

# TYPE APPROVAL CERTIFICATE

**This is to certify:****That the Gears**

with type designation(s)  
**2T709T3099A05-A06, 2T711T3161A08, 2T713C3147011-12, 2T713C3071002,  
MT706T122/125/127/129, 2T707C2046002/2T707C2046A01,  
2T715C3108017/2T715C3108019, MT705T138**

Issued to

**BONFIGLIOLI RIDUTTORI S.P.A.**  
**Calderara di Reno BO, Italy**

is found to comply with

**DNV GL standard DNVGL-ST-0378 – Standard for offshore and platform lifting appliances**

**Application :**

**Gearboxes with failsafe brakes for Slewing System & Hoisting/Luffing Winches applications**

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

Issued at **Høvik** on **2018-03-19**

This Certificate is valid until **2023-03-18**.

for **DNV GL**

DNV GL local station: **Venice**

Approval Engineer: **Chi Wan Bang**

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**Aldo Matteucci**  
**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.



## Product description

The gearboxes with the following information:

| Gearbox                       | Reduction ratio | Application                | Number of stages | Brake              |
|-------------------------------|-----------------|----------------------------|------------------|--------------------|
| 2T709T3099A05-A06             | 1:99,73         | Slewing System             | 3                | 5B                 |
| 2T711T3161A08                 | 1:161,80        | Slewing System             | 3                | 5B-S02A            |
| 2T713C3147011-12              | 1:146,95        | Hoisting / Luffing Winches | 3                | 5W1A47             |
| 2T713C3071002                 | 1:71,00         | Hoisting / Luffing Winches | 3                | 5W1A95             |
| MT706T122 / 125 / 127 / 129   | 1:38,44         | Slewing System             | 2                | 2T236841980        |
| 2T707C2046002 / 2T707C2046A01 | 1:46,53         | Hoisting / Luffing Winches | 2                | 4WXA45 / 5W2A37/47 |
| 2T715C3108017 / 2T715C3108019 | 1:108,12        | Hoisting/Luffing Winch     | 3                | 6W1A102            |
| MT705T138                     | 1:22,67         | Slewing System             | 2                | 5B                 |

## Application/Limitation

- This approval is based on a load sharing factor agreed with Bonfiglioli. The load sharing factor has been proven by testing (see test report QI5.01-05-A.04 Rev.0) for a gearbox 718C3K. This load sharing factor is valid for gearboxes with similar structure.
- Our gear calculations are based on that optimum hardening depths have been achieved according to recognised standards and manufacturer's experience. 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 gears has not been evaluated in this Type Approval. It is assumed that the manufacturer delivers bearings with sufficient capacity for the class of utilization they are intended for.
- The relevance of the class of utilisation and load spectrum is not evaluated by us.
- When a gearbox is delivered for an application according to DNVGL-ST-0378, the brake torque for the specific application shall be calculated taking into consideration the factor as given in [5.2.3.5] respectively except slewing system application gearboxes. (Factor: 1,8 or dynamic factor if this exceeds 1.8 for the application.)
- For braking torques of gearboxes with slewing system applications, the minimum braking torque capacity shall be considered with the dynamic effect on the slewing motion for each time according to the manufacturer's recommendation.
- The friction coefficient has not been evaluated, the value has been provided by the manufacturer.
- 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 where indicated.

### 1) 2T709T3099A05-A06

FEM class : M4 L2 T4 (km=0,228)

Lifetime: 1601 hours

Brake code: 5B

| Phase | Output torque [Nm] | Load in % | Output speed [rpm] | Time phase % | Time length [h] |
|-------|--------------------|-----------|--------------------|--------------|-----------------|
| 1     | 30000              | 100%      | 15                 | 10%          | 160             |
| 2     | 22500              | 75%       | 15                 | 20%          | 320             |
| 3     | 15000              | 50%       | 15                 | 30%          | 480             |
| 4     | 7500               | 25%       | 15                 | 40%          | 640             |

**2) 2T711T3161A08**

FEM class : M3 L2 T3 (km=0,207)  
Lifetime: 1200 hours  
Brake code: 5B-S02A

| Phase | Output torque [Nm] | Load in % | Output speed [rpm] | Time phase % | Time length [h] |
|-------|--------------------|-----------|--------------------|--------------|-----------------|
| 1     | 49600              | 100%      | 9,3                | 9,65%        | 116             |
| 2     | 36208              | 73%       | 12,7               | 20%          | 240             |
| 3     | 22816              | 46%       | 18,6               | 30%          | 360             |
| 4     | 9920               | 20%       | 18,6               | 40,35%       | 484             |

**3) 2T713C3147011-12**

FEM class : M5 L2 T5 (km=0,228)  
Lifetime: 3201 hours  
Brake code: 5W1A47

| Phase | Output torque [Nm] | Load in % | Output speed [rpm] | Time phase % | Time length [h] |
|-------|--------------------|-----------|--------------------|--------------|-----------------|
| 1     | 36800              | 100%      | 26,5               | 10%          | 320             |
| 2     | 27600              | 75%       | 26,5               | 20%          | 640             |
| 3     | 18400              | 50%       | 26,5               | 30%          | 960             |
| 4     | 9200               | 25%       | 26,5               | 40%          | 1280            |

**4) 2T713C3071002**

FEM class : M5 L2 T5 (km=0,199)  
Lifetime: 3201 hours  
Brake code: 5W1A95

| Phase | Output torque [Nm] | Load in % | Output speed [rpm] | Time phase % | Time length [h] |
|-------|--------------------|-----------|--------------------|--------------|-----------------|
| 1     | 38000              | 100%      | 44                 | 5%           | 160             |
| 2     | 28500              | 75%       | 44                 | 25%          | 800             |
| 3     | 19000              | 50%       | 44                 | 30%          | 960             |
| 4     | 9500               | 25%       | 44                 | 40%          | 1280            |

**5) MT706T122 / 125 / 127 / 129**

FEM class : M5 L2 T5 (km=0,228)  
Lifetime: 3250 hours  
Brake code: 2T236841980

| Phase | Output torque [Nm] | Load in % | Output speed [rpm] | Time phase % | Time length [h] |
|-------|--------------------|-----------|--------------------|--------------|-----------------|
| 1     | 8200               | 100%      | 10                 | 10%          | 325             |
| 2     | 6150               | 75%       | 12                 | 20%          | 650             |
| 3     | 4100               | 50%       | 12                 | 30%          | 975             |
| 4     | 2050               | 25%       | 12                 | 40%          | 1300            |

**6) 2T707C2046002 / 2T707C2046A01**

FEM class : M5 L2 T3 (km=0,217)  
Lifetime: 801 hours  
Brake code: 4WXA45 / 5W2A37/47

| Phase | Output torque [Nm] | Load in % | Output speed [rpm] | Time phase % | Time length [h] |
|-------|--------------------|-----------|--------------------|--------------|-----------------|
| 1     | 11950              | 100%      | 72                 | 8%           | 64              |

Job Id: **262.1-024824-1**  
Certificate No: **TAS00001CK**

|   |      |     |    |     |     |
|---|------|-----|----|-----|-----|
| 2 | 8963 | 75% | 80 | 22% | 176 |
| 3 | 5975 | 50% | 90 | 30% | 240 |
| 4 | 2988 | 25% | 90 | 40% | 320 |

**7) 2T715C3108017 / 2T715C3108019**

FEM class : M5 L2 T5 (km=0,156)

Lifetime: 3201 hours

Brake code: 6W1A102

| Phase | Output torque [Nm] | Load in % | Output speed [rpm] | Time phase % | Time length [h] |
|-------|--------------------|-----------|--------------------|--------------|-----------------|
| 1     | 60380              | 100%      | 32,4               | 2%           | 64              |
| 2     | 44983              | 74,5%     | 32,4               | 25%          | 800             |
| 3     | 26869              | 44,5%     | 32,4               | 33%          | 1056            |
| 4     | 12076              | 20%       | 32,4               | 40%          | 1280            |

**8) MT705T138**

FEM class : M5 L2 T5 (km=0,228)

Lifetime: 3300 hours

Brake code: 5B

| Phase | Output torque [Nm] | Load in % | Output speed [rpm] | Time phase % | Time length [h] |
|-------|--------------------|-----------|--------------------|--------------|-----------------|
| 1     | 7000               | 100%      | 8                  | 10%          | 330             |
| 2     | 5250               | 75%       | 8                  | 20%          | 660             |
| 3     | 3500               | 50%       | 12                 | 30%          | 990             |
| 4     | 1750               | 25%       | 12                 | 40%          | 1320            |

## Type Approval documentation

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

## Tests carried out

After completion the gearboxes are to be functionally and pressure tested prior to issuance of a DNVGL product certificate. Final brake capacity is to be verified by testing when brake is fitted.

## Marking of product

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

## Periodical assessment

For retention of the Type Approval, a DNV GL 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 DNVGL-CP-0338.

## END OF CERTIFICATE