



# **RFQ2 LINAC4 Spare**

## **Roughness measurement summary**

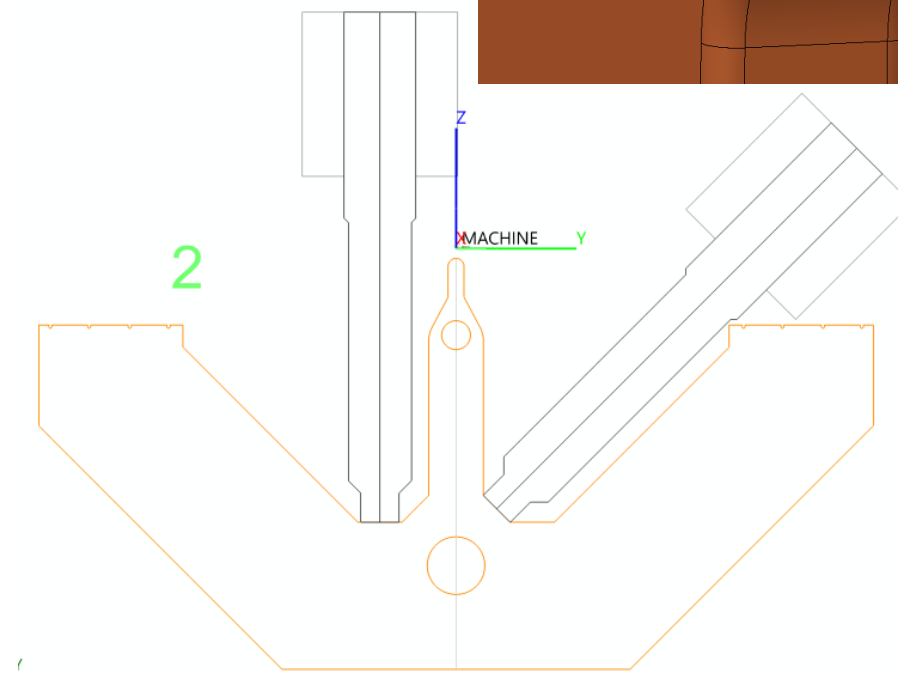
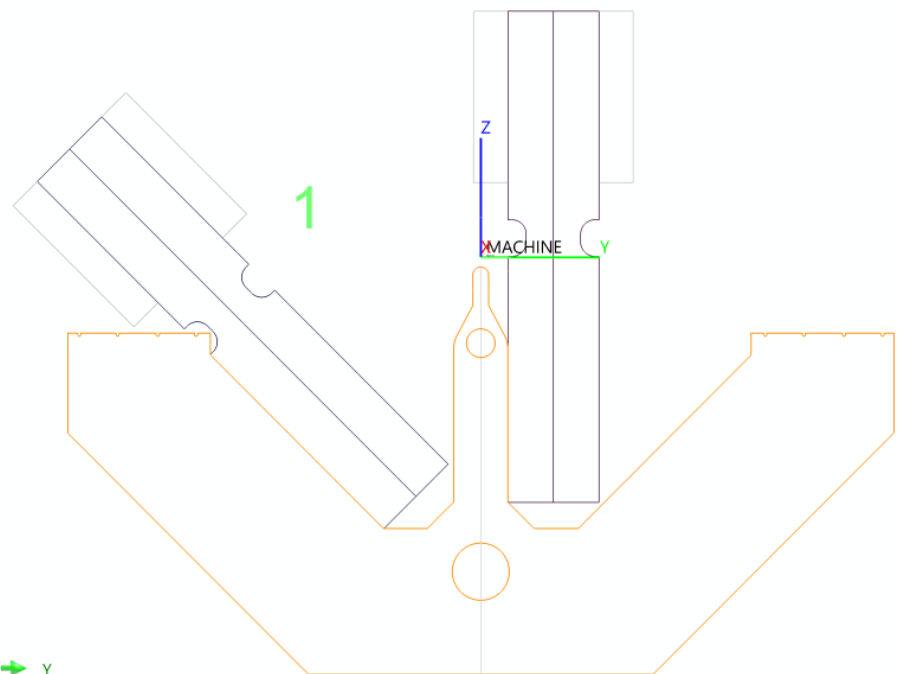
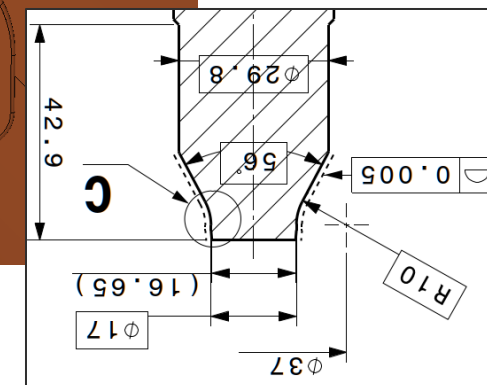
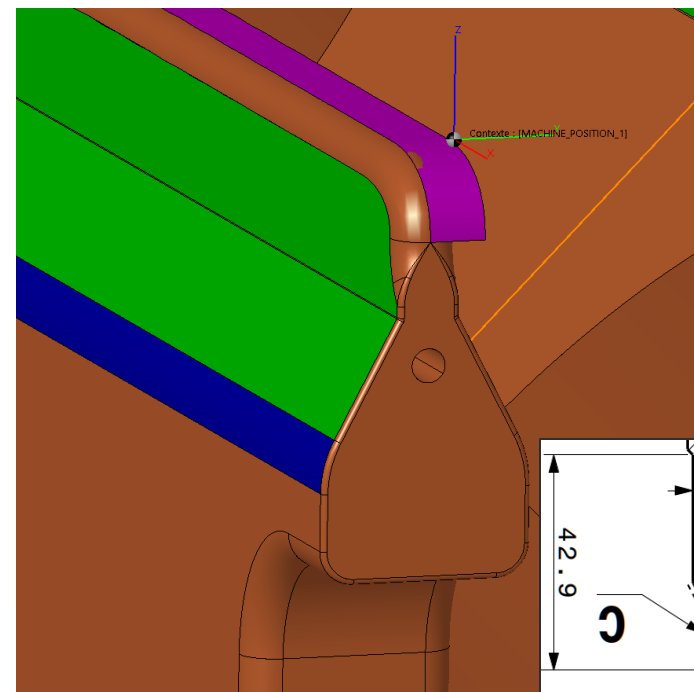
# Outline

- **Cavity**
- **Modulation**
- **Extremity Flanges**
- **Tuners Plugs**

# Cavity machining

- **Four different tools to qualify:**
  - 3x custom made mills
  - 1x standard mills
- **Face and side milling**

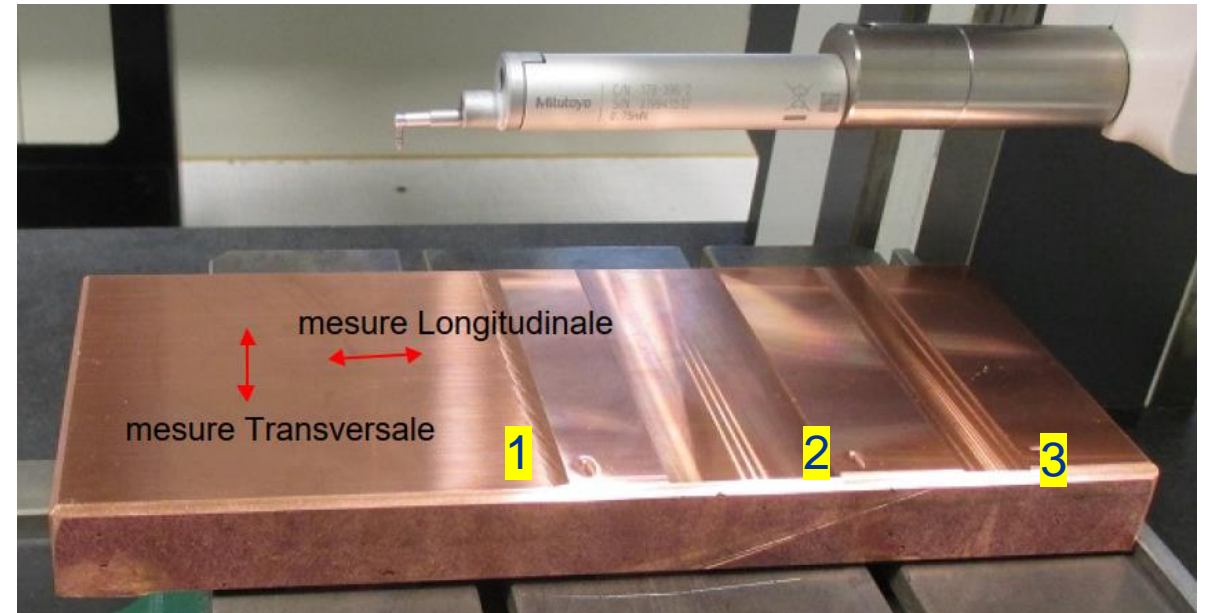
Standard mill  
Custom form mill



# Cavity roughness – first step: flat samples

- Pre-selection of main tools from a pool of 4 different fabricants
- Metrology [EDMS 2383706](#)

Ra measures on the final sample:		
Ra [ $\mu\text{m}$ ]	Longitudinal	Transversal
Mes 1.	0.11 - 0.23	0.27 - 0.60
Mes 2.	0.21 - 0.59	0.19 - 0.50
Mes 3.	0.15 - 0.24	0.19 - 0.25



**Ra < 0.6  $\mu\text{m}$**

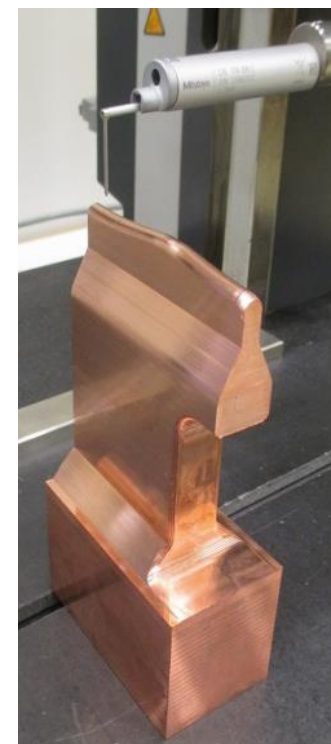
# Cavity roughness – first step: flat samples

- 2x samples: most critical machining → less rigidity; more scatters

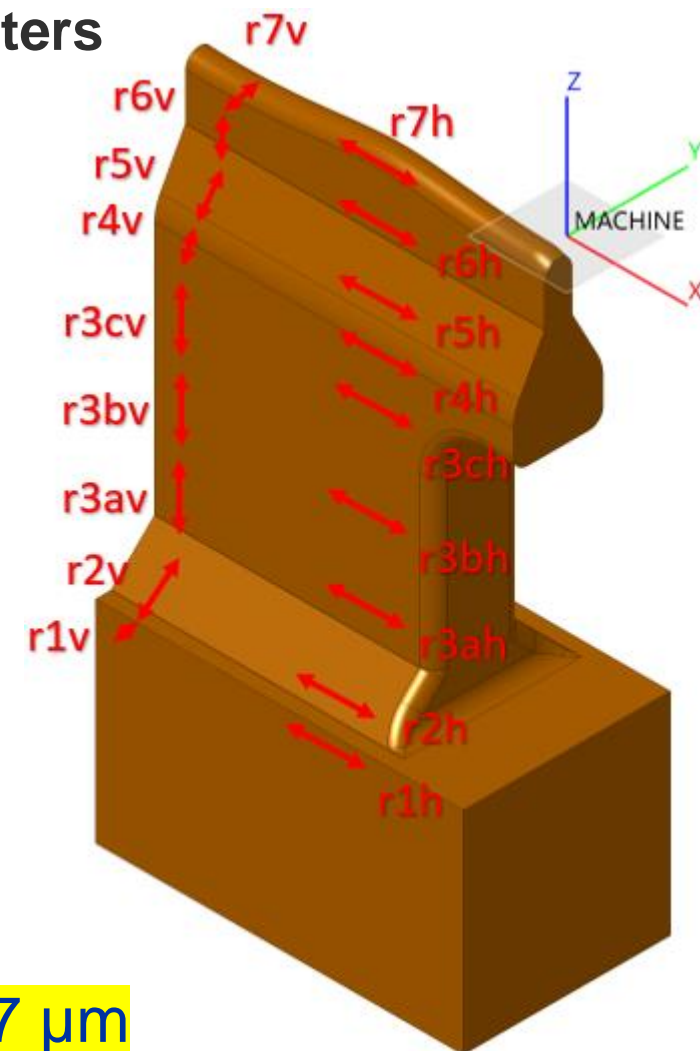
- Metrology EDMS 2425308

4 sets of tool

face	mesure	Ra	face	mesure	Ra
BF1	r1v	0.41	BF2	r1v	0.2
pc1	r1h	0.19	pc1	r1h	0.27
	r2v	0.3		r2v	0.19
	r2h	0.06		r2h	0.09
	r3av	0.4		r3av	0.13
	r3bv	0.09		r3bv	0.13
	r3cv	0.14		r3cv	0.15
	r3ah	0.08		r3ah	0.07
	r3bh	0.7		r3bh	0.07
	r3ch	0.07		r3ch	0.07
	r4v	0.19		r4v	0.18
	r4h	0.14		r4h	0.19
	r5v	0.28		r5v	0.25
	r5h	0.08		r5h	0.08
	r6v	0.21		r6v	0.16
r6h	0.11	r6h	0.05		
SF1	r7v	0.41			
	r7h	0.15			
face	mesure	Ra	face	mesure	Ra
		0			0
JMD	r1v	0.17	BF INC 1,4	r1v	0.18
	r1h	0.14		r1h	0.19
	r2v	0.54		r2v	0.03
	r2h	0.08		r2h	0.05
	r3av	0.35		r3av	0.41
	r3bv	0.35		r3bv	0.69
	r3cv	0.34		r3cv	0.19
	r3ah	0.1		r3ah	0.08
	r3bh	0.09		r3bh	0.09
	r3ch	0.1		r3ch	0.07
	r4v	0.69		r4v	0.17
	r4h	0.17		r4h	0.14
	r5v	0.32		r5v	0.05
	r5h	0.06		r5h	0.05
r6v	0.32	r6v	0.23		
r6h	0.12	r6h	0.07		
SF2	r7v	0.45			
	r7h	0.13			



Final Ra < 0.7 μm

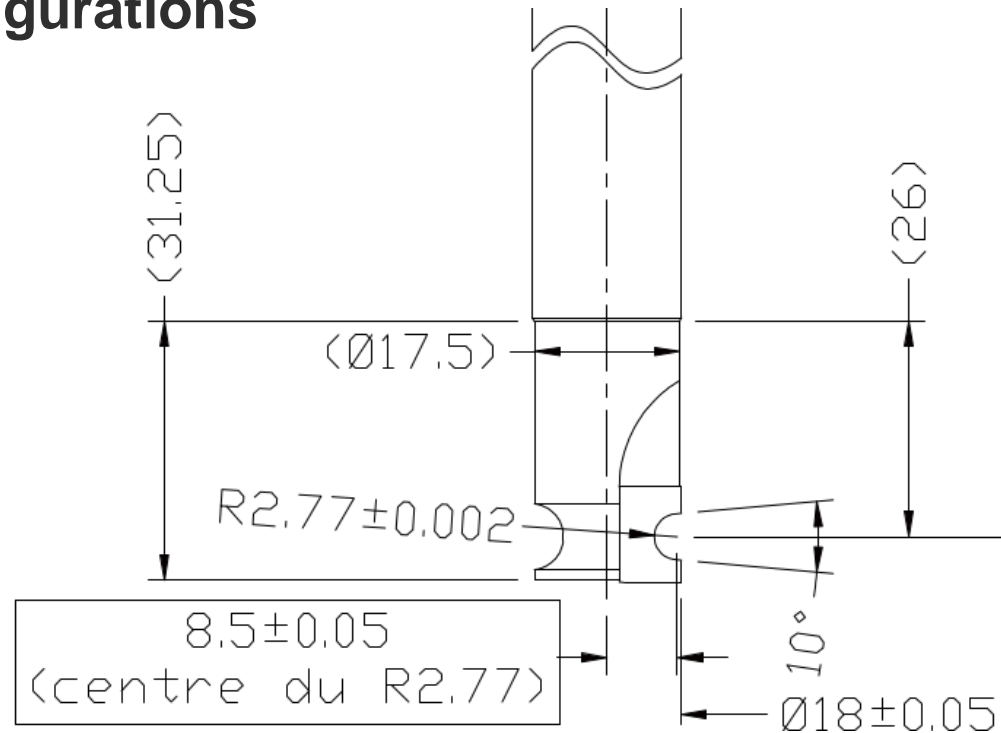


# Modulation machining

## Masnada Diamant Industrie SAS

- Experience in manufacturing PCD diamond form tools for RFQs

## Different tool / machine configurations

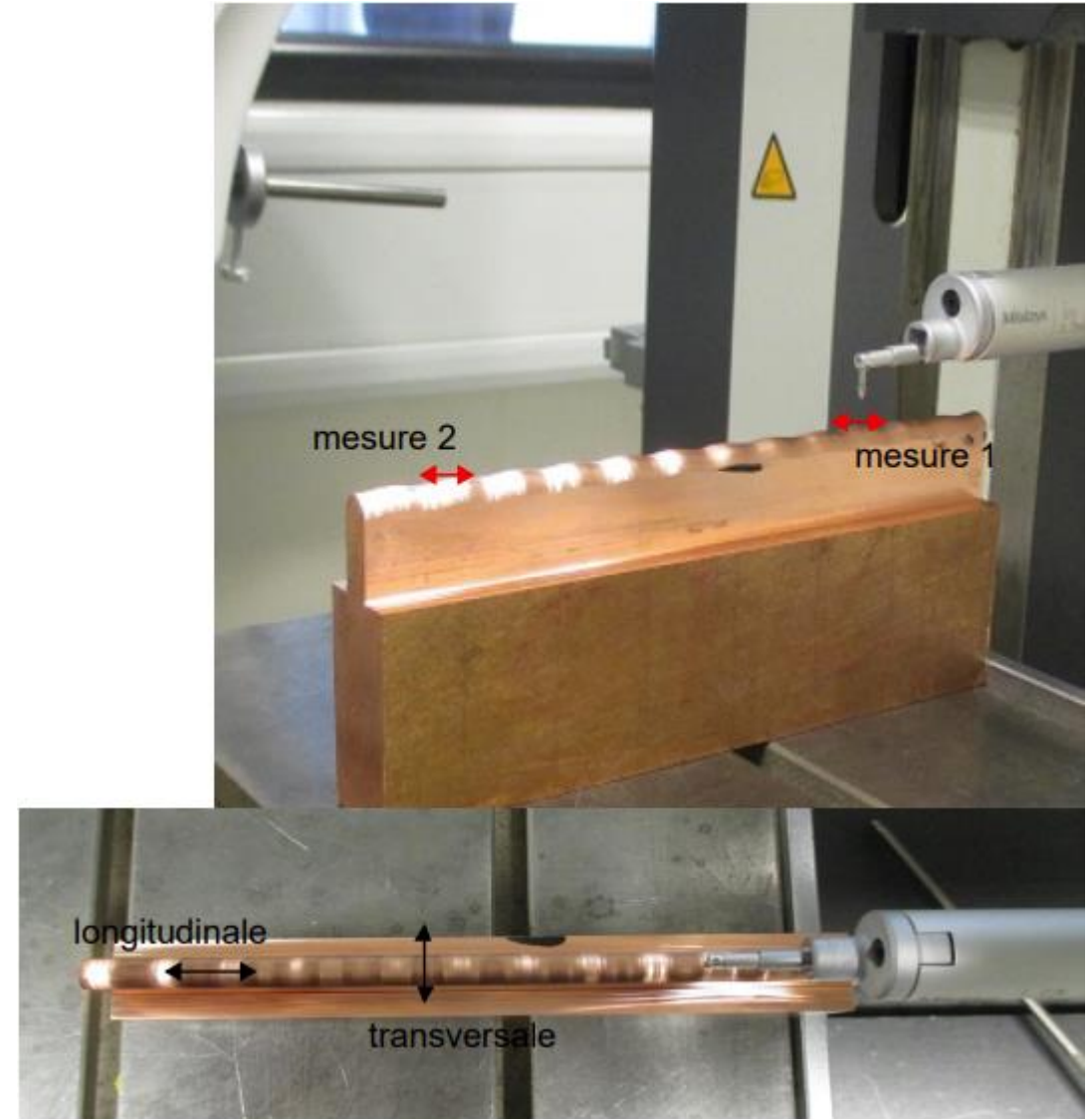


# Modulation roughness

- Metrology [EDMS 2383706](#)
- Transversal and longitudinal measures
- Repeated on 3 different machines and different configurations

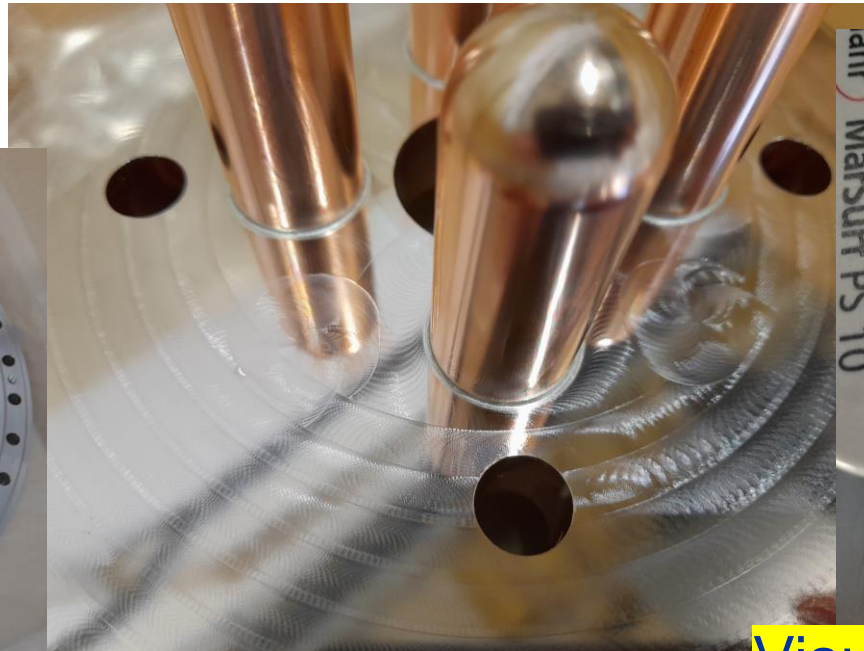
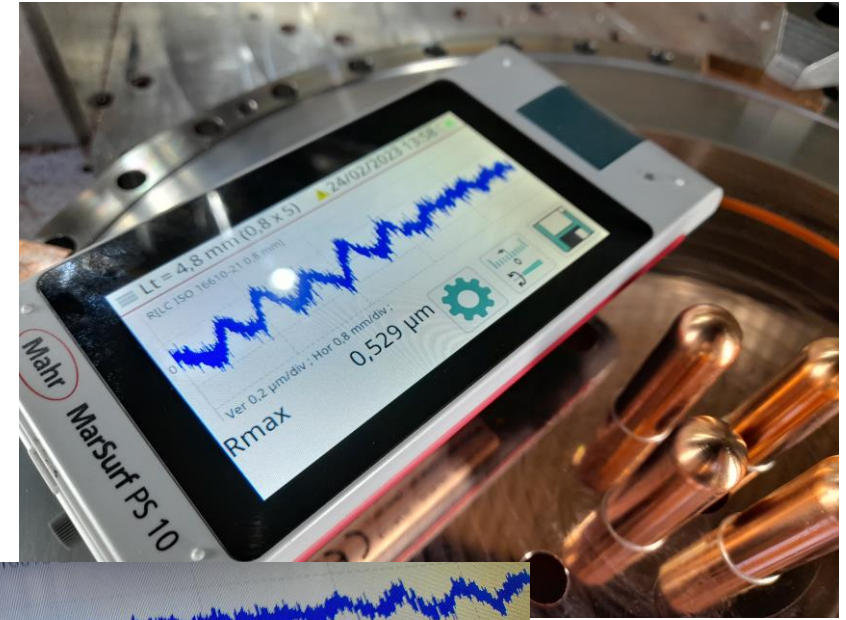
Ra measures on the final sample:

Ra [ $\mu\text{m}$ ]	Longitudinal	Transversal
Mes 1.	0.24	0.28
Mes 2.	0.30	0.28



# Flanges re-machine after brazing

- Final brazing: Metal filler distributed on the RF surface
- Clean re-machining of the whole surface
- Urgency: measures done by workshop means MahrSurf PS 10



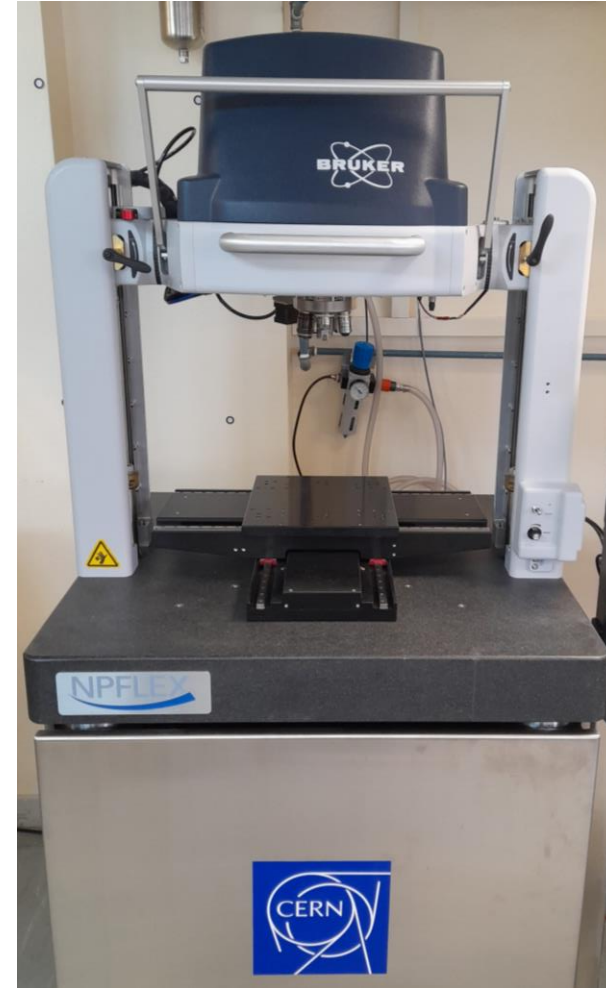
Visual machining indications but Ra correct

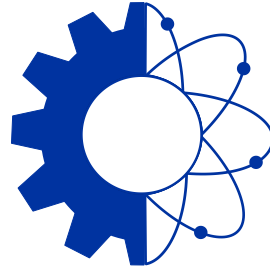
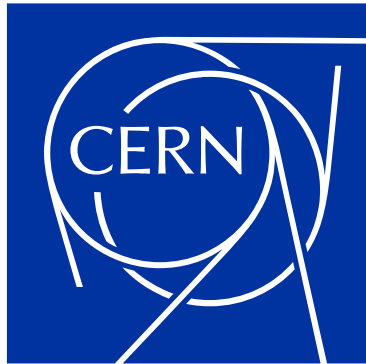


# Tuners RF plugs

## Standard tooling / machining for Cu OFE

- Ra 0.2 – 0.8
- Can be measured to confirm
  - without contact / contamination





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