



Certificate No:
TAM000017Z

TYPE APPROVAL CERTIFICATE

This is to certify:

That the **Turbocharger**

with type designation(s)
TCTxx

Issued to

MAN Energy Solutions 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. Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Issued at **Hamburg** on **2022-03-04**

This Certificate is valid until **2027-03-03**.

DNV local station: **Augsburg**

for **DNV**

Approval Engineer: **Andreas Wolf**

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Olaf Drews
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.



Form code: TA 251

Revision: 2021-03

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Product description

Exhaust driven turbochargers served by cylinder groups with combined maximum power up to 17,500 kW.

Alternative place of production

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

MAN Energy Solutions China Production., Ltd.
Fengming Road 9, Wujin High-Tech Industrial Zone
213164 Changzhou
P.R. China

Application/Limitation

Maximum allowed operating speed, exhaust gas temperature at turbine entry and power rating:

Turbocharger type		Max. operating speed $N_{\max}$ rpm	Max. temperature before turbine (test conditions) °C	Max. engine output kW	Category
TCT 30		24,000	520 (550)	7.500	C
TCT 40		21,350	520 (550)	11.000	C
TCT 50		18,950	520 (550)	14.000	C
TCT 60		16,900	520 (550)	17.500	C

Maximum compressor ratio for all TCTxx types: 5.1

ALARM LEVELS:

Overspeed, maximum alarm level: $0.97 n_{\max}$.
High exhaust temperature at turbine entry, maximum alarm level: $T_{\max}$
Low lubrication oil pressure at turbocharger inlet, minimum alarm level (gauge pressure):

Lubrication oil inlet temperature: 40 - 75 °C
Maximum outlet temperature: 115°C
Alarm oil outlet temperature (Δ inlet temperature/outlet temperature): ≤ 40 °C
Lubrication oil inlet pressure (normal operation): 1.3-2.2 bar
Alarm actuates at: < 1.3 bar
Reduction to engine half load: < 1.0 bar
Engine shut down: < 0.8 bar

Application constraints:

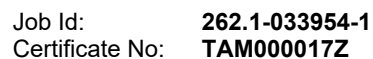
Frequency range 2-200 Hz

Vibration limit values, measurement on the silencer front plate:

Type:	mm/s	g
TCT30	45	2,6
TCT40	45	2.0
TCT50	45	1.7
TCT60	45	1.6

Vibration limit values, measurement on the flange of the compressor casing / silencer:

Type:	mm/s	g
TCT30	35	2,0
TCT40	35	1.6



Vibration limit values, measurement on the bearing casing:

Allowable inclination of turbocharger that may occur during operation:

[illegible]



Job Id: 262.1-033954-1
Certificate No: TAM000017Z

[illegible]

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, 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

This Type Approval covers the mechanical parts of the TCTxx turbochargers. For TCTxx turbochargers with electronically controlled VTA (Variable Turbine Nozzle Ring) system, the Type Approval shall be used together with the corresponding and valid DNV Type Approval Certificate for the control system of the VTA system, or a separate approval of this control system on a case-by-case basis.

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.

END OF CERTIFICATE