LMS 10 Magnet Current Stabilisation & Protection in the "Berlin" Radars

One aspect of the German cavity magnetron which I found intriguing is that unlike the British and US designs, the German LMS 10 used an electromagnet rather than a permanent magnet. This was presumably due to the German industry's inability to come up with suitable metallurgical solutions for large, high-flux permanent magnets with the required long-term stability (although I have not seen this issue documented anywhere.)

The O&M manual for the FuG 224 "Berlin A" radar states that loss of the magnetic field or the forced-air cooling can cause the magnetron to behave as a simple diode, over-dissipate and destroy itself. Thus an interlock is fitted, which immediately shuts down the anode supply and pulse modulator in the event of cooling-fan failure or loss of magnet current. To ensure field stability, the electromagnet feed current is fed via a ballast tube with an iron filament in a hydrogen-filled envelope *(Eisenwasserstoffwiderstand).*

FuG 224 systems aboard U-boats had to shut down immediately to avoid destructive overheating when the cooling fan was switched off during silent running.

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