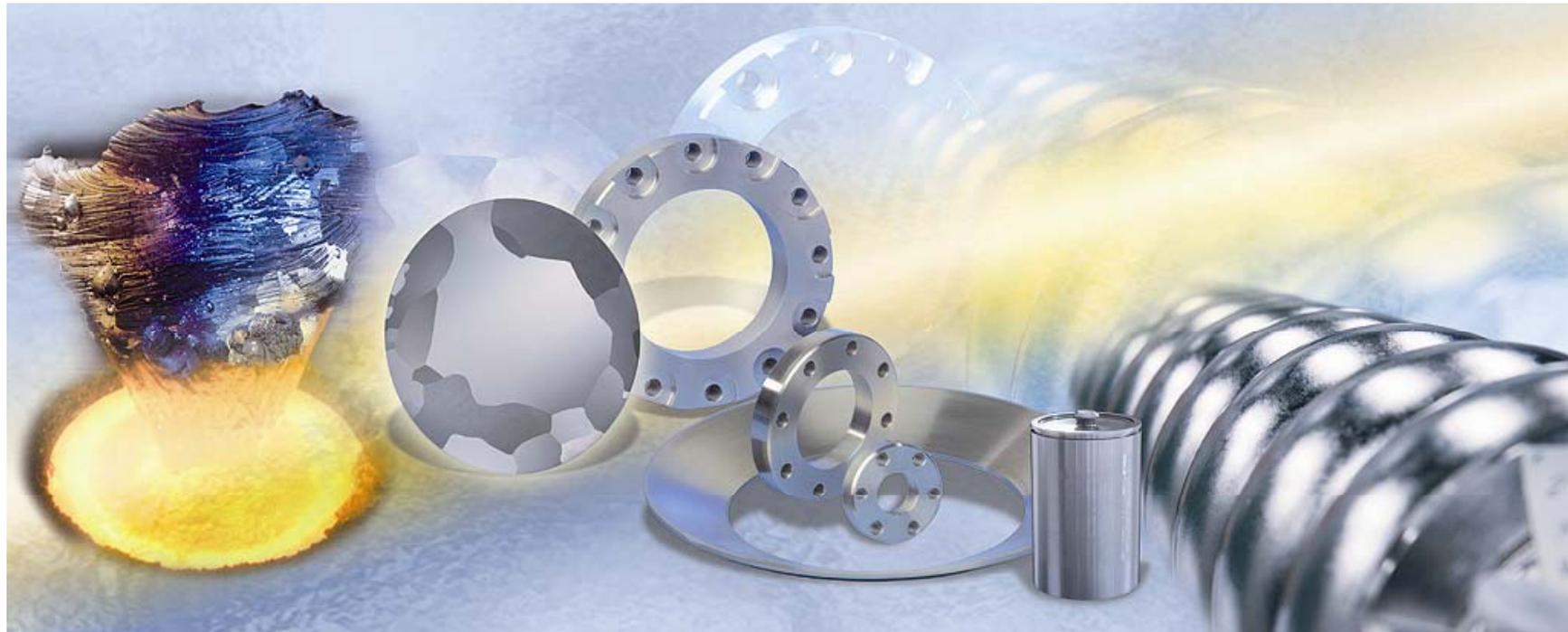


Progress and Capability
of Nb Seamless Tube
and near shape Nb Coupler Housing



- Overview HERAEUS
- RF-SC related Products
- Nb seamless Tubes
- Nb Coupler Housings
 - Technology
 - Available Dimensions
 - what's next

Facts and Figures 2010

Heraeus Group

Product revenue (in € million)	4,079
Precious metals trading revenue (in € million)	17,946
Employees at year-end	12,931

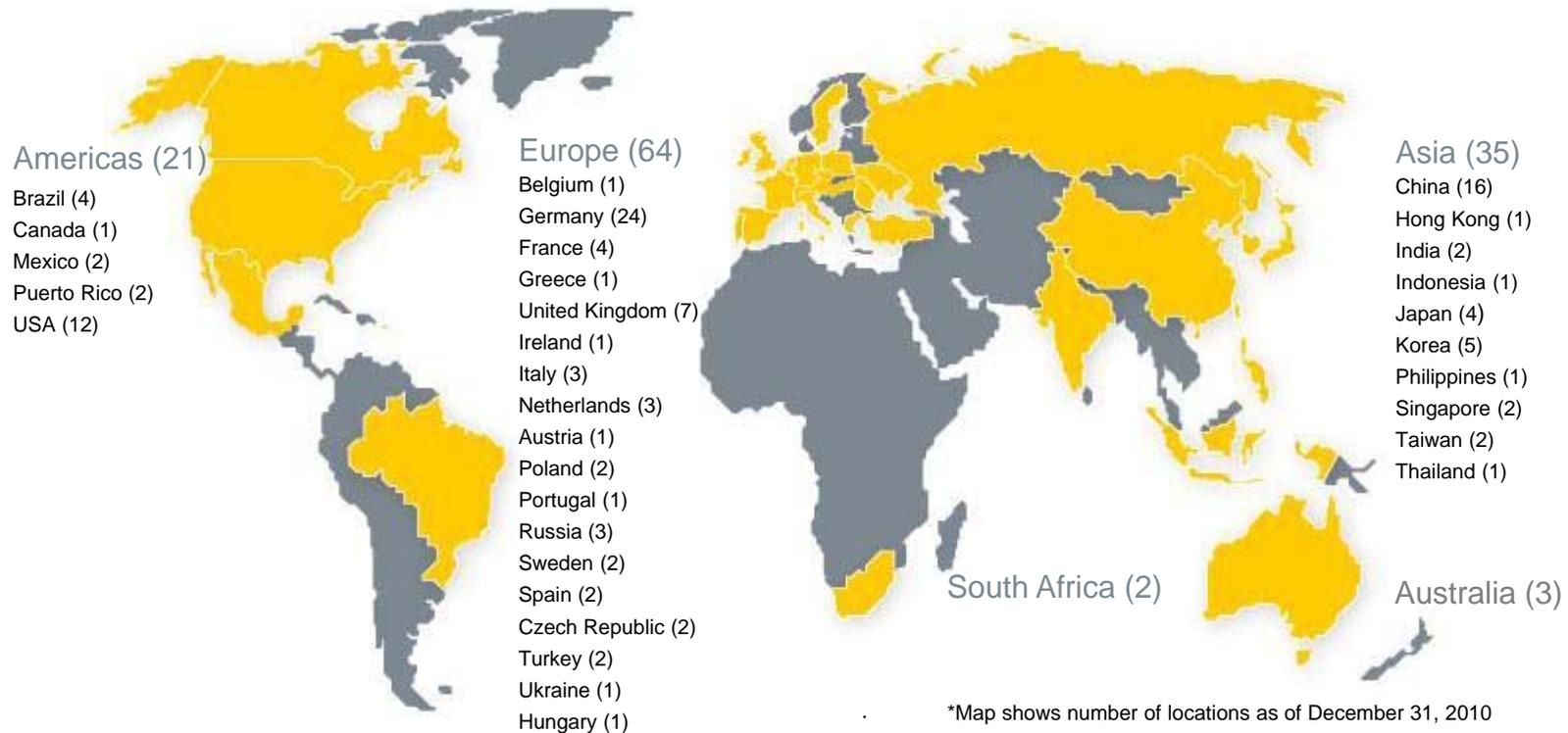
Business Groups

	Product revenues (in € million)	Human resources
Precious metals	1,447	2,489
Materials and technologies	1,501	2,980
Sensors	375	3,144
Dental products	306	1,397
Biomaterials and medical products	67	183
Quartz glass	279	1,419
Specialty light sources	99	689

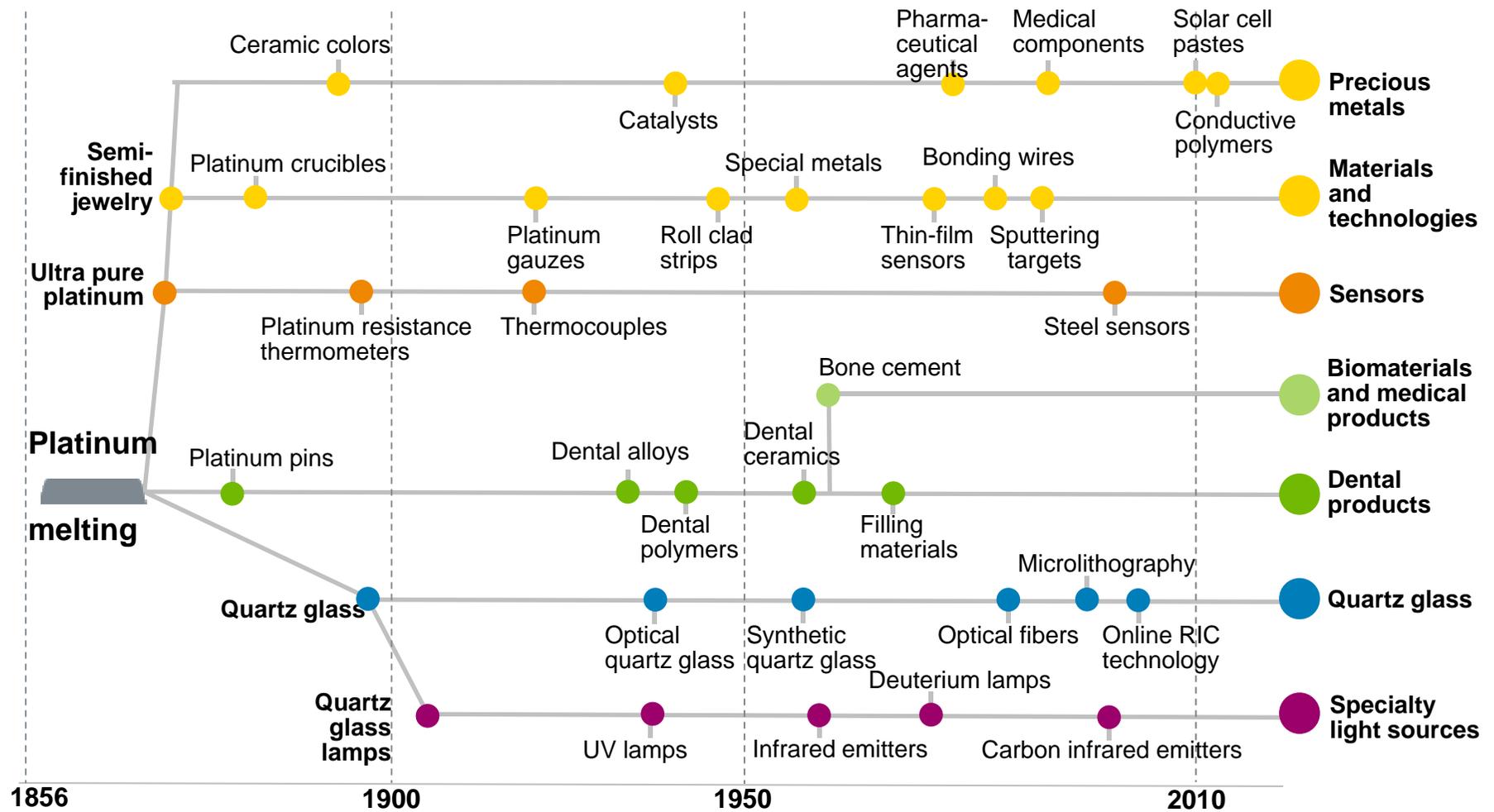
As of December 31, 2010

Our global presence

With 125 locations and 25 dedicated development centers, Heraeus is active in key markets all over the world.*

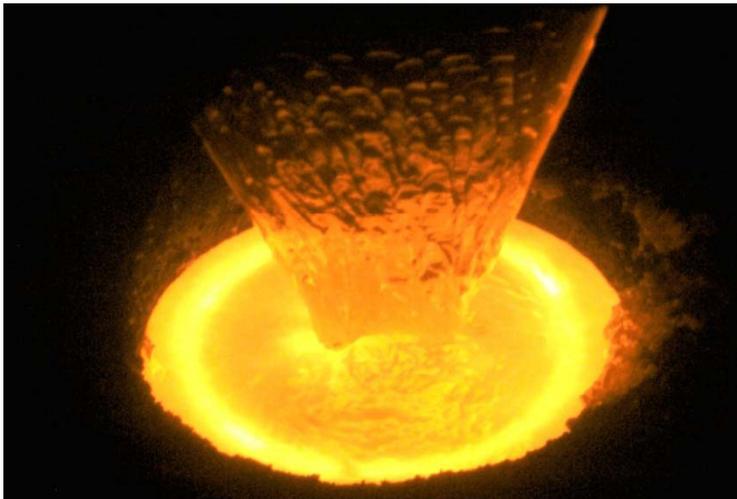


The product development tree



RF-SC related Products

- Nb RRR Ingots
Diameter 305 mm
Length 2000 mm



RF-SC related Products

- Nb RRR Sheet Bars
Starting Material for Sheet Production

Sheet production is done by PLANSEE

→ Talk from Robert Grill

Heraeus PLANSEE
Doubleexpertise
Doubleexpertise



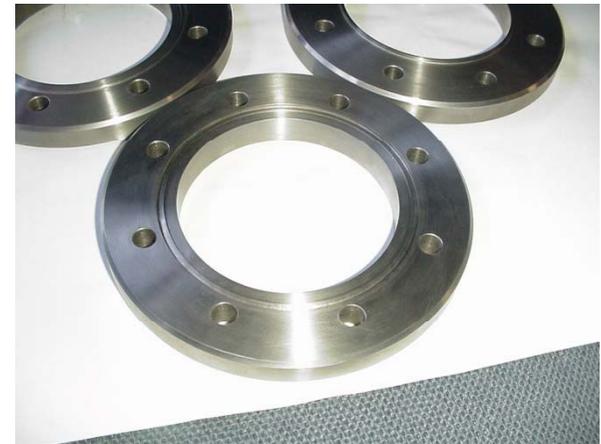
RF-SC related Products

- Nb RRR Large Grain Discs
direct cut from the Ingot

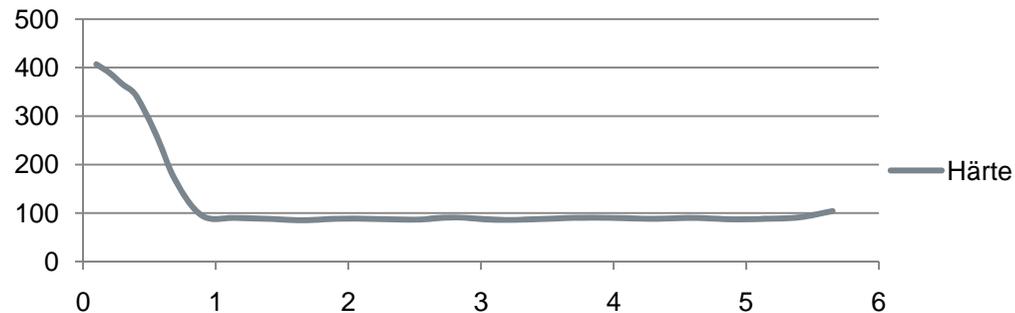


RF-SC related Products

- NbZr1% Con Flat Flanges Oxygen enriched
- The Surface is hardened that the Flange can be opened and closed several times
- The Joint will become SC

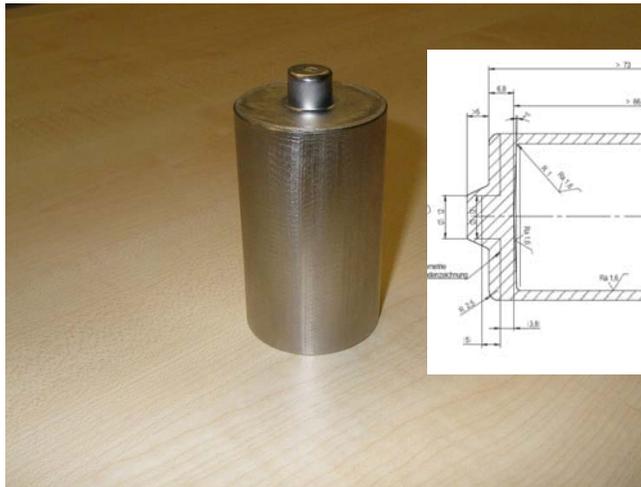


Hardness DPH

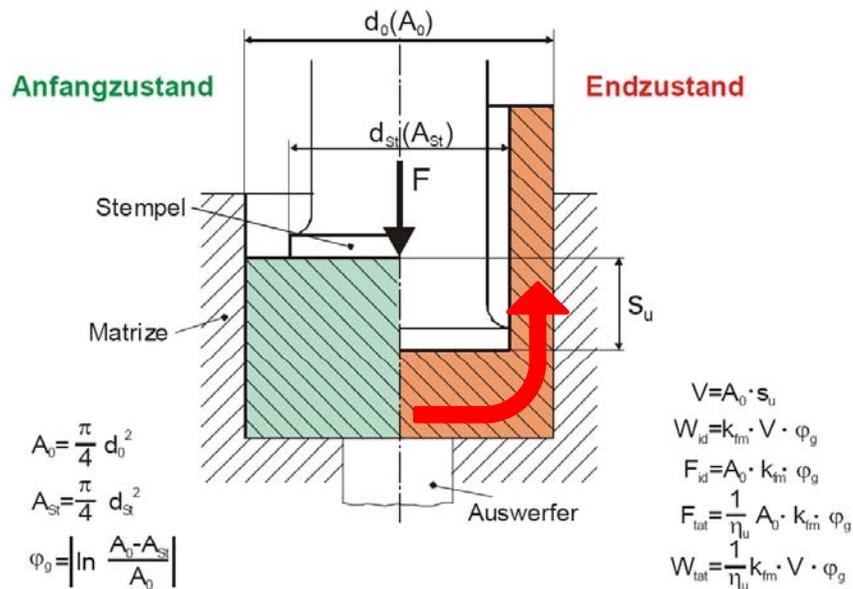


RF-SC related Products

- Nb RRR Seamless Tubes
- Nb RRR Coupler Housings



Back Extruding



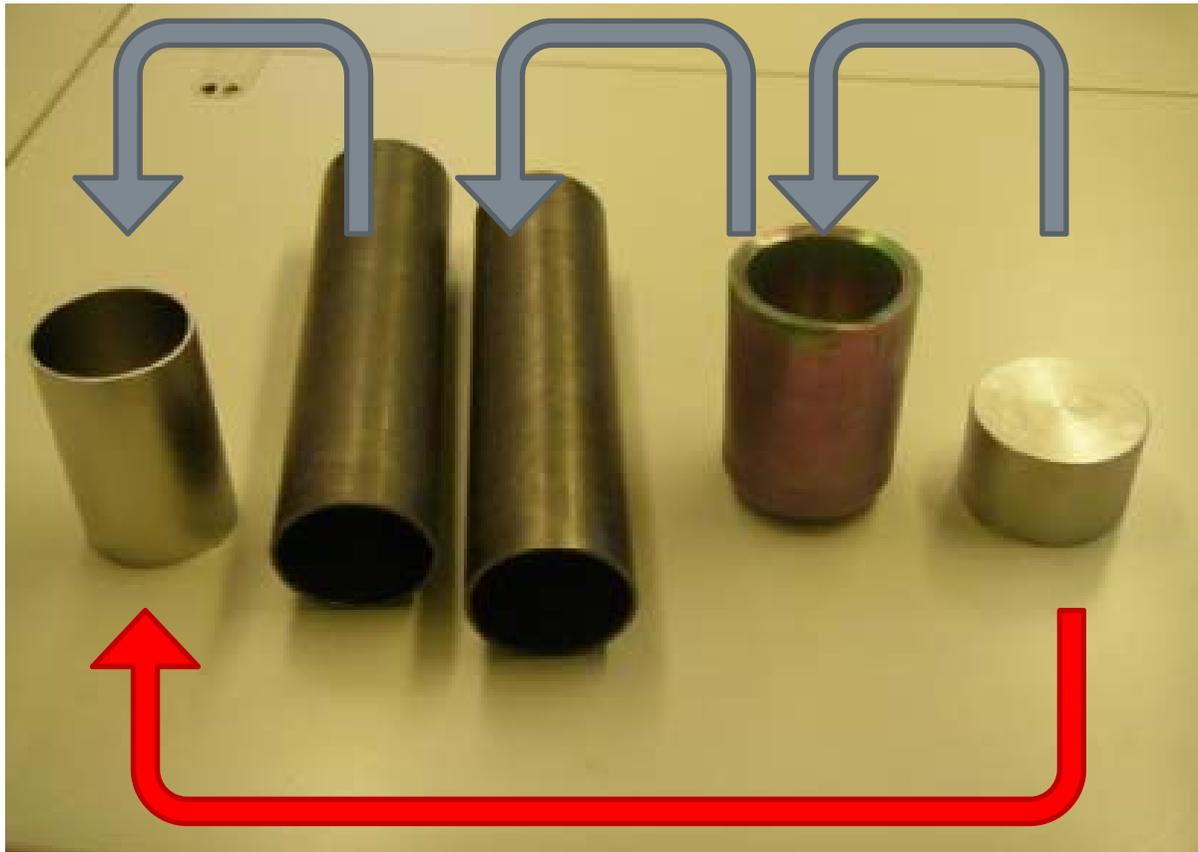
ASTM 6

Advantage:

- High Material Yield
- Shear Stress caused by the Material Flow will give relatively fine Grain after Recrystalization

Back Extruding

Two Ways = One Result



Dimensions:

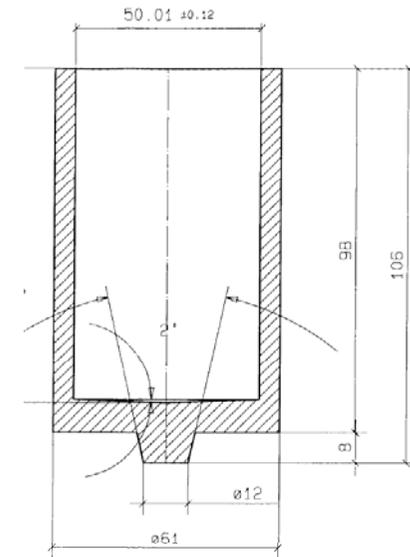
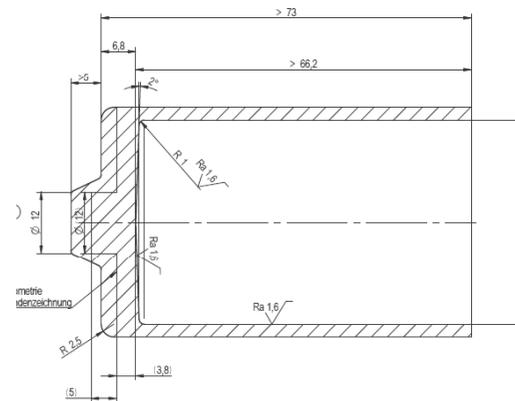
Nb RRR Seamless Tubes

- Up to ID 78 mm
- Up to Length of 400 mm



Nb Coupler Housings

- Available Tools
- TESLA Shape 45 x 40 mm
- Others on Request



Background:

25 Years Extruding Experience in Refractory Metals
100 Mio NbZr1 Parts for the Lighting Industry / Year



Nb RRR 300
tube OD 84
mm



Nb RRR 300
„coupler housing“

Actual:

2800 Endtubes Length 22 and 105 and 140 mm
1400 Coupler Housings
for European X-FEL

Background:

- 1985 Back Extrusion of NbZr1 Caps
Dia 2 mm 3 mm and 4 mm
- 1997 Back Extrusion of Nb RRR Coupler Housing
Dia 45 mm
- 1997 Back Extrusion of Nb RRR Endtubes
Dia 78 mm



What's next:

Where shall the development goes to ?

Large Tubes for Hydroforming ?

Single / Large Grain Discs ?

How fix is the Design for the ILC Cavities ?

How fix is the Production Way ?

How to set the right Frames that the Industry
can run the right Direction ?

Thank you !