

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Turbocharger**with type designation(s)
TPC

Issued to

ABB Turbo Systems AG
Baden, AG, Switzerland

is found to comply with

DNV GL rules for classification – Ships**DNV GL rules for classification – High speed and light craft****Application :****Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.****The turbochargers are approved for use internal combustion engines with application data as given in the certificate.**Issued at **Hamburg** on **2019-04-04**This Certificate is valid until **2024-04-03**.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.



Product description

Exhaust driven turbochargers served by cylinder groups with combined power in the range less than 2500 kW

Alternative place of production

ABB Jiangjin Turbo Systems Co. Ltd

No. 23, Dong Jiang Lu, Degan Jie Dao Degan (Industrial Zone), Jiangjin District
Chongqing, 4002284, P.R. China

Application/Limitation

The turbochargers are approved for the following maximum temperatures and shaft speeds:

Type	Compressor wheel tip diameter (mm)	$N_{\max}$ (s ⁻¹)	$T_{\max}$ (° C)
TPC 47 – A13	158.6	1132	750
TPC 47 – A32	158.6	1132	750
TPC 47 – A33	158.6	1132	750
TPC 49 – A13	181.28	990	750
TPC 49 – A32	181.28	990	750
TPC 49 – A33	181.28	990	750

The stated speeds and temperatures are maximum allowed values for continuous load applications. For cyclic load applications the ratings shall be corrected according to ABB's SiKo instructions.

Maximum allowable compressor pressure ratio for all RR types: 3.5

ALARM LEVELS:

Overspeed	
Condition:	Alarm level:
$N_{M\max} \geq 1.02 \times N_{B\max}$	$N_{\text{Alarm}} \geq 1.02 \times N_{B\max}$
$1.01 \times N_{B\max} \leq N_{M\max} < 1.02 \times N_{B\max}$	$N_{\text{Alarm}} = N_{B\max}$
$N_{B\max} \leq N_{M\max} < 1.01 \times N_{B\max}$	$N_{\text{Alarm}} \geq 0.99 \times N_{B\max}$

$N_{M\max}$ is the turbocharger operational limit at 110% short duration engine load as stated on the rating plate.

$N_{B\max}$ is the turbocharger operational limit at 100% engine load, as stated on the rating plate.

N_{Alarm} is the application dependent alarm level value based on ABB's SiKo and HCF safety concept.

The overspeed alarm value shall be specified in the individual turbocharger DNV Product Certificate.

High exhaust temperature at turbinet entry, maximum alarm level: $T_{M\max} - 15^\circ\text{C}$

$T_{M\max}$ is the turbocharger operational limit at engine overload (110%), as stated on the rating plate

Low lubrication oil pressure at turbocharger inlet, minimum alarm level: 1.25 bar (gauge pressure) and according to the engine builder's manual, section 4 "oil supply".

Type Approval documentation

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. The main scope of the Periodical Assessment will normally include:

- Verification of the Type Approval applicant's production and quality system w.r.t. ensuring continued consistent production of the Type Approved products at the Type Approval applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the Type Approval documentation and that this is still used as basis for the production
- Review of possible changes to the design, the material and the performance of the product
- Verification of the product marking.

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 certificate replaces DNV TAC M12035 and GL TAC 20 082 - 04 HH.

END OF CERTIFICATE