

Inspection of Compressor wheel surface hardness		No.077	
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		CHECKED	
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ENGINE TYPE	NA, TCA Turbochargers	DATE	2012/2/29
<p>Parts replacement criterion was already informed in our Techno News No.6 for NA turbochargers; however, occasionally poor performance or total breakdown of turbocharger is reported. In some of these cases, the replacement criterion for key components such as compressor wheel or turbine blade was not followed. In this technical news, the compressor wheel damage is highlighted.</p> <p>The compressor wheel is made of a heat resistance aluminum alloy, but its hardness drops corresponding to exposing temperature and time as its characteristic. Further the dropping rate increases corresponding to temperature level and time, accordingly to intake air temperature, regular engine load, and running hours. If the compressor wheel is operated in significantly low hardness condition for long time, it shall breakdown. In worst case, it shall lead to the total breakdown of the turbocharger.</p> <p>Recommended hardness measuring position and the sample photo of the damaged compressor wheel are shown in next page. It is recommended to check if the hardness fulfills the <b>Minimum allowable surface hardness 105 HB</b> at every overhauling.</p> <p>Besides, TCA turbochargers are also recommended to follow inspection and replacement procedure for compressor wheel and turbine blade based on Techno News No.6, which describes about NA turbocharger.</p> <p>Besides, technical information for the TCA turbochargers have not been published yet; however, inspection is strongly recommended for the compressor wheel and turbine blade referring to item [Compressor wheel], and [Turbine blade] in Techno News No.6 for NA turbocharger.</p> <p>1<sup>st</sup> revised: 4<sup>th</sup> Dec.2015 / update of damage samples  2<sup>nd</sup> revised: 31<sup>st</sup> Oct.2019 / update of measurement points of compressor wheel</p>			
<b>PRIORITY</b>			
IMMEDIATELY <input type="checkbox"/>	EARLIEST CHANCE <input type="checkbox"/>	DRY DOCK <input type="checkbox"/>	

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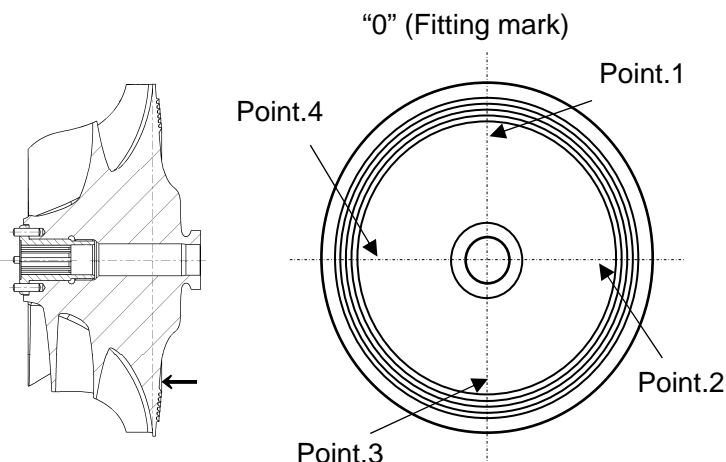
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## 1. Measurement position for surface hardness

Measured surface hardness should be evaluated in average measured at 4 points at backside disk and inside of Labyrinth part that highlighted by arrow in sketch below. A portable measuring instrument can be used for this inspection.



(Important)

Check parameters at your measuring instrument.

Material : Aluminum alloy

Scale : HB

**Minimum limit : 105 HB**

**Measuring interval: Every overhaul**

\* Correct hardness cannot be measured, if measured at other position above mentioned.

## 2. Trouble experiences due to lack of surface hardness on compressor wheel (1)

Turbocharger type : NA70/TM9

Running hour : approx. 101,000 hrs (16 years after delivery)



Measured hardness on compressor wheel : **83 HB**

Blade at the part on air outlet side had been damaged. Dent marks with crack had occurred due to impact of the fractured blade.

### 3. Trouble experiences due to lack of surface hardness on compressor wheel (2)

Turbocharger type : NA57/TO9

Running hour : approx. 103,000 hrs (16 years after delivery)



Measured hardness on compressor wheel : **92 HB**

- Cracks occurred on some blades on compressor wheel → Blades had partly damaged
- unbalance of rotor shaft → compressor wheel contacted to shroud casing
- Shroud was damaged
- Big vibration of silencer and compressor casing → Shroud casing fractured
- Connected part of compressor casing and bearing casing was fractured due to the shock

The condition of “reduction of hardness” could be influenced due to engine operation condition / environment and maintenance situation etc. Therefore, in order to use the turbocharger safely, it is recommended to plan and to carry out the inspection and maintenance regularly and to measure the hardness on compressor wheel by all means regardless of the actual using hours.