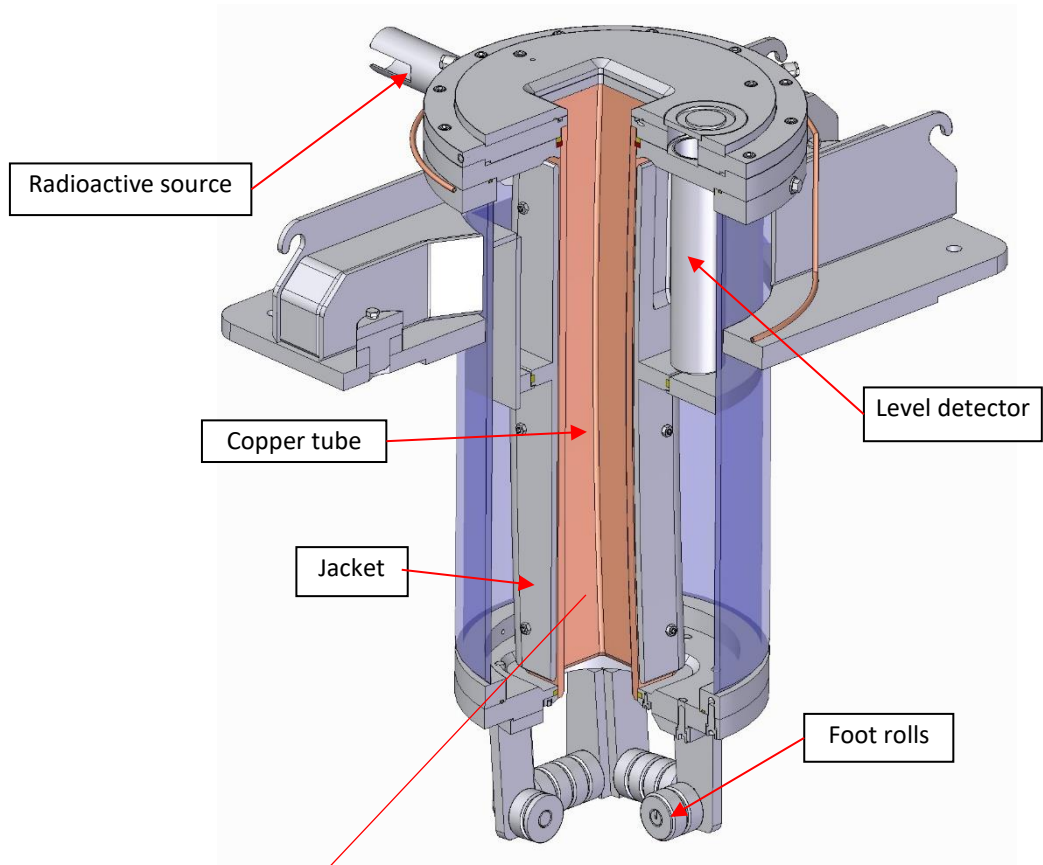


# SOUTH KAVEH STEEL CO.

## MOULD COPPER TUBE 150×150 DATA SHEET



Textured tubes



## MOULD COPPER TUBE 150×150 DATA SHEET

### MOULD PARAMETERS

Tube material .....	<b>CuAg ( P: 0.004 - 0.012 )</b>
Inlet Coating .....	<b>Chrome (Thickness 0.08-0.12 mm)</b>
Length [m m] .....	<b>1000</b>
Taper type .....	<b>Parabolic</b>
Machine radius .....	<b>9/17/∞ [m]</b>
Strand & inter distance .....	<b>6 strands / 1250mm</b>

	<b>b</b>	<b>h</b>
Nominal dimension .....	<b>150</b>	<b>150</b>
Mould exit dimension .....	<b>152</b>	<b>153.5</b>
Mould top dimension .....	<b>153.85</b>	<b>155.37</b>
Absolute taper [mm] .....	<b>1.85</b>	<b>1.87</b>
Average taper .....	<b>1.22 %m</b>	<b>1.22 %m</b>

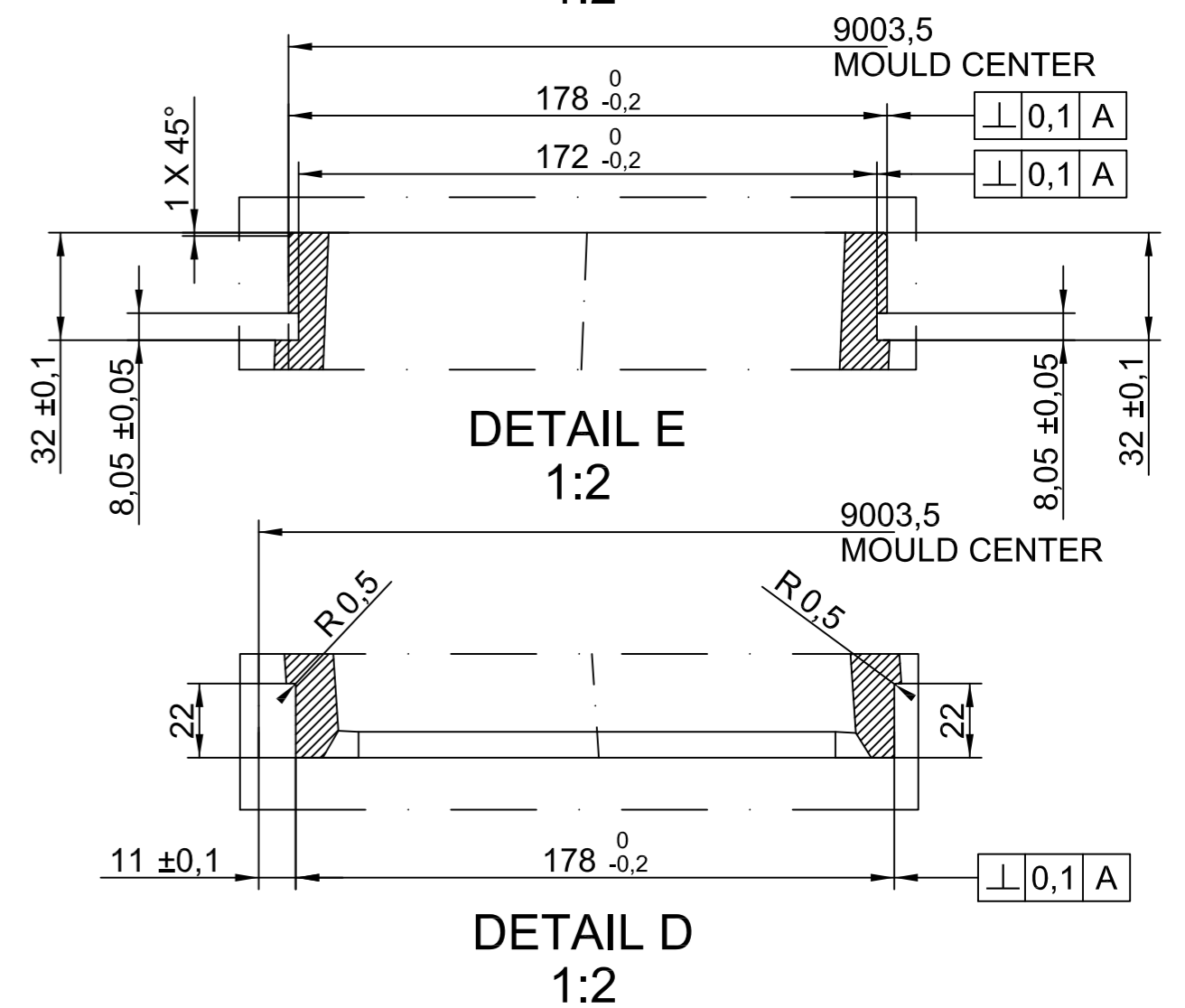
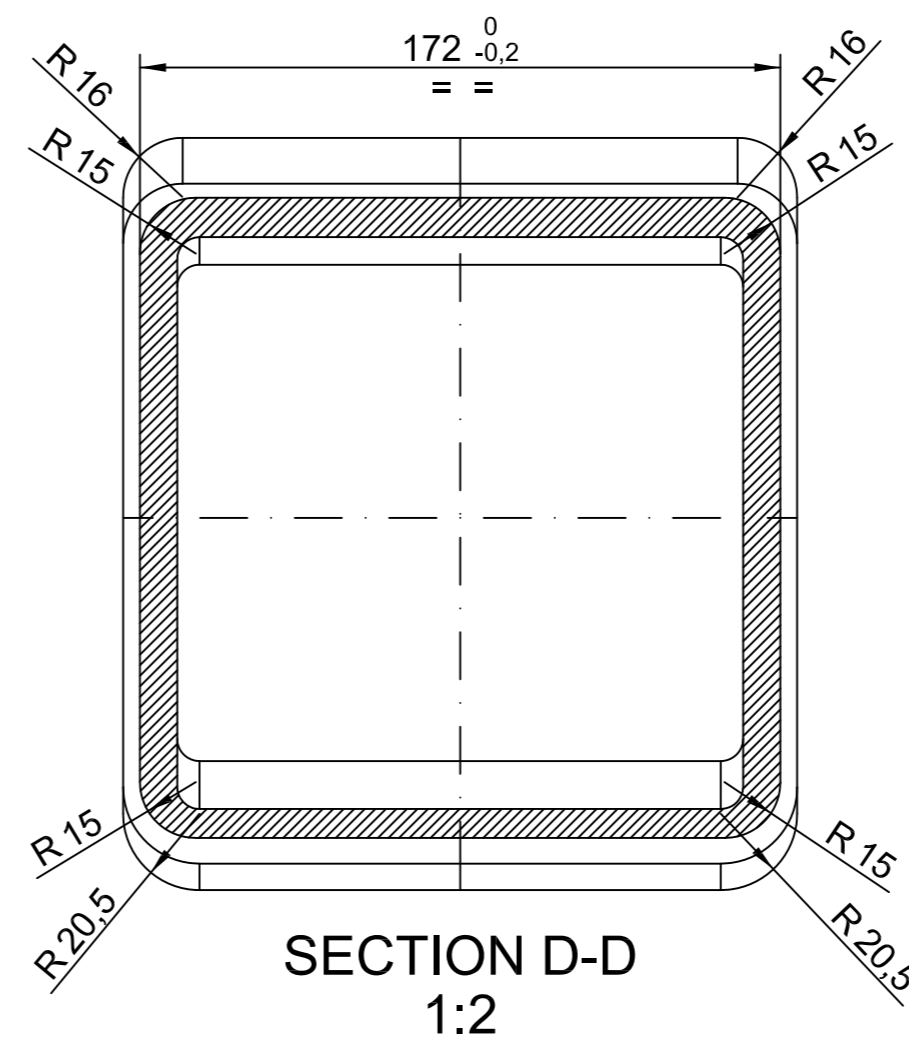
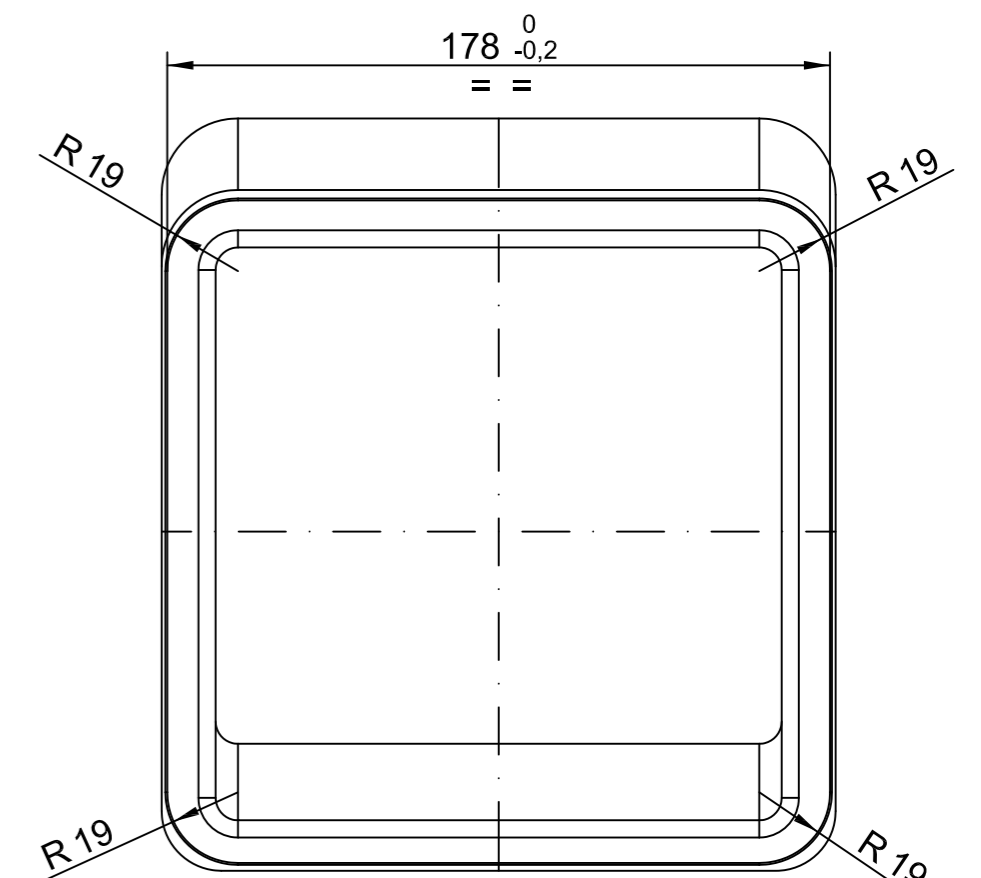
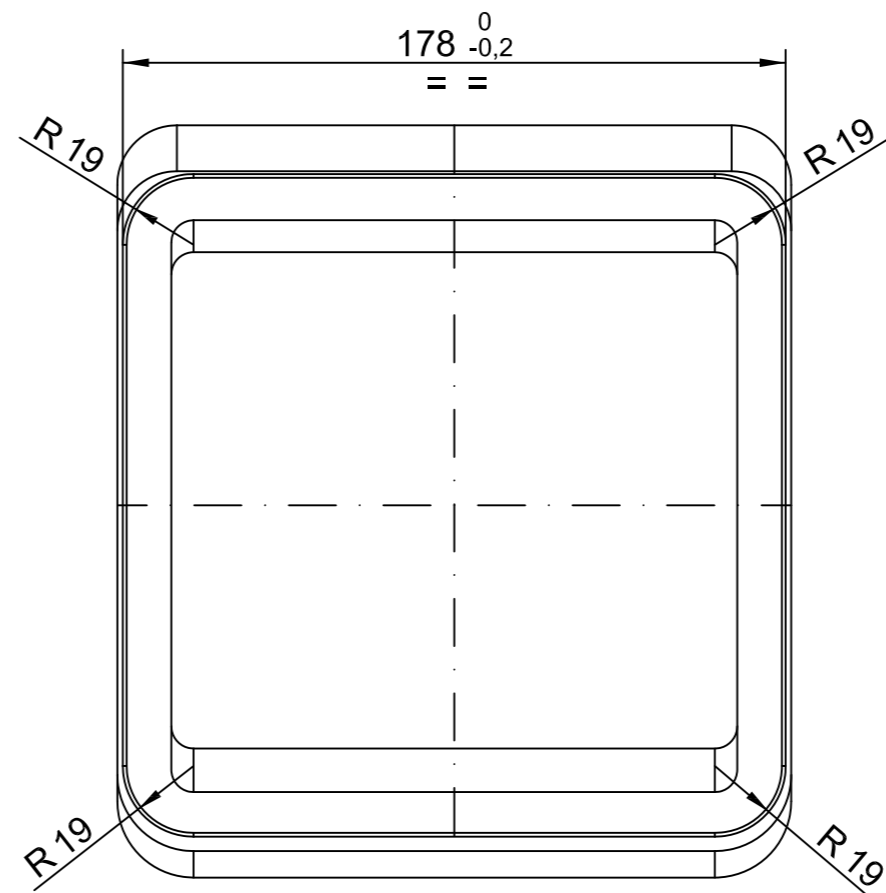
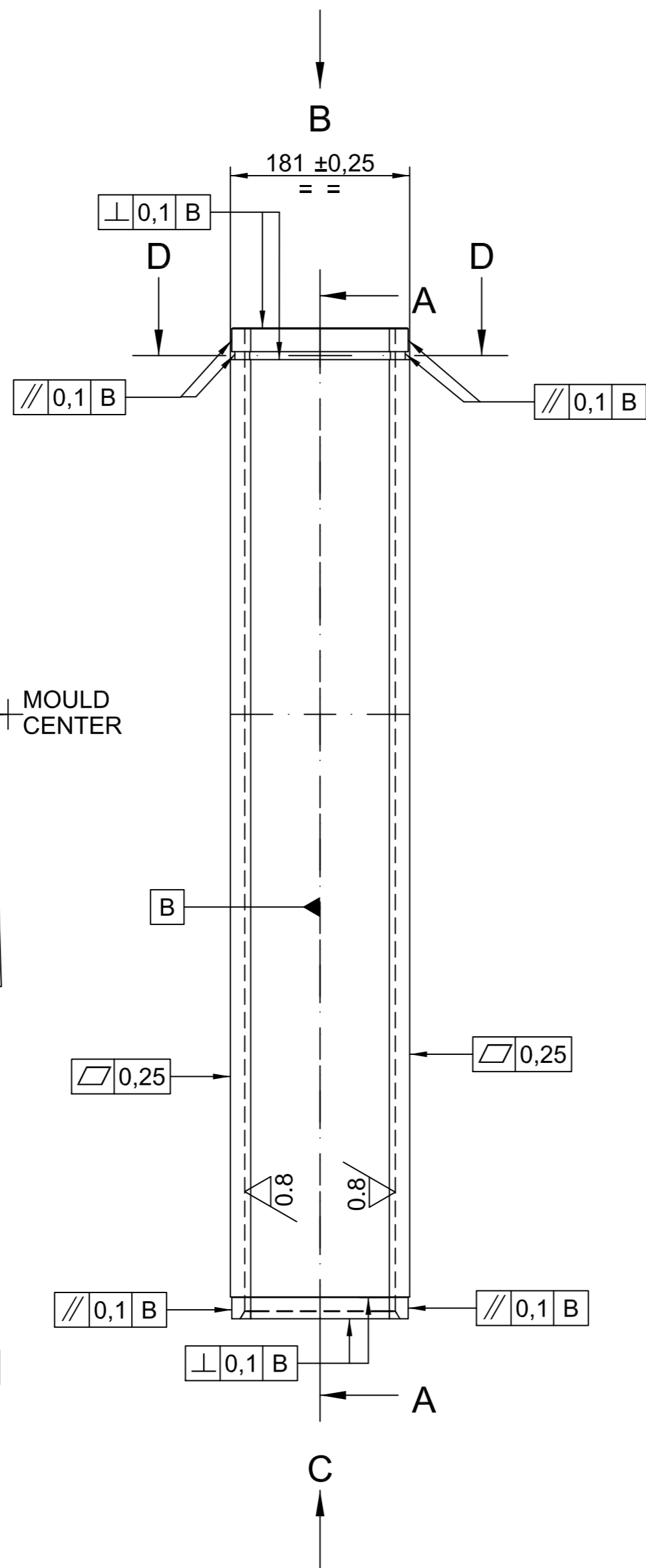
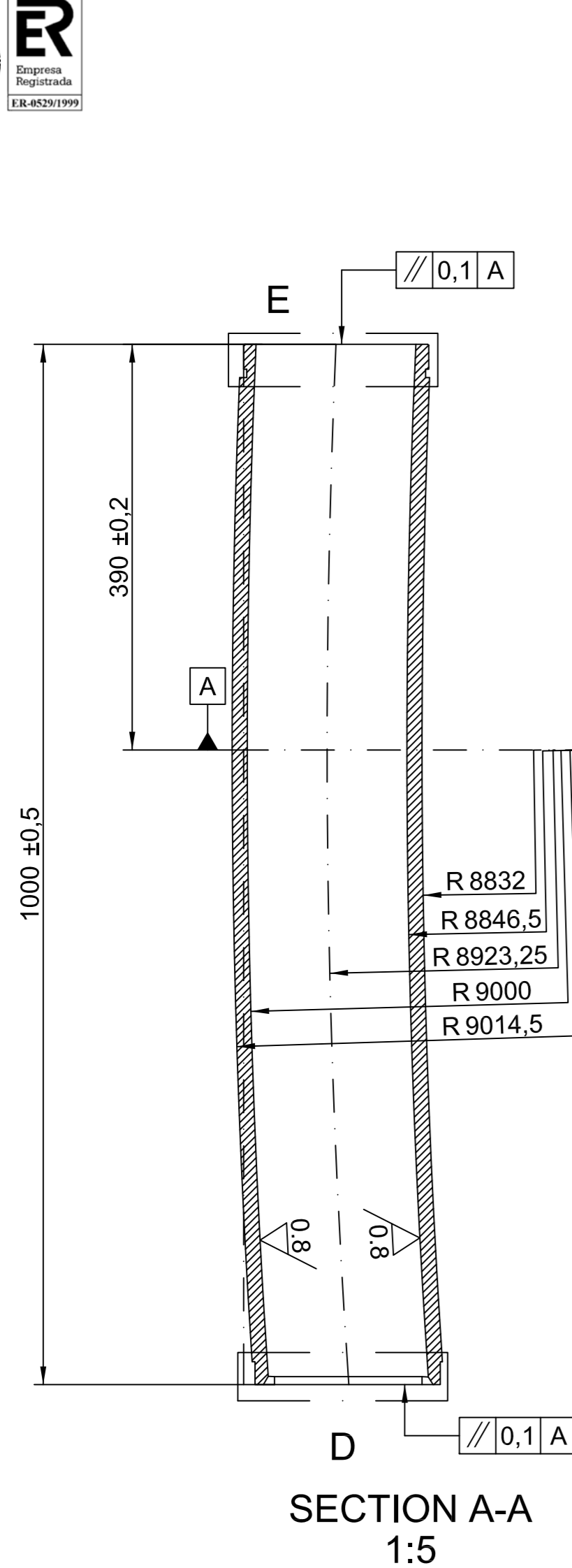
Fillet radius [mm] .....	<b>6</b>
Copper thickness [mm] .....	<b>14.5</b>
Meniscus nominal level position .....	<b>70 % = 125 mm from top Cu</b>
Max level [mm] .....	<b>80 from top Cu</b>
Zero level approx. [mm] ... ..	<b>230 from top Cu</b>
Water gap [mm] .....	<b>3.25</b>
Max Casting speed [m/min] .....	<b>3.2</b>

### PRIMARY COOLING DATA

Length [mm] .....	<b>1000</b>
Working flowrate/strand [l/min] .....	<b>1700</b>
Water gap [mm] .....	<b>3.25</b>
Water speed [m/sec] .....	<b>12.0</b>
Primary water pressure drop [bar] .....	<b>4.6</b>
Inlet pressure [bar] .....	<b>7-8</b>
Min. outlet pressure [bar] .....	<b>3.0</b>
Maximum inlet temperature [°C ] .....	<b>38</b>
Est. Max DT at Max speed [°C] .....	<b>11</b>
Ladle Capacity .....	<b>170 ton</b>
Number of heat (per day) .....	<b>24</b>
Tundish Capacity .....	<b>30 ton</b>
Mould Level Control .....	<b>Automatic</b>

TOLERANCES FOR LINEAL DIMENSIONS ac. to ISO 2768 (Without individual indication of tolerance)

Type of tolerance	Symbol	Maximum length in mm	Maximum diameter in mm
Machining	m	>0.5-3-306	>6-30-300
Oxy. cutting	c	±0.2 ±0.3 ±0.5	±1 ±1.5 ±2



3.2 / (0.8)

MEASUREMENT REGISTER													
Piece	Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Dimension 6	Dimension 7	Dimension 8	Dimension 9	Dimension 10	Dimension 11	Dimension 12	Result
	OK	N OK	OK	N OK	OK	N OK	OK	N OK	OK	N OK	OK	N OK	Accepted
													v.p.p.
													Signature
Last													
	Accepted	Recuperated	Scrap	Date	Made by								
Total pieces													
Document 50/Rev.1													

REV.	DATE	Description	Designed	Approved
History of Revision				

		Client: <b>South Kaveh Steel Company</b>			
PROJECT TITLE:					
<b>STEEL MAKING PLANT</b>					
DWG. TITLE:					
<b>3260 - CCM COOLING MOULD</b> COPPER MOULD 150X150 R9000 MACHINING					
Equipos Siderúrgicos		DRAWING CODE NO. 08158.3260.16.000		Scale: <b>1:5</b> Size: <b>A-2</b>	
		Client code 16-03-02-A-3260-001-008-A		REV. R00	
DESIGNED: I. Saslain	DRAWN: I. Saslain	CHECKED: J. Sesma	APPROVED: M. A. Iriarte	Sheet: 1/1	
DATE: 13/04/2011	DATE: 13/04/2011	DATE: 13/04/2011	DATE: 13/04/2011		

## 1.1. MOULDS.

### 1.1.1. TECHNICAL DATA.

- *Mould assembly.*
  - *Water coupling with the oscillating table:* ..... *Automatic*
  - *Foot rolls:* ..... *one row, fixed to the mould bottom*
  - *EMS:* ..... *External type*
- *Radioactive mould level control*
  - *Detection span:* ..... *200 mm.*
  - *Tolerance:* ..... *± 2%.*
  - *Response time:* ..... *≤ 0,15 ms.*
- *Mould lubricating Device.*
  - *Powder feeding Device:*
    - *Type* ..... *Automatic.*
    - *Location* ..... *on tundish car.*
  - *Oil feeding Device:*
    - *Type* ..... *Automatic.*
    - *Location* ..... *on the casting platform.*

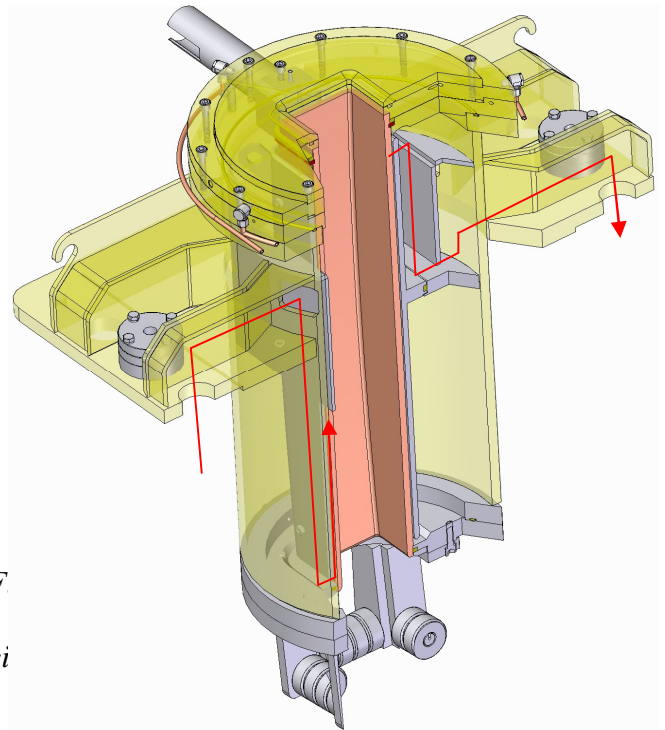
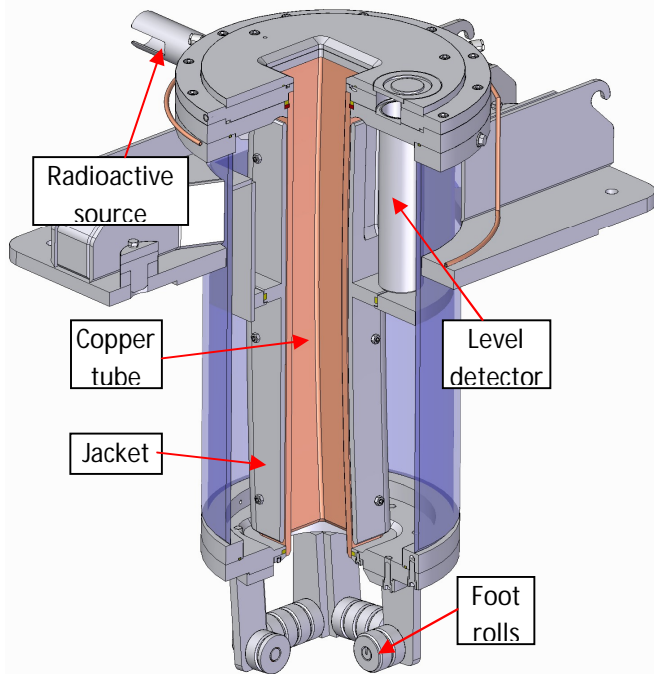
### 1.1.2. DESCRIPTION.

*The molten steel goes from the tundish to the moulds, where the solidification process starts and the steel is shaped as a square of different sizes. The steel is poured inside a copper tube (copper is used because of its good thermal conductivity). Since mechanical properties of copper are not that good, the tube is hard chrome plated on the inside. The copper tube is inserted in a stainless steel jacket, and cooling water flows in the gap between them to evacuate the heat from the steel.*

*The steel level in the mould is measured by a radioactive system. A radioactive source is placed on one side of the mould. The radiation goes through the jacket, copper tube and molten steel, and a scintillation counter measures the radiation at different places, detecting the height of the steel in the mould.*

*The copper tube is bent with the machine radius. The cooling must be enough to guarantee a solidified shell thick enough when the steel leaves the mould. At the end of the copper tube there are one or several rows of foot rolls that guide the strand, prevent bulging and serve as a guide to insert the dummy bar head in the mould.*

*The mould can be seen in figures 25 and 26.*



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ci

To prevent the solidified steel from sticking to the copper tube, the mould is placed on an oscillating bench, that moves it following an arc path. The bench is oscillated by a servo-cylinder, and the stroke, frequency and waveform can be adjusted during casting. When the mould is placed on the oscillating bench, the water circuit is automatically connected to the ports on the bench arms.

The mould also has a circuit for feeding lubrication oil to the copper tube, that is used for submerged nozzle casting. This circuit can be seen in figure 27.

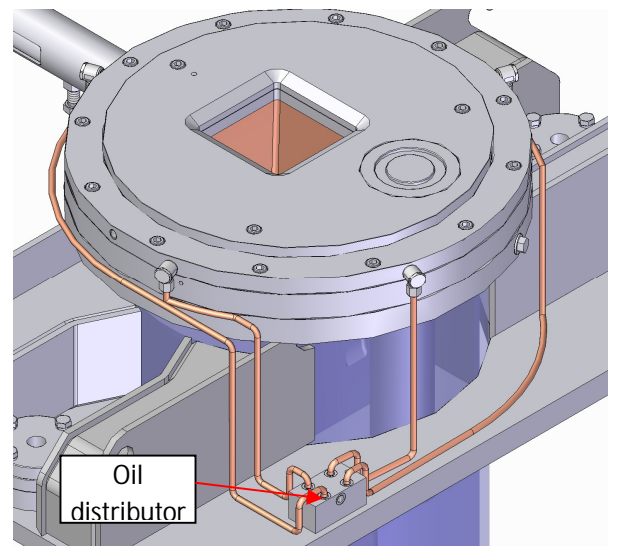
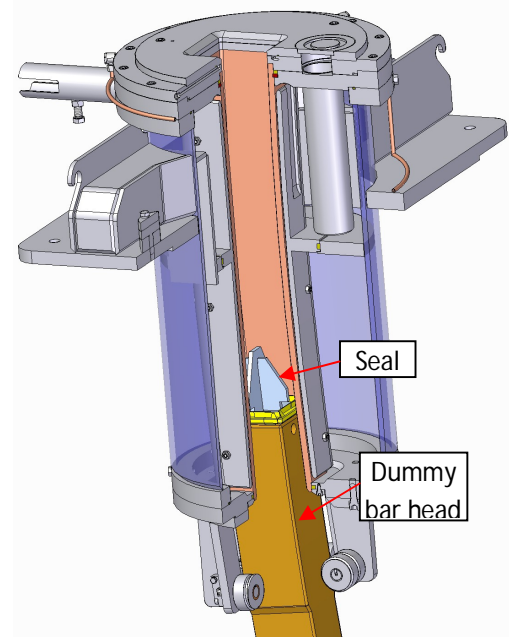


Figure 27. Lubrication oil circuit

Before starting the cast, the dummy bar head is inserted into the mould from the cooling chamber through the foot rolls. The dummy bar head has a seal on top to avoid the molten steel leaking from the copper tube. When the steel starts solidifying in the mould, the straighteners start dragging the dummy bar and the strand starts moving. The dummy bar can be seen in figure 28.

*For some steel grades an Electro Magnetic Stirrer (EMS) is placed outside the mould body. This EMS creates magnetic currents in the molten steel that improve center segregation.*



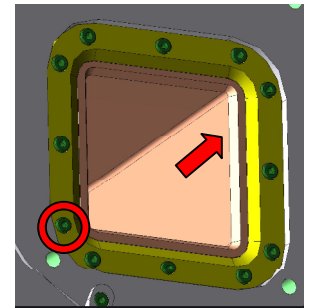
*Dummy bar head inserted in mould.*

## **DISMANTLING OF THE MOULD**

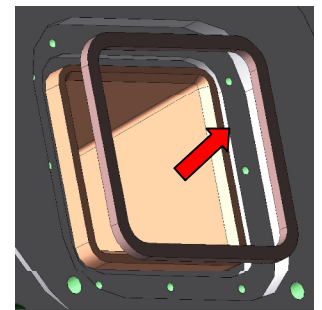
*During dismantling, care should be taken to prevent the ingress of foreign matter into the mould, especially into water passages, tubes etc. It is recommended that small items such as nuts, washers and bolts be kept with their appropriate major assemblies and stored with care until required for assembly.*

*All seals and gaskets should be handled carefully during dismantling and new items fitted at assembly if necessary.*

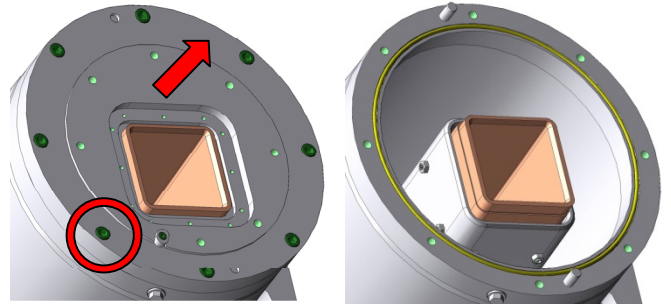
1. Remove the eight cap screws securing the sealing plate to the bottom flange of the mould body and remove the plate.



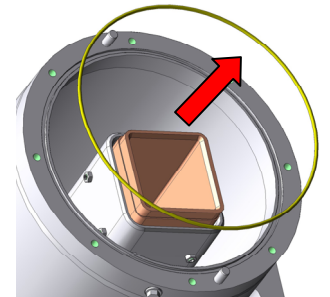
2. Remove the copper tube sealing gasket.



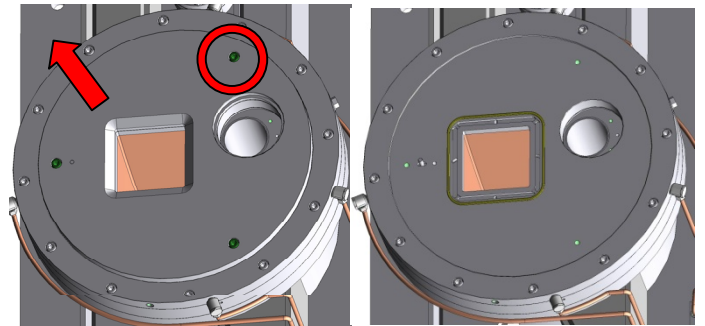
3. Remove the eight socket head cap screws securing the lower flange to the mould body and remove the flange.



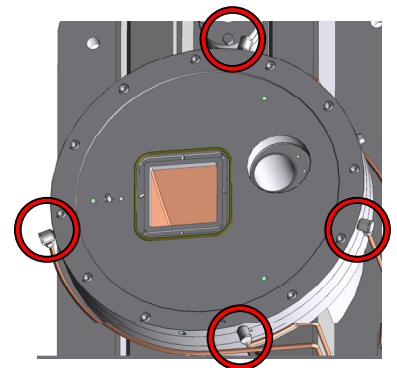
4. Remove the O-ring.



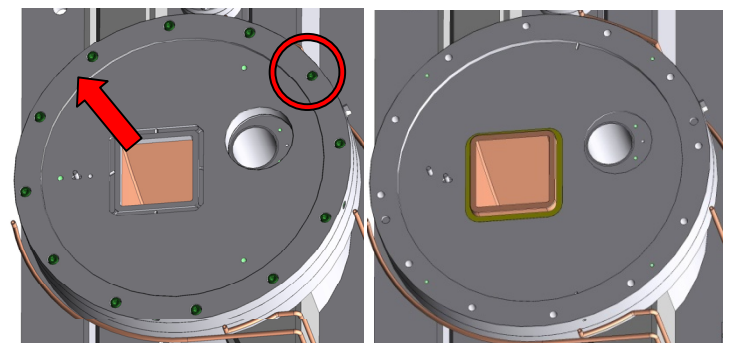
5. Remove the three socket head cap screws securing the top flange and remove it with the O-ring. This step can be avoided and this flange removed along with the next one.



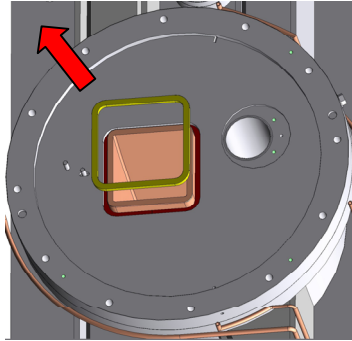
6. Remove the oil feeding nipples.



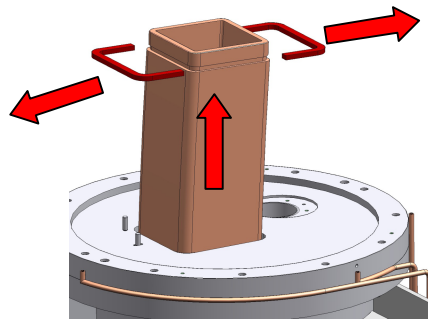
7. Remove the 12 socket head cap screws securing the oil distributing flange and remove the flange.



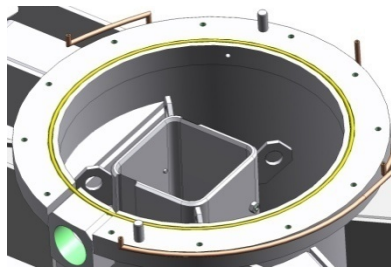
8. Remove the copper tube sealing gasket.



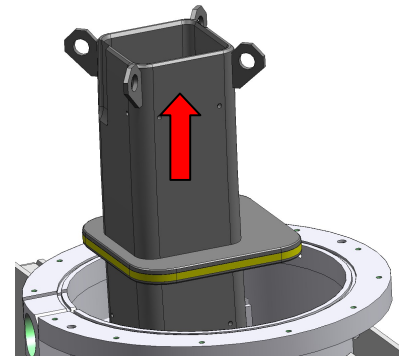
9. Remove the copper tube and the keys from the upper side.



10. Remove the top flange.



11. Remove the water jacket from the top of the mould body.





## ASSEMBLING OF THE MOULD

*Care should be taken when assembling the mould to ensure that all items are absolutely clean and that debris or foreign matter is not allowed to enter cooling tubes or passages. Lubrication connections should be examined before connecting to ensure cleanliness and freedom from obstruction. All nuts, bolts, studs etc. should be tightened to a torque load figure appropriate to the size.*

*The mould can be assembled following the steps indicated in the previous section in the opposite order.*

*To be sure that there will be no leakages new seals and gaskets should be used.*

*The water gap must be checked to ensure an adequate cooling of the strand.*

## INSTALLATION AND ADJUSTMENT OF THE FOOT ROLLERS

*The foot rollers which are attached to the bottom flange of the mould, are provided to enable a smooth insertion of the dummy bar into the mould, and to support the strand as it leaves the mould tube. They have to be aligned very carefully by using the mould template.*

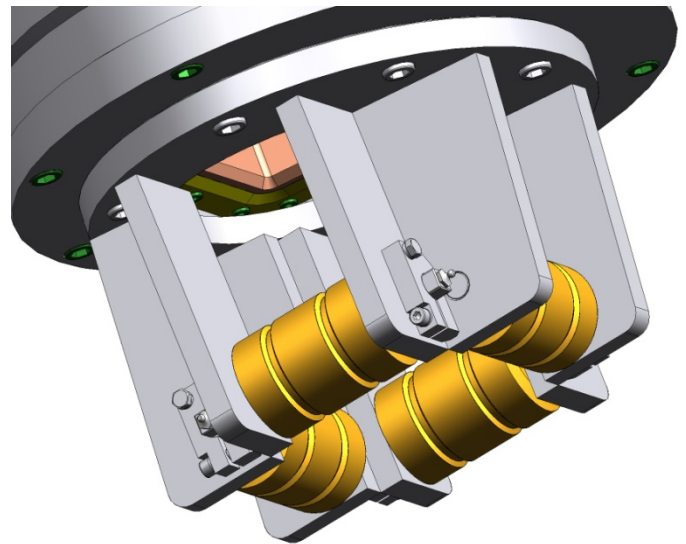
*For alignment, each foot roller has an eccentric axle by which it can be adjusted over a range of  $\pm 2.5$  mm. Adjusting the foot rollers, there should not remain any clearance between the mould template and the roller. Correctly adjusted foot rollers must have a minus measure of 0.2 mm.*

*The foot rollers must be lubricated with the same lubricant that is used for the rollers in the cooling chamber.*

*In case of a break out and after overheating situations, the rollers must be completely dismantled and cleaned or replaced if necessary.*

*Foot rollers are shown in figure 29.*

Figure 29. Foot rollers



## SPECIAL REMARKS

*Geometry between mould and strand guide has to be checked periodically*

*Water flow through the mould is critical, since restrictions or lack of water can end in disastrous results during casting and can be harmful to the operators*

*Mould maintenance is essential and has to be carried out regularly in a proper workshop*

### 1.1.3. SAFETY

*For common safety instructions see chapter 2.*

*Steel or slag can be ejected from mould, and sparks during initial tundish filling.*

*After any maintenance involving the fitting or replacing of a mould tube, it is essential, that the mould is water tested to a pressure of 6 bar. Leakage into the mould tube is dangerous, and therefore not acceptable. Ignoring this rule, could lead to a steam flash explosion with resultant danger to personnel and equipment.*

*It is strictly forbidden to operate the moulds while the emergency water system is not ready!!*

*The EMS creates strong magnetic fields, no one with a condition regarding magnetic fields should stay close.*

*The radioactive sources must be handled strictly according to the safety rules.*

*Check the chapter regarding water systems for more specific safety measures.*



### 1.1.4. MAINTENANCE

*Check the manufacturer manual for instructions on maintenance/handling and storage of the radioactive sources and level detectors.*

*Check the manufacturer manual for instructions on maintenance of the EMS.*

*Daily:*

- *Inspect the copper tubes for signs of burning or damage, wipe clean with dry cloth.*
- *Check for signs of water leaks on bottom and top plates. If present, remove mould and repair.*
- *Check that all fixation bolts are secure.*
- *Clean the mould protection covers.*
- *Check that the mould is free of air by opening bleeding valves.*