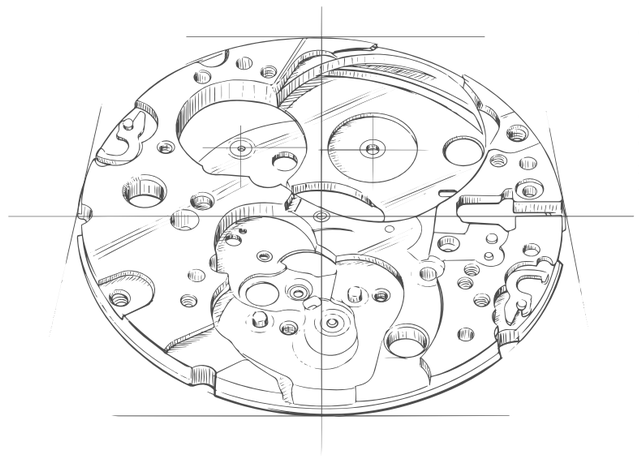
Baseplate/Mainplate

Challenges in machining mainplates
Manufacturing mainplates (baseplates and bridges) is extremely demanding, as they serve as the movement's fundamental structure and require the highest precision. The key challenges are as follows:

1. Choice of materials and their machinability
Mainplates are typically made from the following materials:
- Brass (CuZn39Pb3, CuZn37) → Soft and easy to machine, but tends to scratching
- Nickel silver (CuNi12Zn24/CuNi18Zn20) → Harder than brass, but lead-free, which makes it more difficult to machine
- Titanium → Very light, but tends to work hardening and poor thermal conductivity
- Stainless steel (e.g. 316L) → Corrosion-resistant, but difficult to machine, resulting in high tool wear
- Silicon (used for high-end pallet and balance components) → Requires etching or laser processing

2. High precision and tight tolerances
- Dimensional tolerances in the range of ±2–5 µm → Necessary for precise fitting of gears, jewel bearings and bridges
- Parallelism and flatness → Especially important, as even the smallest deviations can affect the movement's function

3. Tool selection and tool life
- Carbide or diamond tools → Required for hard or brittle materials
- Micro-tools (Ø <0.2 mm) → Required for fine drilling, threads and pockets
- High risk of tool breakage → Due to low cutting forces and vibrations in delicate structures



4. Complex machining strategies
- Multi-stage machining (roughing – semi-finishing – finishing) for dimensional accuracy
- Reduced cutting forces → To prevent deformation in thin areas
- Precise clamping technology (vacuum or zero-point systems) → Necessary for vibration reduction

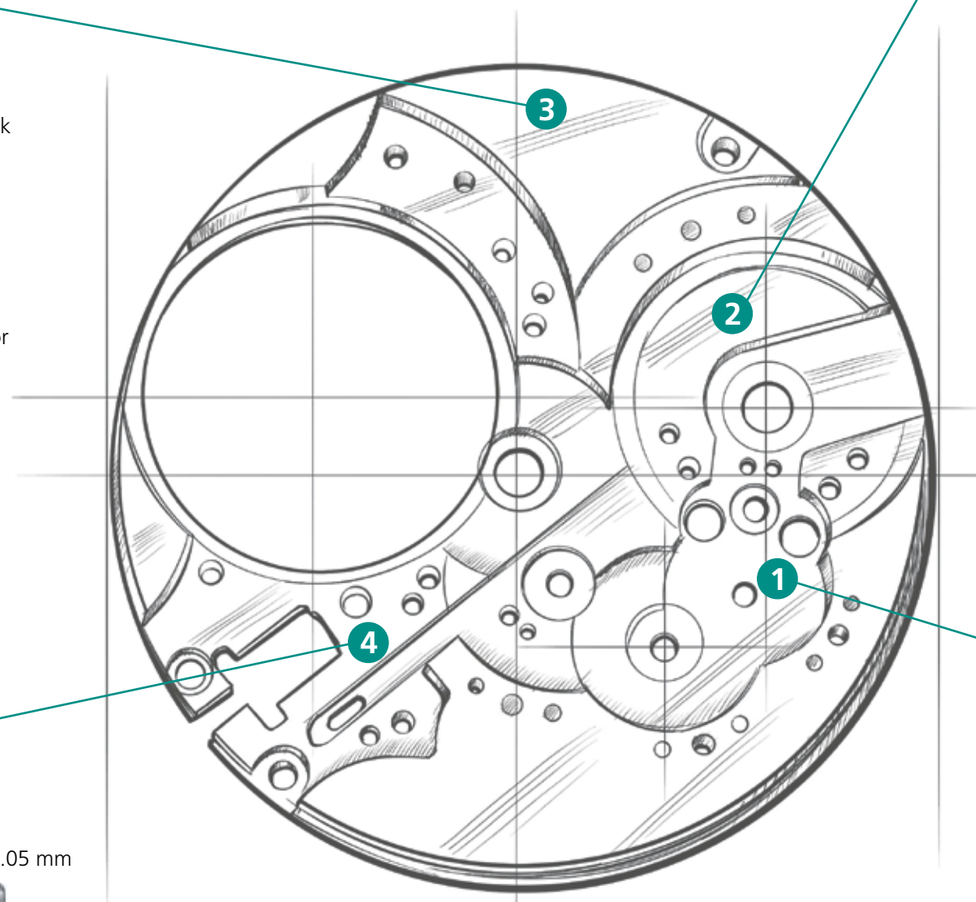
5. Heat development and burr formation
- Brass and nickel silver tend to form burrs, requiring time-consuming manual rework
- Titanium and stainless steel generate significant heat during milling, which can lead to tool wear and deviations in size
- Minimum quantity lubrication (MQL) or high-pressure cooling → Helps to control heat generation

6. Surface finishing
- Electroplating (e.g. rhodium plating, gold plating) for protection and aesthetics
- Perlage and Geneva stripes → Frequently require highly precise, manual finishing
- Edge chamfering → Very time-consuming and often handcrafted

CONCLUSION

Machining watch mainplates places high demands on CNC strategies, tool selection and clamping technology due to the delicate structures, tight tolerances and challenging materials. Burr formation, tool wear and surface finishing are particularly critical factors for successful manufacturing.

Milling



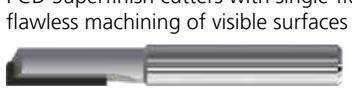
3 FACE MILLING OF VISIBLE SURFACES

WALTER

MP-Series
Straight-fluted PCD finish milling cutters with straight teeth reduce burr formation, while the reinforced shank ensures perfect support of the PCD insert

DIXI polytool

Superfinisher 70630-PCD
PCD Superfinish cutters with single-flute technology for flawless machining of visible surfaces



2 FINISHING MILLING

DIXI polytool

End mill 7233
Straight-fluted end mill for face milling and finishing, a highly tough grade with optimal bending strength, extreme wear resistance, polished flutes and cutting edges for perfect surfaces, two cutting edges for high feed rates, reduced burr formation thanks to straight cutting edges

4 MICRO-MILLING

magafor

Magaforce 8500
For ultra-fine milling work from Ø 0.05 mm

SANDVIK coromant

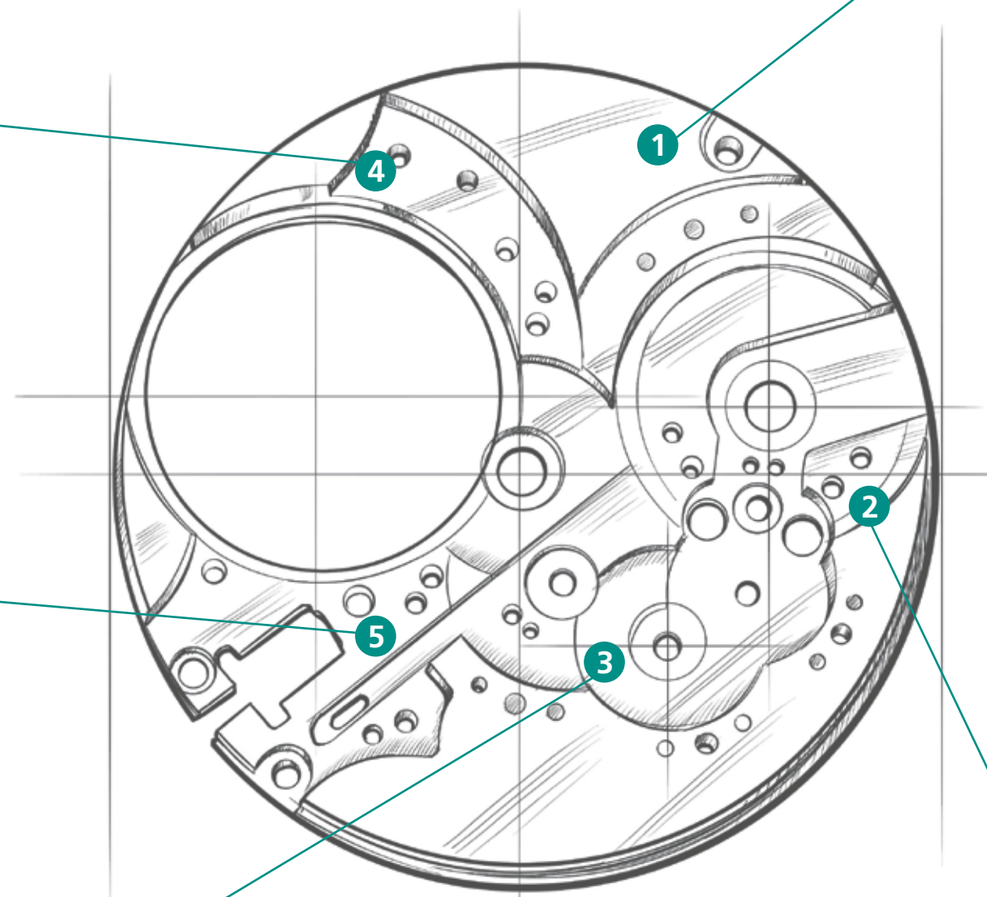
CoroMill Plura
Solid carbide micro shoulder milling cutter,
Types 2P211/2P12/R216.32, Grade 1620, 1700

1 MULTI-OPERATION MACHINING

magafor

MAGAFOR MULTI-V
Chamfering, deburring, drilling, engraving, available in various angles 90°/40°/60°/120°, from Ø 0.1 mm

Drilling



4 SPOT DRILLING

WALTER TITEX

DB131 Supreme
Solid carbide micro pilot drill with 150° point angle, from Ø 0.5 – 1.9 mm

APPLITEC SWISS TOOLING

Micro-Line
Solid carbide micro CNC spot drills 60°/90°, with various special coatings

5 LEAD-FREE BRASS DRILLING

DIXI polytool

Twist drill 1137
Optimised for lead-free brass, polished clamping grooves: Improved chip evacuation, tapered core thickness from Ø 0.5 mm, reduced cutting forces, 140° tip: minimal burr formation at hole exit

3 SPOT DRILLING

WALTER TITEX

DC118 Supreme
Solid carbide spot drill with 180° cutting angle, from Ø 3.0 mm

1 DRILLING AND MICRO-DRILLING

DIXI polytool

Gun drill 1111
Highest precision with cutting edge tolerance of +/- 1 µm, no piloting required thanks to the sharp cutting edge, from Ø 0.1–2.0 mm

DIXI polytool

Twist drill 1345
Self-centring high-performance drill with internal cooling for series production, from Ø 3.0 mm

SANDVIK coromant

CoroDrill 462 XM- X0BU
Versatile multi-material drilling with external cooling, from Ø 0.03 – 3.0 mm

SANDVIK coromant

CoroDrill 862 PCD
Offers longer tool life than solid carbide drills, suitable for challenging materials such as platinum and ceramic greenware, from Ø 0.3 – 3.0 mm

APPLITEC SWISS TOOLING

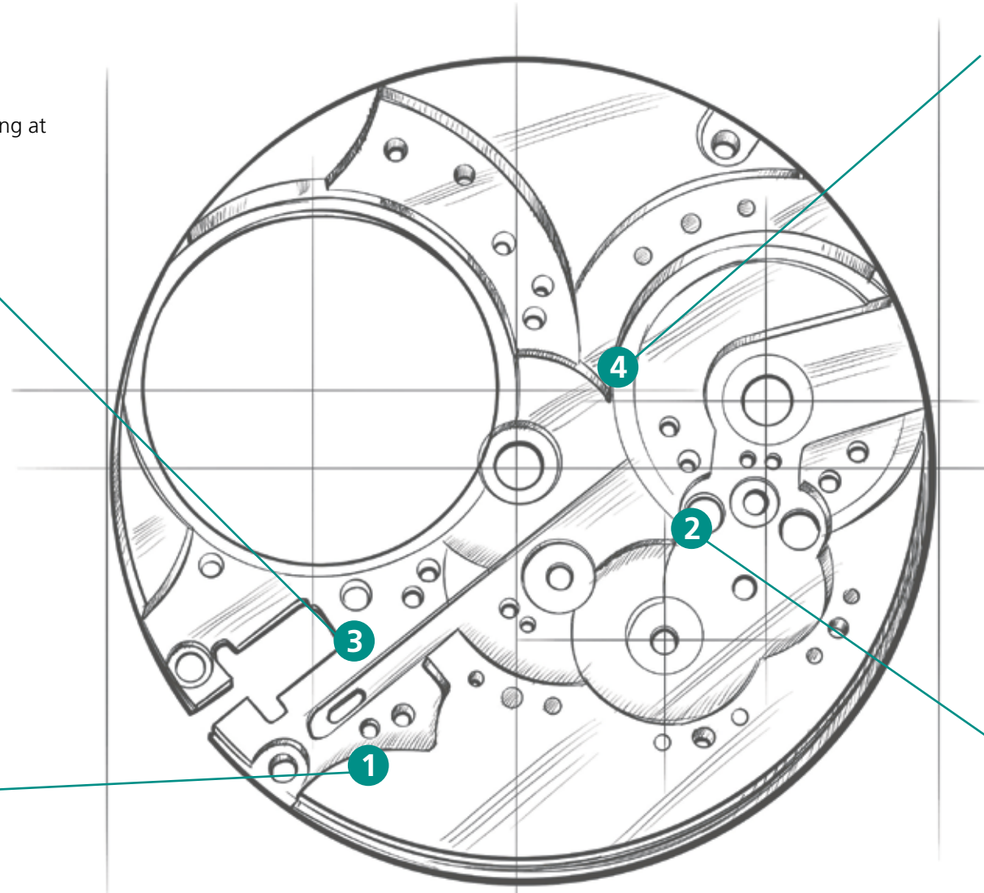
Micro-drill 2020
Solid carbide drill with 130° point angle, from Ø 0.1 – 2.0 mm

2 MICRO REAMERS

magafor

Magaforce 8610
Reamers for cylindrical holes, from Ø 0.2 mm, with left-hand flutes

Finishing



3 FACETING AND ROUNDING

magafor

Form cutters and chamfer mills
Specialised micro-tools for edge rounding starting at R 0.2 mm and faceting from Ø 0.2 mm

1 THREADING

DIXI polytool

Polytool 1739 (Z1)
Thread whirler with partial profile, designed to reduce cutting forces for all materials, from Ø 0.21 – 1.1 mm

DC THREADING TECHNOLOGY

Thread whirler GW1116VS
High-performance thread whirler for mainplate machining, from Ø 0.3 – 2.6 mm, suitable for NIHS threads

DC THREADING TECHNOLOGY

Thread tap CMS50
High-performance thread tap for mainplate machining, from Ø 0.3 – 2.6 mm

4 ENGRAVING

APPLITEC SWISS TOOLING

DLC engraving tool
Special thin-film DLC coating for an extra-sharp cutting edge

2 REAMING

magafor

Magaforce 8610 Reamer
Step size of 0.005 mm for the most precise holes, from Ø 0.2 mm, with left-hand flutes