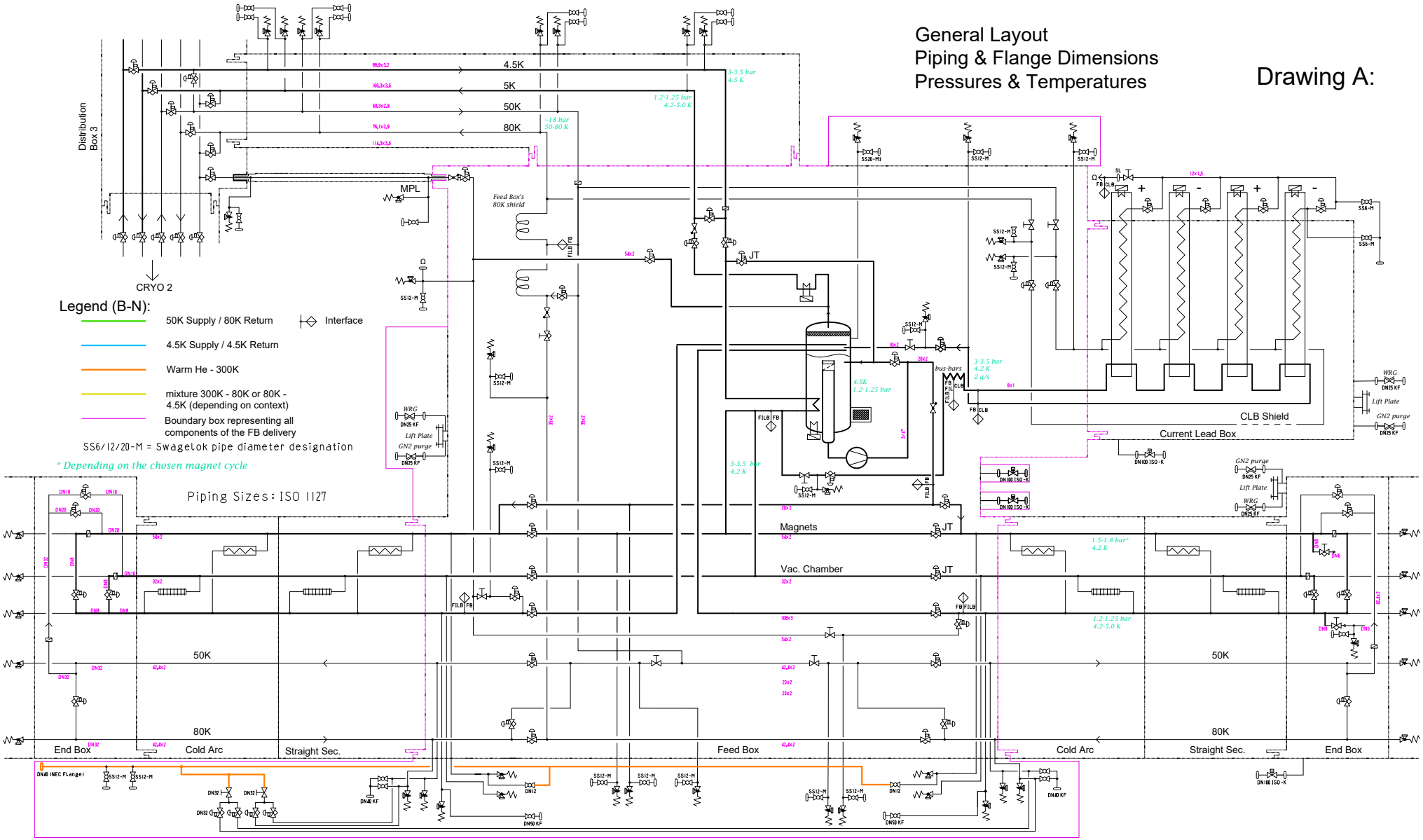
General Layout
Piping & Flange Dimensions
Pressures & Temperatures

Drawing A:

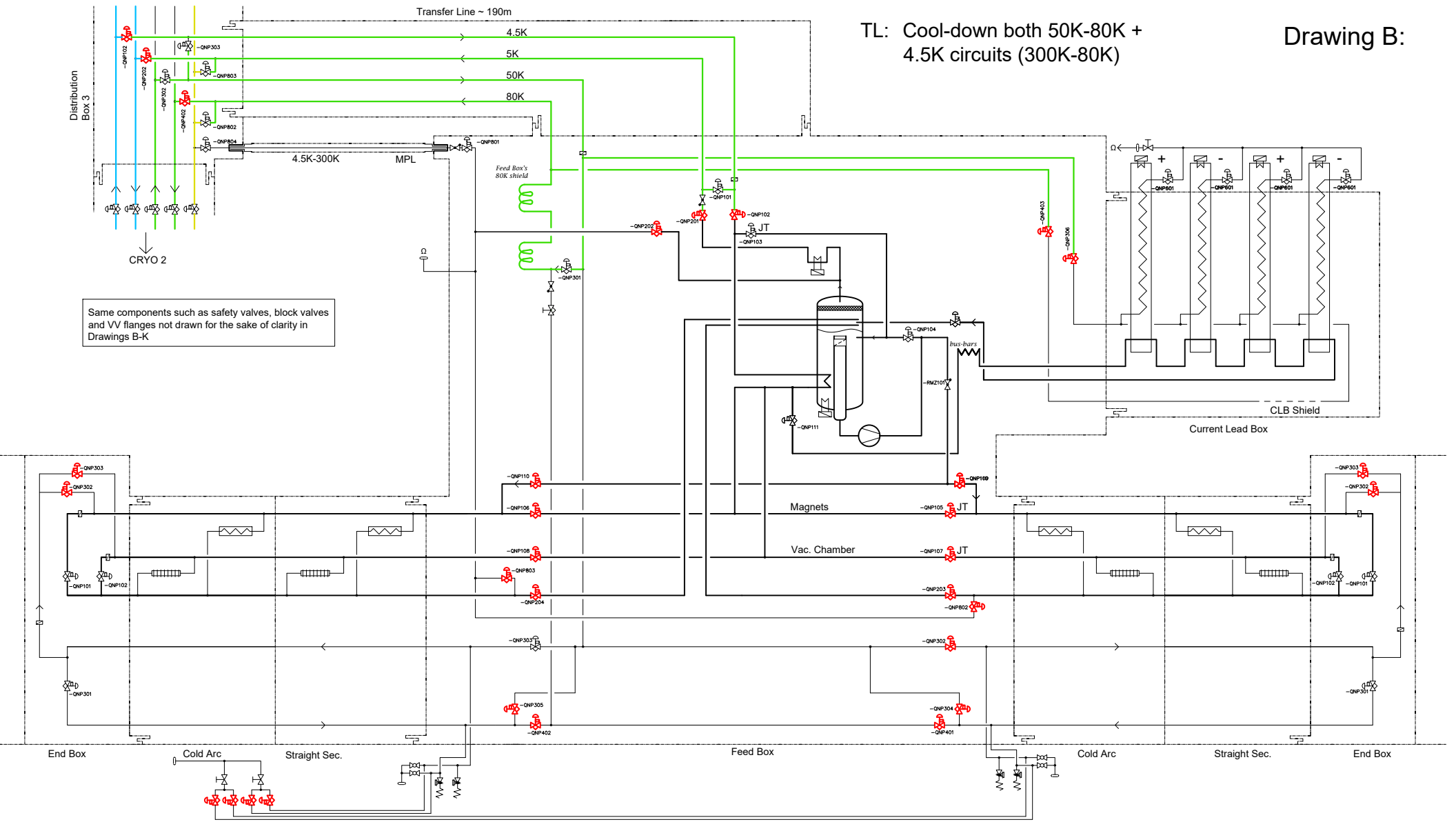


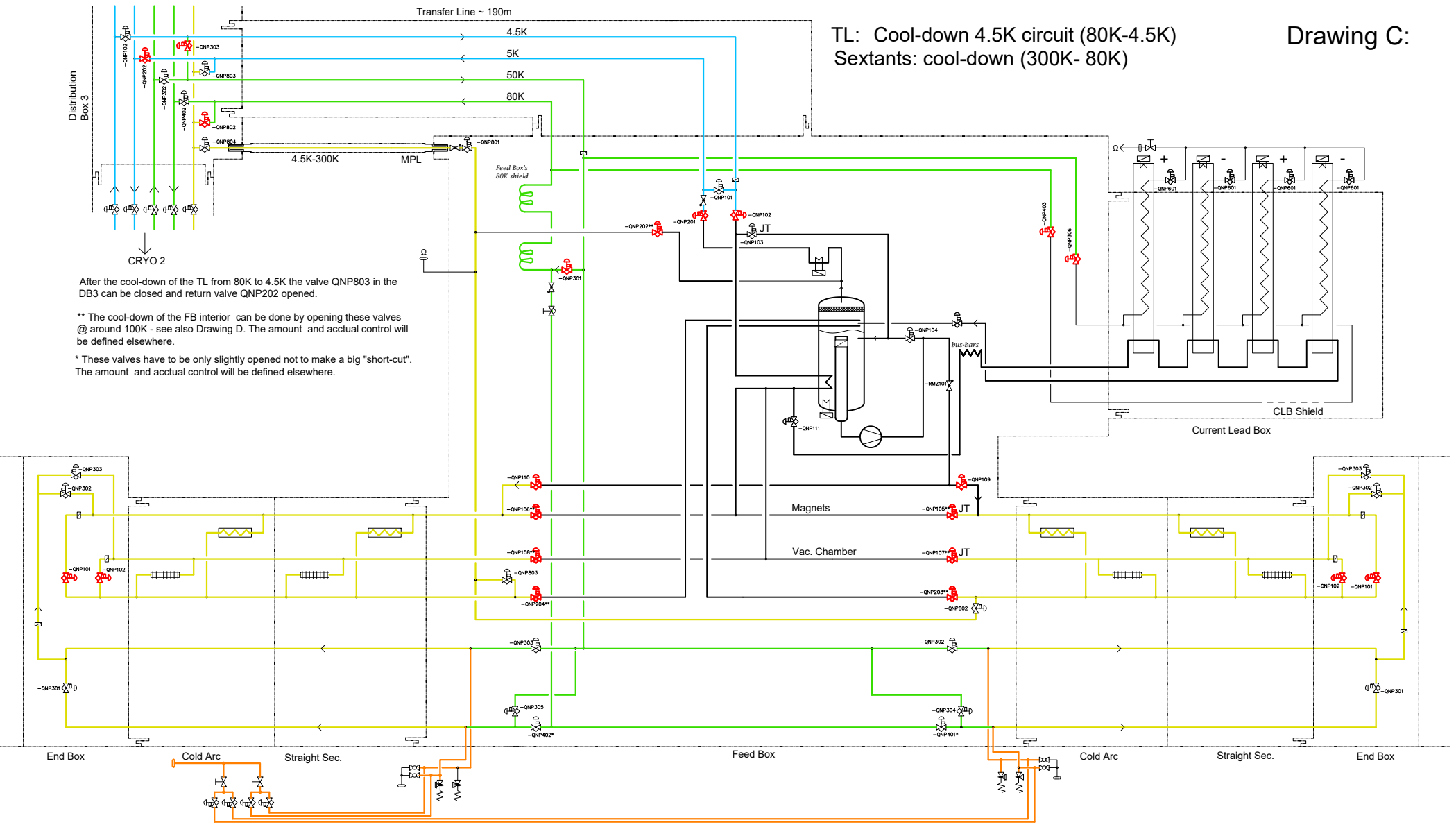
Legend (B-N):

- 50K Supply / 80K Return
- 4.5K Supply / 4.5K Return
- Warm He - 300K
- mixture 300K - 80K or 80K - 4.5K (depending on context)
- Boundary box representing all components of the FB delivery
- Interface

SS6/12/20-M = Swagelok pipe diameter designation

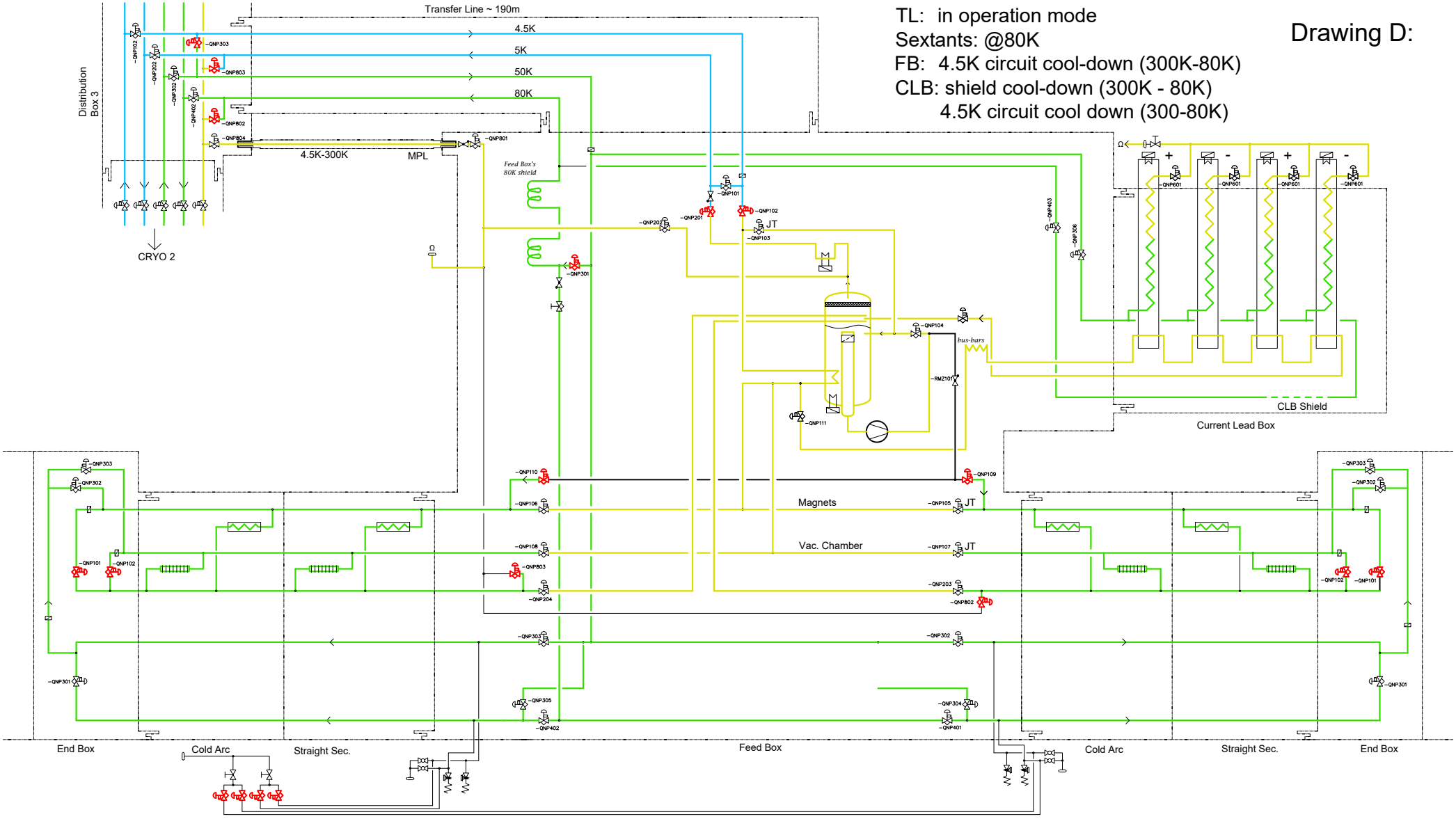
* Depending on the chosen magnet cycle


Transfer Line ~ 190m
TL: Cool-down both 50K-80K + 4.5K circuits (300K-80K)
Drawing B:
Distribution Box 3
4.5K
5K
50K
80K
4.5K-300K
MPL
CRYO 2
Feed Box's 80K shield
JT
bus-bars
CLB Shield
Current Lead Box
Same components such as safety valves, block valves and VV flanges not drawn for the sake of clarity in Drawings B-K
Magnets
Vac. Chamber
End Box
Cold Arc
Straight Sec.
Feed Box
Cold Arc
Straight Sec.
End Box


Drawing C:
TL: Cool-down 4.5K circuit (80K-4.5K)
Sextants: cool-down (300K- 80K)
Transfer Line ~ 190m
4.5K
5K
50K
80K
Distribution Box 3
4.5K-300K
MPL
CRYO 2
Feed Box's 80K shield
JT
bus-bars
CLB Shield
Current Lead Box
Magnets
Vac. Chamber
End Box
Cold Arc
Straight Sec.
Feed Box
Cold Arc
Straight Sec.
End Box
After the cool-down of the TL from 80K to 4.5K the valve QNP803 in the DB3 can be closed and return valve QNP202 opened.
** The cool-down of the FB interior can be done by opening these valves @ around 100K - see also Drawing D. The amount and acctual control will be defined elsewhere.
* These valves have to be only slightly opened not to make a big "short-cut". The amount and acctual control will be defined elsewhere.

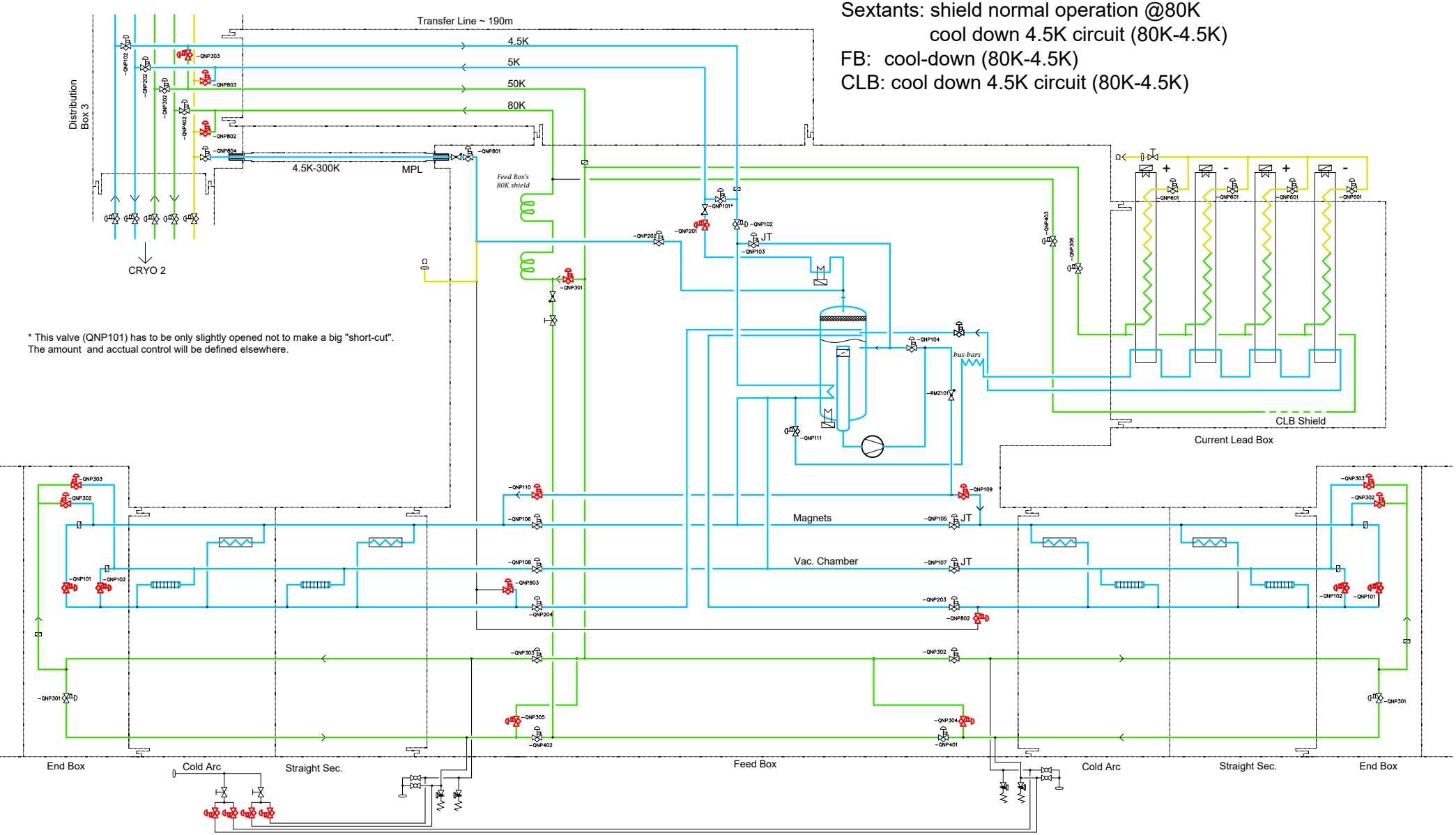
TL: in operation mode
Sextants: @80K
FB: 4.5K circuit cool-down (300K-80K)
CLB: shield cool-down (300K - 80K)
4.5K circuit cool down (300-80K)

Drawing D:



Drawing E:

TL: in operation mode
Sextants: shield normal operation @80K
cool down 4.5K circuit (80K-4.5K)
FB: cool-down (80K-4.5K)
CLB: cool down 4.5K circuit (80K-4.5K)

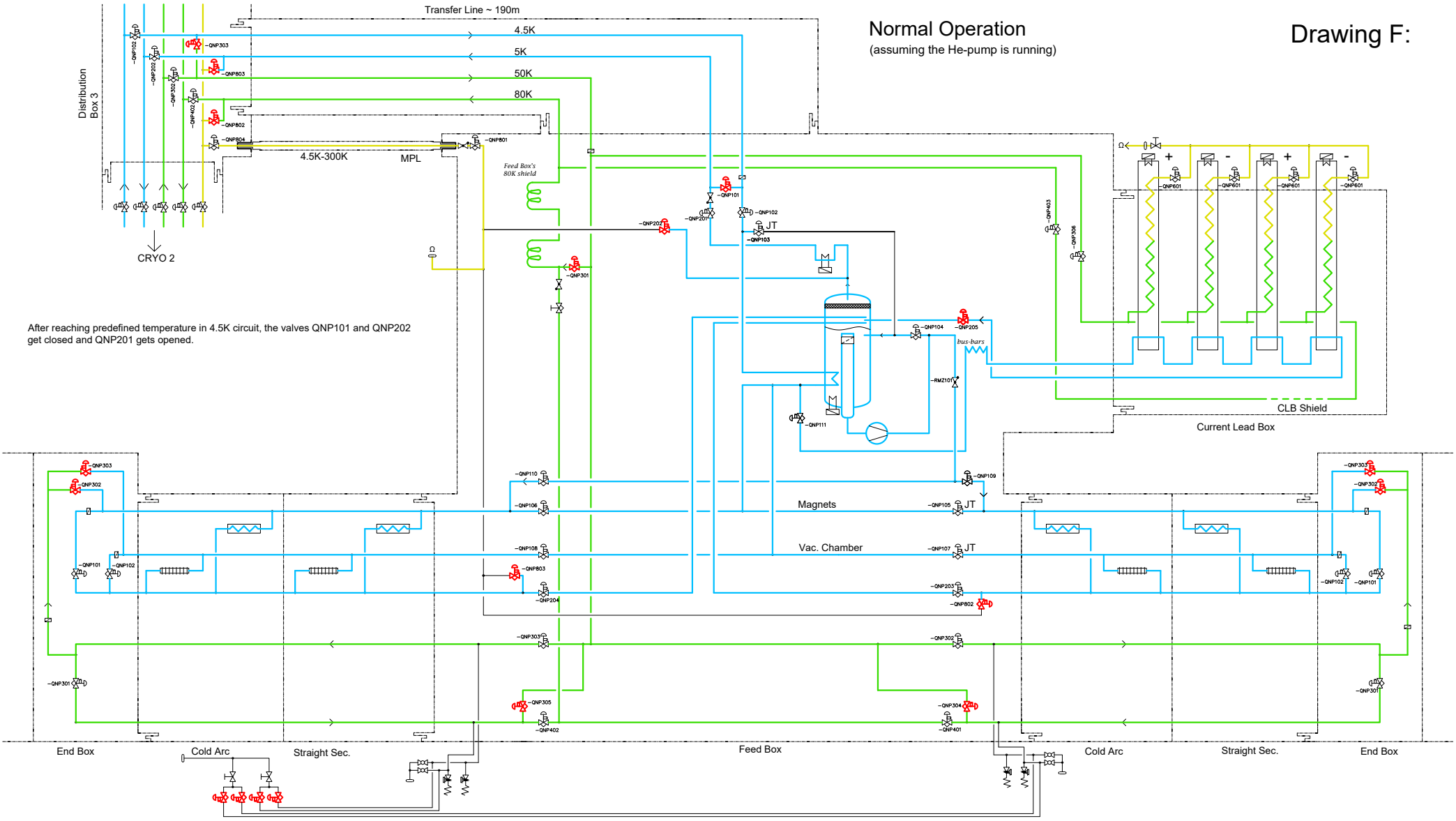


* This valve (QNP101) has to be only slightly opened not to make a big "short-cut". The amount and acctual control will be defined elsewhere.

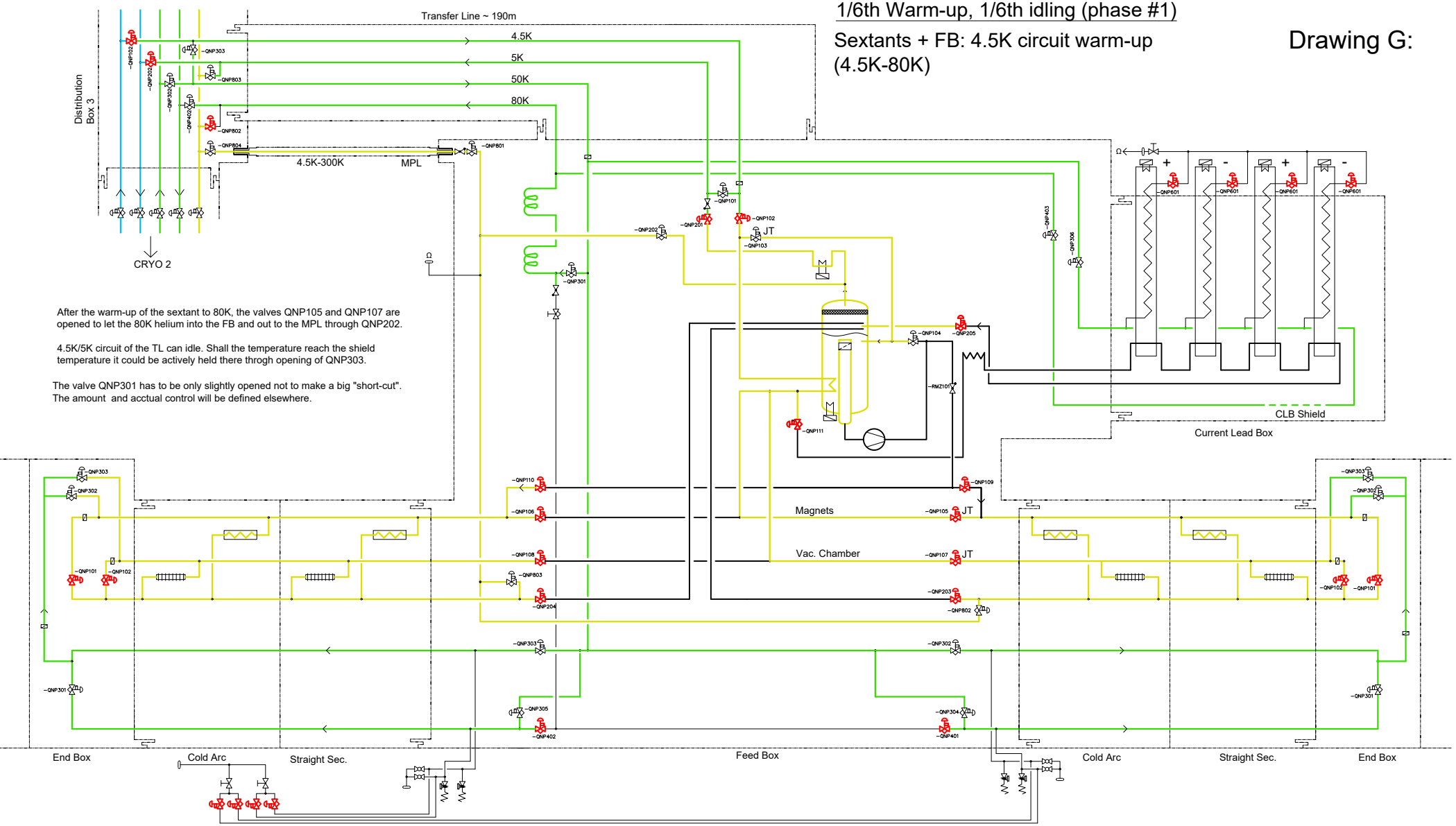
Normal Operation

(assuming the He-pump is running)

Drawing F:



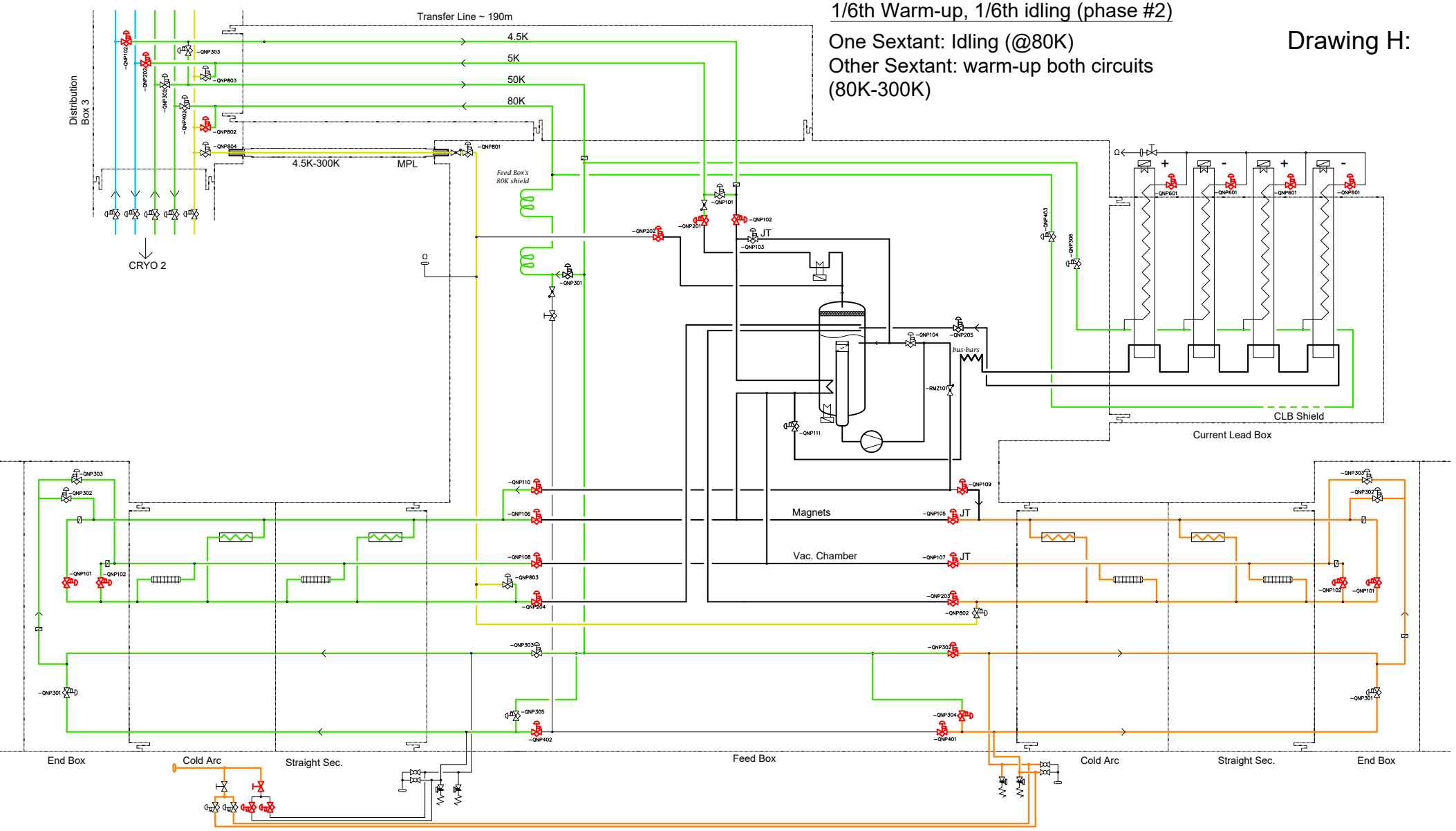
After reaching predefined temperature in 4.5K circuit, the valves QNP101 and QNP202 get closed and QNP201 gets opened.

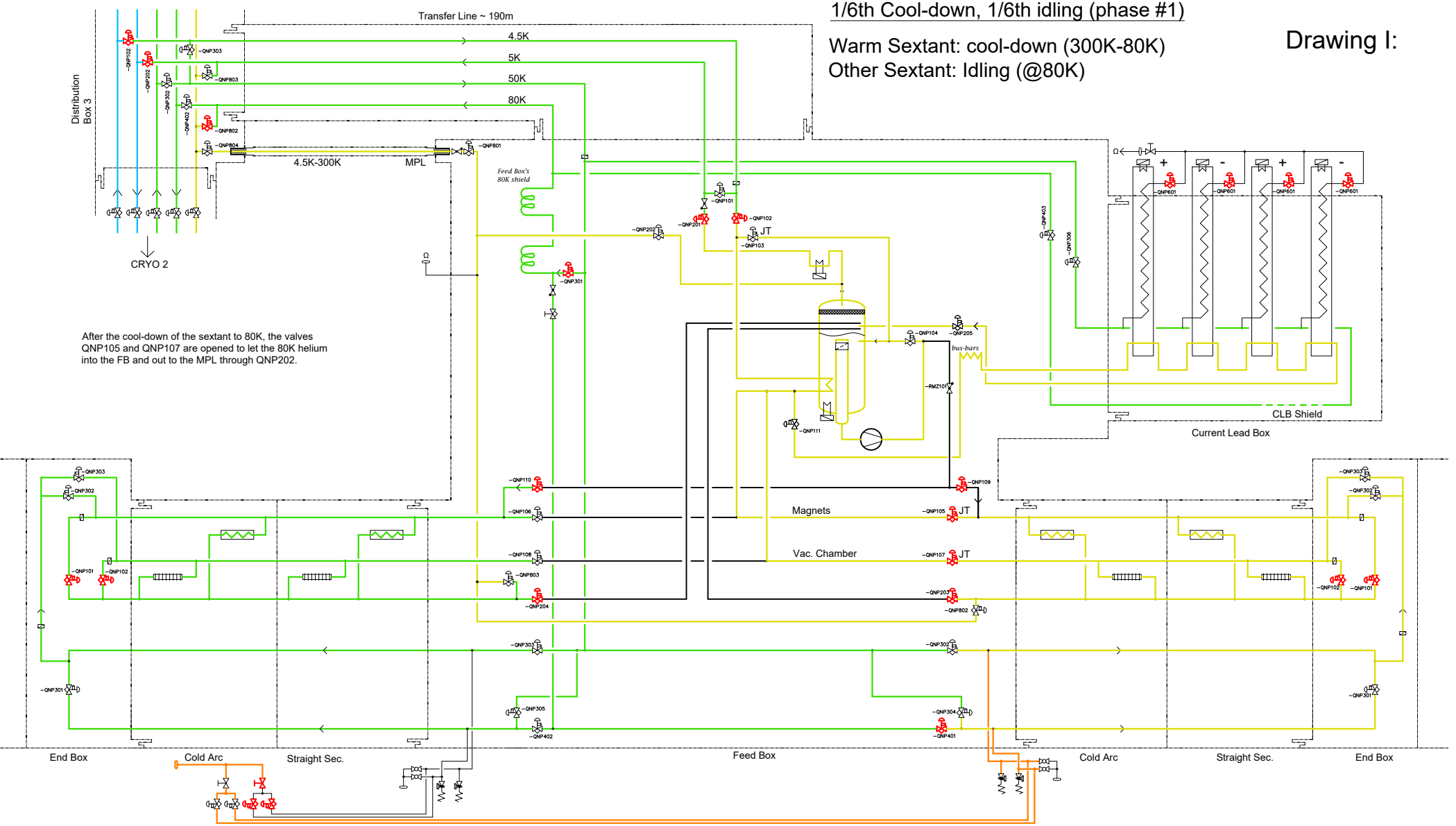

1/6th Warm-up, 1/6th idling (phase #1)
Sextants + FB: 4.5K circuit warm-up (4.5K-80K)
Drawing G:
Transfer Line ~ 190m
4.5K
5K
50K
80K
Distribution Box 3
4.5K-300K
MPL
CRYO 2
JT
CLB Shield
Current Lead Box
Magnets
Vac. Chamber
End Box
Cold Arc
Straight Sec.
Feed Box
Cold Arc
Straight Sec.
End Box
After the warm-up of the sextant to 80K, the valves QNP105 and QNP107 are opened to let the 80K helium into the FB and out to the MPL through QNP202.
4.5K/5K circuit of the TL can idle. Shall the temperature reach the shield temperature it could be actively held there throgh opening of QNP303.
The valve QNP301 has to be only slightly opened not to make a big "short-cut". The amount and acctual control will be defined elsewhere.

1/6th Warm-up, 1/6th idling (phase #2)

One Sextant: Idling (@80K)
Other Sextant: warm-up both circuits (80K-300K)

Drawing H:

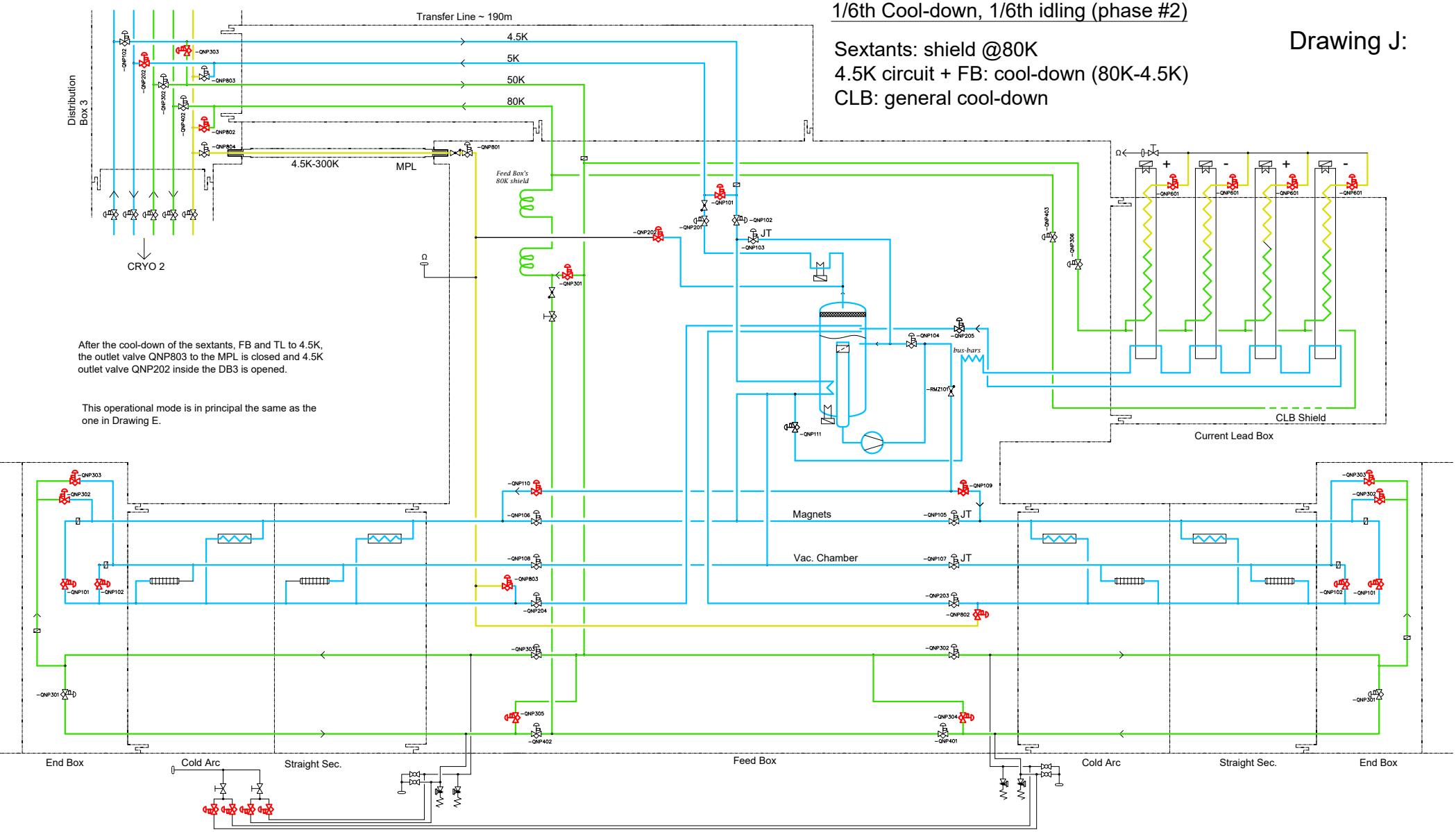



1/6th Cool-down, 1/6th idling (phase #1)
Warm Sextant: cool-down (300K-80K)
Other Sextant: Idling (@80K)
Drawing I:
Transfer Line ~ 190m
4.5K
5K
50K
80K
Distribution Box 3
4.5K-300K
MPL
CRYO 2
Feed Box's 80K shield
JT
bus-bars
CLB Shield
Current Lead Box
Magnets
Vac. Chamber
After the cool-down of the sextant to 80K, the valves QNP105 and QNP107 are opened to let the 80K helium into the FB and out to the MPL through QNP202.
End Box
Cold Arc
Straight Sec.
Feed Box
Cold Arc
Straight Sec.
End Box

Drawing J:

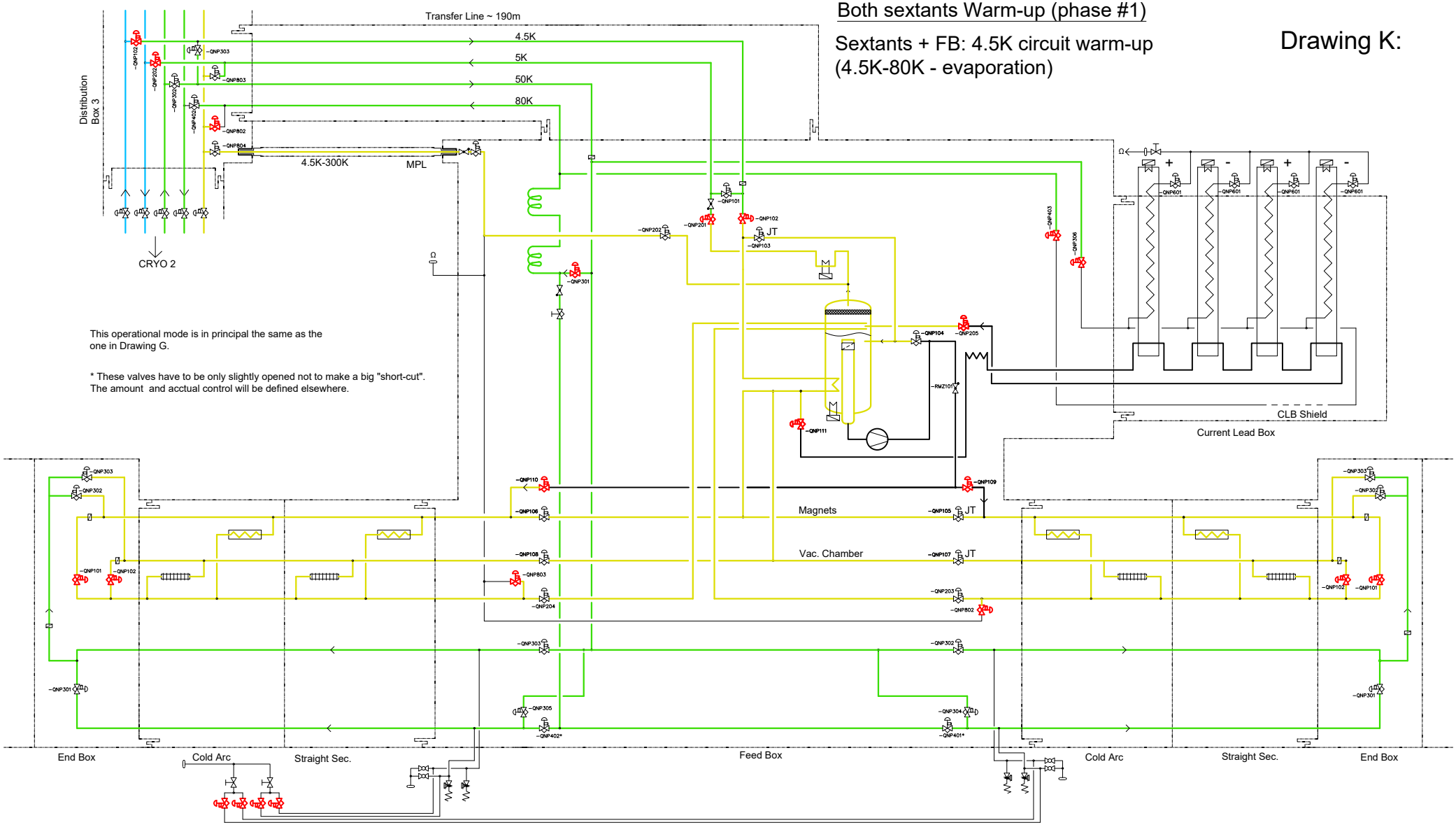
1/6th Cool-down, 1/6th idling (phase #2)

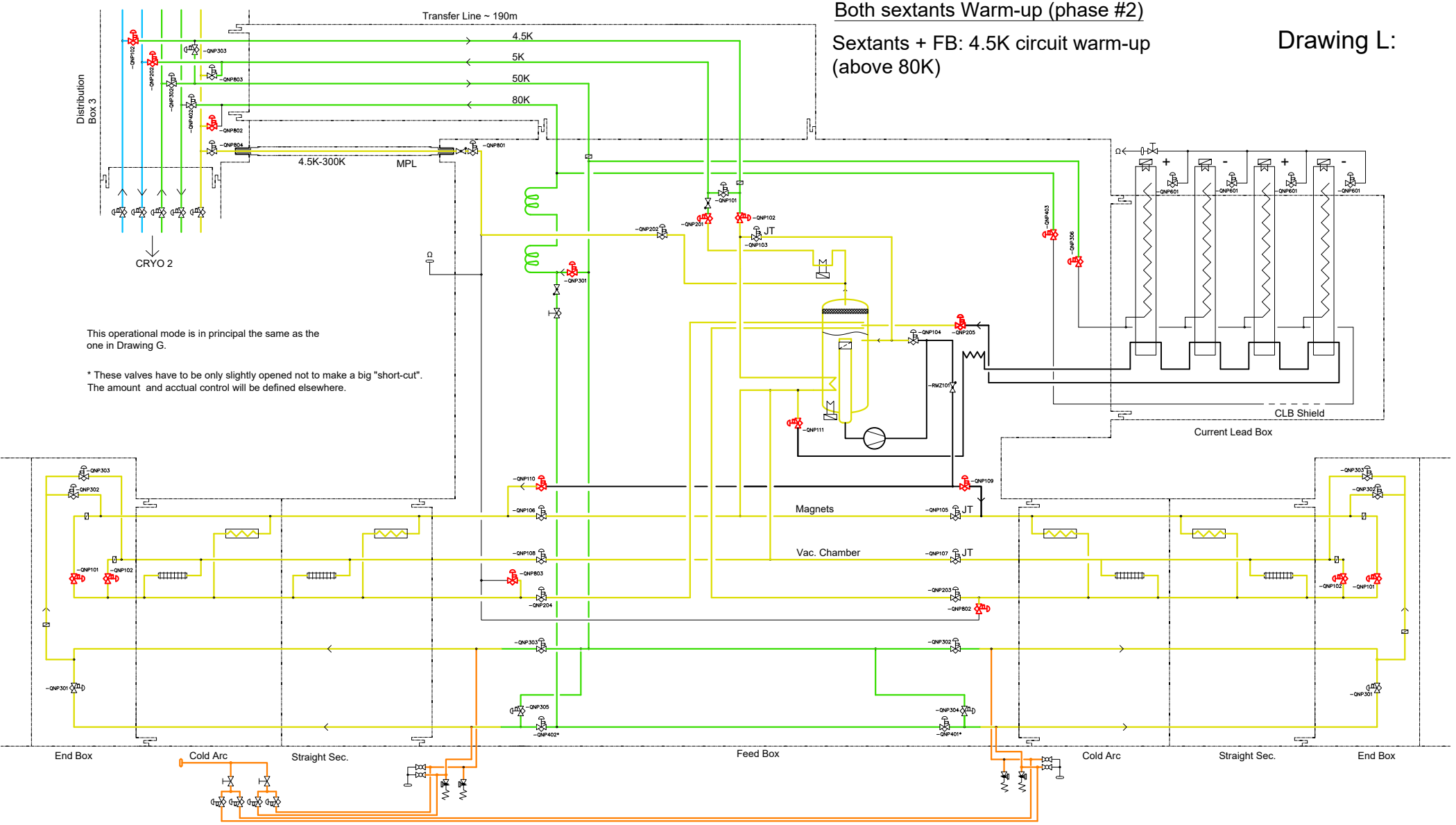
Sextants: shield @80K
4.5K circuit + FB: cool-down (80K-4.5K)
CLB: general cool-down

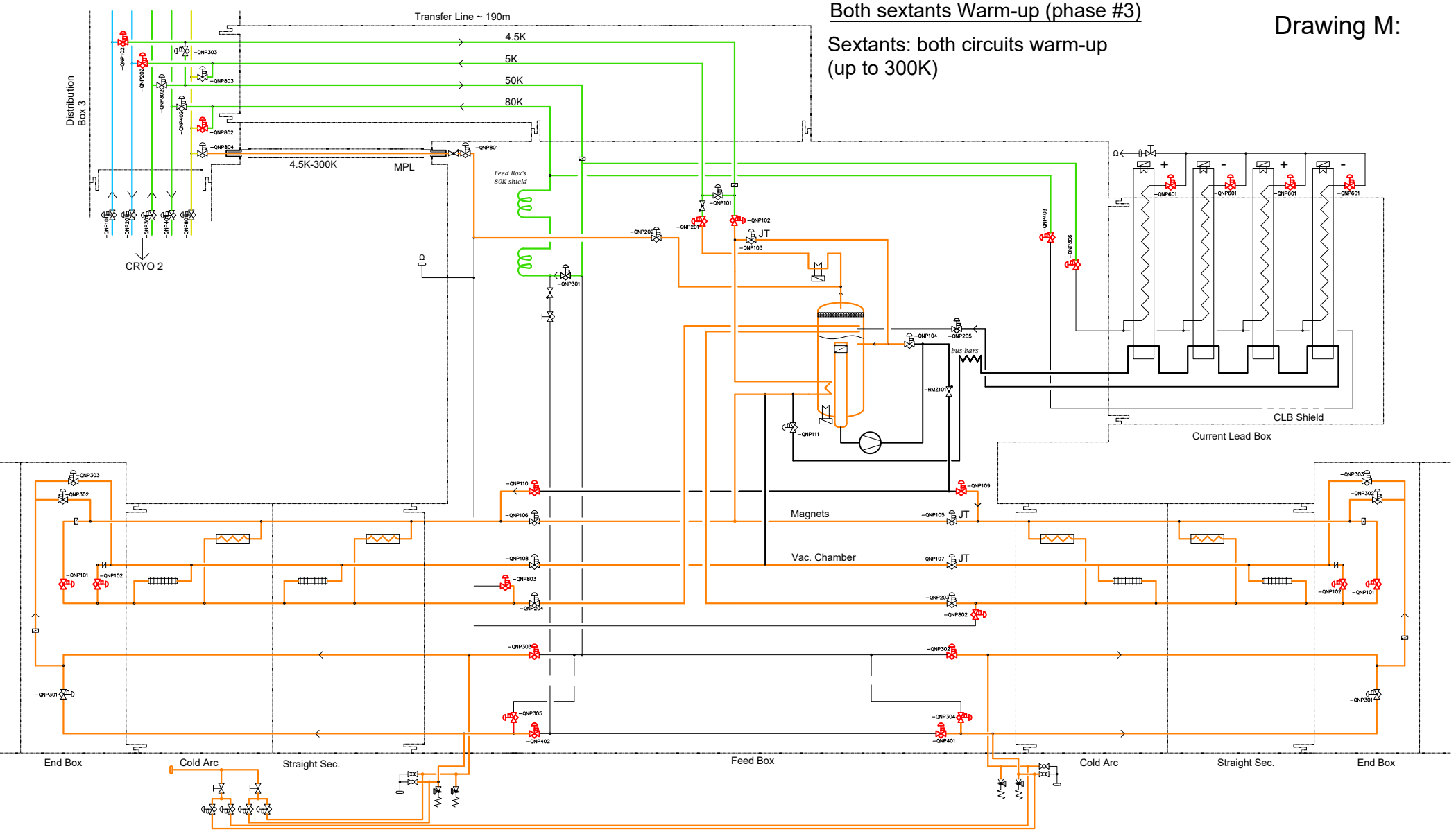


After the cool-down of the sextants, FB and TL to 4.5K, the outlet valve QNP803 to the MPL is closed and 4.5K outlet valve QNP202 inside the DB3 is opened.

This operational mode is in principal the same as the one in Drawing E.


Both sextants Warm-up (phase #1)
Sextants + FB: 4.5K circuit warm-up
(4.5K-80K - evaporation)
Drawing K:
Transfer Line ~ 190m
4.5K
5K
50K
80K
Distribution Box 3
4.5K-300K
MPL
CRYO 2
JT
Magnets
Vac. Chamber
CLB Shield
Current Lead Box
This operational mode is in principal the same as the one in Drawing G.
* These valves have to be only slightly opened not to make a big "short-cut". The amount and acctual control will be defined elsewhere.
End Box
Cold Arc
Straight Sec.
Feed Box
Cold Arc
Straight Sec.
End Box

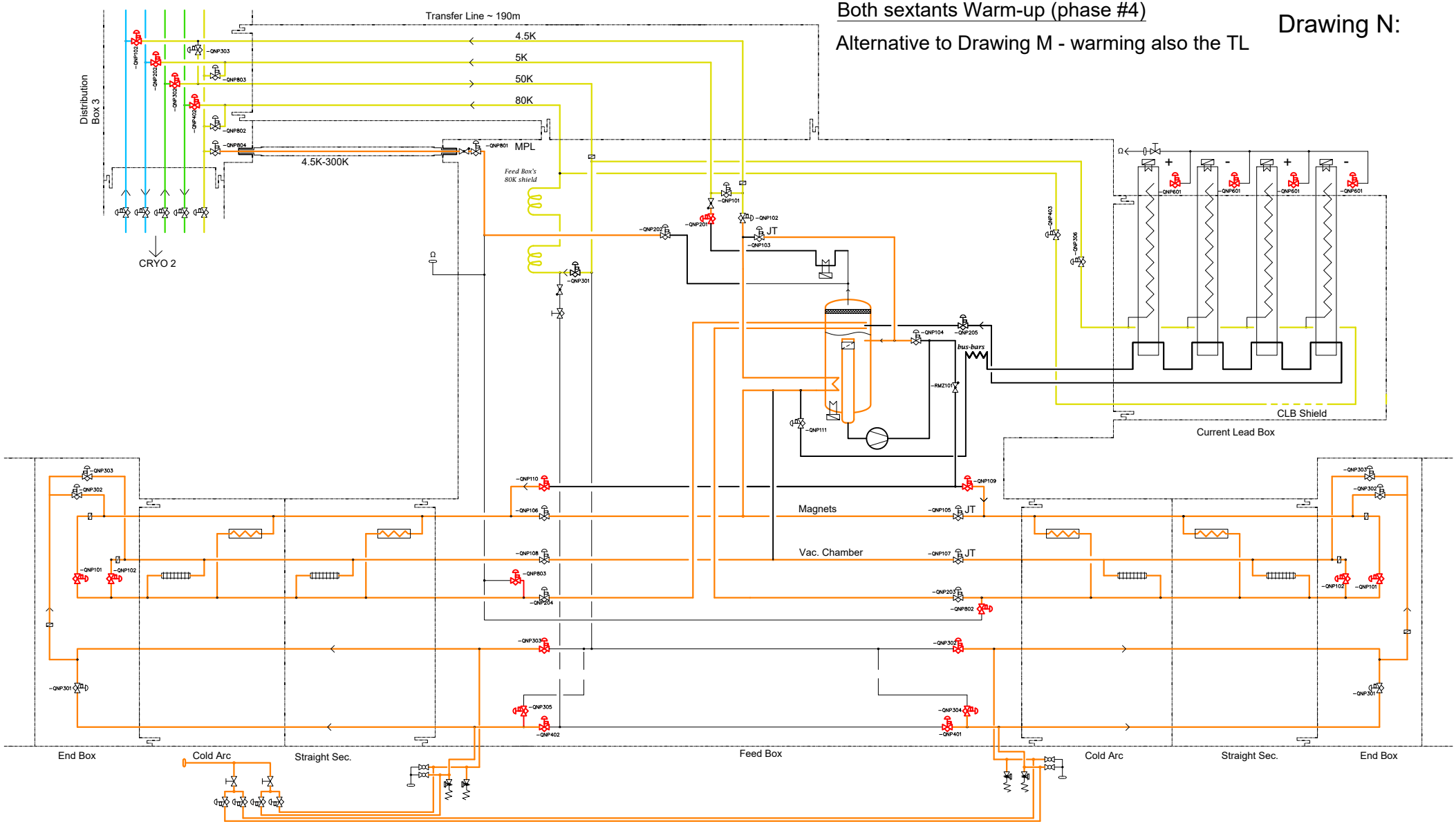

Both sextants Warm-up (phase #2)
Sextants + FB: 4.5K circuit warm-up (above 80K)
Drawing L:
Transfer Line ~ 190m
4.5K
5K
50K
80K
Distribution Box 3
4.5K-300K
MPL
CRYO 2
JT
CLB Shield
Current Lead Box
Magnets
Vac. Chamber
This operational mode is in principal the same as the one in Drawing G.
* These valves have to be only slightly opened not to make a big "short-cut". The amount and acctual control will be defined elsewhere.
End Box
Cold Arc
Straight Sec.
Feed Box
Cold Arc
Straight Sec.
End Box


Both sextants Warm-up (phase #3)
Sextants: both circuits warm-up
(up to 300K)
Drawing M:
Transfer Line ~ 190m
4.5K
5K
50K
80K
Distribution Box 3
4.5K-300K
MPL
CRYO 2
Feed Box's 80K shield
JT
bus-bars
CLB Shield
Current Lead Box
Magnets
Vac. Chamber
End Box
Cold Arc
Straight Sec.
Feed Box
Cold Arc
Straight Sec.
End Box

Both sextants Warm-up (phase #4)

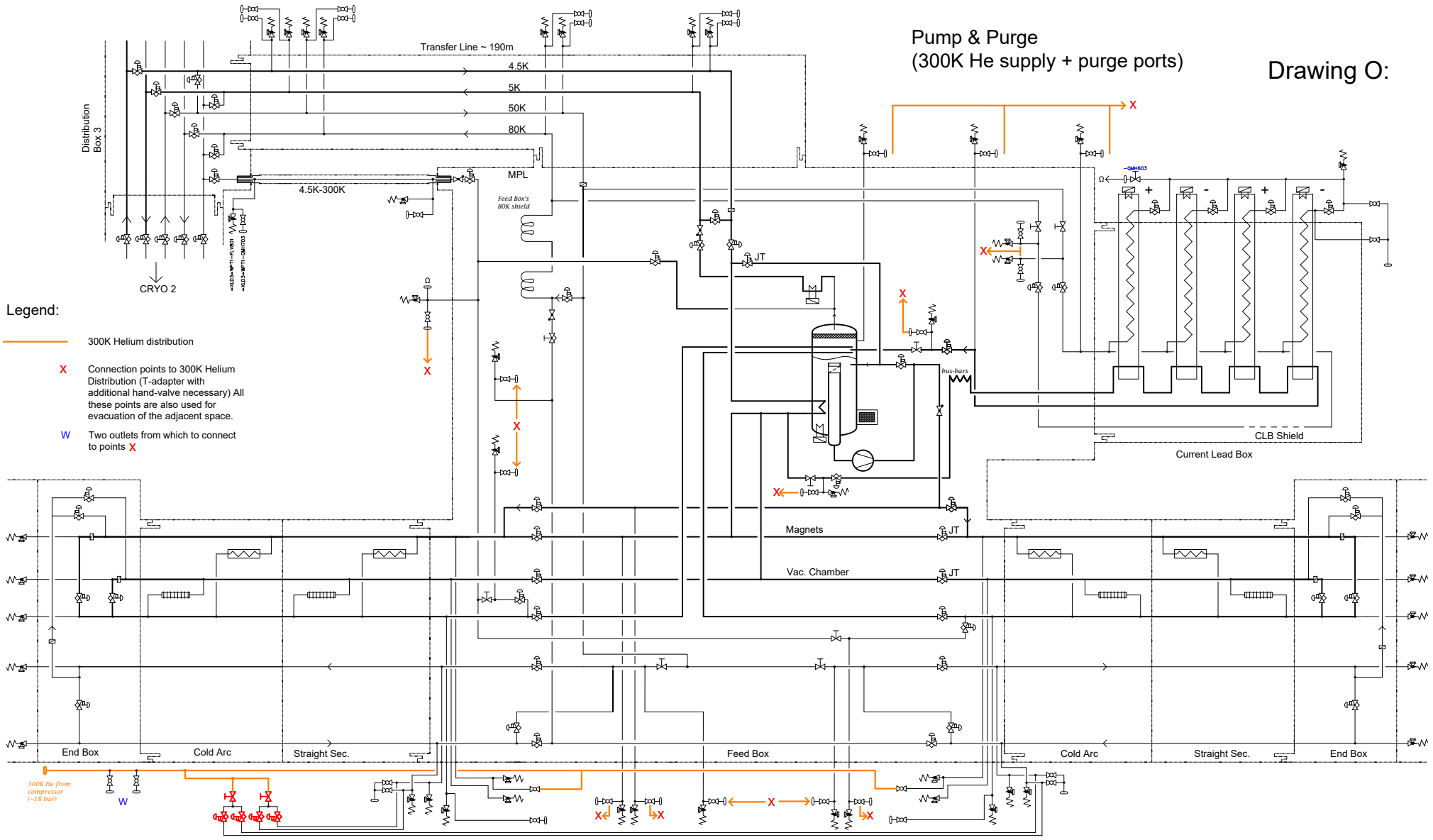
Alternative to Drawing M - warming also the TL

Drawing N:



Pump & Purge
(300K He supply + purge ports)

Drawing O:



Legend:

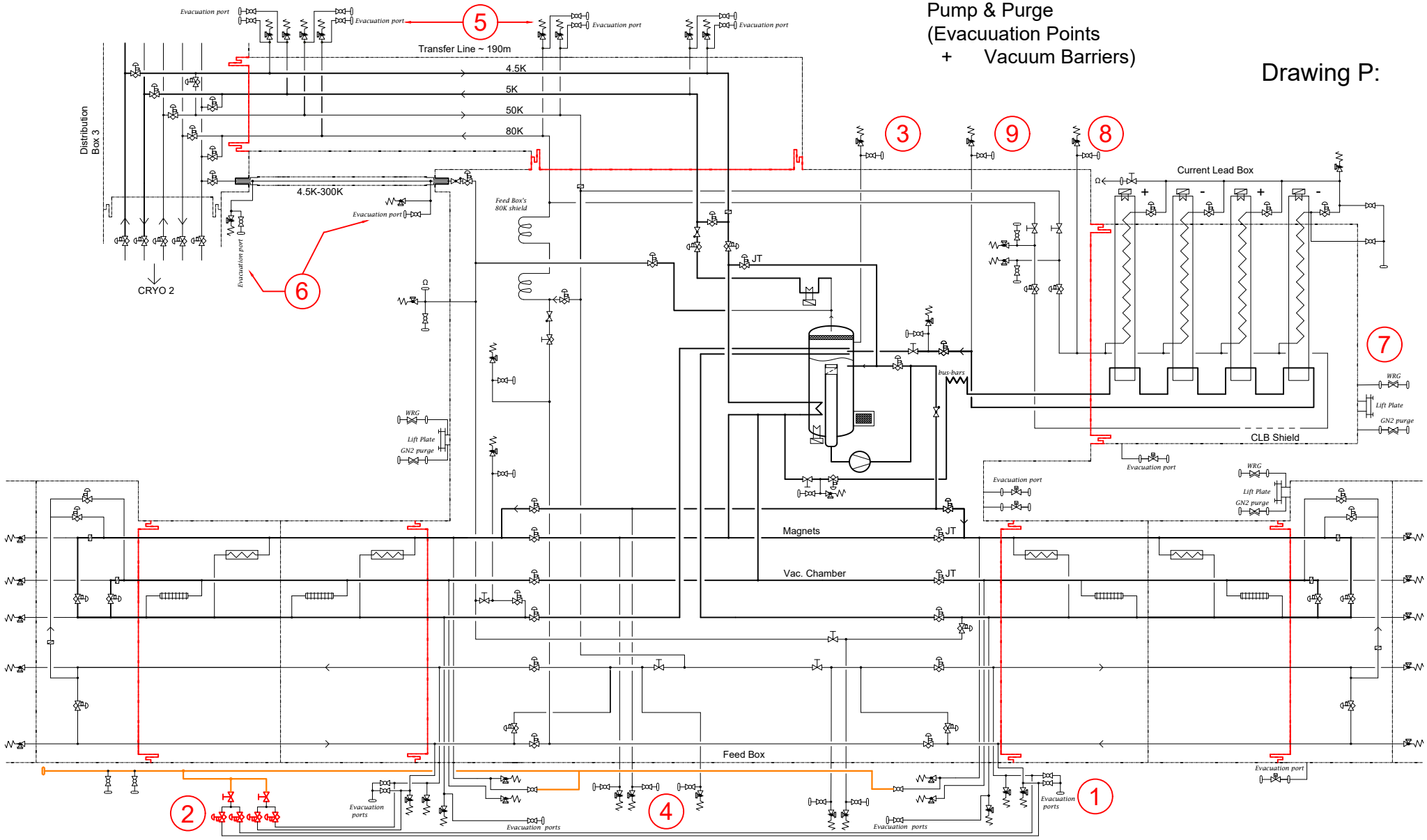
300K Helium distribution

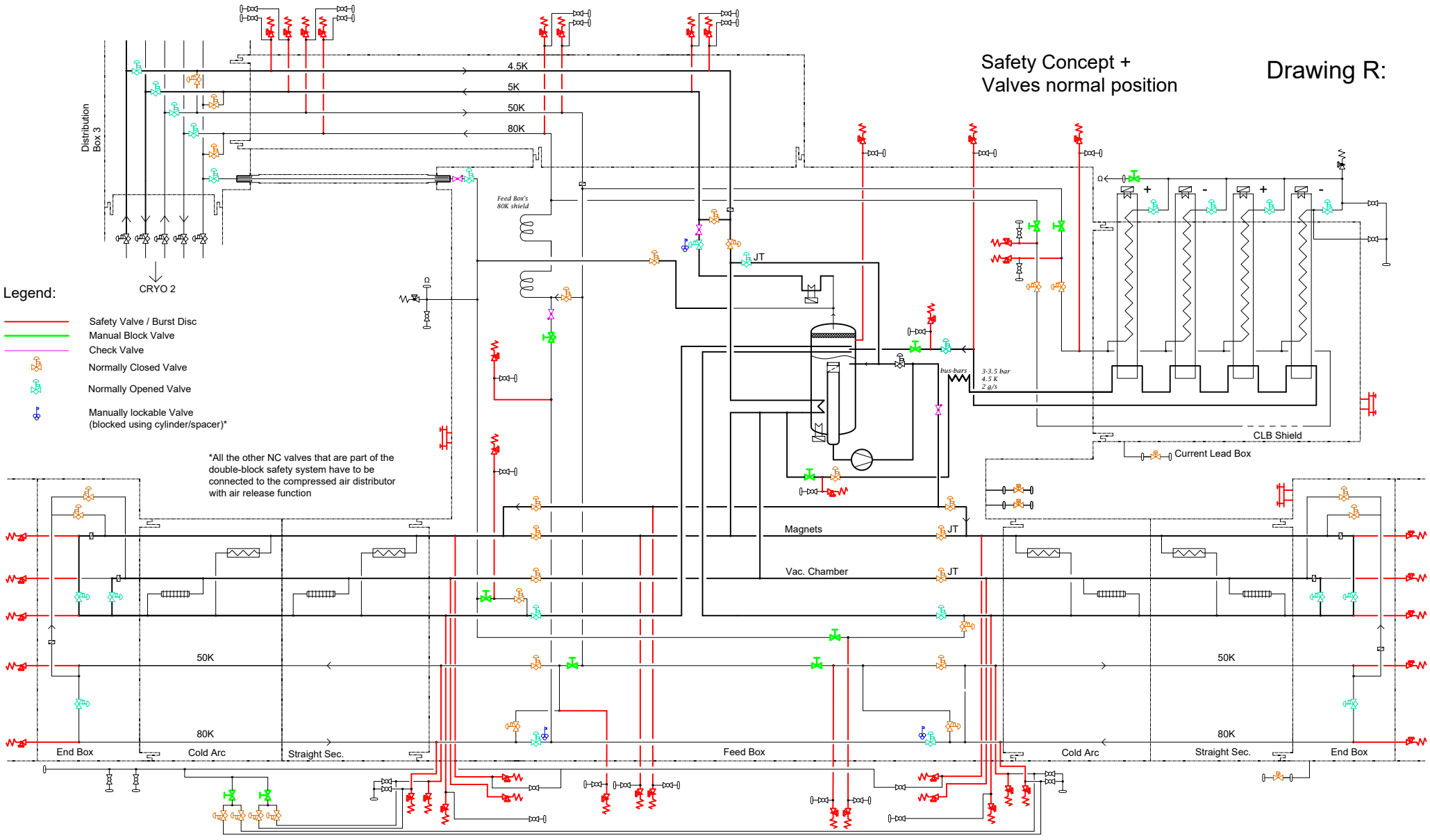
X — Connection points to 300K Helium Distribution (T-adapter with additional hand-valve necessary) All these points are also used for evacuation of the adjacent space.

W — Two outlets from which to connect to points X

Pump & Purge
(Evacuuation Points
+ Vacuum Barriers)

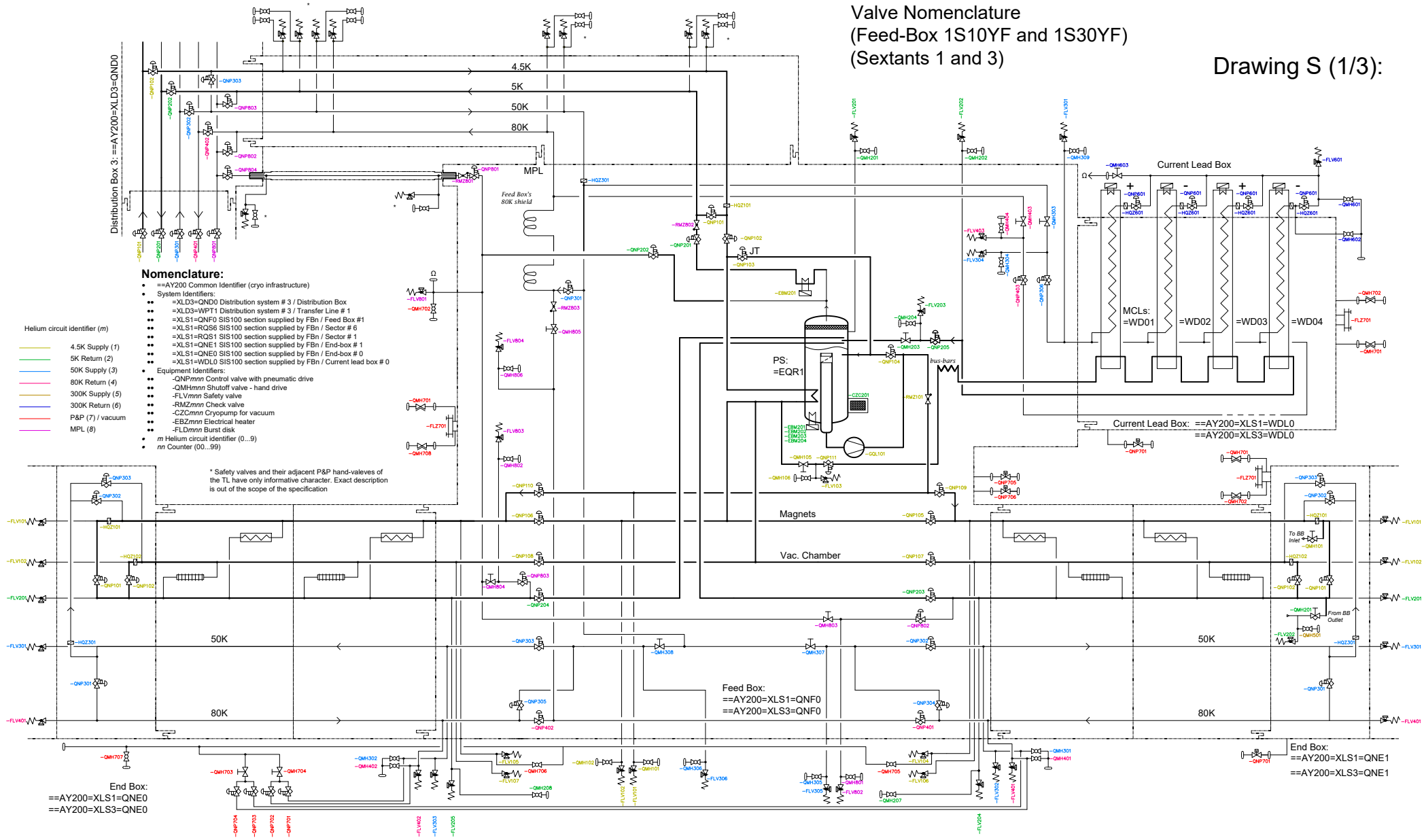
Drawing P:




Safety Concept +
Valves normal position
Drawing R:
Distribution Box 3
4.5K
5K
50K
80K
CRYO 2
Feed Box's 80K shield
JT
bus-bars
3-3.5 bar
4.5 K
2 g/s
CLB Shield
Current Lead Box
Magnets
Vac. Chamber
Legend:
Safety Valve / Burst Disc
Manual Block Valve
Check Valve
Normally Closed Valve
Normally Opened Valve
Manually lockable Valve
(blocked using cylinder/spacer)*
*All the other NC valves that are part of the double-block safety system have to be connected to the compressed air distributor with air release function
End Box
Cold Arc
Straight Sec.
Feed Box
Cold Arc
Straight Sec.
End Box

Valve Nomenclature
(Feed-Box 1S10YF and 1S30YF)
(Sextants 1 and 3)

Drawing S (1/3):



Nomenclature:

- ==AY200 Common Identifier (cryo infrastructure)
- System Identifiers:
  - =XLD3=QND0 Distribution system # 3 / Distribution Box
  - =XLD3=WPT1 Distribution system # 3 / Transfer Line # 1
  - =XLS1=QNF0 SIS100 section supplied by FBn / Feed Box #1
  - =XLS1=RQS6 SIS100 section supplied by FBn / Sector # 6
  - =XLS1=RQS1 SIS100 section supplied by FBn / Sector # 1
  - =XLS1=QNE1 SIS100 section supplied by FBn / End-box # 1
  - =XLS1=QNE0 SIS100 section supplied by FBn / End-box # 0
  - =XLS1=WDL0 SIS100 section supplied by FBn / Current lead box # 0
- Equipment Identifiers:
  - -QNP*mnn* Control valve with pneumatic drive
  - -QMH*mnn* Shutoff valve - hand drive
  - -FLV*mnn* Safety valve
  - -RMZ*mnn* Check valve
  - -CZC*mnn* Cryopump for vacuum
  - -EBZ*mnn* Electrical heater
  - -FLD*mnn* Burst disk
- *m* Helium circuit identifier (0...9)
- *nn* Counter (00...99)

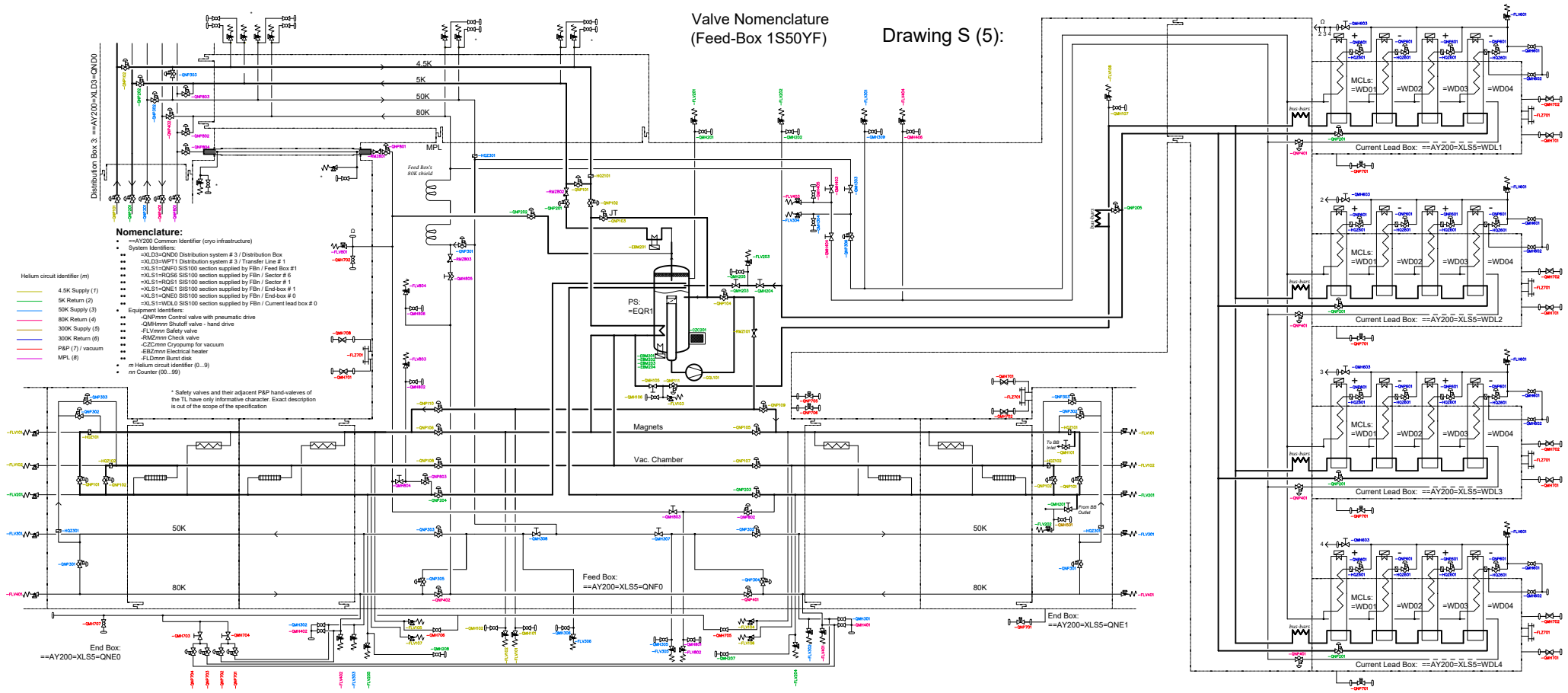
Helium circuit identifier (*m*)

- 4.5K Supply (*1*)
- 5K Return (2)
- 50K Supply (3)
- 80K Return (*4*)
- 300K Supply (*5*)
- 300K Return (*6*)
- P&P (*7*) / vacuum
- MPL (*8*)

* Safety valves and their adjacent P&P hand-valeves of the TL have only informative character. Exact description is out of the scope of the specification

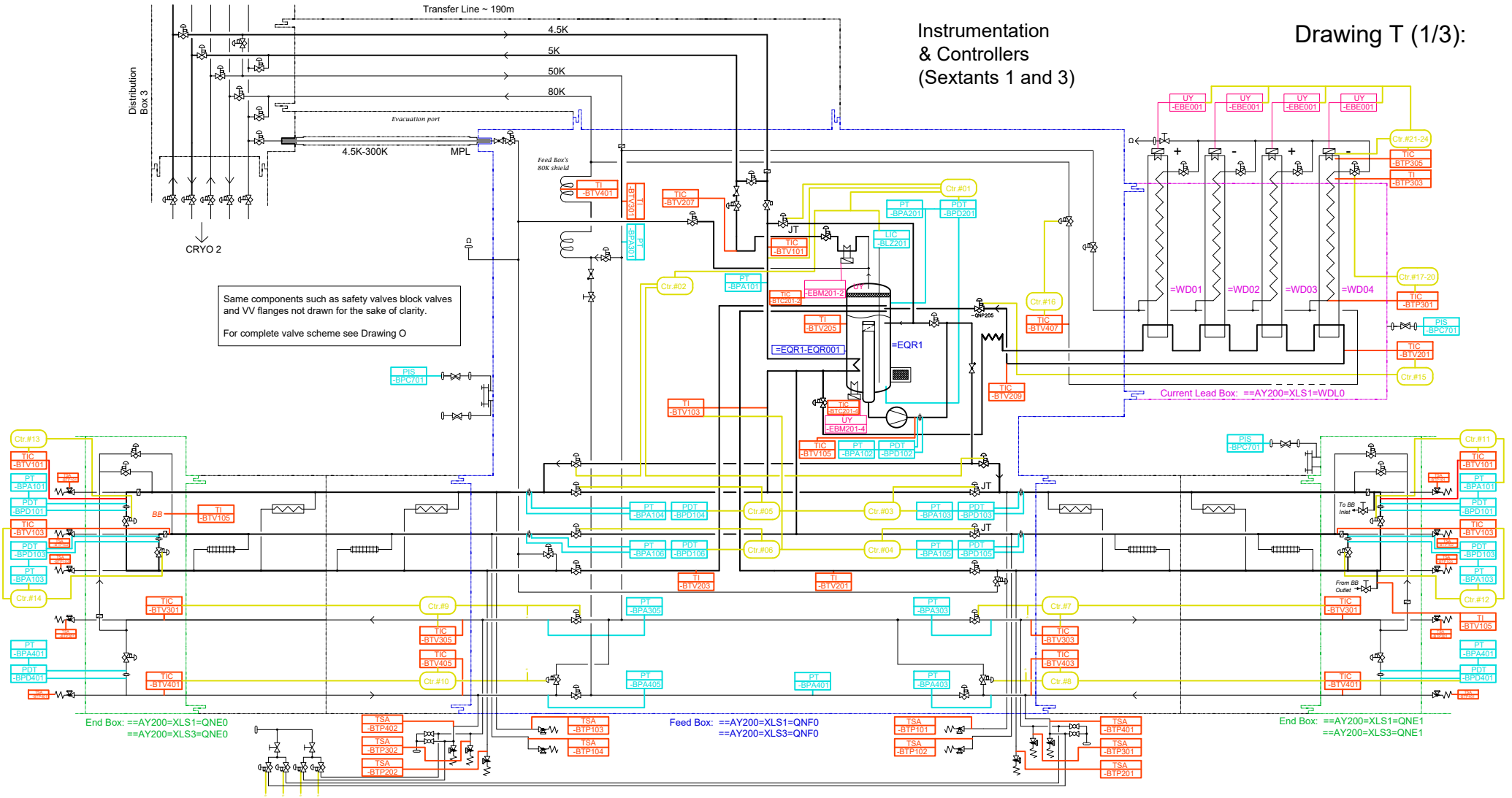
Valve Nomenclature
(Feed-Box 1S50YF)

Drawing S (5):



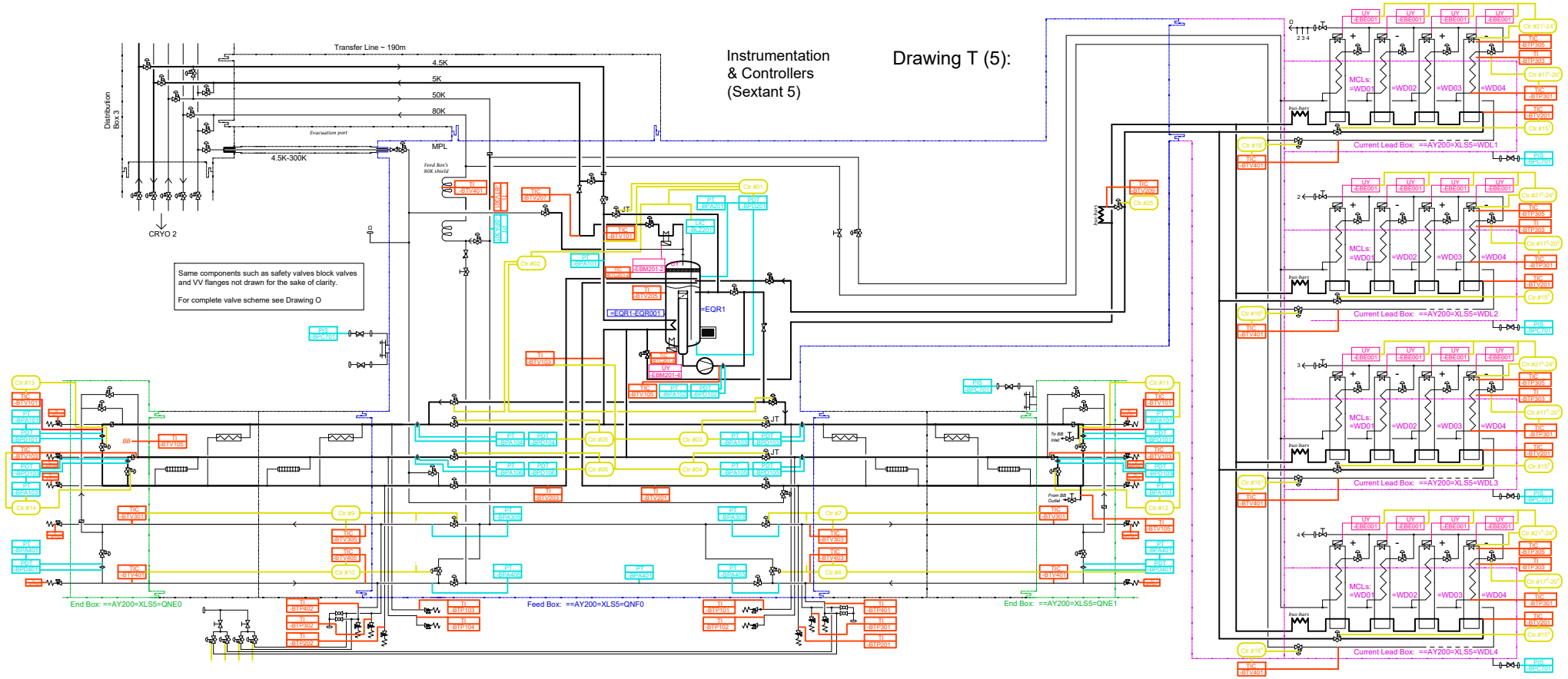
Instrumentation & Controllers (Sextants 1 and 3)

Drawing T (1/3):

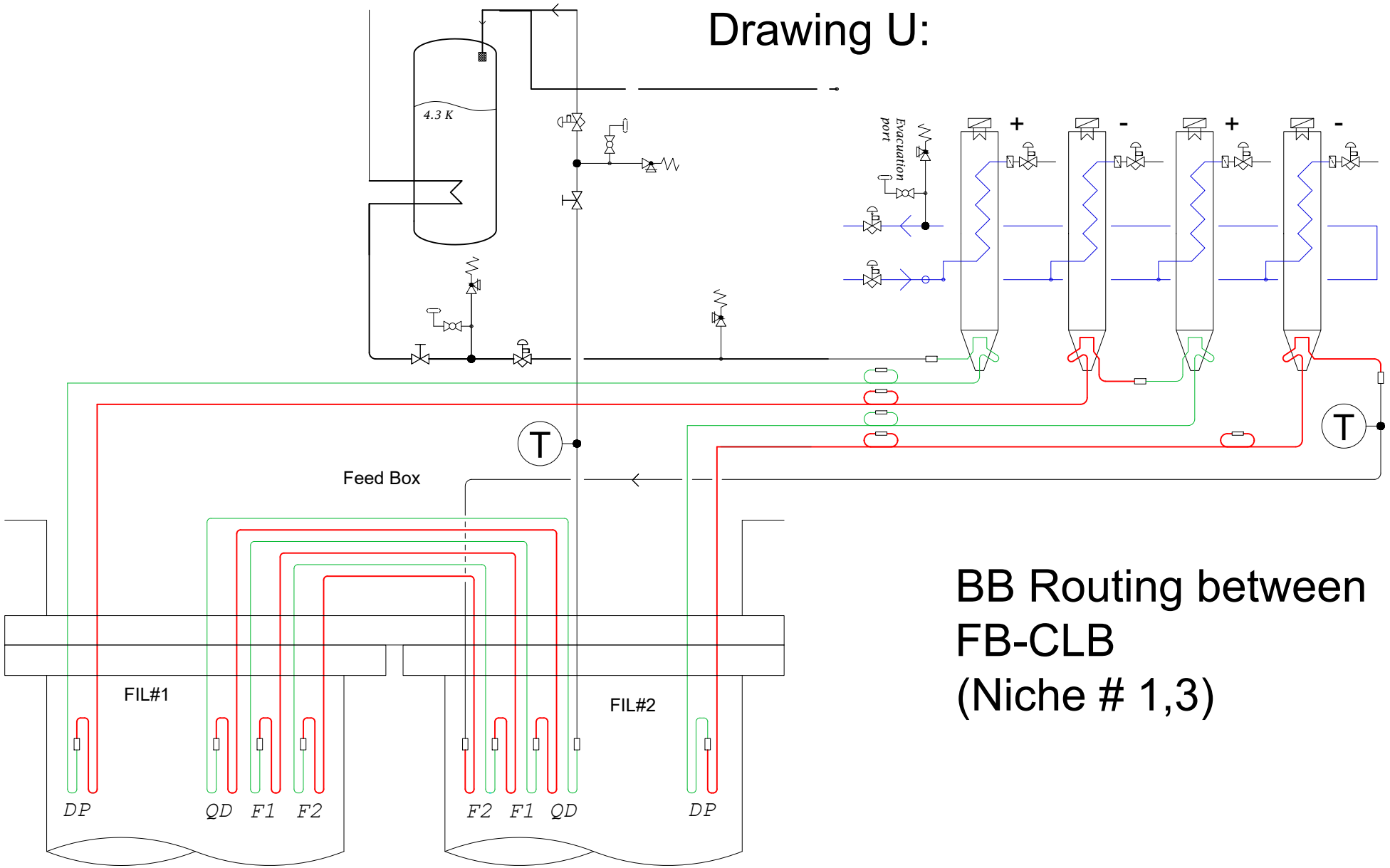


Instrumentation
& Controllers
(Sextant 5)

Drawing T (5):



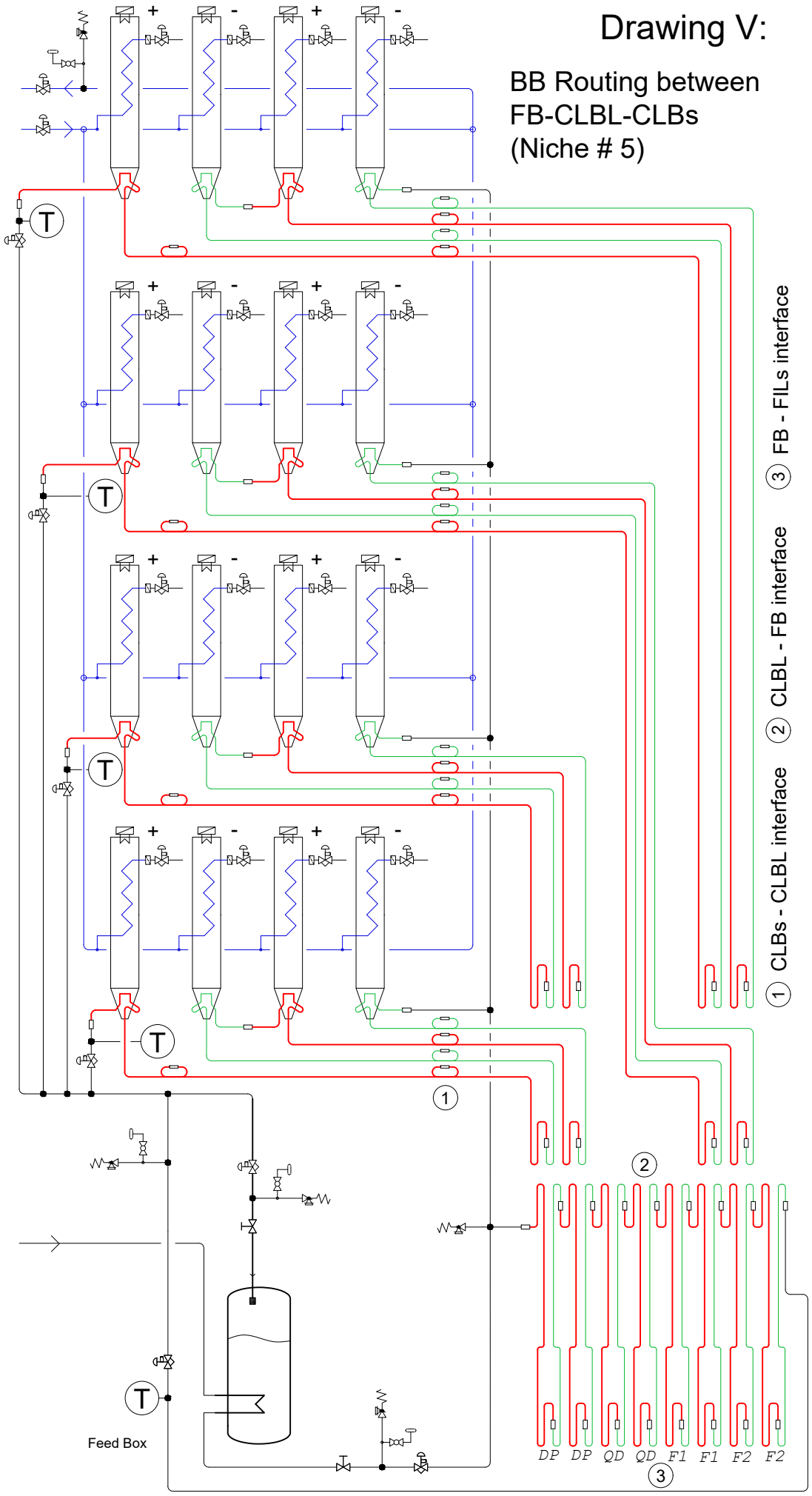
Drawing U:

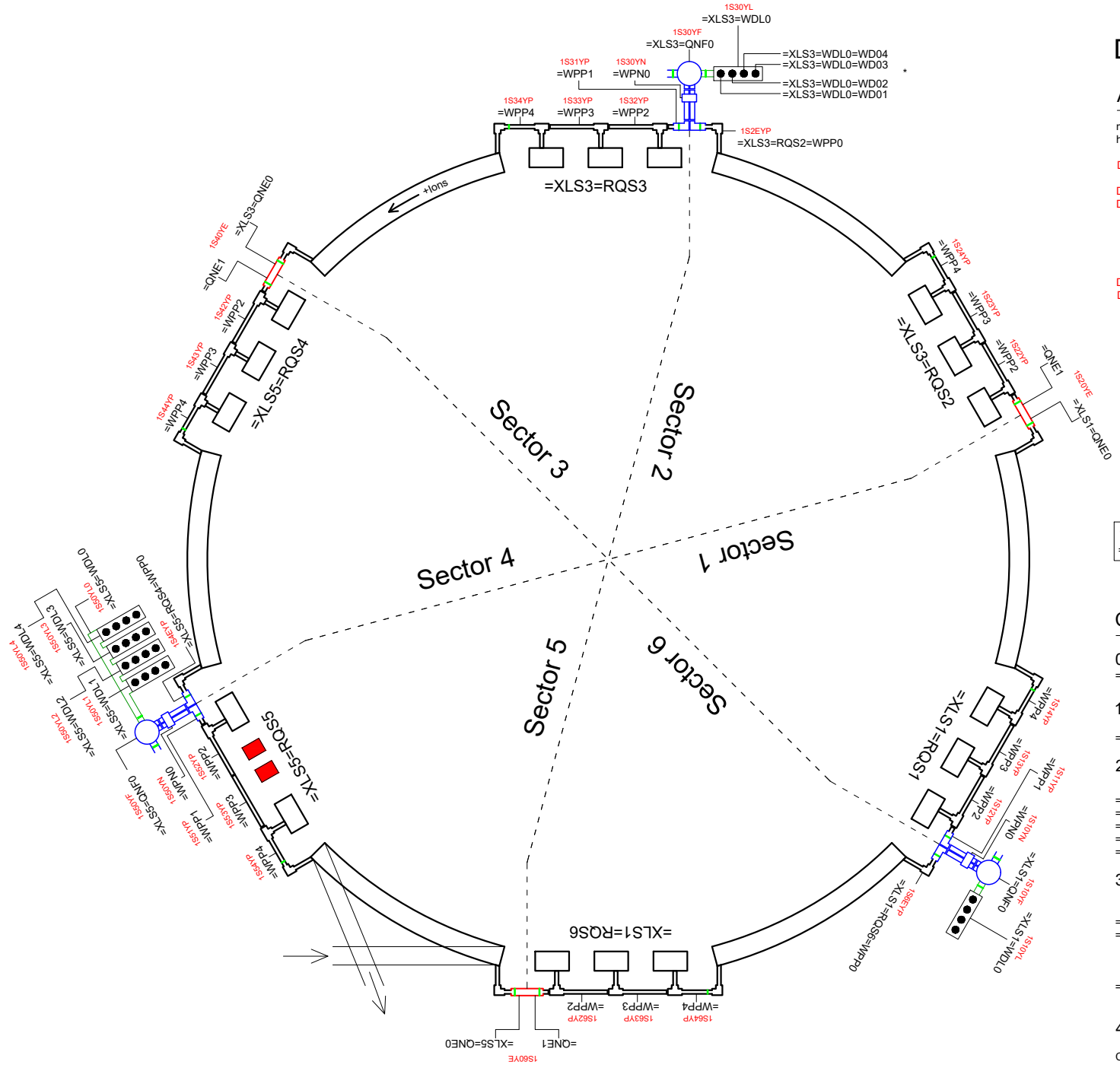


BB Routing between FB-CLB (Niche # 1,3)

Drawing V:

BB Routing between
FB-CLBL-CLBs
(Niche # 5)





Drawing X:

Accelerator Nomenclature

more info:
https://www-acc.gsi.de/wiki/Accnomen/WebHome

Digit 1, 2	Accelerator systems e.g. 1S for SIS100
Digit 3	Section or sextant e.g. 1…6
Digit 4	By-Pass-Line Cells SIS100 1…E similar to SIS100 Cells, devices attached to the magnet modules have the same 3. and 4. digit as the magnet modules. (devices attached to the arc termination magnet module downstream from a sextant will have digit 4 = E) 0 for those components whose function is common to two sextants, e.g. Feed box, End box
Digit 5	Cryogenics = Y
Digit 6	Cryogenic devices:

----YE End box
----YF Feed box
----YL Current Lead box
----YN Feen-iN line box
----YP By-pass line Piece
----YMQ Quadrupole
----YMM Dipole
----YME Missing Dipole

| = Vacuum Barrier

Example:

1S31YL - SIS100 Nomenclature
=XLS3=QNL1 - CSCY Nomenclature

CSCY Nomenclature Structure

0. LEVEL
==AY200

1. LEVEL

=XLSx with x=1,3,5 - Sections supplied by FB1, FB3, FB5

2. LEVEL

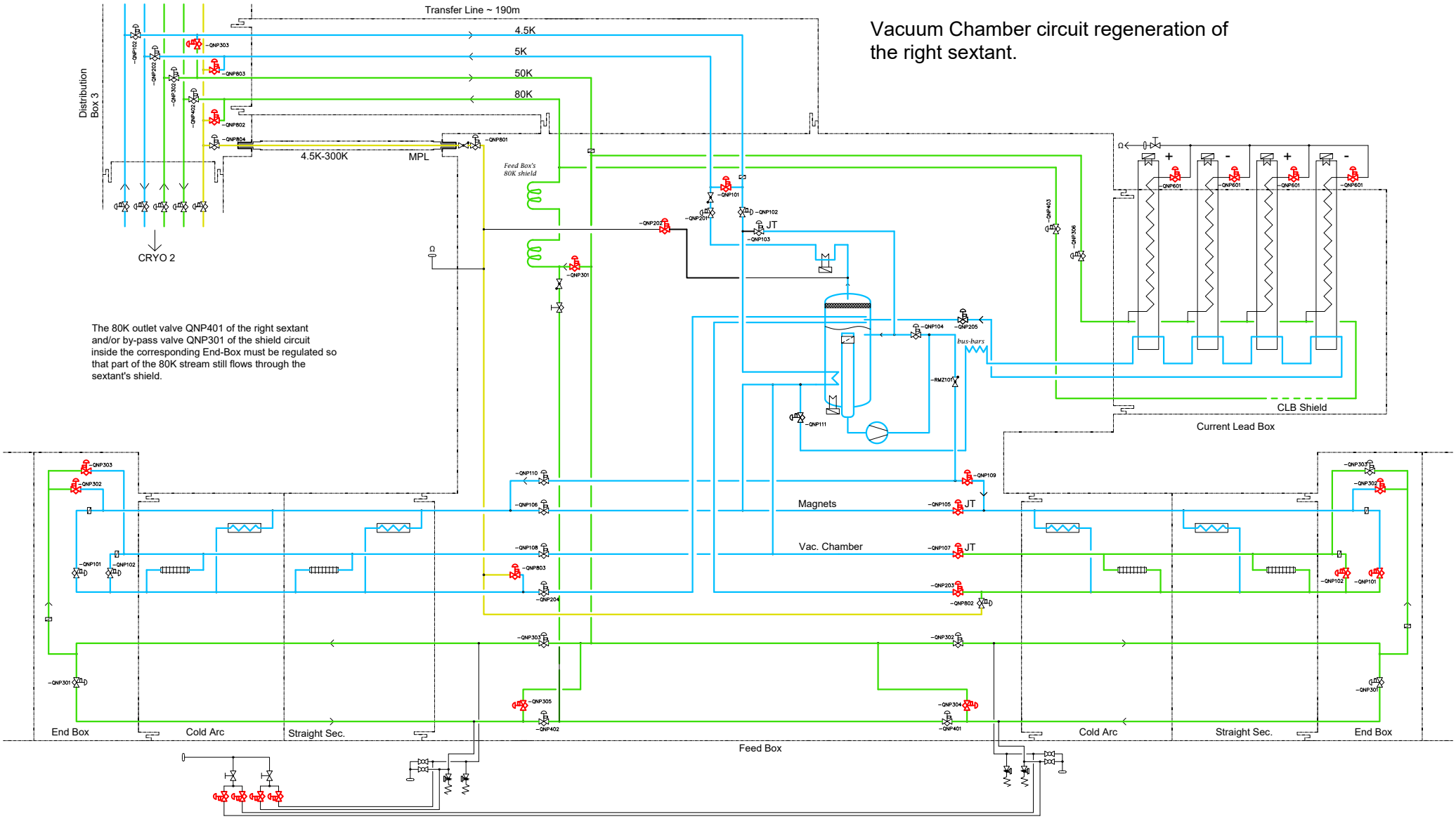
=QNF0 - Feed Box
=RQS1-6 - SIS100 Sextant
=QNE0-1 - End Box
=WPN0 - Feed iN Line Box
=WDL0-4 - Curren Lead Box

3. LEVEL

=WPP0-4 - Bypass Line Piece
=RQxy - Magnets
x=cell(1...E)
y=magnet position/type in cell
(standard is 1=DP,2=DP,3=QPmodule)
=WD01-04 - Main Current Leads
* - All CLBs have the same MCL naming

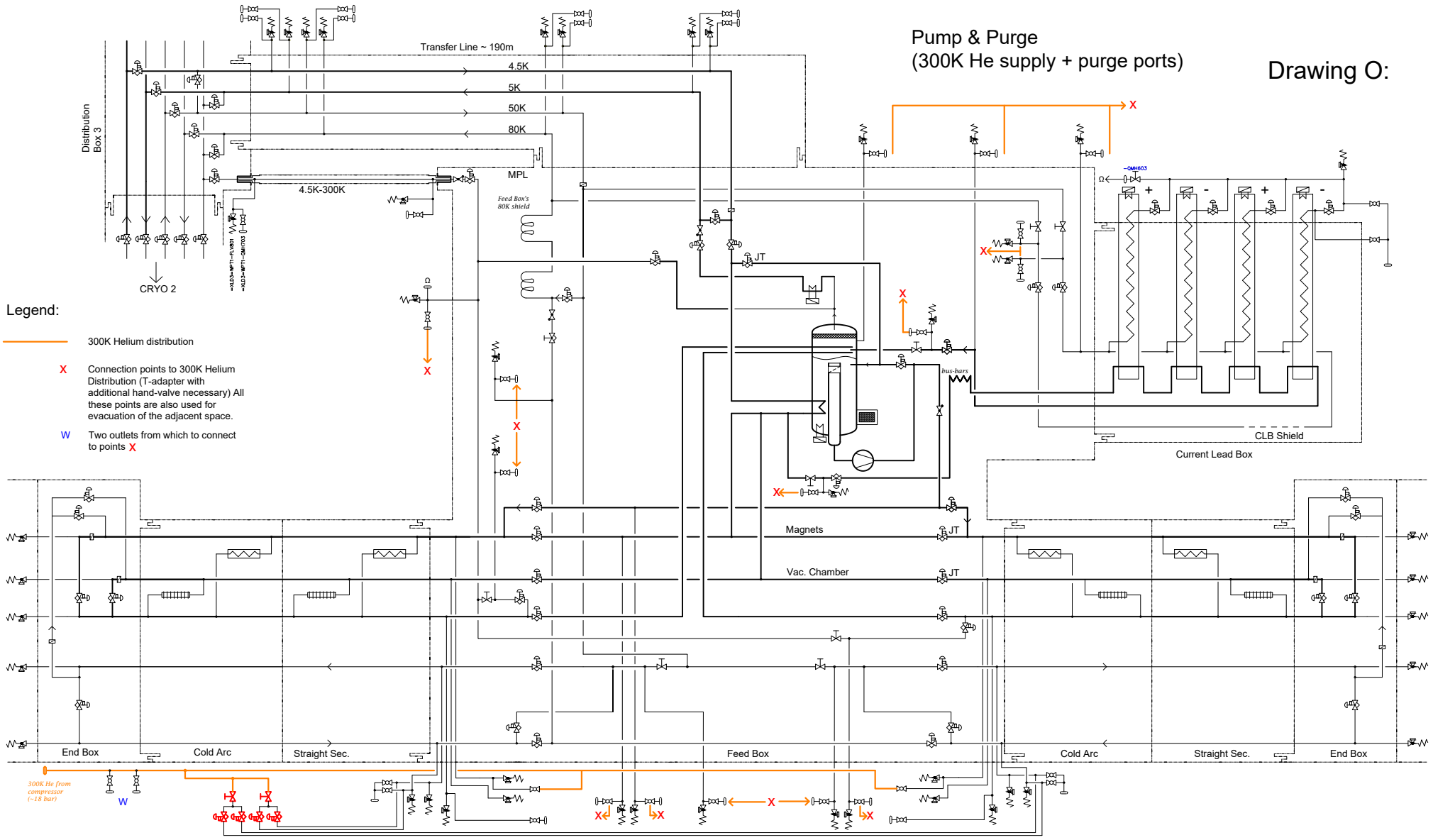
4. LEVEL

Components (sensoric, actuating elements, etc.)


Vacuum Chamber circuit regeneration of the right sextant.
Transfer Line ~ 190m
4.5K
5K
50K
80K
Distribution Box 3
4.5K-300K
MPL
CRYO 2
Feed Box's 80K shield
JT
bus-bars
CLB Shield
Current Lead Box
Magnets
Vac. Chamber
The 80K outlet valve QNP401 of the right sextant and/or by-pass valve QNP301 of the shield circuit inside the corresponding End-Box must be regulated so that part of the 80K stream still flows through the sextant's shield.
End Box
Cold Arc
Straight Sec.
Feed Box
Cold Arc
Straight Sec.
End Box

Pump & Purge
(300K He supply + purge ports)

Drawing O:



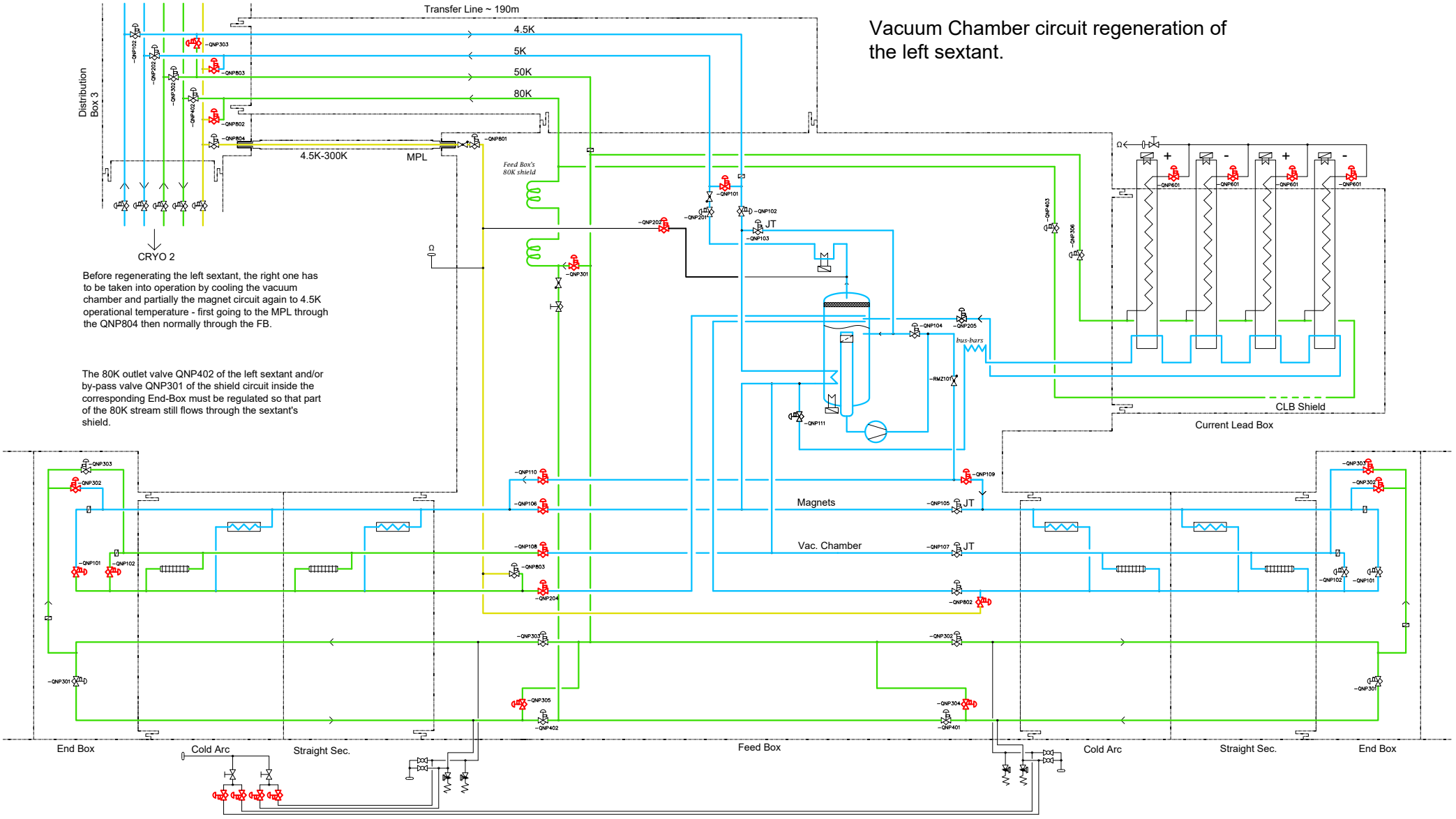
Legend:

300K Helium distribution

X — Connection points to 300K Helium Distribution (T-adapter with additional hand-valve necessary) All these points are also used for evacuation of the adjacent space.

W — Two outlets from which to connect to points X

Vacuum Chamber circuit regeneration of the left sextant.

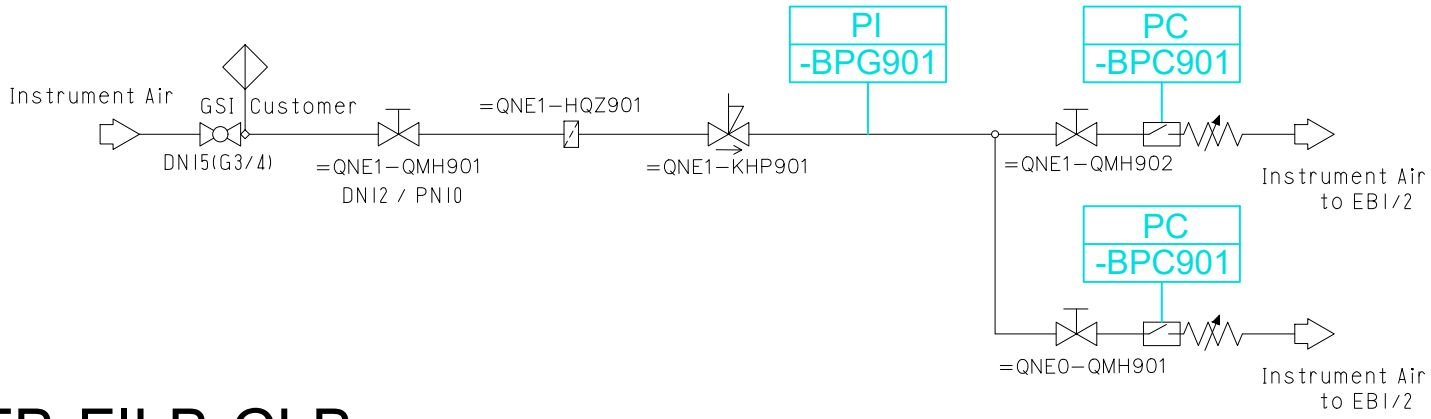


Before regenerating the left sextant, the right one has to be taken into operation by cooling the vacuum chamber and partially the magnet circuit again to 4.5K operational temperature - first going to the MPL through the QNP804 then normally through the FB.

The 80K outlet valve QNP402 of the left sextant and/or by-pass valve QNP301 of the shield circuit inside the corresponding End-Box must be regulated so that part of the 80K stream still flows through the sextant's shield.

EB

Instrument Air



FB-FILB-CLB