Certificate No:
TAS0000420

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Gears

with type designation(s)
RE511, RE512, RE1021, RE2523, RE311, RE521, Brakes F5, F6, F9, F9R

Issued to
Dinamic Oil S.p.A.
Bomporto, MO, **Italy**

is found to comply with
DNV standard DNV-ST-0378 – Offshore and platform lifting appliances

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.
Planetary gear units and brakes for slewing and hoist application. Design Temperature, TD, according to above standard -20 degrees Celsius

Issued at **Høvik** on **2024-07-04**
This Certificate is valid until **2029-07-03**.
DNV local unit: **Italy/Malta CMC**

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

Planetary gears unit with output shaft. If other output speed is required, the number of hours is to be interpolated. Load spectrum and class of utilisation (based on principles according to F.E.M. 1.001 3rd edition) are defined below.

Definition of load spectrum

Class	Load in % of max	Fraction in % of total time	Km
L2	100	2	0.196
	60	65	
	50	23	
	40	10	
L3	100	10	0.276
	70	40	
	50	30	
	20	20	
L4	100	25	0,513
	80	33	
	68	30	
	5	12	

Max allowable torques:

Size	Stage 1	Stage 2	Stage 3	Ratio	Output Speed [rpm]	Max dynamic Torque[Nm]	MAX static Torgue [Nm]	Load spectrum	Lifetime hrs
RE311T	RE310 (R 7,5)			7.5	140	1700	3000	L2/T5/M7	4500
RE511T	RE510 (R 7,5)	-	-	7.5	87.5	3000	6000	L2/T6/M6	6500
RE511T	RE510 (R 7,5)*			7.5	200	2400	7000	L4/T5/M7	3000
RE512T	RE 210 (R 5,77)	RE510 (R 3,6)*	-	21	68	5000	10000	L2/T6/M6	6500
RE 512FS	RE210 (R 5,77)	RE510 (R 5,33)		30.7	117	4000	10000	L4/T5/M7	3000
RE 1021T	RE1020 (R 6,8)	-	-	6.86	400	5000	13000	L3/T4/M5	2000
RE 2523Z	RE510 (R 6,2)	RE1020 (R4,15)	RE2520 (R 4)	103	12	36000	45500	L3/T5/M6	3300
**) R = ratio									

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-0378, the brake torque for the specific application shall be calculated taking into consideration the factor as given in 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)

Brakes type F5, F6, F9 and F9R with static brake torque as given in table below.

BRAKE TABLE F5

	F501	F502	F503	F504	F505	F506	F507	F508
Sintered disk 02941000	3	3	3	3	5	5	5	7
Steel disk 02941001	4	4	4	4	6	6	6	8
No. springs 027010100	4	8	12	15	11	14	16	13
Static Braking Torque (Nm)	110	215	325	405	500	630	720	820
Total opening pressure (Bar)	10	20	30	37,5	27,5	35	40	32,5

BRAKE TABLE F6

	F601	F602	F603	F604	F605	F606	F607	F608	F610	F612	F613
Sintered disk 02941000	3	3	3	3	5	5	7	7	7	8	8
Steel disk 02941001	4	4	4	4	6	6	8	8	8	9	9
No. springs 027010100	4	8	12	15	12	14	11	13	16	16	18
Static Braking Torque (Nm)	110	215	325	405	500	630	690	820	1005	1150	1295
Total opening pressure (Bar)	10	20	30	37,5	27,5	35	27,5	32,5	40	40	45

BRAKE TABLE F9

	F901	F902	F303	F904	F905	F906	F907	F908	F910	F912	F913	F915
Sintered disk 415040400	2	2	2	3	4	4	4	5	5	5	5	5
Steel disk 415030800	3	3	3	4	5	5	5	6	6	6	6	6
No. springs 027010100	7	9	14	12	11	14	16	14	18	21	22	24
Static Braking Torque (Nm)	150	200	300	400	490	20	710	780	1000	1160	1220	1325
Total opening pressure (Bar)	11	14,5	22,5	19	17,5	23	25,5	23	29	33,5	35	38

BRAKE TABLE F9R

	F9R08	R9R09	R9R10	F9R11	F9R12	F9R15	F9R16	F9R22	F9R23	F9R25	F9R28
Sintered disk 415040400	5	8	9	11	9	8	10	13	9	11	13
Steel disk 415030800	6	9	10	12	10	9	11	14	10	12	14
No. springs 027010100	14	10	10	19	13	18	15	15	23	21	20
Static Braking Torque (Nm)	780	880	990	1090	1290	1590	1650	2150	2280	2547	2870
Total opening pressure (Bar)	22,5	16	16	14,5	20,5	28,5	24	24	36,5	33,5	32

The given friction coefficient has not been evaluated.

Manufactured by

Dynamic Oil
Via Togliatti 15
41030 Bomporto MO – Italy

Application/Limitation

1. 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.

2. 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.

3. 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.

4. 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.

Type Approval documentation

Drawings of sun wheels, planets, ring gears, planetary carriers, housing, brakes and shafts.
Detailed calculations for all stages and brakes.

Tests carried out

For issuance of DNV product certificate in accordance with DNV-ST-0378, the gear unit and brake shall be function and load tested, respectively according to Section 14.

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, DNV surveyor shall perform a survey every second year and before expiry date of this certificate in order to verify that the conditions of the type approval are complied with.

END OF CERTIFICATE