DECK 013 sector layout and interfaces

2025-08-16

SPEC-00-STR-DECKS-013-sector-layout-and-interfaces-EN-DE-v0.1.0-DRAFT

Project: Sphere Space Station – Earth ONE (Ø 127.00 m) **Evolution:** EVOL-00 • **Spin Law:** 1 g at r = 52.00 m (DECK 012) → ω = 0.43430 s^{-1} ≈ 4.147 rpm **Document Status:** DRAFT v0.1.0 • **Date:** 2025-08-16

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0. Summary / Kurzfassung (EN/DE)

EN: DECK 013 serves as a **buffer & service ring** between nuclear/thermal systems (014/015) and the habitable mid-decks. It hosts **water/poly shielding**, **heat-exchanger galleries**, **service corridors** and **decon/airlock nodes**. Low-risk technical zones (HZ-1) dominate; select HZ-2 areas in heat-exchanger galleries.

DE: DECK 013 fungiert als **Puffer- & Service-Ring** zwischen den Nuklear-/Thermik-Decks (014/015) und den mittleren Habitatzonen. Es beherbergt **Wasser/Poly-Schilde**, **Wärmetauscher-Galerien**, **Servicegänge** sowie **Dekon-/Schleusenknoten**. Überwiegend **HZ-1** (geringes Risiko), punktuell **HZ-2** in den Wärmetauscher-Galerien.

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1. Scope & Purpose / Zweck und Geltung

- **EN:** Sector-level layout, interfaces, safety zoning, and OPS constraints for DECK 013.
- **DE:** Sektor-Layout, Schnittstellen, Sicherheitszonen und Betriebsgrenzen für DECK 013.

Dependencies / Abhängigkeiten: Global Geometry & Gravitation SPEC (EVOL-00), DECK 014/015 specs, station-wide safety & ICD conventions.

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2. Geometry & Environment / Geometrie & Umgebung

- **Radial band / Radialband: 52.50–56.00 m** (Δr = 3.50 m)
- **g-levels (ceiling→mid→floor): 1.010 g → 1.043 g → 1.077 g**
- **Deck height / Deckhöhe:** structural thickness per band; habitable clearance per compartment.
- **Windows / Fenster:** none / keine (technischer Pufferbereich)

3. Sectorization & Access / Sektorierung & Zugänge

- **Sectors / Sektoren (12 × 30°):** A…L (A: 0–30°, …, L: 330–360°)
- **Radial bulkheads / Radiale Schotts:** at all sector borders A|B,…,L|A; **PT-A** doors (primary), **PT-B** (service)
- **Shafts / Schächte: HL-0/90/180/270** (heavy-lift), **PAX** at ±22.5°, 67.5° …, **UTIL** dual service trunks (inner/outer)
- **Relief / Entlastung: VENT** to space via radial lines; **no BOP** foreseen for 013 (low-energy fluids)

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4. Sector Allocation (Functional) / Sektor-Belegung (Funktional)

Sector	HZ	EN – Primary Function	DE – Primärfunktion	Notes / Hinweise
A	1	Water/Poly shield (N arc)	Wasser/Poly-Schild (Nordbogen)	Tie-in to 014/015; level/sampling
B	1	Water/Poly shield (NNE)	Wasser/Poly-Schild (NNO)	Segment isolation valves
C	1	Water/Poly shield (NE)	Wasser/Poly-Schild (NO)	Leak sumps, monitors
D	1	Water/Poly shield (ENE)	Wasser/Poly-Schild (ONO)	**HL-90** nearby
E	2	HX gallery (N/E headers)	HX-Galerie (Nord/Ost)	THM tie-ins to hull headers
F	2	HX gallery (E)	HX-Galerie (Ost)	Acoustic damping, access control
G	1	Water/Poly shield (S arc)	Wasser/Poly-Schild (Südbogen)	**HL-180** nearby
H	1	Water/Poly shield (SSW)	Wasser/Poly-Schild (SSW)	Segment isolation valves
I	2	HX gallery (S/W headers)	HX-Galerie (Süd/West)	THM tie-ins to hull headers
J	2	HX gallery (W)	HX-Galerie (West)	Access from **HL-270**
K	1	Service & decon node	Service & Dekon-Knoten	**AL-C** airlocks, workshop
L	1	Service, metrology & sampling	Service, Messtechnik & Probenahme	Maint-LAN, stores

HZ classes: 1 = normal technical, **2 = elevated energy/thermal**.

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5. Interfaces / Schnittstellen

5.1 MECH (Structure & Mounts)

- Ring girder raster: **M18** on 013; saddle supports for ring tanks; inspection walkways; spill containment at low points.
- **DE:** Ringträger-Raster **M18**; Auflager für Ringtanks; Inspektionsstege; Auffangwannen an Tiefpunkten.

5.2 PWR (Electrical)

- **DC-HV backbone** continuation (DC-B1/B2 split); MCC panels near HX galleries (**E/F/I/J**).
- **UPS ≥ 30 min** for valve/VENT actuation & monitoring.
- **DE:** DC-Rückgrat fortgeführt; MCC in **E/F/I/J**; **USV ≥ 30 min** für Ventile/VENT/Monitoring.

5.3 THM (Thermal)

- HX strings in **E/F/I/J** feed **hull HX headers** (N/E/S/W) with shortest radial routing.
- Shield-water circuits in **A–D** and **G–H** can **absorb transient heat** and provide **biological shielding**.
- **DE:** HX-Stränge **E/F/I/J** zu Hüllen-Headern; Schild-Wasserringe **A–D**, **G–H** als Wärmepuffer & biologischer Schild.

5.4 COM (Communications)

- Dual **Red/Blue fiber rings**; **Maint-LAN** drops in **K/L**; SAFE-bus pass-through for monitoring.
- **DE:** Doppelte Glasfaserringe; **Maint-LAN** in **K/L**; SAFE-Bus-Durchleitung.

5.5 GAS (Process & Inert)

- Inert **N_2/Ar** feed (from 015-H) to 013 sector manifolds; monitored sector valves.
- **DE:** Inertgas **N_2/Ar** aus 015-H; sektorseitige Verteilbalken mit Überwachung.

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6. Safety, Schotts & Relief / Sicherheit, Schotts & Entlastung

- **PT-A** main doors at sector boundaries (motor/manual, interlocked); **PT-B** for service corridors (fail-safe closed).
- **AL-C** airlocks at **K** (decon node) and selected gallery entries.
- **VENT**: radial ducts from HX galleries to space; shield-water areas vent to dedicated scrubbers (no BOP planned on 013).

- **DE:** PT-A/-B wie oben; **AL-C** in **K** und ausgewählten Galerien; **VENT** radial; Schild-wasser → Scrubber; **kein BOP** auf 013 vorgesehen.

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7. Operations & Human Factors / Betrieb & HF

- **Exposure:** Category **C/D** (≤ 8 h / ≤ 4 h) depending on task; HX galleries treated as **HZ-2** with stricter access control.
- **Wayfinding:** sector color codes; service/decon signage; low-noise policy in shield zones.
- **DE:** Verweilen **C/D** je nach Aufgabe; HX-Galerien als **HZ-2** mit Zugangskontrolle; klare Wegführung & Lärmleitwerte.

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8. Verification & Acceptance / Verifikation & Abnahme

- **Shield-water** integrity (proof/leak), overflow tests, level alarms.
- **HX capacity** checks (flow/ΔT), redundancy (N+1 pumps upstream on 015 D/J).
- **VENT** functional tests; **AL-C** pressure equalization & sensor redundancy checks.
- **DE:** Dichtheit & Alarmierung Schild-wasser; HX-Kapazität/Redundanz; VENT-Funktion; AL-C-Prüfungen.

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9. ICD & Naming / Bezeichner

- **Shafts / Schächte:** `HL-0|90|180|270`, `PAX-22.5|…|337.5`
- **Relief / Entlastung:** `VENT-013-<Sector>`
- **Shield tanks / Schilde:** `SHLD-013-<Sector>-<Nr>`
- **HX strings / HX-Stränge:** `HX-013-<Sector>-<StringID>`
- **Airlocks / Schleusen:** `ALC-013-<Node>`

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10. Change Log / Änderungshistorie

- v0.1.0 (2025-08-16): Initial EVOL-00 buffer/service layout, interfaces, safety & OPS limits.