FORMULA STUDENT GEARBOX

Subassembly "Stepped-Planet"

Version: **V1-2025**

Information for FSAE / FS-Team

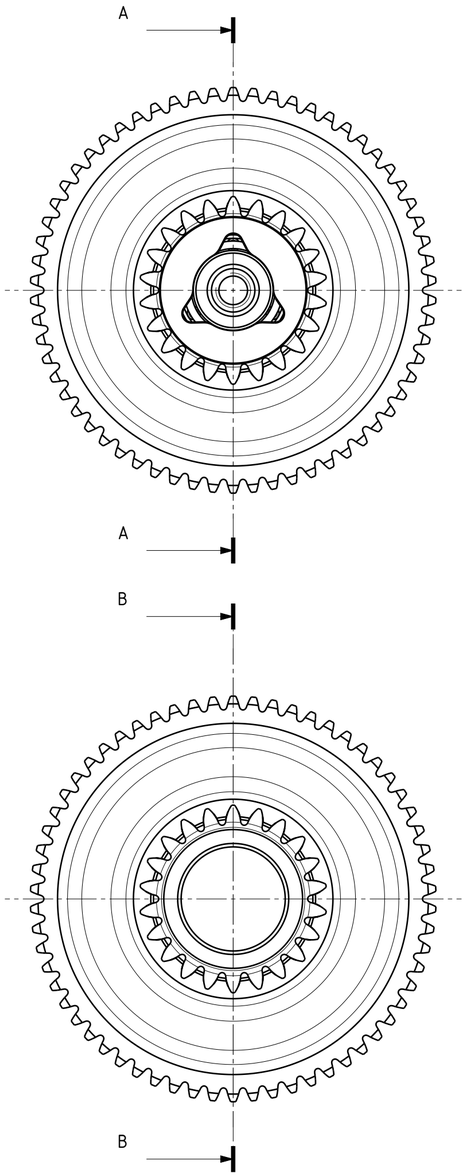
The Formula Student planetary gearbox is designed so that it can be operated with 3 identical stepped planets. These are delivered in assembled condition, secured axially with a retaining ring.

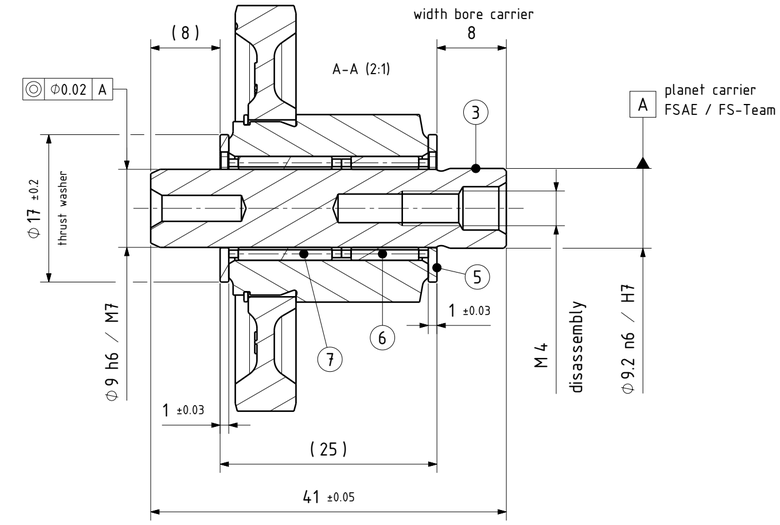
The planet is mounted on a fixed spindle (③) using needle roller bearings (⑥ & ⑦) and is held axially between thrust washers (⑤). While the washers are part of the package, the bearings must be provided by the team.

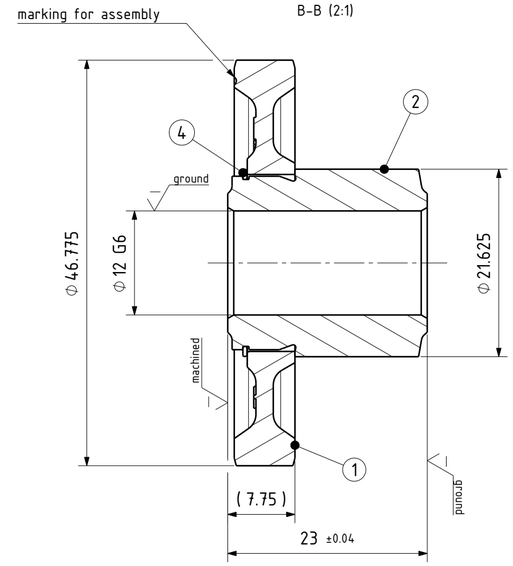
Due to its superiority in terms of rigidity and tolerances, we recommend using the gearset in a one-piece planetary carrier. For easier installation, the bolt is designed with a larger head. Accordingly, a fitting hole with ⌀ 9.2 mm and one (blind) hole with ⌀ 9 mm must be machined in the carrier. To prevent the bolt from rotating, it is advised to secure the bolt using a press fit. Recommendations for the fits are given in section view B-B. Form tolerances for the alignment of the holes are also specified.
It is advisable to cryogenically cool the bolts before assembly in order to prevent the use of a press and, if possible, chip breakage from the carrier into the bearing arrangement.
The bolt should be secured axially. For example, with a retaining ring.
The bolt is equipped with an M4 thread for disassembly.

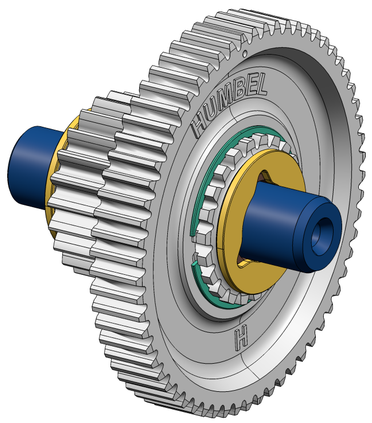
The axial play of the planet between the thrust washers should be set between 0.05 and max. 0.15 mm.
The team must also ensure that there is sufficient clearance so that the rotating gears cannot touch the carrier during operation. For this purpose, a minimum clearance of 1–1.5 mm should be maintained.

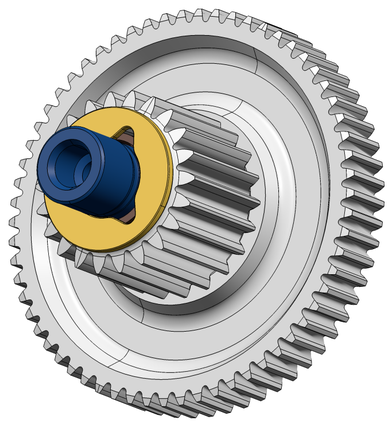
The thrust washers are non-magnetic, so any debris in the gearbox that is picked up by a magnet is due to wear on the gear teeth or bearings.
The planets are made of motorsport-grade case-hardened steel and can be operated at a maximum temperature of 120–130°C (material limit! Oil lubrication limit correspondingly lower at max. 80°C)
These temperatures must also be observed by the teams when assembling their units.











Pos.	Drawing No.	Rev.	Title	Supplier	Qty.
1	HU-00139215	A	HU-FS Planet 1	HUMBEL	1
2	HU-00139213	A	HU-FS Planet 2	HUMBEL	1
3	HU-00139209	A	HU-FS Planet-bolt	HUMBEL	1
4	HU-00139475	A	VSM-20	HUMBEL	1
5	HU-00139476	A	HU-FS Thrust Washer	HUMBEL	2
6	HU-00139897	A	Needle Bearing K9x12x10	FSAE / FS-Team	1
7	HU-00139898	A	Needle Bearing K9x12x13	FSAE / FS-Team	1

Maßstab / *Scale* 2:1	A2	Blatt / *Sheet* 01 / 02	Projektname / *Project name* HUMB.2411	Werkstoff / *Material*	Gewicht / *Weight* 0 kg
		Tolerierungsgrundsatz *Fundamental tolerancing principle*	ISO 8015	Gezeichnet *Drawn by* tim.schulte	07.03.2025
		Allgemeintoleranzen *General tolerances*	ISO 2768-mK	Geprüft *Reviewed by* tim.schulte	17.09.2025
		Revisionskommentar *Revision comment*		Freigegeben *Released by* dominik.brunner	18.09.2025
HUMBEL Gear Technology		Benennung / *Designation* HU-FS Subassembly Planet		Zeichnungsnummer / *Drawing number* HU-00139221	Revision A