SQ9 – Valve Box cooling and 4K tank control level

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| **Sensors and actuators used:** |  |
| - Pressure: PT600 | - Control valve: CV600, CV580, CV590, CV-He-liquefier |
| - Flow rate: FT580 | - Level: LT600 |
| - Valve: FV601, FV602 | - Temperature: TT602, TT614 |

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| --- | --- |
| **The user chooses:** | **Initial conditions:** |
| - Level: LT600setpoint, LT600mini, LT600Maxi | - Sequences from 1 to 3 stopped |
| - Pressure: PT600setpoint | - Sequences 5 & 8 in operation |
| - Flow: FT580limit |  |
| - Valve: CV600%opening, CV580%opening, CV-He-liquefier%opening, CV590%opening |  |
| - Mode: Regulation or Intermittent |  |
| - Helium supplier: Liquefier/Stop Liquefier or Dewar/Stop Dewar |  |

Stop

Stop Liquefier

OR Stop

Intermittent

Stop Liquefier OR Stop

Regulation & Liquefier & Validation

Regulation

CV580 fully opened

CV600 closed

LT600 < LT600mini OR Stop

A

C

LT600 > LT600 Maxi OR Stop

CV-He-liquefier closed

Liquefier valve closing

Close CV-He-liquefier

CV580 regulated

PT600=PT600setpoint

CV600 regulated

LT600=LT600setPoint

FV601 opened

CV580 regulated

PT600=PT600setpoint

CV-He-liquefier closed

Avoid closed volume

Tank 4K

outgassing

Preparation to regulate

Close FV601

CV-He-liquefier %opening

Open CV580

Cool down TL L010

Regulation

mode

CV-He-liquefier %opening

CV600 regulated

LT600=LT600setPoint

FT580 < FT580limit

CV580 regulated

PT600=PT600setpoint

4K tank

Filling

CV-He-liquefier %opening

CV580 regulated

PT600=PT600setpoint

Close FV601

CV600 open and controlled

FT580 < FT580limit

End of

Filling

CV-He-liquefier %opening

CV580 regulated

PT600=PT600setpoint

Close CV600

Close CV-He-liquefier

Liquefier valve closing

Close CV600

Open FV601

CV580 regulated

PT600=PT600setpoint

Dewar

B

LT600 < LT600mini

Waiting for Level

CV-He-liquefier %openingCV580 regulated

PT600=PT600setpoint

Open FV601

CV-He-liquefier %opening

Intermittent & Liquefier & Validation

Regulation OR Stop

A

Liquefier

Waiting for level

Close CV600

TT602 < 10K OR TT614 < 10K OR Stop

Regulation

Intermittent & LT600 < LT600mini

LT600 value > LT600min

C

stop

Dewar

Liquefier

A

B

TT602 < 10K OR TT614 < 10K OR Stop

Stop Dewar

OR Stop

Stop Dewar OR Stop

Start

Regulation

CV580 fully opened

CV600 closed

Intermittent & Dewar& Validation

LT600 > LT600 Maxi OR Stop Regulation

FV602 closed

CV590 closed

Avoid closed volume

Preparation to regulate

Close FV601

CV590 %opening

Open CV580, Open FV602

Cool down TL L010

CV580 regulated

PT600=PT600setpoint

Open FV601

CV590 %opening

FV602 opened

4K tank

Filling

CV590 %opening

CV580 regulated

PT600=PT600setpoint

Close FV601

CV600 open and controlled

FT580 < FT58limit

FV602 opened

End of

Filling

CV590 %opening

CV580 regulated

PT600=PT600setpoint

Close CV600

FV602 opened

Close FV602

CV580 regulated

PT600=PT600setpoint

Close CV600

Open FV601

CV580 regulated

PT600=PT600setpoint

Liquefier

A

Stop

“Have you chosen the recovery circuit for the valve Box? “

Regulation & Dewar & Validation

Yes

“Do you want operate with an extra Dewar or with the liquefier Dewar? “

Intermittent & LT600 < LT600mini

FV601 opened

CV580 regulated

PT600=PT600setpoint

Tank 4K

outgassing

Dewar Isolated

“Do you want close the valve of the Dewar?”

FV602 closed

Close CV590

Dewar valve closed

Yes

No

Dewar Isolated

Close FV602

CV580 regulated

PT600=PT600setpoint

CV600 regulated

LT600=LT600setPoint

FV602 opened & LT600 < LT600mini OR Stop

Intermittent

Regulation OR Stop

LT600 < LT600mini

Preparation to fill

Open FV602

“Have you connected the extra Dewar? “

Yes

B

Dewar

Waiting for level

Close CV600

Waiting level

Regulation

mode

CV590 %opening

CV600 regulated

LT600=LT600setPoint

FT580 < FT580limit

CV580 regulated

PT600=PT600setpoint

FV602 opened