

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Turbocharger**with type designation(s)
A1xx-H/M

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 :****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 **Hamburg** on **2018-05-24**This Certificate is valid until **2023-05-23**.DNV GL local station: **Augsburg**Approval Engineer: **Sven Neddenien**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.



Product description

Exhaust driven turbochargers served by cylinder groups with combined power in the range 500 kW to 5220 kW

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

Maximum operational speed and exhaust gas temperature for turbochargers:

Turbocharger Type	Turbine Type	Compressor Type	n_{max} (1/s)	T_{max} (C°)
A130-H/M	TV01	CV01	1095	750 for turbine casings with one gas inlet 700 for turbine casings with multiple gas inlets
		CV02	1095	
		CV03	1042	
		CV16	1016	
	TV02	CV01	1095	
		CV02	1095	
		CV03	1042	
		CV16	1016	
	TV03	CV01	1095	
		CV02	1095	
		CV03	1042	
		CV16	1016	
	TV04	CV01	1042	
		CV02	1042	
		CV03	1042	
		CV16	1016	
	TV05	CV01	1095	
		CV02	1095	
		CV03	1042	
		CV16	1016	
	TV11	CV01	1095	
		CV02	1095	
		CV03	1042	
		CV16	1016	
	TV12	CV01	1042	
		CV02	1042	
		CV03	1042	
		CV16	1016	

Turbocharger Type	Turbine Type	Compressor Type	n _{max} (1/s)	T _{max} (C°)
A135-H/M	TV01	CV01	917	750 for turbine casings with one gas inlet 700 for turbine casings with multiple gas inlets
		CV02	917	
		CV03	873	
		CV16	851	
	TV02	CV01	917	
		CV02	917	
		CV03	873	
		CV16	851	
	TV03	CV01	917	
		CV02	917	
		CV03	873	
		CV16	851	
	TV04	CV01	873	
		CV02	873	
		CV03	873	
		CV16	851	
	TV05	CV01	917	
		CV02	917	
		CV03	873	
		CV16	851	
	TV11	CV01	917	
		CV02	917	
		CV03	873	
		CV16	851	
	TV12	CV01	873	
		CV02	873	
		CV03	873	
		CV16	851	

Turbocharger Type	Turbine Type	Compressor Type	n _{max} (1/s)	T _{max} (C°)
A140-H/M	TV01	CV01	750	750 for turbine casings with one gas inlet 700 for turbine casings with multiple gas inlets
		CV02	750	
		CV03	714	
		CV16	696	
	TV02	CV01	750	
		CV02	750	
		CV03	714	
		CV16	696	
	TV03	CV01	750	
		CV02	750	
		CV03	714	
		CV16	696	
	TV04	CV01	714	
		CV02	714	
		CV03	714	
		CV16	696	
	TV05	CV01	750	
		CV02	750	
		CV03	714	
		CV16	696	

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A140-H/M	TV11	CV01	750	
		CV02	750	
		CV03	714	
		CV16	696	
	TV12	CV01	714	
		CV02	714	
		CV03	714	
		CV16	696	

Turbocharger Type	Turbine Type	Compressor Type	N_{max} (1/s)	T_{max} (C°)
A145-H/M	TV01	CV01	629	750 for turbine casings with one gas inlet 700 for turbine casings with multiple gas inlets
		CV02	629	
		CV03	599	
	TV02	CV01	629	
		CV02	629	
		CV03	599	
	TV03	CV01	699	
		CV02	699	
		CV03	599	
	TV04	CV01	599	
		CV02	599	
		CV03	599	
	TV05	CV01	699	
		CV02	699	
		CV03	599	
	TV11	CV01	629	
		CV02	629	
		CV03	599	
	TV12	CV01	599	
		CV02	599	
		CV03	599	

Turbocharger Type	Turbine Type	Compressor Type	n_{max} (1/s)	T_{max} (C°)
A150-M	TV11	CV01	-	750 for turbine casings with one gas inlet 700 for turbine casings with multiple gas inlets
		CV02	-	
		CV03	-	
		CV16	-	
	TV12	CV01	-	
		CV02	-	
		CV03	561	
		CV16	547	
		CV26	550	
	TV01	CV01	-	
		CV02	-	
		CV03	561	
		CV16	547	
		CV26	550	

Turbocharger Type	Turbine Type	Compressor Type	Nmax (1/s)	Tmax (C°)
A155-M	TV11	CV01	-	750 for turbine casings with one gas inlet
		CV02	-	
		CV03	-	
		CV16	-	
	TV12	CV01	-	700 for turbine casings with multiple gas inlets
		CV02	-	
		CV03	472	
		CV16	460	

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:
Full load continuous at N_{Bmax} : 6.0
Short duration at N_{Mmax} : 6.5

Alarm levels:

Overspeed	
Condition:	Alarm level:
$N_{Mmax} \geq 1.02 \times N_{Bmax}$	$N_{Alarm} \geq 1.02 \times N_{Bmax}$
$1.01 \times N_{Bmax} \leq N_{Mmax} < 1.02 \times N_{Bmax}$	$N_{Alarm} = N_{Bmax}$
$N_{Bmax} \leq N_{Mmax} < 1.01 \times N_{Bmax}$	$N_{Alarm} \geq 0.99 \times N_{Bmax}$

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

N_{Bmax} 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 turbine entry, maximum alarm level: $T_{Mmax} - 15^{\circ}\text{C}$.

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 (105°C lubrication oil temperature at inlet)

Application constraints:

Maximum allowable vibration level:

Frequency range: 10 - 300Hz

Velocity: 50 mm/s

Acceleration: 29m/s^2 ($\approx 3g$)

Maximum allowable inclinations:

Lateral: $\pm 25^{\circ}$

Longitudinal: $\pm 15^{\circ}$

Longitudinal: $\pm 25^{\circ}$ under special conditions acc. to the Engine Builder Manual



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Type Approval documentation



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Material specifications:

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Technical documentation:

Containment verification:

This certificate replaces the following certificates:

- DNV M-12394
- GL 58538-08 HH
- DNVGL 20105-11 HH

Tests carried out

Type test of A140-H61 Turbocharger: 2007-12-12 Report: HZX-VB 9067

Marking of product

The product is 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 a certificate is not mandatory.

END OF CERTIFICATE