8 Description of schematic circuit of heat removal from the core, target and other elements of SAD.

8.1 The blanket and target are cooled by closed-loop forced circulation of air coolant through the core, target and other elements of the loop 1 (Figure 8.1). The coolant flow through the core is organized top-down. The circuit given in Figure 8.1 was developed in collaboration with FSUE GSPI (State Special Project Institute) and it is proposed for implementation in the SAD installation project. Schematic solutions given below are considered in chapter 12 at safety analysis of the SAD.

8.2 The cooling system includes two gear-type compressors of type 34VF - 37/1 (items A 5/1 and A 5/2), two air cooling devices (heat exchanger of loop 1) of type AVM-9-06-BZ-N (items 2-1 and 2-2) and one air cooling device of loop 2 (heat exchanger of loop 2) of type AVM-20-06-B1-N (item 4), piping, locking and regulating armature and a number of auxiliary systems.

8.3 The pressure in loop 1 is maintained by volume change compensation system called gasholder, which is connected to loop 1 at the suck-in part of the compressor. Working pressure of coolant in the gasholder amounts to ~ 0,1 MPa.

8.4 The compressor provides for a prescribed coolant flow rate through the core and target (excess air circulates through by-pass line D_{pass} = 80 mm). At the expense of compression, the coolant temperature at the output of compressor raises up to ~ 90°C, that is why the coolant travels, through the pipe line of D_{pass} =200 mm to heat exchanger 2-2, where it is cooled to temperature ~ 42°C, after that the coolant flows through pipeline D_{pass}200 mm to blanket and target of SAD.

8.5 Before entrance to SAD, coolant flow is divided in two flows: the greater part of the coolant flows, through the pipeline D_{pass}200 mm, to the core, the lesser part flows, via pipeline D_{pass}70 mm, to cool the lead target. The discharges for the core and lead target are 0,6 and 0,00662 kg/s, correspondingly. To regulate coolant discharge ratio for the core and lead target, regulatory valves (items A 1-1 and A 4-1) are installed at pipelines D_{pass}200 mm and D_{pass}70 mm. In case with tungsten target, the valve A 4-1 closes completely and the whole coolant flow for the core and tungsten target travels through pipeline D_{pass}200 mm with a discharge rate 0,65 kg/s.

8.6 At the entrance to blanket housing, the pipeline D_{pass}200 mm reduces to pipeline D_{pass}134 mm and, further, to a rectangular box of cross-section 440 × 60 mm. From the box, the coolant flows to upper collector of the core, then flows down in space between fuel elements and tungsten target, thus removing heat and cooling fuel elements and tungsten target. Coolant intended to cool the lead target flows, through pipelines D_{pass}70 mm and D_{pass}24 mm, to the lower collector of the target, and raises, through six U-shaped tubes, built in in target lead, along the target, then it flows down, thus cooling the target. Bottom ends of tubes are extracted to lower collector of the core, where coolant flows from the core and target get mixed and further removed as a joint flow, through rectangular box 440 × 60 mm and pipelines D_{pass}134 mm and D_{pass}200 mm to heat exchanger 2-1.

8.7 Coolant temperature at output from the lower collector of blanket with tungsten target is 88°C, that with lead target is - 93°C. Pressure difference at the core with lead target is ~ 9,72KPa, at that with tungsten target is ~ 12,66KPa. After cooling, the coolant temperature in heat exchanger 2-1 is lowered up to ~ 40°C. After

passing the heat exchanger 2-1, the coolant flows, through the pipeline D_{pass}200 mm to the suck-in part of compressor.

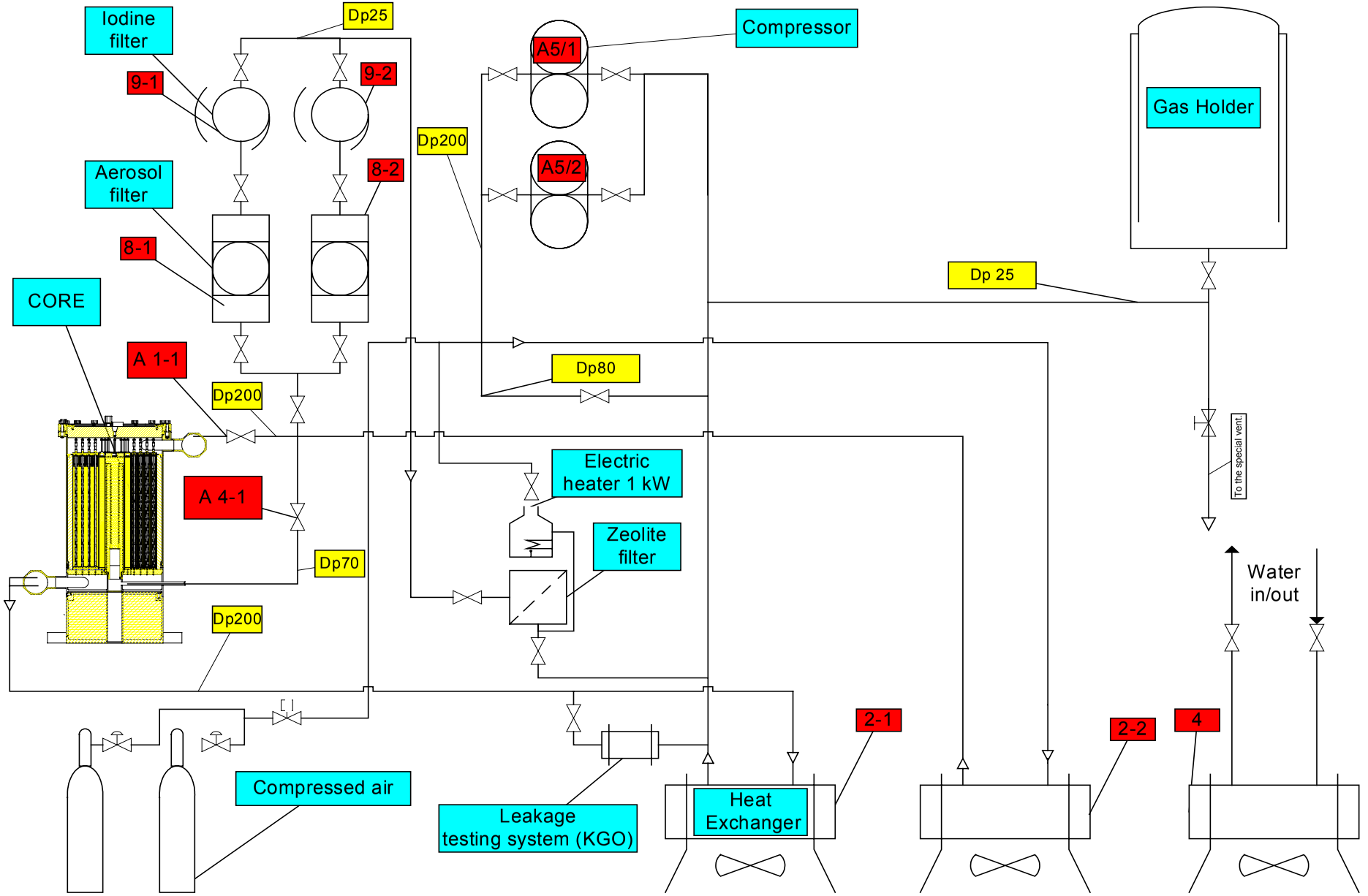
8.8 At output pipeline between blanket and heat exchanger 2-1, coolant extraction and return pipelines of KGO system are inserted.

8.9 A pipeline D_{pass}25 mm to clean the coolant (item 7 is ciolyte filter, items 8/1 and 8/2 are aerosol filters, items 9/1 and 9/2 are iodine filters) is cut in at pressure pipeline D_{pass}200 mm. After cleaning, coolant is returned to loop 1 through pipeline D_{pass}25 mm, which is cut in into suck-in pipeline D_{pass}200 mm.

8.10 Coolant of loop 1 is cooled by removing heat in heat exchangers to the medium of loop 2, which is surrounding air, and surrounding air (air in the room) is cooled in water-air heat exchanger of loop 2. For this purpose, air cooling devices of loop 1 have built-in fans, which force cool room air along branchy external surface of heat exchanger and remove heat, cooling the heat exchanger of loop 1.

8.11 To cool the room air (loop 2), this air is forced, like in heat exchangers of loop 1, by built-in heat exchange fans of loop 2 along external surface of heat exchanger pipes and gives its heat to cold water, which comes to heat exchanger from cooling tower loop.

8.12 The cooling system is equipped with necessary means of monitoring and control.


Iodine filter
Dp25
9-1
9-2
Compressor
A5/1
Gas Holder
Dp200
A5/2
Aerosol filter
8-2
8-1
Dp 25
CORE
A 1-1
Dp80
Dp200
To the special vent.
Electric heater 1 kW
A 4-1
Zeolite filter
Dp70
Water in/out
Dp200
2-1
2-2
4
Compressed air
Leakage testing system (KGO)
Heat Exchanger