

§11. Acceptance Test of Poloidal Coil Power Supply

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Poloidal Coil Power Supply is a power supply that drives poloidal field coils for steady operation in the phase I of the LHD project. The power supply is consist of three power supply units that correspond to three pairs of poloidal coils (OV,IS,IV) as is shown in Figure 1. Specifications of these power supply units are shown in Table 1. The rated currents shown in the table are the maximum currents in the all operation modes at the phase I of the LHD project.

Each unit consists of a parallel connected double-star thyristor rectifiers, a dc filter, a coil protection system and current and voltage control system. These supply units can provide positive currents and positive and negative voltages.

The coil protection system can dump coil current at the case of coil quench with a time constant within 20 seconds. The protection system consists of a dump resistor and a dc current breaker that was developed newly in our institute. Rated values of the dump resistors are shown in Table 2.

There are two control types that are current control and voltage control. Current control precision of the unit is 0.04%+6A for the demanded value in the all current region. A capability of a current measuring equipment used in the current control system is shown in Table 3.

Acceptance test of these power supply units has completed in March 1995. The test has been carried out in the condition without real super conducting coils. Current test was, therefore, carried out by means of short circuited at the output terminals of the power supply units. Voltage test was carried out by use of a normal conducting reactor that has inductance of 0.45H and resistance of 0.45Ω.

Summary of the test is as follows:-

1. Ripple voltage has been measured to be 0.06%(rms) which is sufficiently smaller than the specification value 1% (rms) of the rated output voltage.
2. Voltage control error of the units has been measured to be less than 0.3% which is smaller than the specification value of 1%.
3. Current control error of the units was less than the specification 0.04%+6A for the demand value. It was less than 70% of the allowance.
4. Current stability was good. Measured fluctuation showed to be less than 22% of the allowable limit 0.02%+3A/2h.

5. All logic test and all sequential test were carried out. Good results have been obtained.

There is no acceptance test concerning with quench protection action under real current because that there is no SC coil at the present point of construction of LHD. This test will be planned in 1995.

Table 1. Specification of the poloidal power supply units

Name of unit	OV	IS	IV
Rated voltage(V)	33	33	33
Rated current(kA)	23.5	16.5	15.7

Table 2. Ratings of the dump resistors

Name of unit	OV	IS	IV
Resistance(mΩ)	62.0	82.4	80.3
Heat capacity(MJ)	186	76	84

Table 3. Capability of the current measuring equipment

Precision	0.035%+4.5A (of reading value)
Linearity	0.01%/FS
Thermal drift	10ppm/degree in C
Stability	0.02%+3A/2h

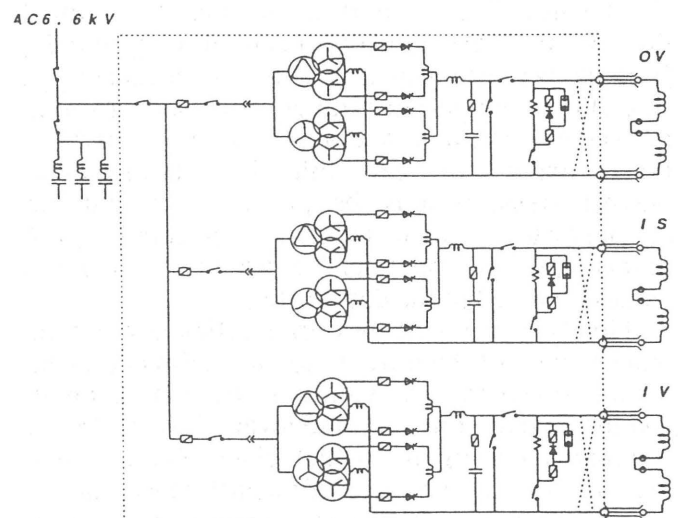


Fig.1 Skeleton diagram of the poloidal power supply