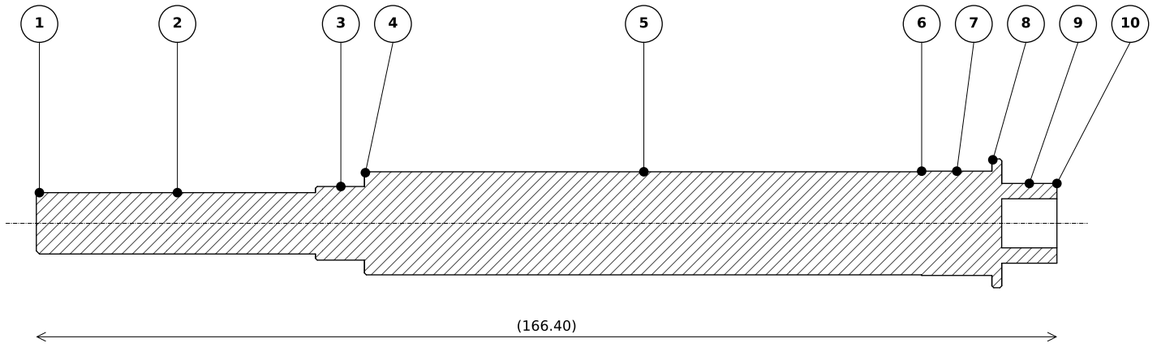


VIEW FROM THE INLET



SECTION A-A

REQUIREMENTS

1 M10×1-6g LEFT-HAND, 7.8 long from the front end; 45° chamfer at the start

2 Compressor seat Ø10 h5 (9.994–10.000); Ra 0.4; runout 0.003 to A-B

3 A: front bearing seat Ø12 g5 (11.986–11.994), ground after welding; Ra 0.2

4 Shoulder face (the front bearing's inner ring): axial runout 0.003 to A-B

5 Ø16.80 ±0.03: the rear bearing slides over it on assembly

6 M17×1-6g LEFT-HAND, 4.5 long ahead of B, for the rear bearing's nut; a 2 mm slot along it to stake the nut into

7 B: rear bearing seat Ø17 g5 (16.986–16.994), ground after welding; Ra 0.2

8 Shoulder face (the rear bearing's inner ring): axial runout 0.003 to A-B

9 Heat dam, steel part: neck Ø13 ±0.05, 9.0 long (the other 8 is cast with the turbine), R0.5 at the shoulder; blind bore Ø8 ±0.1, 9.0 deep from the weld face, drilled before welding (with the cast part it keeps the rear bearing under 130 C: rotor_heat.py)

10 Weld to the turbine's cast neck (HL-TJ-16) at Ø13: inertia friction weld, 4140 to Alloy 713C; flash turned off outside (the blind bore keeps its inner flash); whole weldment runout 0.005 to A-B

NOTES

1. Model is master: sizes not called out come from shaft.step, at the general tolerance.
2. Break sharp edges 0.1–0.3 unless noted. No burrs. No tool marks across sealing or seating faces.
3. Surface finish Ra 1.6 µm unless noted. Threads to ISO 965 (metric fine).
4. Rotor set: balanced as one assembly (the shaft-and-turbine weldment, the compressor wheel, both nuts), two planes, ISO 21940-11 G2.5 at 86,000 rpm. Scribe the angular position after balancing; reassemble to it.
5. Experimental use only. Sold under Highland's experimental-use agreement.
6. A weldment with the turbine (HL-TJ-16): the shaft rough-turned, welded to the cast turbine by a friction-welding specialist (turbocharger practice), stress relieved after welding, inspected, then every seat and journal finish-ground on the weldment's own centres.
7. Weld inspection: ultrasonic (ASTM E164) and fluorescent penetrant (ASTM E1417) on the weld zone; a test weld from the same lot pulled to failure must break outside the weld.
8. Centre holes A2 (ISO 6411) at the front end and in the turbine's back face, for grinding between centres.
9. Material: 4140 quenched and tempered at 620 °C or above, the certificate showing the tempering temperature. The weld runs about 220 °C at full power, far under that; the post-weld stress relief at 600 °C or below.
10. Thread hands: the rotor turns clockwise seen from the intake, so drag and spin-up tighten both left-hand nuts.
11. Inspection report, CMM and material certificates are add-ons on the quote.

HIGHLAND Turbojet, 170 N class

shaft.step · highlandmetal.ca

PART	PART NUMBER		REVISION
Shaft (welded to the turbine)	HL-TJ-05		A
MATERIAL			
Steel 4140 prehard, 28-32 HRC (ASTM A434 bar)			
FINISH		HEAT TREAT	
None, as machined		None	
TOLERANCE UNLESS NOTED			
±0.13 mm (±0.005 in) unless noted; angles ±0.5°			
QUANTITY	MASS		SCALE
1 per engine	223.7 g		1:1
UNITS	PROJECTION	DATE	SHEET
mm	Third angle	2026-11-20	A3, 1 of 1