VISIT TO A.S.E.A., Västerås

on 23-24 January, 1969

Discussions with : Mr. Renborg
Mr. Rönnevig
Mr. Lindvall

Visit to tooling department, Mr. Reimer, and welding laboratory, Mr. Lundquist.

Good progress has been made since we placed the order. The most important drawings, laminations and blocks have been remade by ASEA. The design of all dies (for BM and Quad.) is practically finished and some components (cast steel frames of the dies) already ordered.

Design of machining frame and stacking frame for BM is well advanced, for Quad. ideas not quite fixed. ASEA will send one copy of each drawing including those for tools.

1. Planning

   for BM : see diagram,
   for Quad. : not yet fixed.

2. Steel

   ordered on 18.12.1968 from V.O.E.S.T.
   Quantity : 28.5 tons
   Delivery : first half of March
   Acceptance tests : in Austria, end Feb./beginning March.

   ASEA representatives will come first to CERN for discussions.
   From here we can go together to VOEST.
3. **Lamination machining for BM**

   Stack of laminations - 750 mm high - held in rigid frame, machined on planning machine. All surfaces finished, except reference surfaces and gap, 2 mm left for punching.

4. **Varnish for laminations**

   Type of varnish not yet chosen; is being investigated in chemical laboratory - thickness, ~15 µ. Nothing known about radiation resistance, have to make tests ourselves.

5. **Punching of laminations**

   One operation for BM, three for Quad. Punching will be done in minimum time, to avoid too big temperature difference.

   ![Graph of heating of die](image)

   expect ta ≤ 1/2 hour, during this time punching with any other material available.

6. **Stacking frame**

   For BM, see Fig. 1, for Quad. not fixed, but will closely follow our proposal.

7. **Welding**

   ASEA agrees that new arrangement of welding straps better. They do not think that intermittent welding would have any advantage, would rather reduce size of weld.

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Electrode: OK 53.35 corresponds to Philips 27. New electrode with very small hydrogen content, very small penetrations ∼0.5 mm. Therefore less gas development from varnish and smaller porosity of weld.

Will make handwelding for prototypes: diagonal welding, starting from corners, simultaneous on both sides. Top and bottom tension straps eventually only welded to end plates. Each weld being done twice, first up to 4.5 mm, second up to 6 mm.

Heating of temperature: estimate: 300°C, up to 20 to 25 mm inside material for a few seconds.

For Quad small changes (see Fig. 2)

They do not think that with the electrodes used hammering will give any advantage.

8. Endplates

Start with 30 mm thickness and machined down to about 23 mm as proposed.

Steel SIS 14 1311 C = 0.12 %
Si = 0.25 %
Mn = 0.4 - 0.7 %
P max 0.08 %
S " 0.06 %

For 300 A/cm $B = 1.94$ Wb/m² (we asked for 2.0 Wb/m²)

Hc = ?

Will send two ring samples from two different plates beginning of February.

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9. **Block**

For BM welding straps probably machined after welding.

Machining of target holder needs different machine.

For Quad. machining allowance: 3 mm (not 0.3 mm).

Machines on planning machine in direction of laminations (Vorschub 0.2 mm).

**Threads:** Up to M8 metric for bigger threads they use UNC standards (O.K. for CERN?)

10. **Coils**

**Cooling tube**

Long discussion if 6 mm inner diameter can be used for cooling tube of BM, because they cannot get small quantities.

We finally agreed on:

- 7/8 mm diam. for BM
- 6.5/7.5 mm diam. for Quad, and special coil.

Material is in stock of steel manufacturer and was ordered the same day.

**Dipole coil**

Agree to modifications:

- 16 turns/gap, copper cross-section: 3 x 5 mm²
- inter-turn insulation: 0.36 mm
- pancake insulation: 1 mm
- resistivity of copper: \( \rho = 0.0172 \) at \( 15^\circ C \)
Main coil insulation

The tape used has a thickness of 0.18 mm; it is half overlapped, therefore thickness of one layer: 0.36 mm. We can have two layers.

Interturn insulation: 0.72 mm,
Breakdown voltage: > 30 kV

Insulation material

No tape on the market with amine curing agent 792 or 796.

ASEA will use SAMICATHERM 366.25 from Isolawerke, Breitenbach. Same material was used for the de Raad coil.

We shall ask Isolawerke directly for samples for radiation tests.

Coil moulds

Not yet designed. For applying pressure coil heads, they want to use eventually a plastic tube which shrinks when heated.

M. Giesch

Distribution:

Messrs. A. Arn
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Prototype B/M

- Steel making
- Machining Frame
- Stacking Frame
- Die
- Core Models
- Copper making
  - Coppering tubes
- Insulation material
- Baking instruments
  - Titanium, Fluorite etc.
- Coil supports etc.
- Test Core
- Punching of Lamination
- Deburring, Varnishing
- Stacking, Welding
in two as more gaps

Laminations stacked from back side

pressure 30 atm
pressing every 300 mm

no welds here because not necessary, reduces # of welding seams

Fig 1

Fig 2