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STRIPPING FOIL SYSTEM SPECIFICATION

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A thin plate, the so-called "Stripping Foil" has to move on demand into and out of a particle beam. In the "IN" position the foil will absorb the remaining electrons of the Pb-ions hitting it.

Figure 1 shows the "Stripping Foil Assembly" with its main parts. It will be installed in one of the beam transfer tunnels, working at ambient temperature, is operated by the main control room computer about 400 m away. All of its parts are to be laid out such that they can withstand a radiation of up to 10^9 Rads.

The actual motion mechanism has two distinct parts : the inner part is working under a vacuum of $\leq 10^{-9}$ mbar while the outer one, the driving part, is at atmospheric pressure. There is no direct mechanical link between the two (like bellows, sealed shafts,...) however, they are coupled to each other via a magnetic field.

This specification describes a rotary motion feedthrough, but any other system, driving e.g., the foil with a pendular movement, also driven by a magnetic field under the conditions given, will be accepted just as well.

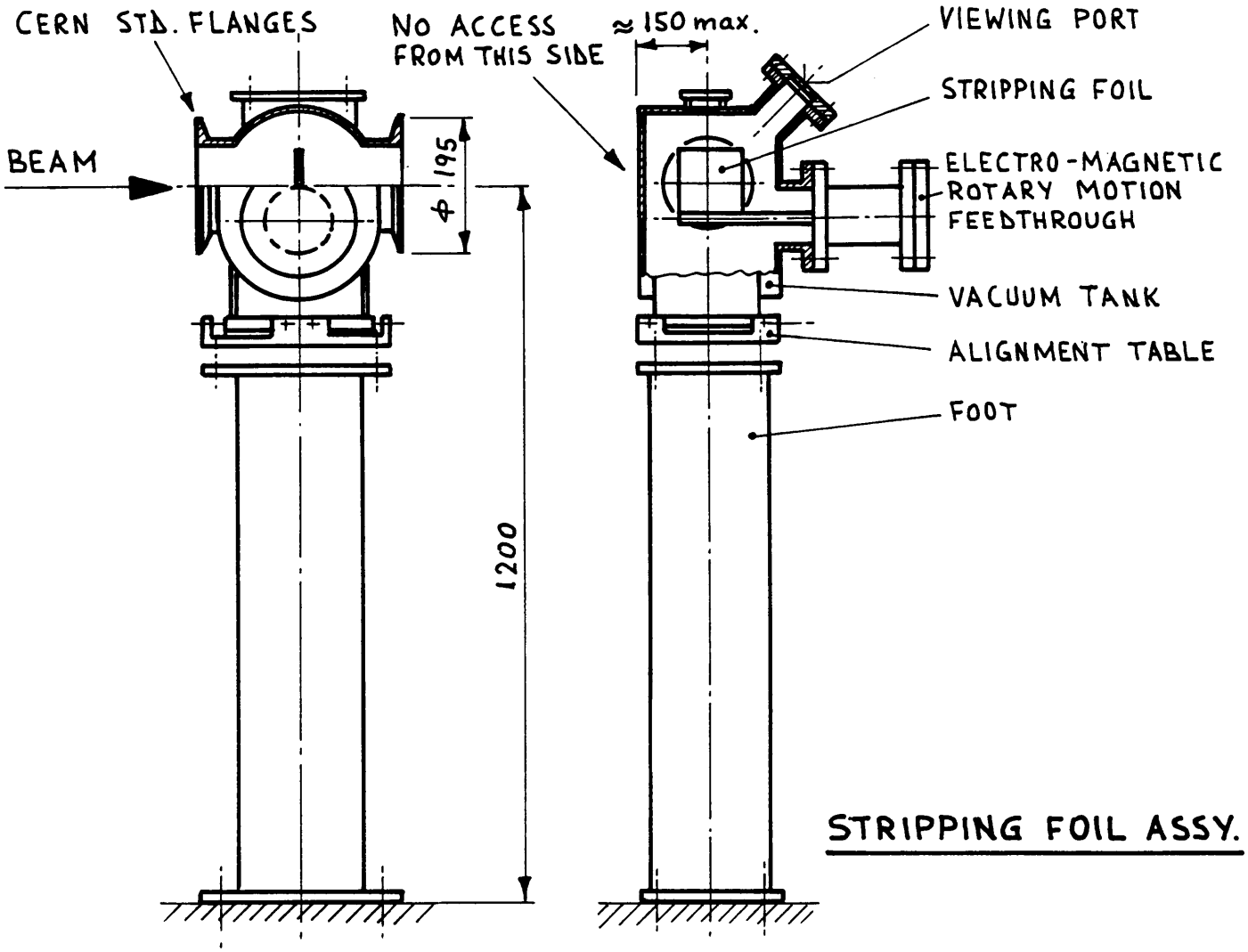


Figure 1

The feedthrough will have to withstand roughly 2.5 million cycles per year without interruption, i.e., there is normally no access during the operation to it. Only after such a run maintenance and a check-up is possible. Operating time foreseen is going to be between 5 and 10 years. Reliability is the main demand on this element.

The movement itself should be smooth, free of shock, ideally following a sinusoidal curve (Fig. 2).

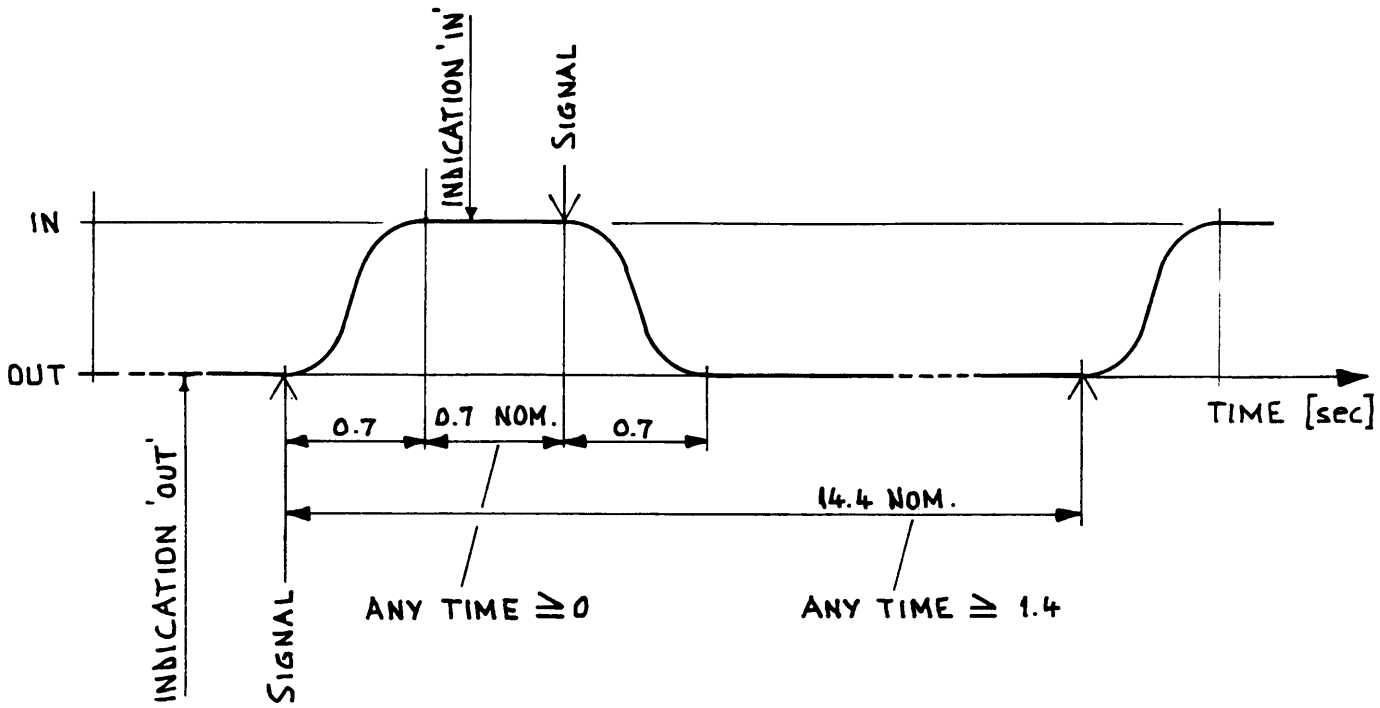


Figure 2

The mounting shaft of the mechanism has to carry a load of 0.5 Kg max. and produce a turning movement of 1 Nm min. (Fig. 3). The desired tolerance for the "IN" position should be in the order of +/- 1 degree.

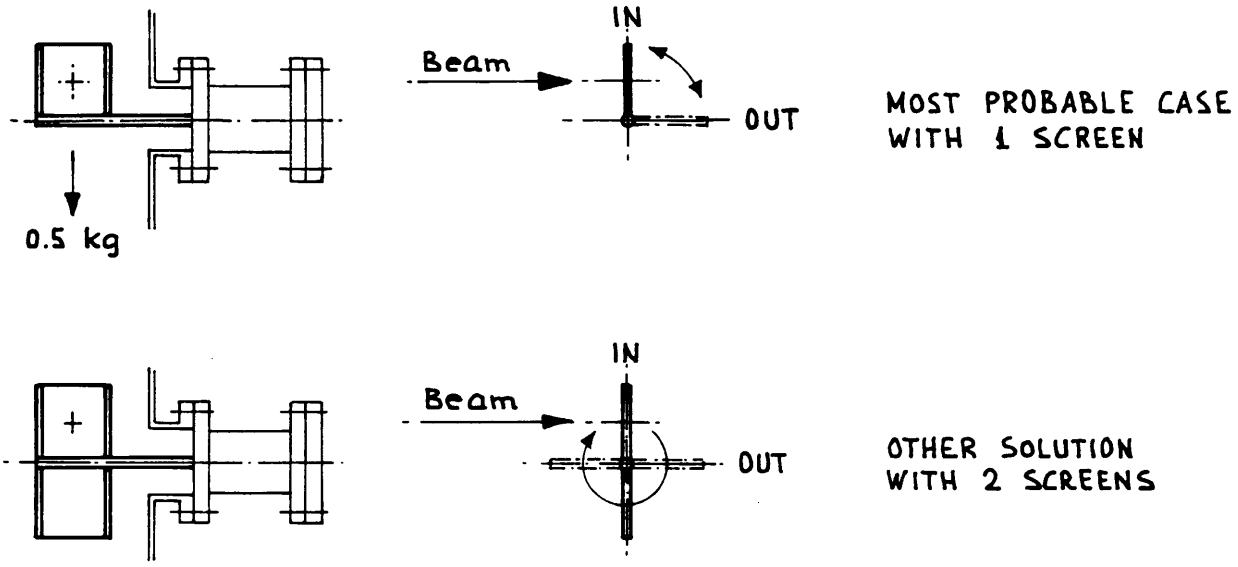


Figure 3

The load is actually a frame (100 x 100 MM) holding a thin metal sheet, to be exchanged frequently during running-in. The thickness and material of this foil is of outmost importance, as it determines the efficiency of the system. Calculations and extrapolation of known data of smaller experiments can give only very approximative values (between 0.1 and 2mm). To have an assurance about the screen position, it is intended to firmly place switches inside the vacuum tank. However, they can only indicate the pre-set end positions of the screen (Fig. 4).

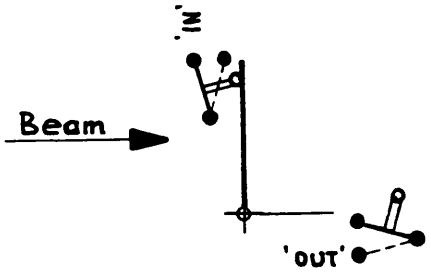


Figure 4

Figure 5 shows the principle of an electromagnetic rotary motion feedthrough. It illustrates the very small number of details from which it is made up, thereby simplifying the system and increasing its reliability. Controls : the screen IN-OUT movement has to be controlled in a simplest way. For example, by a control signal (TTL) like in Fig. 6.

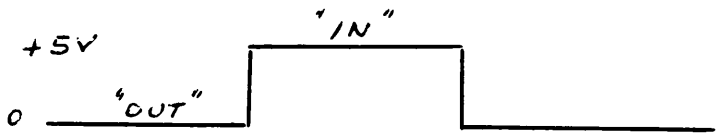
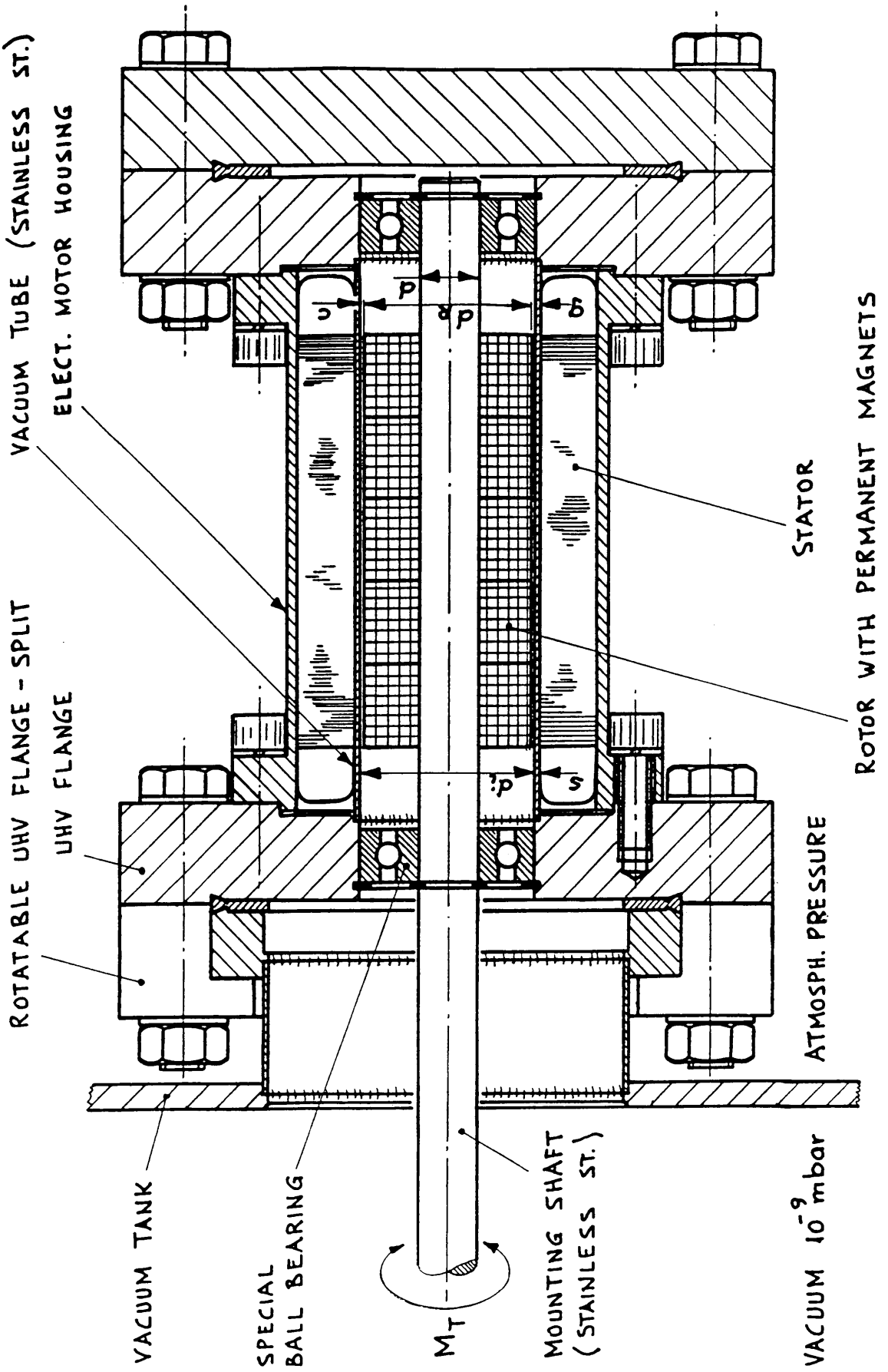


Figure 6 - Control voltage

Any necessary non-welded vacuum joint should make use of standard UHV ("conflat" type) flanges.



PRINCIPLE OF AN
ELECTRO-MAGNETIC ROTARY MOTION FEEDTHROUGH

Figure 5

Great care has to be taken in the selection of materials employed in vacuum and in a radio-active atmosphere. No plastic (organic materials may be chosen). The outgassing rate, with a special view to the permanent magnets, should be very low and the determining factor.

The ball bearings may not be lubricated, but St.St bearings with ceramic (St.St.??) balls and a special cage are offered on the market.

CERN is also to be prepared to hand out to industry the design and manufacture of the vacuum tank, the alignment table, and the foot. If interest exists, an evaluation of the costs for every item should be made, i.e., for the design, material, manufacture and installation.

CERN needs two complete assemblies including the control units to be installed in the control room. Furthermore, a spare of the driving mechanism, the electro-magnetic feedthrough is required.

The systems should be operational in summer/autumn 1993.