DNV·GL

Certificate No:
TAM00000CU

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Turbocharger

with type designation(s)
NRxx/S

Issued to
MAN Diesel & Turbo SE
Augsburg, Germany

is found to comply with
DNV GL rules for classification – Ships
DNV GL rules for classification – High speed and light craft

Application :

The turbochargers are approved for use on internal combustion engines with application data as given in the certificate.
Product approved by this certificate is accepted for installation on all vessels classed by DNV GL.

This Certificate is valid until **2023-05-15**.

Issued at **Hamburg** on **2018-05-16**
DNV GL local station: **Augsburg** for **DNV GL**

Approval Engineer: **Andreas Wolf**

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.

Job Id: **262.1-000554-7**
Certificate No: **TAM00000CU**

Product description

Exhaust driven turbochargers served by cylinder groups with combined maximum power between 670kW and 5400 kW.

Alternative place of production

PBS Turbo s.r.c.
Vikovska 279
595 01 Velká Bites
Czech Republic

MAN Diesel & Turbo China Production Co., Ltd.
Fengming Road 9, Wujin High-Tech Industrial Zone
213164 Changzhou
P.R. China

Application/Limitation:

Compressor wheel tip diameter, maximum allowed operating speed, exhaust gas temperature at turbine entry and power rating:

Turbocharger type		N_{max} (rpm)	T_{max} (°C)	P_{max} (kW)
NR12/S		75000	720	670
NR14/S		62200	720	950
NR17/S		52600	720	1350
NR20/S		44700	720	1870
NR24/S		37300	720	2690
NR29/S		31300	720	3820
NR34/S		26300	720	5400

Maximum compressor ratio for all NRxx/S types: 4.5

Alarm Levels:

Overspeed, maximum alarm level: 0.97 n_{max}.
High exhaust temperature at turbine entry, maximum alarm level: T_{max} [1)]

Low lubrication oil pressure at turbocharger inlet, minimum alarm level (gauge pressure):
Normal operation and full engine load: 1.3 bar < p_{oil} ≤2.2 bar
Alarm and reduction to engine half load (50% MCR) [2)]: ≤ 1.0 bar
Engine shut down: < 0,8 bar

Maximum lubrication oil outlet temperature[3)]: 105°C
Maximum lubrication oil outlet temperature alarm level: acc. engine commissioning log

[1)]can be found on the type plate
[2)]in case the engine control makes this possible
[3)]only required for turbochargers served by cylinder groups with combined power > 2500 kW

Application constraints:

Maximum allowable vibration level:

Frequency range (Hz)	Measurement locations	Acceleration (g)
0-300	Flange compressor casing	2
2-300	Silencer front wall	5
2-600	Flange compressor casing and silencer front wall	0.8 (limit of single order)

Allowable inclination of turbocharger that may occur during operation:

Direction of turbocharger	Maximum allowable angle of inclination, static (continous)	Maximum allowable angle of inclination, dynamic (short time)
List (athwartships)	±15°	
Trim (fore and aft)	±10°	
Rolling (athwartships)		0° ± 22.5°
Pitching (fore and aft)		0° ± 10°

Type Approval documentation

Tests carried out

Test report, dated:

1996-03-06	NR29/S
1996-05-14, 1996-10-15	NR 34/S
1997-09-02, 1997-09-04	NR 12/S
1998-03-05	NR14/S
1999-04-21	NR24/S
1999-04-21	NR20/S
2001	NR34/S

Marking of product

The product to be marked with manufacturer’s name or trademark and type number identification.

Periodical assessment

Periodical assessment is to be performed after 2 years and after 3.5 years. 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.

In cases where the type approved product is manufactured at other companies, periodical assessments shall be carried out randomly at these companies. All companies shall be assessed at least once in the period of validity of the TA certificate.

This will be according to Class Guideline DNVGL-CG-0338, Section 4.

Other conditions

Turbochargers are categorized in three categories depending on power served by each turbocharger: Category A = ≤ 1000 kW, Category B = > 1000 kW and ≤ 2500 kW, Category C = >2500 kW.

Turbochargers shall be delivered with a product certificate issued by the manufacturer (category B) or by the class society (category C). For turbochargers of category A an certificate is not mandatory.

This Type Approval Certificate replaces DNV TAC M-12228 and GL TAC's 14 934-99 HH and 14 575-15 HH.

END OF CERTIFICATE