



QUALITY AND MANUFACTURING PLAN

Révision D

Page 1/15

Coil report

Operation SHMS n° 1

Conductor acceptance

- Conductor cleanliness(oxydation,burrs stripes..)
- Conductor geometry
- Mechanical properties
- Supraconducting properties

follower

Operation SHMS n° 2

Conductor insulation with Kapton on taping machines

- Visual inspection(insulation cleanliness)
- Insulation quality(without wrinkle, tear)
- Insulation quality(start and stop)
- repeatability

computed

Operation SHMS n° 3

Check dimension insulated conductor with Kapton

- To be determinate with prototype experience

follower

Operation SHMS n° 4

Conductor insulation with prepreg on taping machines

- Visual inspection
- Insulation quality(without wrinkle, tear)
- Insulation quality(start and stop)
- repeatability

computed

Operation SHMS n° 5

Check dimension insulated conductor with prepreg (and Kapton)

- To be determinate with prototype experience

follower

Operation SHMS n° 6

Spool manufacturing(with insulated conductor)

- Check the length during manufacturing
- Storage on the spool



QUALITY AND MANUFACTURING PLAN

Révision D

Page 2/15

Follower

Operation SHMS n° 7

Key spacers acceptance with 3D FARO arm

- Check the dimensions
- Test shape with a sheet of paper

Follower

Operation SHMS n° 8

Winding of lower pancake

- Check the resistance at the end of each winding block

Follower

Operation SHMS n° 9

Check the turn position

- Angular position versus mandrel

Follower

Operation SHMS n° 10

Visual inspection of quality winding

Follower

Operation SHMS n° 11

Control

- Polarity Control
- Resistance measure

Follower

Operation SHMS n° 12

Curing the pancake

Follower

Operation SHMS n° 13

Control

- Resistance measure

Follower

Operation SHMS n° 14

Winding the first upper pancake

- Check the resistance at the end of each winding block

Follower

Operation SHMS n° 15

Check the turn position

- Angular position versus mandrel

Follower

Operation SHMS n° 16

Visual inspection of quality winding

Computed

Operation SHMS n° 17

Control

- Polarity Control
- Resistance measure

Follower

Operation SHMS n° 18

Curing the pancake

Follower

Operation SHMS n° 19

Control

- Resistance measure

Follower

Operation SHMS n° 20

Interturn insulation test of the first double pancake

Follower

Operation SHMS n° 21

Redo the same operation and control of the first double pancake to have 3 double pancakes

Follower

Operation SHMS n° 22

Dielectric test between each double pancake

Follower

Operation SHMS n° 23

Qualification of the soldering process

- Samples tested at 4k
- Radiographic control?(other)
- Process monitoring of the soldering (send samples all the « x » soldering)
- Soldering length

computed

Operation SHMS n° 24

Clean double pancakes junctions



Follower

Operation SHMS n° 25

Soldering double pancakes junctions and cleaning

Follower

Operation SHMS n° 26

Insulating double pancake junctions

Follower

Operation SHMS n° 27

Interturn insulation test of assembled pancake

Follower

Operation SHMS n° 28

Redo the same operation and control for the other double pancake junctions

Follower

Operation SHMS n° 29

Redo the same operation and control for the second coil

Follower

Operation SHMS n° 30

Coils assembly

- Check the cylindricity
- Check the outer diameter

Follower

Operation SHMS n° 31

Clean coils junctions

Follower

Operation SHMS n° 32

Soldering coils junction

Follower

Operation SHMS n° 33

Insulating coils junction

Follower

Operation SHMS n° 34

Interturn insulation test of
assembled coils

Follower

Operation SHMS n° 35

Coil insulation

- B-stage tape and heating or fiber glass and moulding

Follower

Operation SHMS n° 36

Interturn insulation test of insulated
coils



QUALITY AND MANUFACTURING PLAN

Révision D

Page 7/15

Follower

Operation SHMS n° 37

DC Resistance

Follower

Operation SHMS n° 38

Coil machining

Report

Operation SHMS n° 39

Machined coil dimensional test and collars machining

Follower

Operation SHMS n° 40

Assembled coils interturn insulation test

Follower

Operation SHMS n° 41

Assembled coils DC resistance

Report

Operation SHMS n° 42

Check collars dimensions



Follower

Operation SHMS n° 43

Collars heating

- Temperature
- Check the temperature

Follower

Operation SHMS n° 44

Coils collaring

Follower

Operation SHMS n° 45

Collars cooling

Follower

Operation SHMS n° 46

Collared coil interturn insulation test

Follower

Operation SHMS n° 47

Collared coil DC resistance

Follower

Operation SHMS n° 48

Coil dimensional test



QUALITY AND MANUFACTURING PLAN

Révision D
Page 9/15

Coil report

Operation SHMS n° 49

Ringing test at 500V

Coil report

Operation SHMS n° 50

Conductor to ground insulation
tightness

Coil report

Operation SHMS n° 51

Conductor to ground insulation
resistance

Coil report

Operation SHMS n° 52

Coil polarity control

Follower

Operation SHMS n° 53

Dimensional control of each vessel
chamber parts

- Validate certificate raw materials before machining

Follower

Operation SHMS n° 54

Weld and welder qualifications
according to ASME

Follower

Operation SHMS n° 55

Piping and plate vessel chamber welding

- Validate certificate raw materials before machining

Report

Operation SHMS n° 56

Helium leakage test

- Bag test

Report

Operation SHMS n° 57

Dye penetrant test

Follower

Operation SHMS n° 58

100% Weld tests by radiography or ultrasonic tests according to ASME

Follower

Operation SHMS n° 59

Pneumatic pressure test according to ASME

- Air quality
- Humidity
- Gaz used?

Follower

Operation SHMS n° 60

Helium vessel inner tube wrapping with aluminized mylar sheet



QUALITY AND MANUFACTURING PLAN

Follower

Operation SHMS n° 61

Weld and welder qualifications according to ASME

Follower

Operation SHMS n° 62

N2 vessel parts dimensional control

- Validate certificate raw materials before machining

Follower

Operation SHMS n° 63

N2 vessel piping and plate welding

Report

Operation SHMS n° 64

Helium leakage test

Report

Operation SHMS n° 65

N2 vessels dye penetrant test

Follower

Operation SHMS n° 66

100% weld tests by radiography or ultrasonic tests according to ASME



Follower

Operation SHMS n° 67

Pneumatic pressure test according to ASME

- Air quality
- Humidity
- Gaz used?

Follower

Operation SHMS n° 68

Process Control

- Instrumentation wires (temperature, Voltage, deformation gauges..)

Follower

Operation SHMS n° 69

Super insulation wrapping

- Cutting pattern
- Assistance supplier to practice cutting

Follower

Operation SHMS n° 70

Visual inspection of Super insulation wrapping laying

Follower

Operation SHMS n° 71

Outer vessel parts dimensional control

- Validate certificate raw materials before machining

Follower

Operation SHMS n° 72

Outer vessel piping and plate welding



QUALITY AND MANUFACTURING PLAN

Révision D
Page 13/15

Follower

Operation SHMS n° 73

Helium leakage test

Follower

Operation SHMS n° 74

Outer vessel dye penetrant test

Follower

Operation SHMS n° 75

Tests according to ASME by
certification control body

Follower

Operation SHMS n° 76

Suspension link manufacturing and
fitting

- Validate certificate raw materials before machining

Follower

Operation SHMS n° 77

Cryostat assembly

Follower

Operation SHMS n° 78

Piping welding



QUALITY AND MANUFACTURING PLAN

Révision D
Page 14/15

Report

Operation SHMS n° 79

Helium, N2, and outer vessels
helium leak test

Report

Operation SHMS n° 80

Dimensional inspection

Report

Operation SHMS n° 81

DC resistance 20°C

Report

Operation SHMS n° 82

Conductor to ground insulation
tightness

Report

Operation SHMS n° 83

Conductor to ground insulation
resistance

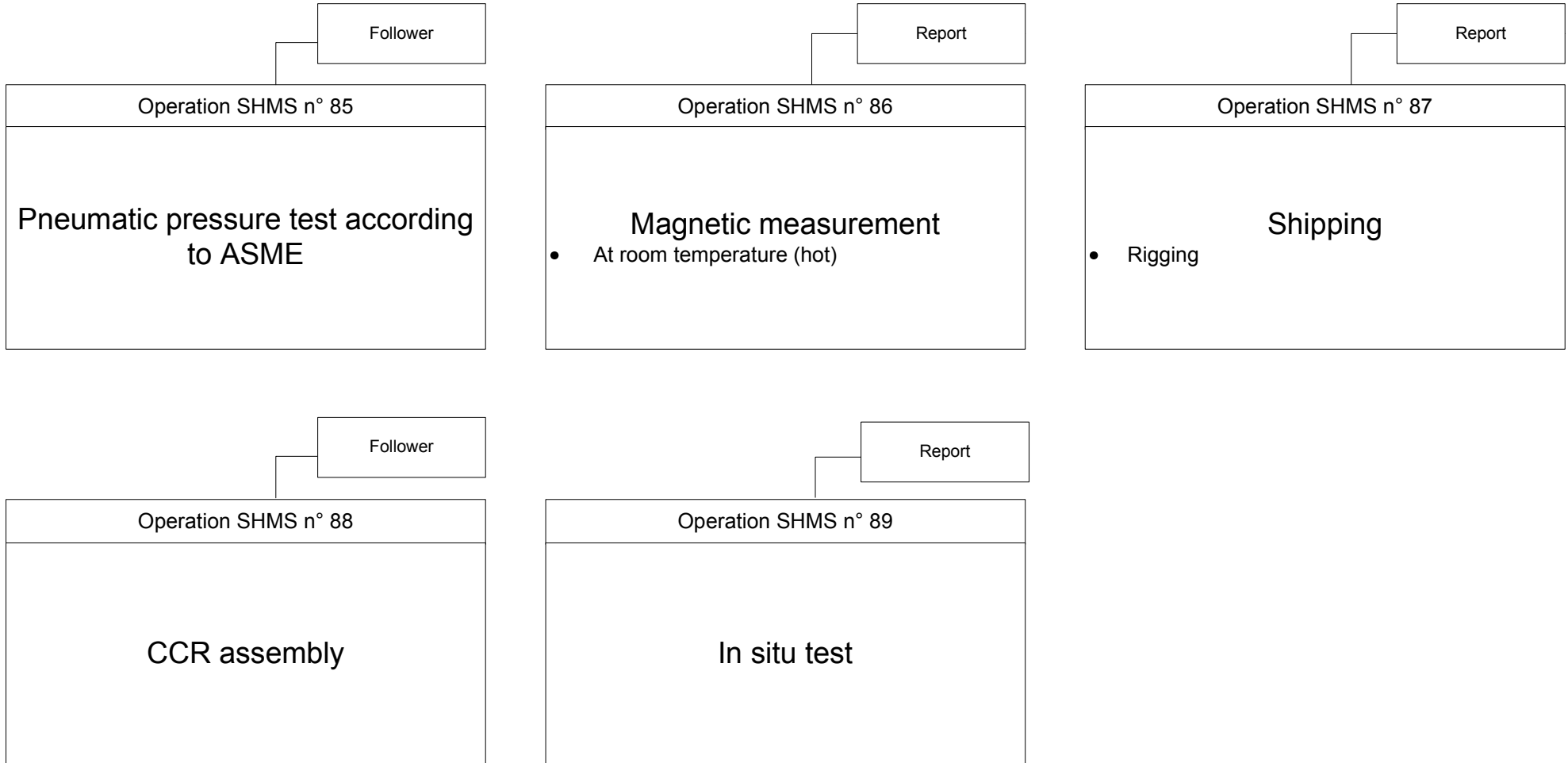
Follower

Operation SHMS n° 84

100% weld tests by radiography or
ultrasonic tests according to ASME



QUALITY AND MANUFACTURING PLAN



Followers and computed (internal verification available for consultation) are kept six months after delivery by the manufacturer
Reports (contractual test and control) are given to the customer and stored by the manufacturer for ten years.