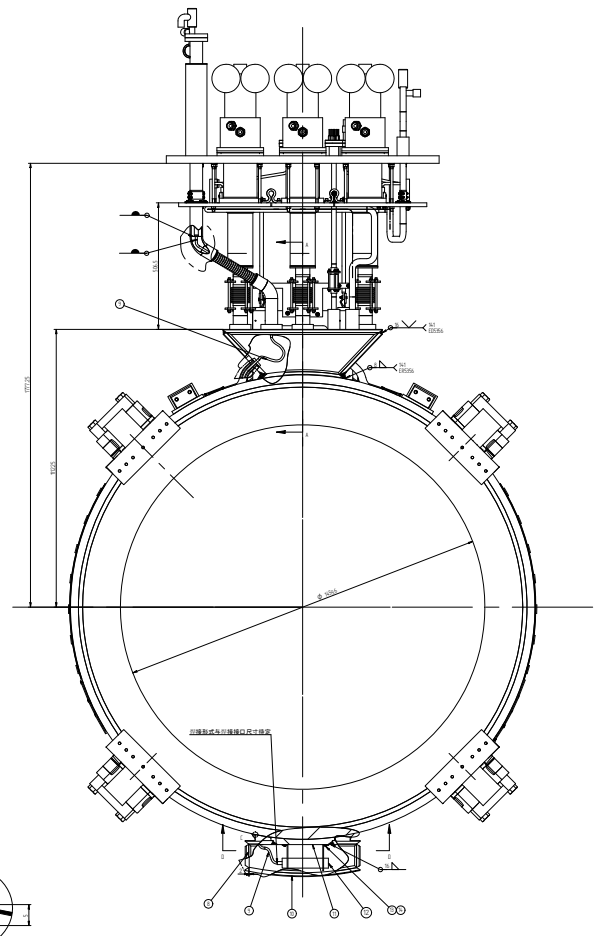
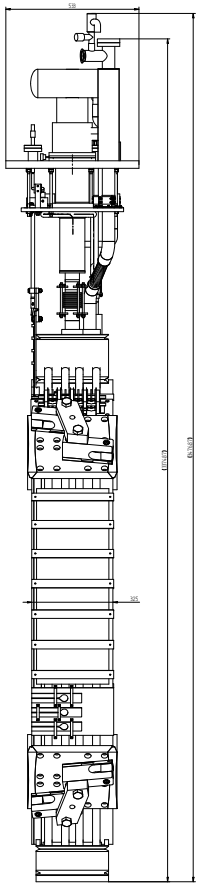
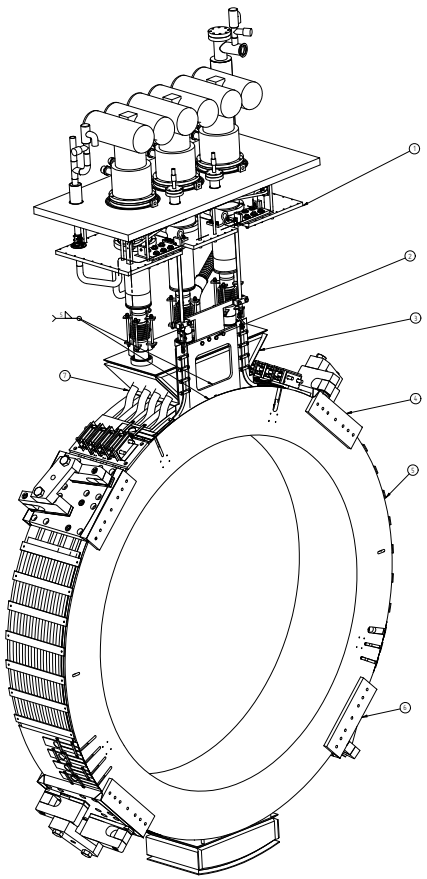
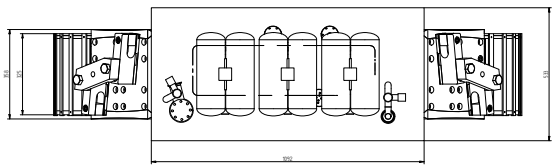
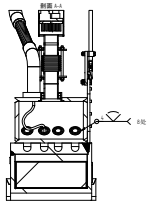






剖面 A-A



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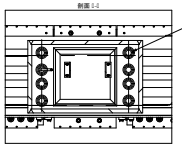

技术要求 Technical Req.:

1. 所有焊接件应按照焊接标准进行焊接并进行检验，并提供相关的检验报告。All welding parts shall be welded and inspected according to the welding standard, and the relevant inspection reports shall be provided.
2. **所有冷却剂接触部位的管路均采用整管路，原则使用不大于 SUS316L/316H，316L 等级的焊接标准焊接管路；**MIG 焊 TIG。**原则使用不大于** 316/316L、1Cr18Ni9Ti 等级的焊接标准焊接管路，**原则使用不大于** 1Cr18Ni9Ti/321H 等级的焊接标准焊接管路。All parts that contact with coolant shall be made of seamless pipes as much as possible. Welding standard for SUS316L/316H, 316L grade pipes shall be used as much as possible, welding standard for 1Cr18Ni9Ti/321H grade pipes shall be used as much as possible.
3. 所有焊缝应采用氩弧焊打底，手工电弧焊盖面或全部氩弧焊。All welds shall be welded with argon-arc welding method and MIG/TIG/MMA welding method.
4. 焊材按 GB/T4334-2008 不锈钢晶间腐蚀试验方法，GB/4923-1985 不锈钢焊缝铁素体测定方法，GB/T228.1-2010 金属材料 拉伸试验 第 1 部分：室温试验方法，GB/T2652-1989 焊缝及熔敷金属拉伸试验方法，GB/T2653-1989 焊接接头弯曲试验方法，GB/T2654-2008 焊接接头硬度试验方法，GB/T2650-2008 焊接接头冲击试验方法 To comply GB4334-2008, GB4923-1985, GB/T228.1-2010, GB/T2652-1989, GB/T2653-1989, GB/T2654-2008 and GB/T2650-2008.
5. 所有焊材应选择熔敷金属中铁素体含量在 5%-10%之间的焊材，如 308L-16、308L-15、316L-16、316L-15 等。All welding materials shall be selected with ferrite content in weld metal between 5% and 10%, such as 308L-16, 308L-15, 316L-16, 316L-15, etc.
6. 所有焊材应选择熔敷金属中铁素体含量在"奥氏体+铁素体"双相不锈钢焊缝金属中铁素体含量在 3%-10%之间的焊材，如 2209 等。All welding materials shall be selected with ferrite content in weld metal between 3% and 10% in austenitic-ferritic duplex stainless steel, such as 2209, etc.
7. 冷却剂管路焊接完成后，应进行水压试验，试验压力为 1.5MPa，试验介质为纯净水，保压时间不小于 30 分钟，不得有渗漏现象。After the welding of coolant pipelines is completed, a hydrostatic test shall be carried out with a test pressure of 1.5MPa, using pure water as the test medium. The pressure shall be maintained for no less than 30 minutes, and no leakage shall occur.
8. 焊缝外观应平滑，不得有裂纹、气孔、夹渣、咬边等缺陷。焊缝表面应进行着色检查，不得有裂纹、未熔合等缺陷。Welds shall be smooth in appearance, free from cracks, porosity, slag inclusions, undercut, and other defects. Surface inspection by dye penetrant testing shall be performed, and no cracks or lack of fusion shall be allowed.
9. 焊缝内部应进行射线检测，检测比例为 100%，检测结果应符合 NB/T47013.2-2015 标准 II 级及以上要求。Internal weld inspection shall be performed by radiographic testing, with an inspection ratio of 100%. The results shall meet the requirements of Class II or above in accordance with NB/T47013.2-2015.
10. 焊缝应进行晶间腐蚀试验，试验方法应符合 GB/T4334-2008 中规定的方法 E 或方法 F，试验结果应合格。Intergranular corrosion testing of welds shall be performed in accordance with Method E or Method F specified in GB/T4334-2008, and the test results shall be qualified.
11. 焊缝铁素体含量应在 3%-10%之间，采用铁素体测量仪进行测量，并提供测量报告。The ferrite content of the weld shall be between 3% and 10%, measured using a ferrite gauge, and a measurement report shall be provided.
12. 焊缝应进行力学性能试验，包括拉伸试验、弯曲试验、冲击试验和硬度试验，试验结果应符合相关标准的要求。Mechanical property tests of welds shall be performed, including tensile, bend, impact, and hardness tests, and the results shall meet the requirements of relevant standards.
13. 焊缝应进行晶间腐蚀试验，试验方法应符合 GB/T4334-2008 中规定的方法 E 或方法 F，试验结果应合格。Intergranular corrosion testing of welds shall be performed in accordance with Method E or Method F specified in GB/T4334-2008, and the test results shall be qualified.
14. 焊缝应进行铁素体含量测定，铁素体含量应在 3%-10%之间，采用铁素体测量仪进行测量，并提供测量报告。The ferrite content of the weld shall be between 3% and 10%, measured using a ferrite gauge, and a measurement report shall be provided.
15. 焊缝应进行力学性能试验，包括拉伸试验、弯曲试验、冲击试验和硬度试验，试验结果应符合相关标准的要求。Mechanical property tests of welds shall be performed, including tensile, bend, impact, and hardness tests, and the results shall meet the requirements of relevant standards.
16. 焊缝应进行晶间腐蚀试验，试验方法应符合 GB/T4334-2008 中规定的方法 E 或方法 F，试验结果应合格。Intergranular corrosion testing of welds shall be performed in accordance with Method E or Method F specified in GB/T4334-2008, and the test results shall be qualified.
17. 焊缝应进行铁素体含量测定，铁素体含量应在 3%-10%之间，采用铁素体测量仪进行测量，并提供测量报告。The ferrite content of the weld shall be between 3% and 10%, measured using a ferrite gauge, and a measurement report shall be provided.
18. 焊缝应进行力学性能试验，包括拉伸试验、弯曲试验、冲击试验和硬度试验，试验结果应符合相关标准的要求。Mechanical property tests of welds shall be performed, including tensile, bend, impact, and hardness tests, and the results shall meet the requirements of relevant standards.
19. 焊缝应进行晶间腐蚀试验，试验方法应符合 GB/T4334-2008 中规定的方法 E 或方法 F，试验结果应合格。Intergranular corrosion testing of welds shall be performed in accordance with Method E or Method F specified in GB/T4334-2008, and the test results shall be qualified.
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21. 焊缝应进行力学性能试验，包括拉伸试验、弯曲试验、冲击试验和硬度试验，试验结果应符合相关标准的要求。Mechanical property tests of welds shall be performed, including tensile, bend, impact, and hardness tests, and the results shall meet the requirements of relevant standards.
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25. 焊缝应进行晶间腐蚀试验，试验方法应符合 GB/T4334-2008 中规定的方法 E 或方法 F，试验结果应合格。Intergranular corrosion testing of welds shall be performed in accordance with Method E or Method F specified in GB/T4334-2008, and the test results shall be qualified.
26. 焊缝应进行铁素体含量测定，铁素体含量应在 3%-10%之间，采用铁素体测量仪进行测量，并提供测量报告。The ferrite content of the weld shall be between 3% and 10%, measured using a ferrite gauge, and a measurement report shall be provided.
27. 焊缝应进行力学性能试验，包括拉伸试验、弯曲试验、冲击试验和硬度试验，试验结果应符合相关标准的要求。Mechanical property tests of welds shall be performed, including tensile, bend, impact, and hardness tests, and the results shall meet the requirements of relevant standards.
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| 序号 | 代号 | 名称 | 数量 | 材料 | 单重 | 总重 | 备注 |
|---|---|---|---|---|---|---|---|
| 14 | GB/T 848 | 垫圈 4 | 4 | 304 | | 0 | |
| 13 | GB/T 70 | 内六角圆柱头螺钉 M4×6 | 4 | 304 | | 0 | |
| 12 | MMSF-0301-0003—00 | 筋板小支架 | 1 | | | | 配对 |
| 11 | MMSF-0301-0002—03 | 下底部盖板组 | 1 | 6061-T6511 | | 2.2 | |
| 10 | MMSF-0301-0002—02 | 下底部盖分板 | 1 | 6061-T6511 | | 0.4 | |
| 9 | MMSF-0301-0002—00 | 冷却管内束套出入管组件 | 1 | | | | |
| 8 | MMSF-0301-7000—00 | 下底部盖 | 1 | | | 8.4 | |
| 7 | MMSF-0301-0000—01 | 冷却管内束管路 | 7 | 6061-T6511 | | 19.0 | |
| 6 | MMSF-0301-0000—00 | 冷却支撑立件 | 2 | | | | |
| 5 | MMSF-0301-0000—00 | 冷却管立件 | 1 | | | | 配对 |
| 4 | MMSF-0301-4000—00 | 冷却支撑立件 | 2 | | | 66.0 | |
| 3 | MMSF-0301-3000—00 | 上底部盖 | 1 | | | 14.4 | |
| 2 | MMSF-0301-2000—00 | 仪器导线引件 | 1 | | | | |
| 1 | MMSF-0301-0000—00 | 制冷机及冷却管路引件 | 1 | | | | |

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|---|---|---|---|---|---|---|---|
| 设 计 | | | | | SSRF上海光源 | | |
| 绘 图 | | | | | | | |
| 校 核 | | | 计算机文件名 | MMSF-0301-0000A0.prt | 冷质量及冷屏 | | |
| 审 核 | | | | | | | |
| 会 签 | | | 制图软件 | Solid Edge | 冷质量及冷却组件 | | |
| | | | 数 量 | 重 量 | 比 例 | 图 幅 | |
| 审 定 | | | 1 | 1 | 1 | A0 | MMSF-0301-0000 |
| 批 准 | | | 共 1 张 | | 第 张 | | |

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| A | | | INITIAL REVISION | | |
| REV. | AUTHOR | APPROVED | DATE | CHANGE DESCRIPTION | |

PROJECT NAME: MUSR

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| DRAWN | |
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| APVD. | |
| PROJ. SURF. | |

SCALE: 1:1 WT: LBS

SHEET 1 OF 1 SIZE: D

ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA

MUSR: IONIZATION COOLING EXPERIMENT (MICE)
MICE MUSEUM: SUPERCONDUCTING COUPLING MAGNET
3D E-MAG & STRUCTURAL ANALYSIS

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