

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Turbocharger**

with type designation(s)
A1xx-L & A2xx-L

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 :

Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.

The turbochargers are approved for use on diesel engines with application data as given in the certificate.

This Certificate is valid until **2022-04-05**.

Issued at **Hamburg** on **2017-04-06**

DNV GL local station: **Augsburg**

for **DNV GL**

Approval Engineer: **Andreas Wolf**

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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:
Certificate No: **TAM00000AH**

Product description

Exhaust driven turbochargers served by cylinder groups with combined power in the range up to 30000 kW

Alternative place of production

ABB Turbo Systems Ltd
Bruggerstrasse 71a
CH-5401 Baden
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 A1xx-L turbochargers:

Turbocharger Type		Turbine Type	Compressor Type	Compressor wheel diameter (mm)	Nmax (1/s)	Tmax (C°)
A160-L	-	TV23	CV32	356.000	510	550
	-		CV33	356.000	510	
	-		CV36	380.920	477	
A165-L	-32	TV08	CV06	445.997	410	550
	-34		CV07	481.667	382	
	-35		CV08	499.516	382	
	-37		CV09	499.516	374	
	-32	TV09	CV06	445.997	395	550
	-34		CV07	481.667	382	
	-35		CV08	499.516	382	
	-37		CV09	499.516	374	
A170-L	-32	TV08	CV06	514.135	355	550
	-34		CV07	555.266	331	
	-35		CV08	575.831	331	
	-37		CV09	575.831	324	
	-32	TV09	CV06	514.135	343	550
	-34		CV07	555.266	331	
	-35		CV08	575.831	331	
	-37		CV09	575.831	324	
A175-L	-32	TV08	CV06	619.440	295	550
	-34		CV07	668.995	275	
	-35		CV08	693.773	275	
	-37		CV09	693.773	269	
	-32	TV09	CV06	619.440	285	550
	-34		CV07	668.995	275	
	-35		CV08	693.773	275	
	-37		CV09	693.773	269	
A180-L	-34	TV08	CV07	755.964	243	550
	-35		CV08	783.963	243	
	-37		CV09	783.963	238	

Job Id:
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A185-L	-34	TV09	CV07	755.964	243	550
	-35		CV08	783.963	243	
	-37		CV09	783.963	238	
	-34	TV08	CV07	842.934	218	550
	-35		CV08	874.154	218	
	-37		CV09	874.154	213	
	-34	TV09	CV07	842.934	218	550
	-35		CV08	874.154	218	
	-37		CV09	874.154	213	
A190-L	-34	TV08	CV07	929.903	198	550
	-35		CV08	964.344	198	
	-37		CV09	964.344	194	
	-34	TV09	CV07	929.903	198	550
	-35		CV08	964.344	198	
	-37		CV09	964.344	194	

Max. operation speed and exhaust gas temperature for A2xx-L turbochargers:

Turbocharger Type	Turbine Type	Compressor Type	Compressor wheel diameter (mm)	Nmax (1/s)	Tmax (C°)
A265-L	TV08	CV21	499.516	361	550
	TV09	CV21	499.516	361	550
A270-L	TV08	CV21	575.831	313	550
	TV09	CV21	575.831	313	550
A275-L	TV08	CV21	693.773	260	550
	TV09	CV21	693.773	260	550
A280-L	TV08	CV21	783.963	230	550
	TV09	CV21	783.963	230	550

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} : 5.1
Short duration at N_{Mmax} : 5.6

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 DNVGL 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.

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

Maximum lubrication oil outlet temperature (alarm level):
100°C (45°C lubrication oil temperature at inlet)
120°C (85°C lubrication oil temperature at inlet)

Application constraints

Allowable inclination of turbocharger that may occur during operation is limited to $\pm 15^\circ$ in lateral and longitudinal directions continuously and to $\pm 22.5^\circ$ temporary.

Maximum allowable vibration level (both self- and externally induced) has to be within the specified limits given in ABB's "Engine Builder Manual"

Tests carried out

Type test of A175-L Turbocharger 2008-11-28 Report: HZX-VB 9207

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

This Type Approval covers the mechanical parts of the A1xx-L turbochargers. For A1xx-L turbochargers with electronically controlled VTG (Variable Turbine Geometry) system, the Type Approval shall be used together with the corresponding and valid DNVGL Type Approval Certificate for the control system of the VTG 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) and by the class society (category C). For turbochargers of category A an certificate is not mandatory.

END OF CERTIFICATE