DNV·GL

Certificate No:
TAM00000F4

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Turbocharger

with type designation(s)
Power2 3xx-H/M

Issued to
ABB Turbo Systems Ltd
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 :

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 GL.

Issued at **Høvik** on **2017-11-23**
This Certificate is valid until **2022-11-22**.
DNV GL local station: **Augsburg**

Approval Engineer: **Andreas Wolf**

for **DNV GL**

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.

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Job Id: **262.1-011042-6**
Certificate No: **TAM00000F4**

Product description

Exhaust driven turbochargers served by cylinder groups with combined power in the range up to 2700 kW

Power2 Designation	High pressure stage	Low pressure stage
A340-H/M	P135	Z140

Alternative place of production

ABB Turbo Systems Ltd
Weierstrasse 5
CH-5313 Klingnau
Switzerland

ABB Jiangjin Turbo Systems Co ., Ltd.
No. 23 Dong Jiang Lu, Degan Jie Dao
Degan Industrial Zone, Jiangjin
Chongqing 402284
P.R. China

Application/Limitation

Max. operation speed and exhaust gas temperature for P100-H/M turbochargers:

Turbocharger Type (high pressure stage)		**Turbine Type**	**Compressor Type**	**Compressor wheel diameter (mm)**	**Nmax (1/s)**	**Tmax (C°)**
P135	-H45	TV10	CV11	176.00	854	700 at gas inlet of 2-stage turbocharging system (inlet of P100 high pressure turbine)
	-M45					

Max. operation speed and exhaust gas temperature for Z100-H/M turbochargers:

Turbocharger Type (low pressure stage)		**Turbine Type**	**Compressor Type**	**Compressor wheel diameter (mm)**	**Nmax (1/s)**	**Tmax (C°)**
Z140	-H74	TV01	CV15	244.73	715	700 at gas inlet of 2-stage turbocharging system (inlet of P100 high pressure turbine)
	-M74					
	-H75		CV10	257.00	678	
	-M75					

The stated speeds and temperatures are the highest allowed values and should not be exceeded at any time, nor at engine overload (110%). For each specific application, the ratings shall be corrected according to ABB's SiKo instructions.

Maximum allowable compressor ratio:
P135 & Z140
Full load continous at N_{Bmax}: 8.0
Short duration at N_{Mmax}: 10.0

ALARM LEVELS:
Overspeed, maximum alarm level: $\mathbf{N_{Alarm} \leq 0.99\ N_{Mmax}}$
N_{Mmax} is the turbocharger operational limit at engine overload, as stated on the rating plate.
N_{Alarm} is the application dependent alarm level value based on ABB's SiKo and HCF safety concept.

High exhaust temperature at turbine entry, maximum alarm level: $\mathbf{T_{Mmax}}$ **-15°C**.
T_{Mmax} is the turbocharger operational limit at engine overload, as stated on the rating plate.

Minimum lubrication oil pressure at turbocharger inlet (alarm level): **1.25 bar** (gauge pressure)

Maximum lubrication oil outlet temperature (alarm level): **155°C**
max 105°C lubrication oil temperature at inlet
max temp. increase measured at lub. oil outlet: 50°C

Application constraints
Maximum allowable vibration level (both self- and externally induced):
P135:
Frequency range: 10-300Hz
Velocity: 45 mm/s
Acceleration: 29 m/s^2
Z140:
Frequency range: 10-300Hz
Velocity: 50 mm/s
Acceleration: 29 m/s^2

Allowable inclination of turbocharger that may occur during operation is limited to ±25° in lateral and ±25° in longitudinal directions.

Tests carried out
Type Approval test of Power2 340-H/M turbocharging system, dated 2011-03-03/04
Type Approval test report no. HZX-VB 09633, dated 2011-04-01

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 certificate replaces DNV TAC M-11914 and GL TAC 19247-11HH.

END OF CERTIFICATE