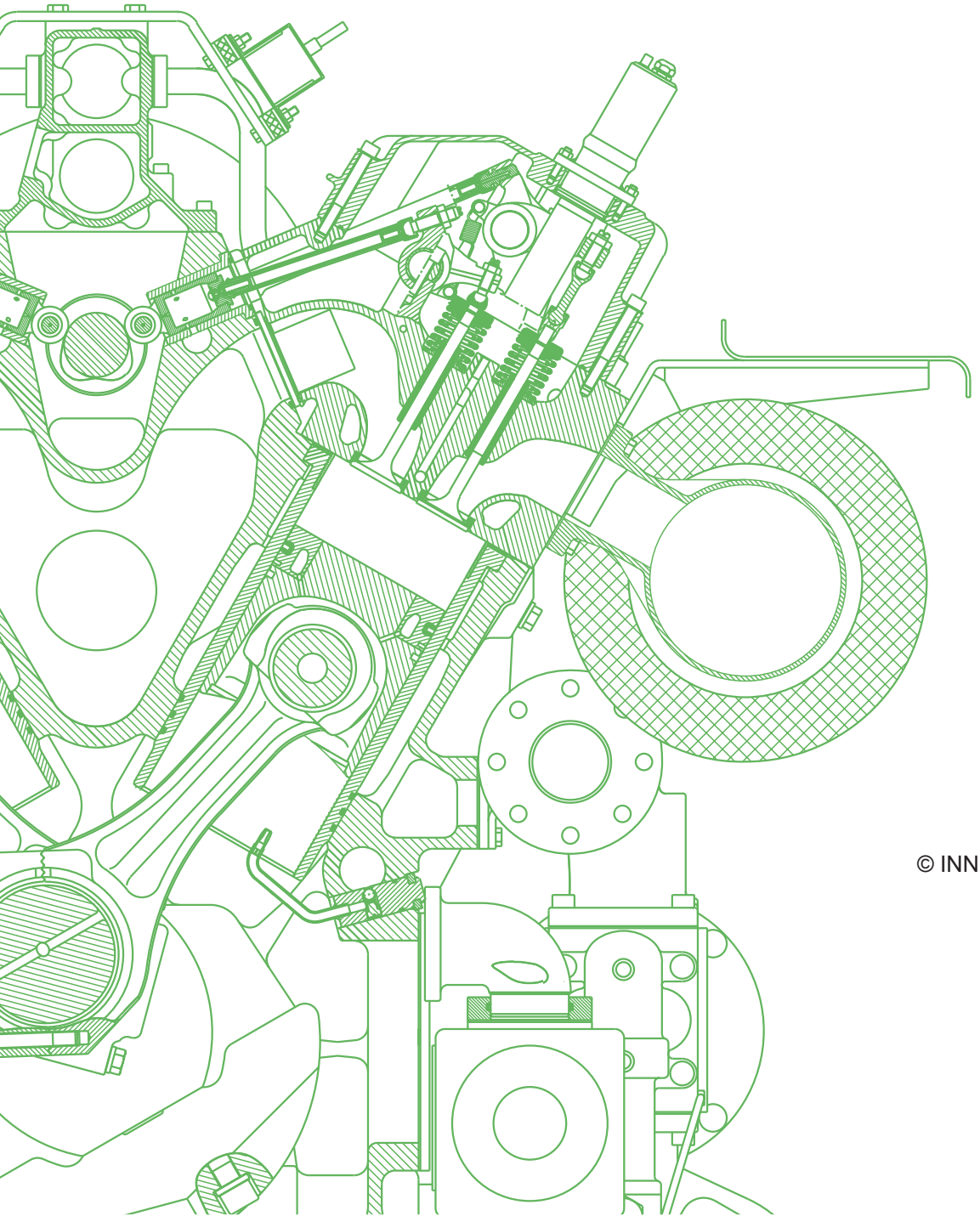
JENBACHER

TA 1902-0228E/F/J

Technical Instruction

Tightening torques for type J 6... engines, versions GS-E/F/J



Achenseestr. 1-3
A-6200 Jenbach, Austria
www.innio.com

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1 Scope

This Technical Instruction (TA) applies to the following Jenbacher Gas Engines:

- Type 6 engines, versions E/F/J

2 Purpose

This Technical Instruction (TA) describes the tightening torques for gas engine components.

3 Additional information

Drip some fresh engine lubricating oil on the screw thread and sealing faces of screws and bolts which are not secured using Loctite!

Observe TI 000-00-003!

When tightening torques and angular displacements are given, always tighten the bolts crosswise to the specified tightening torque first, then check them, and only then tighten them through the angular displacement. Document and check the angular displacement by marking the bolt with a vertical dash before the final tightening.

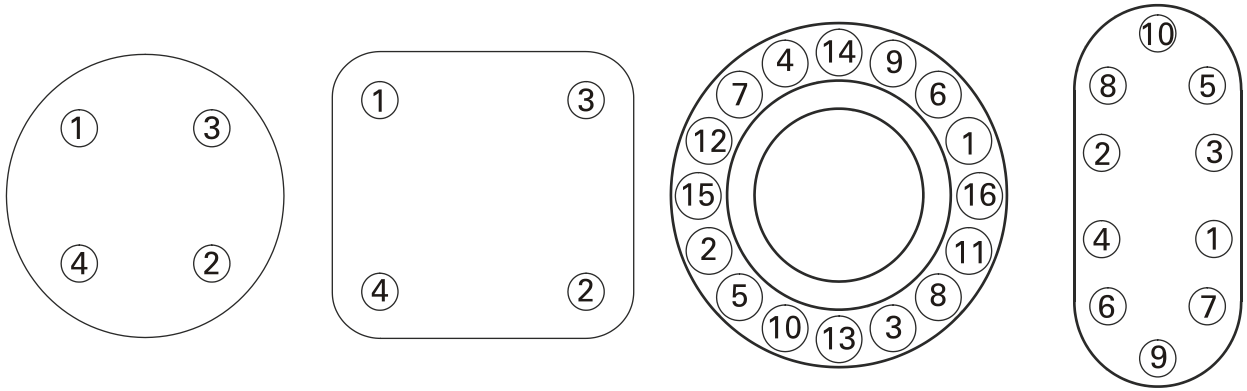
4 Tightening torques

It is absolutely essential to always keep to the specified order/priority of tightening methods:

1. **Hydraulic tightening**
2. **Tightening torque with angular displacement**
3. **Tightening torque**

If 2 methods are given, the preferred method should be used unless there are problems with tool availability or with access.

Always tighten bolts crosswise, changing frequently between bolts (see illustration).



Unless different tightening torques are specified in greater detail for rigid bolts, the values in the table below apply in [Nm].

Tightening torques for rigid bolts in [Nm]

Thread	Grade 8.8	Grade 10.9
M8	23	31
M10	44	64
M12	80	110
M16	190	260
M18	260	370
M20	370	520
M24	620	880
M27	930	1320

Tightening torques for rigid bolts in [Nm]

Thread	Grade 8.8	Grade 10.9
M30	1280	1770

Special bolts are covered by the following values

Designation	Drawing No. Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Big-end bolts	E 16452 02 00 07 1204374 (NEW) J 0702 202 02 07 184310 (OLD)	M16 x 1.5 x 126 (12.9)	----	----	For details, see the section ⇨ Big-end bolts	
Balance weight bolt (OLD)	J 0767 03 01 06 216192	M24 x 1.5 x 150	190/60°	140/60°	Assembled using the rotation angle method, secured using LOCTITE® 243™	
Cap screw with collar for counterweight (NEW)	J 0759 03 01 06 304063	M24 x 1.5 x 145 (10.9)	190/60°	140/60°		
Sealing pin for oilway in crankshaft	J 0759 903 01 10 427687	M18 x 1.5 x 70 (10.9)	150	111	Secured using LOCTITE® 243™	

Designation	Drawing No. Part No.	Thread	Torque Nm	 lbf.ft	Note	Graphical representation
Hexagonal head bolt with collar for vibration damper mounting (J620)	J 0759 203 00 09 304741	M16 x 1.5 x 110 (10.9)	290	214		
Cap screw with collar for vibration damper mounting (J612 and J616)	J 0757 603 00 09 304035	M18 x 1.5 x 85 (10.9)	420	310		
Hexagon-head bolt with collar for mounting the flywheel	J 0759 103 00 05 309657	M18 x 1.5 x 62 (10.9)	420	310	Secured using LOCTITE® 243™	
Flywheel ring gear bolt	100475	M12 x 40	80	59	Secured using LOCTITE® 243™	

Designation	Drawing No. Part No.	Thread	Torque Nm	 lbf.ft	Note	Graphical representation
Main bearing stud	J 0759 05 01 05 229865	M33 x 2 x 400	800	590	**Material 10.9**	
	J 0758 705 01 05 351504				**Material 12.9**	
Main bearing nut With hydraulic power system Manufacturer ITH – part no. 426567 (Kit Part no. 373279)	J 0759 05 01 06 229867	M33 x 2			**With material 12.9:** 1189 bar, stud elongation: 1.30 mm Permanent strain: 0.95 - 1.00 mm **With material 10.9:** 846 bar, stud elongation: 0.76 mm Permanent strain: 0.58 - 0.62 mm For details regarding the **manual** measurement of the remaining expansion specified here, see Section ⇨ Main bearings	
Cylinder head stud	388586	M30 x 2 x 448 (10.9)	85	63		
Cylinder head nut	J 0702 05 01 06 119730	M30x2				
With hydraulic power system Manufacturer ITH – part no. 426567 (Kit Part no. 373279)					675 bar, permanent strain: 0.8. ±0.03 mm For details regarding the **manual** measurement of the remaining expansion specified here, see Section ⇨ Cylinder head	
With the Schaaf hydraulic tool (hydraulic cylinder no. B3401EG04)					For details, see the section ⇨ Schaaf hydraulic tool	

Designation	Drawing No. Part No.	Thread	Torque Nm	 lbf.ft	Note	Graphical representation
Hexagon socket-head cap screw (lateral tie bolt)	J 0759 605 01 07 304055	M27 x 2 x 200	200/ 90°	148/ 90°	Mounted using angular displacement method	
Hexagon head bolt (lateral tie bolt)	J 0758 705 01 07 351505	M27 x 2 x 200 (10.9)	400/ 120°	295/ 120°	Mounted using angular displacement method	
Stud for rocker arm support	J 0702 06 00 28 119726	M16 x 196	105	77	Secured using LOCTITE® 243™	
	J 0759 706 00 16 301923	M16 x 176				
Stud for prechamber retaining bracket	J 0752 106 01 10 122482	M10 x 140	12	9		
Stud for prechamber retaining bracket	E1 7562 06 01 10 9022649	M10x11 6	12	9	"H" cylinder head	

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Nut for stud for prechamber retaining bracket	101817	M10	40	30	Apply the tightening torque alternately in 3 steps: 1st step: 10 Nm 2nd step: 20 Nm 3rd step: 40 Nm	 *"F" cylinder head* *"H" cylinder head*
Sealing pin for endoscopy bore	431306	M16	80	59	Sprayed with Ultratherm	
Sealing pin for endoscopy bore	431307	M16	80	59	Sprayed with Ultratherm "H" cylinder head	

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Sealing pin for indicator bore	542208	M18 x 1.5	25	18.4	Sprayed with Ultratherm	
Sealing pin for indicator bore	542209	M18 x 1.5	25	18.4	Sprayed with Ultratherm "H" cylinder head	
Spark plug in cylinder head	436782	M18 x 1.5	30	22	Denso 518 Injected with Never-Seez®	
	1236099		40	30	P611 injected with Ultratherm (except with natural gas applications with brass-copper ferrule)	

Designation	Drawing No. Part No.	Thread	Torque Nm	 lbf.ft	Note	Graphical representation
Prechamber gas valve	433894/389588	M12 x 1.5	30	22	Series prechamber gas valve	
	321631		20	15	Prechamber gas valve for high O_2 content in the gas	
Prechamber gas valve	1239066 (7J-V17)	M10 x1	35	26	"H" cylinder head	
	9029070 (7J-V16+)		35	26		
	8000262 (7J-V16)		30	22		
Sleeve for engine lifting equipment	J 0759 11 00 09 285657	M30 x 2	650	479		

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Bolt for engine lifting equipment	194194	M30 x 2 x 70	650	479		
Cap screw for inlet rocker arm shaft	101615	M16	140	103	Secured using LOCTITE® 222	
Nut for stud on exhaust rocker arm support	101849 (NEW) 101829 (OLD)	M16	140	103		

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Hexagonal nut for valve adjustment screw - inlet valve	161400 (NEW) 113793 (OLD)	M12 x 1.5	80	59		
Hexagonal nut (at valve push rod) for valve adjustment screw - inlet valve	113807 (NEW) 113798 (OLD)	M14 x 1.5	80	59		
Hexagonal nut for valve adjustment screw – exhaust valve	113807 (NEW) 113798 (OLD)	M14 x 1.5	80	59		
Bolt for rocker cover	411183 (NEW) 101610 (OLD)	M12 x 150 M12 x 100	40	30		

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Bolt for rocker cover	115249	M12 x 45	40	30		
Bolt for camshaft bearing bush	100466 (NEW)	M12 x 25	50	37	Secured using LOCTITE® 243™	
	100473 (OLD)	M12 x 35				
Hexagon-head mounting bolt for gear train	1214629	M10 x 1 x 100	25/ 45°	18.4/ 45°	Secured using LOCTITE® 243™	
Hexagon-head bolts for gear train	100495	M16 x 40	190	140	Secured using LOCTITE® 243™	

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Hexagon-head mounting bolt for gear train	1214629	M10 x 1 x 100	25/ 45°	18.4/ 45°	Secured using LOCTITE® 243™	
Hexagon-head bolts for gear train (to idler gear shaft)	100474	M12 x 35 (10.9)	110	81	Secured using LOCTITE® 243™	
Bolt for camshaft gear	195472	M12 x 70 (10.9)	110	81	Secured using LOCTITE® 243™	
Bolts for split-type camshaft	309606 (NEW)	M10 x 65 (10.9)	65	48	Secured using LOCTITE® 243™	
	115245 (OLD)	M10 x 70 (10.9)				

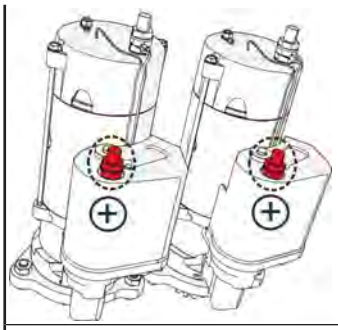
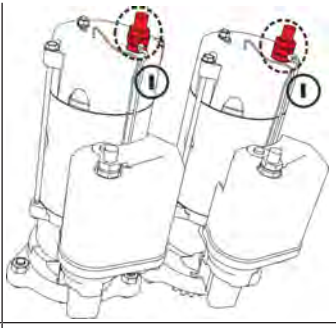
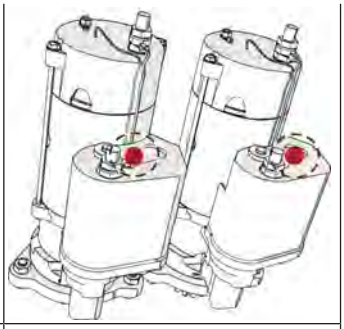
Designation	Drawing No. Part No.	Thread	Torque Nm	 lbf.ft	Note	Graphical representation
Cap screw with collar for intermediate flange (timing cover) (OLD)	195330	M30 x 310 (8.8)	750	553	Secured using LOCTITE® 243™	
	195331	M30 x 150 (8.8)				
	234831	M30 x 300 (8.8)				
Cap screw with collar for intermediate flange (timing cover) (NEW)	J 0759 10 00 11 361570	M30 x 315 (8.8)	1300	959		
	J 0759 10 00 09 361573	M30 x 150 (8.8)				
	J 0759 10 00 81 361634	M30 x 300 (8.8)				
Hexagon-head bolt with collar for mounting block (timing cover)	J 0759 10 00 83 361574 (NEW)	M30 x 200 (10.9)	150/ 60°	111/ 63°	Mounted using angular displacement method	
	234832 (OLD)		1800	1328		

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Slotted nut for intermediate gear 1 (gear train)	195478	M80 x 2	550	406	Tightened using claw wrench I (part no. 472697)	
Slotted nut for intermediate gear 2 (gear train)	110963	M45 x 1.5	400	295	Tightened using claw wrench II (part no. 472698)	
Bolt for oil pan	111249 (NEW)	M12 x 90 (10.9)	110	81	With extension sleeve	
	100309 (OLD)	M12 x 90 (8.8)	80	59		
Bolt for turbocharger / exhaust gas manifold (heat-resistant)	356682	M16-T x 70	190	140	Bolt and nut in material 1.4980 Increased flank clearance With high-temperature lubricant	
Bolt for two-part exhaust manifold DN200	340755	M12-T x 55	100	74	Bolt and nut in material 1.4980 Increased flank clearance With high-temperature lubricant	

Designation	Drawing No. Part No.	Thread	Torque Nm	 lbf.ft	Note	Graphical representation
Nut for exhaust gas line stud (between T-piece and cylinder head)	101823	M12	80	59	With high-temperature lubricant	
Exhaust gas turbocharger console stud (to crankcase)	236878	M20 x 215 (10.9)	190	140		
Nut for stud for exhaust-gas turbocharger bracket	297626	M20	160/ 90°	118/ 90°	Mounted using angular displacement method	
Hexagon-head bolt with collar for exhaust gas turbocharger console	J 0759 322 00 08 314950	M20	160/ 90°	118/ 90°	Mounted using angular displacement method	

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Cap screw for mixture cooler (inlet/outlet)	115253 (with extension sleeve)	M12 x 90 (10.9)	60/120	44/89	Tightened starting at the centre and crosswise evenly to an initial torque of 60 Nm. Then again to a final torque of 120 Nm.	
	409702 (with extension sleeve)	M12 x 105 (10.9)				
	408809 (without extension sleeve)	M12 x 35 (10.9)				
	101605 (without extension sleeve)	M12 x 55 (12.9)				
Ball valve for venting charge air cooler	408895	M18 x 1.5	30	22		

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Bolt for knock sensor	100418	M8 x 25	20	15	Do not use a washer	
Boost-pressure, cooling-water and oil-pressure sensors			40	30		
Cylinder pressure sensor in the combustion chamber	1230049 (NEW) 1216761 (OLD)		20	15		
Locknut for pre-lubrication pump adjusting screw	----	----	100	74	Take care to ensure that the screw keeps its setting.	
Cover for the pre-lubrication pump adjusting screw						
Starter motor: Type Iskra AZG	1201866					

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Nut for securing the + terminal		M12	21 ± 3	15.5 ± 2.2		
Nut for securing the - terminal		M12	21 ± 3	15.5 ± 2.2		
Hexagonal nut for connection 50		M6	5.8 ± 1	4.3 ± 0.7		

Designation	Drawing No. Part No.	Thread	Torque Nm	 lbf.ft	Note	Graphical representation
Hexagonal nut for connection 45 (Multi-starter applications with parallel starter relays)		M10	12 - 18	8.9 - 13.3		
Starter motor: Bosch, type TB(R)	120345					
Nut on starter		M6	4 - 4.5	3 - 3.3		
		M12	30 ± 3	22 ± 2.2		
Starter motor: Bosch, type HEP	1219313					

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Nut for securing the + terminal		M12	22 - 28	16 - 21		
Nut for securing the - terminal		M 12	22 - 28	16 - 21		

PBS exhaust gas turbocharger: NR17 + NR20

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Nut + stud for mounting the turbocharger to the turbocharger console, PBS: NR17 + NR20	398516 (NR17 bolt)	M20 x 385 (12.9)	30	22	Tightening torque (stud)	
	398510 (NR20 bolt)	M20 x 425 (12.9)				
	297626 (nut)	M20				
With ITH hydraulic tool, drg. no. 33.02361					Preliminary tightening torque (nut) = 20 Nm Then with hydraulic tool, 1100 bar	
Mounted using angular displacement method			240/ 90°	177/ 90°		
Fastening with clamping nut					See Section ⇨ Clamping nuts	

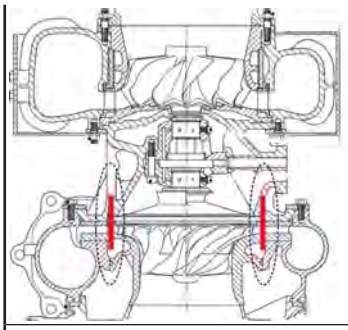
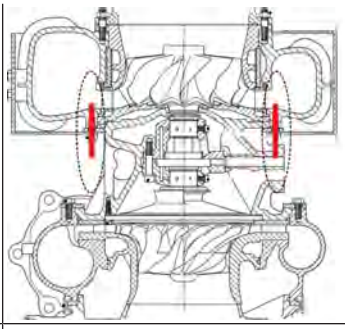
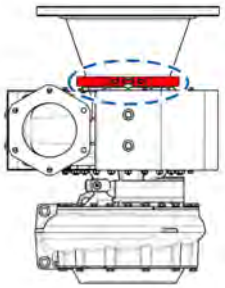
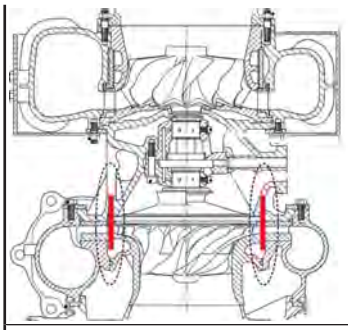
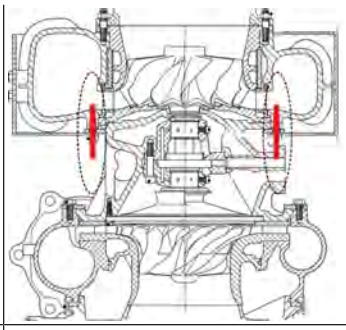
Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Bolt for mounting the compressor casing to the bearing housing, PBS: NR17 and NR20			34	25		
Bolt for mounting the turbine housing to the bearing housing, PBS: NR17 and NR20			34	25	With high-temperature paste	
V-belt for turbine exhaust PBS: NR17/S and NR20/S			12	9	Moisten screw thread and inside of profile using high-temperature resistant lubricant	

ABB turbocharger: TPS52 + TPS57

Description	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Collar bolt for mounting the turbocharger to the turbocharger console, ABB: TPS52 + TPS57	361236 (TPS 52)	M20 x 220 (10.9)	240/ 90°	177/ 90°	Mounted using angular displacement method	
	360862 (TPS 57)	M20 x 260 (10.9)				
Bolt for mounting the compressor casing to the bearing housing, ABB: TPS52			70	52		
Nut for mounting the turbine housing to the bearing housing, ABB: TPS52			45	33	With high-temperature paste	

Description	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Nut for mounting the compressor casing to the bearing housing, ABB: TPS57			105	77		
Bolt for fitting the turbine to the bearing housing, ABB: TPS57			75	55	With high-temperature paste	

Description	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Stud for mounting the turbine exhaust, ABB: TPS52	578639 (NEW)	M10-T x 50	40	30	Check the position of the gas exhaust flange relative to the turbine housing with high-temperature paste	
	370899 (OLD)	M10-T x 45				
Stud for mounting the turbine exhaust, ABB: TPS57	586829 (NEW)	M12-T x 55	65	48	Check the position of the gas exhaust flange relative to the turbine housing with high-temperature paste	
	370900 (OLD)	M12-T x 50				

Description	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Nut and lock nut for securing the diffuser at the turbine outlet, ABB: TPS52	128466 (NEW) 370897 (OLD)	M10-T	40	30		
Nut and lock nut for securing the diffuser at the turbine outlet, ABB: TPS57	110971 (NEW) 370898 (OLD)	M12-T	65	48		

Description	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
V-belt for turbine exhaust ABB: TPS52 and TPS57		M12	60	44	Moisten screw thread and inside of profile using high-temperature resistant lubricant	
Speed sensor ABB: TPS52 and TPS57			15	11		

TCR16 turbocharger

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Nut + stud for mounting the turbocharger to the turbocharger console, TCR 16	398516 (stud)	M20 x 385 (12.9)	30	22	Tightening torque (stud)	
	297626 (nut)	M20				
With ITH hydraulic tool, drg. no. 33.02361					Preliminary tightening torque (nut) = 20 Nm Then with hydraulic tool, 1100 bar	

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Mounted using angular displacement method			240/90°	177/90°		
Fastening with clamping nut					See Section ⇨ Clamping nuts	

TCR18 turbocharger

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Nut + stud for mounting the turbocharger to the turbocharger console, TCR 18	527366 (stud)	M24 x 471 (12.9)	30	22	Tightening torque (stud)	
	300822 (nut)	M24				
Mounted using angular displacement method			540/90°	398/90°	Preliminary tightening torque (nut) = 540 Nm/90°	
Fastening with clamping nut					See Section ⇨ Clamping nuts	

ABB turbocharger: A135

Designation	Drawing No. / Part No.	Thread	Torque Nm	Torque lbf.ft	Note	Graphical representation
Nut + stud for mounting the turbocharger to the turbocharger console, ABB: A135	577152 (stud)	M20 x 395 (12.9)	30	22	Tightening torque (stud)	
	297626 (nut)	M20	560	413		
With ITH hydraulic tool, drg. no. 33.02361					Preliminary tightening torque (nut) = 20 Nm Then with hydraulic tool, 1100 bar	
Fastening with clamping nut					See Section ⇨ Clamping nuts	

ABB turbocharger: A140

Description	Drawing No. Part No.	Thread	Torque Nm	 lbf.ft	Note	Graphical representation
Stud for mounting the turbocharger to the turbocharger console, ABB: A140	527366	M24 x 471 (12.9)	30	22		
Clamping nuts for fastening the exhaust gas turbocharger; FIG: A140			----	----	For details, see the section ⇨ Clamping nuts	

5 Appendix

5.1 Big-end bolts

• **Always tighten the bolts in the order 1-2-3-4.** • Pretighten the bolts by hand using a ratchet wrench (use a universal joint to reach the upper bolts). • Retighten the bolts to a torque of 100 Nm (use a universal joint). • Continue turning the crankshaft with a turning bar until all the bolts can be easily accessed without a universal joint. • Tighten the bolts to 100 Nm without a universal joint.	
• Mark the bolts in their pretightened position as shown the photo alongside, and turn through a further 90°.	
• The markings on the 4 big-end bolts must be horizontal.	

5.2 Main bearings

Use the crankcase underside surface as the reference for measuring the permanent stud strain **manually**.

5.3 Cylinder head

Measuring the permanent strain with the hydraulic power tool from ITH

The steps described below are only necessary if parts of a bolted joint that was assembled in the factory have to be replaced in the field/at a service due to damage and/or loss. If the parts fitted in the factory are re-used (not replaced by other new or used parts), the measurement of the permanent elongation described below is not necessary and monitoring/observing the pressure values specified in the TA is sufficient.

After replacing part of a bolted joint, such as the studs or nuts, measure the permanent elongation of the stud in the "new" bolted joint after fitting the nut in order ensure that the bolted joint is correctly assembled. In addition to the stud in the new bolted joint one stud in an existing bolted joint must be measured to ensure the plausibility of the elongation values.

- Set up the hydraulic power tool in the usual way. At least 2 magnetic measuring stands with dial gauges will be necessary (see the illustration alongside, here with 4 dial gauges).
- Start off by setting up the magnetic measuring stand on the flat machined surface of the adjacent cylinder.
- For the end cylinder, fasten the magnetic measuring stand to the crankcase.
- Align the dial gauge parallel to the stud axis on the adapter bushing of the hydraulic power tool.
- Apply a load of 20 bar to the stud and then set the dial gauge to zero.
- Set up the respective final pressure and then read off and note down the elongation of the screw L_{max}.

- After fitting the nut, reduce the pressure down to 20 bar again and read off and record the bolt length L_{min}.

The remaining screw elongation L_{Remain} results from the difference $L_{max} – L_{min}$. This must then correspond to the residual elongation specified in the TA in Section Cylinder head nut. If this is not the case, the bolted joint must be completely undone and the entire bolting process repeated. If the specified values are still not obtained at the repeat procedure, stop assembly work and contact the INNIO Jenbacher GmbH & Co OG Service Helpdesk.

5.4 Schaaf hydraulic tool

This hydraulic tool is an option for use on the cylinder head nuts **only**.

Procedure:

- Mount the hydraulic tool with the part number B3401EG04 on the cylinder head.
- Select the appropriate program (cylinder head).
- Build up a defined hydraulic pressure of 110 bar with the hydraulic tool, and set the measuring system to zero.
- Then build up to a final pressure of 1569 bar.
- Fit the cylinder head nuts and tighten them.
- Relieve the pressure down to 110 bar.
- Read off the permanent strain (0.96 mm ±0.1).
- Relieve the pressure to zero.
- Remove the hydraulic tool.

5.5 Clamping nuts

Clamping nuts for fastening the exhaust gas turbocharger	• Lightly oil the thread. • Fit the thrust washer. • Tighten the clamping nut by hand turn it back by a ¼-turn (distance between thrust washer and clamping nut is approx. 1 mm).	

Tightening torques for clamping screws in clamping nuts:

Exhaust gas turbocharger	Clamping nut part no.	Thread	Torque	
			Nm	lbf.ft
ABB: A135, TPS 52, TPS 57 PBST: TCR16, NR17, NR18	1235727	M20	14	10
ABB: A140 PBST: TCR18	1235728	M24	36	27

Clamping screws in clamping nut	• Tighten the clamping screws crosswise by hand. • Tighten the clamping screws crosswise to 50% of the tightening torque. • Tighten the clamping screws crosswise to 100 % of the tightening torque.	
	• Tighten all the clamping screws to 100% of the tightening torque in a circular sequence.	

	• Repeat until all the clamping screws have been equally tightened (less than 20° residual movement).	

6 Revision code

Revision history

Index	Date	Description / Revision summary	Expert *Auditor*
13	31.07.2019	Teilenummer von Hydraulikvorrichtung ITH für Zylinderkopfmutter korrigiert / Part number of hydraulic power system ITH for cylinder head nut corrected	**Entner W.** *Becker F.*
		Vorkammergasventile für „H“-Zylinderkopf aktualisiert / Prechamer gas valves für H cylinder head udpated	**Grotz M.** *Becker F.*
		Einstellschrauben für Vorschmierpumpe ergänzt / adjusting screws für pre lubrication pump added	**Raman V.** *Becker F.*
		Zündkerze P611 hinzugefügt / spark plug P611 added	**Mai T.** *Becker F.*
12	30.03.2018	Kapitel 5.3 – Zylinderkopf (Messung der verbleibenden Dehnung mit Hydraulikvorrichtung Fa. ITH) überarbeitet / Chapter 5.3 – Cylinder head (Measuring the permanent strain with hydraulik power tool ITH) revised	**Wolf S.** *Wolf S.*
		Neues Vorkammergasventil TInr. 9029070 für „H“-Zylinderkopf hinzugefügt / New pre chamber gas valve part number 9029070 for „H“-cylinder head added	**Grotz M.** *Wolf S.*
11	13.01.2017	Bemerkung „mit Loctite gesichert“ bei Schwingungsdämpfer entfernt / Comment „Secured using Loctite“ at vibration damper deleted Ergänzungen für „H“-Zylinderkopf hinzugefügt / Additions for „H“-cylinder head added	**Becker F.** *Wolf S.*
10	04.11.2016	Grundlegende Überarbeitung / fundamental revision	**Tomar R.** *Wolf S.*

Revision history

9	16.10.2012	Position 83 korrigiert / corrected point 83	**Bilek** *Waldron*
8	10.10.2012	Position 89 hinzugefügt / add position 89	**Berger** *Thummer*