

SPES Meeting 14/8/01

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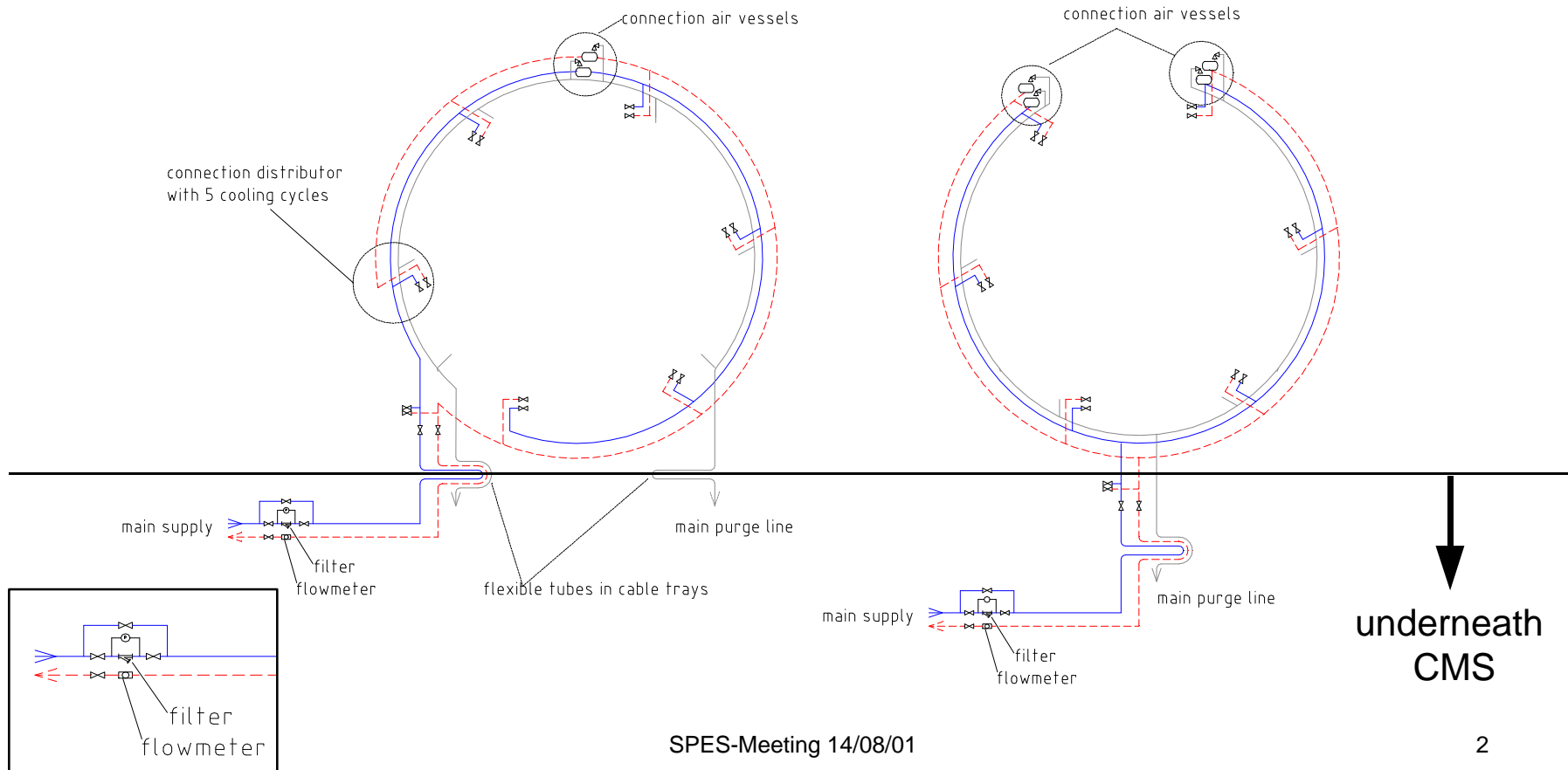
Topics

- **Pipework/equipment of cooling/purging system in UXC**
- **Commissioning using the MCU**
- **Alternative to DEKABON flexible tube**
- **Contact corrosion Al/SS - demineralised water**
- **Malfunction scenarios**

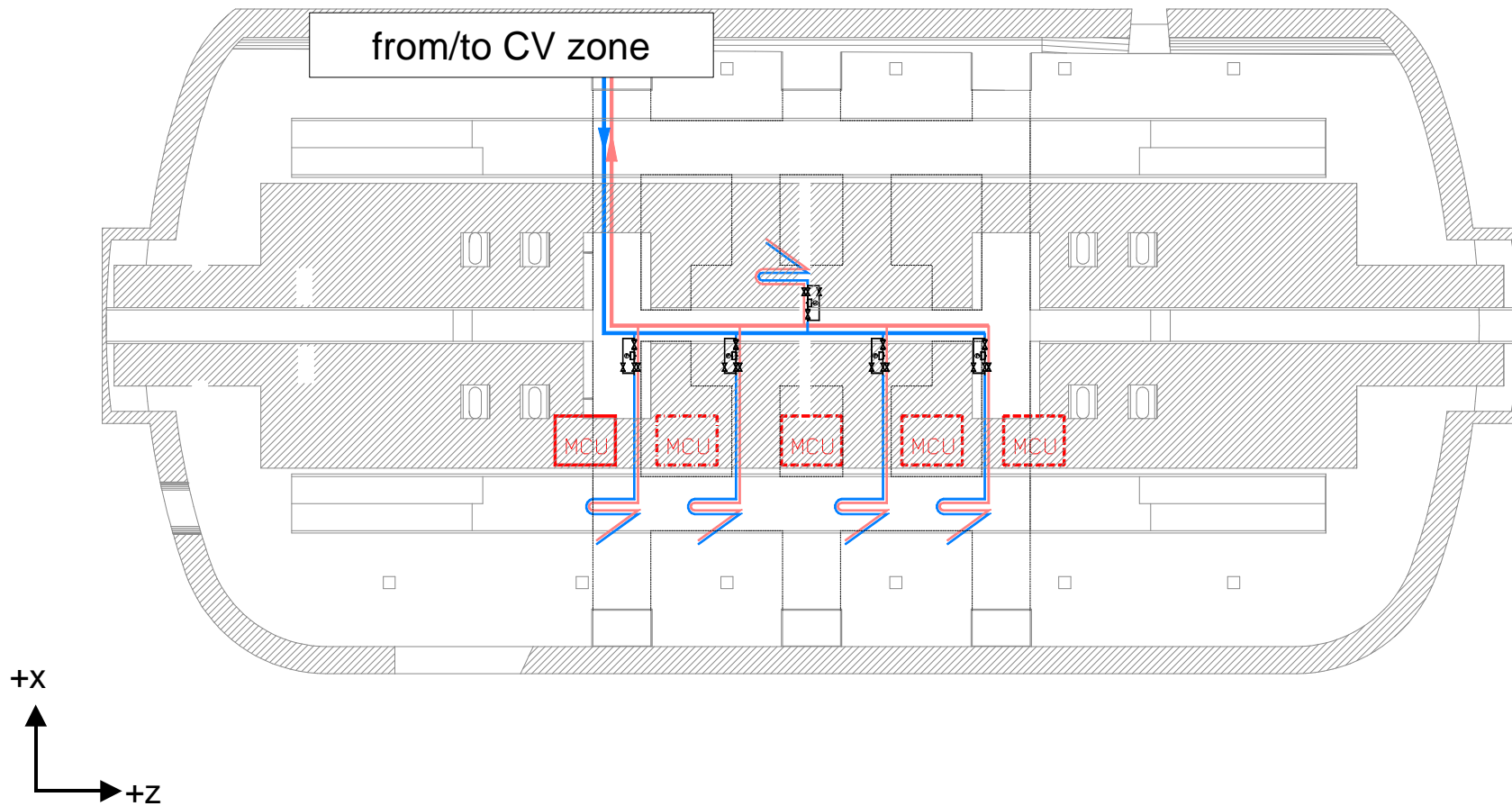
Circular manifolds of cooling system

wheel -2, -1, +1, +2

wheel 0



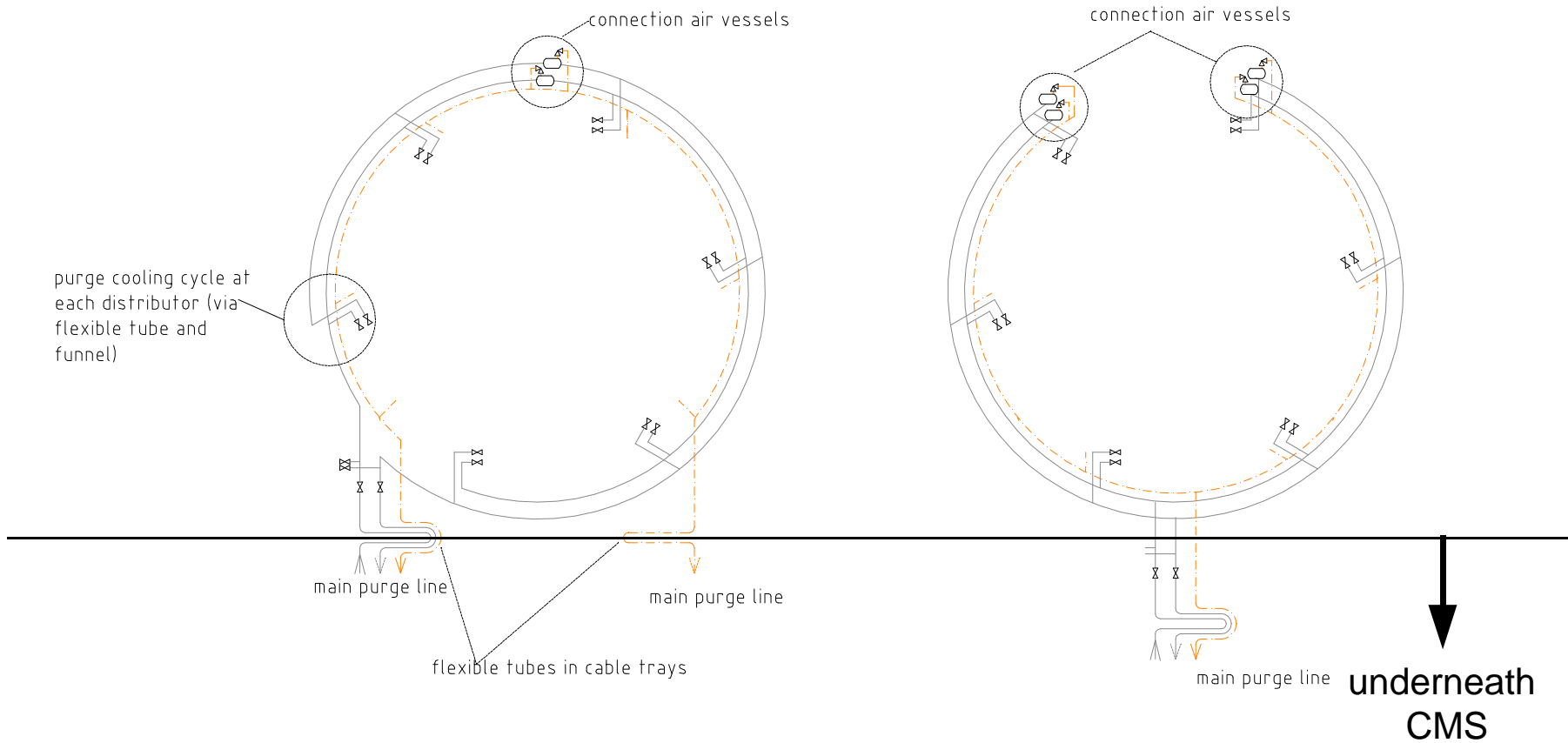
Cooling system underneath CMS



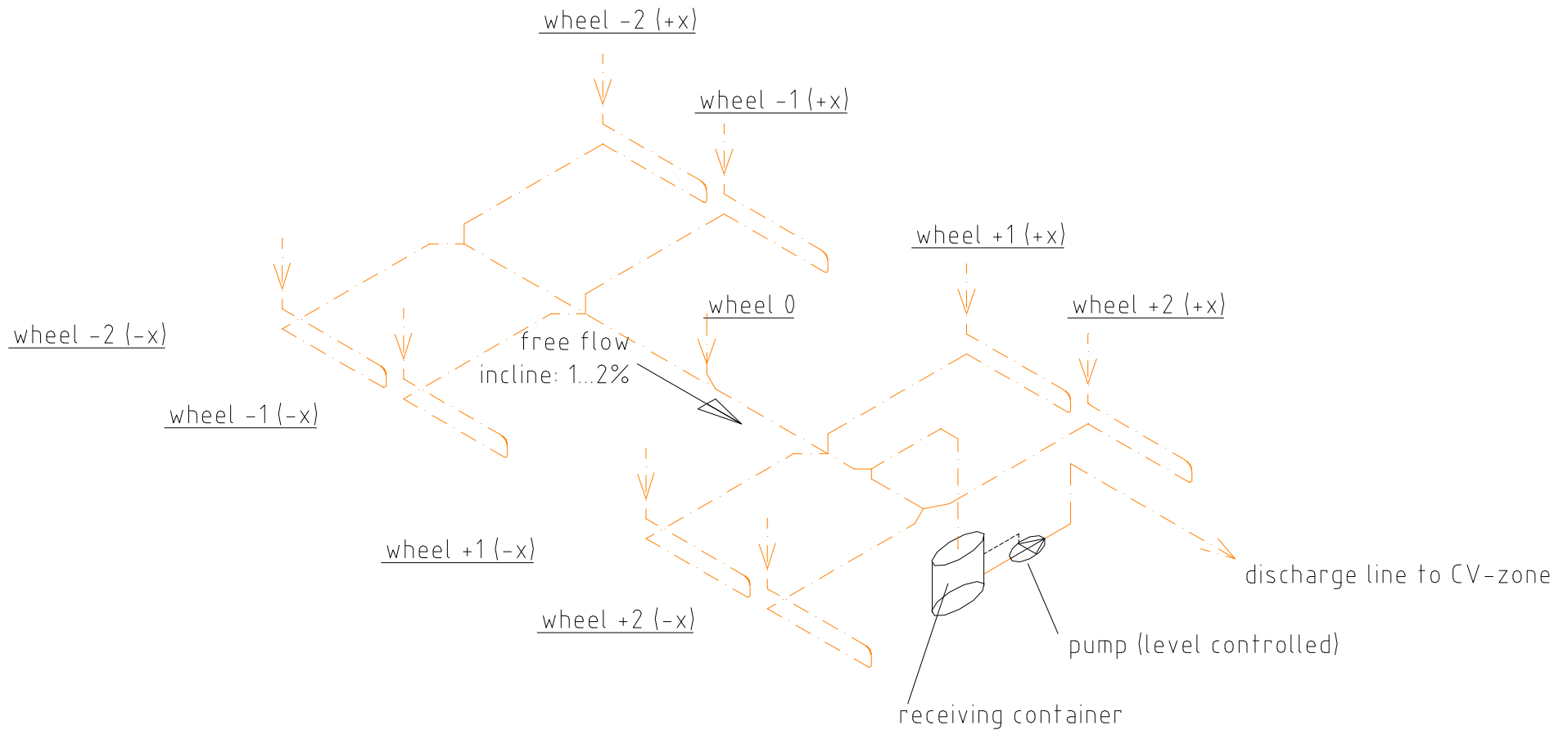
Circular manifolds of purging system

wheel -2, -1, +1, +2

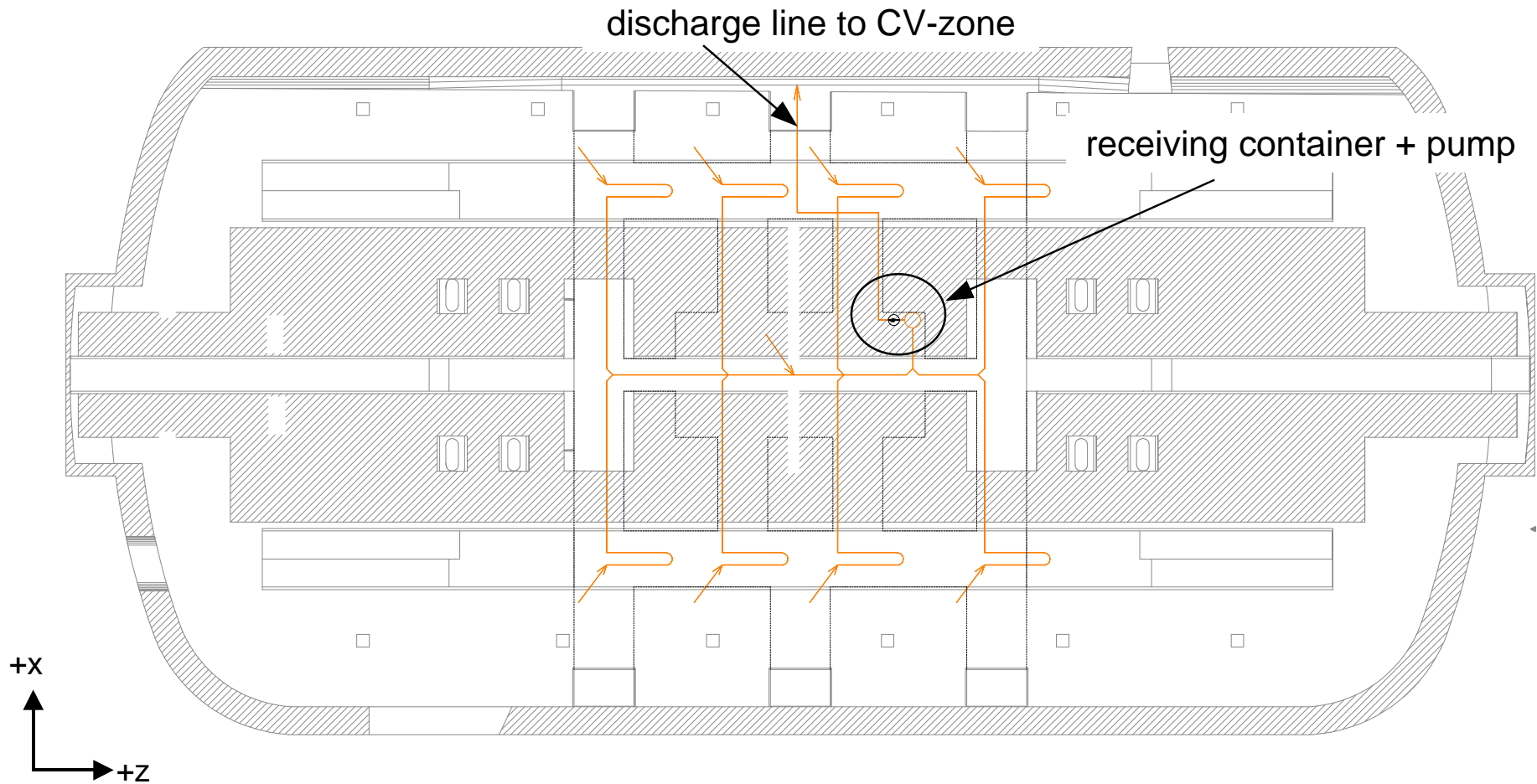
wheel 0



Purging system underneath CMS



Purging system underneath CMS

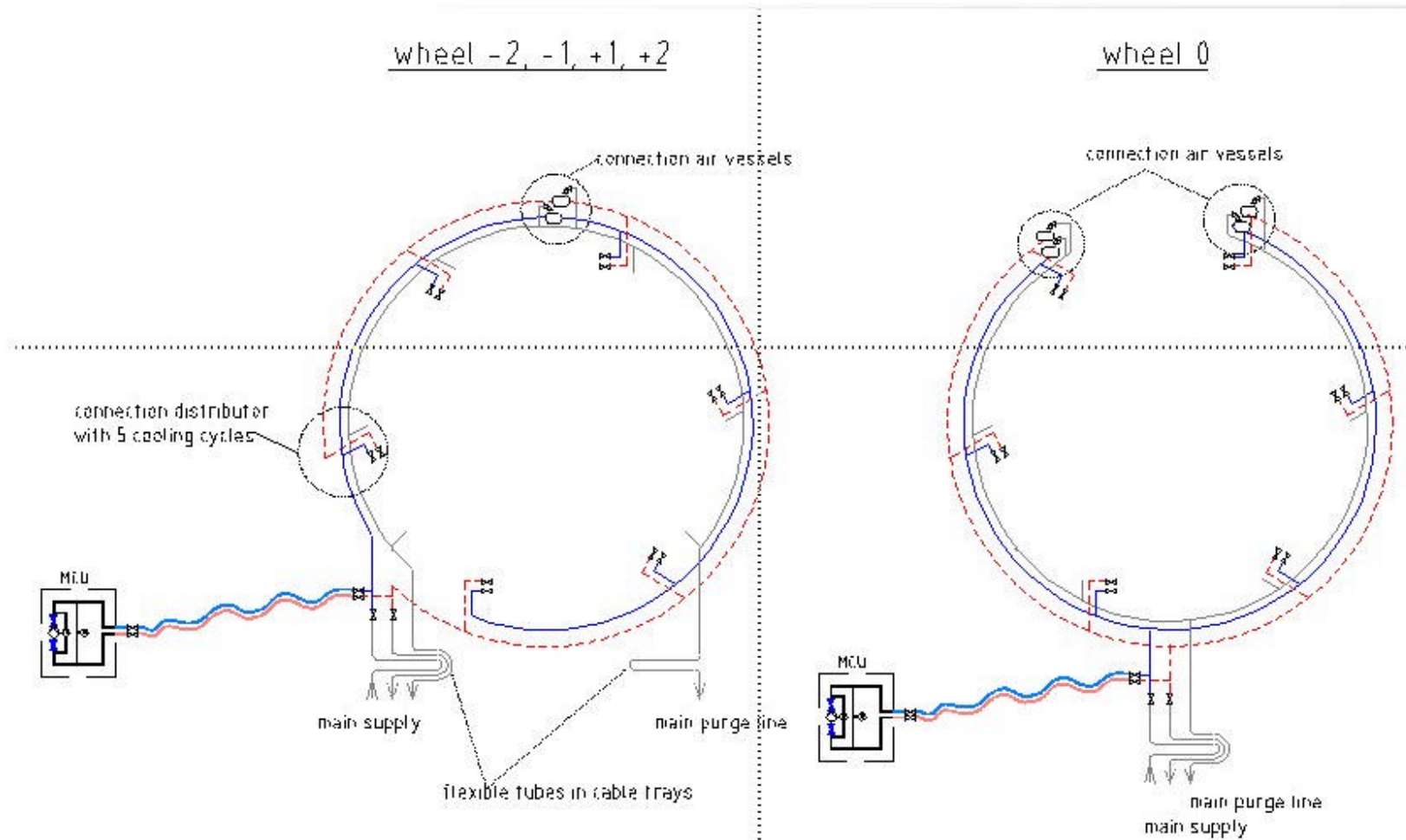


Mobile Commissioning Unit (MCU)

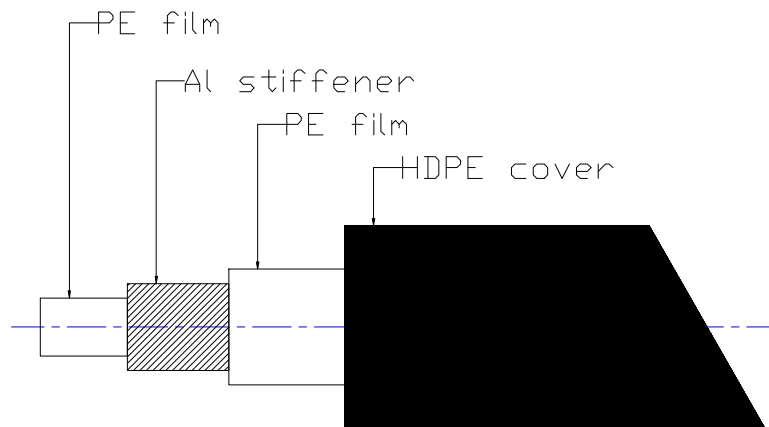


- **Example of a MCU**
 - Pressure raising system (WILO)
- **Dimensions:**
 - length 600 mm
 - width 300 mm
 - height 1000 mm
 - weight 55 kg
 - material SS (1.4301)

Commissioning situation



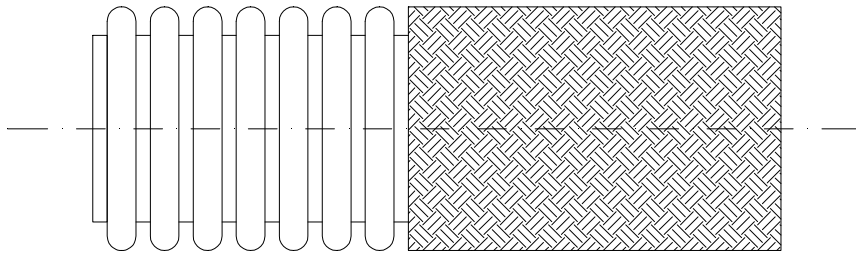
Flexible tube DEKABON



No fire resistance

- **Benefits:**
 - no halogens
 - oxygen stable
 - easily formable
 - form stable
 - high stability and resistance
- **Temperature:**
 - -25 °C...+65 °C (+80 °C)
- **Operation pressure:**
 - 24 bar (25 °C)...12 bar (65 °C)

Alternative: Corrugated pipe from SS



- **Material:**
 - High-grade-steel 1.4541
- **Benefits:**
 - easily formable
 - bending radius: 40 mm statically
150 mm dynamically
 - form stable
 - high stability and resistance
- **Temperature:**
 - -200 °C...+600 °C
- **Operation pressure:**
 - 100 bar (d = 10 mm)

Contact corrosion Al/SS

- IKS - Institute for Corrosion Protection (Institut für Korrosionsschutz) :
 - “ *...the material transition AL <-> SS in combination with demineralised water is uncritical if water system is free of oxygen and copper.*“
 - Each oxygen entry is corrosion increasing at locations of direct contact between Al<->SS (contact corrosion) → effloresces at Al material
- Problem:
 - Elimination of air entry is practically impossible
 - during procedures of commissioning, maintenance, revision, etc. (150 RPC/DT/RPC circuits !)
 - through couplings at chambers (900 couplings !)
 - Reduction of entered air by means of inhibitors not possible due to increase of salt content (increase of electrical conductivity).
- Critical locations:
 - All connections between chambers (Al pipe socket) < - > cooling cycle (pipes, tubes, fittings ...)

Recommendations for system handling

- **Quality of demineralised water:**
 - Oxygen content $< 0,1 \text{ mg O}_2/\text{l}$
 - Electrical conductivity $< 0,1 \text{ }\mu\text{S/cm}$
 - Free of copper ions

- **Operation:**
 - Bleeding (blowing off) of cooling circuits only with N2
 - “N2 security filling” for bled chambers/cooling circuits
 - Continuous water-chemical supervision of circulating water, refilling with regenerated water (e.g. $< 0,1 \text{ mg O}_2/\text{l}$)
 - Use of copper materials (e.g. brass or red brass fittings) has to be excluded also for temporary works (e.g. for filling, commissioning)

Malfunction scenarios

(selected examples)

Registration	Cause	Action		Location
		online	Measure	
malfunction signal	pump failure	X	automatic switching over to spare system (concerned parts of system)	CV
	heat exchanger or regulating faulty			
	conductivity >0,1µS/cm			
	oxygen content >0,1mgO2/l			
temperature change in chambers	gas entrance, mass flow in concerning cooling circuit is changing	X	self-regulation: automatic deaerator and difference pressure controller on each distributor, adjusting of cooling circuit, supervision by flowmeter	UXC55
	faulty electronic at chamber		switching-off of each cooling circuit, shut the valves at the distributor	
	faulty difference pressure controller		switching-off of each cooling circuit, shut the valves at the distributor	
	changed mass flow		adjusting of cooling circuit, supervision by flowmeter	
	polluted precision filter		opening of by-pass, cleaning	
continuous re-filling of cooling water	leackage	X	leackage locating: optically handling: partially possible	CV, USC55
		-	leackage locating: only at standstill (e.g. measuring of pressure loss for every wheel) handling: cut-off of faulty cooling circuit	UXC55