

RESEARCH VESSEL SONNE



Handbook for Scientists



0. Overview of Changes

Chapter	Editor	Date
7.4; 8.3.10; 10.7	Leppin	16.11.2015
Coverpage and all Chapters	Bergmann	01.11.2016
4.3 Antenna arrangement	J. Fokken Meyer Werft	20.10.2017
3.1 Involved parties	J. Fokken Meyer Werft	20.10.2017
Coverpage and all Chapters	Bergmann	02.03.2018
8.3.21 CleanSeaWaterlab	Bergmann	26.11.2018
13.9 Thermosalinograph	Bergmann	26.11.2018
3.1, 3.2, 10.2 bis 10.4	Bergmann	26.01.2021
3.3 Radius of action and endurance	Bergmann	25.01.2022
3.8 Seismic Compressors, overview "power" added	Bergmann	25.01.2022
7.7.7. UCTD deleted	Bergmann	25.01.2022
13.1 OFOS and 13.10 UCTD added	Bergmann	25.01.2022
3.3 Radius of action adjusted based on op. experience	Bergmann	06.12.2022
7.2 Single Core Winch II usable length adjusted	Bergmann	06.12.2022
10.3 EM122 – additional info	Bergmann	04.01.2023
10.5 EK60 – Calibration by users	Bergmann	04.01.2023
10.7 IXBLUE (IXSEA) Posidonia - Calibration	Bergmann	04.01.2023
13.17 Milli-Q-Device – 2. Installation	Bergmann	04.01.2023
13.19 Deepest Freezer (-80°C) – Replacement device	Bergmann	04.01.2023
3.8. Seismic compressors – correction to m³/min	Narawitz	08.09.2023
3.1 Involved parties	WTD Sonne/Bergmann	23.06.2025
8.3.15 Scientific Electronics Laboratory	WTD Sonne/Bergmann	23.06.2025
10.2 Atlas PARASOUND DS P-70	WTD Sonne/Bergmann	23.06.2025
10.7 USBL Sonardyne RANGER 2 ACOUSTIC POSITIONING SYSTEM	WTD Sonne/Bergmann	23.06.2025
10.8 On-board releaser	Bergmann	23.06.2025
10.10 Hydrophones	Bergmann	23.06.2025
11.11 PC workstations	WTD Sonne/Bergmann	23.06.2025
12.4 Radio direction finder	WTD Sonne/Bergmann	23.06.2025
13.1 Ocean Floor Observation System (OFOS)	WTD Sonne/Bergmann	23.06.2025
13.12 Sound profile probe	WTD Sonne/Bergmann	23.06.2025
14.2.3 Internet	WTD Sonne/Bergmann	23.06.2025
3.1 Involved Parties	Bergmann	30.06.2026
3.2 Communication to vessel	Bergmann	30.06.2026
3.12 Information Seawater supply	WTD Sonne/Bergmann	30.06.2026
4.1.3 Bow – View / Stern – View	WTD Sonne/Bergmann	30.06.2026
4.3 Antenna arrangement (Index)	WTD Sonne/Bergmann	30.06.2026
4.4 Antenna Configuration (Views)	WTD Sonne/Bergmann	30.06.2026
4.4.2 Front view of the Main Mast	WTD Sonne/Bergmann	30.06.2026
4.4.3 Side view of the Main Mast	WTD Sonne/Bergmann	30.06.2026
4.4.4 Top view of the Main Mast	WTD Sonne/Bergmann	30.06.2026
8.3.16 Data center	WTD Sonne/Bergmann	30.06.2026
9.1 Storage space science	WTD Sonne/Bergmann	30.06.2026
10.7. USBL Sonardyne RANGER 2 ACOUSTIC POSITIONING SYSTEM	WTD Sonne/Bergmann	30.06.2026
10.7.3 Sonardyne Subsea Equipment (Transponder)	WTD Sonne/Bergmann	30.06.2026
10.7.4 The dimensions of the WMT6 transponders	WTD Sonne/Bergmann	30.06.2026
10.8 On-board Releaser	WTD Sonne/Bergmann	30.06.2026



Overview of Changes

3

10.11 Hydrophone	WTD Sonne/Bergmann	30.06.2026
11.4.2 Schematic representation of the navigation data online distribution	WTD Sonne/Bergmann	30.06.2026
12.2 Navigation sensors	WTD Sonne/Bergmann	30.06.2026
13.19 Deepest Freezer	WTD Sonne/Bergmann	30.06.2026
13.20 Flake ice machine	WTD Sonne/Bergmann	30.06.2026
13.26. Mobile cabin for rock saw	WTD Sonne/Bergmann	30.06.2026
new 13.26 Mobile Kabine für Gesteinssäge	WTD Sonne/Bergmann	30.06.2026
new 14. Meteorology	WTD Sonne/Bergmann	30.06.2026
new 14.1 Global Radiation Sensors	WTD Sonne/Bergmann	30.06.2026
neu 14.1.1 Pyranometer	WTD Sonne/Bergmann	30.06.2026
new 14.1.2 Pyrgeometer	WTD Sonne/Bergmann	30.06.2026
new 14.1.3 Quantum Scalar Irradiance PAR Sensor	WTD Sonne/Bergmann	30.06.2026
15.1 Alarms and emergency calls	WTD Sonne/Bergmann	30.06.2026

Changes from the previous version are marked in yellow in the manual!



1. Table of Contents

0.	Overview of Changes	2
1.	Table of Contents	4
2.	Research Vessel SONNE	10
2.1.	Informations regarding the "first" RV SONNE (DFCG)	10
2.2.	Informations regarding the newbuilding RV SONNE (DBBE)	10
3.	General information	11
3.1.	Involved Parties	11
3.2.	Communication to vessel	12
3.3.	General Data of Vessel	13
3.4.	Details of the safety devices	14
3.5.	Information Engine and drive system	15
3.6.	Information maneuvering aids	15
3.7.	Information Electrical power	15
3.8.	Information Seismic compressors (high pressure air compressors)	16
3.9.	Information Working air compressor	17
3.10.	Information Fresh water supply	17
3.11.	Information Soft water supply (laboratory freshwater / distillate)	17
3.12.	Information Seawater supply	18
3.13.	Information Clean-Ship	18
3.14.	Ship crew complement	19
3.15.	Scientific crew complement	20
3.16.	Details Scientists Cabins	20
3.16.1.	Cabins plan	21
3.16.2.	Cabins Deck 02 (Tween deck)	22
3.16.3.	Cabins plan Deck 03 (Main deck)	23
3.16.4.	Cabins plan Deck 06 (3. Structure deck)	24
3.16.5.	Cabins plan Deck 07 (4. Structure deck)	24
4.	Ship plans	25
4.1.	General arrangement	25
4.1.1.	Starboard – View	25
4.1.2.	Port – View	25
4.1.3.	Bow – View / Stern – View	26
4.1.4.	Tank bottom / Tank division	27
4.1.5.	Deck 01 – Tank deck	28
4.1.6.	Deck 02 – Tween deck	29
4.1.7.	Deck 03 – Main deck	30
4.1.8.	Deck 04 – 1. Structure deck	31
4.1.9.	Deck 05 – 2. Structure deck	32
4.1.10.	Deck 06 – 3. Structure deck	33
4.1.11.	Deck 07 – 4. Structure deck	34
4.1.12.	Deck 08 – Bridge deck; Deck 09 – Observation deck; Deck 10 – Elevated observation deck	35
4.1.13.	Cut-frame 34; Cut-frame 102	36
4.1.14.	Deck 03 (Main deck) – Container foundations and M24 lashing elements	37
4.2.	Measurement and signal mast forecastle	38
4.3.	Antenna arrangement (Index)	39
4.4.	Antenna Configuration (Views)	40
4.4.1.	3D-View Main Mast	40
4.4.2.	Front view of the Main Mast	41
4.4.3.	Side view of the Main Mast	42



Table of Contents

5

4.4.4.	Top view of the Main Mast	42
5.	Container	43
5.1.	Container storage areas	43
5.1.1.	Container storage areas Deck 02	43
5.1.2.	Container Deck 03 (Main deck)	44
5.1.3.	Container storage areas Deck 04 and Deck 05	45
5.1.4.	Container storage areas Deck 07 and Deck 09	46
5.2.	Lab-Container terminal boxes	47
6.	Hoisting equipment	48
6.1.	Crane 1 – 4 / Working cranes	48
6.1.1.	Specifications	48
6.1.2.	Load pictures crane 1 to 4	48
6.1.3.	Crane Arrangement	49
6.1.4.	Outreach of Cranes	49
6.1.5.	Crane 1	50
6.2.	Assistant Cranes	52
6.2.1.	Crane 5 / Assistant crane work boat	52
6.2.1.1.	Technical Data	52
6.2.1.2.	Outreach	52
6.2.1.3.	Handling work boat	53
6.2.2.	Crane 6 / Assistant crane deck 06 forecastle (provisions crane)	54
6.2.2.1.	Technical Data	54
6.2.2.2.	Outreach	54
6.2.3.	Crane 9 / Assistant crane observation deck	56
6.2.3.1.	Technical Data	56
6.2.3.2.	Outreach	56
6.2.4.	Hangar-hanging jib crane	58
6.2.4.1.	Technical Data	58
6.2.4.2.	Arrangement and Outreach	58
6.3.	Hoisting Equipment for scientific puposes	59
6.3.1.	Sliding Beam 70kN	59
6.3.1.1.	Technical Data - according to data sheets hoists REV. 4	59
6.3.1.2.	Views and Outreach	60
6.3.1.3.	Working positions	61
6.3.2.	Sliding Beams 250kN	62
6.3.2.1.	Technica Data Sliding Beams 250 kN	62
6.3.2.2.	Operating case I: Working as a crane with SWL 16t	62
6.3.2.3.	Operating Case II: Working as sliding beam	62
6.3.2.4.	Views, Outreach and Load Limits	63
6.4.	Core pipe handler	64
6.4.1.	Technical Data	64
6.4.2.	Sketch of the modified frame	64
6.4.3.	Stowage and Working Position(s)	65
6.5.	A-Frame	67
6.5.1.	Operating Case I: 30t SWL on center cross head without lateral forces	67
6.5.2.	Operating Case II: 10t SWL on center cross head	67
6.5.3.	Operating Case III SWL 10t lifted by auxiliary winches at crosshead	68
6.5.4.	Operating Case IV: Hole strip for attachment of additional blocks and shackles	69
6.5.5.	Operating Case V: Towing winches case research	69
6.5.6.	3D-View Working Positions	70
6.5.7.	Working Positions and Outreaches	70
6.5.8.	View Crosshead	72
6.5.8.1.	Detailed View Crosshead	72



Table of Contents

6

7.	Scientific winches	73
7.1.	Winchroom	73
7.2.	Scientific winches	74
7.2.1.	Single-core cable winches I	74
7.2.2.	Single-core cable winches II	74
7.2.3.	Storage winch I	74
7.2.4.	Storage winch II	74
7.2.5.	Friction winch I for 18mm rope	74
7.2.6.	Friction winch II for 18mm rope	74
7.2.7.	Serial winch	75
7.2.8.	Stroke compensation / cable run	75
7.2.9.	Tuckerwinch Sliding beam 250 kN	75
7.2.10.	Pulserwinches	75
7.2.11.	A-Frame	75
7.2.12.	A-Frame winches	75
7.3.	Cable and Wire	76
7.3.1.	Deep Sea Working wire 18 mm	76
7.3.2.	Deep Sea 18 mm Fiber-Coaxial Cable	77
7.3.3.	11mm Single-core coaxial cable	79
7.3.4.	Kevlarrope, 8mm	81
7.4.	Mechanical, electrical and fiberoptical Termination	82
7.4.1.	Mechanical Termination	82
7.4.2.	Single-core coaxial cable 11mm	84
7.4.3.	Fiber coaxial cable 18 mm	85
7.4.4.	Laboratory connection	86
7.5.	Winch measurement system	90
7.5.1.	Components	90
7.5.2.	Hardware:	90
7.5.3.	Indicators of the winch measurement system	90
7.5.4.	Working image winch operator	91
7.5.5.	Winch image selection	91
7.5.6.	Image fault indicator	91
7.5.7.	Settings from the bridge:	91
7.5.8.	Protocols	92
7.6.	Research Assistant winch	93
7.6.1.	Cable transfer winch	93
7.6.2.	A-Frame Winches	93
7.6.3.	Load / auxiliary winch sliding beams 250kN	93
7.6.4.	Portable horizontal capstan	93
7.6.5.	Portable storage winch	94
7.6.6.	Airgun-Winches	95
8.	Scientific work spaces	96
8.1.	Overview	96
8.2.	Laboratory Equipment	97
8.2.1.	C-Rails	97
8.2.2.	Grid Plug System	97
8.2.3.	Seating	97
8.2.4.	Drawing Legend	97
8.3.	Overview Laboratories	98
8.3.1.	Laboratories deck 03 (main deck)	98
8.3.2.	Laboratories deck 02 (tween deck)	99
8.3.3.	Measurement and observation room	100
8.3.4.	Meeting room	101



Table of Contents

7

8.3.5.	Dry lab 4	102
8.3.6.	Dry lab 3	106
8.3.7.	Dry lab 2	110
8.3.8.	Climate lab 2	114
8.3.9.	Climate lab 1	118
8.3.10.	Dry lab 1	122
8.3.11.	Wet lab 2	126
8.3.12.	Pulser station	130
8.3.13.	Hydroacoustic central	134
8.3.14.	Wet lab 1	138
8.3.15.	Scientific Electronic Lab	142
8.3.16.	Data center	143
8.3.17.	Hangar	147
8.3.18.	Freezing / cold storage +2°C	151
8.3.19.	Salinometer room	155
8.3.20.	Gravimeter room	159
8.3.21.	Clean SeaWater Lab (data collection and supply)	163
8.3.22.	Clean SeaWaterLab (Sensors)	165
8.3.23.	Sound Velocity Sensor	165
8.3.24.	Fluorometer	165
8.3.25.	Clean SeaWaterLab (View)	167
8.3.26.	Isotopencontainer	170
9.	Other Rooms	172
9.1.	Storage space science	172
9.2.	Frozen storage -20°C	174
9.3.	Laboratory gas storage	178
9.4.	Chemistry Store	179
10.	Hydroacoustic Systems	180
10.1.	Overview	180
10.2.	Atlas PARASOUND DS P-70	181
10.3.	EM 122 multibeam echo sounder - Kongsberg Maritime	182
10.4.	EM 710 multibeam echo sounder - Kongsberg Maritime	183
10.5.	EK60 - Echo sounder for fisheries research - Kongsberg Maritime	184
10.6.	RD Instruments Acoustic Doppler Current Profiler / ADCP	185
10.7.	USBL Sonardyne RANGER 2 ACOUSTIC POSITIONING SYSTEM	186
10.7.1.	Gyro USBL Transceiver (Transmitter/Receiver)	186
10.7.2.	Sonardyne Surface Equipment	187
10.7.3.	Sonardyne Subsea Equipment (Transponder)	187
10.7.4.	The dimensions of the WMT6 transponders	188
10.8.	On-board Releaser	189
10.9.	Dual-axis doppler speed log SAM 4683	190
10.10.	SAM Navigational echo sounder NES 4651	191
10.11.	Hydrophone	192
11.	Data Management	194
11.1.	Networks and Servers	194
11.2.	Data acquisition and sensor systems	195
11.3.	Data processing	196
11.4.	Data distribution	197
11.4.1.	Online-data in the laboratories	197
11.4.2.	Schematic representation of the navigation data online distribution	199
11.5.	Online presentation	200
11.6.	Data export	202



Table of Contents

8

11.7.	Data backup	203
11.8.	Data archiving	203
11.9.	Scientific planning	203
11.10.	Action Log	203
11.11.	PC Workstations.....	203
12.	Navigation systems	204
12.1.	NACOS Platinum - Navigation and planning system.....	204
12.2.	Navigation sensors	206
12.3.	Dynamic positioning	207
12.4.	Radio Direction Finder.....	208
13.	Other equipment and facilities	209
13.1.	Ocean Floor Observation System (OFOS)	209
13.2.	AirGun deployment rails	212
13.3.	Arrangement of MEBO 70 and 200.....	213
13.4.	Flying cabling	215
13.5.	Hydrographic shafts.....	219
13.5.1.	Measuring basket	220
13.6.	Hydrographic pipe -- Equipment rack for small devices	222
13.7.	Extending apparatus.....	224
13.8.	Freight elevator cargo space	225
13.9.	CTD System.....	226
13.10.	Underway-CTD (Ocienscience)	227
13.11.	Thermosalinograph	229
13.12.	Sound profile probe	230
13.13.	Fluorometer	231
13.14.	Working boat	232
13.15.	Fast Rescue and working boat	233
13.16.	Nitrogen liquefaction plant	234
13.17.	Milli-Q-Device	235
13.17.1.	Merck Millipore Integral 10.....	235
13.17.2.	Merck Milli-Q IQ7005.....	235
13.18.	Laborwasser (Destillat).....	236
13.19.	Deepest Freezers.....	237
13.19.1.	Deepest Freezer 35 Liter	237
13.19.2.	Deepest Freezer 37 Liter	237
13.19.3.	Deepest Freezer 549 Liter	238
13.19.4.	Tiefstkühlschrank 394 Liter	238
13.20.	Flake Ice machine	239
13.21.	Laboratory Dishwashers.....	240
13.22.	Digistorien Cabinets	241
13.23.	Heat Cabinets.....	242
13.24.	Refrigerators	244
13.25.	Deep Freezers.....	245
13.26.	Mobile Cabin for Rock Saw	246
14.	Meteorology	248
14.1.	Global Radiation Sensors	248
14.1.1.	Pyranometer	248
14.1.2.	Pyrgometer	249
14.1.3.	Quantum Scalar Irradiance PAR Sensor	249
15.	Communication	250
15.1.	Alarme und Notrufe	Fehler! Textmarke nicht definiert.
15.2.	External Communications.....	251



Table of Contents

9

15.3.	Internal Communication.....	252
15.4.	TV-Monitoring.....	253
16.	Life on board	254
16.1.	Generally used rooms	254
16.1.1.	Mess room, lounge, lounge, library, smoking room.....	254
16.1.2.	Sauna and fitness room.....	255
16.1.3.	Laundry	256
16.1.4.	Luggage storage	256
16.2.	Hospital und medizinische Einrichtung	257
16.3.	Sale of goods on board	258
16.4.	Smoking on board	259



2. Research Vessel SONNE

2.1. Informations regarding the "first" RV SONNE (DFCG)

10

2. Research Vessel SONNE

2.1. Informations regarding the "first" RV SONNE (DFCG)

The SONNE was built in 1968-69 as a stern trawler on the Rickmers-Werft Bremerhaven (building no. : 350) for the "deep-sea fishing North Sea".

The RF Reederei Community Forschungsschiffahrt bought the ship in 1977 and it was a collaboration between the shipyards Schichau Unterweser and Rickmers shipyard on the research ship, mainly converted to marine resource exploration.

In 1991 a further modification to the Schichau Seebeck Werft Bremerhaven. The ship was, among others, extended to 10.8 m and received an additional superstructure deck. The machinery was renewed, brought the scientific equipment up to date.

In September 2014 the "first" RV SONNE finished all research activities and was sold to Argentina. The new name of the "first" RV SONNE now is "RV "Austral".

<http://www.defensa.com/frontend/defensa/ara-austral-incorporo-agrupacion-buques-hidrograficos-armada-vn17523-vst330>

<http://www.lacapitalmdp.com/noticias/La-Ciu->

dad/2015/11/07/290729.htm/https://es.wikipedia.org/wiki/Buque_oceanogr%C3%A1fico_AR_A_Austral

2.2. Informations regarding the newbuilding RV SONNE (DBBE)

In 2008, the Federal Ministry of Education and Research, together with the coastal states of Niedersachsen, Mecklenburg-Vorpommern and Schleswig-Holstein and the Hanseatic cities of Hamburg and Bremen agreed to build a new deep-sea research vessel.

Following a Europe-wide competitive tendering process, a merger of the Meyer Werft Papenburg and the shipping company RF Forschungsschiffahrt Bremen received the Deep Sea Research Vessel GmbH & Co. KG, the surcharge. In August 2011, the contract was signed to build and ship management of the new research vessel.

04.12.2012	First steel cut at the Meyer Werft Papenburg
12.04.2013	Keel laying
05.04.2014	Undocking
10.05.2014	Ems Conveyance to Emden
11.07.2014	Launching ceremony. at Neptun Werft Rostock-Warnemünde The ship's godmother: Bundeskanzlerin Dr. Angela Merkel

17.11.2014	Handover to the client in Wilhelmshaven Signing transfer agreement between Federal Republic of Germany, country Lower Saxony, University Oldenburg, Shipping company Briese Schifffahrt, Abteilung Forschungsschiffahrt and University Hamburg
------------	---

The Control Station "*German research Vessels*" is assigned to be responsible for the logistic execution.

Origin:

Pressemitteilungen der Meyer Werft Papenburg

Wikipedia



3. General information

3.1. Involved Parties

11

3. General information

3.1. Involved Parties

Name of ship	SONNE
Call signal	DBBE
IMO-Number	9633927
Flag	German flag (German State Service Flag)
Owner	Federal Republic of Germany represented by the Federal Ministry of Education and Research
Representative Owner Scientific Scheduling	Lower Saxony Research Center Jülich GmbH PtJ, Sector MGS Branch Office Rostock-Warnemünde PO Box 30114 18112 Rostock Phone: +49-381-5197 291 Homepage: http://www.fz-juelich.de
Logistics/Supervision	German research fleet coordination centre University of Hamburg Institute for Oceanography Bundesstraße 53 D-20146 Hamburg Tel.: +49-40-23952 3640 E-Mail: leitstelle.ldf@uni-hamburg.de Homepage: http://www.ldf.uni-hamburg.de
Shipping company	Briese Schifffahrts GmbH & Co. KG Dept. Research shipping Hafenstraße 12 D-26789 Leer Tel.: +49-491-92520-160 E-Mail: research@briese.de Homepage: http://www.briese-research.de

12



3. General information
3.3. General Data of Vessel

13

calls from the chamber via the wallmounted telephone set (or any other telephone on board) Lead country (price currently about 13 Ct / min to German landline or about 35Ct / min in the German mobile network).

To this end, the WTD awards personal PIN codes worth US \$ 10 at the beginning of each research trip. If this is used up, further PIN codes can be purchased.

There is a line for telephone calls (Voice over IP) available.

For each expedition, the first PIN code - value US \$ 10 – is for free. Additional amounts must be paid by the respective user on board at the end of the voyage in cash or by debit card / credit card.

A call from land to the individual telephone sets is **NOT** possible and **NOT** wanted (time shift, etc.).

3.3. General Data of Vessel

Shipyard	MEYER WERFT GmbH Papenburg
Year built	2012 - 2014
Construction number	S 530
Class	DNVGL
Service Area	World wide
Safety / Environment	Environmental standards for innovative ship design (Blue Angel) Redundant Propulsion 50%, Safe Return to Port “Inventory of Hazardous Materials” certified acc. „Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships“ (SR/CONF.45) „Guidelines for the Preparation of Inventory of Hazardous Materials (MEPC Res. 197(62)).
Overall length -- LOA	116,00m
Length between perpendiculars	104,86 m (acc. tonnage certificate)
Moulded breadth	20,60 m
Draught	6,40 m
Height of main deck	9,80 m
Total height	42,40 m
Tonnage, London Rules	8.554 BRZ / 2.566 NRZ
Empty ship weight	6.844,8 t

3. General information

3.4. Details of the safety devices

14

Scientific dead weight	430 t
Speed	12 kn; max. 15 kn
Radius of action (at 12 kn)	app. 11.500 nm (based on operational experience)
Endurance at sea	app. 52 days (dependent on weather conditions and speed profile)

3.4. Details of the safety devices

Lifeboats	2	80 persons each
Liferaft	8	20 persons each
Recue Star	1	for the recovery of persons from the water
High-pressure water mist fire extinguishing system	number of pumps output delivery pressure	5 6,9 m³/h 140 bar
Emergency fire pump	output head	80 m³/h 80 m
Radar transponder	SAFELINK AIS SART	
Radar transponder	Kannad Marine Rescuer 2 SART	
Satellite distress beacon	SAT- distress beacon SAFELINK Auto GPS	



3. General information

3.5. Information Engine and drive system

15

3.5. Information Engine and drive system

Engine	Diesel-electric propulsion system		
Main engines	Manufacturer:	Wärtsilä	
	Model:	9L20CR	
	Power Rating:	1.620 kW	
	Rotation:	1.000 rpm	
	Number:	4	
Total installed capacity	6480 kW		
Generators	Manufacturer:	Anhaltische Elektromotorenwerke	Des-
	sau GmbH		
	Power Rating:	1.555 kW	
	Number:	4	
Emergency power generator	Manufacturer:	Caterpillar	
	Model:	C32ACERT	
	Performance:	874 kW	
	Number:	1	
Drive	2 x 1 traction motor via shaft on a fixed propeller		
Traction motors	Manufacturer:	VEM Sachsenwerk GmbH Dresden	
	Performance:	2.350 kW	
	Number:	2	
Propeller	2 Fixed propeller each 3.25 m in diameter		

3.6. Information maneuvering aids

Manoeuvring	1 retractable thrusters at frame 156 SCHOTTEL 860 kW
	1 pump jet at frame 119 SCHOTTEL 2.990 kW
	1 retractable thrusters at frame 21 SCHOTTEL 860 kW

3.7. Information Electrical power

Three-phase network	400 V, 50 Hz, with neutral conductor
Normal network (white socket)	230 V, 50 Hz
Uninterruptible power supply (red socket)	230 V, 50 Hz, 125 kVA, cos phi 0,8 (Bridging time approx 20 min)



3. General information

3.8. Information Seismic compressors (high pressure air compressors)

16

3.8. Information Seismic compressors (high pressure air compressors)

Manufacturer Sauer & Sohn
Performance each 12 m³/min – 208 bar
Number 4

Optional compressors,
Installation in containers on deck

Manufacturer Sauer & Sohn
Performance each 12 m³/min – 208 bar
Number 2

Power Range RV "Sonne" Rev.1

m ³ /min	Power Range	Leistungsanforderung [kW]	Compressor 1			Compressor 2			Compressor 3			Compressor 4			Blower 1	Blower 2
			40Hz	50Hz	60Hz	40Hz	50Hz	60Hz	40Hz	50Hz	60Hz	40Hz	50Hz	60Hz	250mbar	250mbar
6,5	A	128	6,5													
8,0		156		8												
10,0		186			10											
13,0		256	6,5			6,5										
14,5	B	284		8		6,5										
16,0		312		8			8									
19,5		384	6,5			6,5			6,5							
21,0		412		8		6,5			6,5							
24,0	C	468		8			8			8						
26,0		512	6,5			6,5			6,5			6,5				
27,5		540	6,5			6,5			6,5				8			
29,0		568	6,5			6,5				8			8			
30,5	D	596	6,5				8			8			8			
32,0		624		8			8			8			8			
34,0		654		8			8			8				10		
36,0		684		8			8				10			10		
38,0	E	714		8				10			10			10		
40,0		744			10			10			10			10		
44,0		840			10			10			10			10	4	
44,0		840			10			10			10			10		4
48,0		936			10			10			10			10	4	4

The compressors are selected depending on the operating hours. (e.g. compressor 2-4 can also be used for a performance level of 6m³/h.)

Power Seismic-Container

m ³ /min	Power Range	Compressor Container 1x WP6442		
		40Hz	50Hz	60Hz
6,5	116kW - 128kW			
8,0	145kW - 156kW			
10,0	172kW - 186kW			



3. General information

3.9. Information Working air compressor

17

3.9. Information Working air compressor

Manufacturer Hatlapa

Working pressure 30 bar

Air flow at working pressure 85 ³/h

3.10. Information Fresh water supply

Vacuum evaporator 1 15 m³/d

Vacuum evaporator 2 15 m³/d

Reverse Osmosis System 15 m³/d

Tank capacity TK 07 134,4 m³
TK 57 62,3 m³

Operating pressure 6 bar

3.11. Information Soft water supply (laboratory freshwater / distillate)

The laboratories are supplied via a pressure tank system (600 l / 6 bar) from the distillate tanks.

The distillate production takes place via 2 vacuum evaporators (15m³ / d), these are part of the fresh water production.

In wet laboratory 1, a high-purity water plant of the type Milli-Q® Integral 10 is available.

See also Milli-Q system

3. General information

3.12. Information Seawater supply

18

3.12. Information Seawater supply

	Sinus pump	Centrifugal pump
Number	1	2
Performance	4 m ³ /h	3 m ³ /h 1,2 m ³ /h
Operating pressure	4 bar	4 bar
Suction depth and intake location optionally:		
Portside		2100mm above baseline (BL)
Midships		3900 above BL
Starboardside		3900 above BL
Extending device frame 148		BL

3.13. Information Clean-Ship

The "Clean Ship" operation is guaranteed for 48 hours.



3. General information

3.14. Ship crew complement

19

3.14. Ship crew complement

Function	Number
Captain (Master)	1
Senior Deck Officer (Chief-mate)	1
Deck Officer	2
Senior Engineer (Chief)	1
Engineer	2
Electrician	2
Electronics technician	2
System-Operator	1
Surgeon	1
1st Cook	1
Assistant cook	1
Steward (mess)	4
Boatswain	1
Ship mechanic (Deck)	7
Ship mechanic (Engine)	3
Deck fitter	1
Crew total	31



3. General information

3.15. Scientific crew complement

20

3.15. Scientific crew complement

Chief Scientist	1	single cabin 3. Structure deck (deck 06)
Senior-Scientist	1	single cabin 3. Structure deck (deck 06)
2 single cabins	2	3. Structure deck (deck 06)
2 double cabins	4	4. Structure deck (deck 07)
12 single cabins	12	Main deck (deck 03)
12 single cabins	12	Tween deck (deck 02)
4 double cabins	8	Tween deck (deck 02)
scientists total	40	

3.16. Details Scientists Cabins

The cabins are outside cabins with windows.

The device consists of bed, lockable wardrobe, a small table or desk with chair. Some cabins are equipped with an additional couch.

The upper bunk at the double cabin is designed as Pullmann berth.

Each cabin has a sanitary unit with washbasin, shower and toilet.

The cabins have LAN (2xRJ45), telephone, radio and TV.

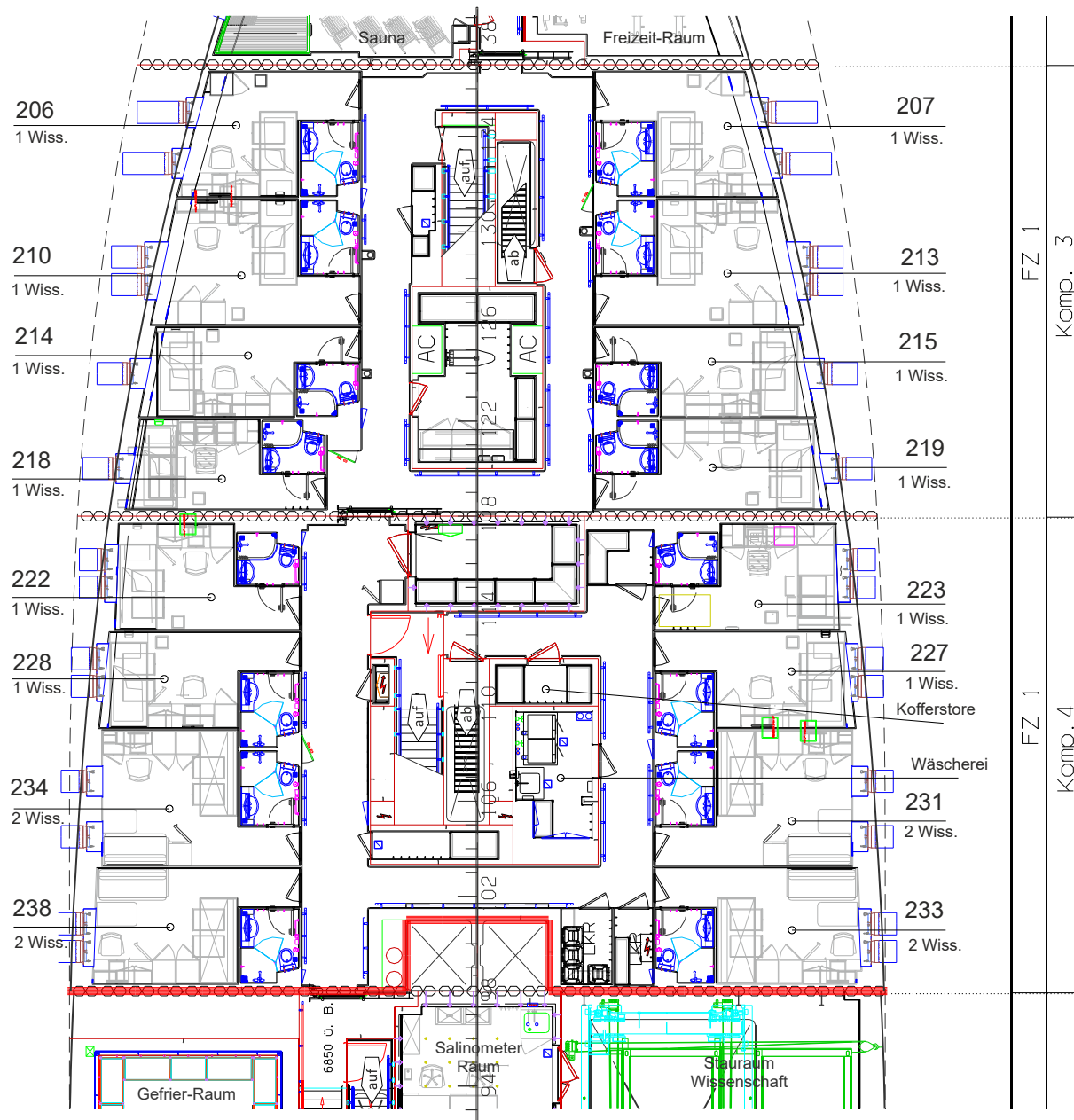


3.16.1. Cabins plan

Cabine-No.	Phone-No.	Occupancy
642	610+611	Chief-Scientist
648	612	Senior-Scientist
646	613	1 Scientist
640	614	1 Scientist
704	615	2 Scientist
710	616	2 Scientist
307	624	1 Scientist
308	623	1 Scientist
310	622	1 Scientist
311	625	1 Scientist
314	621	1 Scientist
315	626	1 Scientist
318	620	1 Scientist
319	627	1 Scientist
322	619	1 Scientist
323	628	1 Scientist
324	618	1 Scientist
326	617	1 Scientist
206	636	1 Scientist
207	637	1 Scientist
210	635	1 Scientist
213	638	1 Scientist
214	634	1 Scientist
215	639	1 Scientist
218	633	1 Scientist
219	640	1 Scientist
222	632	1 Scientist
223	641	1 Scientist
227	642	1 Scientist
228	631	1 Scientist
231	643	2 Scientist
233	644	2 Scientist
234	630	2 Scientist
238	629	2 Scientist

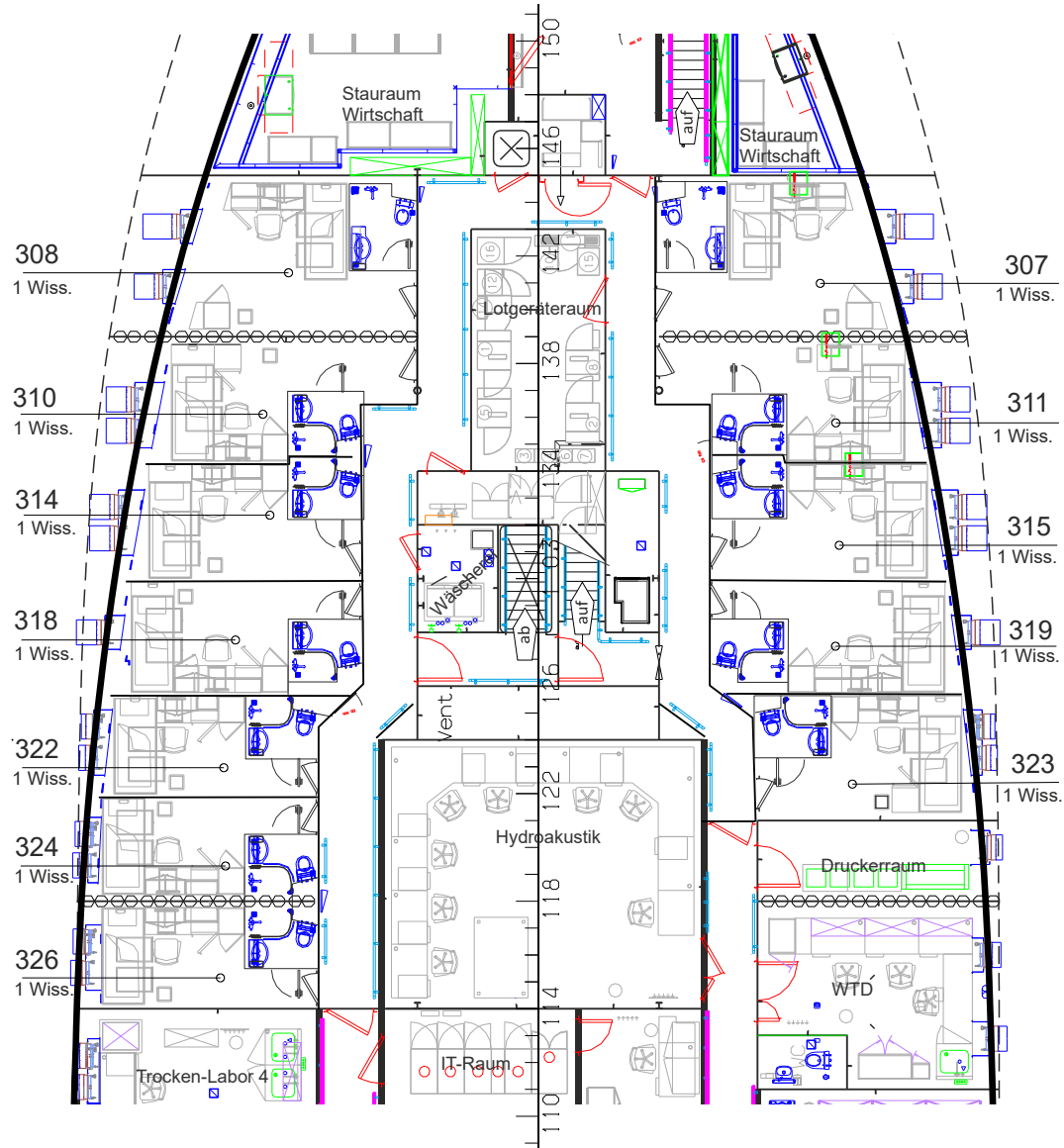


3.16.2. Cabins Deck 02 (Tween deck)



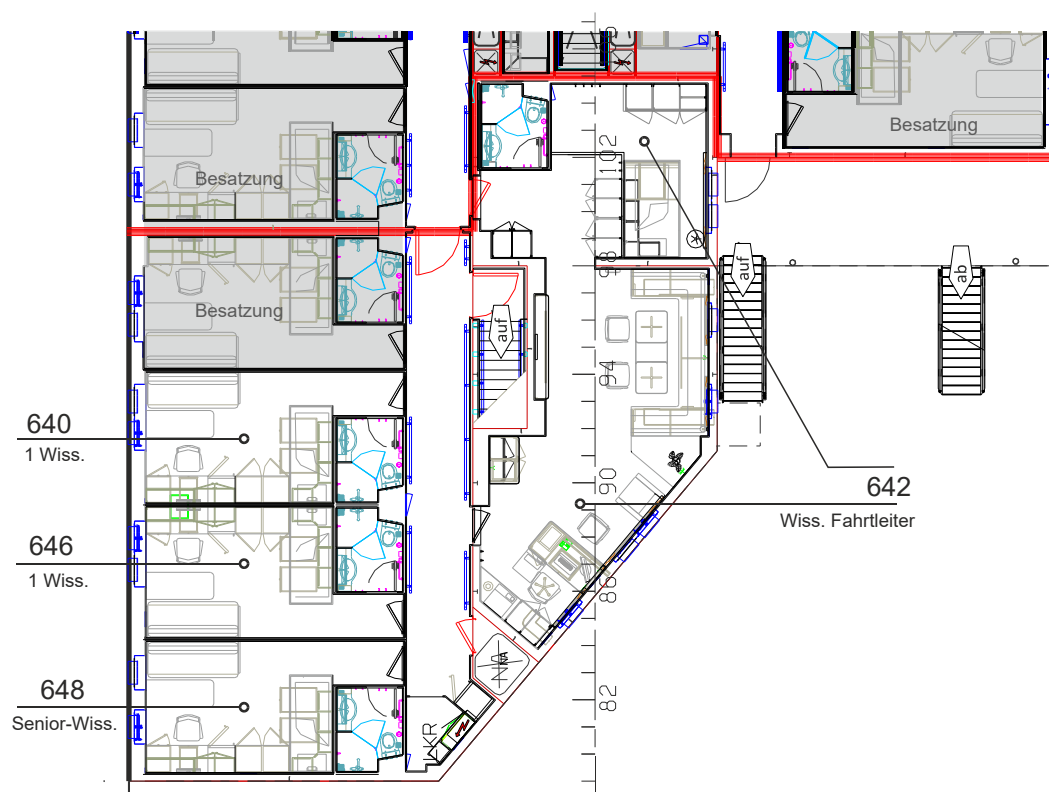


3.16.3. Cabins plan Deck 03 (Main deck)

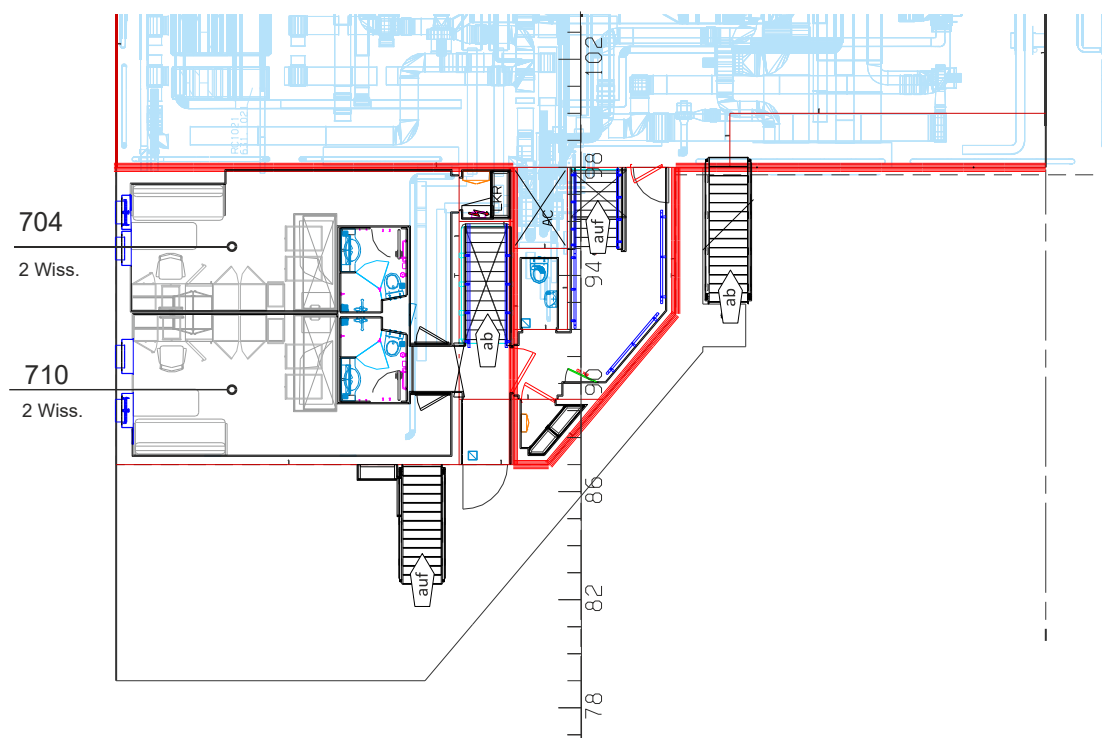




3.16.4. Cabins plan Deck 06 (3. Structure deck)



3.16.5. Cabins plan Deck 07 (4. Structure deck)





4. Ship plans
 4.1. General arrangement

25

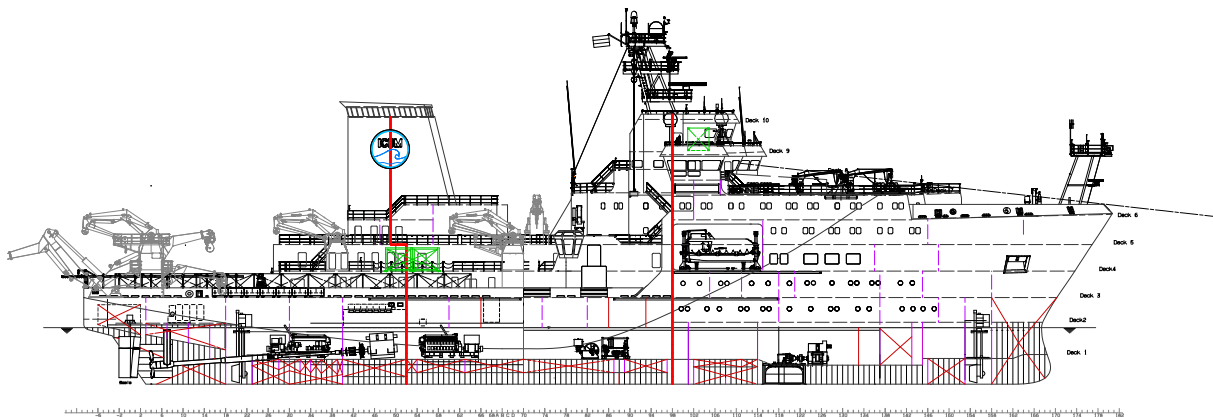
4. Ship plans

For orientation in the ship different door colors are assigned to the decks:

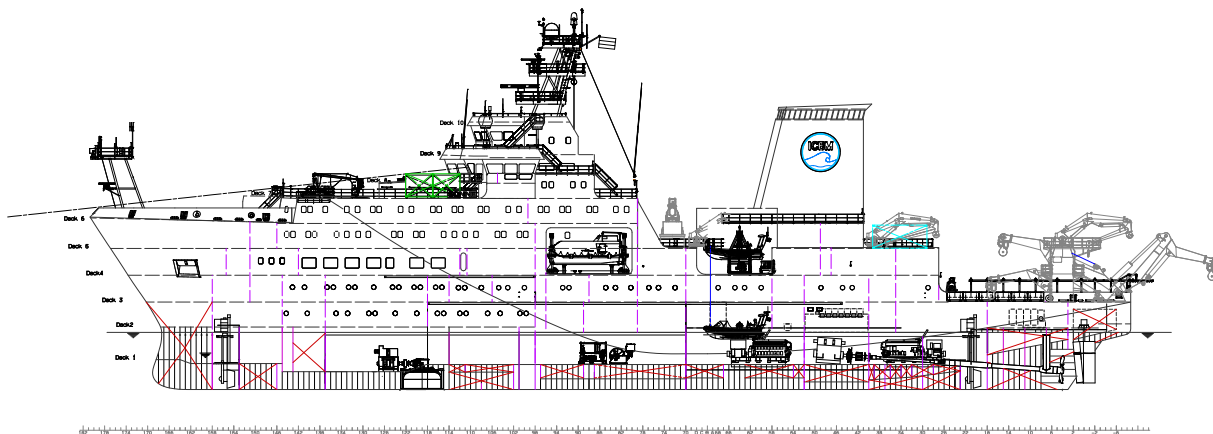
Deck 02 – Tween deck	Dark Green
Deck 03 – Main deck	Blue
Deck 04 – 1. Structure deck	Red
Deck 05 – 2. Structure deck	Orange
Deck 06 – 3. Structure deck	Yellow
Deck 07 – 4. Structure deck	Lime Green

4.1. General arrangement

4.1.1. Starboard – View



4.1.2. Port – View

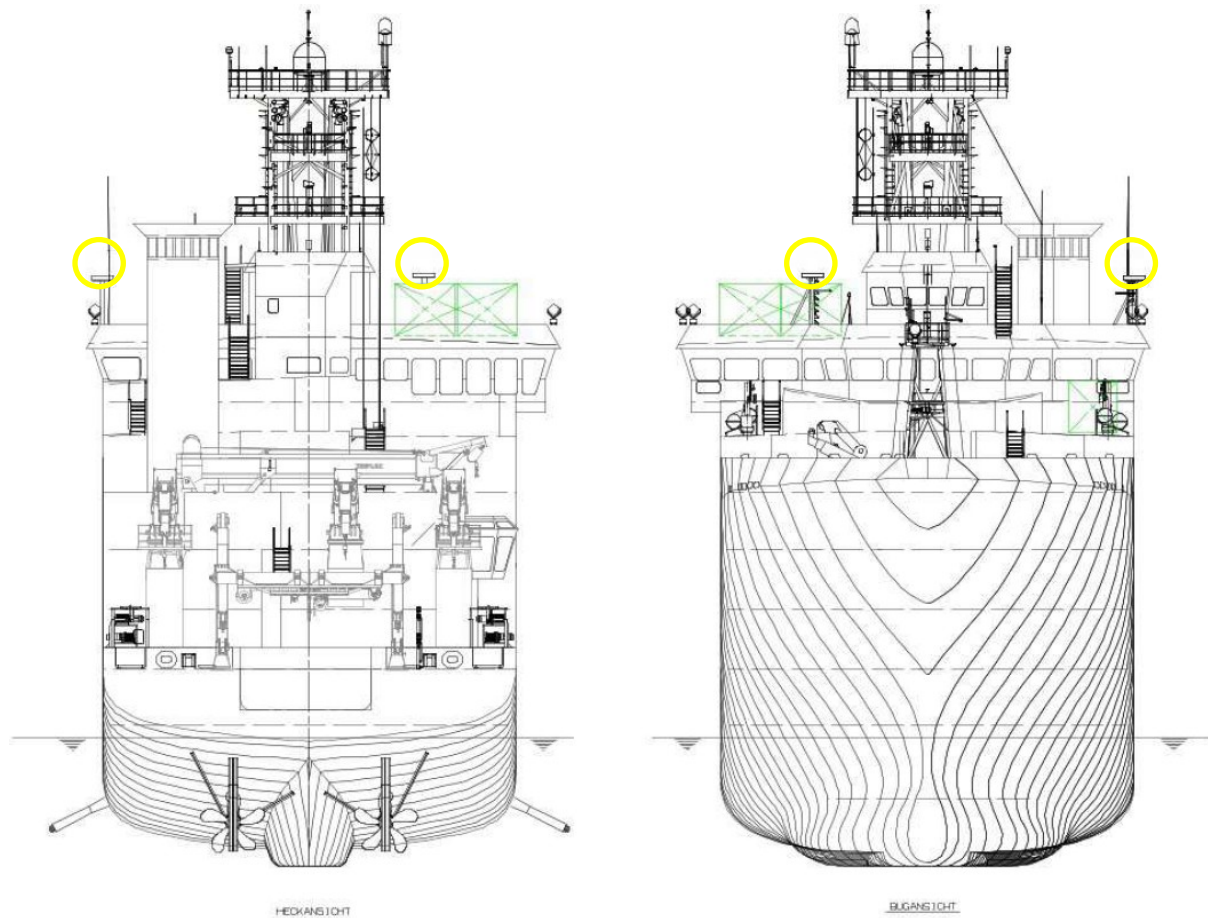




4. Ship plans
4.1. General arrangement

26

4.1.3. Bow – View / Stern – View

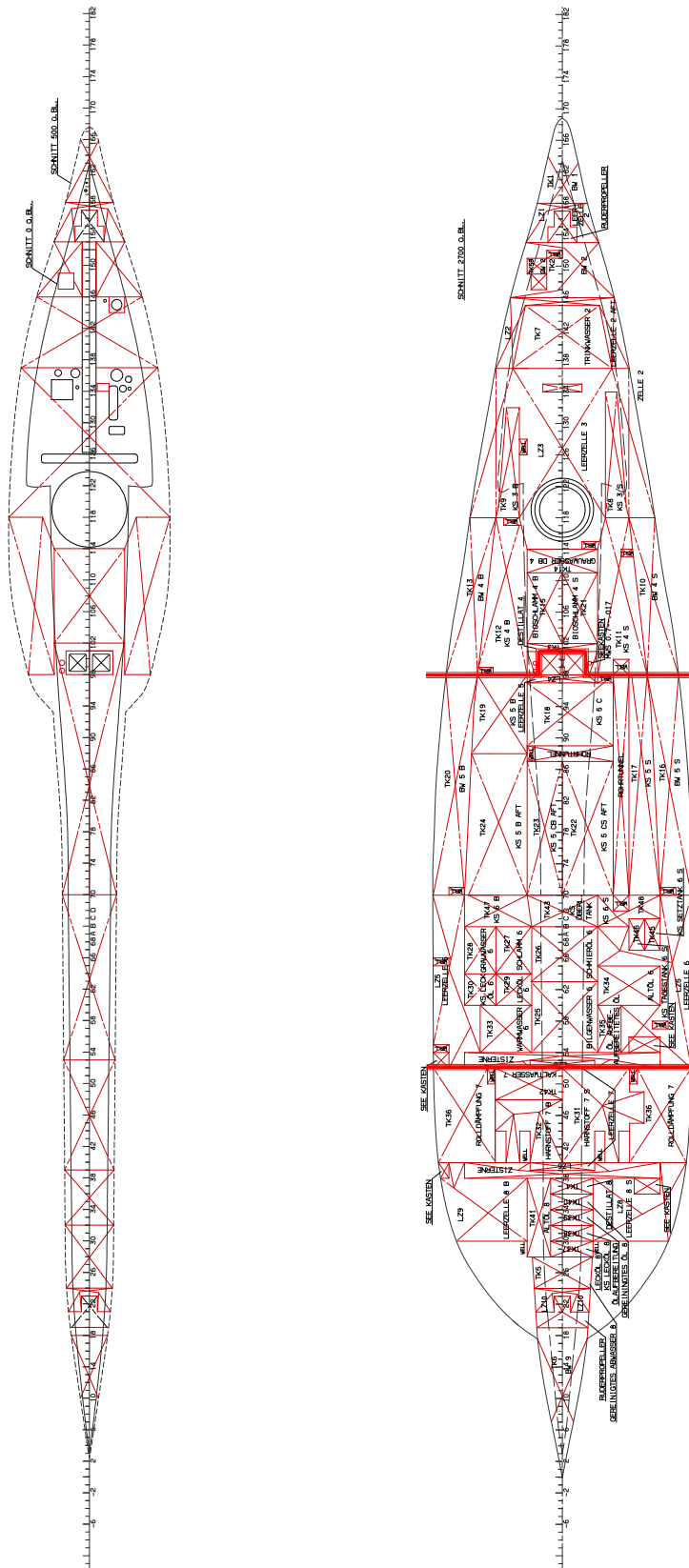




4. Ship plans 4.1. General arrangement

27

4.1.4. Tank bottom / Tank division



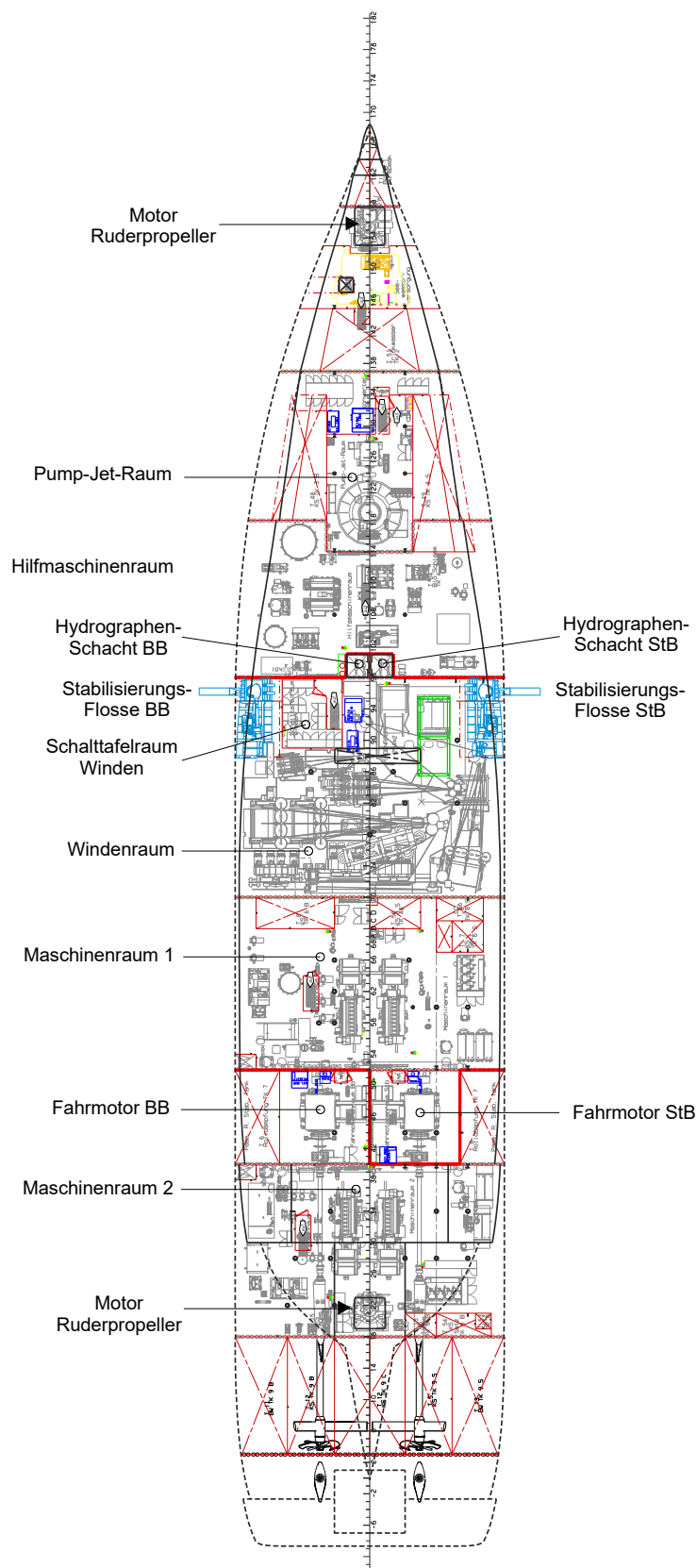


4. Ship plans

4.1. General arrangement

28

4.1.5. Deck 01 – Tank deck



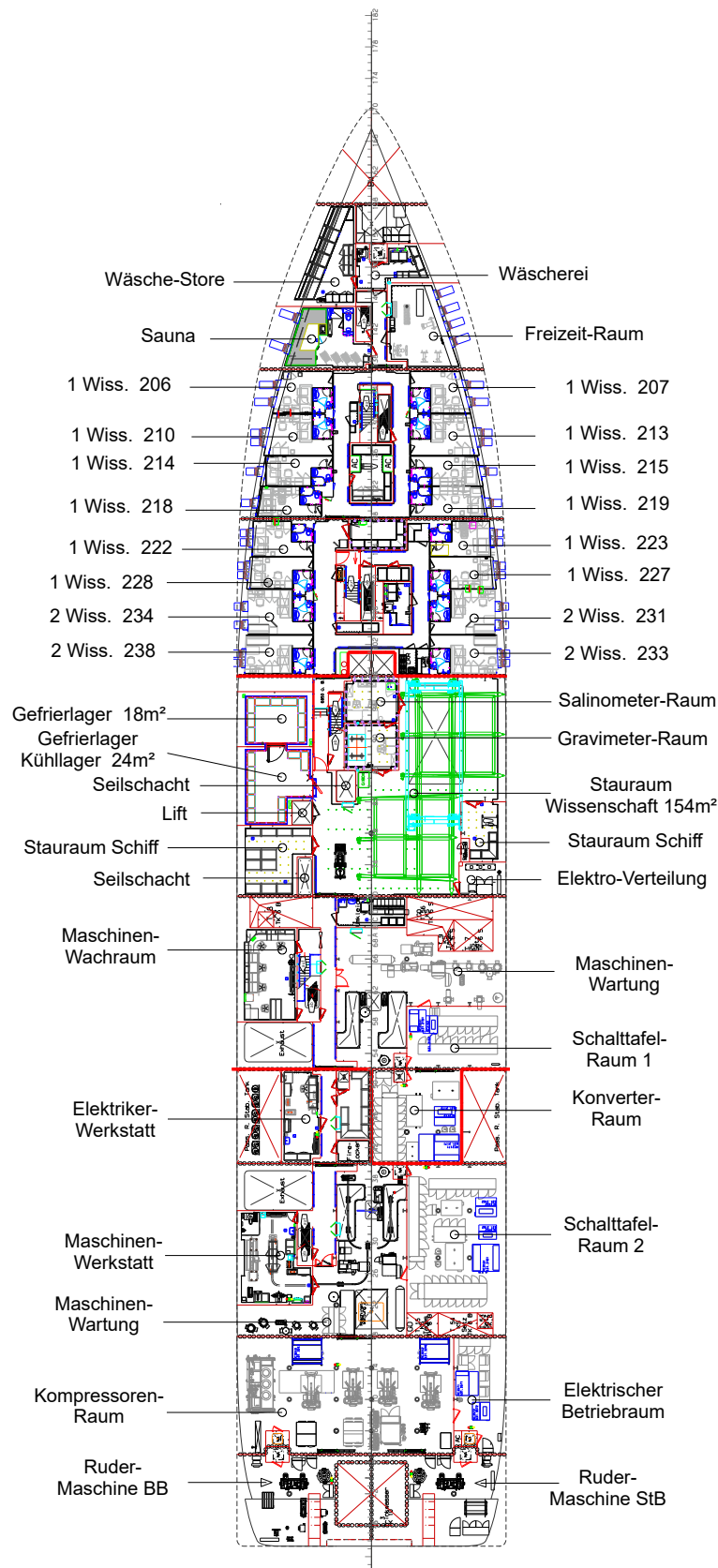


4. Ship plans

4.1. General arrangement

29

4.1.6. Deck 02 – Tween deck



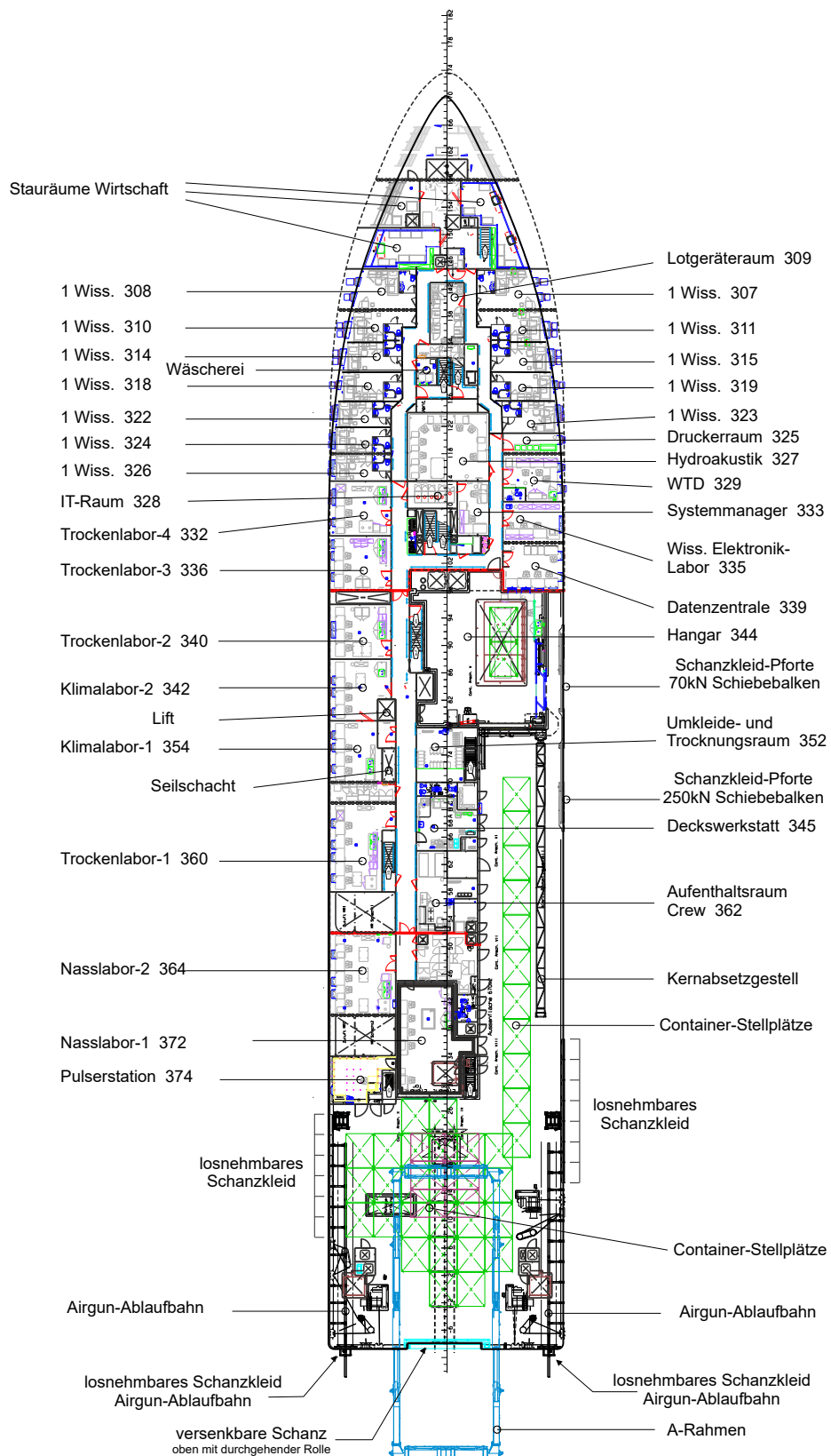


4. Ship plans

4.1. General arrangement

30

4.1.7. Deck 03 – Main deck



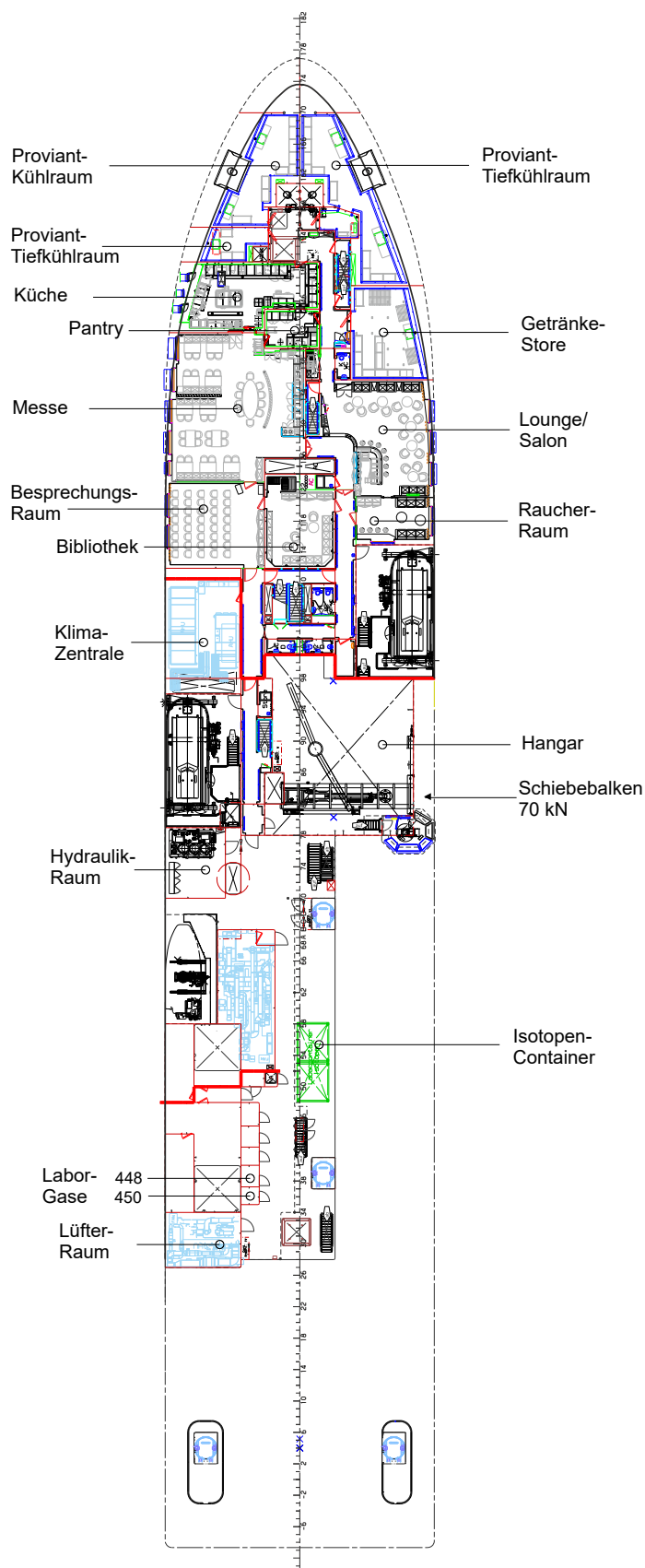


4. Ship plans

4.1. General arrangement

31

4.1.8. Deck 04 – 1. Structure deck



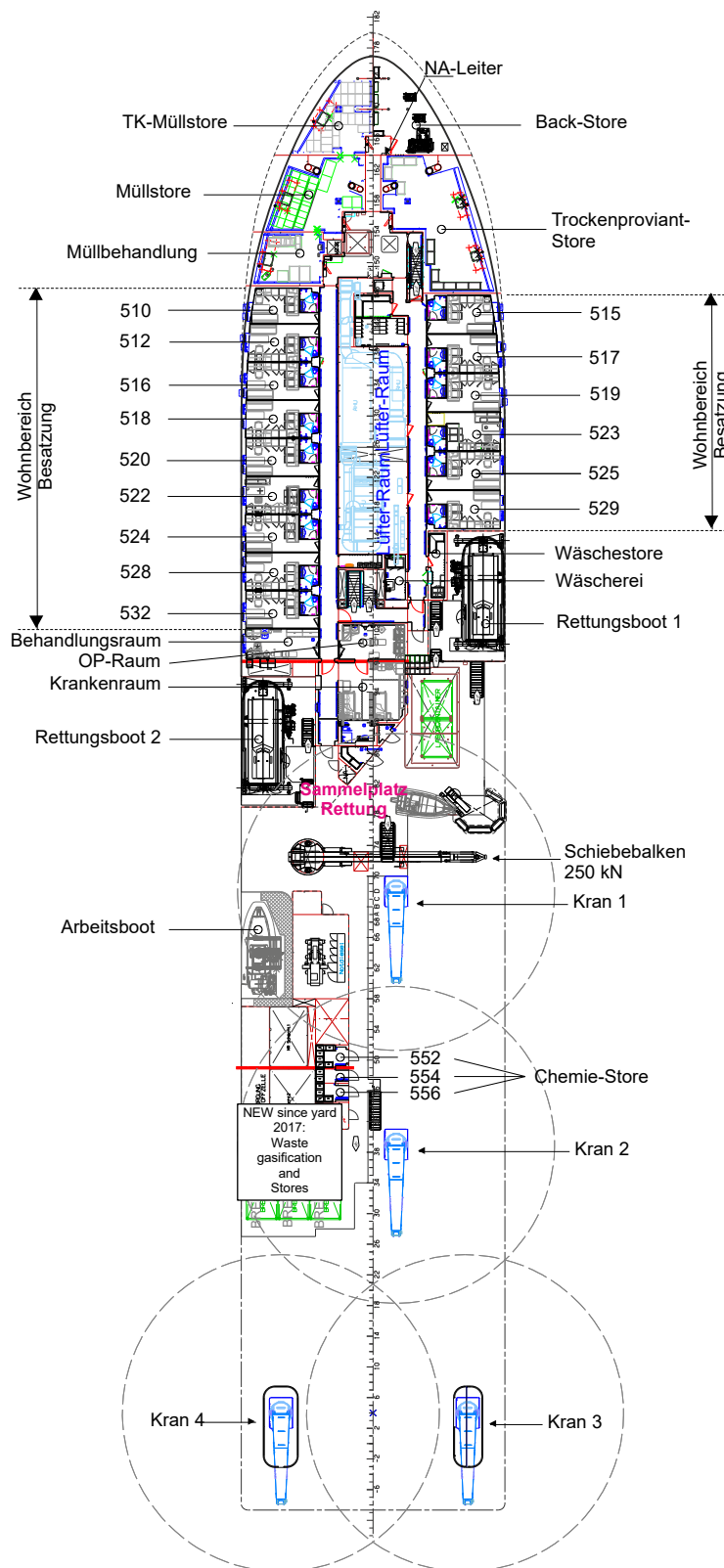


4. Ship plans

4.1. General arrangement

32

4.1.9. Deck 05 – 2. Structure deck



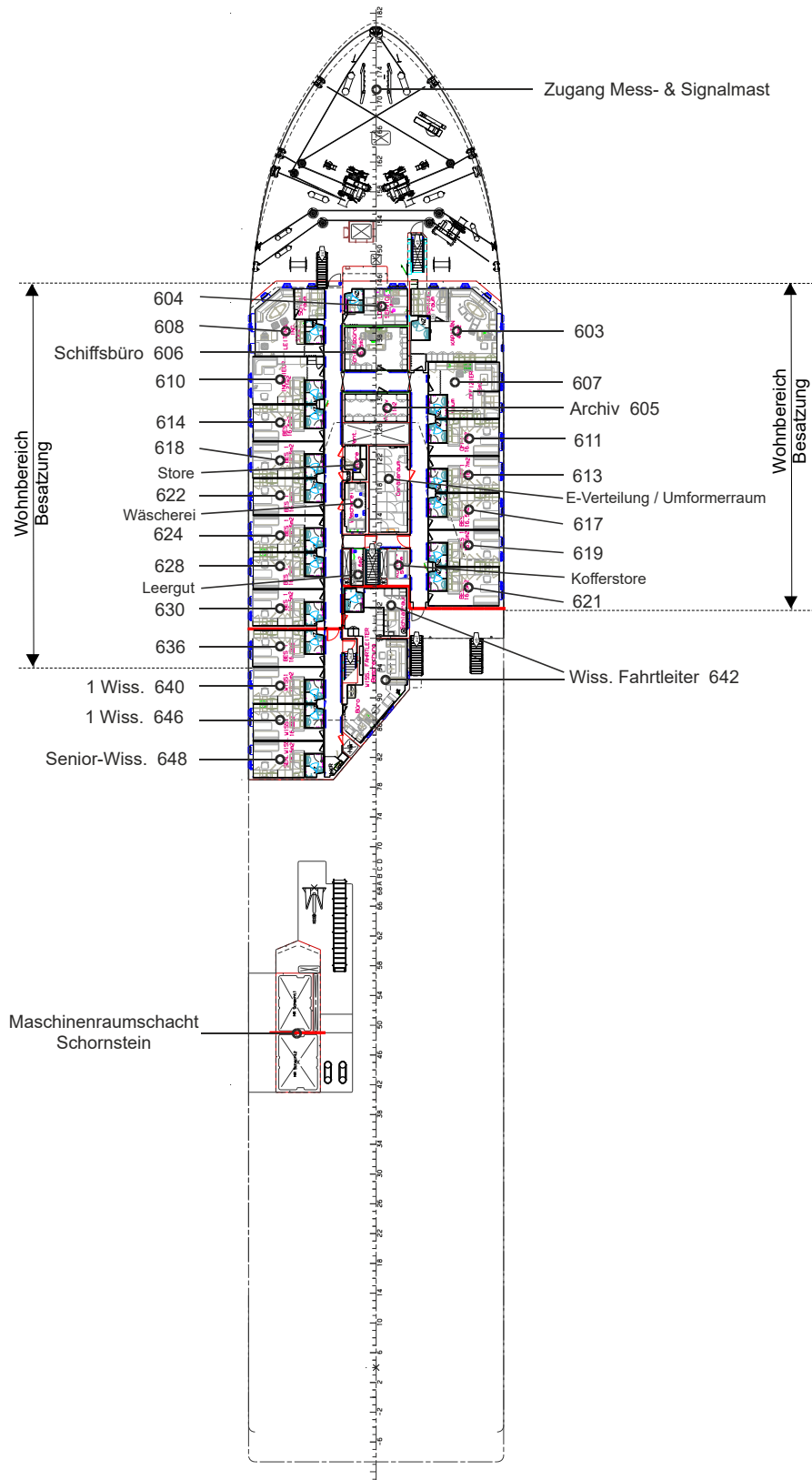


4. Ship plans

4.1. General arrangement

33

4.1.10. Deck 06 – 3. Structure deck

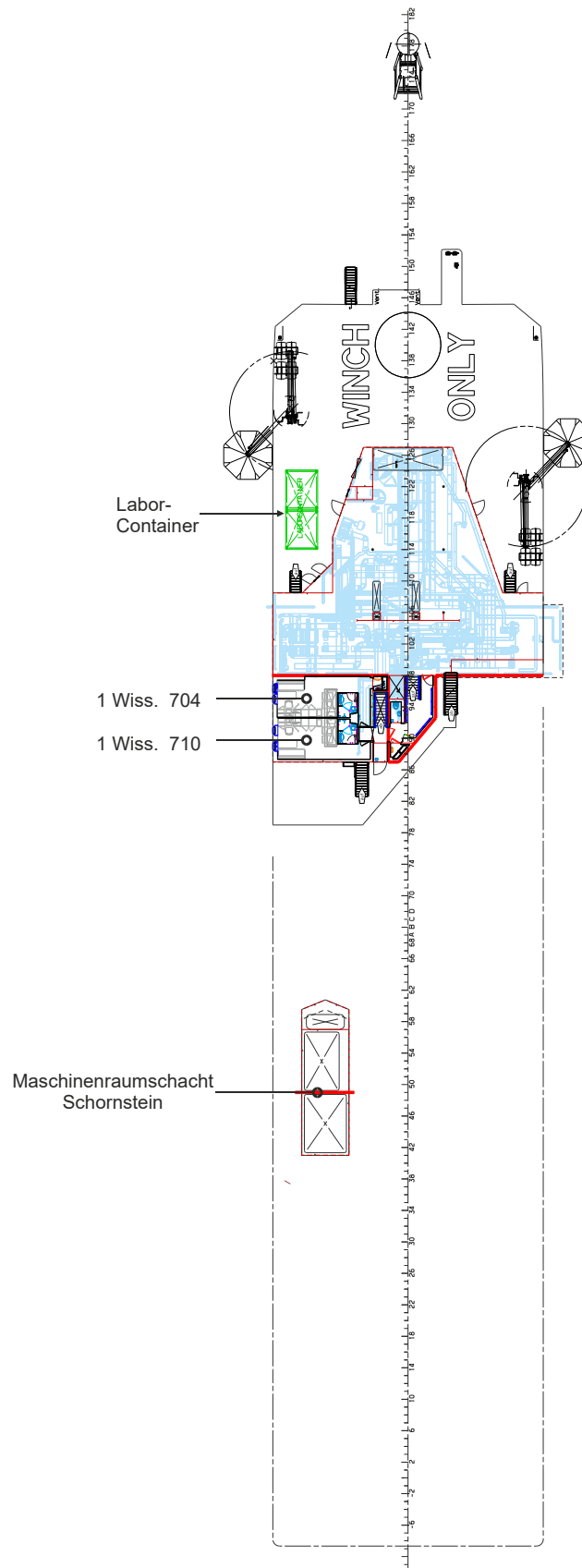




4. Ship plans
4.1. General arrangement

34

4.1.11. Deck 07 – 4. Structure deck



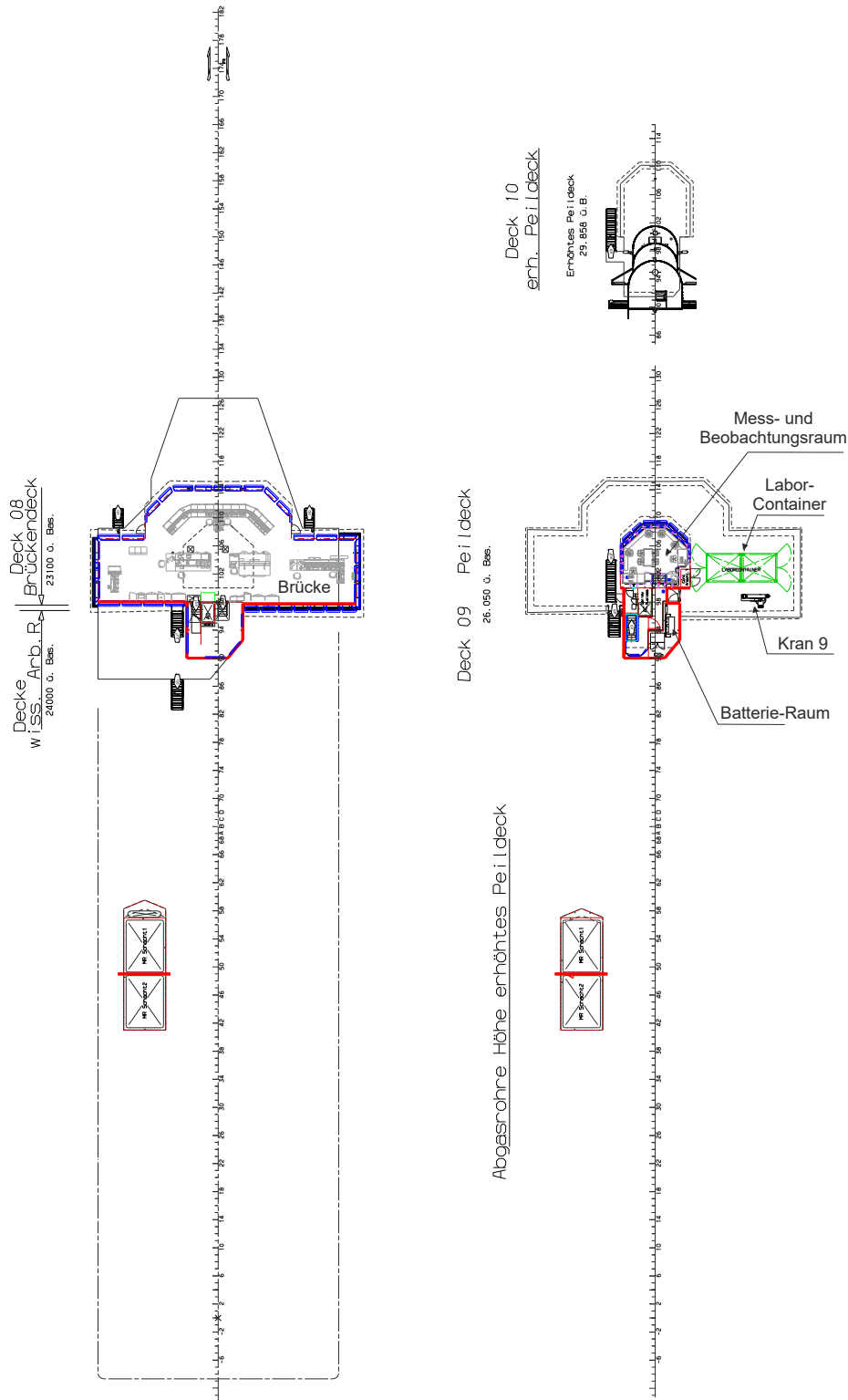


4. Ship plans

4.1. General arrangement

35

4.1.12. Deck 08 – Bridge deck; Deck 09 – Observation deck; Deck 10 – Elevated observation deck



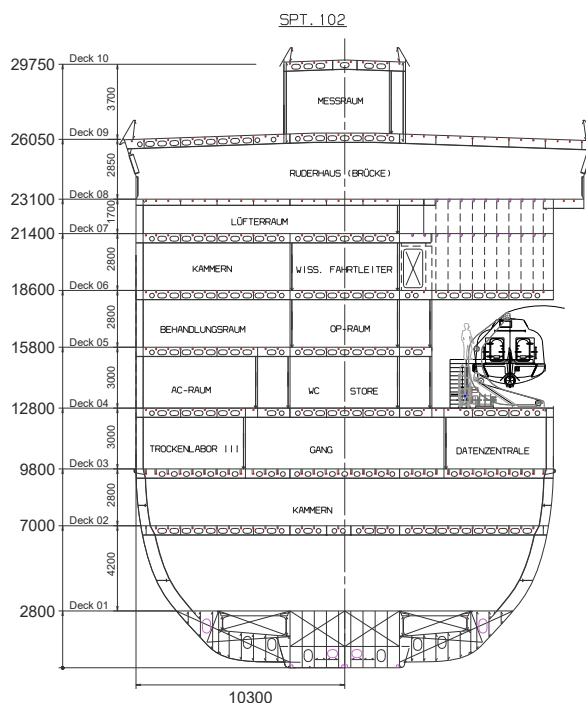
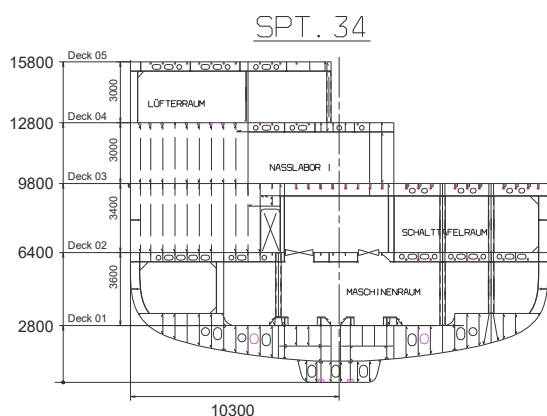


4. Ship plans

4.1. General arrangement

36

4.1.13. Cut-frame 34; Cut-frame 102

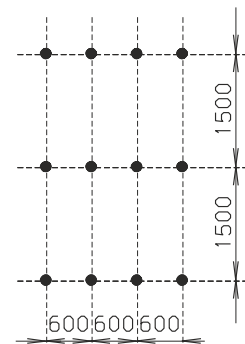
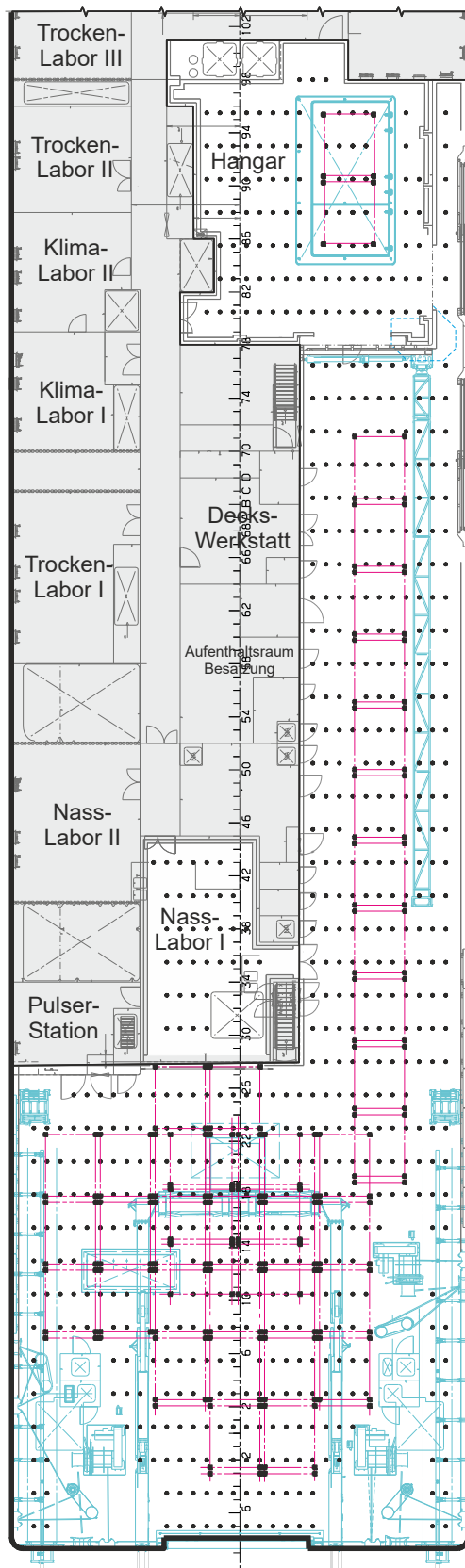




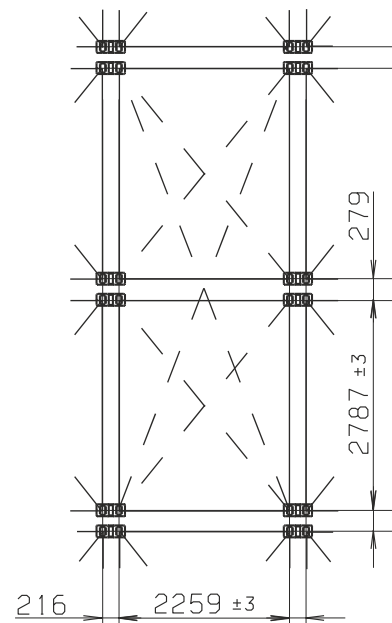
4. Ship plans
4.1. General arrangement

37

4.1.14. Deck 03 (Main deck) – Container foundations and M24 lashing elements



M24-Zurrbuchsen



Containerfundamente

Maximum tensile force per 24 mm lashing bush: 5t



4. Ship plans

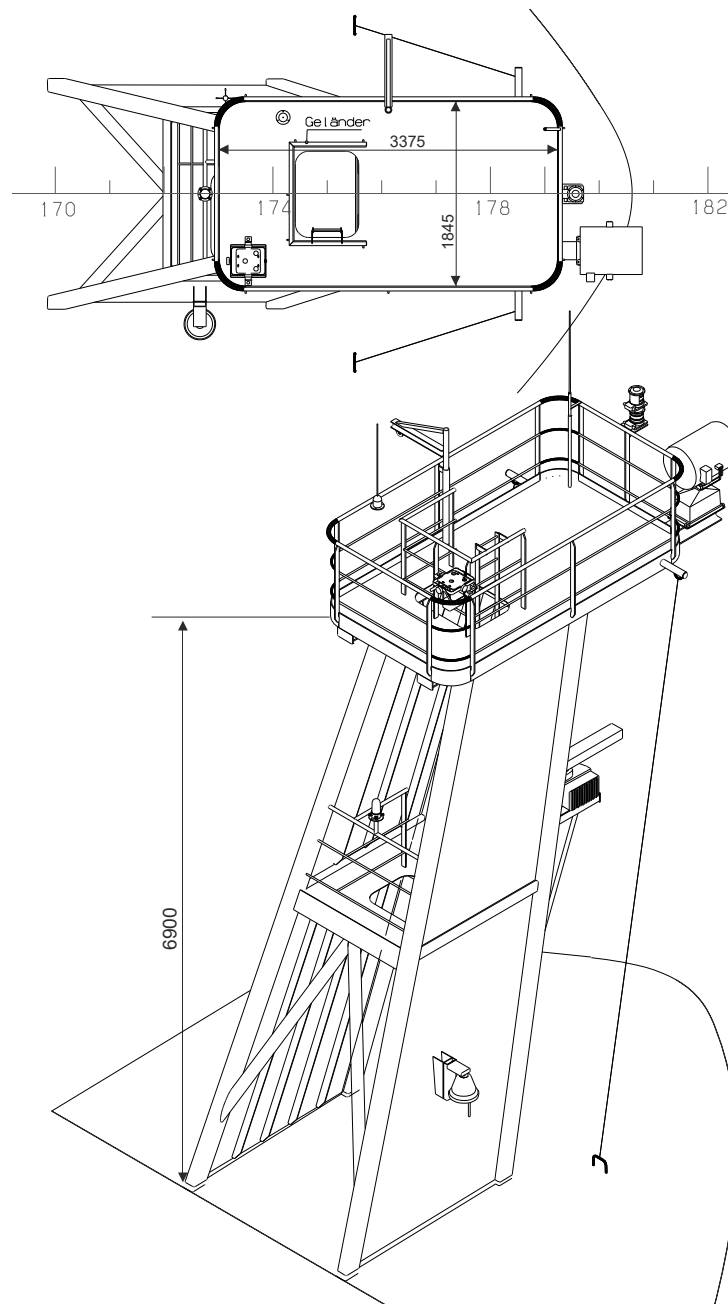
4.2. Measurement and signal mast forecastle

38

4.2. Measurement and signal mast forecastle

On the forecastle deck of 06 (3 superstructure deck) is a measurement and signal mast.

- The measurement platform is arranged such that uncontaminated air flows past the leading edge.
- The size of the platform is 3375 x 1845 mm.
- 230 V AC Normal
- LAN port 1
- A radar antenna wave height meter is installed
- Access is via an internal conductor
- Access and work on the platform for security reasons only after consultation with the guard officer.





4. Ship plans

4.3. Antenna arrangement (Index)

39

4.3. Antenna arrangement (Index)

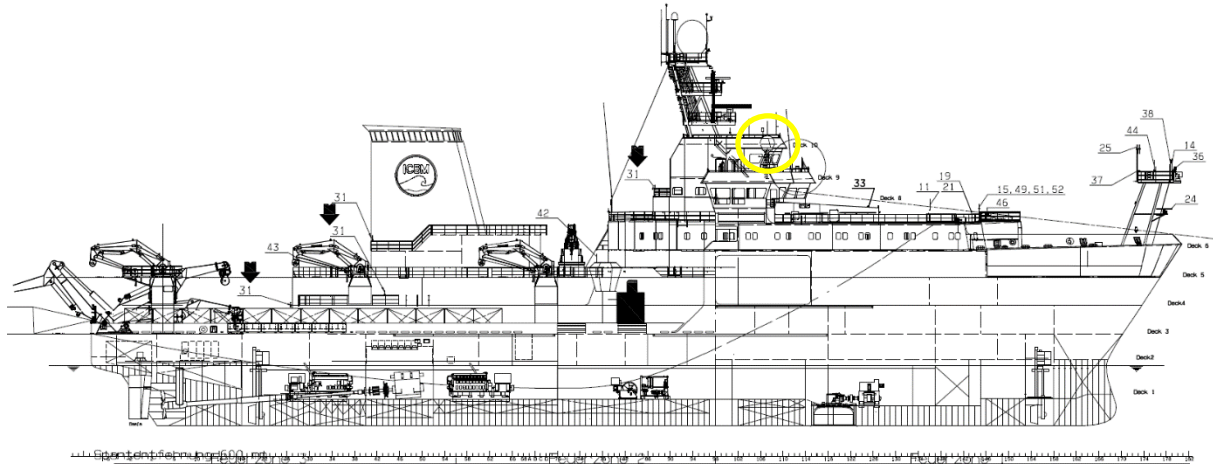
55	IC-BAND VSAT ANTENNE	v240C		
54	LUFTDRUCKEINLASS		DWD	
53	ENTFALLT			
52	Bewegungssensor GNSS Antenne 2		KONGSBERG	993.1020
51	Bewegungssensor GNSS Antenne 1		KONGSBERG	993.1010
50	MF/HF TX/RX Reserveantenne	Draht (Vorbereitet)	SAM	971.1035
49	JALA Beacon	AR10A-300K	Kongsberg/ Comrod	993.1000
48	Leica DGPS Antenne	AS10	Kongsberg/ AeroAntenne	993.1050
47	Fleet Broadband 500 Antenne	TT-3050A	SAM/ Thrane&Thrane	972.1100
46	Geräteträger Strahlungsmesssonden	--	4hJena/ Messen Nord	957.3040
45	Sensor Luftfeuchte/ Lufttemperatur		DWD	957.2035
44	Seefunk Aktiv-Empfangsantenne	STA 10 A	AAS	975.3000
43	GPS Repeater Antenne Nr.2	--	--	993.1502
42	GPS Repeater Antenne Nr.1	--	--	993.1501
41				
40	Magnetkompass	Reflecta 1	Raytheon-Anschütz	951.1220
39	COSPAS-SARSAT EPIRB	KANNAD SAFELINK	SAM	975.2010
38	Windsensor (Ultrasonic Sensor)	--	Kongsberg /Gill	832.1090
37	Bewegungssensor GNSS Ant. Reserve		Kongsberg	
36	Bewegungssensor GNSS Ant. Reserve		Kongsberg	
35				
34	Schallsignalempfang Microphoneein.	SRD 414 / 2	SAM/ Zöllner	954.1000
33	VDR Datenschutzkapsel	FRM	SAM/ Interschalt	958.1160
32	Windsensor	Ultrasonic 2D-a	DWD / Thies	957.xxxx
31	UHF Paging Antenne	UHF Typ 1, Outdoor	SAM/ Kathrein	976.1001/1003/1010/4002/4102
30				xxxx.xxxx
29	UKW Antenne Nr.6	CXL2-1	SAM/ Procom	973.1630
28	UKW Antenne Nr.5	CXL2-1	SAM/ Procom	973.1630
27	Sat. TV Antenne	Seatel 5004A	SAM/ Comham-Seatel	935.1000
26				
25	UKW-Funkpeilantenne Adcock	EA-351A	SAM/ Taiyo TD-A1630	953.1190
24	Radarantenne 3, 5°X-Band	GR 3050 mit GR 3020	SAM (mit Wellennadar)	952.1560/1570
23	Radarantenne 2, 8°X-Band	GR 3050 mit GR 3020	SAM	952.1510/1520
22	Radarantenne 1, 14°S-Band	GR 3051 mit GR 3021	SAM	952.1460/1470
21	SAT LOG GPS Antenne	MGL 4 / Saab R4	SAM/ Hemisphere	954.1090
20	DGPS Antenne Nr. 2	MGL 4 / Saab R4	SAM/ Hemisphere	953.1090
19	DGPS Antenne Nr. 1	MGL 4 / Saab R4	SAM/ Hemisphere	953.1000
18	Starlink Nr.2			
17	Starlink Nr.1			
16	Fleet Broadband 500 Antenne	TT-3050A	SAM/ Thrane&Thrane	972.1000
15	AIS GPS Antenne	GPS 4	SAM/ Procom	959.1010
14	AIS UKW Antenne	CXL2-1	SAM/ Procom	959.1040
13				
12	Navtex Antenne	ANT-2K-R00	SAM	978.1710
11	UKW Antenne Nr.4 (SrtP)	CXL2-1	SAM/ Procom	973.1430
10	UKW Antenne Nr.3	CXL2-1	SAM/ Procom	973.1330
9	UKW-DSC Antenne Nr.2	CXL2-1	SAM/ Procom	973.1290
8	UKW Antenne Nr.2	CXL2-1	SAM/ Procom	973.1280
7	UKW-DSC Antenne Nr.1	CXL2-1	SAM/ Procom	973.1140
6	UKW Antenne Nr.1	CXL2-1	SAM/ Procom	973.1130
5	Inmarsat C Antenne Nr.2	TT-3027C	SAM/ Thrane&Thrane	972.1600
4	Inmarsat C Antenne Nr.1	TT-3027C	SAM/ Thrane&Thrane	972.1500
3	MF/HF DSC Antenne	AR72	SAM/ Comrod	971.1040
2	MF/HF Antennen Koppler	6381	SAM/ Thrane&Thrane	971.1010
1	MF/HF TX/RX Antenne	AT 100 D	SAM/ Comrod	971.1030
Pos.	Bezeichnung	Typ	Bemerkungen	Gerätenummer



4.4. Antenna Configuration (Views)

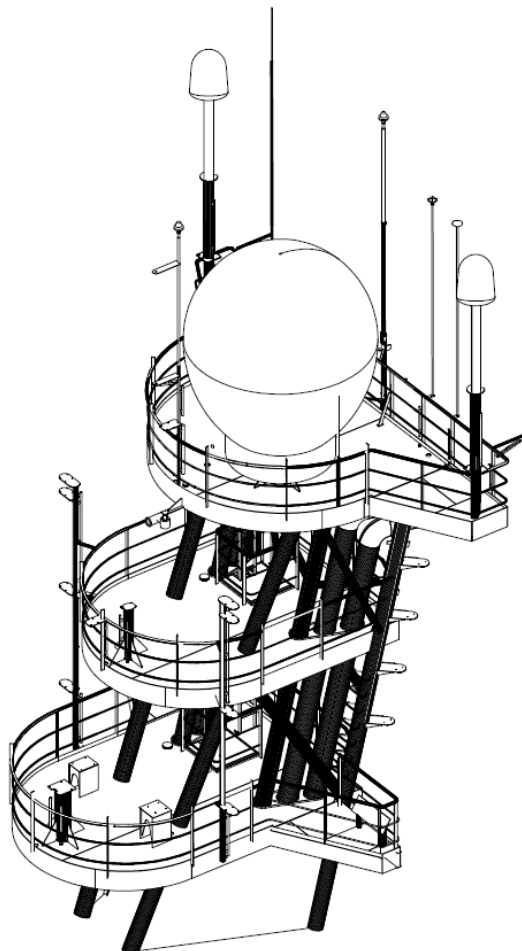
SEITENANSICHT

1:200



4.4.1. 3D-View Main Mast

3D-ANSICHT MAST



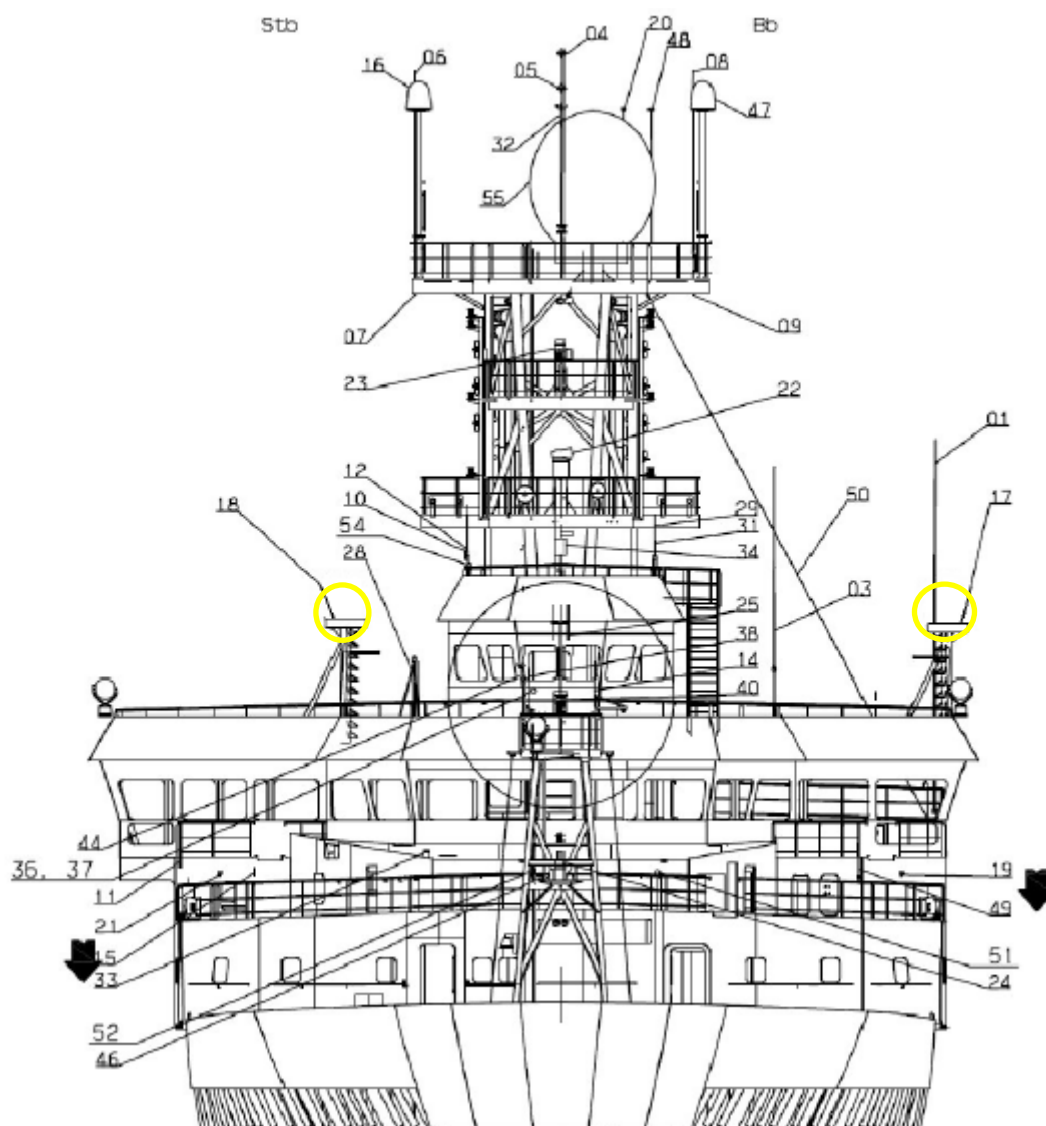


4. Ship plans

4.4. Antenna Configuration (Views)

41

4.4.2. Front view of the Main Mast



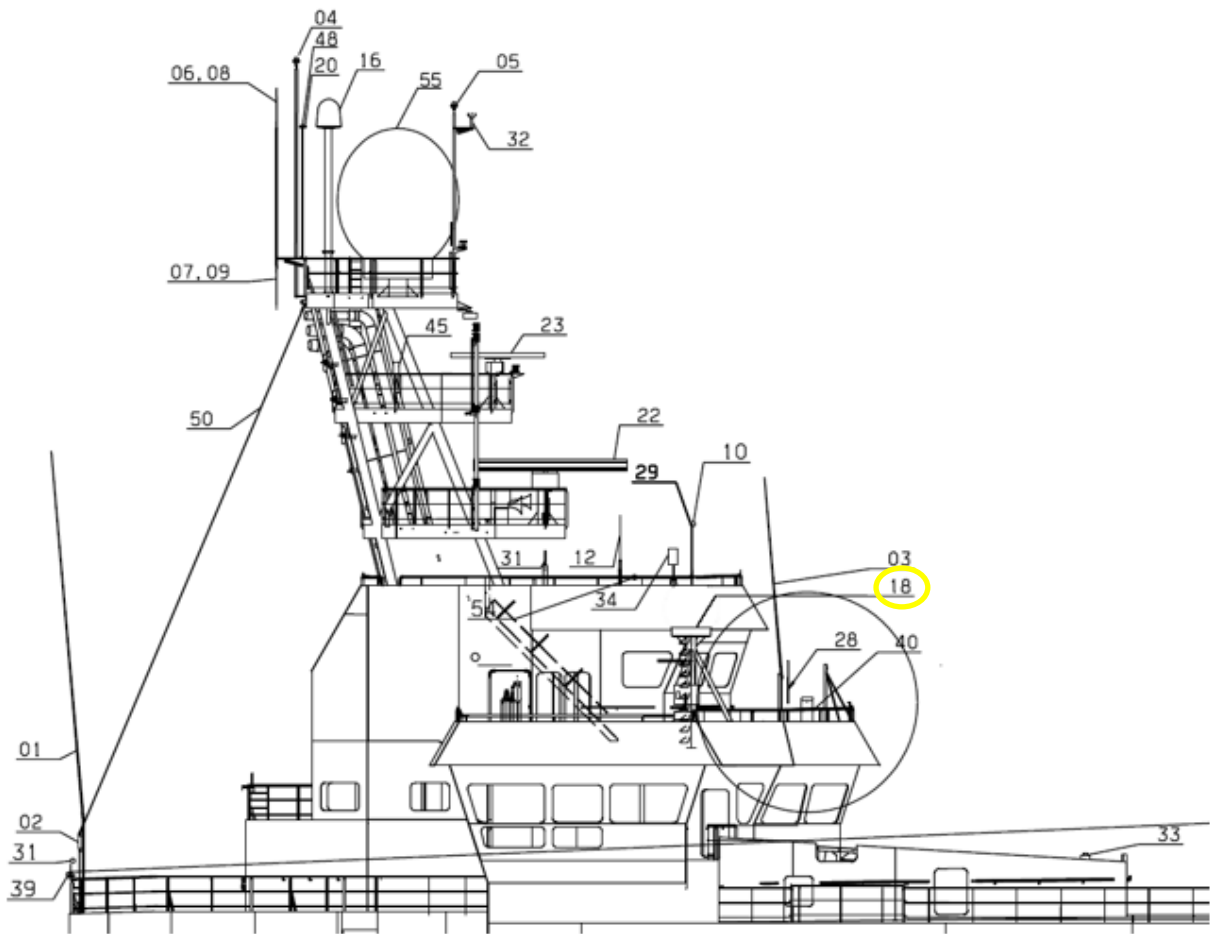


4. Ship plans

4.4. Antenna Configuration (Views)

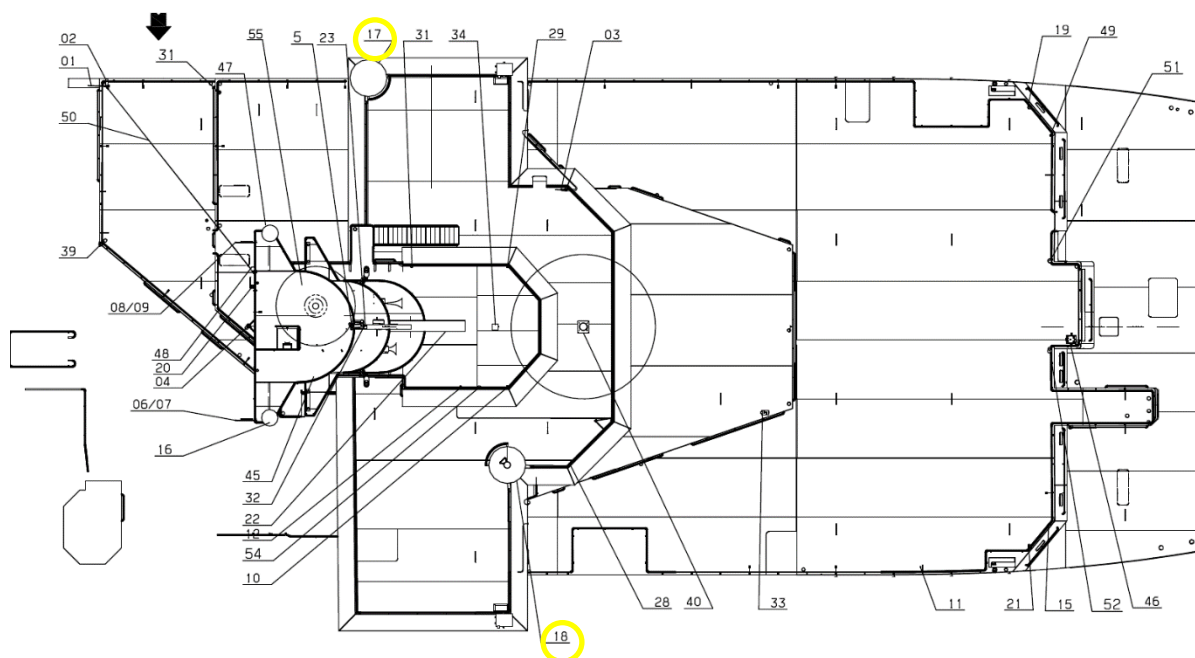
42

4.4.3. Side view of the Main Mast



4.4.4. Top view of the Main Mast

DRAUFSICHT DECK 09





5. Container

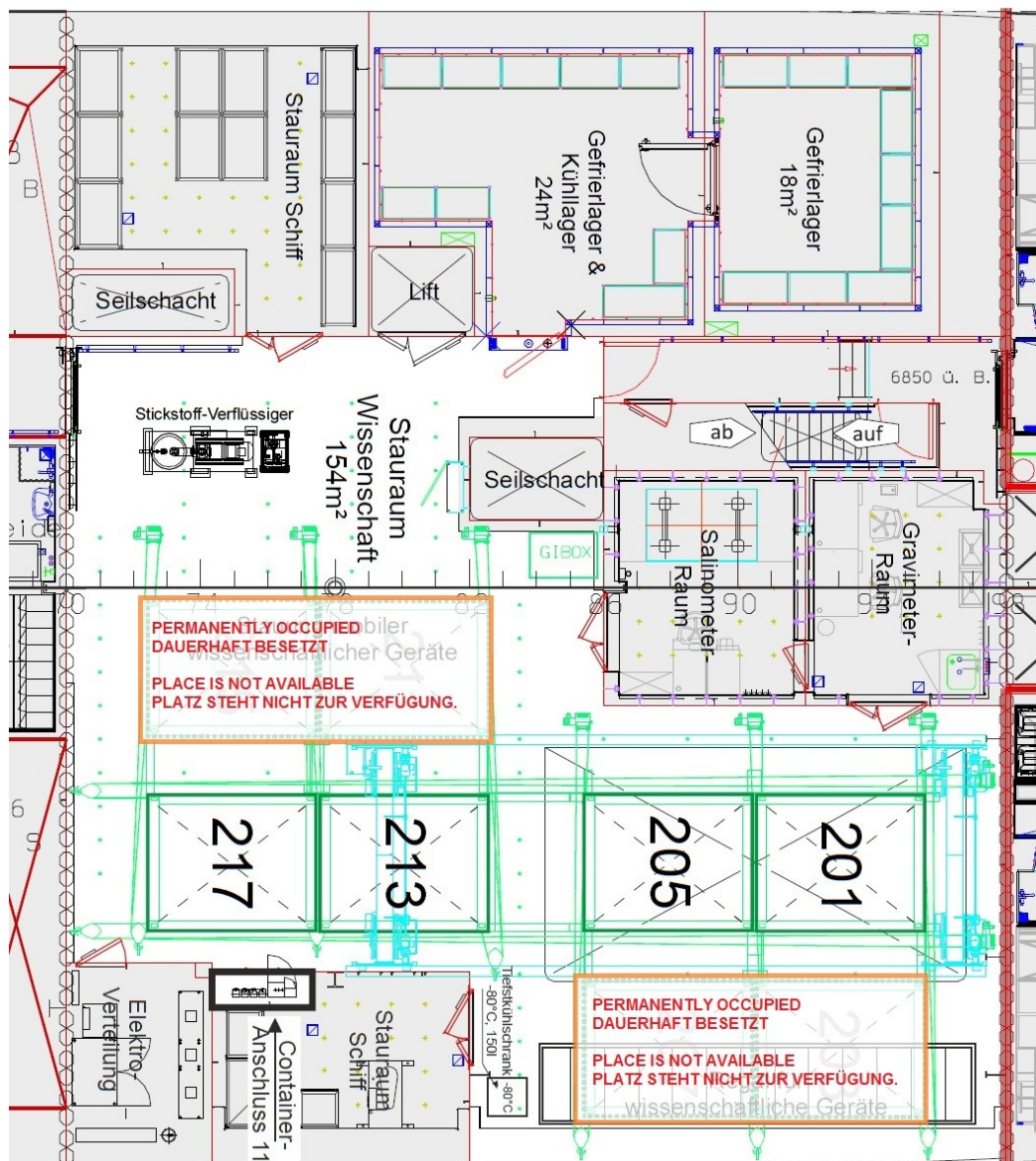
5.1. Container storage areas

43

5. Container

5.1. Container storage areas

5.1.1. Container storage areas Deck 02



Maximum Stackloads : 4x 10'-Container each 6t or 2x 20'-Container each 12t

Maximum traction lashing bushes : 5 to

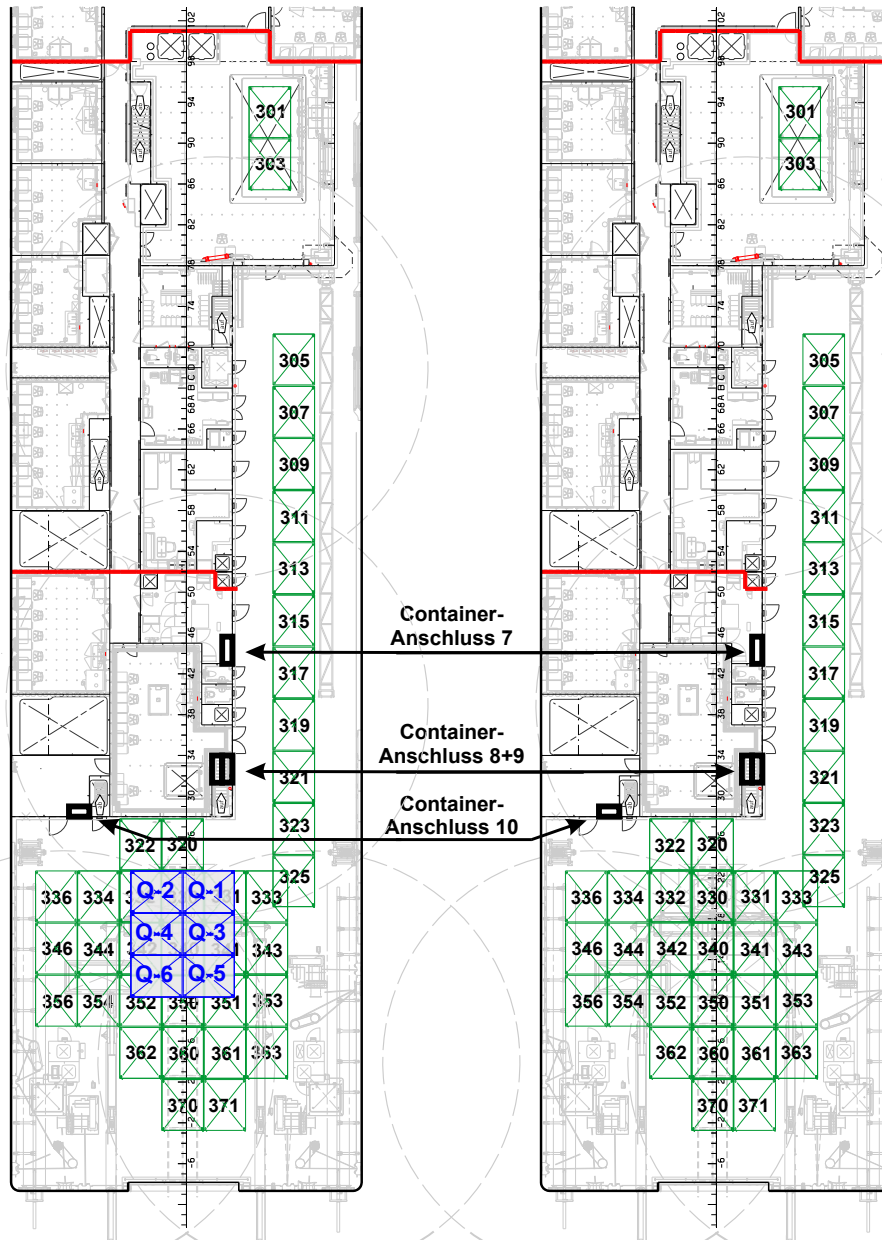


5. Container

5.1. Container storage areas

44

5.1.2. Container Deck 03 (Main deck)



Maximum Stackloads:

In Hangar on hatch cover: 2x 10'-Container each 6t or 1x 20'-Container 12t.

Outside: 10'-Area each 22,5t (= max 2x 10'-Container each max. 11,25t one above the other).
20'-Area each 45t (= max 2x 20'-Container each max. 22,5t one above the other).

Maximum traction lashing bushes: 5t

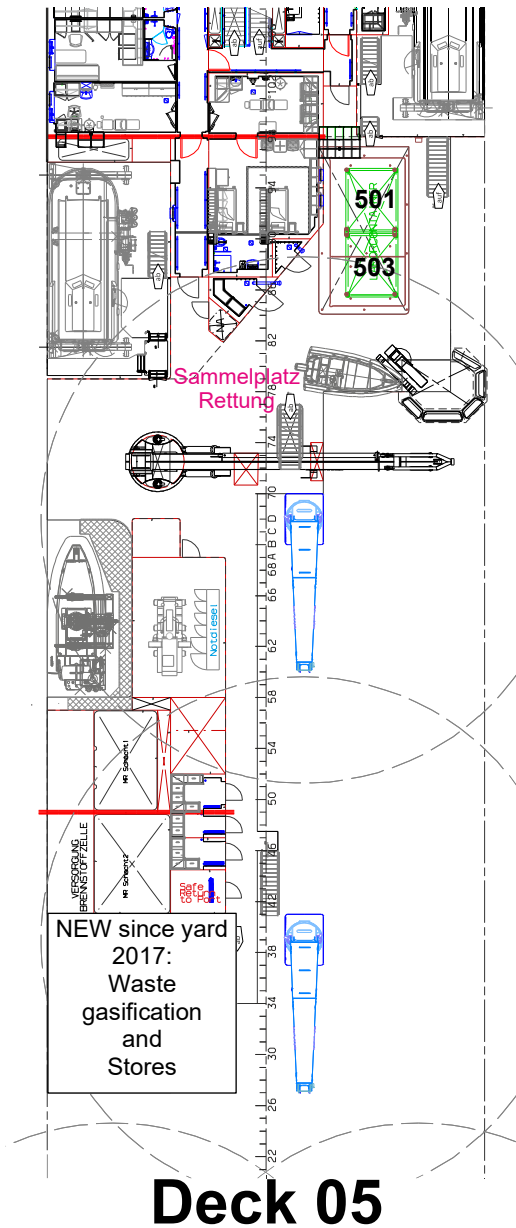
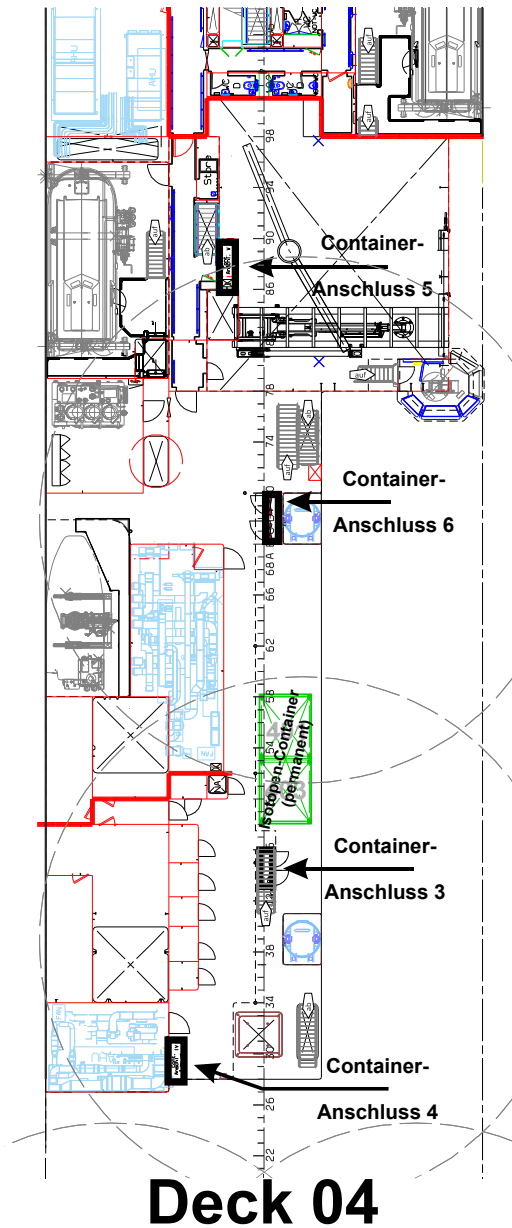


5. Container

5.1. Container storage areas

45

5.1.3. Container storage areas Deck 04 and Deck 05



Maximum Stackloads Deck 04: 2x 10'-Container each 6t or 1x 20'-Container each 12t

Maximum Stackloads Deck 05: 2x 10'-Container each 6t or 1x 20'-Container each 12t. on the hatch cover.

Maximum traction lashing bushes: 5t

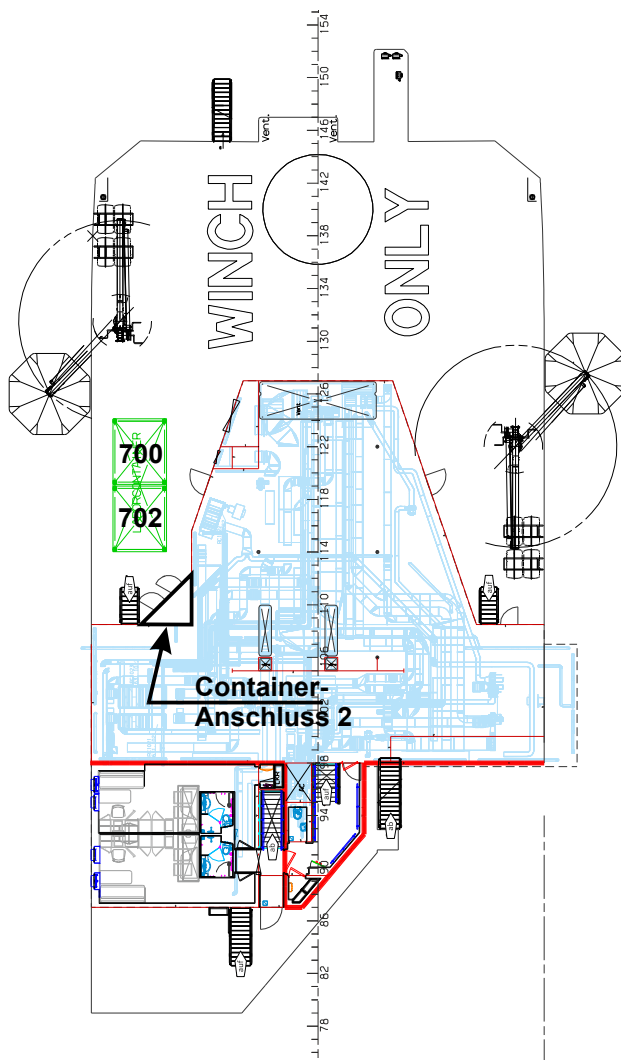


5. Container

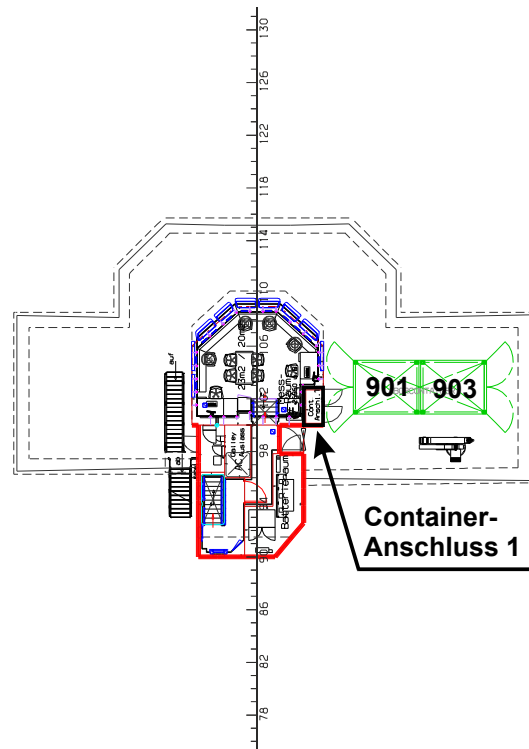
5.1. Container storage areas

46

5.1.4. Container storage areas Deck 07 and Deck 09



Deck 07



Deck 09

Maximum Stackloads Deck 07:

2x 10'-Container each 5t or 1x 20'-Container each 10t
These places can not be reached with the ship's crane

Maximum Stackloads Deck 09:

2x 10'-Container each 3t or 1x 20'-Container each 10t
These places can not be reached with the ship's crane

Maximum traction lashing bushes: 5t



5. Container

5.2. Lab-Container terminal boxes

47

5.2. Lab-Container terminal boxes

Container terminal box	01	02	03	04	05	06	07	08	09	10	11
Deck	09	07	04	04	04	04	03	03	03	03	02
Frame	102	110	38	29	88	69	44	32	32	28	76
	StB	BB	MS	BB	MS	MS	StB	StB	StB	BB	StB
230V 16A Network white	3		3	3	4	3	2	2	1	2	4
230V 16A Network red	3	4	3	3	3	3	2		1	2	4
400V 16A Three-phase	1				2			2	1	2	3
400V 32A Three-phase	1	1	2	2	2	2	2	1	2	2	3
400V 63A Three-phase						1	2	1		1	
LAN 1	4	4	4	4	4	4	4	4	4	4	4
Fire alarm system											
Public address system	1	1	1	1	1	1	1	1	1	1	1
Intercom											
Phone (LAN2)											
Connections for single-core cable winches					1			1		1	1
Connector for cable entry	1	1	1	1		1	1	1		1	
Cold water	1	1	1	2	1	2	2	1	1	1	3
Warm water	1	1	1	2	1	2	2	1	1	1	3
Destillat			1								
Seawater/Centrifugal pump	1	1	1	1	1	2	1	1	1	1	2
Seawater/Diaphragm pump	1	1	1	1	1	2	1	1	1	1	2
Grey water (waste water)	1	1	1	1	1	1	1	1	1	1	1
Laboratory waste water.			1	1	1	1	1	1	1	1	1
Scupper	1	1	1	1		1	1	1	1	1	
Laboratory compressed air	2	2	2		2	2	2	2	2		2
Compressed air 0-6 bar	4	4		2			2	2		2	6
High pressure air 208 bar							2				
Overproduction							2				
Condensate drain							2				
Sea cooling water / feed							2				
Sea cool water / drain							2				
Fire water	1					3		2		2	
Sewage blind flange							2	2		2	

Container terminal box 07 = connection Seismik-Container

Container terminal box 03 = connection Isotopen-Container



6. Hoisting equipment
6.1. Crane 1 – 4 / Working cranes

48

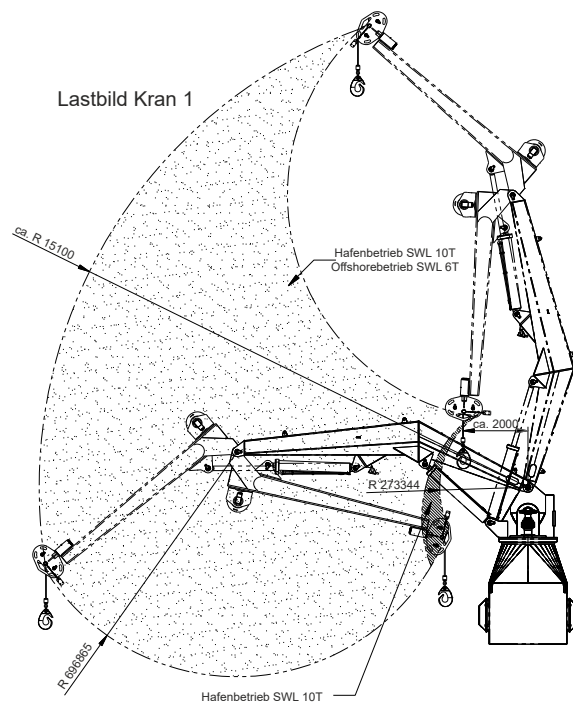
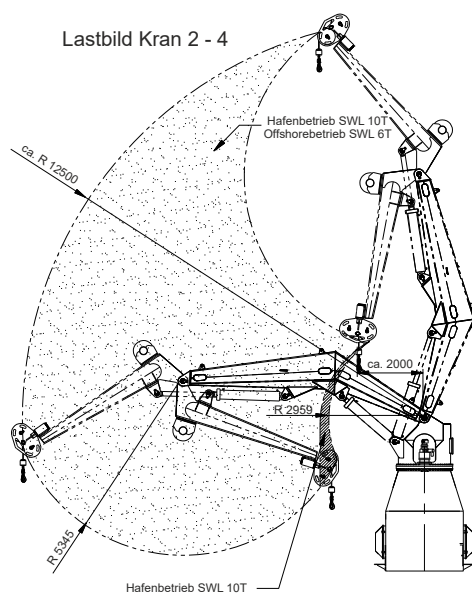
6. Hoisting equipment

6.1. Crane 1 – 4 / Working cranes

6.1.1. Specifications

	Kran 1	Kran 2-4
Lifting capacity	150,0 Tm	124,0 Tm
Working load port operation	SWL 10t	SWL 10t
Working load offshore operation	SWL 6t	SWL 6t
Effective rope length of winch approximately	60 m	60 m
Hoist speed	0 ... 25 m/min	0 ... 25 m/min
Winch capacity rapid	25 kN	25 kN
Hoist speed rapid	0 ... 60 m/min	0 ... 60 m/min
Max. swing radius hook	15,1 m	12,5 m
Min. swing radius hook	2,0 m	2,0 m
Slewing torque	715 kNm	500 kNm
Slewing angle	360°	360°
Slewing speed	0 ... 1,0 rpm	0 ... 1,0 rpm
Luffing time up / in	55 / 50 s	55 / 50 s
Jib time out / in	55 / 50 s	40 / 35 s
Max. heel / trim when slewing	10° / 3°	10° / 3°

6.1.2. Load pictures crane 1 to 4



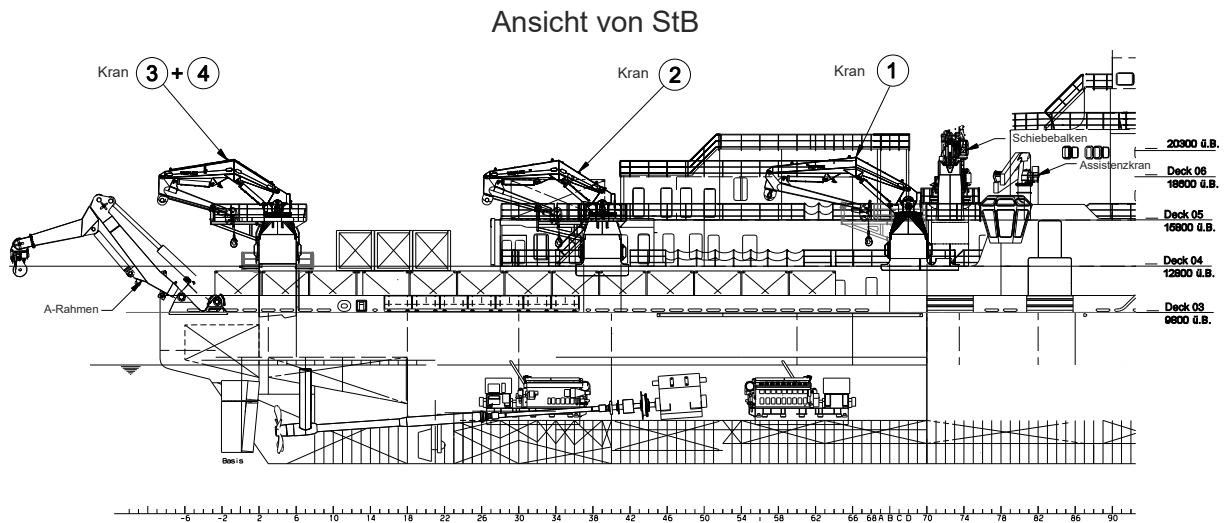


6. Hoisting equipment

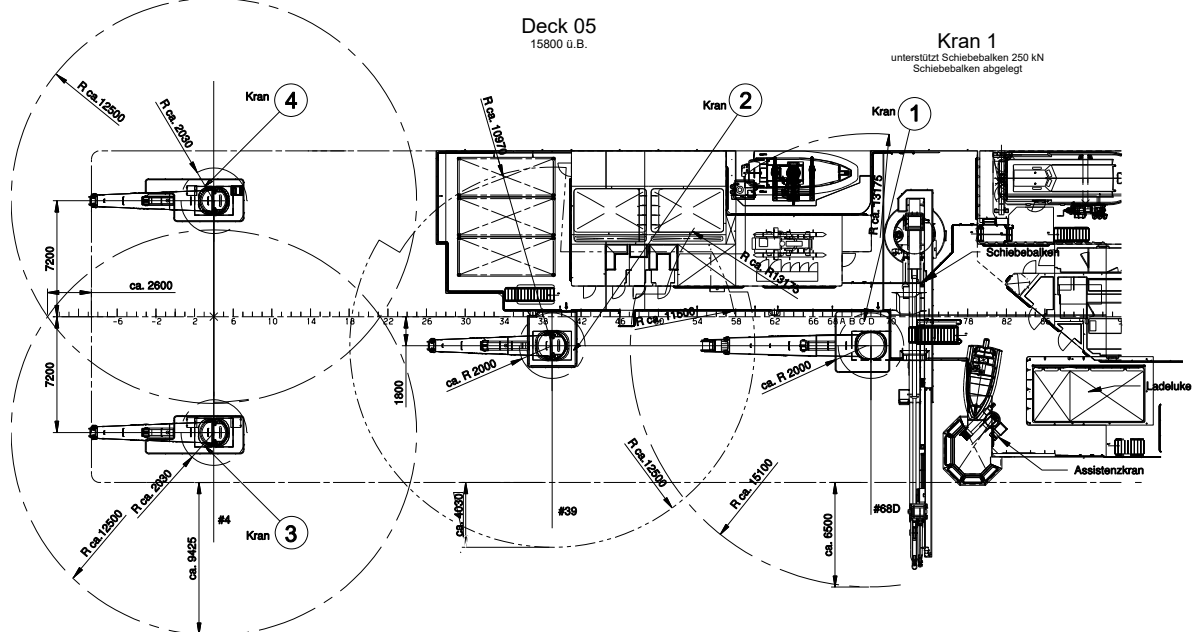
6.1. Crane 1 – 4 / Working cranes

49

6.1.3. Crane Arrangement



6.1.4. Outreach of Cranes

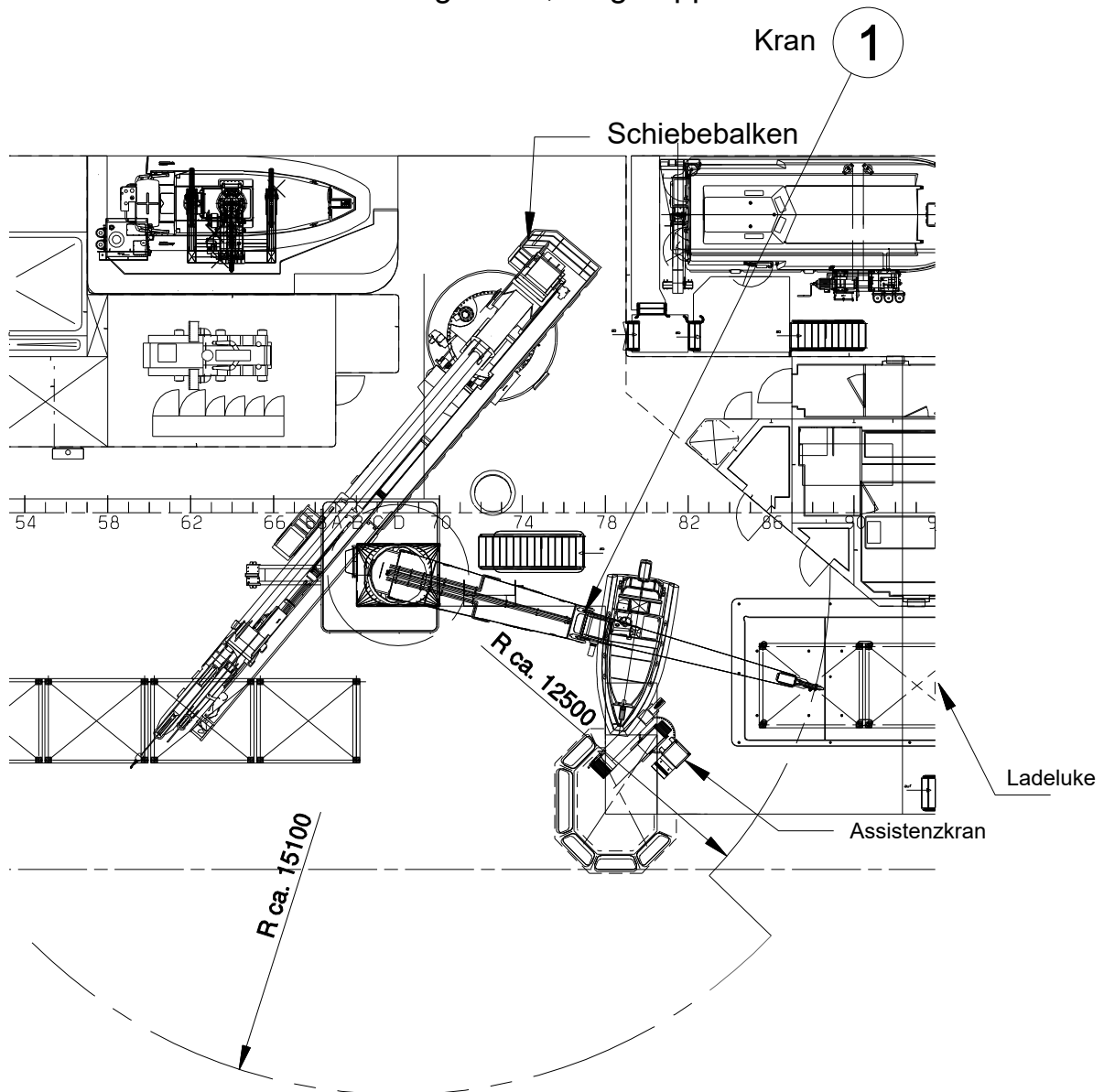


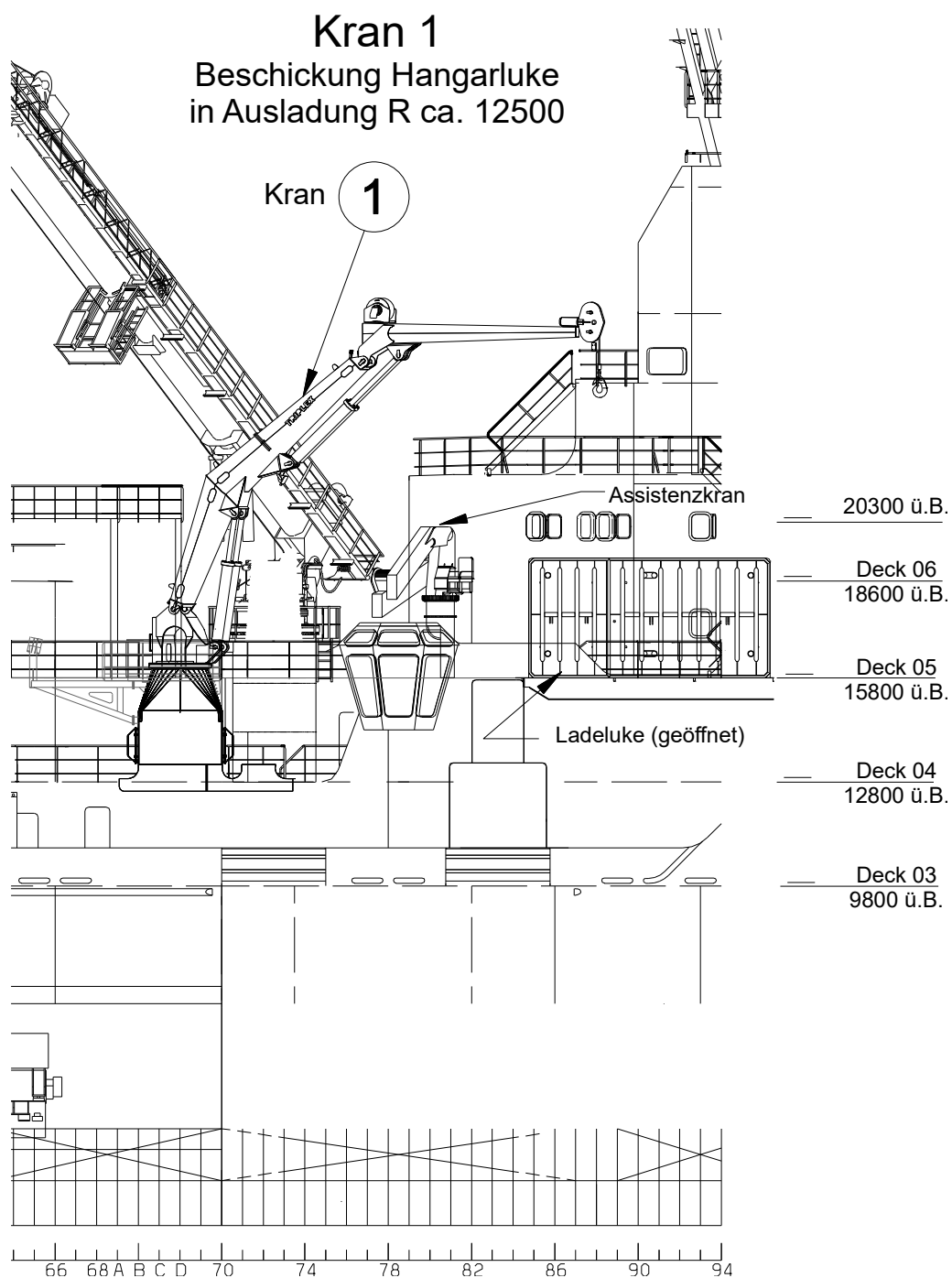


6.1.5. Crane 1

Kran 1

Beschickung Hangarluke
Schiebebalken nach hinten gedreht, aufgetoppt







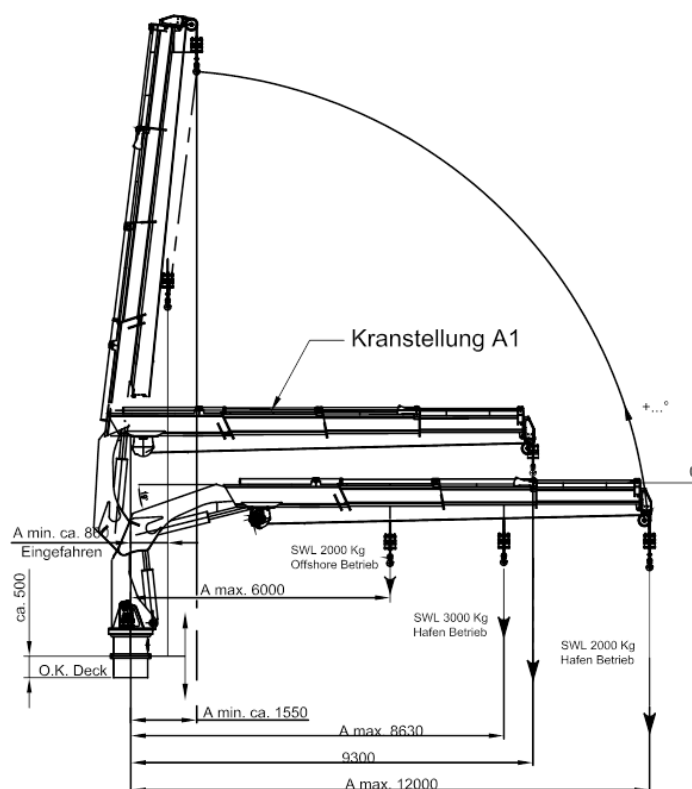
6.2. Assistant Cranes

6.2.1. Crane 5 / Assistant crane work boat

6.2.1.1. Technical Data

Operation	Radio remote and from the central control station
Laid lifting capacity at maximum reach	24 Tm
Workig load port operation	2000 kg SWL at 12,00m outreach
At 220 bar hydraulic pressure (Workig load port operation)	3000kg SWL at 8.63m outreach
Workig load offshore operation Significant wave height 2 meter (SWH) to H $\frac{1}{3}$	2000 kg SWL at 6,00m outreach
Max. swing radius hook	12000 mm
Telescopic prolongation	3 each
Telescopic speed	0 - 9 m/min
Min. swing radius hook	ca. 860/ 1550 mm
Rope length	60 m
Slewing tourque	107910 Nm
Slewing speed	0 1,0 1/min
Slewing angle	unlimited
Luffing time	30 sec
Buckling time	45 sec
Lifting speed	0 - 30 m/min
Heel / trim	10°/ 3°

6.2.1.2. Outreach

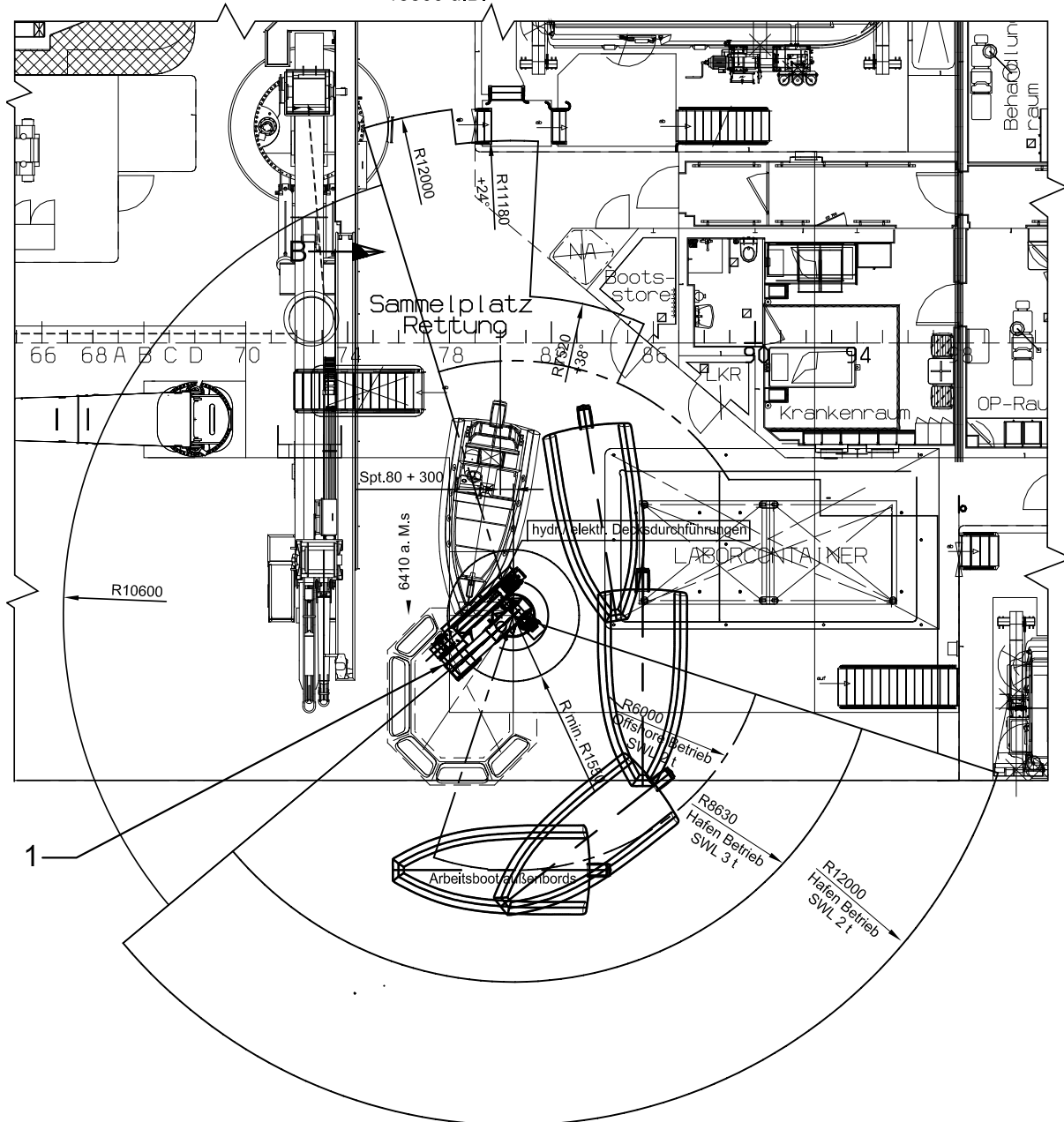




6.2.1.3. Handling work boat

Draufsicht Deck 05

15800 ü.B.



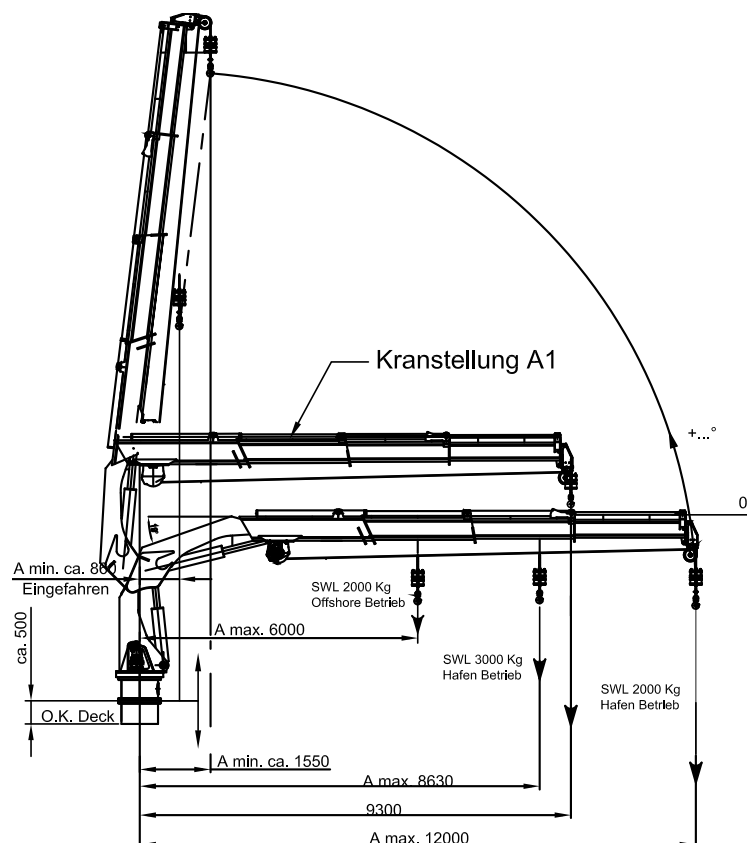


6.2.2. Crane 6 / Assistant crane deck 06 forecastle (provisions crane)

6.2.2.1. Technical Data

Operation	Radio remote and from the central control station
Laid lifting capacity at maximum reach	24 Tm
Workig load port operation	2000 kg SWL at 12,00m outreach
At 220 bar hydraulic pressure (Workig load port operation)	3000kg SWL at 8.63m outreach
Workig load offshore operation	2000 kg SWL at 6,00m outreach
Significant wave height 2 meter (SWH) to H $\frac{1}{3}$	
Max. swing radius hook	12000 mm
Telescopic prolongation	3 each
Telescopic speed	0 - 9 m/min
Min. swing radius hook	ca. 860/ 1550 mm
Rope length	60 m
Slewing tourque	107910 Nm
Slewing speed	0 1,0 1/min
Slewing angle	unlimited
Luffing time	30 sec
Buckling time	45 sec
Lifting speed	0 - 30 m/min
Heel / trim	10°/ 3°

6.2.2.2. Outreach



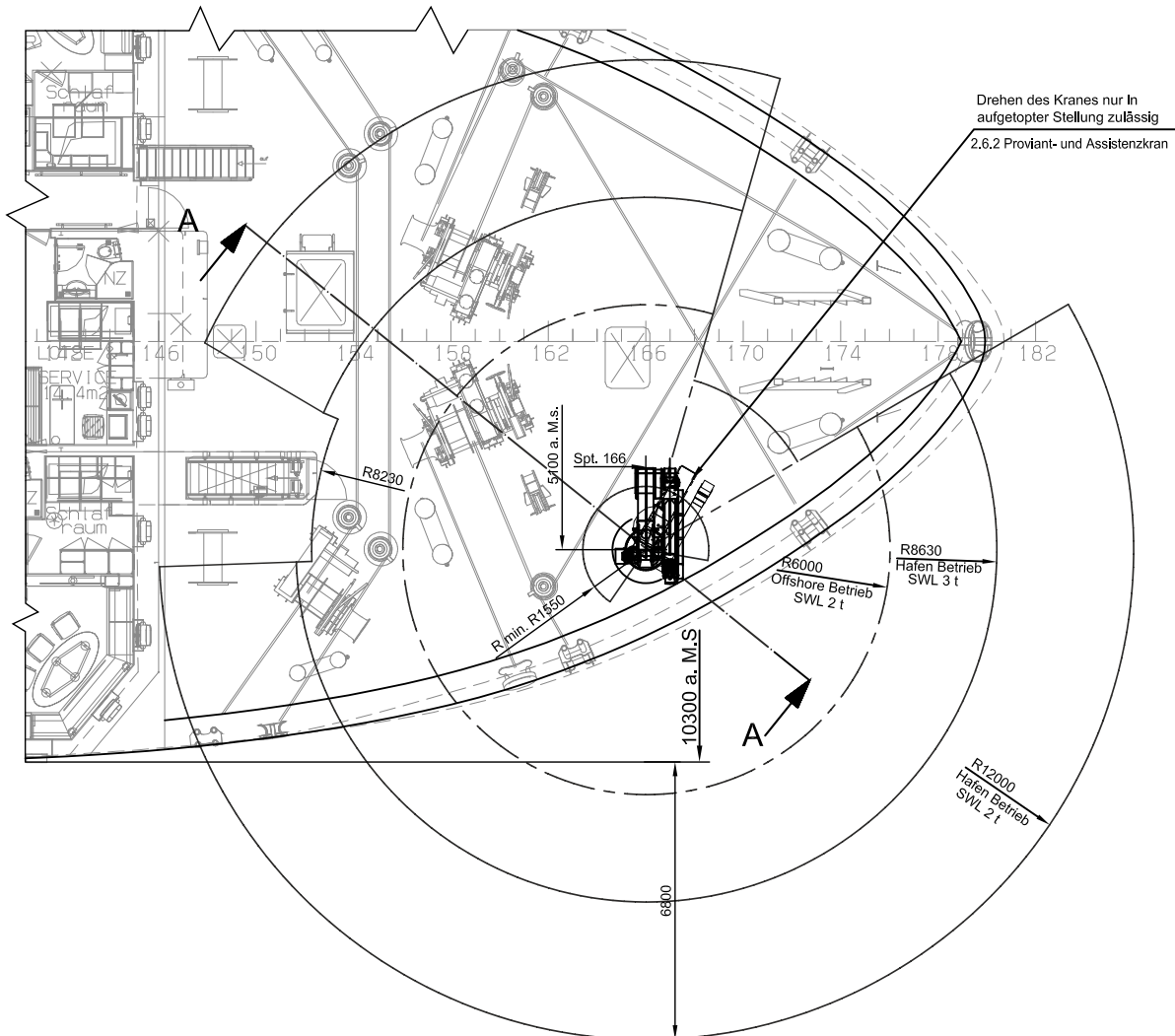


6. Hoisting equipment
 6.2. Assistant Cranes

55

Draufsicht Deck 06

18600 ü.B.



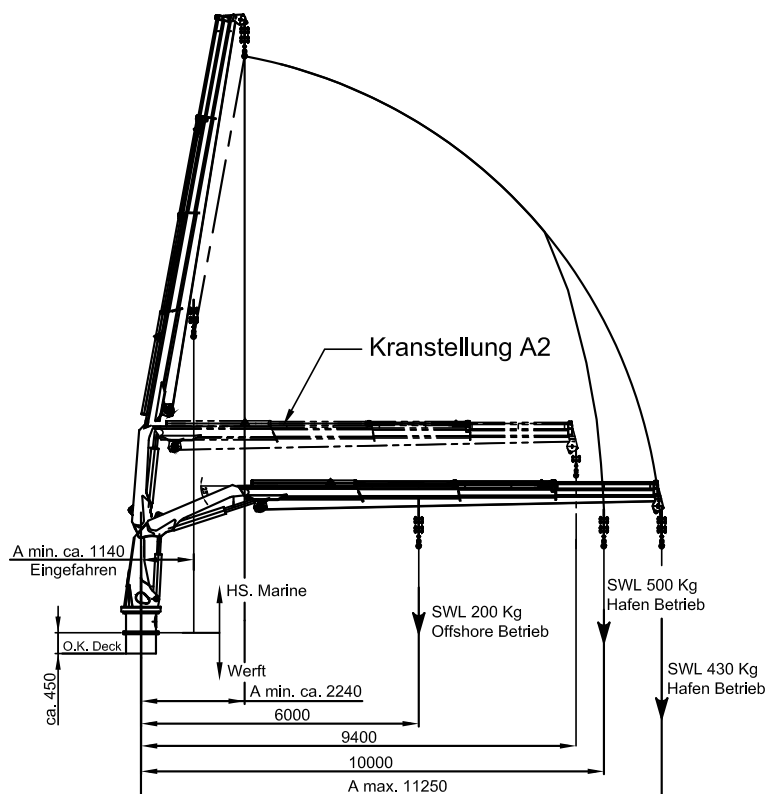


6.2.3. Crane 9 / Assistant crane observation deck

6.2.3.1. Technical Data

Operation	Radio remote
Laid lifting capacity at maximum reach	4,83 Tm
Workig load port operation	430 kg SWL at 11,25m outreach 500kg SWL at 10,00m outreach
Workig load offshore operation	200 kg SWL at 6,00m outreach
Significant wave height 2 meter (SWH) to H $\frac{1}{3}$	
Max. swing radius hook	11250 mm
Telescopic prolongation	3 each
Telescopic speed t	0 - 9 m/min
Min. swing radius hook	ca. 1140 / 2240 mm
Rope length	60 m
Slewing tourque	20601 Nm
Slewing speed	0 1,0 1/min
Slewing angle	unlimited
Luffing time	20 sec
Buckling time	27 sec
Lifting speed	0 - 40 m/min
Heel / trim	10°/ 3°

6.2.3.2. Outreach



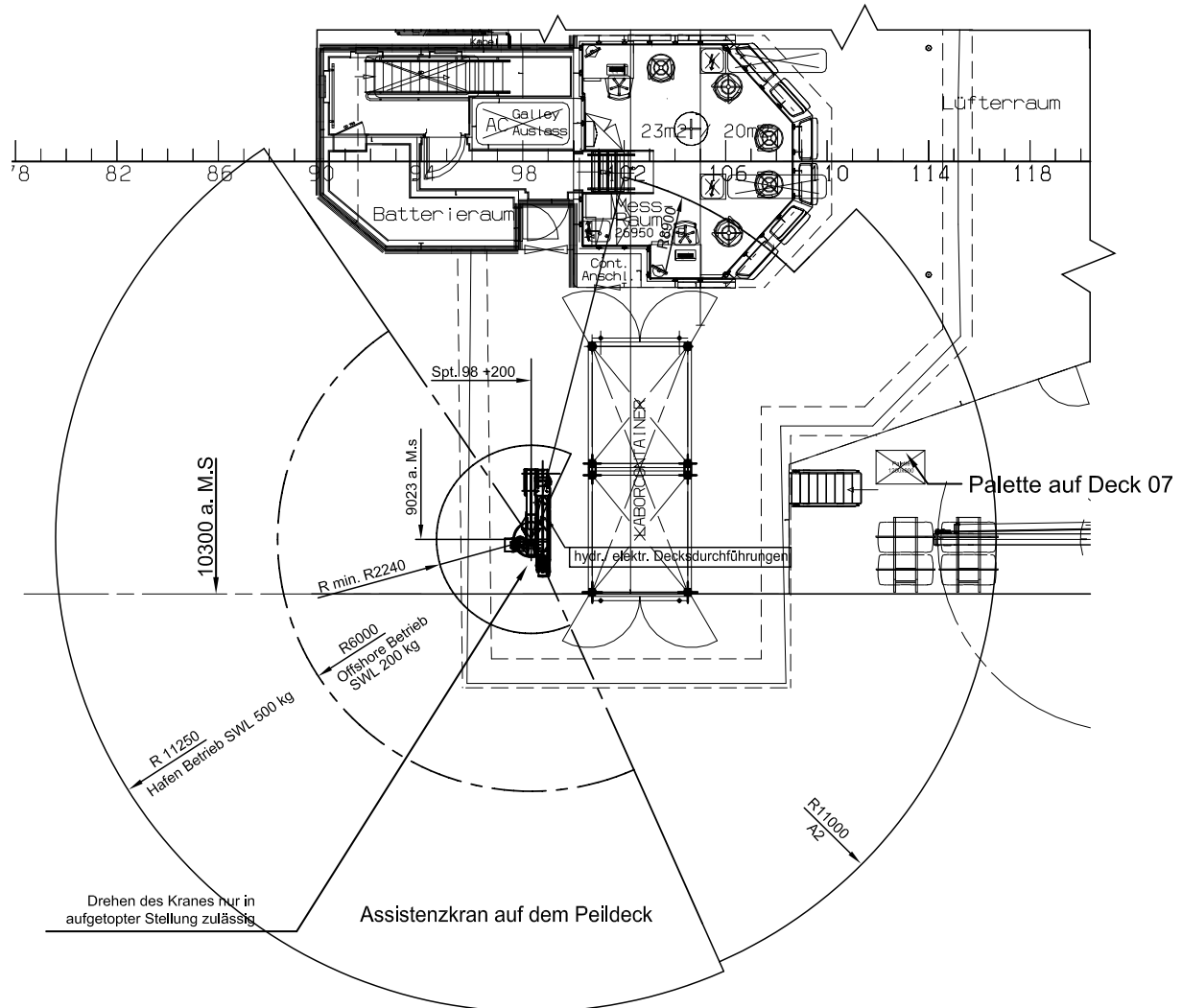


6. Hoisting equipment
 6.2. Assistant Cranes

57

Draufsicht Deck 9

26138 ü.B.



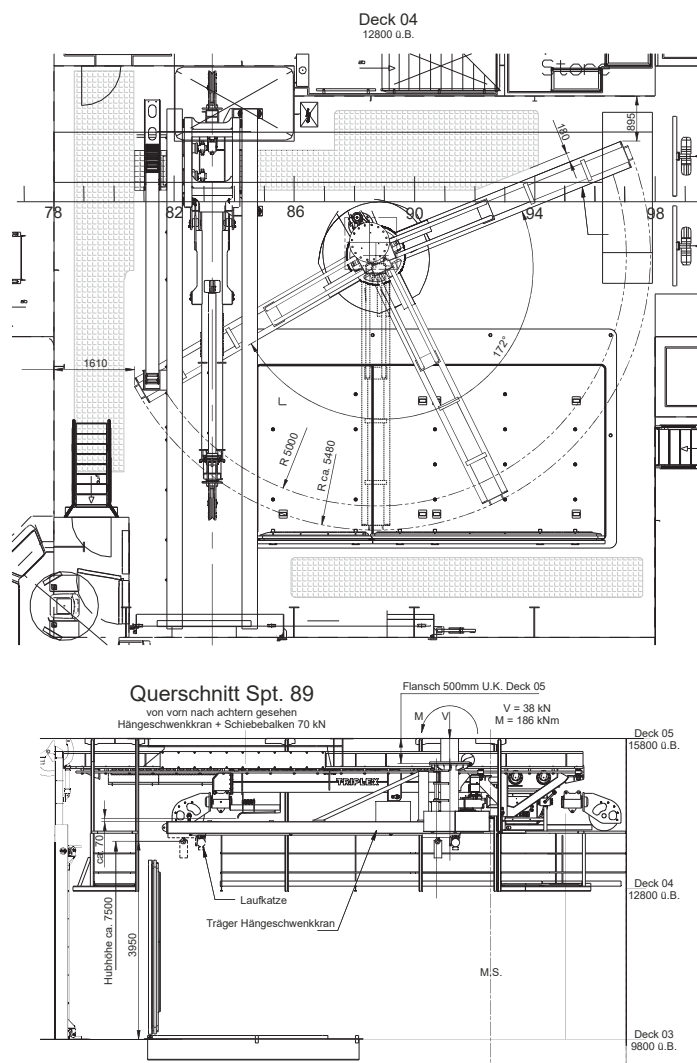


6.2.4. Hangar-hanging jib crane

6.2.4.1. Technical Data

Operation	Radio remote, Emergency directly control
Drive	electric
Crane type	GL crane type A
Heel / trim	10° / 3°
Significant wave height 2 meter (SWH) to H $\frac{1}{3}$	2,0 m
Workig load SWL	1,5 t
max. reach	5,0 m
min. reach	ca. 0,5 m
Lifting speed	4 m/min
Lifting height	7,5 m
Turning speed	0,26 1/min
Turning range	172°

6.2.4.2. Arrangement and Outreach





6. Hoisting equipment
6.3. Hoisting Equipment for scientific puposes

59

6.3. Hoisting Equipment for scientific puposes

6.3.1. Sliding Beam 70kN

6.3.1.1. Technical Data - according to data sheets hoists REV. 4

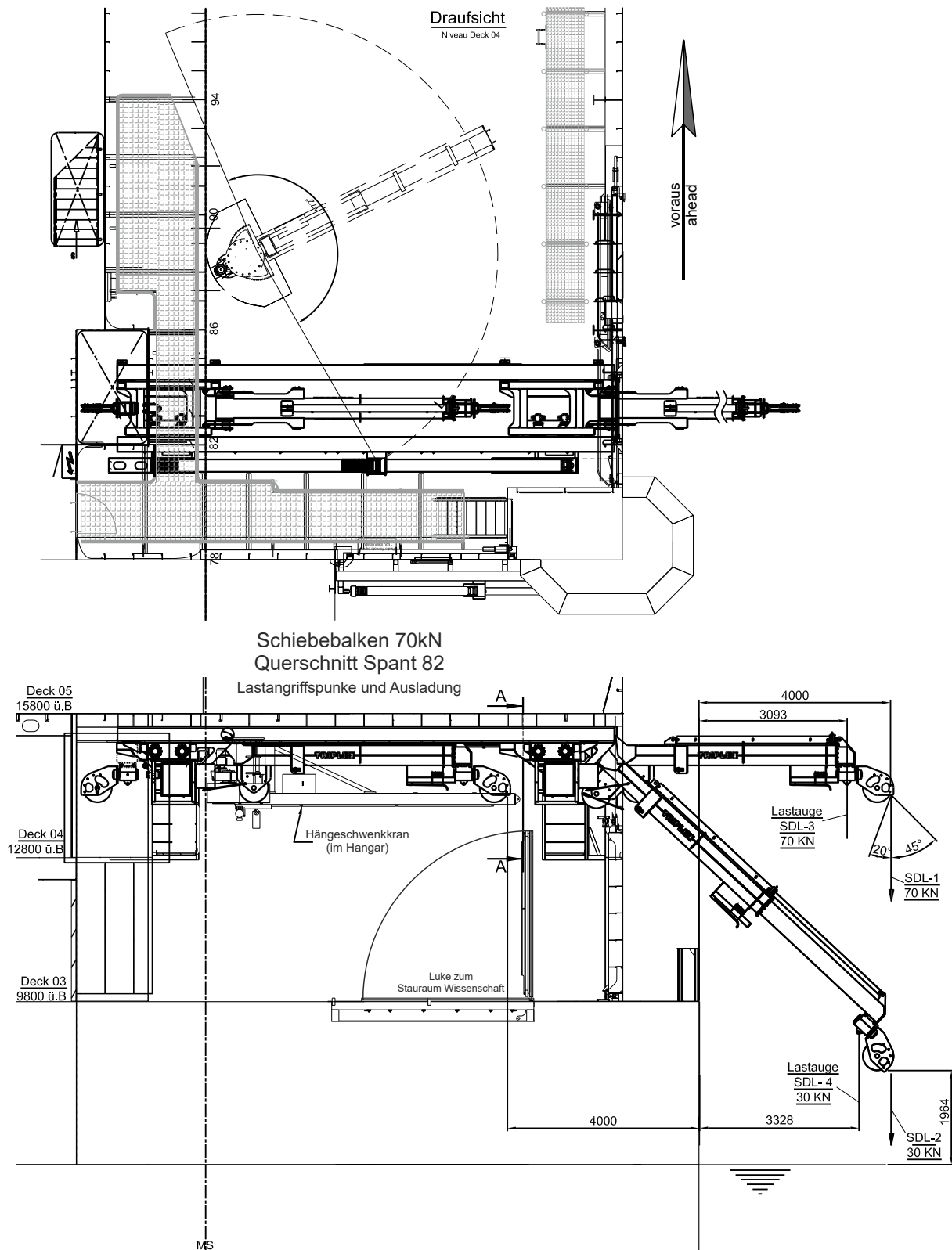
Drive	hydraulic
Operation	Radio remote and from the central control station
Breaking strength of the rope used	max. 70 kN
SDL 1 when extended, horizontal position	70 KN
SDL 3 when extended, horizontal position load eye	70 KN
SDL lowered 2 telescopic jib, about 45 °	30 KN
SDL lowered 4 telescopic jib, load eye about 45 °	30 KN
Perm. Rope diameter coming from the cable winch	11 mm cable
Perm. Rope diameter coming from the series winch	8 mm cable
max reach	4,0 m outboard
min. reach	4,0 m inboard
Track car speed - Extend	0-11m/min
Luffing time / Buckling time	35/ 30 s
Telescoping time out / in	45 /40 s
Telescopic jib	lowered to 1.96 m above the water line



6. Hoisting equipment
6.3. Hoisting Equipment for scientific puposes

60

6.3.1.2. Views and Outreach



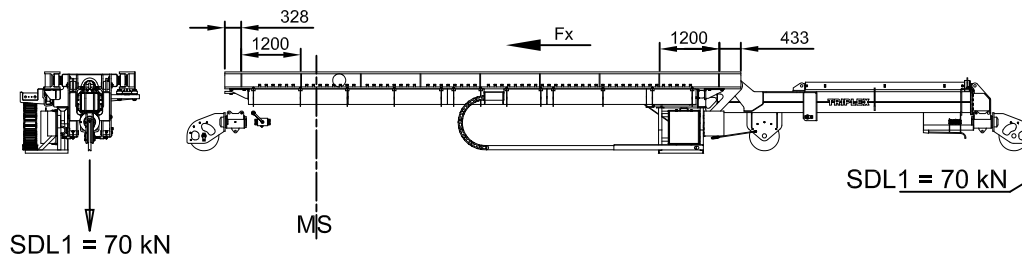


6. Hoisting equipment
6.3. Hoisting Equipment for scientific puposes

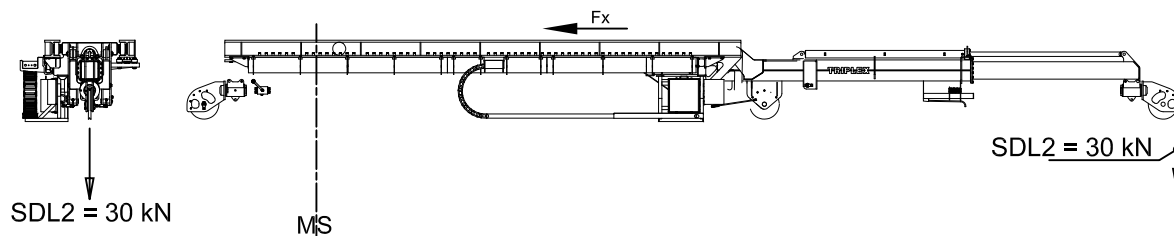
61

6.3.1.3. Working positions

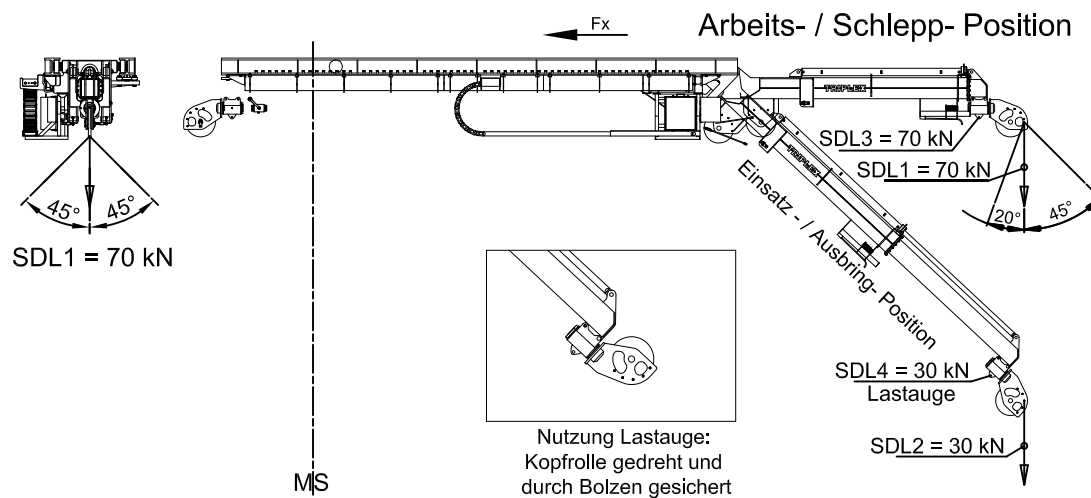
ARBEITSPOSITION ausgefahren



MAX. AUSTELESKOPIERTE POSITION



Arbeits- / Schlepp- Position





6. Hoisting equipment
6.3. Hoisting Equipment for scientific purposes

62

6.3.2. Sliding Beams 250kN

6.3.2.1. Technica Data Sliding Beams 250 kN

Drive	hydraulic 16t winch for crane operation 10 t winch assistant
Operation	Radio remote and from the central control station

6.3.2.2. Operating case I: Working as a crane with SWL 16t

Crane type	GL crane type A, Interpretation by crane type B	
Heel / trim	10° / 3°	port and offshore operation
Capacity SWL	160 kN	port operations
	100 kN	offshore operation
Significant wave height (SWH) of H $\frac{1}{3}$	2,0 m	offshore operation
max. reach	ca. 20,5 m	
min. reach	ca. 9,7 m	
Lifting speed	0 ... 30 m/min	
Swing speed	0 ... 1,0 1/min	
Lifting boom up / down	60s / 50s	
Telescoping time out / in	50s / 30s	
Lifting jib up / down	35s / 25s	
environmental conditions	-20°C / +45°C	
rotation range	90° (40° abaft / 50° ahead)	
hook height	about 15 m above the main deck	
Cable length 16t winch	100 m (maximum three layers)	
max. Cable speed at half the nominal tensile	0 ... 30 m/min	

**6.3.2.3. Operating Case II: Working as sliding beam
up to rope breaking strength of 250 kN SDL; Beam resting on foundation**

diagonal pull	45 ° from vertical
Breaking strength of the rope used (SDL)	max. 250 kN
Permissible cable diameter of the single core winch I / II	11 mm cable (Hybrid / coax / fiber)
Permissible cable diameter of traction winch I / II	18 mm wire
	18 mm Hybrid / coax / fiber
Permissible cable diameter coming from the serial winchs	8 mm wire
max. reach	3,0 m outboard
min. reach	4,0 m inboard
Telescoping speed up to 250 kN	0 ... 10 m/min
Telescoping speed up to 250 kN	0 ... 15 m /min
Spherical roller head (+/- 90 ° tilt)	hydraulic motor, adapted to the rope course
Lower edge caster telescopic beam	min. 5,3 m above the working deck
10 t winch assistance P3	hydraulically, increased board plate for chains and shackles
capacity	50 m (max. 2-ply)
Rope speed 1st layer	0 ... 30 m/min

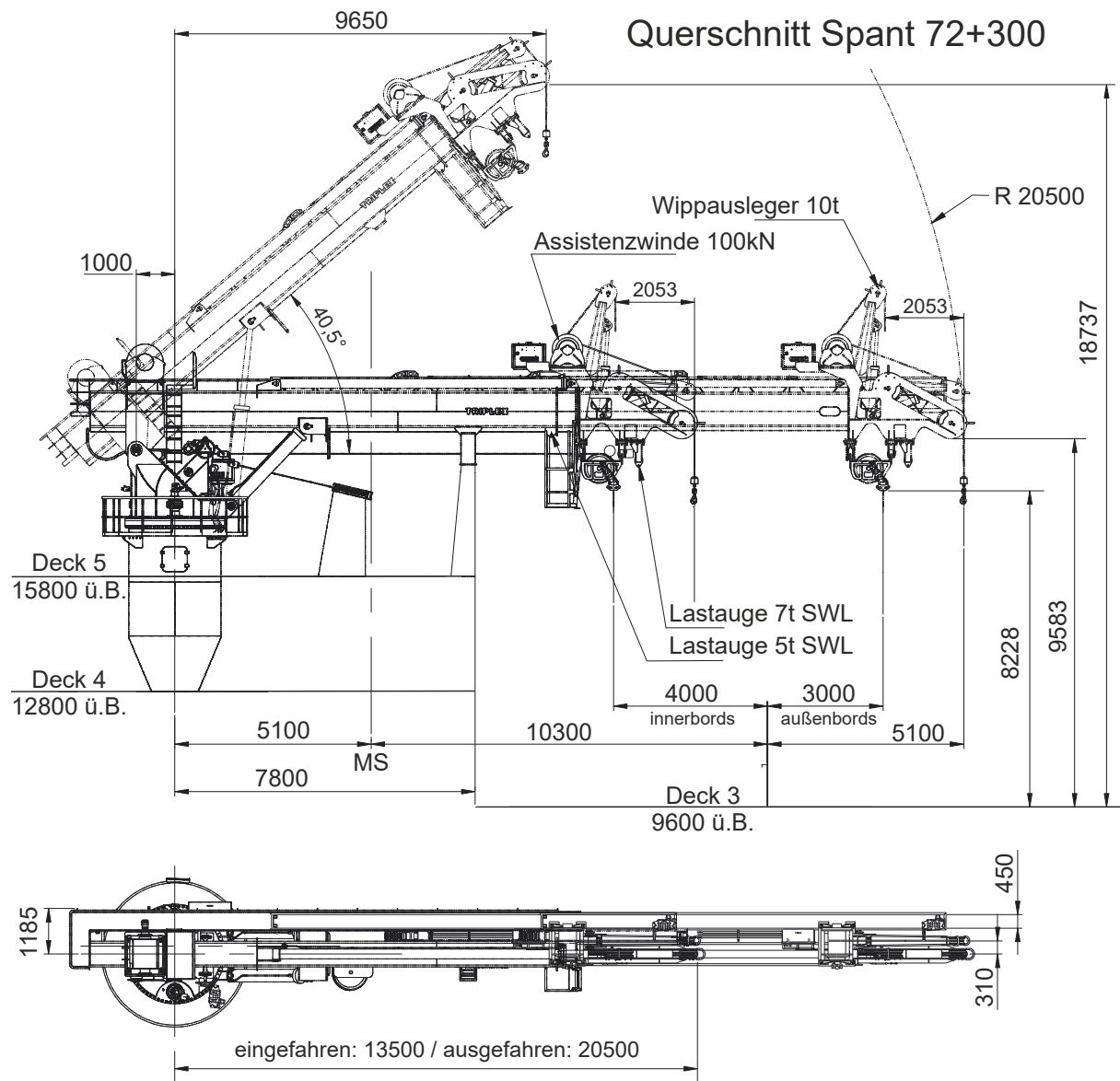


6. Hoisting equipment

6.3. Hoisting Equipment for scientific purposes

63

6.3.2.4. Views, Outreach and Load Limits



Note:

Since the shipyard lay time 2017 in Emden, it is now possible by modification of the deflection block in the same way as RV "Maria S. Merian", to change quickly and safely between 18mm working wire and 18mm fiber optic wire.

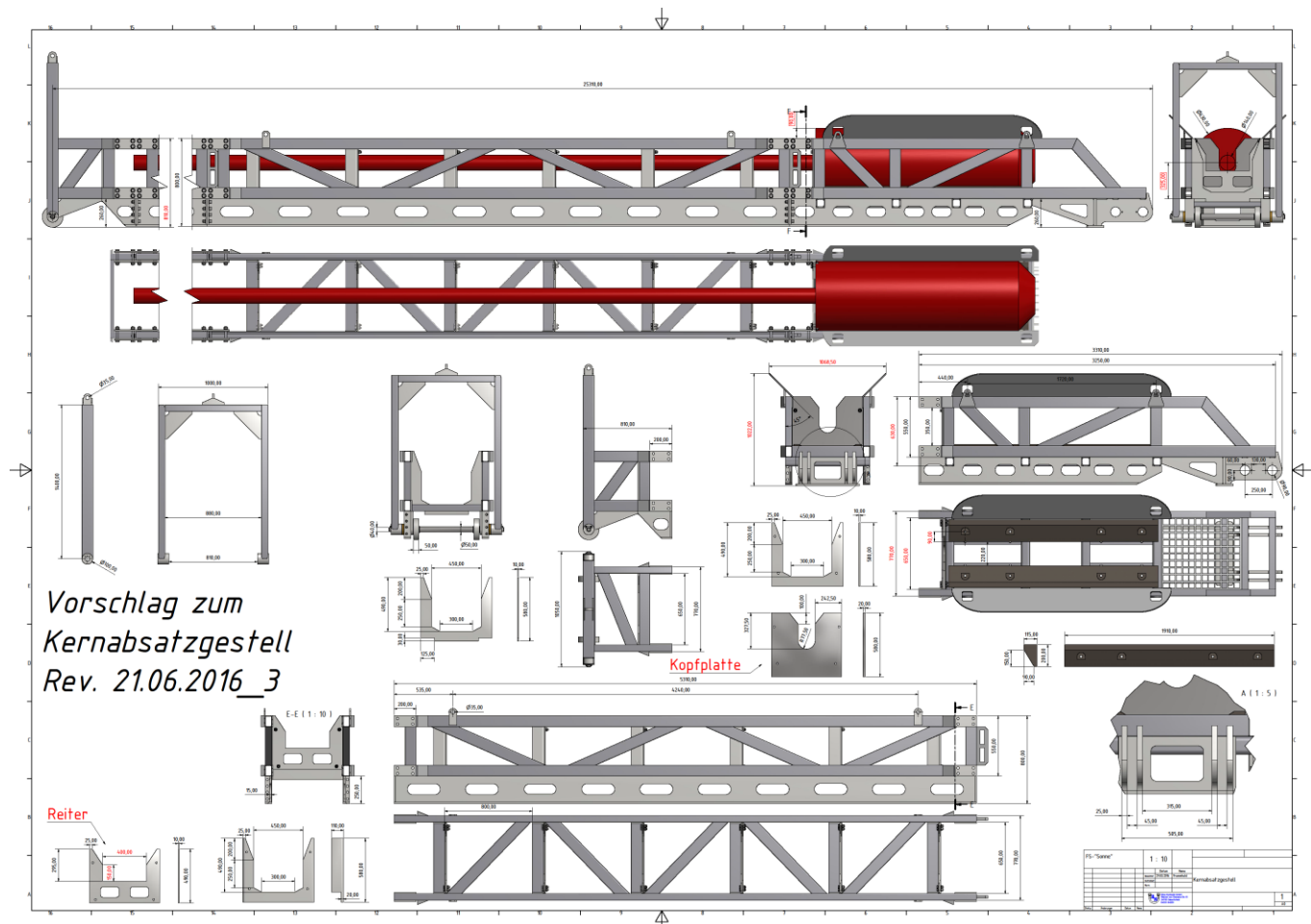


6.4. Core pipe handler

6.4.1. Technical Data

Drive	hydraulic
Operation	Radio remote and from the central control station
Crane type	A
Capacity remove unit SDL 1	100 kN
max. Equipment load in a vertical position SDL 2	180 kN
max reach	1,92 m outboard
min. reach	2,08 m inboard
Lifting time up / down	25 / 30 s
Driving time retract / extend	50 / 55 s
Lifting height	1,24 m
Angle during lifting	53°
Heel / trim	10° / 3°
Signifikante wave height swH H1 / 3	2.0 m

6.4.2. Sketch of the modified frame

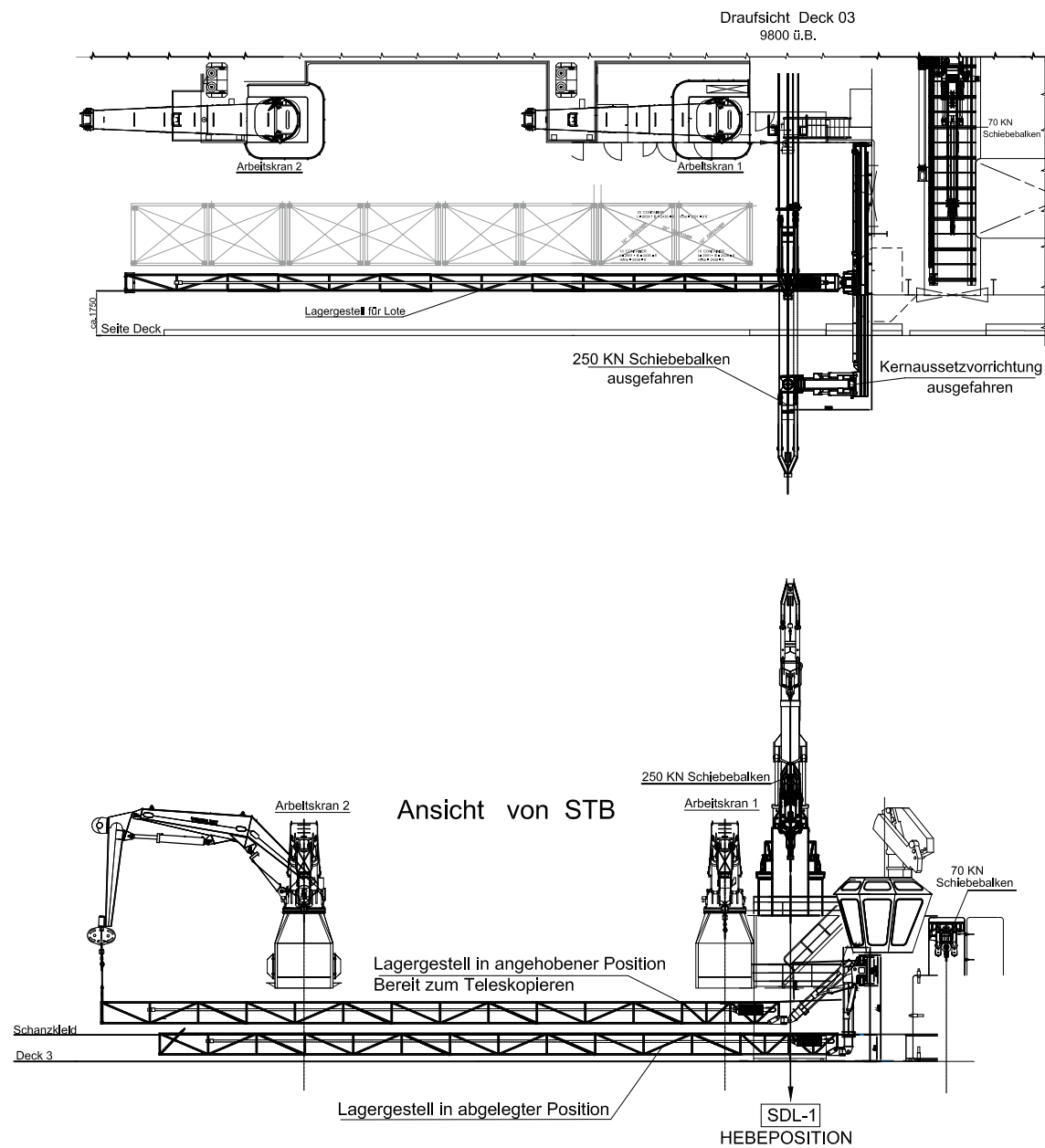


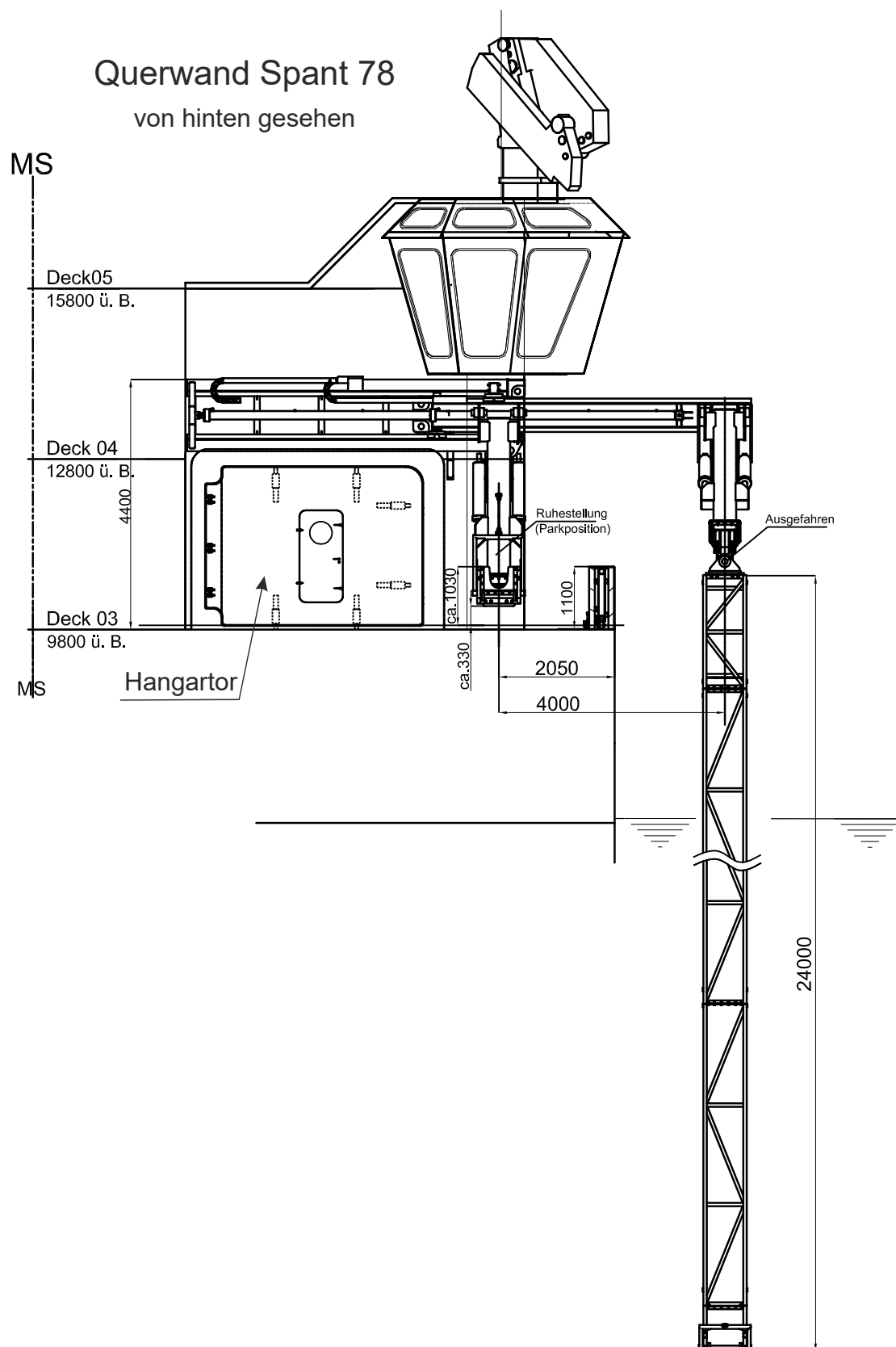


6. Hoisting equipment
6.4. Core pipe handler

65

6.4.3. Stowage and Working Position(s)







6. Hoisting equipment
 6.5.A-Frame

67

6.5. A-Frame

Auxiliary winches at crosshead:

5t auxiliary winch 2 pieces

10t auxiliary winch 1 piece

6.5.1. Operating Case I: 30t SWL on center cross head without lateral forces

<u>Crane type</u>	A, Interpretation by Crane type B
Heel / trim	10° / 3°
Signifikante wave height swl 1/3	2 m
Capacity	30t (180° Wrap the block possible)
<u>Reach</u>	
max. stretched	7,5 m outboard at -40° Tilt Angle footer
max. Jib 78 ° lowered	9,0 m outboard at -40° Tilt Angle footer
min.	12,5 m inboard at 64° Tilt Angle footer
<u>Working speed</u>	both movements one by one (combined with reduced speed)
Footer	Rotation time 104° 120 s
Telescopic jib	Rotation time 78° 90 s

**6.5.2. Operating Case II: 10t SWL on center cross head
 Launch and recovery tow bodies**

<u>Crane type</u>	A, Interpretation by Crane type B
Heel / trim	10° / 3°
Signifikante wave height swl 1/3	2 m
Capacity SWL	max. 10t
<u>10t Winch</u>	hydraulic drive
Speed 1st layer	0 ... 42 m/min
max. speed with SWL / 2	59 m/min
Capacity	60 m
Driving power	90 kW, 25% ED
<u>Reach</u>	
max. stretched	7,5 m outboard at -40° Tilt Angle Footer
max. Jib 78 ° lowered	9,0 m outboard at -40° Tilt Angle Footer
min.	12,5 m inboard at 64° Tilt Angle Footer
<u>Working speed</u>	both movements one by one (combined with reduced speed)
Footer	Rotation time 104° 120 s
Telescopic jib	Rotation time 78° 90 s



6.5.3. Operating Case III SWL 10t lifted by auxiliary winches at crosshead

<u>Crane type</u>		A, Interpretation by Crane type B
Heel / trim		10° / 3°
Signifikante wave height swh 1/3		2 m
Capacity SWL		max. 10t (lifted by 10 t winch or winch 2x5t)
<u>Winches</u>		
5t Winch		hydraulic drive
Speed 1st layer		0 ... 15 m/min
max. Speed atSWL/2		30 m/min
Capacity		40 m drum in two layers
Driving power		15 kW
10t Winche		hydraulic drive
Speed 1st layer		0 ... 42 m/min
max. Speed atSWL/2		59 m/min
Capacity		60 m
Driving power		90 kW, 25% ED
<u>Reach</u>		
max. stretched		7,5 m outboard at -40° Tilt Angle Footer
max. Jib 78 ° lowered		9,0 m outboard at -40° Tilt Angle Footer
min.		12,5 m inboard at 64° Tilt Angle Footer
<u>Working speed</u>		both movements one by one (combined with reduced speed)
Footer	Rotation time 104°	120 s
Telescopic jib	Rotation time 78°	90 s



6. Hoisting equipment

6.5.A-Frame

69

**6.5.4. Operating Case IV: Hole strip for attachment of additional blocks and shackles
 SWL each hole max. 30t or max. 10t; Pivot lug on the footer and jib 10t SWL
 each hole**

<u>Crane type</u>	A, Interpretation by Crane type B
Heel / trim	10° / 3°
Signifikante wave height swh 1/3	2 m
<u>Hole strip 5 – 30t</u>	
Capacity SWL	30t each hole
permissible load	max. 30t distributed crosshead
<u>Hole strip 10t</u>	
Capacity SWL	10t each hole
permissible load	max. 10t distributed crosshead
<u>Pivot lug</u>	
Capacity SWL	10t each hole
permissible load	max. 30t distributed crosshead
Concomitant use of holes in the hole strip at crosshead and pivot eye is only possible while maintaining a defined load combination	
<u>Reach</u>	
max. stretched	7,5 m outboard at -40° Tilt Angle Footer
max. Jib 78 ° lowered	9,0 m outboard at -40° Tilt Angle Footer
min.	12,5 m inboard at 64° Tilt Angle Footer
<u>Working speed</u>	both movements one by one (combined with reduced speed)
Footer	Rotation time 104° 120 s
Telescopic jib	Rotation time 78° 90 s

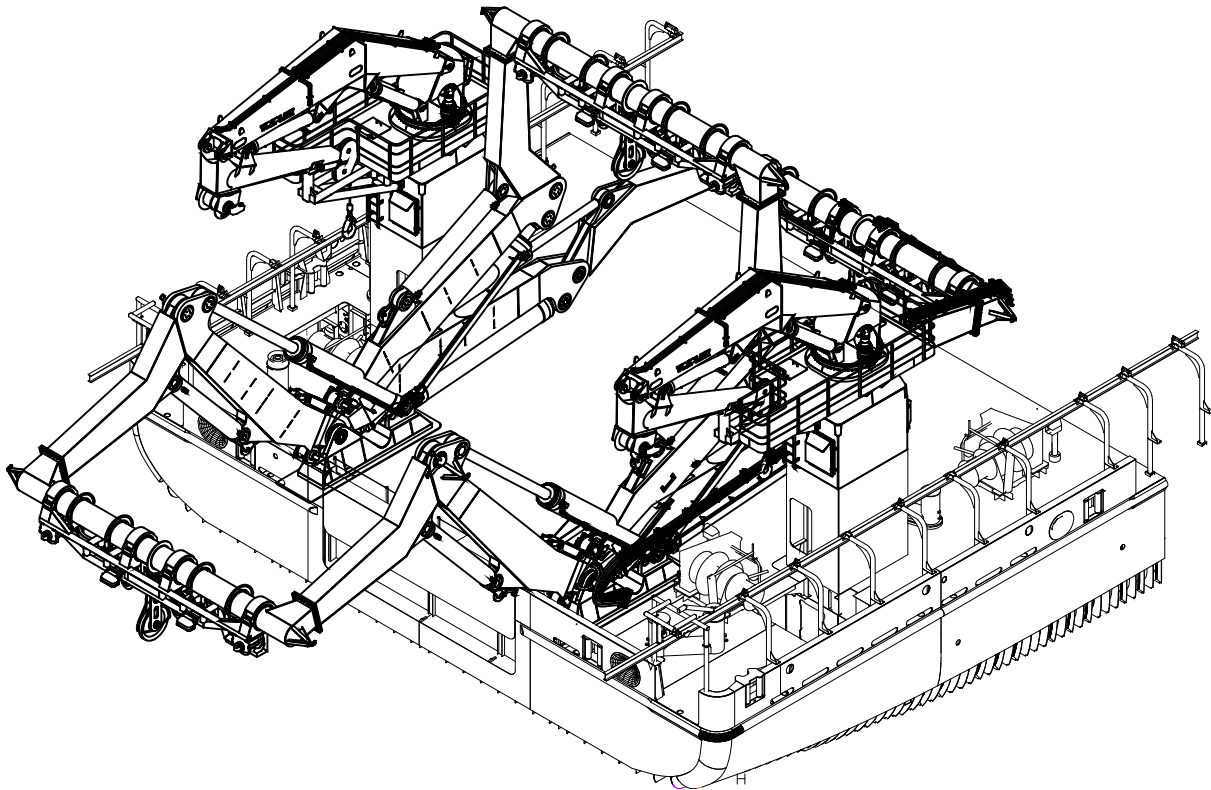
**6.5.5. Operating Case V: Towing winches case research
 (fixed or foreign); Rope comes from working winch in the winch room or winch
 stands on deck amidships**

Breaking strength of the rope used (SDL)	max. 300 kN
exit angle	22,5° horizontally from amidships to port and starboard 45° from vertical
angle of arrival	± 4° from the winch room as well as container position on amidships with full width
<u>Reach</u>	
max. stretched	7,5 m outboard at -40° Tilt Angle Footer
max. Jib 78 ° lowered	9,0 m outboard at -40° Tilt Angle Footer
min.	12,5 m inboard at 64° Tilt Angle Footer
<u>Working speed</u>	both movements one by one (combined with reduced speed)
Footer	Rotation time 104° 120 s
Telescopic jib	Rotation time 78° 90 s

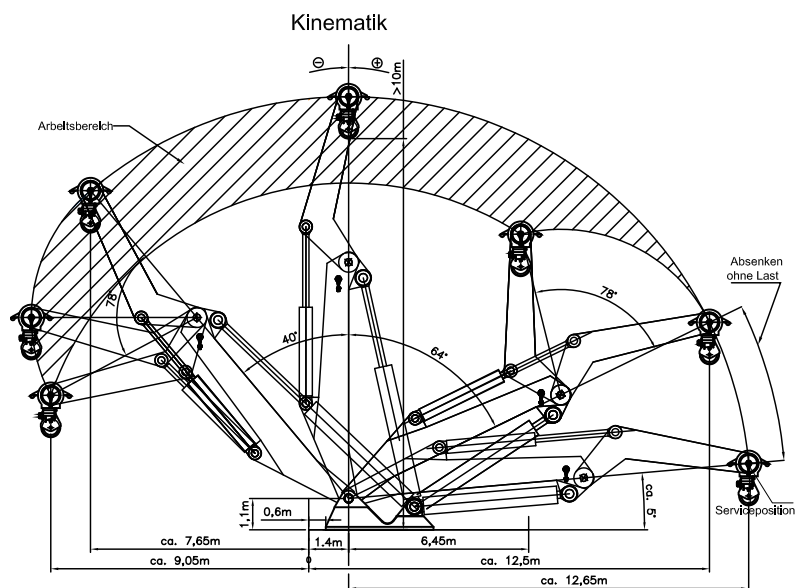


6.5.6. 3D-View Working Positions

Ansicht Achterdeck
 Isometrie



6.5.7. Working Positions and Outreaches

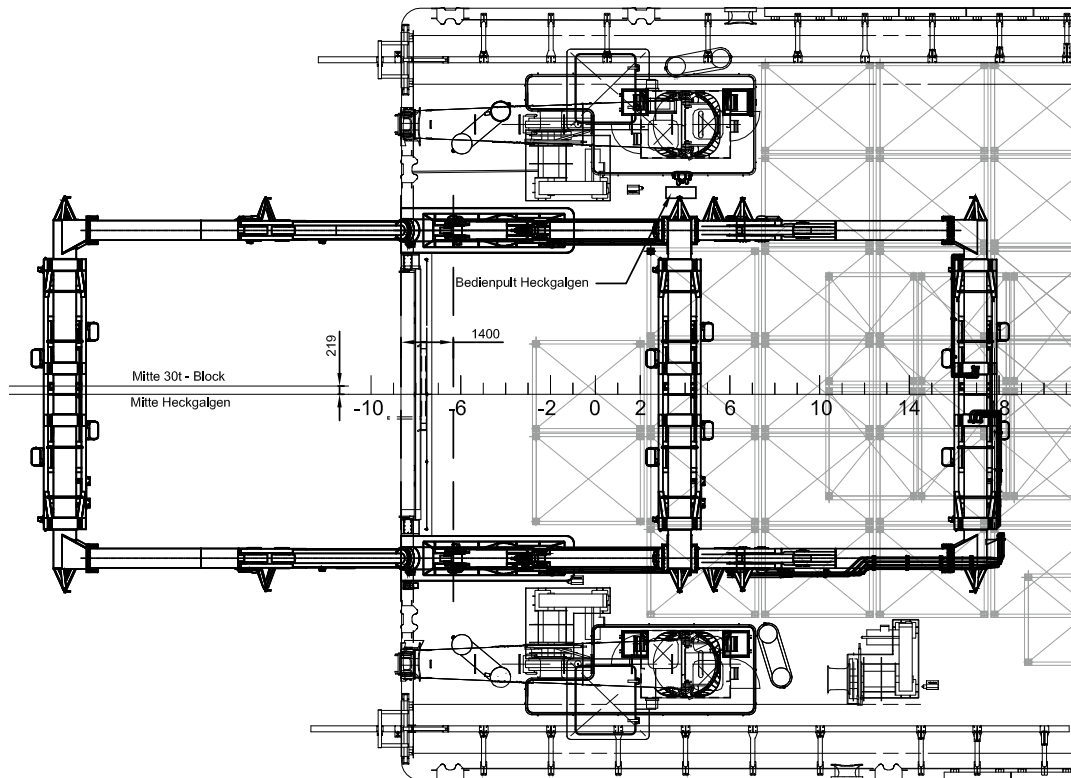




6. Hoisting equipment
 6.5.A-Frame

71

Draufsicht - Deck 3
 9800 über Basis



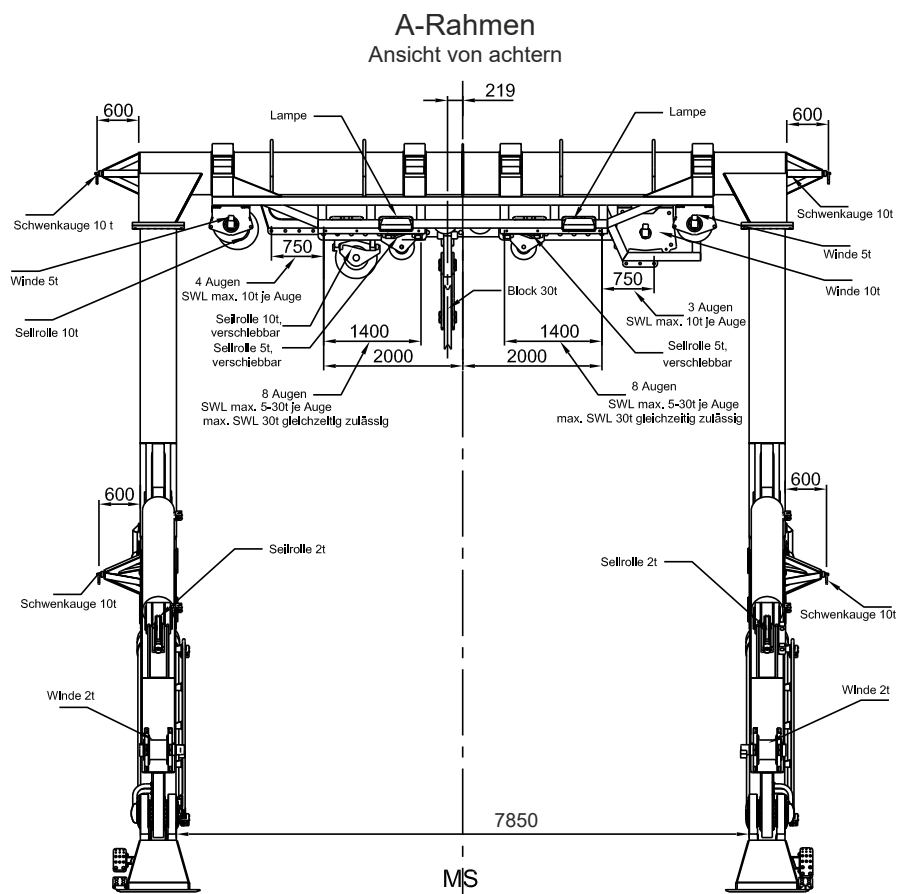


6. Hoisting equipment

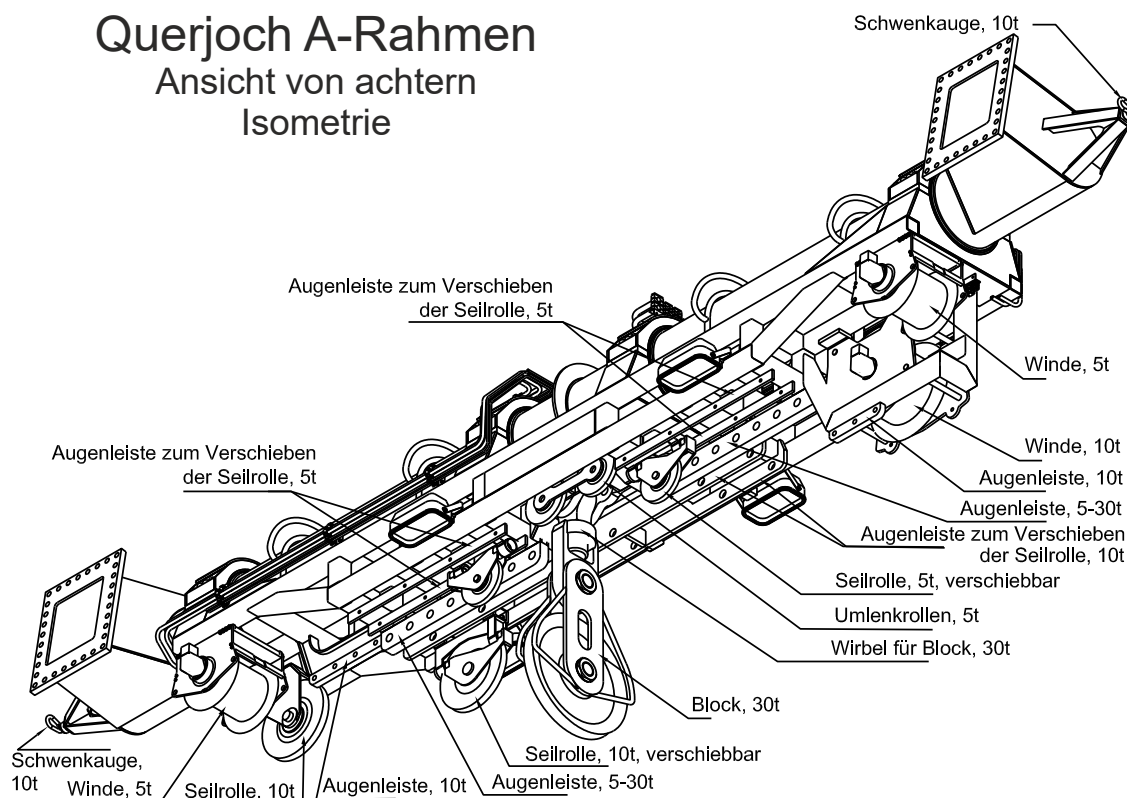
6.5.A-Frame

72

6.5.8. View Crosshead



6.5.8.1. Detailed View Crosshead





7.2. Scientific winches

7.2.1. Single-core cable winches I

- Cable drum for single core coaxial and hybrid fiber optic cable 11 mm, usable cable length 8000 m
- Measuring current transformers (2-pole and 2x optical)
- Nominal traction and speed approx mittlere Seillage: 30 kN / 0- 120 m/min

7.2.2. Single-core cable winches II

- Cable drum for single core coaxial and hybrid fiber optic cable 11 mm, usable cable length 5700 m
- Measuring current transformers (2-pole and 2x optical)
- Nominal traction and speed approx mittlere Seillage: 30 kN / 0- 120 m/min

7.2.3. Storage winch I

- Cable drum for 18 mm wire or 18 mm hybrid fiber, usable cable length 12000 m
- Nominal traction and speed approx 2.Seillage: 20 kN / 0- 120 m/min
- Measuring current transformers (3-pole and 2x optical)

7.2.4. Storage winch II

- Cable drum for 18 mm wire or 18 mm hybrid fiber, usable cable length 12000 m
- Nominal traction and speed approx 2.Seillage: 20 kN / 0- 120 m/min
- Measuring current transformers (3-pole and 2x optical)

7.2.5. Friction winch I for 18mm rope

- 2 Friction drums, 1x6 and 1x7 rope grooves rope grooves for 18 mm ropes
- Groove base diameter 900 mm for cable Ø 18 mm
- Nominal tensile force / velocity 150 kN / 0 – 120 m / min,
- Short-time operation to 90% rope breaking load.
- Deflection block with hydraulically driven pressure roller for rope slack prevention and measuring device for cable length, cable speed and line pull
- Hydraulically operated clamping device for compensating About moments between friction and storage winches
- Alternative operation with the storage winch I and II is easy and simple.

7.2.6. Friction winch II for 18mm rope

- 2 Friction drums, 1x6 and 1x7 rope grooves rope grooves for 18 mm ropes
- Groove base diameter 900 mm for cable Ø 18 mm
- Nominal tensile force / velocity 150 kN / 0 – 120 m / min,
- Short-time operation to 90% rope breaking load.
- Deflection block with hydraulically driven pressure roller for rope slack prevention and measuring device for cable length, cable speed and line pull
- Hydraulically operated clamping device for compensating About moments between friction and storage winches
- Alternative operation with the storage winch I and II is easy and simple.



7. Scientific winches

7.2. Scientific winches

75

7.2.7. Serial winch

- Cable drum for series wire 8 mm, effective length 6000 m
- Nominal traction and speed approxmittlere Seillage: 30 kN / 0- 120 m/min

7.2.8. Stroke compensation / cable run

The stroke compensation for the 18 mm cable / wire is made with the friction winch, shaft balancing beträt than ± 3 m.

The cable outlet is either via the A-frame or slide bar 250 kN.

7.2.9. Tuckerwinch Sliding beam 250 kN

- Max. 100 kN
- Drum for 50 Meter wire in maximum 2 LayersPulser
- 0 – 30 m/min

7.2.10. Pulserwinches

- Drum for wire 16 mm; 50 Meter
- 22 kN tension 1. Layer by 20 m/min
- 11 kN tension 1. Layer by 40 m/min
- Holding power 33 kN

7.2.11. A-Frame

- SWL 30 t bis 2000 mm from midships right and left
- SWL 10 t von 2000 mm to 2750 mm from midships right and left
- Swivel eyes SWL 10 t

7.2.12. A-Frame winches

- | | |
|----------|---|
| 1x 10 t: | <ul style="list-style-type: none">- Synthetic fiber 28 mm- 50 Meter- 0 to 42 m/min |
| 2x 5 t: | <ul style="list-style-type: none">- Synthetic fiber 20 mm- each 60 Meter- 0 to 30 m/min |
| 2x 2 t: | <ul style="list-style-type: none">- Synthetic fiber 12 mm- each 40 Meter- 0 to 40 m/min |



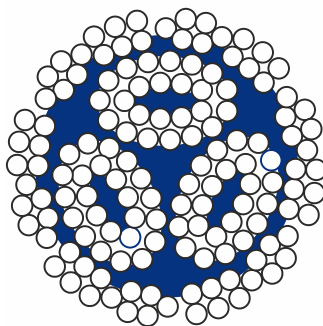
7.3. Cable and Wire

7.3.1. Deep Sea Working wire 18 mm

Manufacturer: Pfeifer Drako
Drahtseilerei Gustav Kocks GmbH & Co
D-45479 Mülheim an der Ruhr
<http://www.drako.de>

PFEIFER DRAKO

DRAKOFLEX

	
Seildurchmesser	8 - 22 mm
Gesamtzahl der Drähte	144
Gesamtanzahl der Litzen	15
Anzahl der Außenlitzen	12
Anzahl der tragenden Drähte in den Außenlitzen	72
Charakterisierung	Hochflexibles, nahezu drehungsfreies Seil für besondere Einsätze. Schlagart: Gleichschlag
Einsatzgebiete	Freileitungsbau (Einziehseil), Forschungsschiffe (Tiefseesondenseil), Hafen-Umschlagkrane (Hubseil), Turmdrehkrane (Hubseil).
Anwendungshinweise	Abschnitt „Seilauflegen“ besonders beachten!

Bestimmung der Adegereife nach DIN 15020 BL 2

Seil-Nenn-Ø -0 + 5%	Gewicht	Mindestbruchkraft	
		bei einer Nennfestigkeit der Drähte von 1770 N/mm ²	1960 N/mm ²
mm	kg/100 m	kN	kN
8	26	42,7	47,4
10	37	61,5	68,1
11	44	72,5	80,0
12	58	96,4	107
13	63	102	114
14	75	124	137
15	85	139	153
16	94	154	171
18	126	207	229
20	150	247	272
22	176	289	320

DRAKOFLEX - 11/04



7.3.2. Deep Sea 18 mm Fiber-Coaxial Cable

Manufacturer: Rochester Wire and Cable, LLC
751 Old Brandy Rd, Culpeper, VA 22701, USA
<http://www.rochestercables.com>

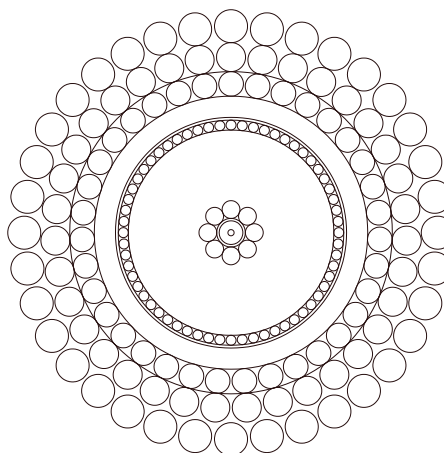
Model: Dataline A303717

751 Old Brandy Road
Culpeper, Virginia 22701

Tele: 540 825-2111
Fax: 540 825-2238

DATALINE

Description	Inch	mm
<u>OPTIC WAVEGUIDE</u>		
Fbr: 8.3/125/250 Tm SMF	0.010	0.25
Bfrr: Hytrel®	0.038	0.97
Belt:: Nylon	0.046	1.17
<u>CONDUCTOR</u>		
8/0.0285" (3.29 mm ²) HD Cu	0.103	2.62
<u>INSULATION</u>		
LDPE	0.330	8.38
<u>RETURN</u>		
60/0.0159" (7.69 mm ²) HD Cu	0.362	9.19
Tape: Cu/Poly	0.371	9.42
<u>BELT</u>		
HDPE	0.439	11.15
<u>STRENGTH MEMBER</u>		
Layer #1: 35/0.0395" GEIPS void filled and taped.	0.521	13.23
Layer #2: 35/0.0465" GEIPS	0.614	15.60
Layer #3: 36/0.053" GEIPS	0.720	18.29



Hytrel® is a registered trademark of DuPont.

PROPRIETARY; Use Pursuant to Company Instructions

 **Tyco Electronics** *The Rochester Corporation*

Instrumentation and Control Cable
Code: IM0030373PO00

Date	Page	Revision	Part No.
06/23/2009	1	G	A303717



PERFORMANCE CHARACTERISTICS

Nominal Values @ 20°C

Metric

English

PHYSICAL

Weight in Air	1,212 kg/km	814 lb/kft
Weight in Seawater	971 kg/km	653 lb/kft
Specific Gravity	5.0	5.0

MECHANICAL

Breaking Strength	213 kN	48,000 lbf
Working Load (@ 0.40% Strain ref.)	53 kN	12,000 lbf
Recommended Bend Radius	36 cm	14 in

ELECTRICAL

Voltage Rating	3,000 V	3,000 V
dc Resistance		
inner cdr	5.67 : /km	1.73 : /kft
outer cdr	2.56 : /km	0.78 : /kft
Insulation Resistance		
inner cdr - outer cdr	24,000 M: •km	80,000 M: •kft
outer cdr - armor	1,200 M: •km	4,000 M: •kft
Capacitance	105 pF/m	32 pF/ft
Characteristic Impedance		
@ 1 MHz	50 :	50 :
Attenuation		
@ 0.1 MHz	1.7 dB/km	0.5 dB/kft
@ 0.5 MHz	3.8 dB/km	1.2 dB/kft
@ 1.0 MHz	5.4 dB/km	1.6 dB/kft
@ 5.0 MHz	12.0 dB/km	3.7 dB/kft
@ 10.0 MHz	17.0 dB/km	5.2 dB/kft

OPTICAL

Attenuation Rate	
@ 1310 nm	0.45 dB/km
@ 1550 nm	0.30 dB/km

PROPRIETARY; Use Pursuant to Company Instructions

 **Tyco Electronics** *The Rochester Corporation*

Instrumentation and Control Cable
 Code: IM0030373PO00

Date	Page	Revision	Part No.
06/23/2009	2	G	A303717



7.3.3. 11mm Single-core coaxial cable

Manufacturer: Rochester Wire and Cable, LLC
751 Old Brandy Rd, Culpeper, VA 22701, USA
<http://www.rochestercables.com>

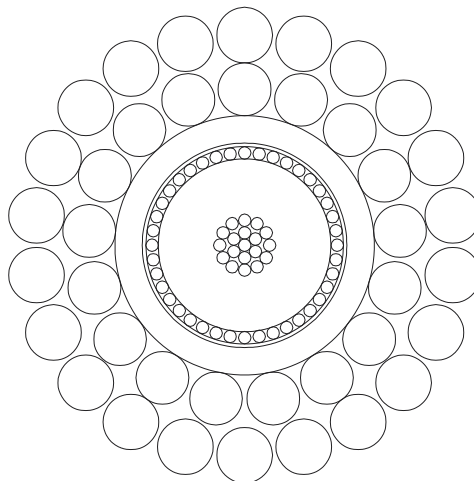
Model: Dataline A303613

751 Old Brandy Road
Culpeper, Virginia 22701

Tele: 540 825-2111
Fax: 540 825-2238

DATALINE 

Description	Inch	mm
<u>ELEMENT A: Coax</u>		
Cdr: #16 AWG (1.23 mm ²) Cu	0.054	1.37
Ins: EPC	0.157	3.99
Rtrn: #13 AWG (2.59 mm ²) Cu	0.179	4.55
Tape: Copper Polyester	0.186	4.72
Belt: EPC	0.236	5.99
<u>ARMOR</u>		
Layer #1: 17/0.048" GEIPS	0.332	8.43
Layer #2: 22/0.0505" GEIPS	0.433	11.00



PROPRIETARY; Use Pursuant to Company Instructions

 **Tyco Electronics** *The Rochester Corporation*

Signal Transmission Cable
Code: SC0010192CO00

Date	Page	Revision	Part No.
07/01/2010	1	N	A303613



PERFORMANCE CHARACTERISTICS

Nominal Values @ 20°C

Metric

English

PHYSICAL

Weight in Air	466 kg/km	313 lb/kft
Weight in Seawater	384 kg/km	258 lb/kft
Operating Temperature	-20°C to 90°C	-5°F to 200°F

MECHANICAL

Breaking Strength	85 kN	19,100 lbf
Working Load @ 0.4% Strain	21.3 kN	4,800 lbf
Torque Ratio	1.7	1.7
Recommended Bend Radius	23 cm	9 in
Minimum Bend Radius ¹	15 cm	6 in

ELECTRICAL

Voltage Rating	1,500 V	1,500 V
dc Resistance		
cdr	14.8 ? /km	4.5 ? /kft
return	7.6 ? /km	2.3 ? /kft
loop	22.4 ? /km	6.8 ? /kft
Insulation Resistance		
cdr - return	16,000 M? •km	55,000 M? •kft
return - armor	4,000 M? •km	13,000 M? •kft
Capacitance	115 pF/m	35 pF/ft
Characteristic Impedance @ 1 MHz	45 ?	45 ?
Attenuation		
@ 0.5 MHz	7.9 dB/km	2.4 dB/kft
@ 1.0 MHz	11.5 dB/km	3.5 dB/kft

¹The relationship between sheave diameter and cable diameter is a critical factor used to establish a product's fatigue resistance or relative serviceability. Operation over smaller than recommended diameters may adversely affect service life.

PROPRIETARY; Use Pursuant to Company Instructions



Signal Transmission Cable
Code: SC0010192CO00

Date	Page	Revision	Part No.
07/01/2010	2	N	A303613



7.3.4. Kevlarrope, 8mm



Werkszeugnis
nach EN 10 204 2.2

Empfänger: Briese Schifffahrts GmbH & Co. KG Abtlg. Forschungsschifffahrt
Hafenstraße 12
26789 Leer

Belegnummer: WZ15-0763

Auftrags-Nr. Empfänger: DBRBL00114905

Auftrags-Nr. Gleistein: V-AU15-1740

Lieferschein Gleistein: V-LI15-5896

Lieferdatum: 15.07.15

Liefermenge: 1 x 4.000 M

Seiltype: 689080333
GeoSpecial Technora® / Technora® 8 mm Ø
schwarz, umextrudierter Mantel

Werkstoff:

Prüfergebnis

Seilbruchkraft: 3.500 daN

Gewicht kg/100 m: 4,4 kg

Bemerkungen:

28777 Bremen, 15.07.15





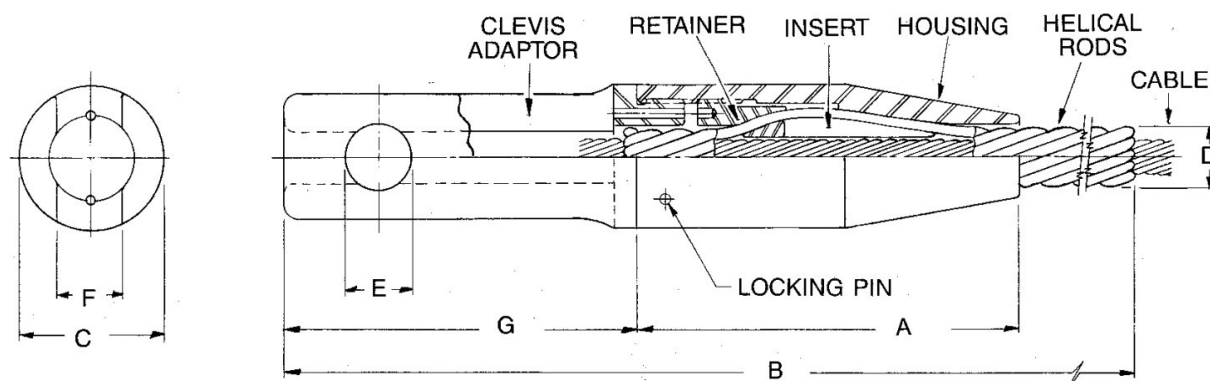
7.4. Mechanical, electrical and fiberoptical Termination

7.4.1. Mechanical Termination

The mechanical completion of the 11mm single core coaxial and hybrid fiber optic cable and the 18 mm hybrid fiber optic cable is a "EVER GRIP™ Termination"

Manufacturer: PMI INDUSTRIES, INC.
5300 St. Clair Avenue▪ Cleveland, Ohio 44103

<http://www.pmiind.com>



Cable	11 mm	18 mm
Model-No.	124	130
Rated Load (kN)	100,5	222,0
A (mm)	174,5	262,1
B (mm)	1041,4	1600,2
C (mm)	54,0	85,7
D (mm)	18,7	28,7
E (mm)	22,2	31,7
F (mm)	21,4	34,7
G (mm)	167,6	256,5

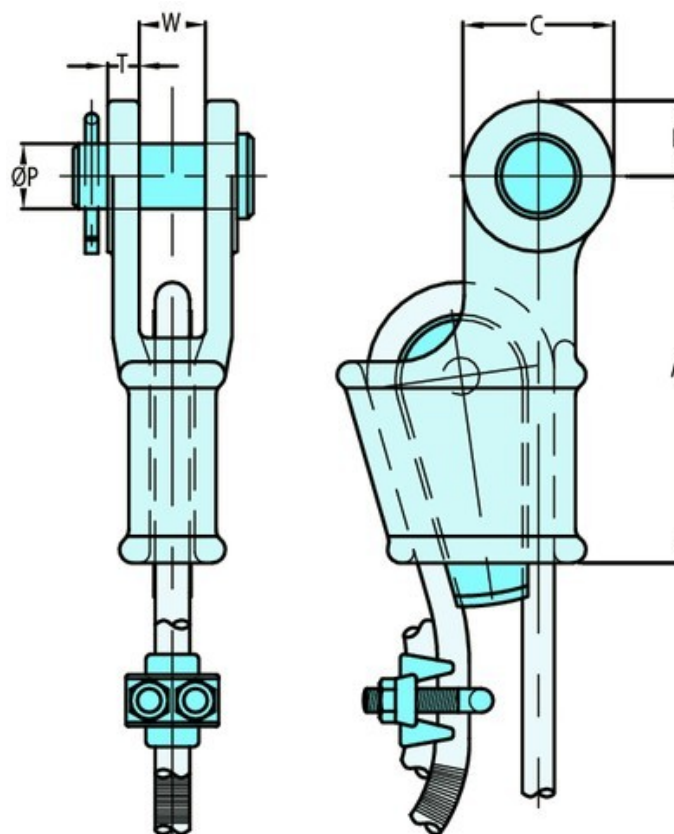


7. Scientific winches

7.4. Mechanical, electrical and fiberoptical Termination

83

The mechanical termination of the 18mm rope wire is a wedge end clamp of the company Crosby, Typ S-421WT



	A	B	C	P	T	W
mm	251	35,6	66,8	35,1	16,8	38,1
inch	9,88	1,40	2,63	1,38	0,66	1,50

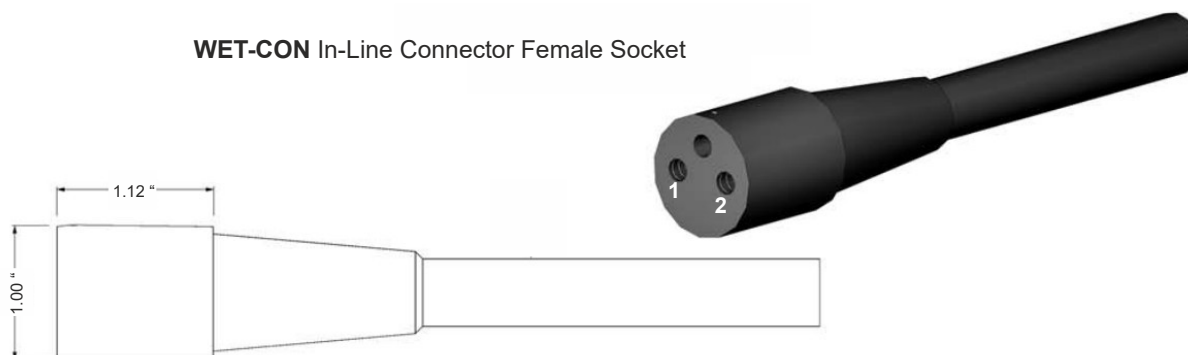


7.4.2. Single-core coaxial cable 11mm

The single-core coaxial cable 11mm will be completed on the "wet end" with the following underwater connector.

Manufacturer	SubConn Inc. http://www.macartney.com	
Model	Standard SUBCONN IL-2-F	
Pin assignment	1 black 2 white	Screen Coax (Masse) Center Coax

WET-CON In-Line Connector Female Socket





7.4.3. Fiber coaxial cable 18 mm

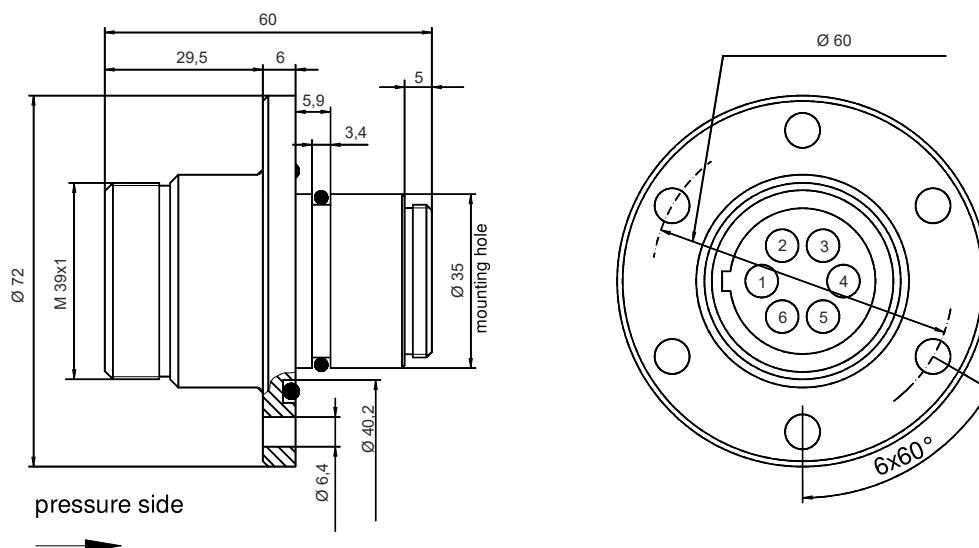
The hybrid fiber optic cable 18mm will be completed on the "wet end" with a "GISMA Underwater Connector Series 40".

Manufacturer GISMA Steckverbinder GmbH
<http://www.gisma-connectors.de>

Model Underwater Connector Series 40

Pin assignment	1 + 2	Center Coax
	3	optical fiber
	4 + 5	Screen Coax (Masse)
	6	nc

FLANGE RECEPTACLE



The connection between the cable and conclusion of the devices is via a corresponding patch cable.



7. Scientific winches

7.4. Mechanical, electrical and fiberoptical Termination

86

7.4.4. Laboratory connection

The electrical and fiber optic connection of the winches installed in the data center.

Electrical connection	7/16 connector (female) according to DIN 47223
Fiber optic connector	FC/PC connector

7/16 coaxial connector:

Impedance	50 Ohm
Inner contact	ø 7mm
External contact	ø 16mm
Contact-power	3 KVA

The electrical and optical fiber can be passed in the following laboratories:

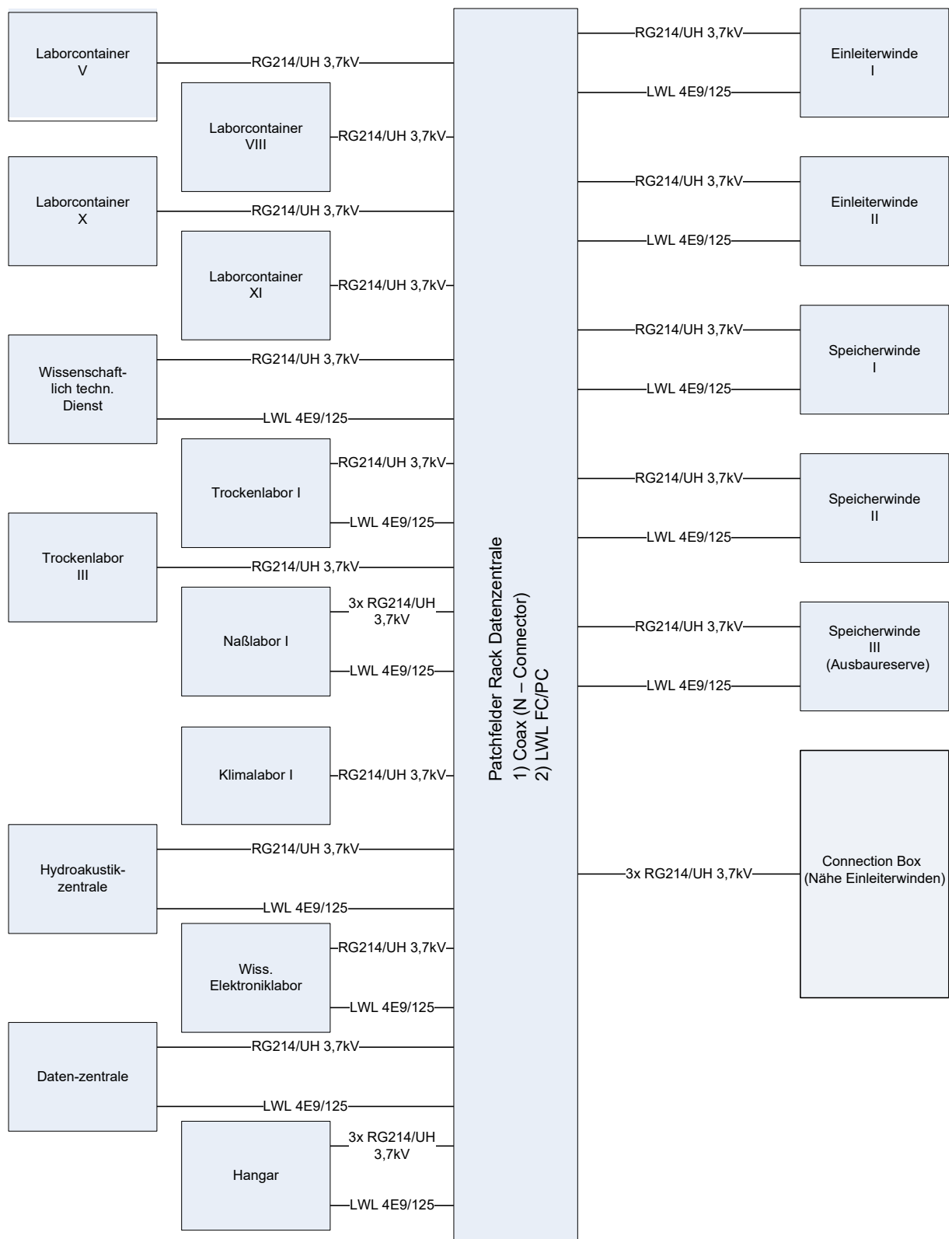
Overview scheme see next three pages!



7. Scientific winches

7.4. Mechanical, electrical and fiberoptical Termination

87

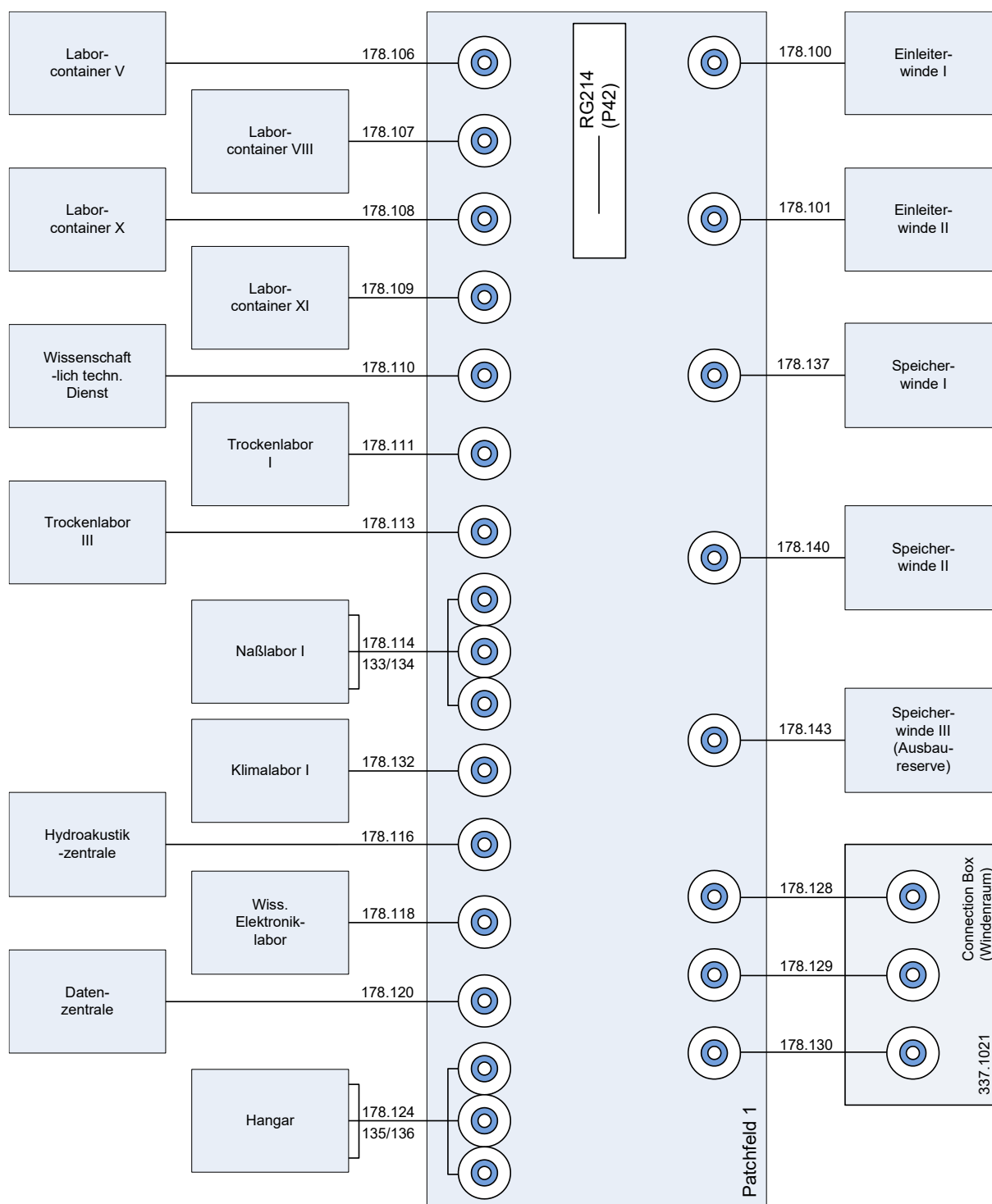




7. Scientific winches

7.4. Mechanical, electrical and fiberoptic Termination

88

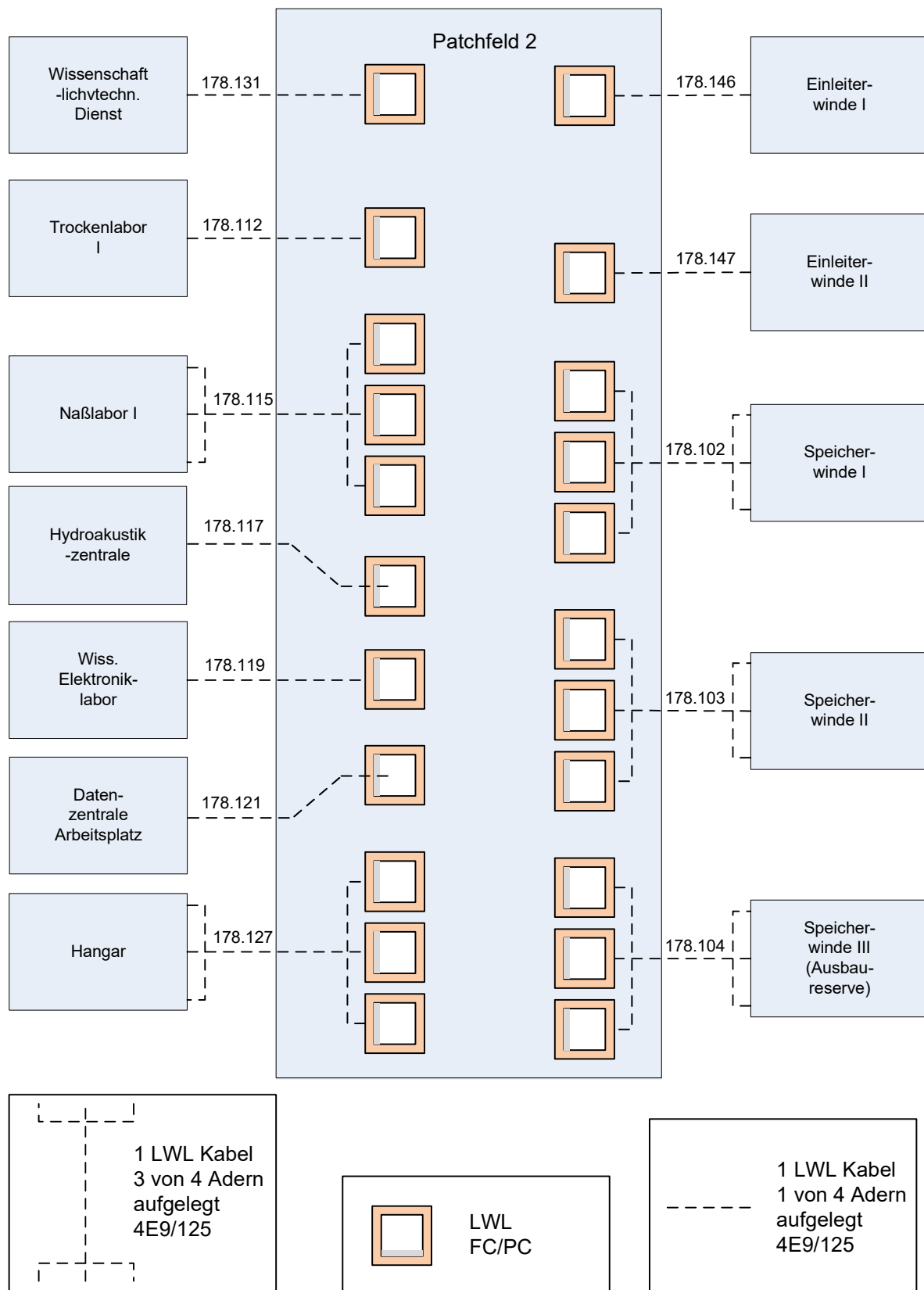




7. Scientific winches

7.4. Mechanical, electrical and fiberoptic Termination

89





7.5. Winch measurement system

7.5.1. Components

- 1 PLC for the detection of cable lengths and wire rope hoists winches
- 2 PC systems for operation and display, with arrangement on the bridge and in the winch operator room
- LAN network networking components
- Interfaces to control winch and to exchange data with the data distribution
- Large display on the working deck on the unplugged cable length, cable speed and water depth
- Specification of the allowable tensile values and the working length with appropriate warnings for the work cable length. From the winch operator unacknowledged alerts the winch will stop automatically.
- The rope diary, winch journal, faults and limit values can be printed on demand.
- Input for Portable "foreign winches.

7.5.2. Hardware:

- Switchgear room winches
- Supply 230V with failure protection via UPS
- PLC for data collection winches with clear operating circuit
- Control station with 19 "flat screen TV
- Bridge:
 - Control station with PC and 19 "flat screen TV
 - Flat screen with winch data (parallel display to the winch helm) on Nockfahrstand tr.
 - Protocol printer
- Winch operator room
 - PC with 15 "touch screen
- Control functions
 - Towing with stop
 - Deep automatic via external control signal of a towed unit
- Interfaces
 - Winch Control
 - Data distribution system (DVS)
 - Inputs: water depth / speed of the ship.
 - Output: winch data / log data / images (eg driving Scoreboards for winch operation of the laboratories.)
 - Clock System
 - Connecting an external winch

7.5.3. Indicators of the winch measurement system

- Driving Scoreboards
- Overview display winches
- Presentation of the main inverter data
- "Tableau" Winch selection of bridge
- System Overview
- System Diagnostics
- Overview arrangement emergency stop button with trip indicator
- Failure reports
- Stroke compensation (Optional step)
- Clear working image for winch operator / bridge control dc / DVS.



7. Scientific winches

7.5. Winch measurement system

91

7.5.4. Working image winch operator

- Winch name and color icon view
- "Large" Display Cable length 0.1 m resolution
- "Large " display resolution rope speed of 0.1 m / s
- "Large " display resolution cable 0.1 kN
- Display working length (m)
- Display resolution 0.1 m water depth
- Message "alarm 40m above"
- Message "early warning below" 40 m
- Alarm "max. load"
- Fault displays (single message)
- Stop / alarm acknowledgment
- Insertion of operations and monitoring during operation circuits of the control functions and switched stroke compensation
- menu navigation

7.5.5. Winch image selection

- Operating Clear display
- Winch selecting friction winch I with coupled storage winch I / II
- Winch selecting friction winch II with coupled storage winch I / II
- Winch selecting cable winch I
- Winch selecting cable winch II
- Winch selecting series winch
- Display Operation winch control / remote control / remote control laboratory
- Display inverter circuit
- Display switched service operation
- stroke compensation

7.5.6. Image fault indicator

- Distinction in fault messages and alarm / limit releases
- Single interferences of the converters
- Motor temperatures
- Failure brake supply
- Function monitoring load measurement (wire break)
- Group alarm each winch for display on the "control panel"
- Cable slack message between friction and storage winch
- Rope limit alarms with pre-alarms

7.5.7. Settings from the bridge:

- Input protection via Password (except for changing the rope working length)
- Travel data automatically from DVS (
- Date
- Time
- Travel with section number
- Station number



7.5.8. Protocols

- Individually selectable printout with choice of polling rate between 0.3 and 10 sec.
- Winch data to the DVS for logging "Station Protocol" and the Protocol for "inserts of equipment and winches"
- Analog load on screen and writer on the bridge and in laboratories for online evaluation (improved detection of ground contact / release)
- Rope protocol for individual expression and participants by the end of the journey

Display panel working deck

- Water depth (m)
- Lifted cable length (m)
- Line speed



7.6. Research Assistant winch

7.6.1. Cable transfer winch

Manufacturer MacGregor Germany GmbH & Co. (before Hatlapa)
D-25436 Uetersen, Germany
<http://www.macgregor.com>

General information:

- The winch is used to replace all the wires / cables in the winch space.
- Required deflection rollers are permanently installed.
- The winch is portable.
- The base frame is designed to fit the container grid and M 24 grid.

Specifications:

- Receiving device for cable drums and reels of installed cable types and length
Tensile / Speeds:
 - 88 kN is 0 - 36 m / min
 - 60 kN at 0 - 60 m / min
 - 22 kN is 0 - 120 m / min
- Infinitely variable speed and load setting from a mobile controller (Hawker)
- Spooling device via electrically driven acme screw with manual or automatic, adjustable from the mobile controller (Hawker)

7.6.2. A-Frame Winches

see Chapter [#A-Frame](#)

7.6.3. Load / auxiliary winch sliding beams 250kN

see Chapter [#Sliding Beams 250kN](#)

7.6.4. Portable horizontal capstan

Manufacturer MacGregor Germany GmbH & Co. (before Hatlapa)
D-25436 Uetersen, Germany
<http://www.macgregor.com>

Design:

- The base frame is designed to fit the container grid and M 24 grid.
- Capstan head: 630 * 630 mm Ø, according to DIN 84154
- Driven by Electric motor and 3-stage helical gearbox

Specifications:

- Nominal tensile force and speed:
- 30 kN / 0 - 30 m / min



-
- 5 kN / 0-120 m / min

E Drive:

- AC motor with mounted electric magnetic brake, motor protection, space heater mode S2-60, 30 kW
- Speed control of the drive motor continuously over a AFE inverter.
- Control via joystick, situated on the winch foundation



Picture: Mobile horizontal capstan

7.6.5. Portable storage winch

Manufacturer

MacGregor Germany GmbH & Co. (before Hatlapa)
D-25436 Uetersen, Germany
<http://www.macgregor.com>

The transportable storage winch serves to receive a timber reel up to a max. Diameter of 1600 mm and a max. Total length of 1000 mm. The winch is used in conjunction with the transportable horizontal capstan.

Design:

- Mounted on a sturdy frame, matching the M24 grid.
- Driven by Electric motor and 3-stage planetary gear angle

Specifications:

- Tensile force of 5 kN with 0-60 m / min based on 500mm diameter
- Empty rope 0-120 m / min

E Drive:

- AC, S1 mode, 5 kW of protection IP 56, mounted electric brake, anti-condensation heater, motor protection, encoders



7. Scientific winches

7.6. Research Assistant winch

95

- Infinitely variable speed control via frequency converter with braking resistor
- Control via joystick, situated on the winch foundation



Picture: Portable storage winch with wooden empty drum

7.6.6. Airgun-Winches

Manufacturer

HATLAPA Uetersener Maschinenfabrik GmbH & Co.
D-25436 Uetersen, Germany
www.hatlapa.de

General information:

- Compact design
- Arrangement on the port side and starboard side respectively 2 winches
- The winch of port side are fixed
- The winch of the starboard side are functionally positioned to the end frame and running degradable in the same manner as the flow structure.

Specifications:

- Electric drive with infinite speed adjustment via frequency inverter and braking resistors.
- On-site operation
- Spring-loaded roller to support the rope spooling
- Multi-disc brake
- Limit at least 3 safety turns on the drum.
- Line pull 1st layer 22 kN
- Nominal rope speed 1st position at nominal tensile force 21 m/min
- Maximum Rope Speed at 1/2 nominal tensile force 40 m/min
- Steel rope 16 mm
- Mind. Drum Capacity in 2 layers 50 m
- Drive power 9,8 kW 25% ED



8. Scientific work spaces

8.1. Overview

96

8. Scientific work spaces

8.1. Overview

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	29
Raum Nummer	900	408	360	340	336	332	372	364	354	342	374	309	327	325	335	329	339	344	242	246	241	239	243	337	556 554	224	101	333
Raumbezeichnung 1 Anforderungskatalog	Mess + Beobachtungsraum	Besprechungsraum	Trockenlabor 1	Trockenlabor 2	Trockenlabor 3	Trockenlabor 4	Nasslabor 1	Nasslabor 2	Klimalabor 1	Klimalabor 2	Pulserstation	Loggerraum	Hydroakustikzentrale	Druckerraum	wiss. Elektroniklabor	Wiss. Techn. Dienst WTD	Datenzentrale	Hangar	Gefrierlager -20°C	Gefrier-/Kühlager +2°C	Salinometeraum	Gravimeteraum	wiss. Stauraum	Elektronikstore	Chemiestore	EDV-Store	Seewasserversorgung	Arbeitsraum Systemmanager
2 Fläche (m²)	20	35	32	15	20	19	45	15	20	20	12	11	52	9	15	15	16	115	16	20	9	8	160	4	9	9	12	15
3 Türbreite in m	1,2	1	1,2	1,2	1,2	1,2	2	1,2	1,2	1,2	1	1	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1	1	1	1	1,2	1
4 Arbeitsplätze	2	1	6	3	4	4	6	4	4	2	1	0	10	0	3	3	4	2	0	1	2	1	1	1	0	0	1	2
5 Telefon	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x					x	x
6 Frischwasser w/k	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x			x						x	
7 Reinseewasser	K		M	K	K	M	K/M	K	M	K								K/M			K						K/M	
8 weiches Wasser			x	x	x	x		x	x																			
9 Ausgüsse (Becken)	1		2	2	2	2	2	2	2	1	1		1		1	1	1	2			1						1	
10 Laborabwasser			1	1	1	1	1	1	1									1										
11 Speigatte, direkt					x		x	x	x									x										
12 Arbeitsluft 6 bar	1		1	1	1	1	1	1	1	1	1					1	1	1	3									
13 230/16 A Bordnetz	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
14 230V/16 A Labornetz- USV	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
15 400V/ 32 A Drehstrom	1		1	1	1	1	1	1	1		1		1		1	1	1	2					1	2			1	
16 Erdungsbolzen	x		x	x	x	x	x	x	x		x	x	x		x	x	x	x				x						x
17 Netzwerkanschluss DVS	12	12	16	12	12	12	12	12	8	8	12	16	12	12	12	12	24	16		4	12	12	12				12	12
18 Einleiterkabelanschluss			x		x		x		x				x		x		x	x										
19 Multikabel/LWL (Winde)			x				x						x		x		x	x										
20 Wechselsprechanlage	x		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x			x						x	
21 Wandschienen	x		x	x	x	x	x	x	x	x	x	X4	x	x	x	x	x	x	X4	X4	x	x		x		x	X4	x
22 Deckenschienen	x		x	x	x	x	x	x	x	x	x		x		x	x	x				x	x						
23 Bodenbuchsen			M 8	M 8	M 8	M 8	M24	M 8	M 8	M 8	M 8				M 8		M 8	M24			M 8	M 8	M24					
24 indiv. Temperatur 0-28°C										x	x																	
25 indiv. Temperatur 18-28°C	x	x	x	x	x	x	x	x	x	x	x		x		x		x				x	x					x	
26 Abzugsstutzen			2		2	2		2	1																			
27 Abzug			1			1	1	1																				
28 Kühlschrank +4°C	1		1	1	1	1	1	1					1		1	1	1	1					1					
29 Kühlschrank -18°C			1	1	1	1	1	1										1					1					
30 Kühlschrank -80°C						1	1																1					
31 Laborspülmaschine			1		1																							
32 Trockenschrank			1			1		1							1													
33 kardanisch aufgehängter Tisch			1			1																						
34 Eismaschine							1																					
36 GPS, ZDA, PPS direkt	x		x	x	x	x	x	x	x	x	x		x		x	x	x	x			x	x				x	x	
37 GPS-Repeater							x											x										
38 Wanduhr	x		x	x	x	x	x	x	x	x	x		x		x	x	x	x			x	x	x					x
39 Sonstiges													X2		X3	X3												

X4 C-tracks as surface mount variant

K Clean sea water centrifugal pump

M Clean seawater diaphragm pump



8.2. Laboratory Equipment

8.2.1. C-Rails

For holding devices and other equipment wall and ceiling construction are installed in all laboratories, a C-track system.

The C-tracks are perpendicular to the walls, mounted to the ceiling fore and aft.

The pitch of the C-rails is 600 mm.

The C-tracks are designed for use with self-locking nuts M8 slip, with 1000 N per running meters strong and grounded (ie with the ship's mass electrically connected).

8.2.2. Grid Plug System

In the floor open space is built depending on the location a M8 jacks grid system.

The grid size is 600 x 600 mm and is in agreement (escape) to the wall and the ceiling grid.

The grid jacks to 1000 N per jack resilient and grounded (ie, electrically connected to the ship's ground).

In the wet lab 1, hangar and scientific storage space are M24 jacks fitted grid

8.2.3. Seating

The jobs are with normal laboratory swivel chairs (seat height approx 400-560mm) and partly with laboratory swivel chairs with foot (foot rest) and elevated seating position (Seat height ca.480-660mm).

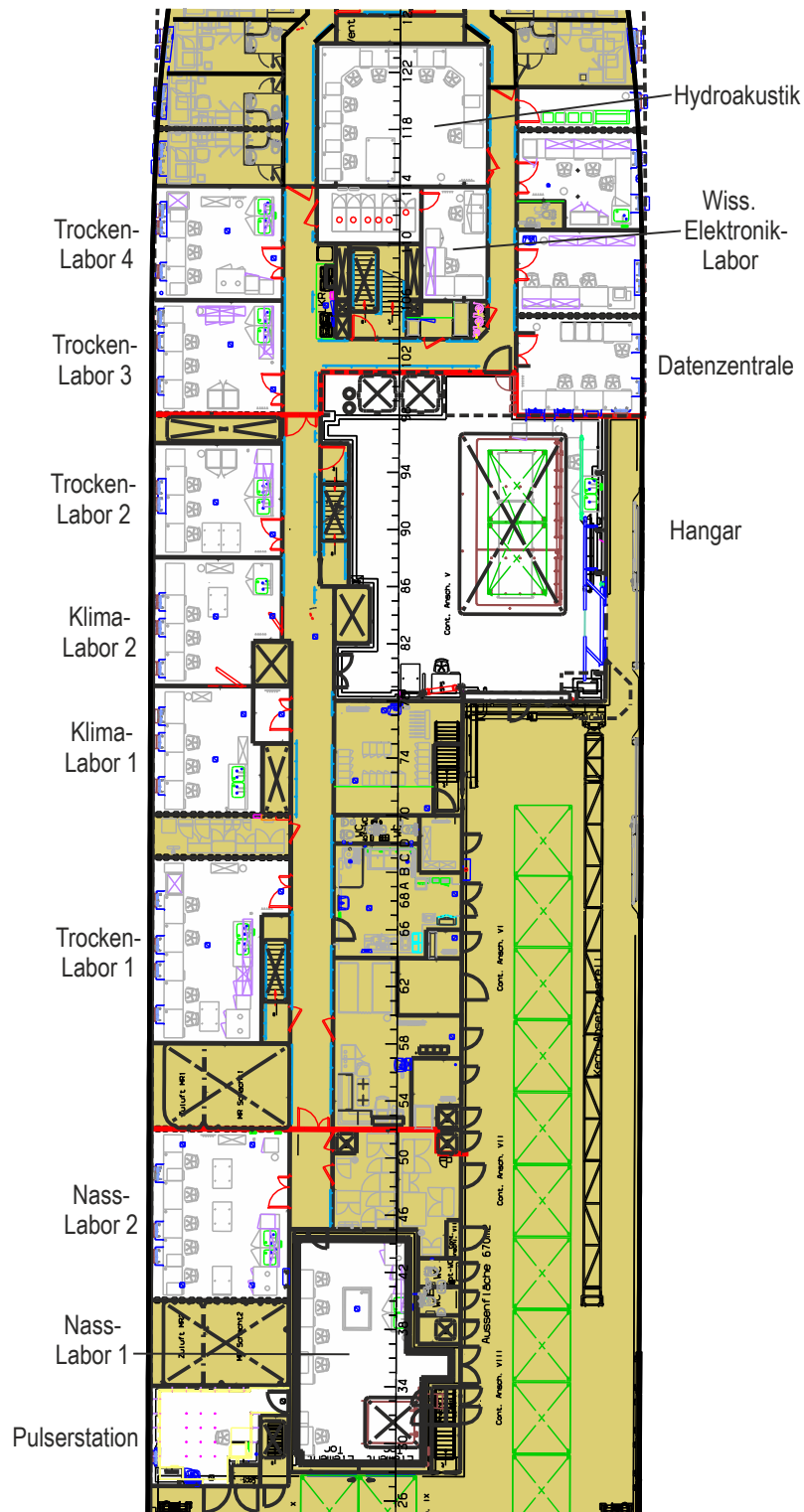
8.2.4. Drawing Legend

	230 V AC board power (White) Double socket IP20, cable duct		Working air 6 bar
	230 V AC laboratory power (red) Double socket IP20, cable duct		Fresh water hot / cold
	Socket 230V / 32A AC CEE standard construction		clean seawater (Centrifugal pump)
	Outlet 400V / 32A three-phase CEE Norm, construction, 5pin. with switch lock		clean seawater (Centrifugal pump, 1 "connection)
	Single outlet Recessed IP20		Clean seawater pump (diaphragm pump)
	double button Recessed IP20		soft water
	double switch Recessed IP20		gray water
	LAN network socket RJ45		laboratory wastewater
	4 Port Network Switch Built-in cable duct		scupper
	Single core Outlet in the cable duct		floor drain according outboard
	Multi cable / fiber optic Outlet in the cable duct		Ground socket M8 or M24
	double switch		
	GPS, CSP, PPS directly, loose in the cable duct Wiss. Intercom, telephone, clock Free cable entry		



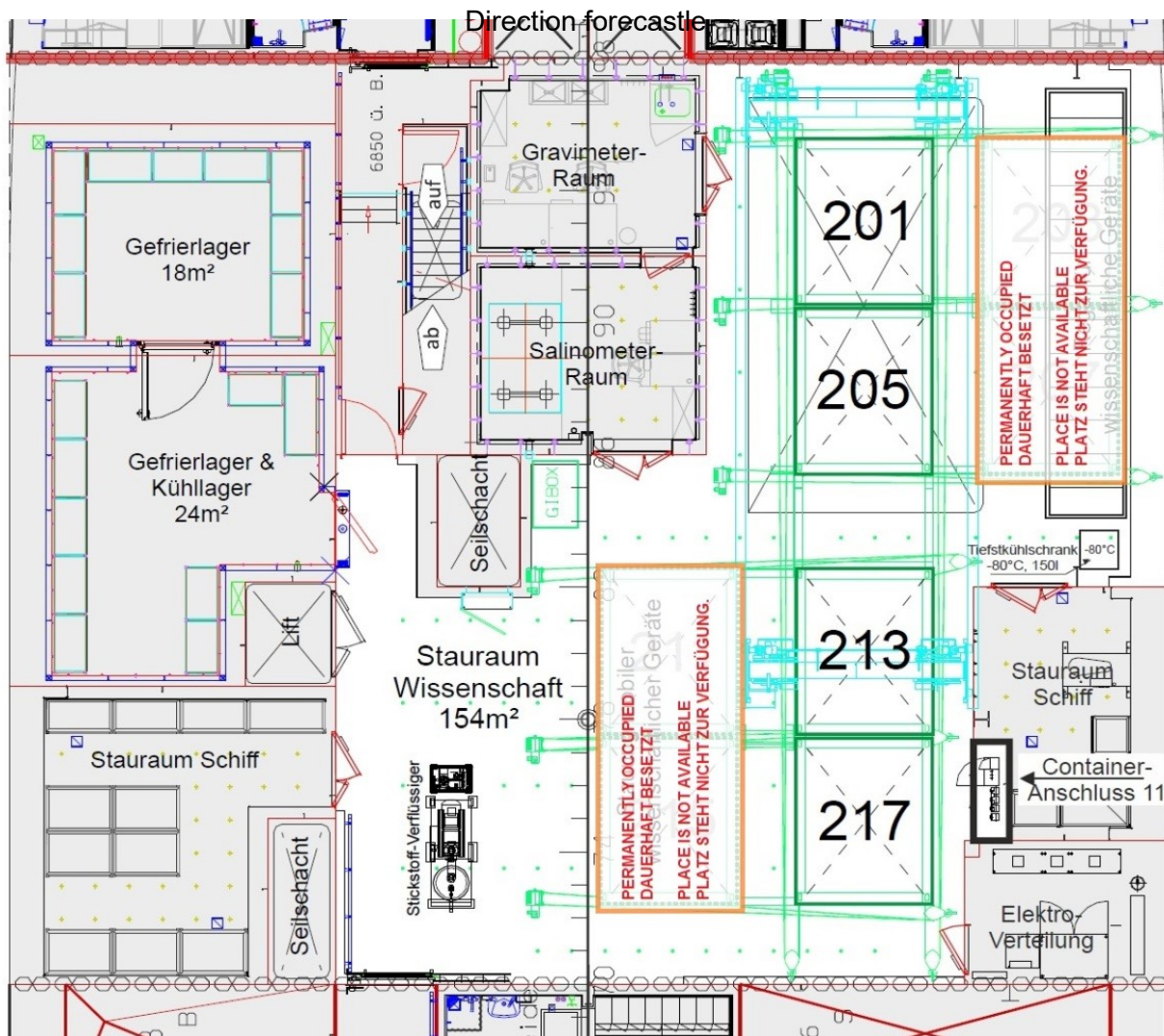
8.3. Overview Laboratories

8.3.1. Laboratories deck 03 (main deck)





8.3.2. Laboratories deck 02 (tween deck)





8. Scientific work spaces
8.3. Overview Laboratories

100

8.3.3. Measurement and observation room

Location	Deck 09 (observation deck), Frame 100 – 110
Room-No.	900
Phone	501

Area (m ²)	20	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	
Workplaces	2	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	12	Refrigerator -18°C	
Fresh water w / c	x	Single-core cable		Refrigerator -80°C	
Clean seawater	K	Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom	x	Drying oven	
Drains (basin)	1	Wall C-tracks	x	gimbal left off. table	
lab wastewater		Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket		GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

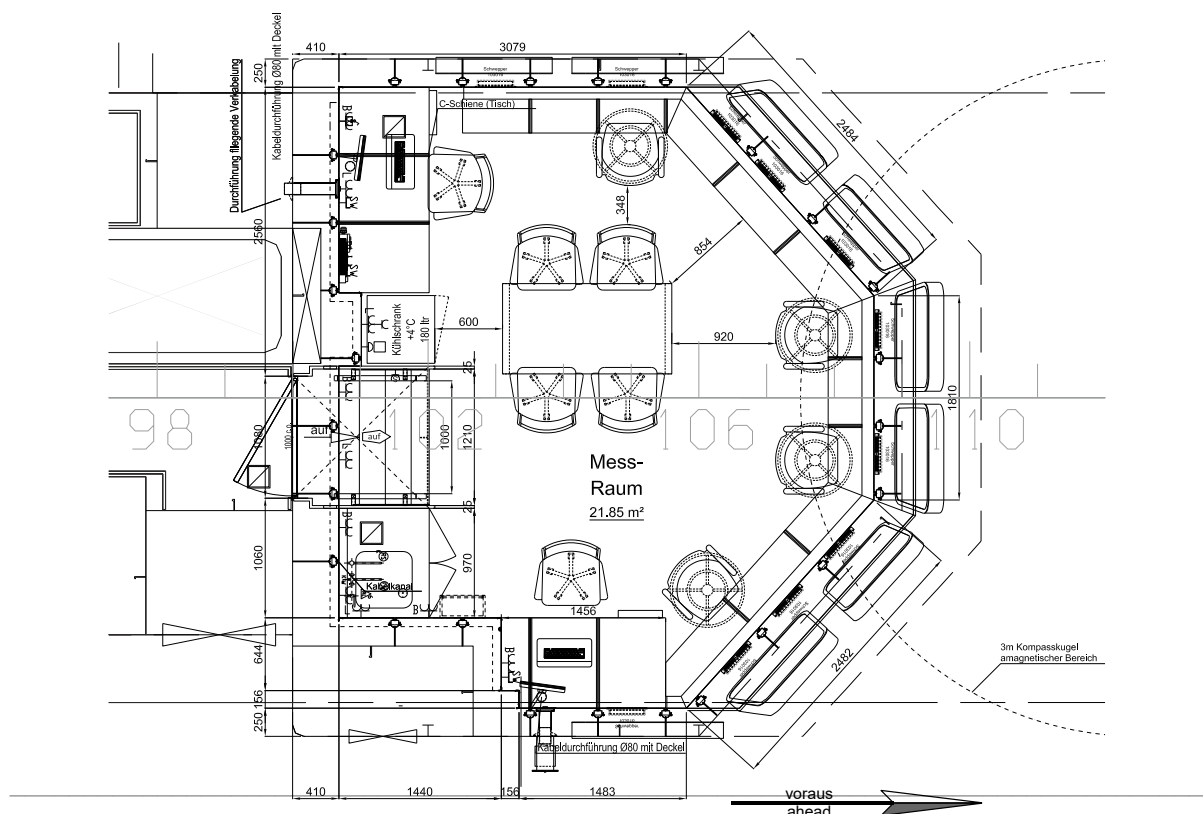
Function definition:

- The measurement and measurement and observation room room on the top deck is mainly used for air chemistry and the visual observation of the environment.

Equipment:

- Refrigerator +4 °C

Grundriss

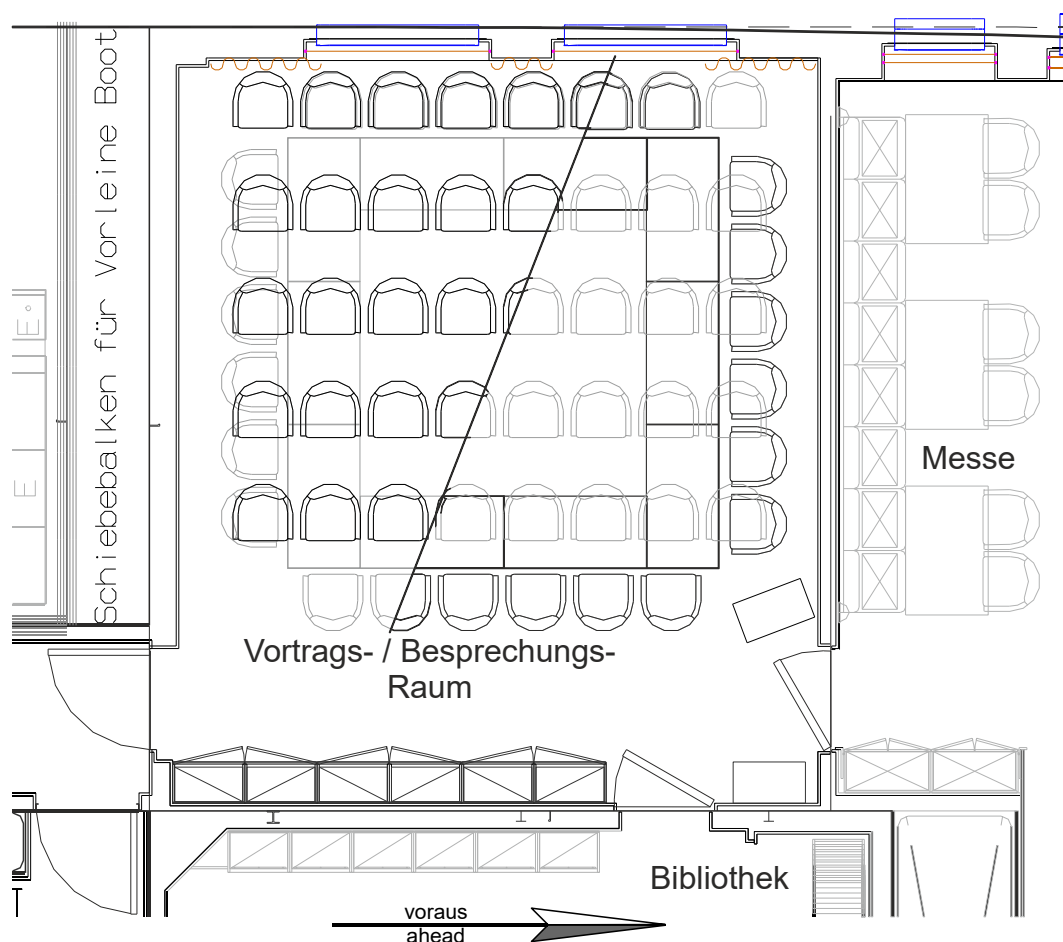




8.3.4. Meeting room

Location	Deck 04 (1. Structure deck PORT), Frame 112 – 123
Room-No.	408
Phone	404

Area (m²)	35	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,0	400V/ 32 A Three-phase		Outlet	
Workplaces	1	Ground stud		Refrigerator +4°C	
Phone	x	LAN	12	Refrigerator -18°C	
Fresh water w / c		Single-core cable		Refrigerator -80°C	
Clean seawater		Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom		Drying oven	
Drains (basin)		Wall C-tracks		gimbal left off. table	
Lab wastewater		Ceiling C-tracks		Ice maker	
Scuppers, directly		Ground socket		GPS, ZDA, PPS directly	
Working air 6 bar		indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	





8.3.5. Dry lab 4

Location	Deck 03 (Main deck PORT), Frame 106 – 114
Room-No.	332
Phone	503



Area (m²)	19	230V/16 A Lab power UPS	x	Suction	2
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	1
Workplaces	4	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	12	Refrigerator -18°C	1
Fresh water w / c	x	Single-core cable		Refrigerator -80°C	1
Clean seawater	M	Multi cable / fiber optic		Lab dishwasher	
soft water	x	Intercom	x	Drying oven	1
Drains (basin)	2	Wall C-tracks	x	gimbal left off. table	1
Lab wastewater	1	Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

- Universal lab for all "dry work" from many different disciplines

Equipment:

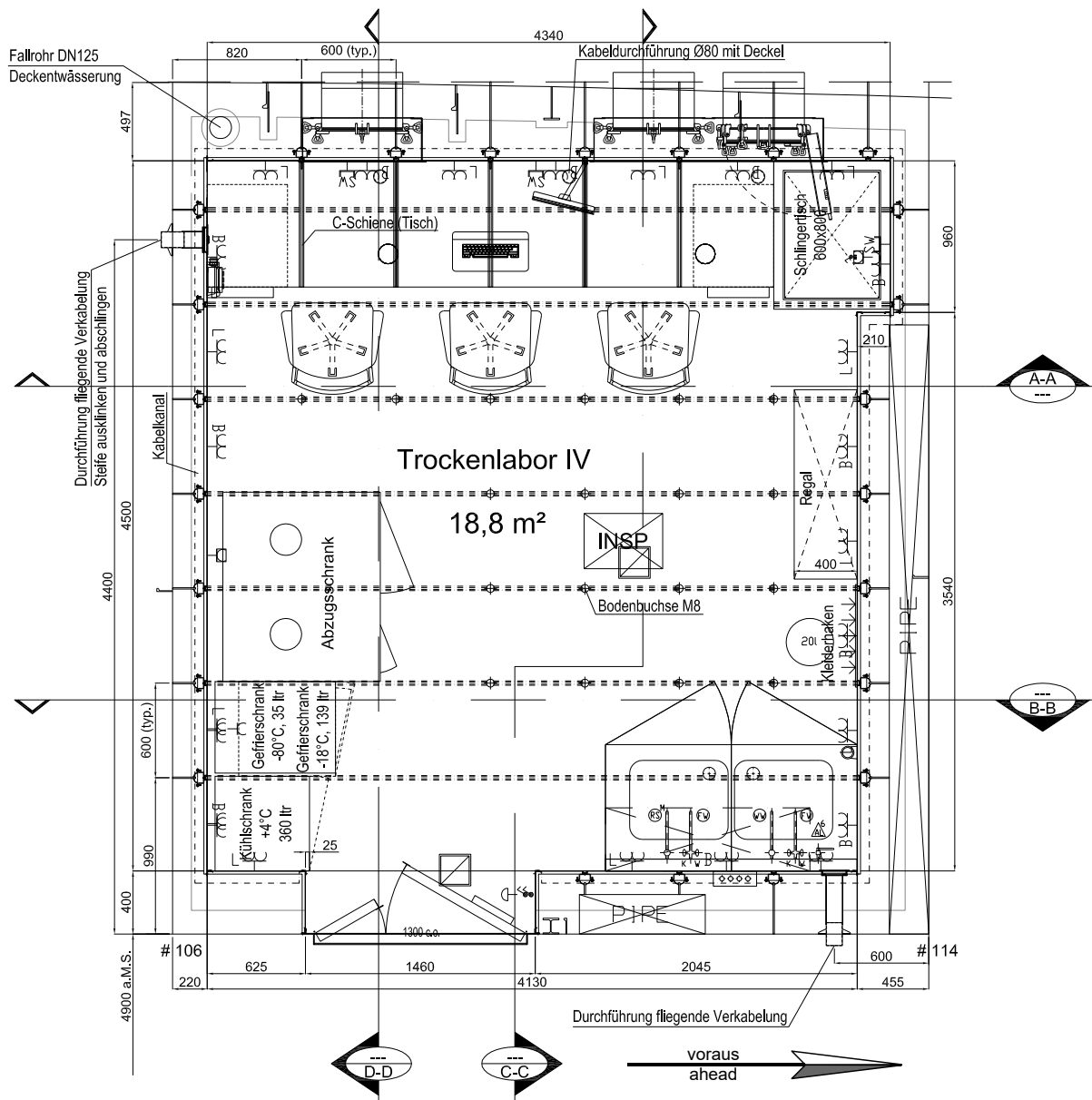
- | | | | |
|----------------|-------|-------|--------------------------|
| - Refrigerator | 360 l | +4°C | - Drying oven |
| - Freezer | 139 l | -18°C | - Digestor |
| - Freezer | 35 l | -80°C | - Yaw table 600 x 800 mm |



8. Scientific work spaces
8.3. Overview Laboratories

103

View:

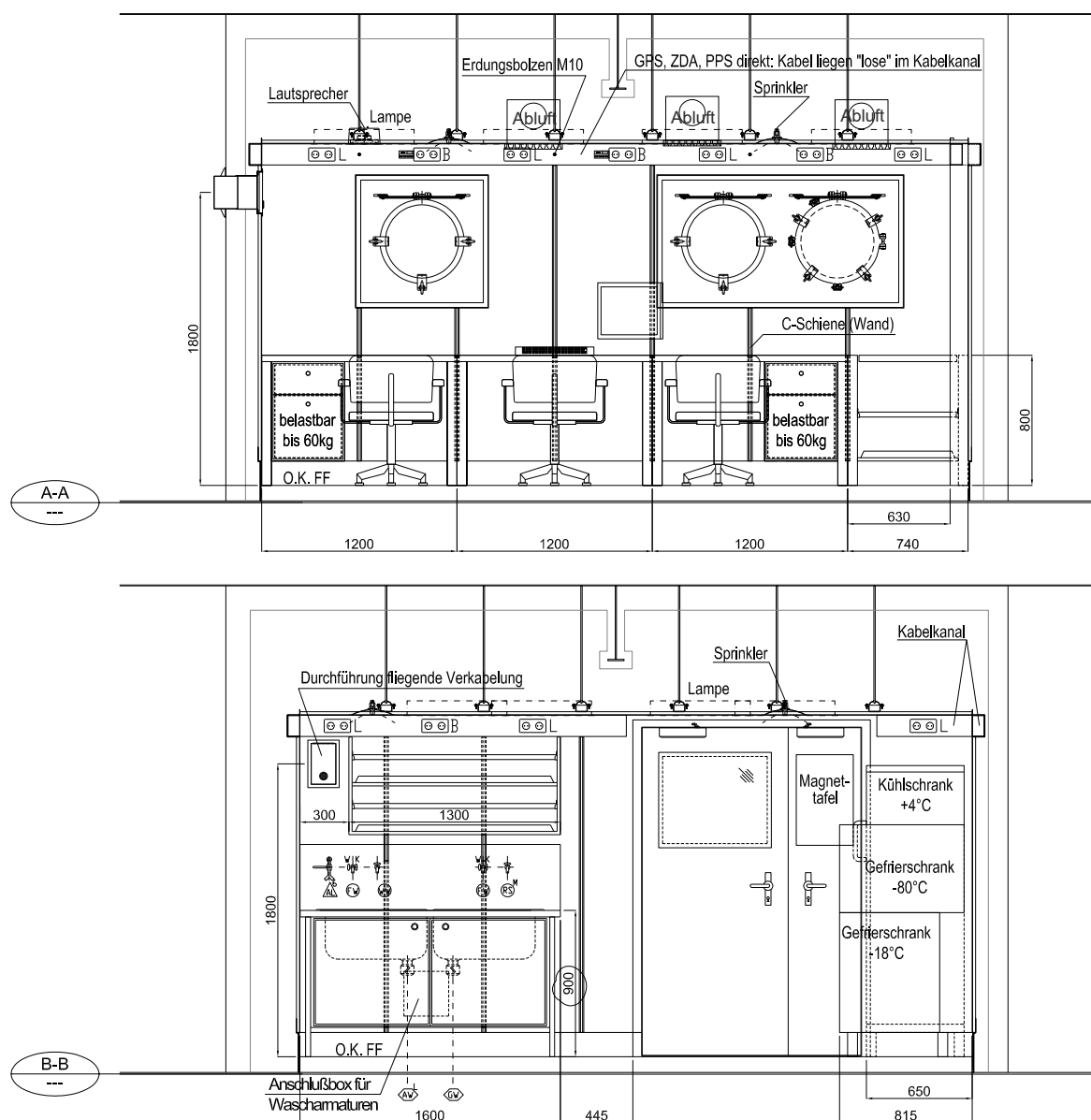




8. Scientific work spaces
8.3. Overview Laboratories

104

View:

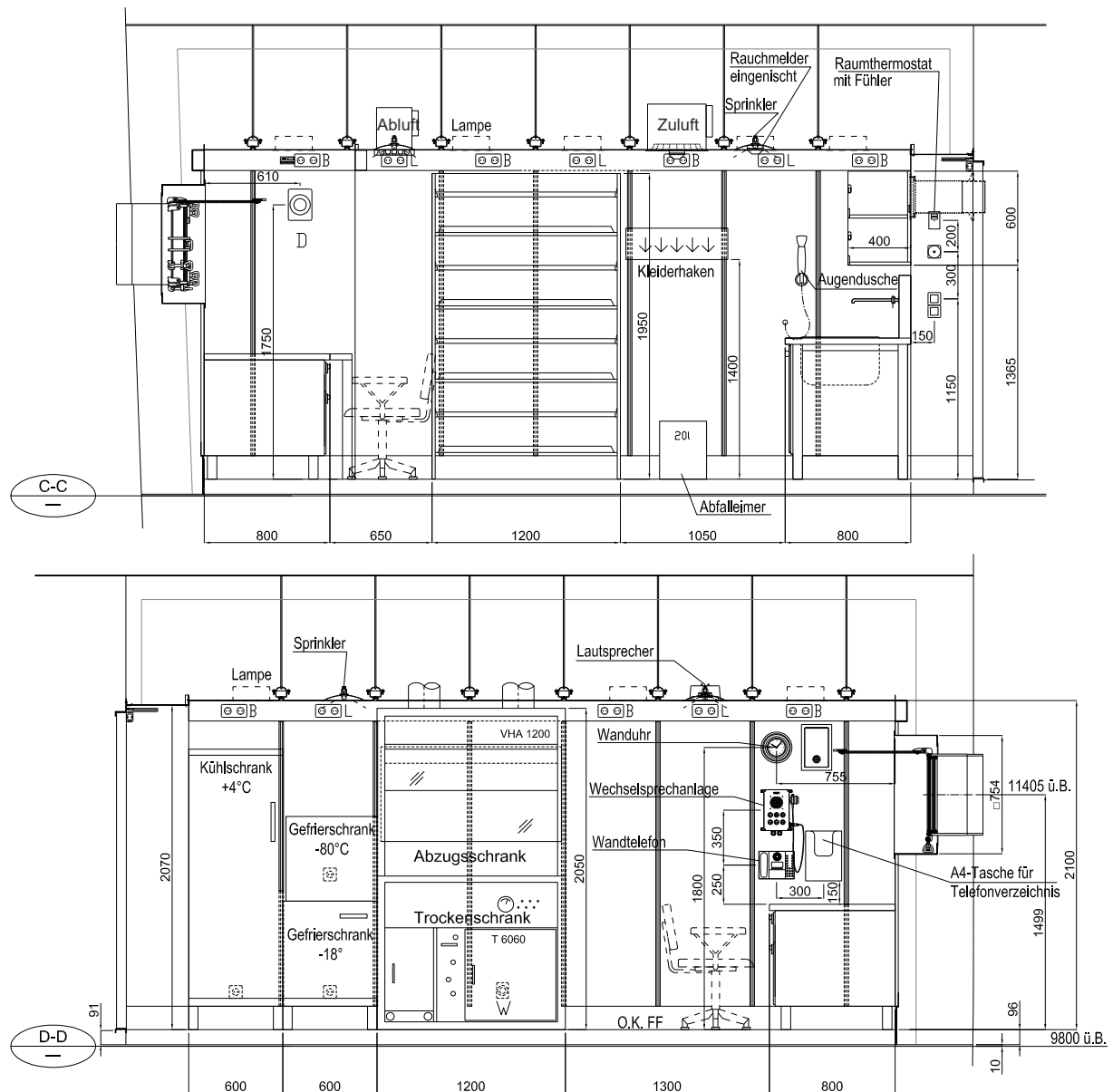




8. Scientific work spaces
8.3. Overview Laboratories

105

View:





8.3.6. Dry lab 3

Location	Deck 03 (Main deck PORT), Frame 96 – 106
Room-No.	336
Phone	504



Area (m²)	20	230V/16 A Lab power UPS	x	Suction	2
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	
Workplaces	4	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	12	Refrigerator -18°C	1
Fresh water w / c	x	Single-core cable	x	Refrigerator -80°C	
Clean seawater	K	Multi cable / fiber optic		Lab dishwasher	1
soft water	x	Intercom	x	Drying oven	
Drains (basin)	2	Wall C-tracks	x	gimbal left off. table	
Lab wastewater	1	Ceiling C-tracks	x	Ice maker	
Scuppers, directly	x	Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

- Universal lab for all "dry work" from many different disciplines

Equipment:

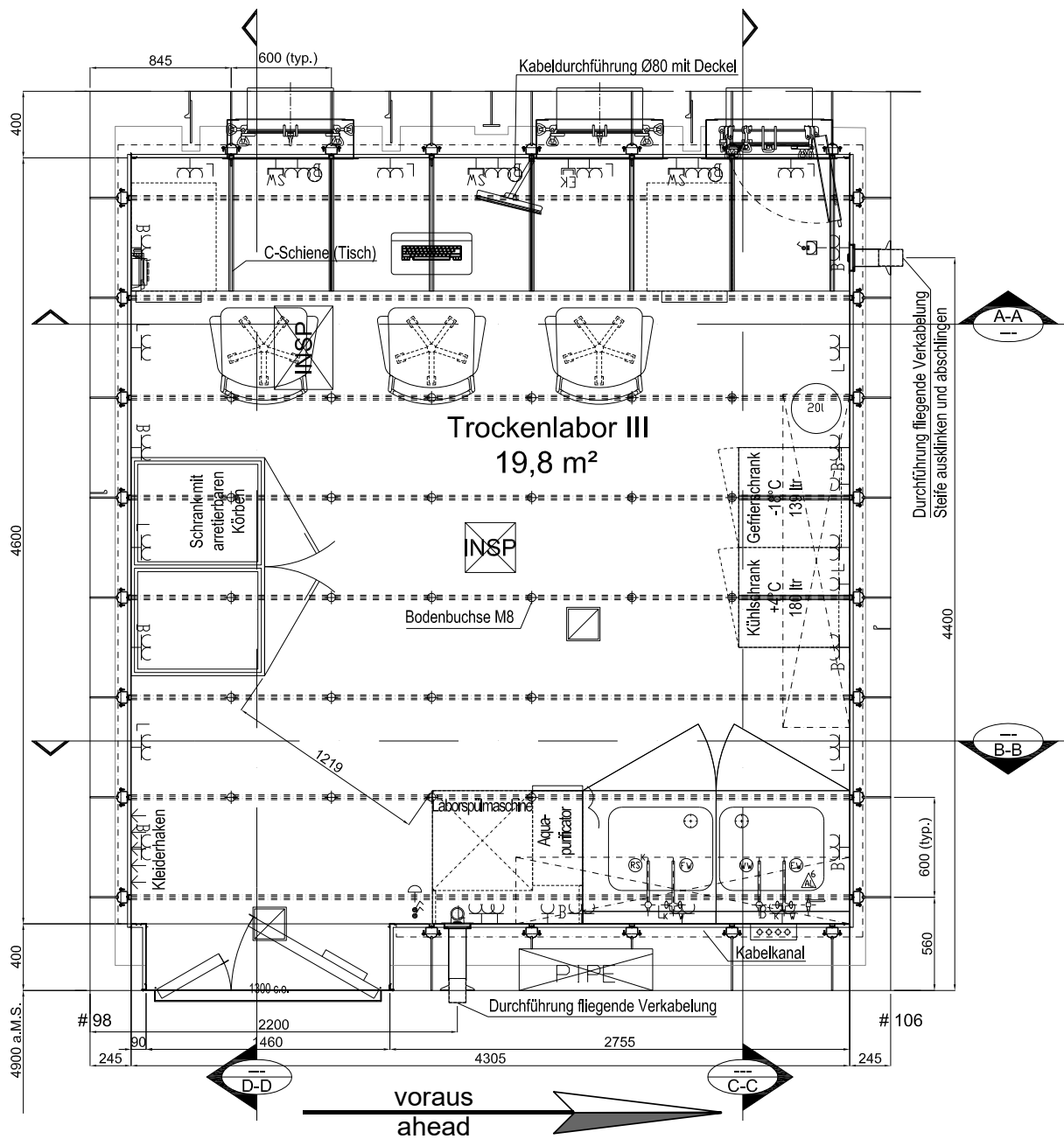
- Refrigerator 180 l +4°C
- Freezer 139 l -18°C
- Lab dishwasher



8. Scientific work spaces
8.3. Overview Laboratories

107

View:



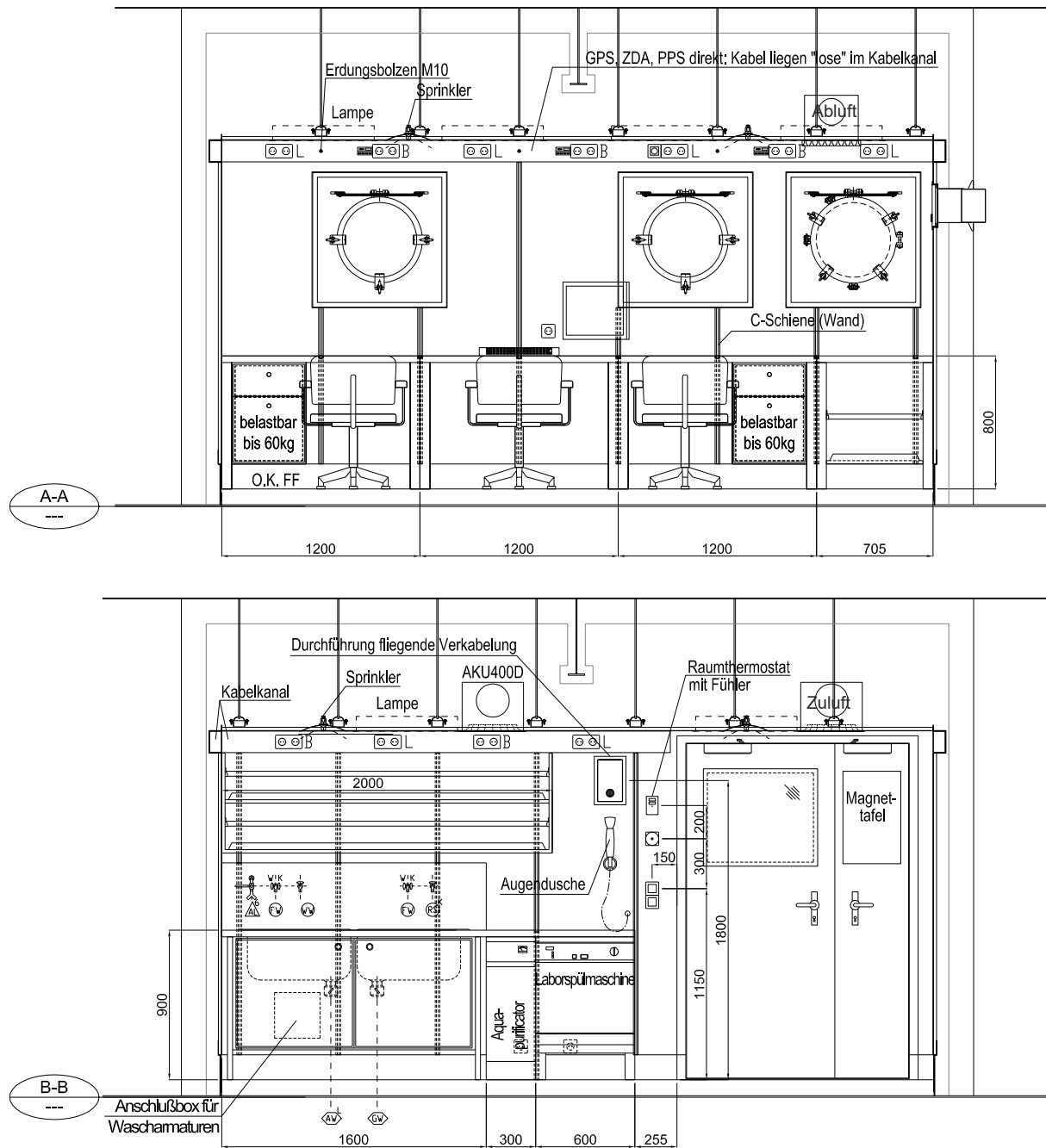


8. Scientific work spaces

8.3.Overview Laboratories

108

View:

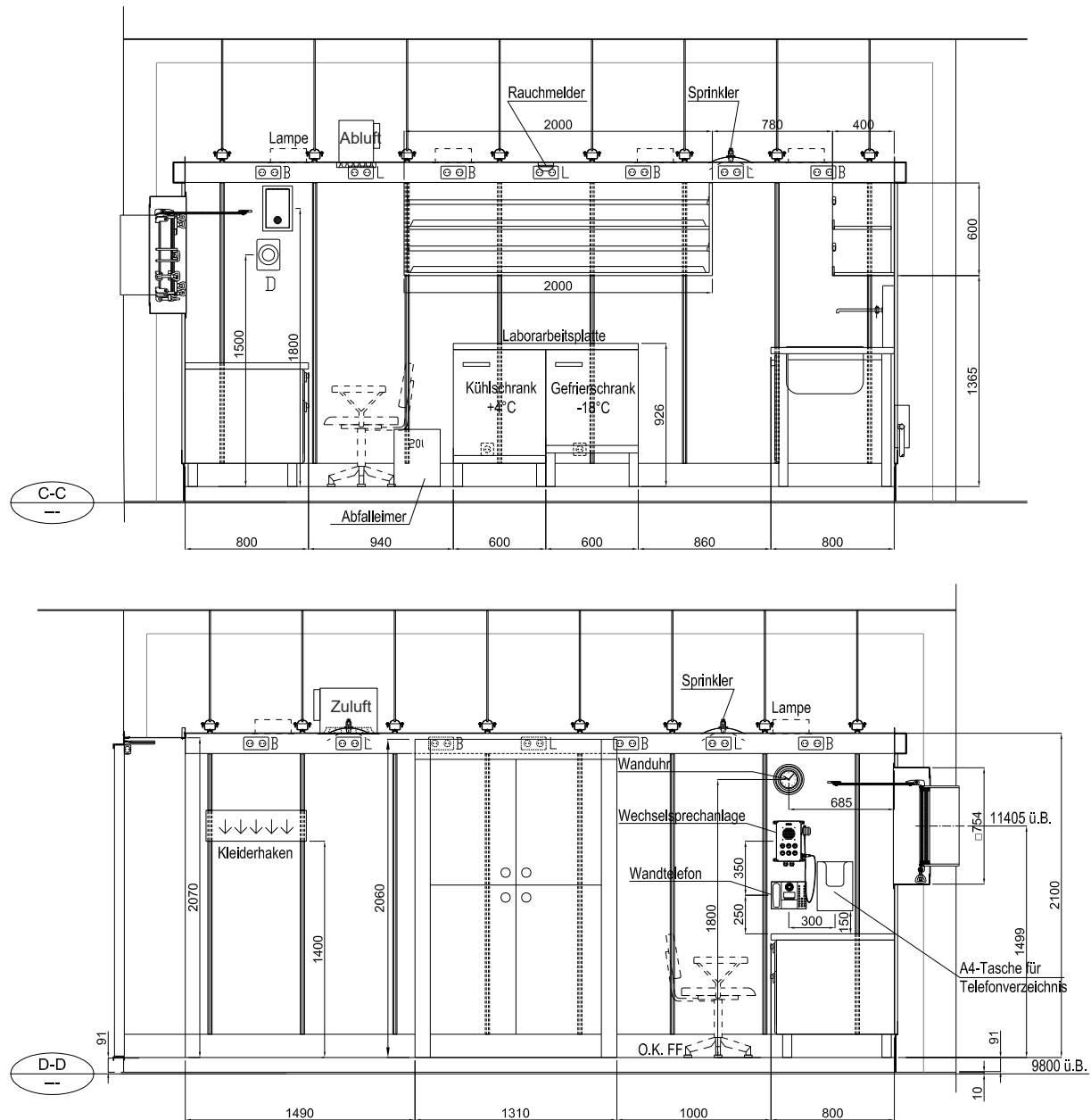




8. Scientific work spaces
8.3. Overview Laboratories

109

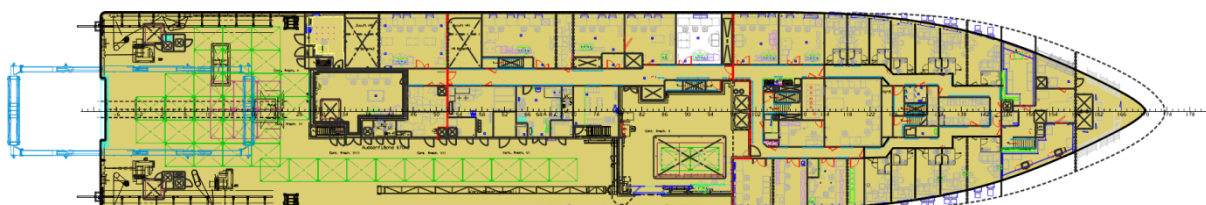
View:





8.3.7. Dry lab 2

Location	Deck 03 (Main deck PORT), Frame 88 – 96
Room-No.	340
Phone	505



Area (m²)	15	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	
Workplaces	3	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	12	Refrigerator -18°C	1
Fresh water w / c	x	Single-core cable		Refrigerator -80°C	
Clean seawater	K	Multi cable / fiber optic		Lab dishwasher	
soft water	x	Intercom	x	Drying oven	
Drains (basin)	2	Wall C-tracks	x	gimbal left off. table	
Lab wastewater	1	Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

- Universal lab for all "dry work" from many different disciplines

Equipment:

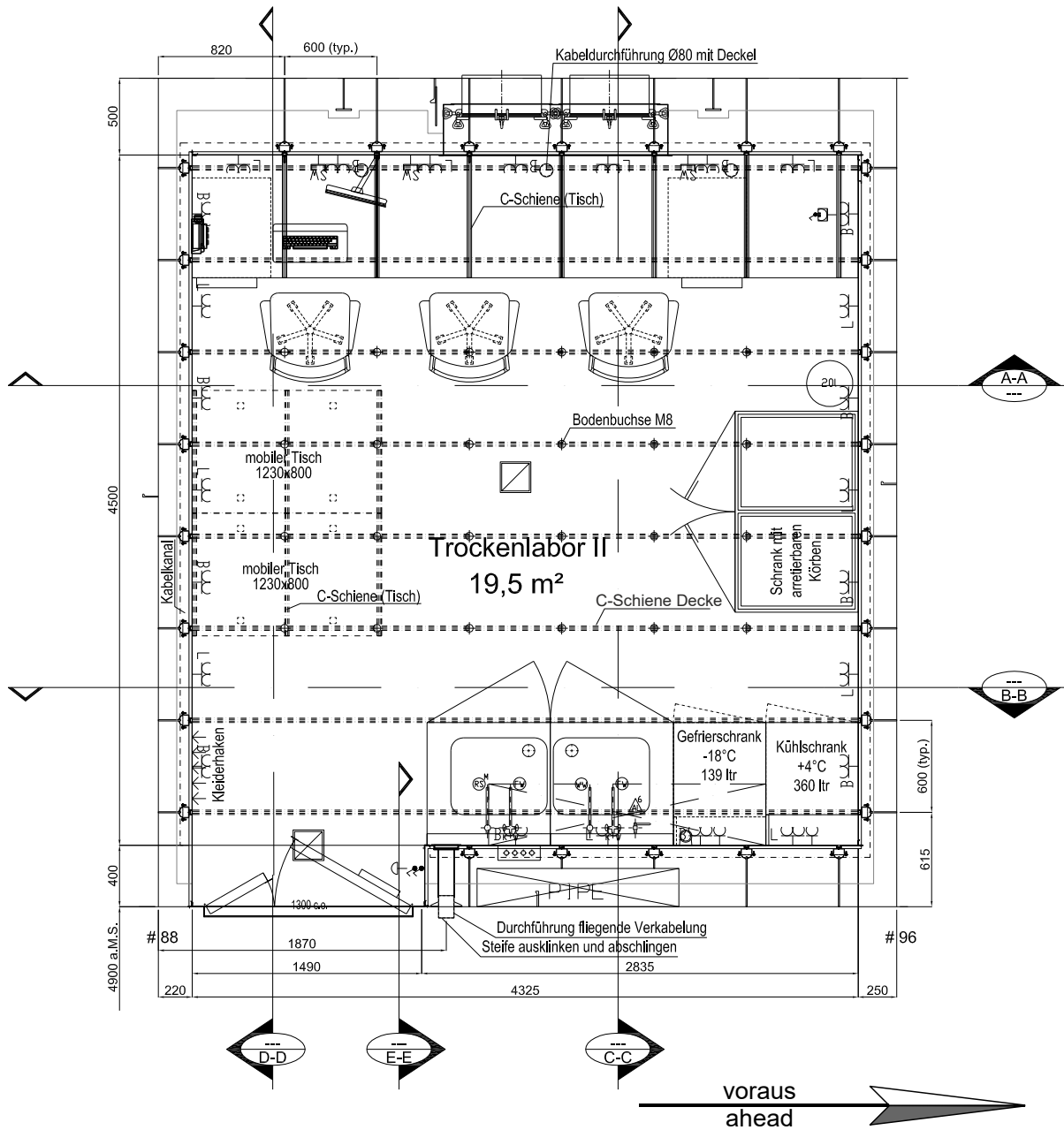
- Refrigerator 360 l +4°C
- Freezer 139 l -18°C
- 2 mobile tables 1230 x 800



8. Scientific work spaces
8.3. Overview Laboratories

111

View:

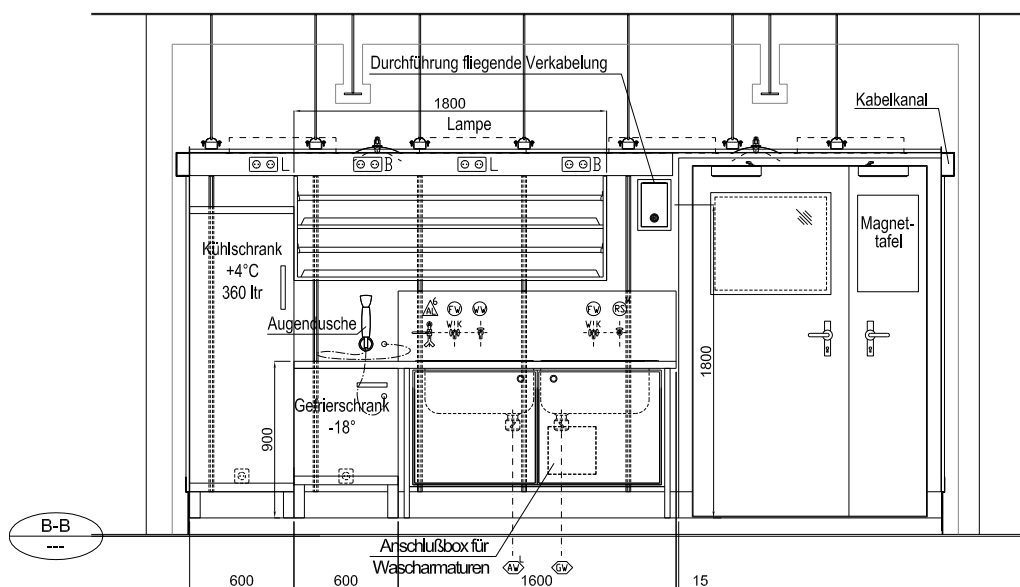
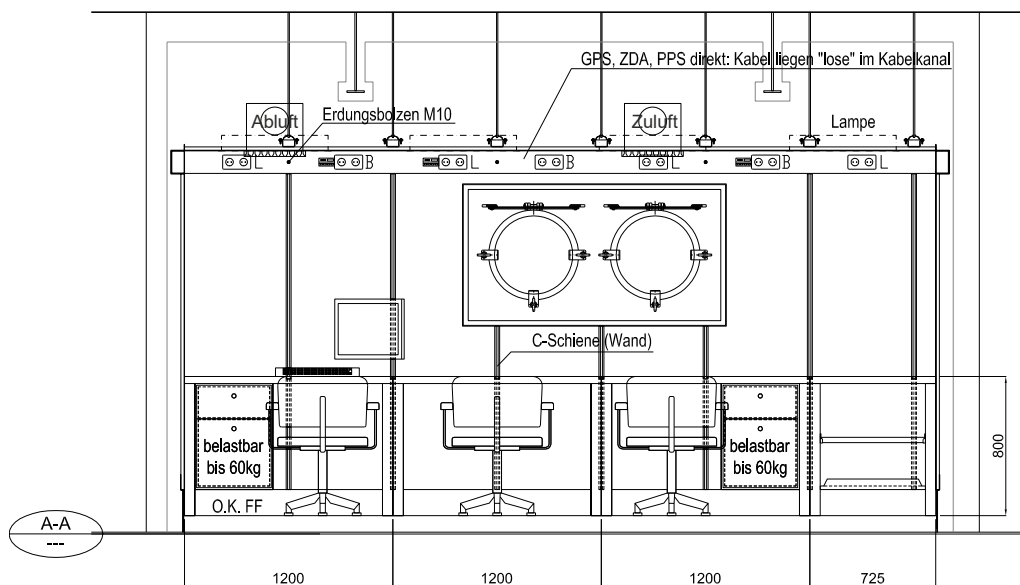




8. Scientific work spaces
8.3. Overview Laboratories

112

View:

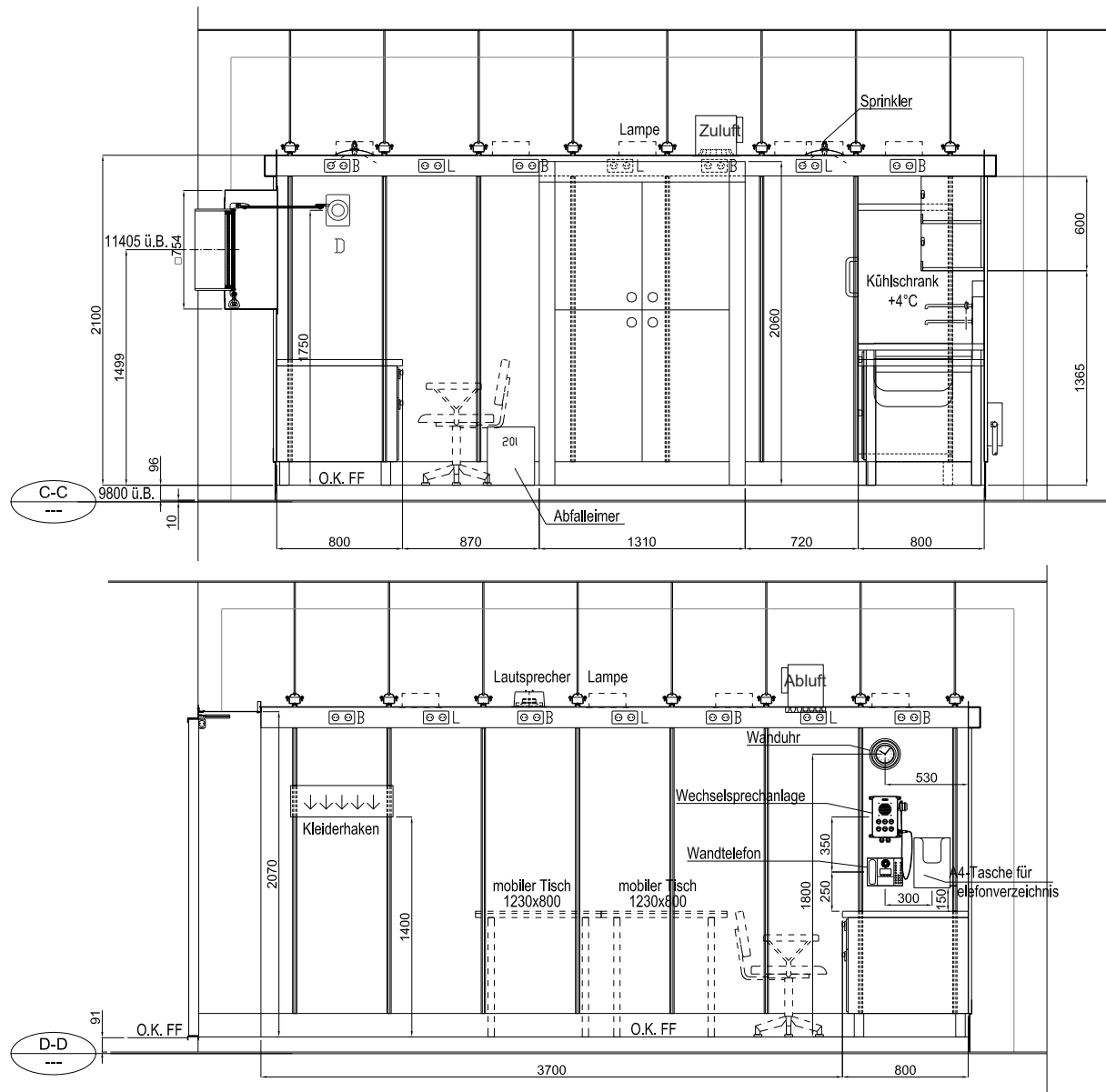




8. Scientific work spaces
8.3. Overview Laboratories

113

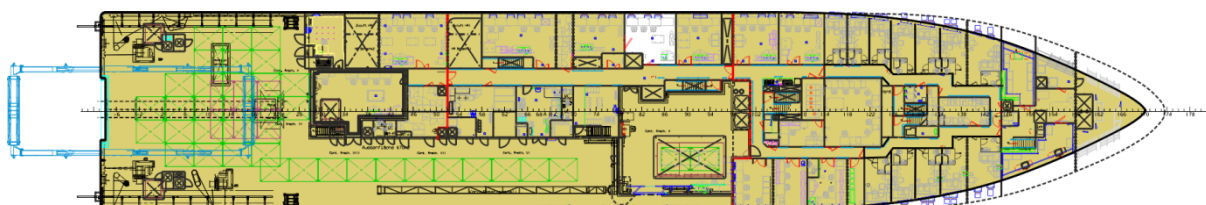
View:





8.3.8. Climate lab 2

Location	Deck 03 (Main deck PORT), Frame 55 – 70
Room-No.	342
Phone	506



Area (m ²)	20	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase		Outlet	
Workplaces	2	Ground stud		Refrigerator +4°C	
Phone	x	LAN	8	Refrigerator -18°C	
Fresh water w / c	x	Single-core cable		Refrigerator -80°C	
Clean seawater	K	Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom	x	Drying oven	
Drains (basin)	1	Wall C-tracks	x	gimbal left off. table	
Lab wastewater		Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C	x	GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

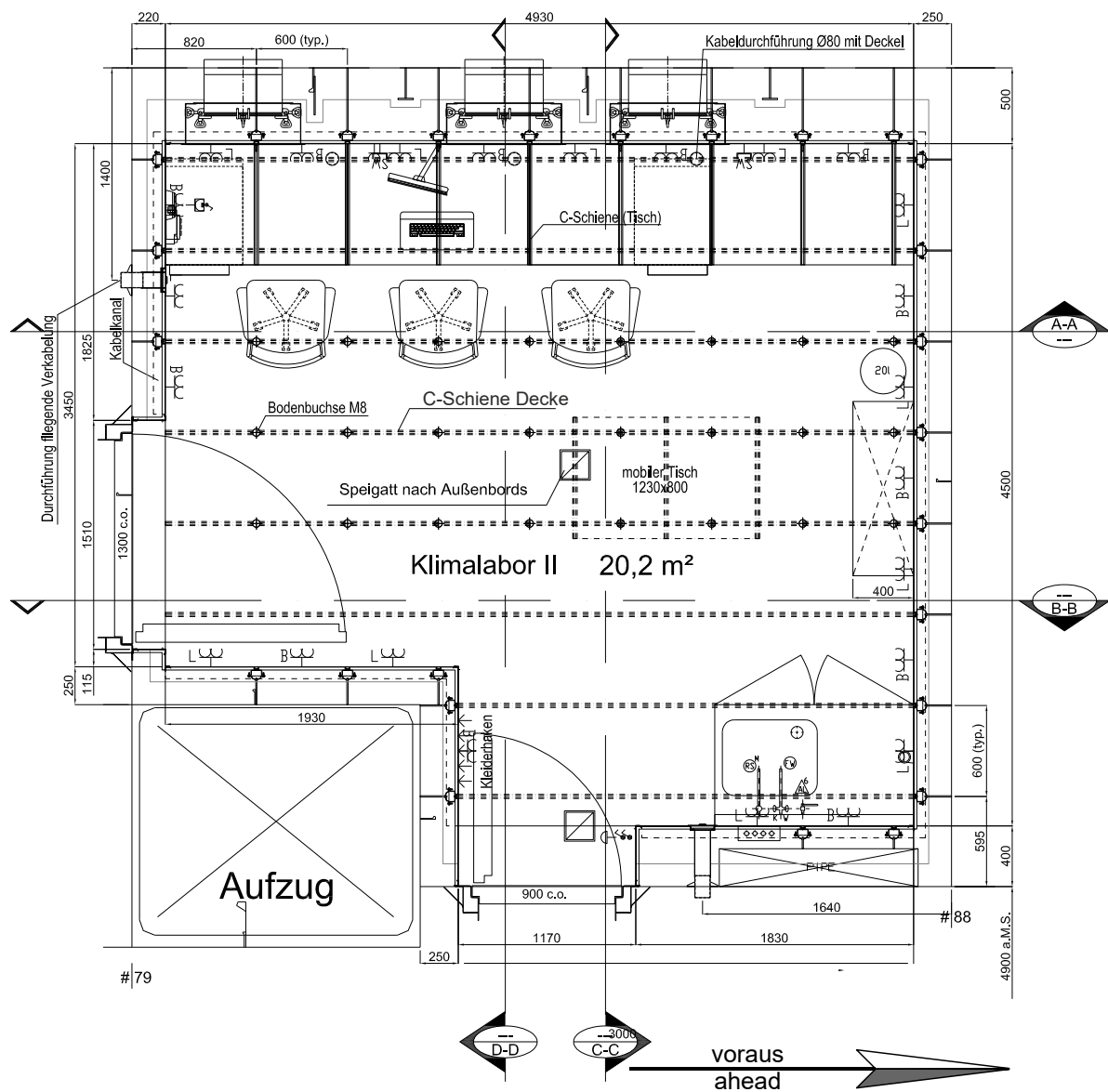
- Climate Laboratory 2 is a 'multi-functional lab' in which a temperature range from the 'normal' room temperature, the labs can be adjusted down to 0 ° C.
- It can be used as normal lab and as a cooling lab for example, the caging and investigation of the deep sea organisms are used.
- Temperature is selected individually in the laboratory. The temperature tolerance is $\pm 0.5K$.
- Climate Laboratory 2 is connected by a door with the Climate Laboratory 1.
- In the room no refrigeration units may be operated.



8. Scientific work spaces
8.3. Overview Laboratories

115

View:

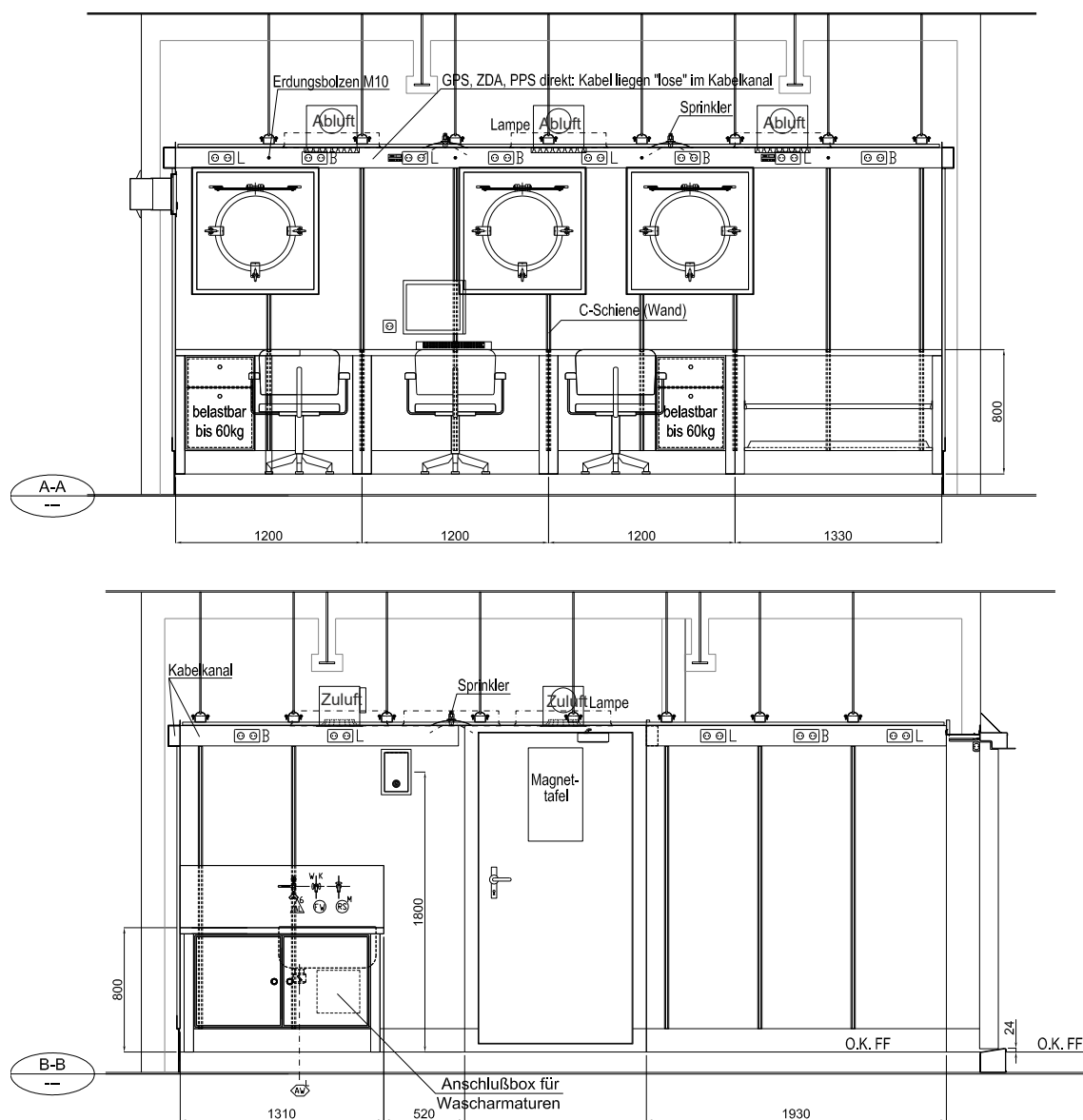




8. Scientific work spaces
 8.3. Overview Laboratories

116

View:

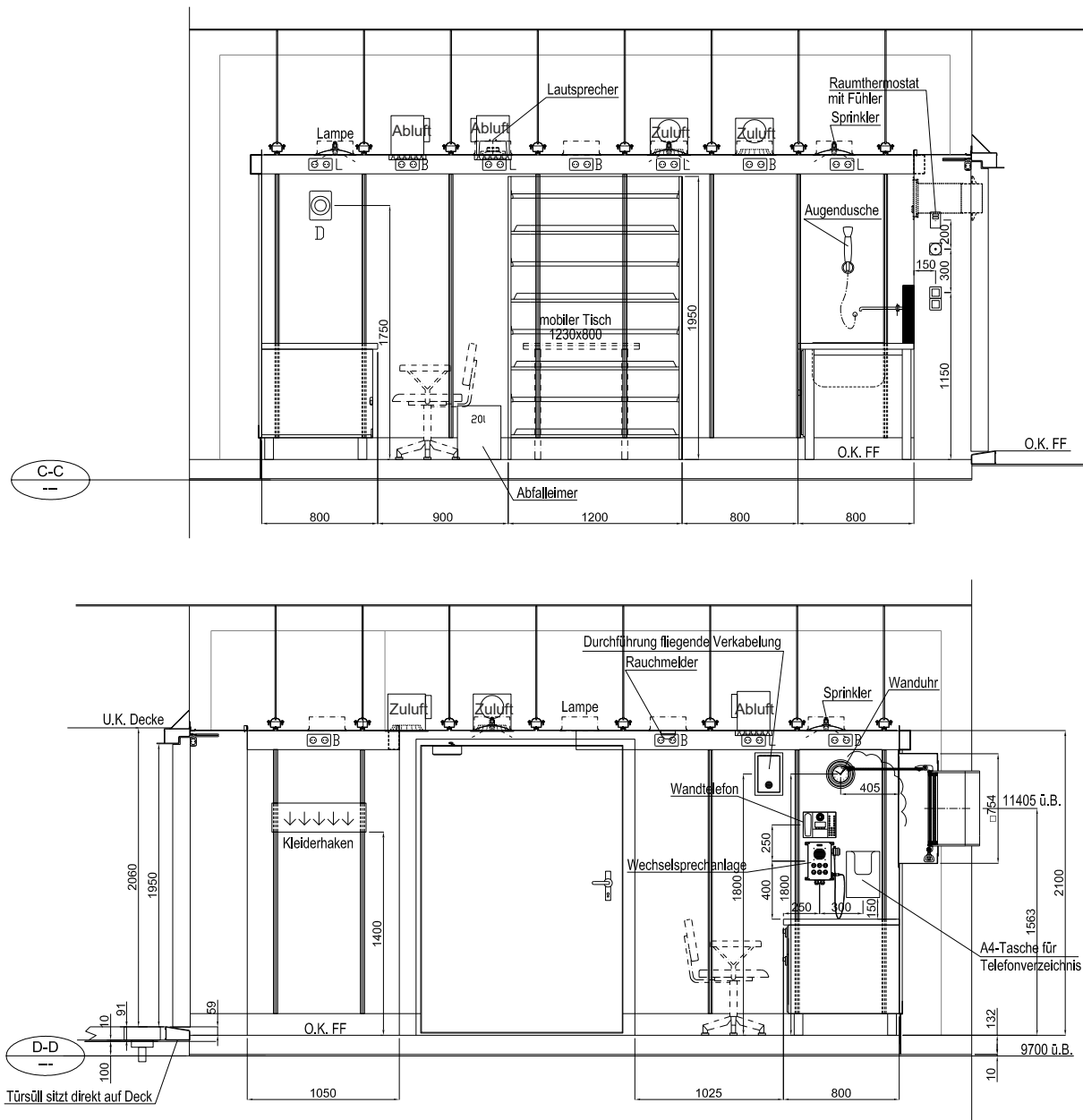




8. Scientific work spaces
8.3. Overview Laboratories

117

View:





8.3.9. Climate lab 1

Location	Deck 03 (Main deck PORT), Frame 55 – 70
Room-No.	354
Phone	507



Area (m²)	20	230V/16 A Lab power UPS	x	Suction	1
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	
Workplaces	4	Ground stud	x	Refrigerator +4°C	
Phone	x	LAN	12	Refrigerator -18°C	
Fresh water w / c	x	Single-core cable	x	Refrigerator -80°C	
Clean seawater	M	Multi cable / fiber optic		Lab dishwasher	
soft water	x	Intercom	x	Drying oven	
Drains (basin)	2	Wall C-tracks	x	gimbal left off. table	
Lab wastewater	1	Ceiling C-tracks	x	Ice maker	
Scuppers, directly	x	Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C	x	GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

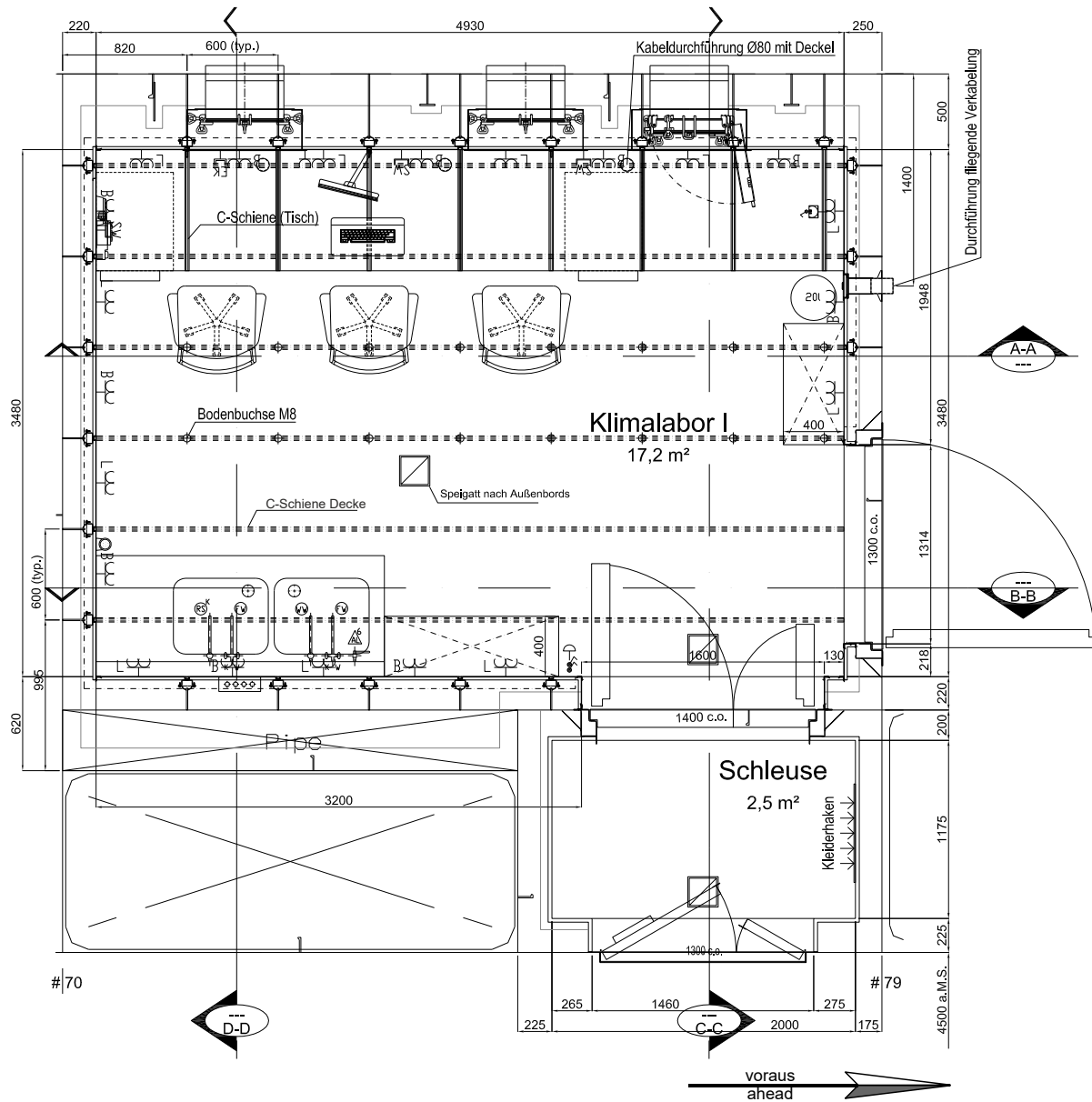
- Climate Laboratory 1 is a 'multi-functional lab' in which a temperature range from the 'normal' room temperature, the labs can be adjusted down to 0 ° C.
- It can be used as normal lab and as a cooling lab for example, the caging and investigation of the deep sea organisms are used.
- Temperature is selected individually in the laboratory. The temperature tolerance is $\pm 0.5K$.
- Climate lab 1 is provided in the entrance with a lock and is connected by a door with the Climate Laboratory 2.
- In the room no refrigeration units may be operated.



8. Scientific work spaces
8.3. Overview Laboratories

119

View:

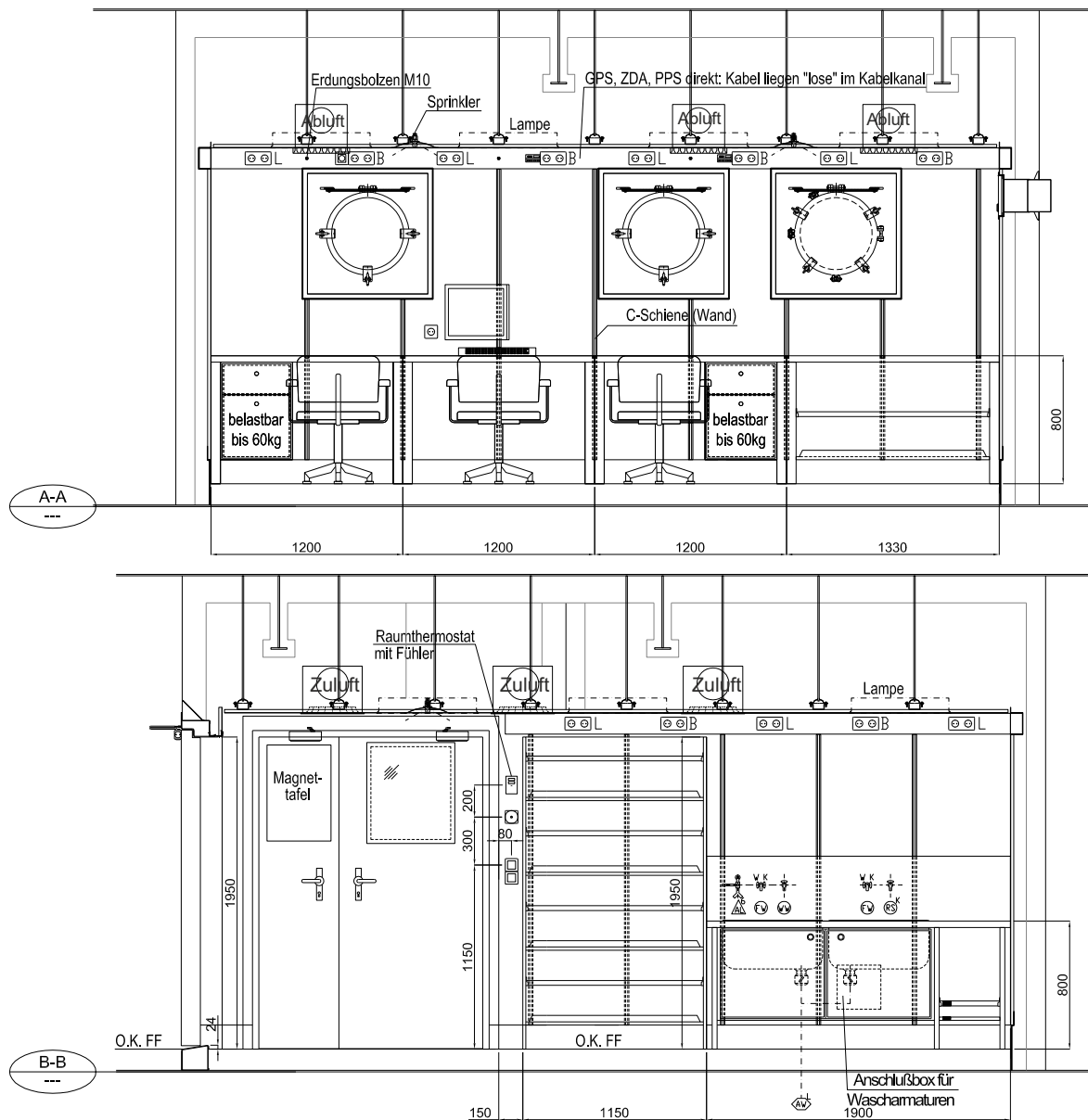




8. Scientific work spaces
 8.3. Overview Laboratories

120

View:

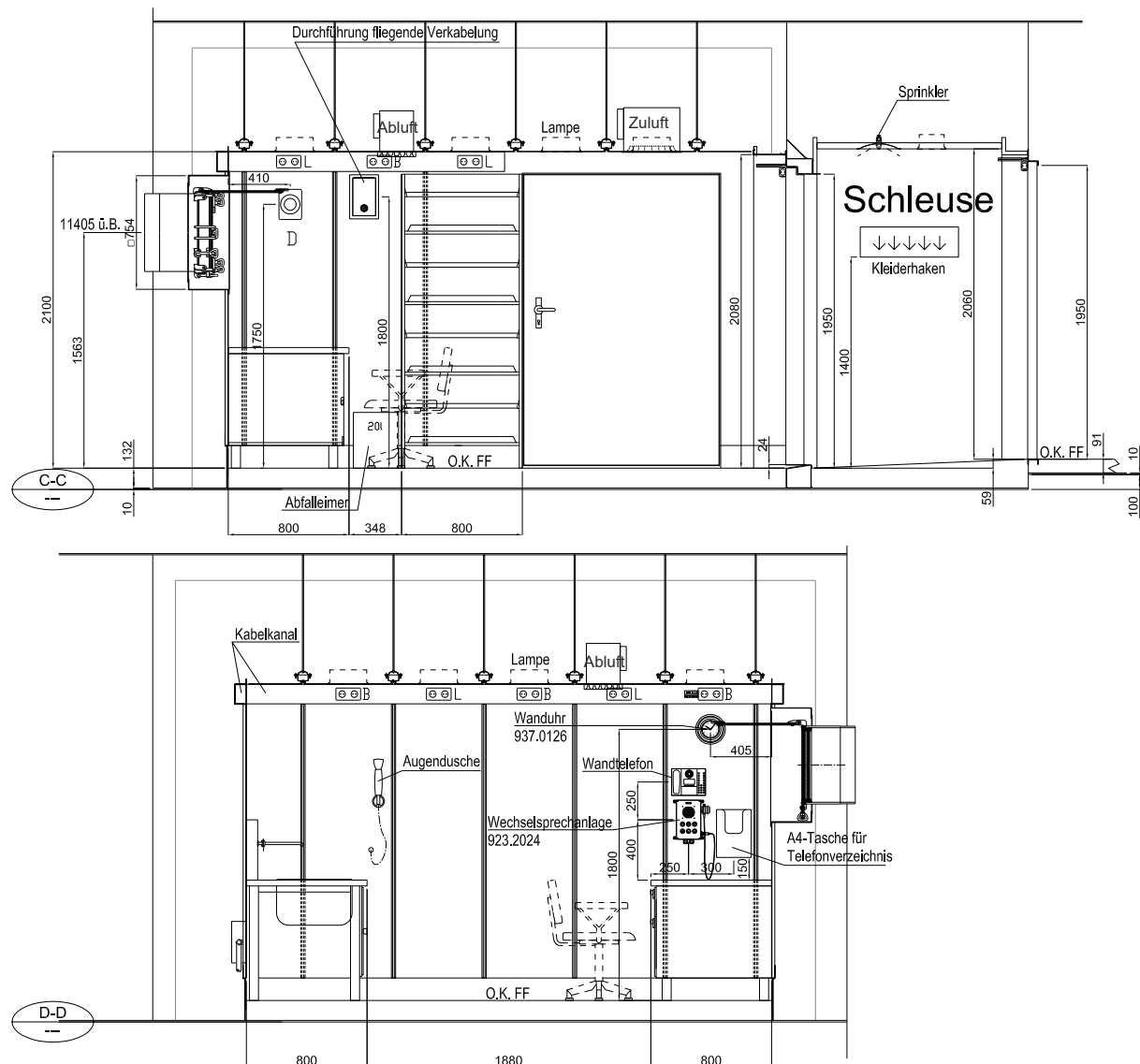




8. Scientific work spaces
8.3.Overview Laboratories

121

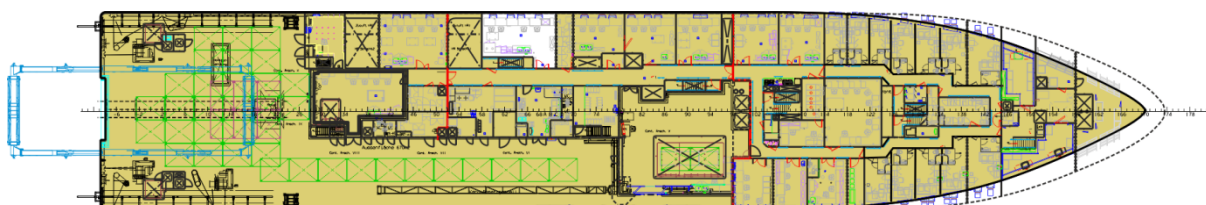
View:





8.3.10. Dry lab 1

Location	Deck 03 (Main deck PORT), Frame 55 – 70
Room-No.	360
Phone	508



Area (m²)	32	230V/16 A Lab power UPS	x	Suction	2
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	1
Workplaces	6	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	16	Refrigerator -18°C	1
Fresh water w / c	x	Single-core cable	x	Refrigerator -80°C	
Clean seawater	M	Multi cable / fiber optic	x	Lab dishwasher	1
soft water	x	Intercom	x	Drying oven	1
Drains (basin)	2	Wall C-tracks	x	gimbal left off. table	1
Lab wastewater	1	Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

- Universal lab for all "dry work" from many different disciplines.
- The location is disposed close to the Pulserstation and the aft working deck. Cable connections between devices and installations by example seismic or other equipment on the aft deck can be kept relatively short.

Equipment:

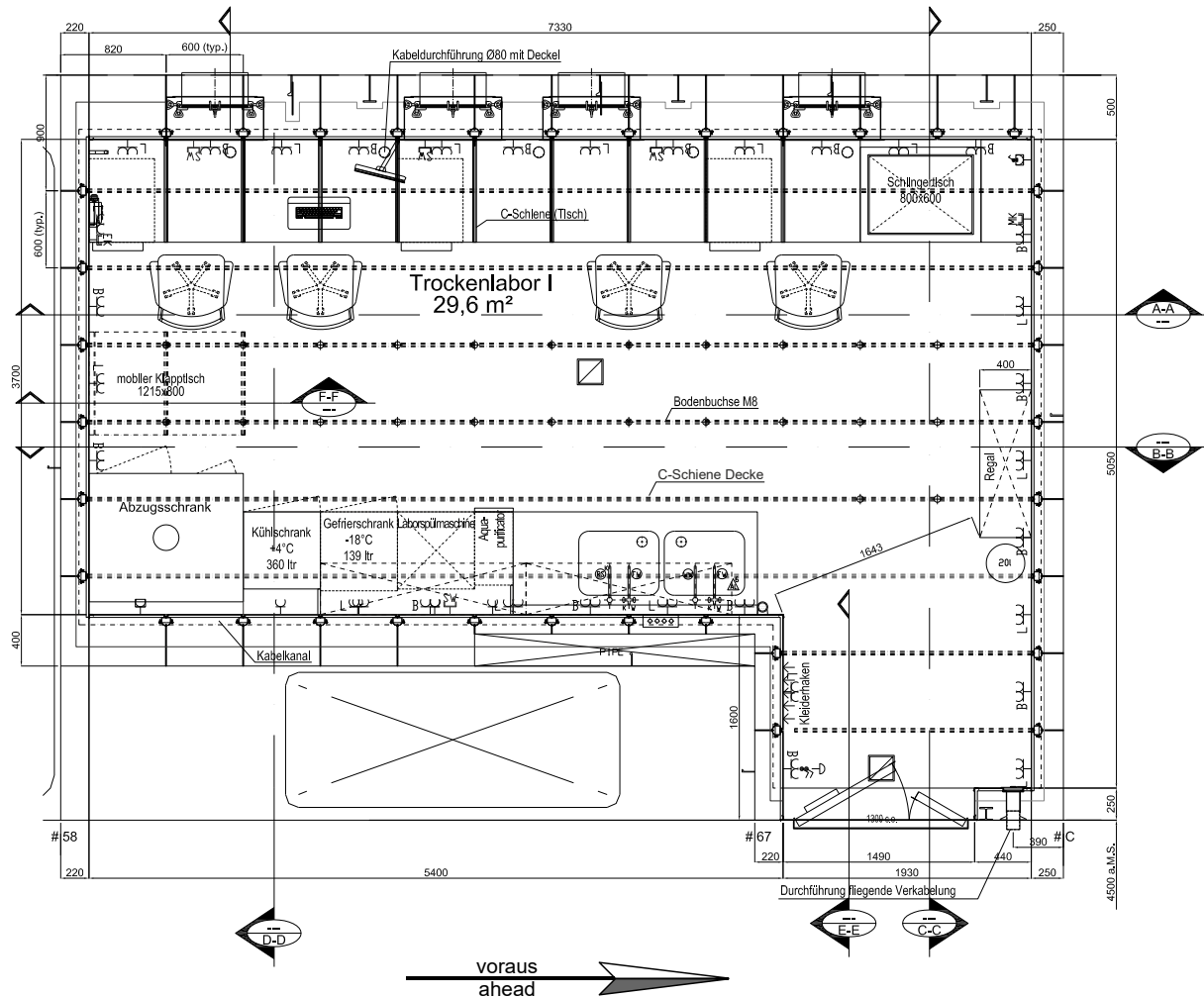
- | | | | |
|------------------|-------|-------|---|
| - Refrigerator | 360 l | +4°C | - Drying oven |
| - Freezer | 139 l | -18°C | - Digestor |
| - Lab dishwasher | | | - Yaw table 600 x 800 mm |
| - Milli-Q-Device | | | - Heat refrigeration cabinet (+180°C / -40°C) |



8. Scientific work spaces
 8.3. Overview Laboratories

123

View:



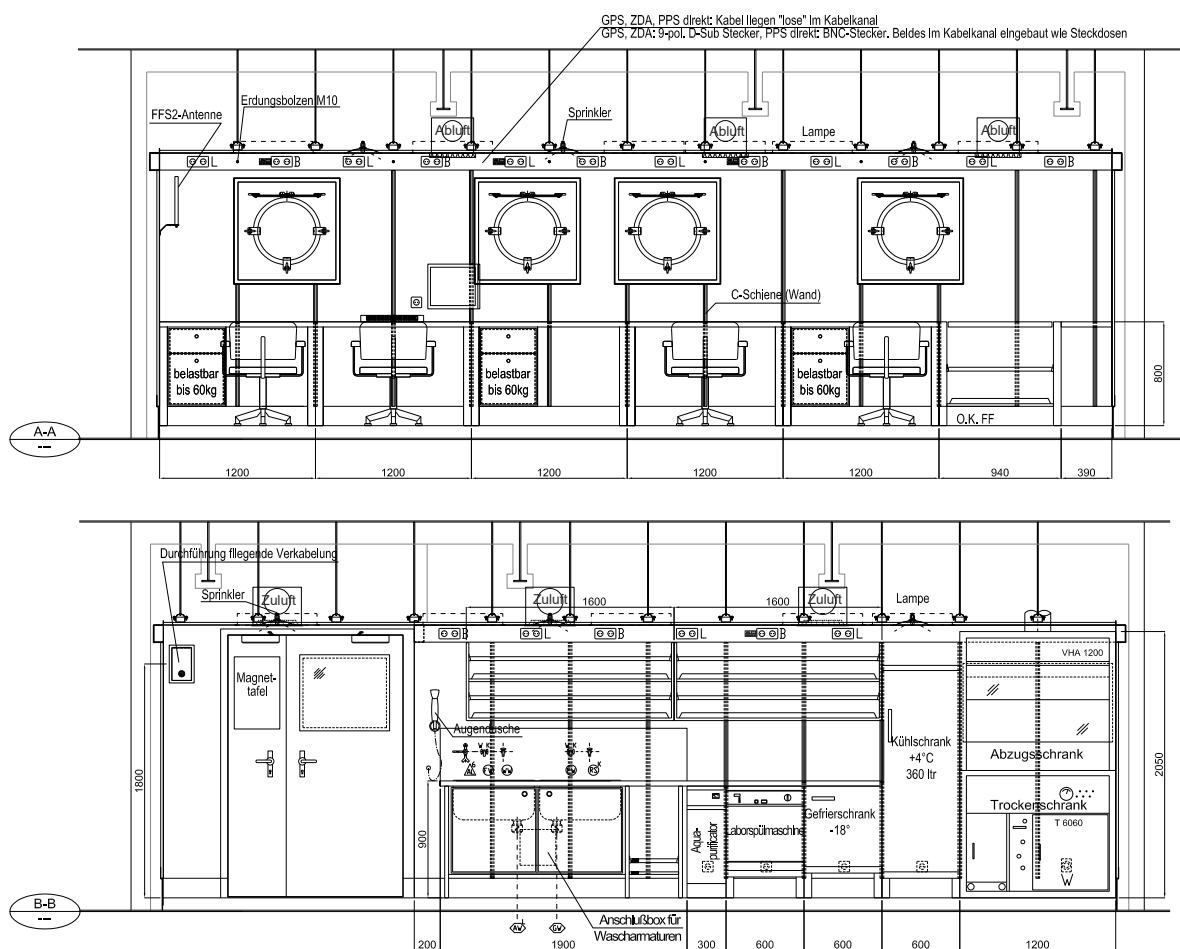


8. Scientific work spaces

8.3.Overview Laboratories

124

View:



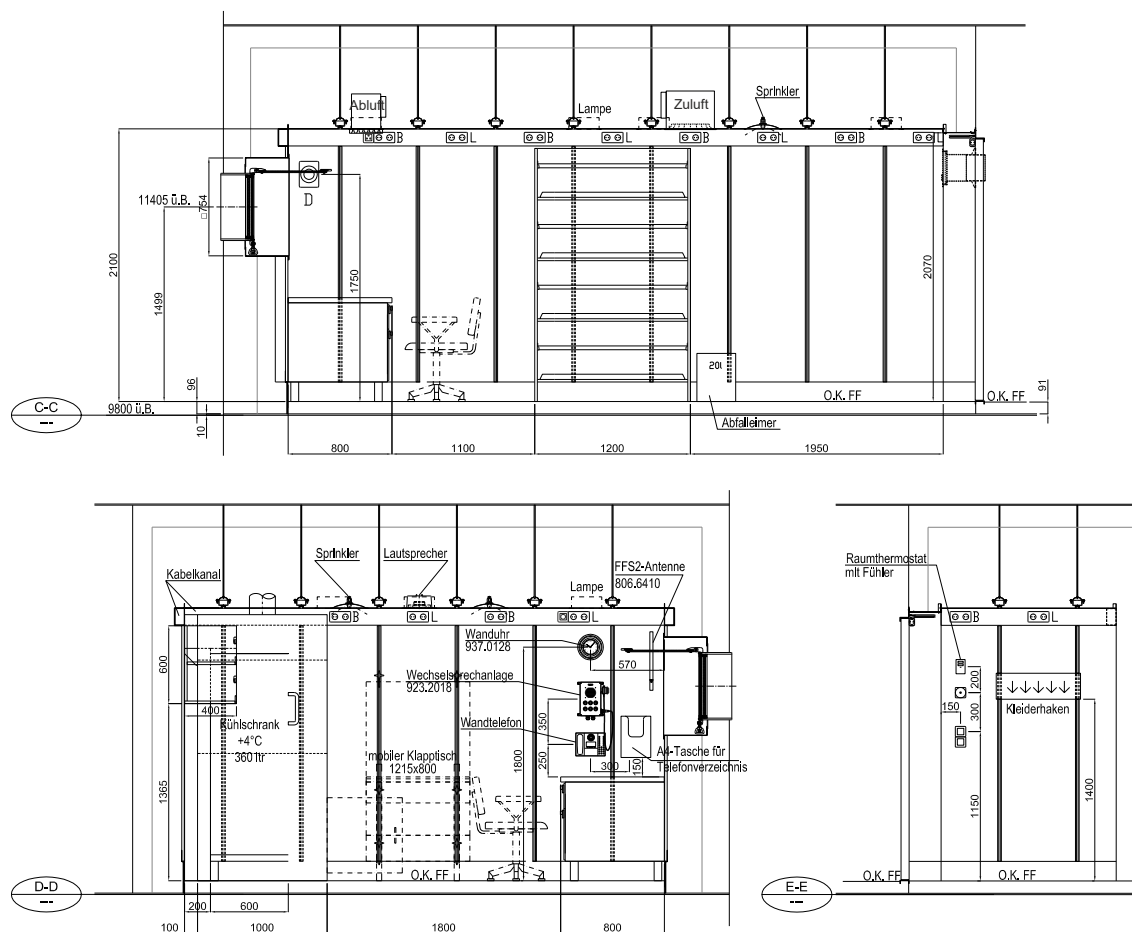


8. Scientific work spaces

8.3.Overview Laboratories

125

View:





8.3.11. Wet lab 2

Location	Deck 03 (Main deck PORT), Frame 40 – 52
Room-No.	364
Phone	509



Area (m²)	15	230V/16 A Lab power UPS	x	Suction	2
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	1
Workplaces	4	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	12	Refrigerator -18°C	1
Fresh water w / c	x	Single-core cable		Refrigerator -80°C	
Clean seawater	K	Multi cable / fiber optic		Lab dishwasher	
soft water	x	Intercom	x	Drying oven	1
Drains (basin)	2	Wall C-tracks	x	gimbal left off. table	
Lab wastewater	1	Ceiling C-tracks	x	Ice maker	
Scuppers, directly	x	Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

- Universal lab for many different disciplines

Equipment

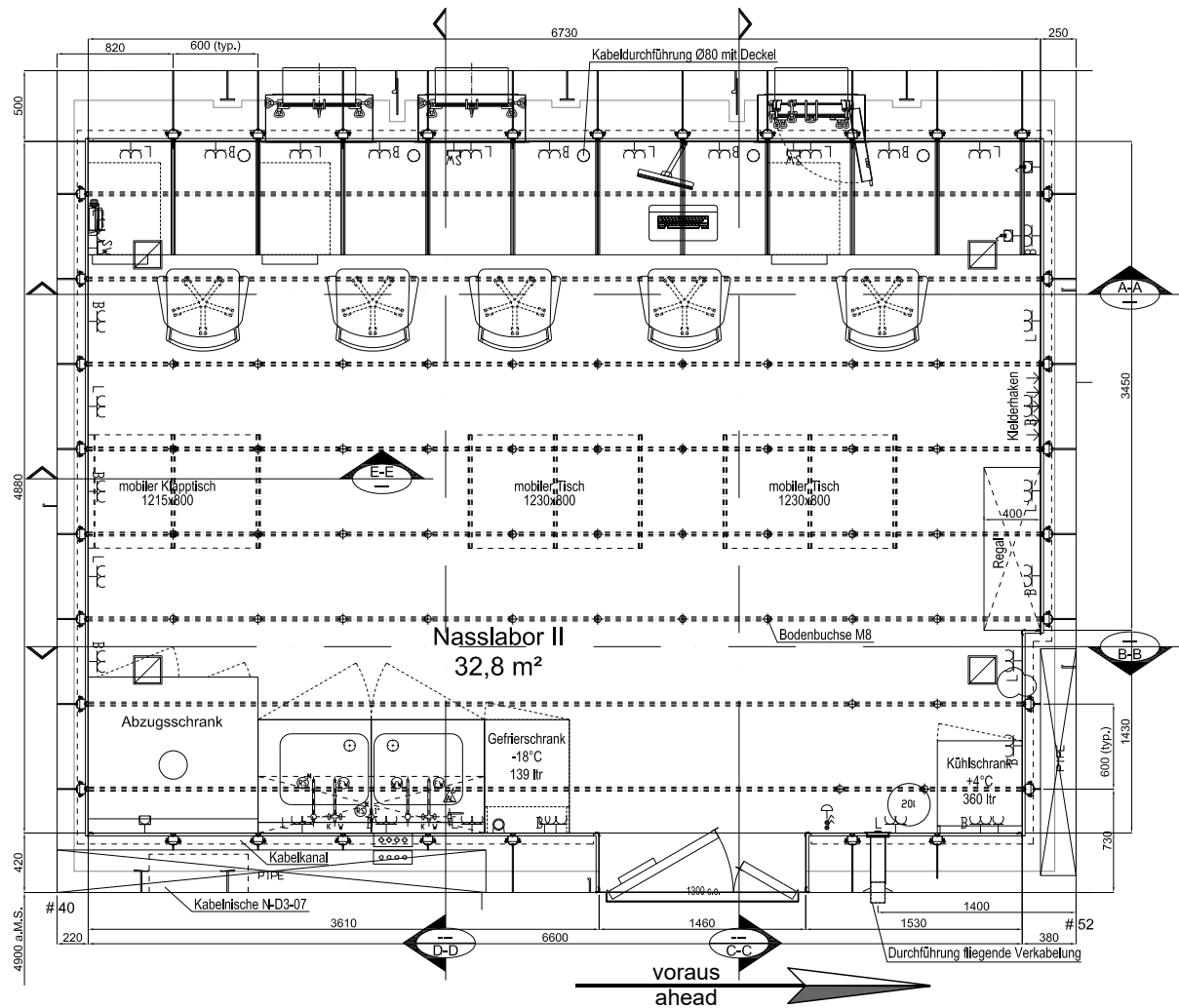
- Refrigerator 360 l +4°C
- Freezer 139 l -18°C
- 1 folding table
- Drying oven
- Digestor
- 2 mobile tables



8. Scientific work spaces
8.3. Overview Laboratories

127

View:

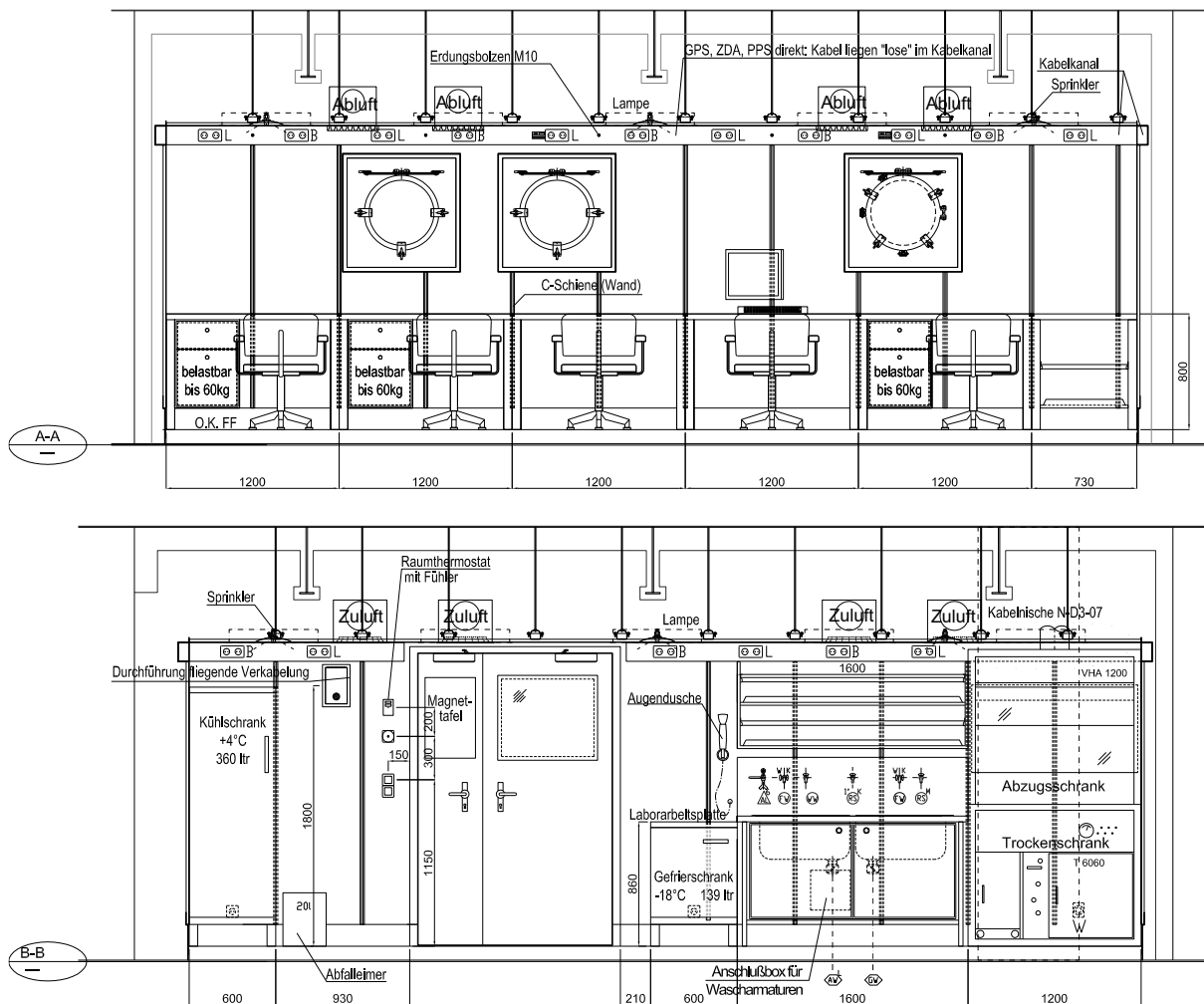




8. Scientific work spaces
 8.3. Overview Laboratories

128

View:

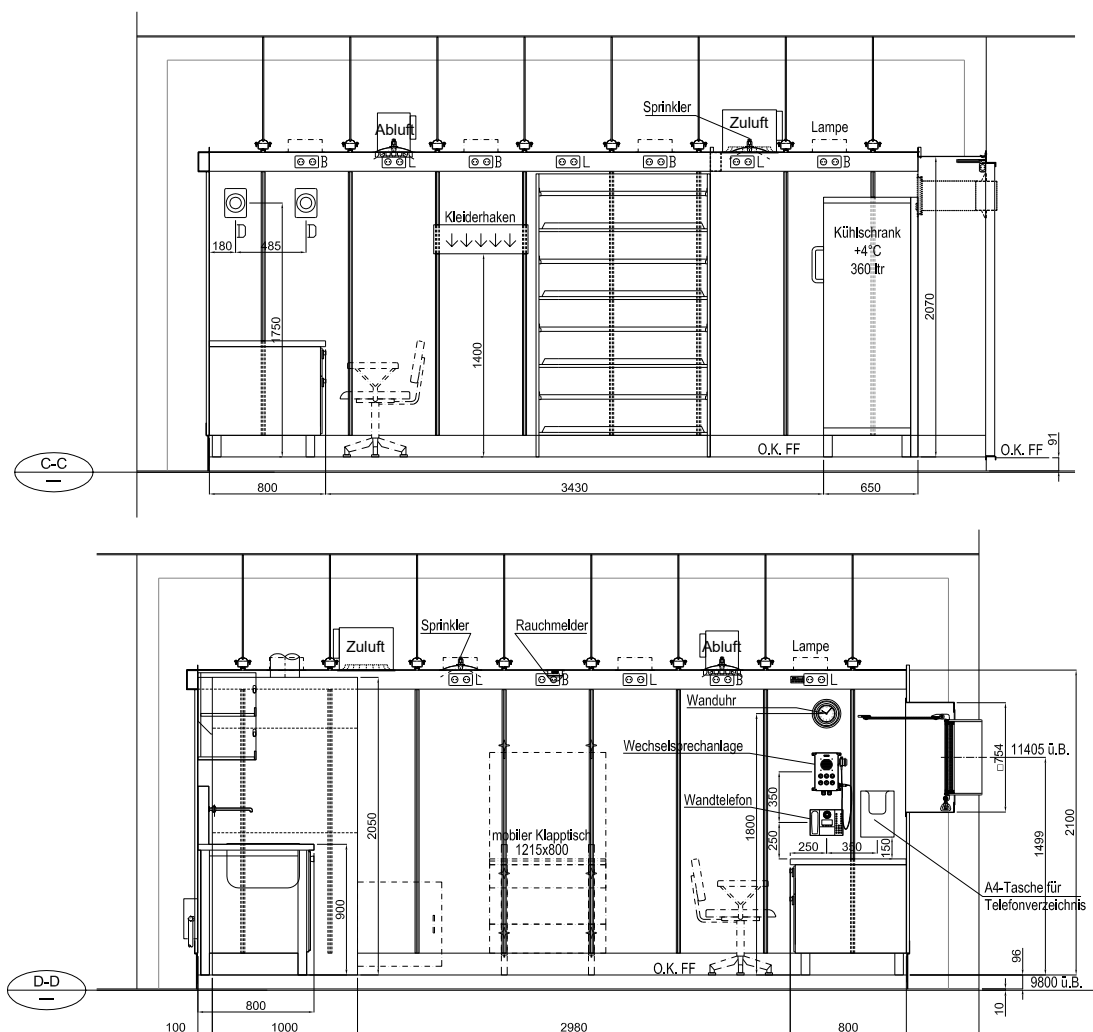




8. Scientific work spaces
 8.3. Overview Laboratories

129

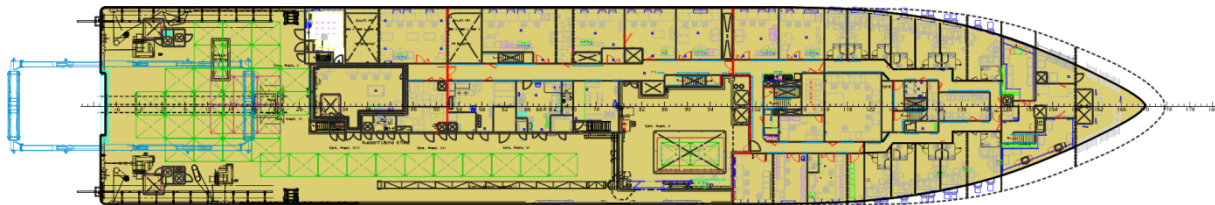
View:





8.3.12. Pulser station

Location	Deck 03 (Main deck PORT), Frame 28 – 34
Room-No.	374
Phone	511



Area (m ²)	12	230V/16 A Lab power UPS	x	Suction	
Door width in m	1	400V/ 32 A Three-phase	1	Outlet	
Workplaces	1	Ground stud	x	Refrigerator +4°C	
Phone	x	LAN	8	Refrigerator -18°C	
Fresh water w / c	x	Single-core cable		Refrigerator -80°C	
Clean seawater		Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom	x	Drying oven	
Drains (basin)	1	Wall C-tracks	x	gimbal left off. table	
Lab wastewater		Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

- two release stations for each 16 Airguns port and starboard
each release station is equipped with pressure gauges and trip valves

Four compressors and two compressor containers are to generate high-pressure air for seismic research available.

The high-pressure compressors and the 10 reservoir-air cylinders with 50 l at 208 bar are located on the tween deck (aft).

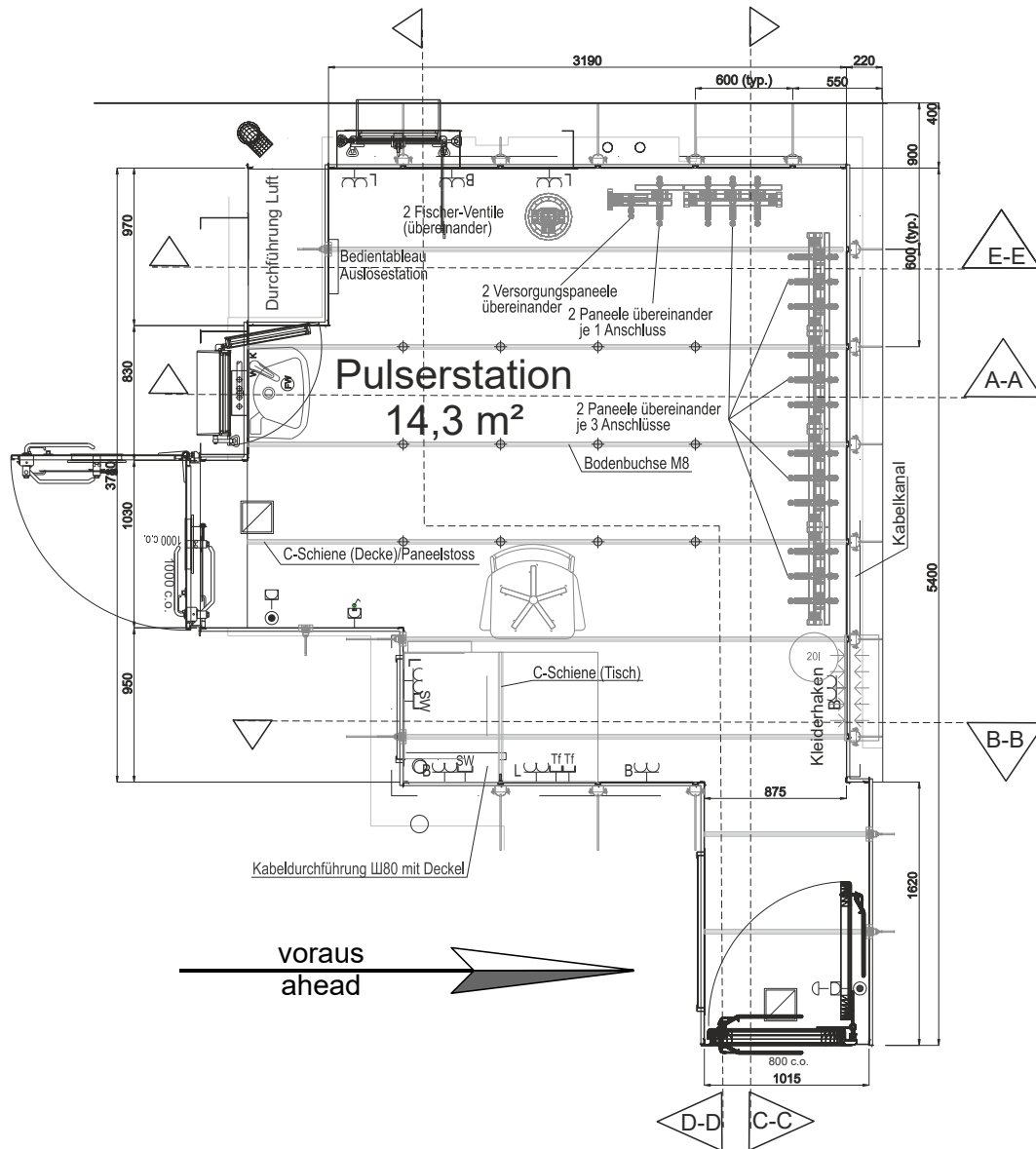
The reservoir-air cylinders are connected with manifold, pressure gauges and safety valves on the system. On reservoir-air cylinders at the Pulserstation a pressure sensor is installed, the system measures the pressure in the bottles.



8. Scientific work spaces
8.3. Overview Laboratories

131

View:

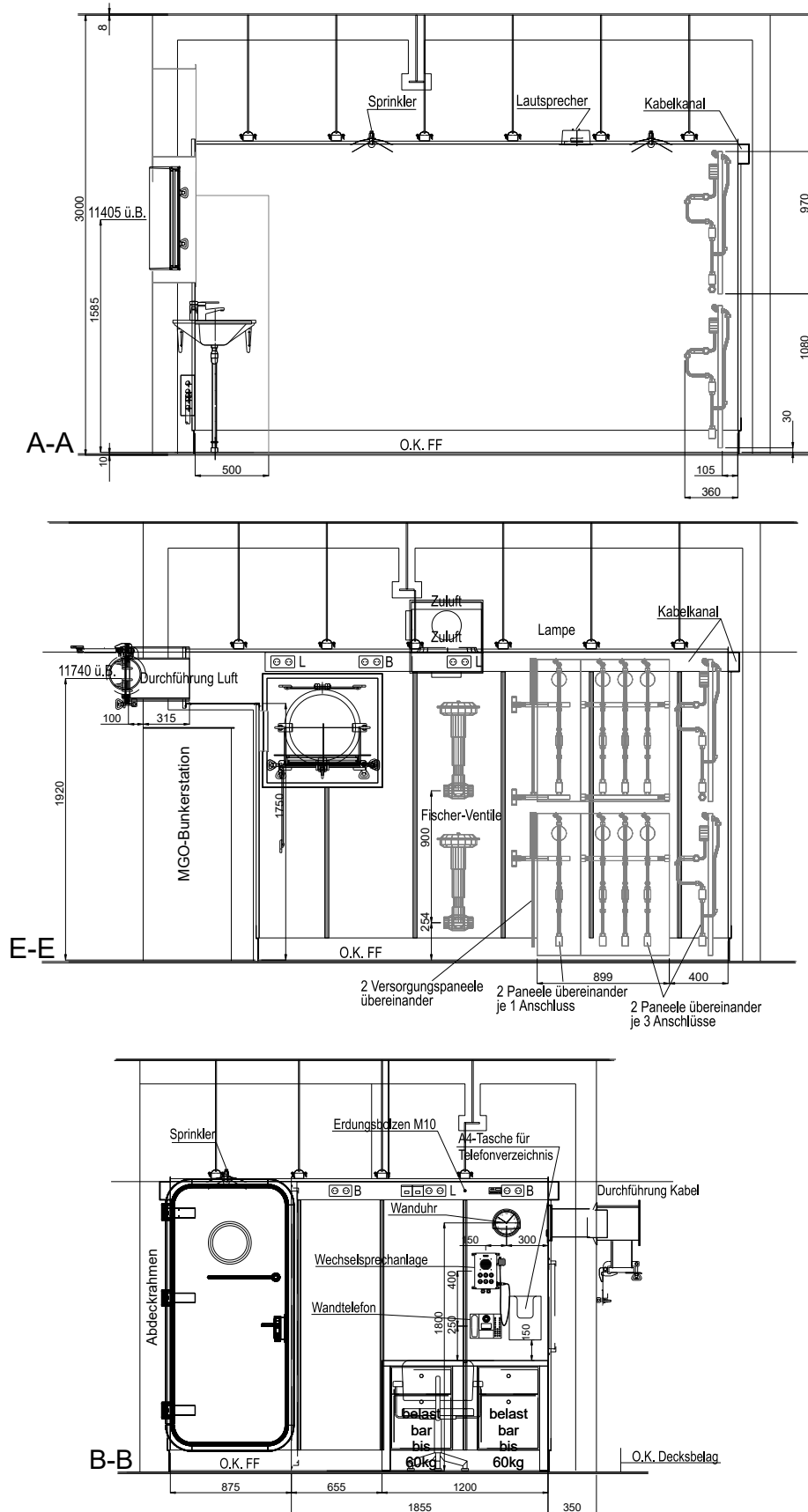




8. Scientific work spaces
8.3. Overview Laboratories

132

View:

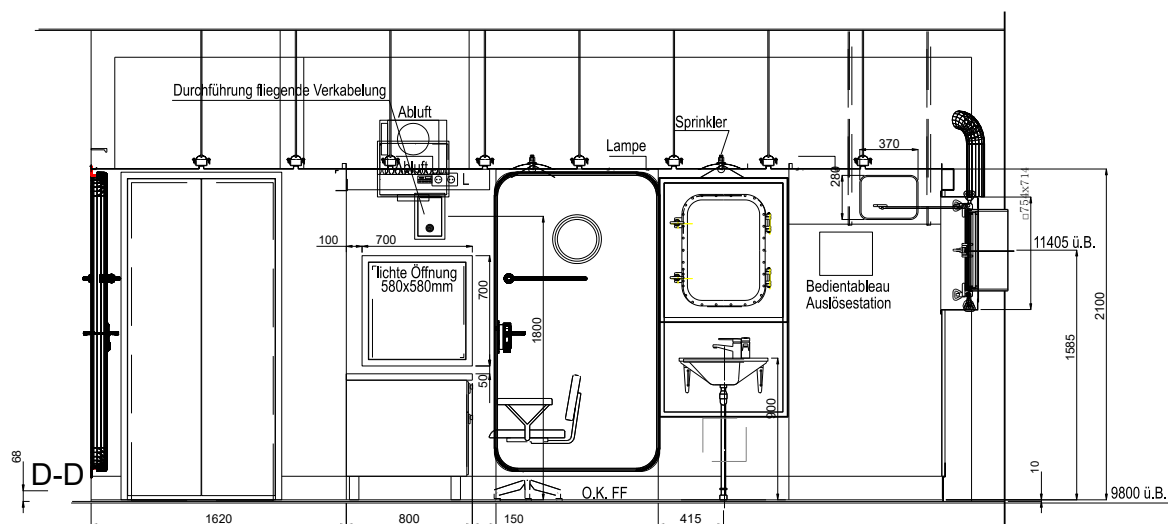
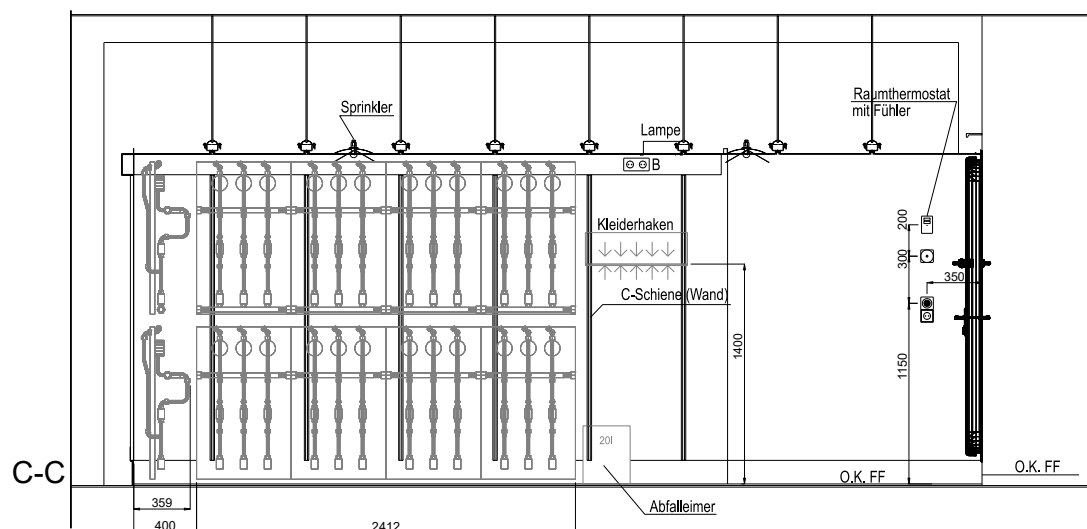




8. Scientific work spaces
8.3. Overview Laboratories

133

View:





8.3.13. Hydroacoustic central

Location	Deck 03 (Main deck amidships), Frame 114 – 124
Room-No.	327
Phone	502



Area (m²)	52	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	
Workplaces	10	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	16	Refrigerator -18°C	
Fresh water w / c	x	Single-core cable	x	Refrigerator -80°C	
Clean seawater		Multi cable / fiber optic	x	Lab dishwasher	
soft water		Intercom	x	Drying oven	
Drains (basin)	1	Wall C-tracks	x	gimbal left off. table	
Lab wastewater		Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket		GPS, ZDA, PPS directly	x
Working air 6 bar		indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

- Control and operating room of hydroacoustic systems

Equipment

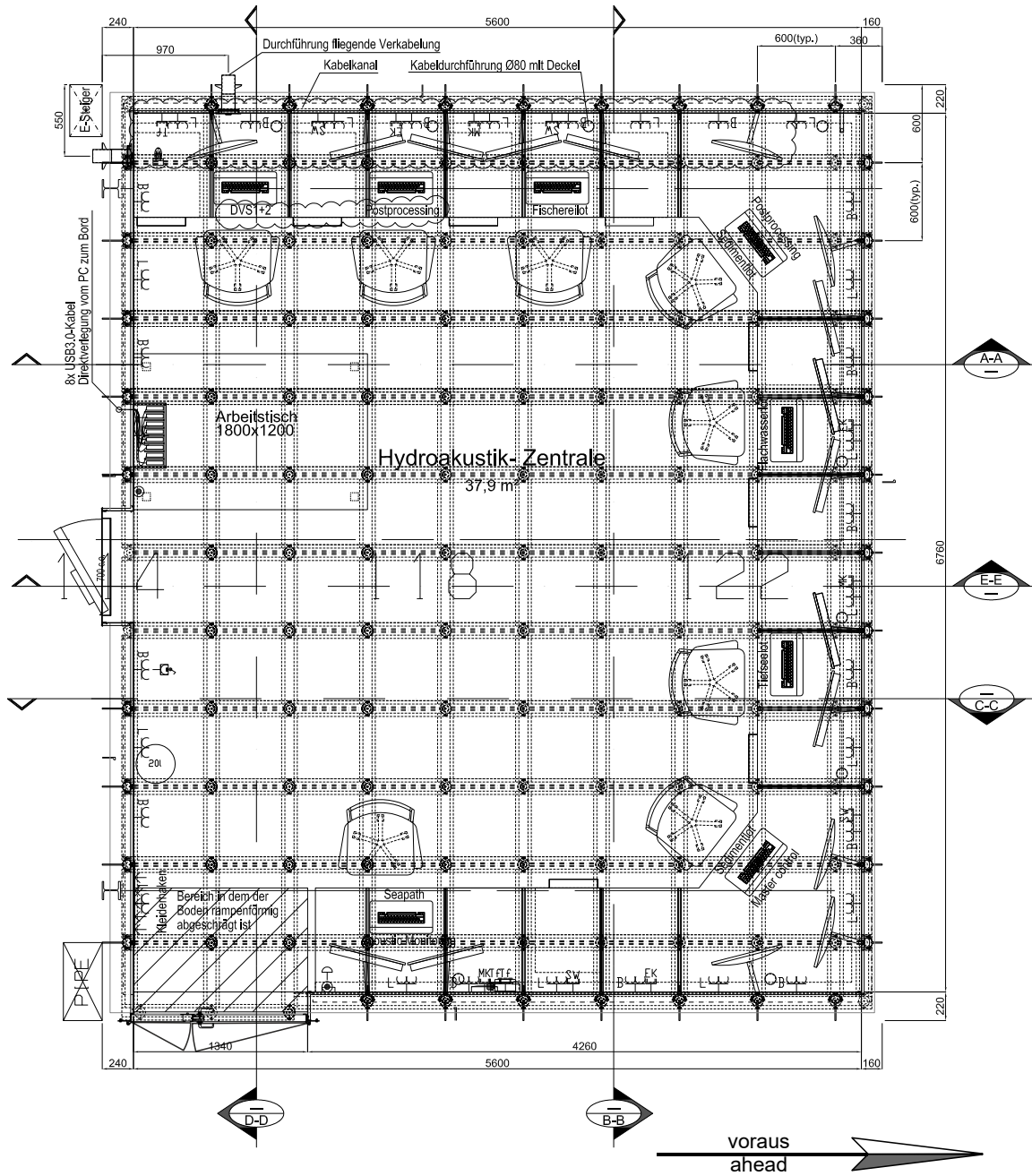
- DIN A0 Plotter
- DIN A3 Color Multifunction Printer
- DIN A4 Color-Laser Printer



8. Scientific work spaces
8.3. Overview Laboratories

135

View:



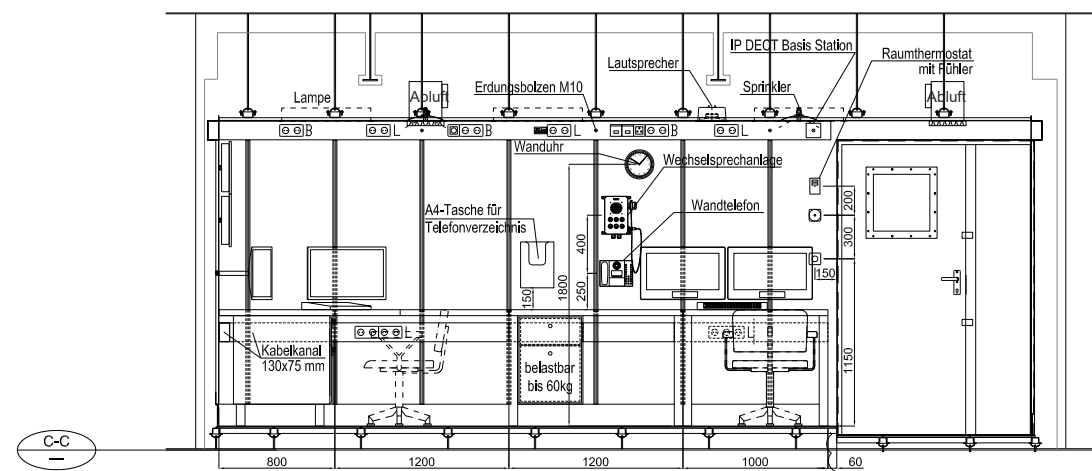
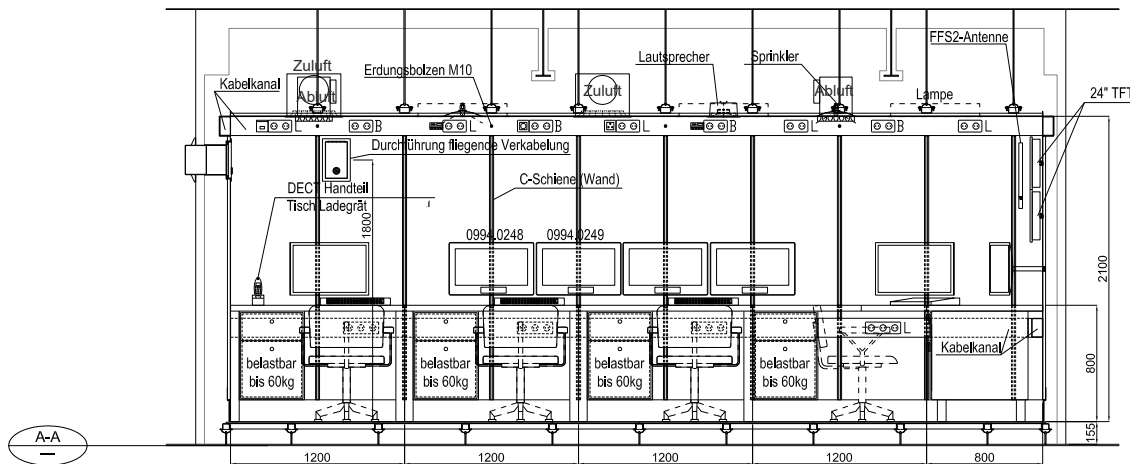
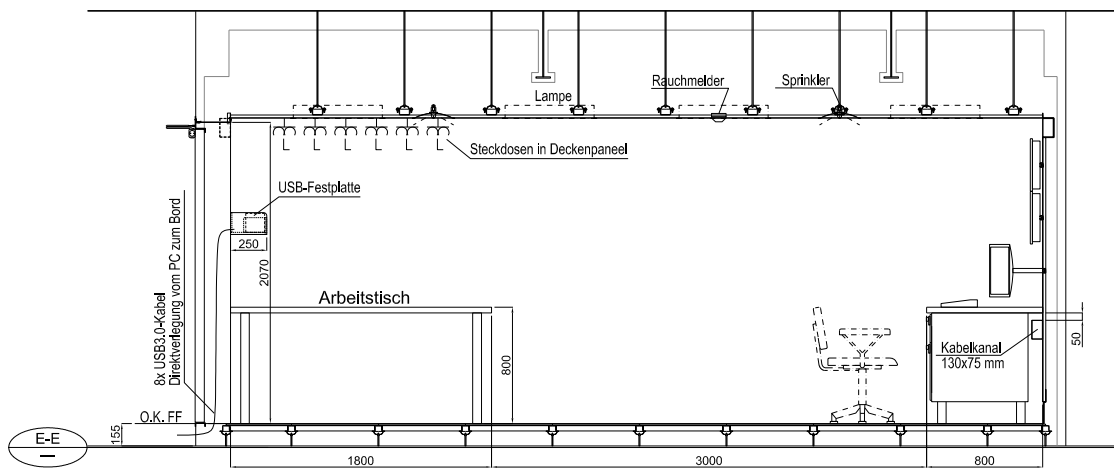


8. Scientific work spaces

8.3.Overview Laboratories

136

View:

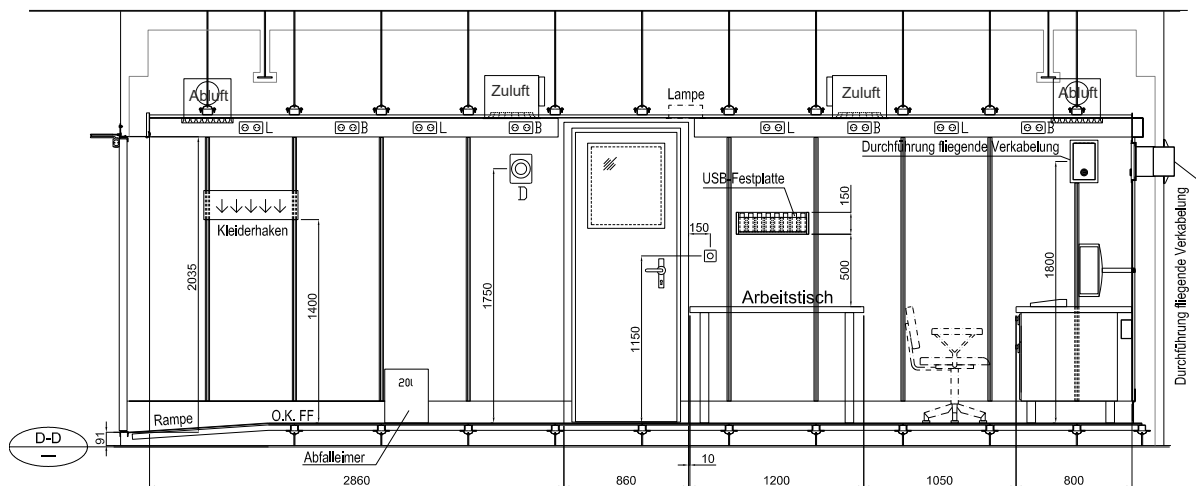
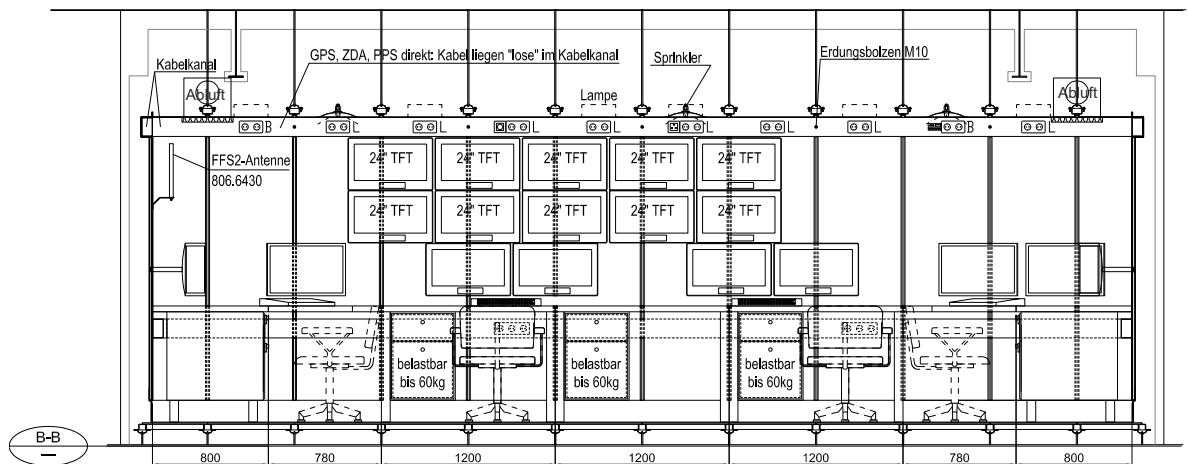




8. Scientific work spaces
8.3. Overview Laboratories

137

View:





8.3.14. Wet lab 1

Location	Deck 03 (Main deck amidships), Frame 28 – 45
Room-No.	372
Phone	510



Area (m²)	45	230V/16 A Lab power UPS	x	Suction	
Door width in m	2	400V/ 32 A Three-phase	1	Outlet	1
Workplaces	6	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	12	Refrigerator -18°C	1
Fresh water w / c	x	Single-core cable	x	Refrigerator -80°C	1
Clean seawater	K/M	Multi cable / fiber optic	x	Lab dishwasher	
soft water		Intercom	x	Drying oven	
Drains (basin)	2	Wall C-tracks	x	gimbal left off. table	
Lab wastewater	1	Ceiling C-tracks	x	Ice maker	1
Scuppers, directly	x	Ground socket	M24	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C		GPS-Repeater	x
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

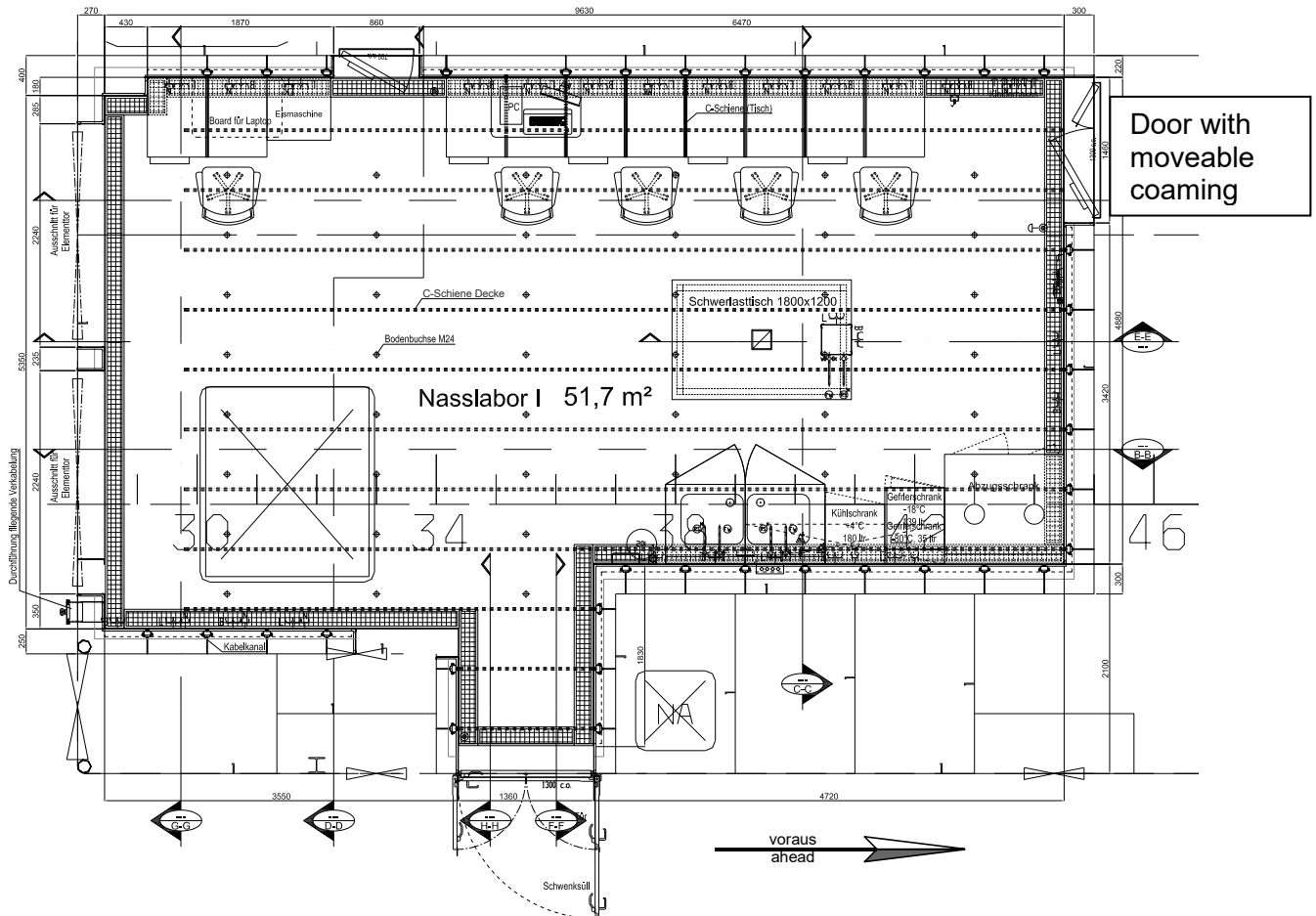
- Deck lab (Universal lab) for all wet scientific work such as biology and geology
- Access from the work deck there is a 2m wide double doors.
- At the aft side of two large element gates are arranged in size of container end sides to integrate laboratory containers in the wet lab I can
- The flooring is made of wood with integrated M24 jacks.

Equipment

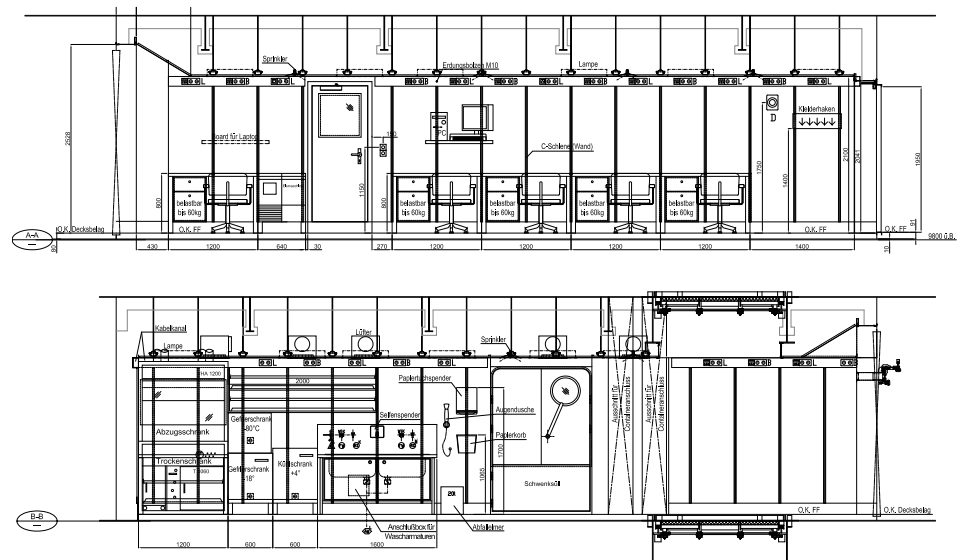
- Heavy duty table (1200 x 1800 mm) with removable Niro tub. Above the table leads for fresh and sea water (pure and service water), 4 double sockets (onboard and laboratory network) and under the table a scuppers are installed
- Refrigerator 360 l +4°C
- Freezer 139 l -18°C
- Freezer 35 l -80°C
- Ice Machine
- Digestor
- Yaw table 600 x 800 mm
- GPS-Repeater

139

Smooth lid hatch for transporting heavy, bulky parts into the engine room; may not be opened at sea



The moveable coaming of the door to the operation aisle inside ship must be firmly closed at sea, since the "wet lab I" according to the freeboard rule is considered as a free deck space!

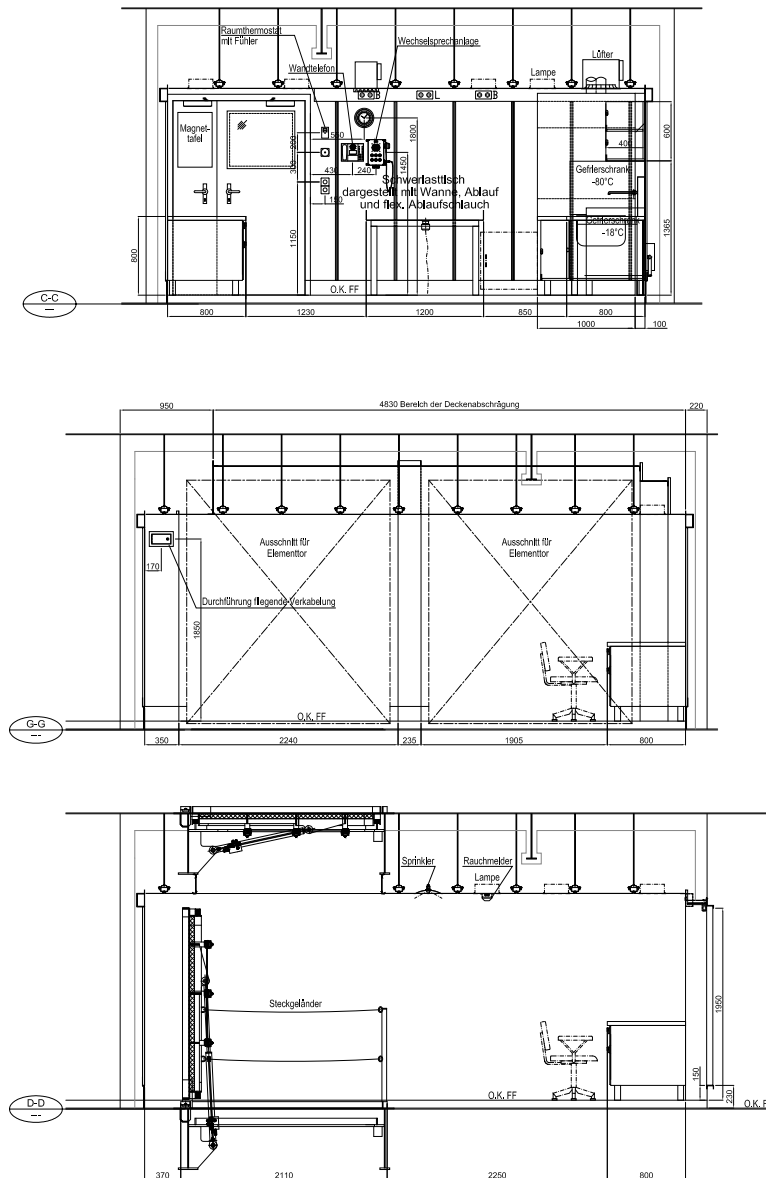




8. Scientific work spaces
8.3. Overview Laboratories

140

View:

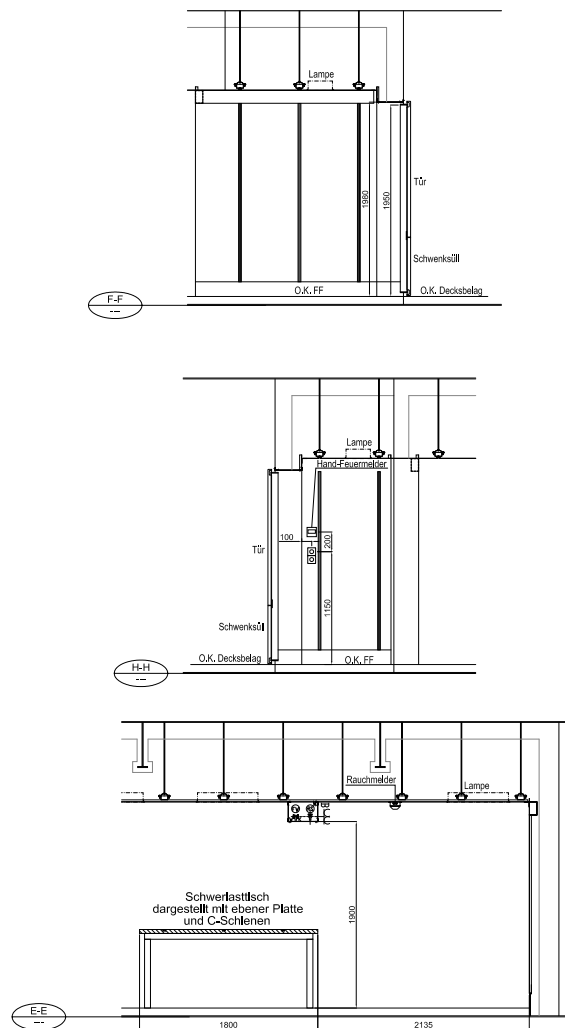




8. Scientific work spaces
8.3. Overview Laboratories

141

View:



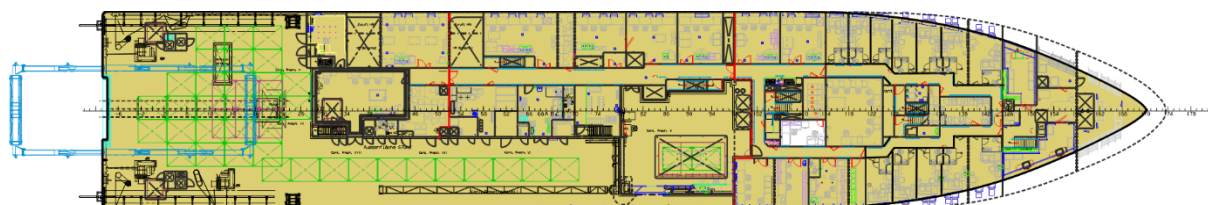


8. Scientific work spaces
8.3.Overview Laboratories

142

8.3.15. Scientific Electronic Lab

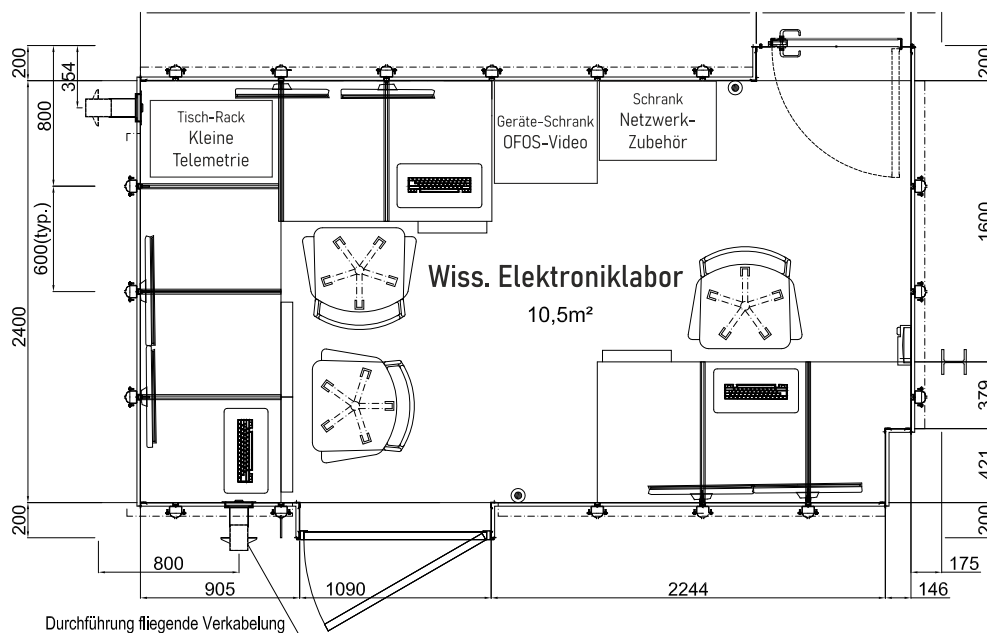
Location	Deck 03 (Main deck midships), Frame 105 – 111
Room-No.	333
Phone	512



Area (m²)	14	230V/16 A Lab power UPS	X	Suction	
Door width in m	1,2	400V/ 32 A Three-phase		Outlet	
Workplaces	2	Ground stud	X	Refrigerator +4°C	
Phone	X	LAN Connection DVS	12	Refrigerator -18°C	
Fresh water w / c		Single-core cable		Refrigerator -80°C	
Clean seawater		Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom		Drying oven	1
Drains (basin)		Wall C-tracks	X	gimbal left off. table	
Lab wastewater		Ceiling C-tracks	X	Ice maker	
Scuppers, directly		Ground socket		GPS, ZDA, PPS directly	X
Working air 6 bar		indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	X	Wall clock	X

Function definition:

- Operating station for OFOS (Ocean Floor Observation System), see there
- Electronics workroom for scientific purposes (depending on OFOS deployment)





8.3.16. Data center

Location	Deck 03 (Main deck starboard), Frame 98 – 105
Room-No.	339
Phone	303



Area (m²)	16	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	
Workplaces	4	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	24	Refrigerator -18°C	
Fresh water w / c	0	Single-core cable	x	Refrigerator -80°C	
Clean seawater		Multi cable / fiber optic	x	Lab dishwasher	
soft water		Intercom	x	Drying oven	
Drains (basin)	0	Wall C-tracks	x	gimbal left off. table	
Lab wastewater		Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar	1	indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

Control of the following devices:

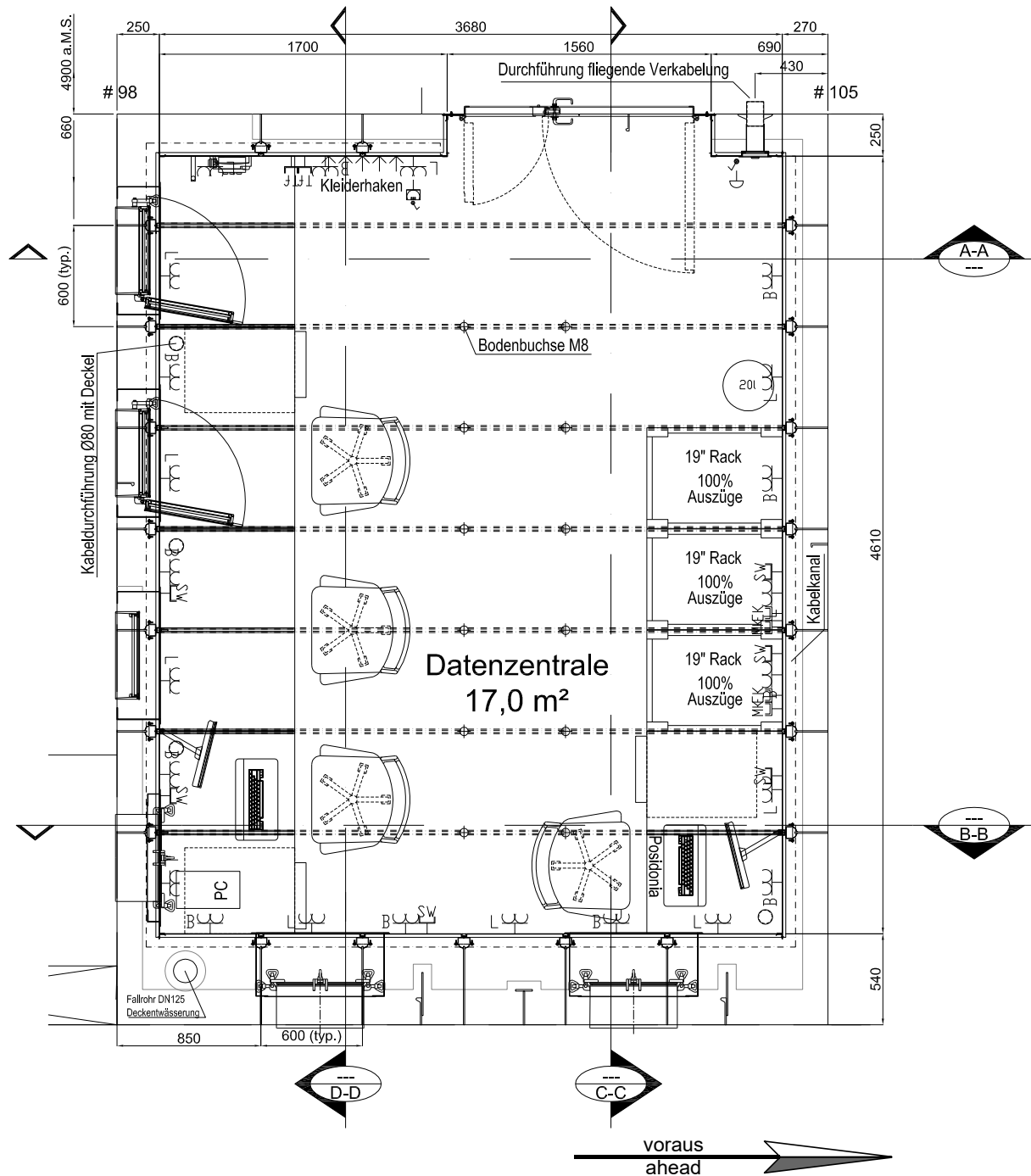
- ADCP 38 kHz
- ADCP 75 kHz
- WAMOS
- Posidonia Sonardyne
- CTD



8. Scientific work spaces
8.3. Overview Laboratories

144

View:

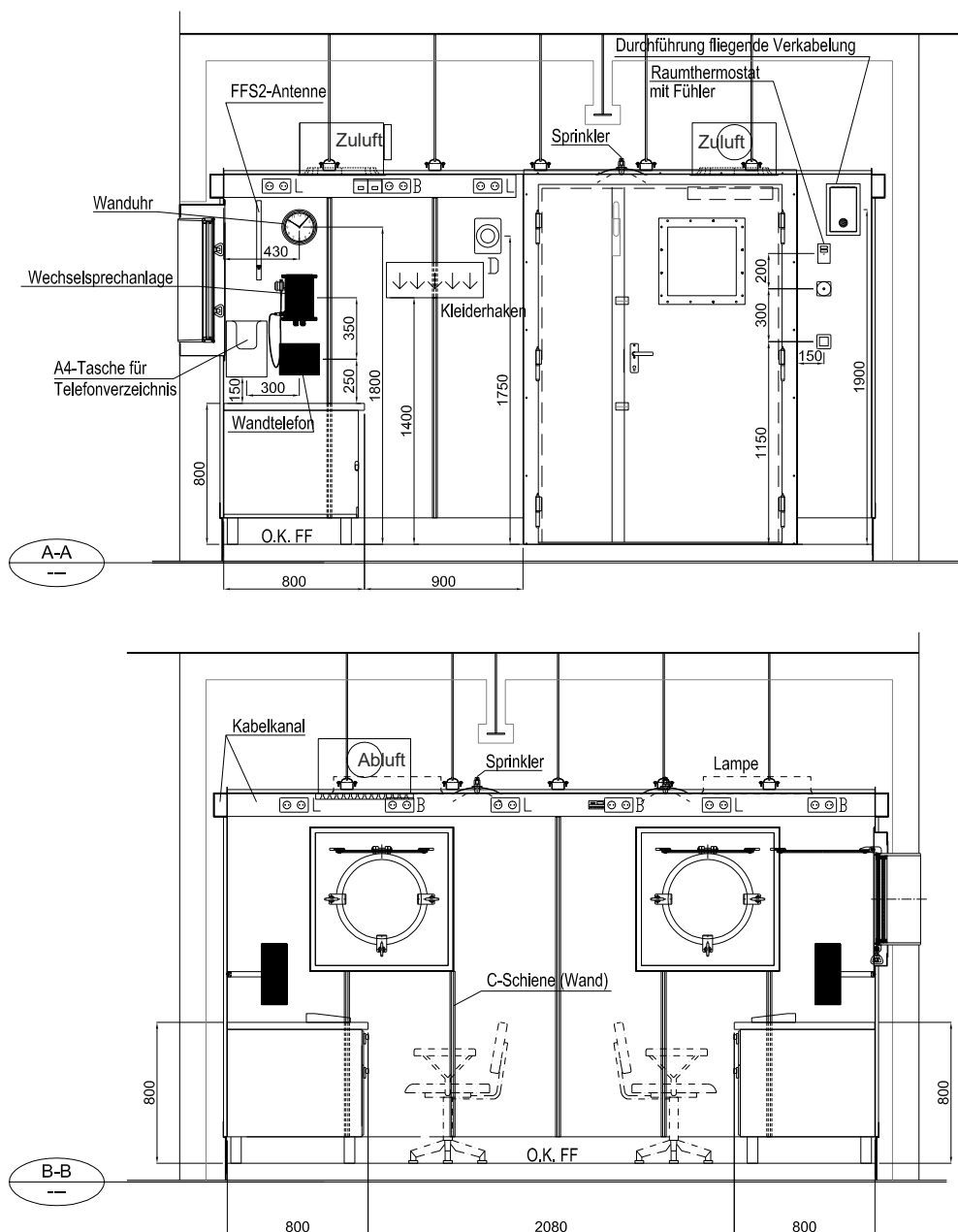




8. Scientific work spaces
8.3. Overview Laboratories

145

View:

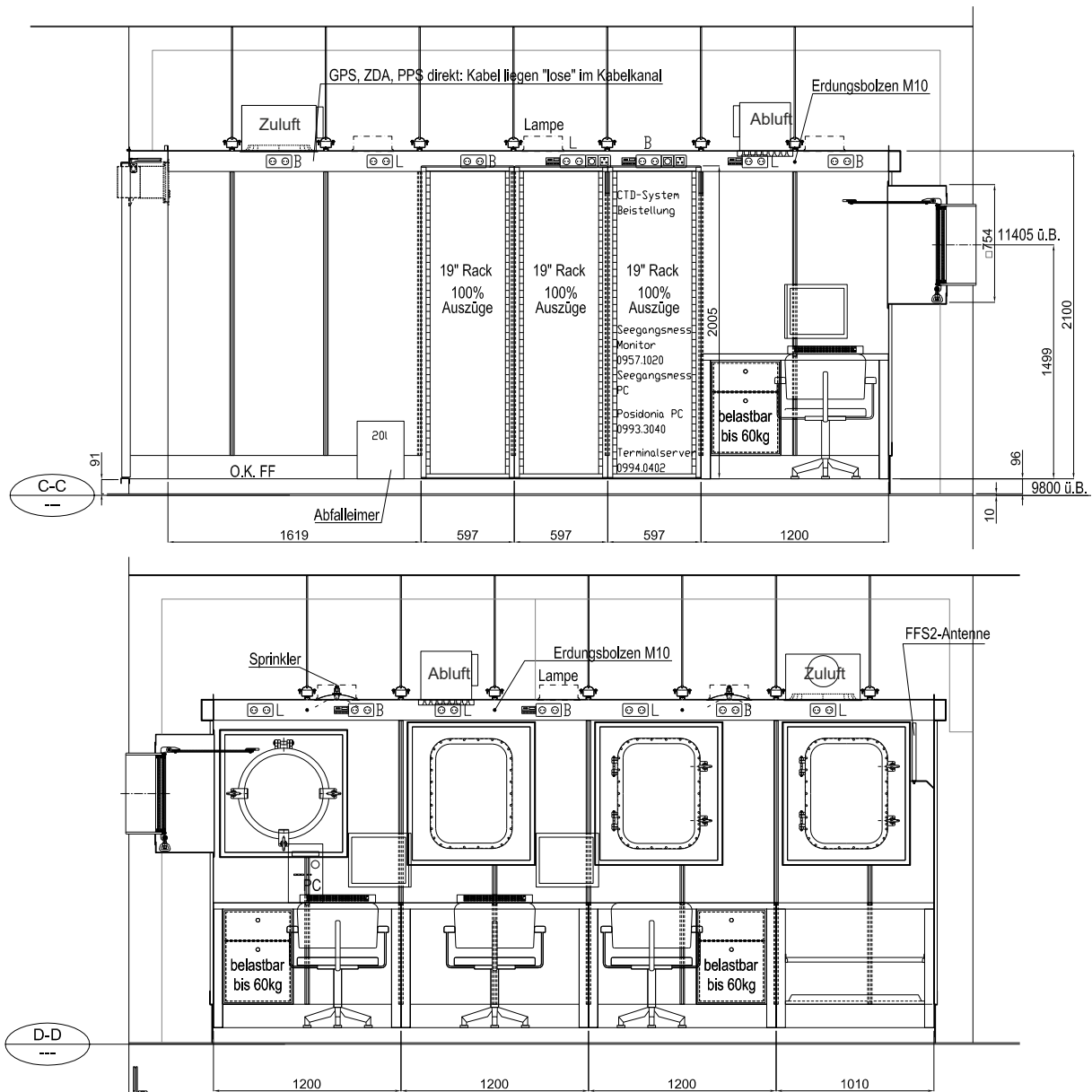




8. Scientific work spaces
8.3. Overview Laboratories

146

View:





8.3.17. Hangar

Location	Deck 03 (Main deck starboard), Frame 79 – 98/101
Room-No.	344
Phone	500



Area (m²)	115	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase	2	Outlet	
Workplaces	2	Ground stud	x	Refrigerator +4°C	1
Phone	x	LAN	16	Refrigerator -18°C	1
Fresh water w / c	x	Single-core cable	x	Refrigerator -80°C	
Clean seawater	K/M	Multi cable / fiber optic	x	Lab dishwasher	
soft water		Intercom	x	Drying oven	
Drains (basin)	2	Wall C-tracks	x	gimbal left off. table	
Lab wastewater	1	Ceiling C-tracks		Ice maker	
Scuppers, directly	x	Ground socket	M24	GPS, ZDA, PPS directly	x
Working air 6 bar	3	indiv. Temperature 0-28°C		GPS-Repeater	x
230/16A power	x	indiv. Temperature 18-28°C		Wall clock	x

Function definition:

- The hangar provides secure as possible working conditions in all weather conditions. It is designed with 2 deck heights.
- Extension and retraction of large rosette water samplers using the slide beam 70kN with filling option in the hangar
- Preparation of mooring work
- Working in combination with the Hydrographic tubes
- Wet work Geology
- Stowage of large equipment
- Protected work on the slider with portable winches
- Protected to handle work on deck.
- Monitoring ISPS

Attention:

Smooth deck hatch (split) for transporting 20 'containers and other heavy objects; may not be opened at sea!

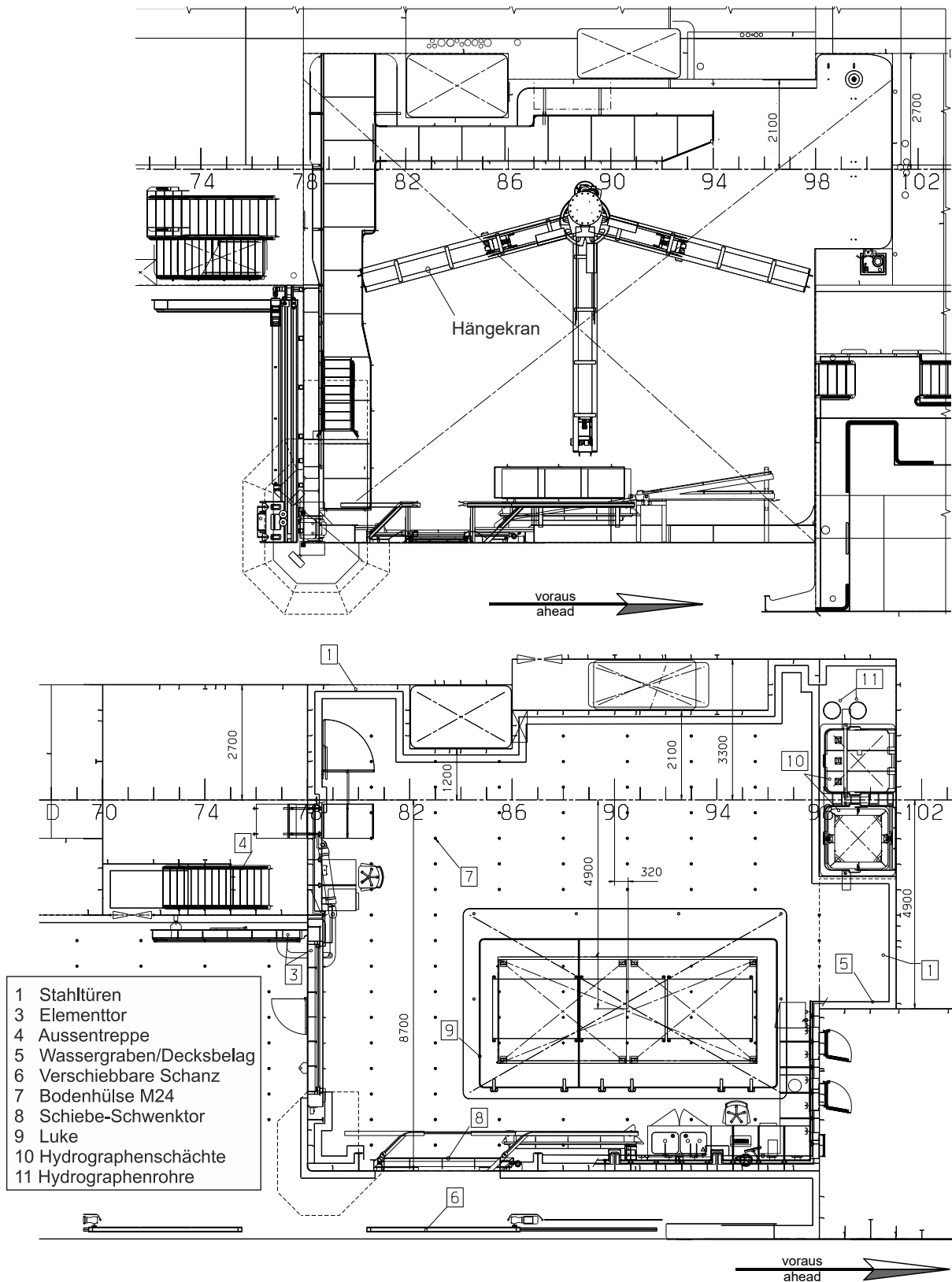
The **moveable coaming** of the doors to the operation aisle inside ship must be firmly closed at sea, since the "Hangar" according to the freeboard rule is considered as a free deck space!



8. Scientific work spaces
8.3. Overview Laboratories

148

View:



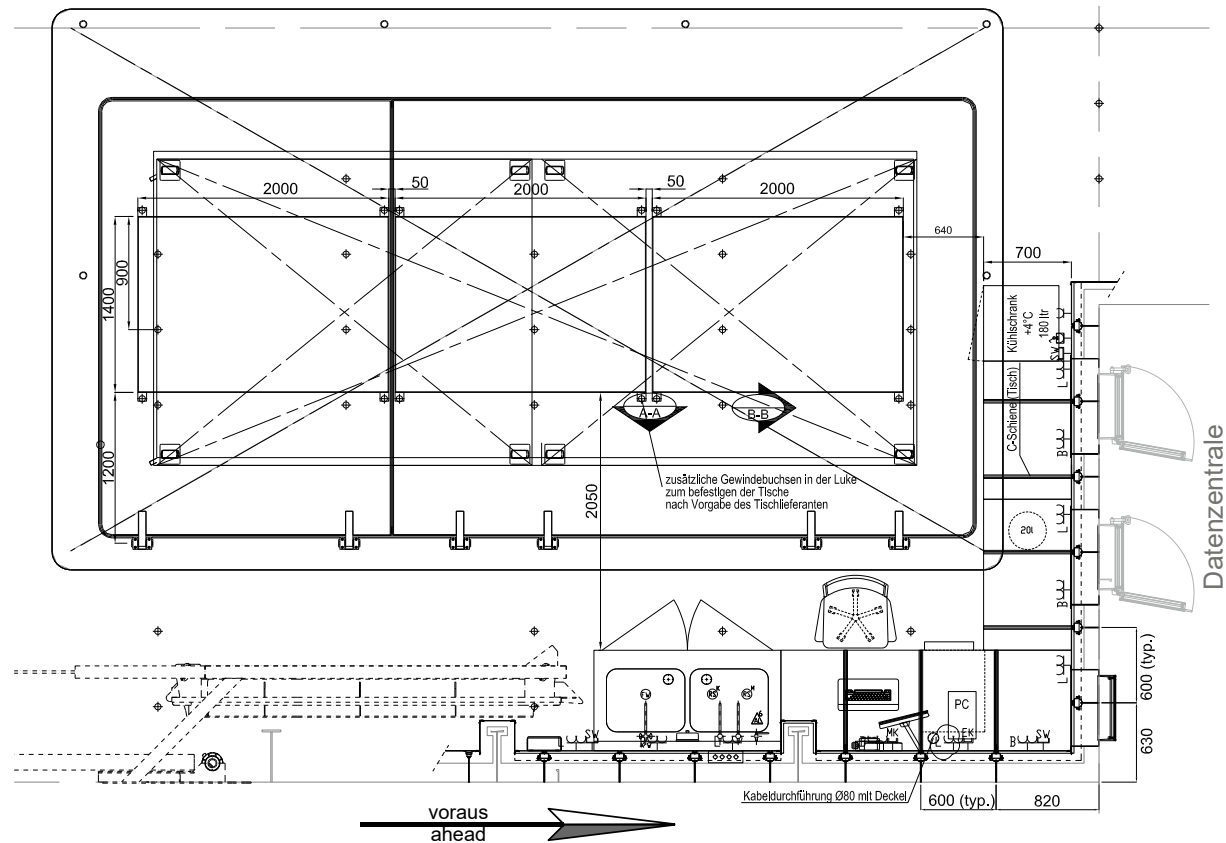


8. Scientific work spaces
8.3.Overview Laboratories

149

View:

Grundriss Hangar Labor-Arbeitsplatz

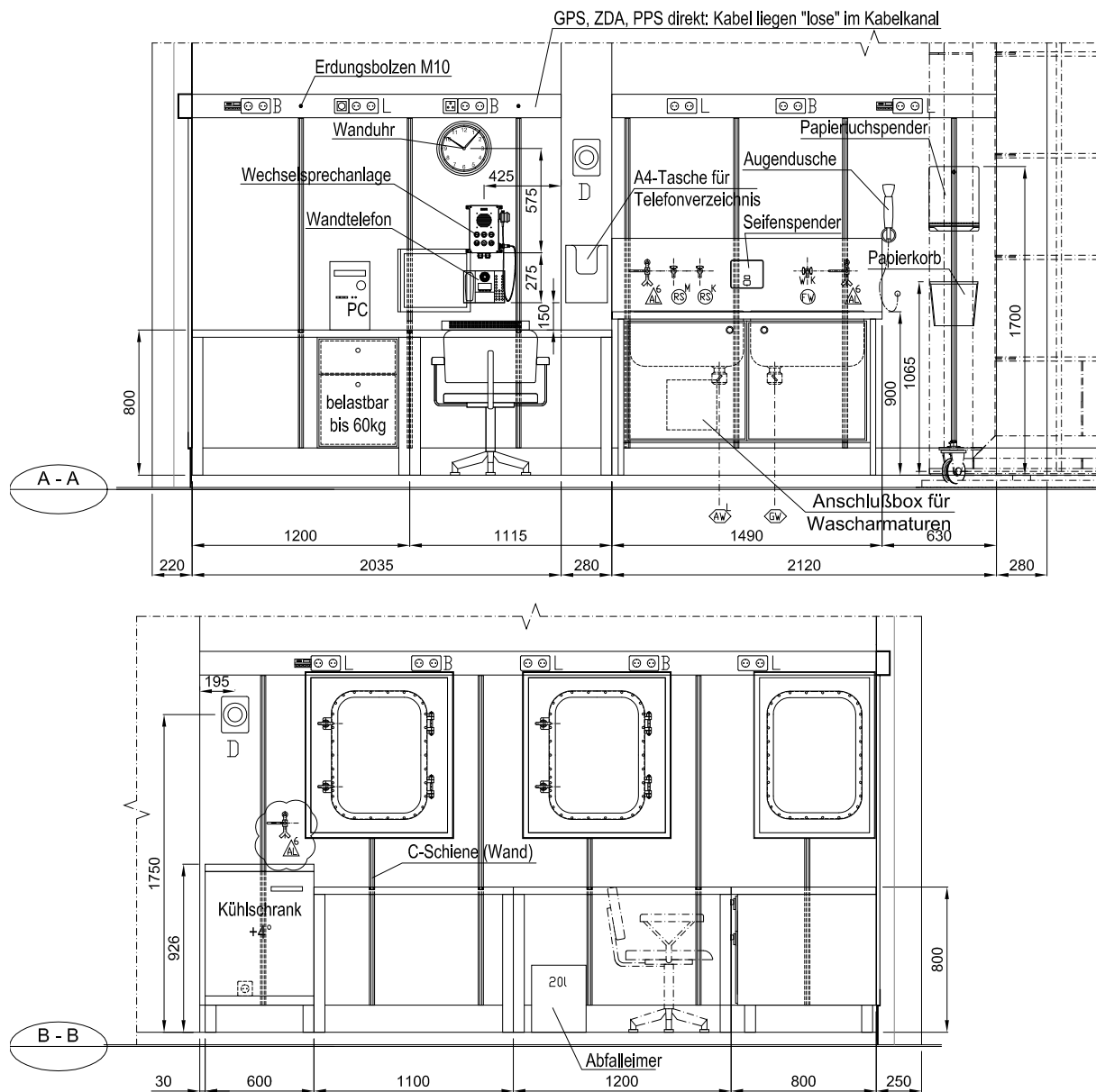




8. Scientific work spaces
8.3. Overview Laboratories

150

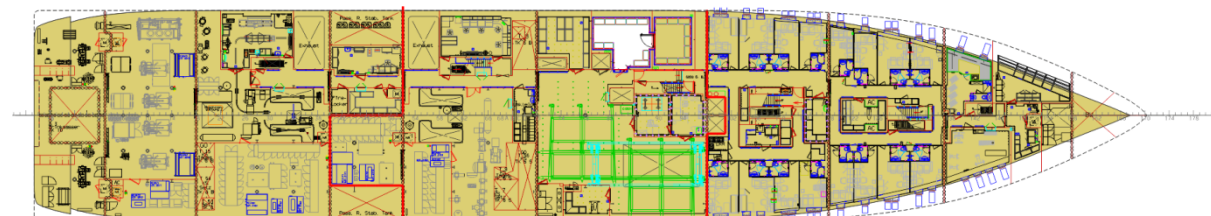
View:





8.3.18. Freezing / cold storage +2°C

Location	Deck 02 (Zwischendeck PORT), Frame 77 -- 88
Room-No.	246
Phone	513



Area (m²)	20	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase		Outlet	
Workplaces	1	Ground stud		Refrigerator +4°C	
Phone	x	LAN	4	Refrigerator -18°C	
Fresh water w / c		Single-core cable		Refrigerator -80°C	
Clean seawater		Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom		Drying oven	
Drains (basin)		Wall C-tracks Aufputz	x	gimbal left off. table	
Lab wastewater		Ceiling C-tracks		Ice maker	
Scuppers, directly		Ground socket		GPS, ZDA, PPS directly	
Working air 6 bar		indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C		Wall clock	

Function definition:

- The refrigerated storage is used as storage space and cooling lab for example, Biologists and geologists.
- It is to be cooled to -6 ° C and has a finely adjustable temperature control tolerance of ± 0.5 K

Equipment

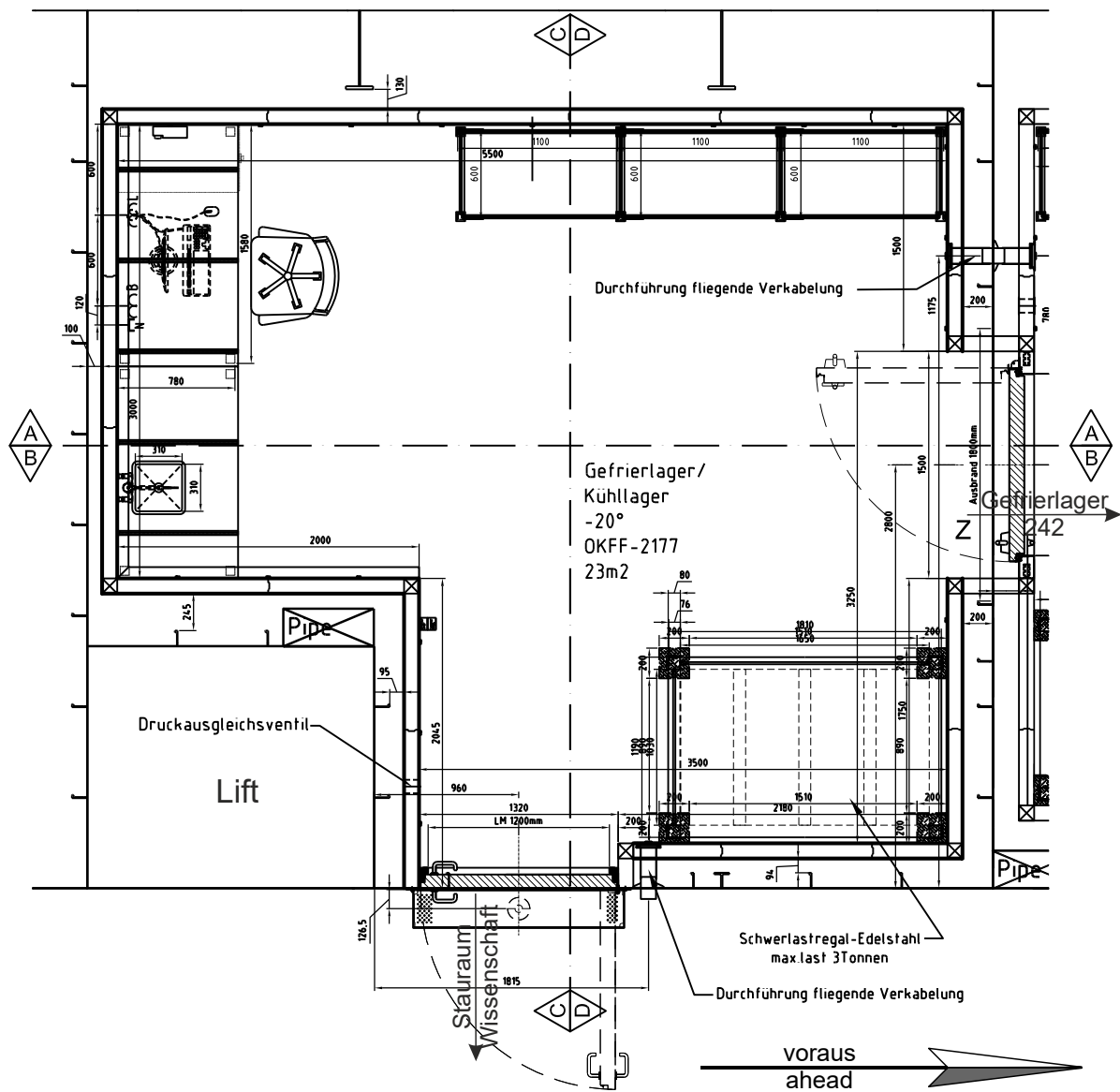
- 1 work place
- Shelves for conventional aluminum boxes



8. Scientific work spaces

8.3.Overview Laboratories

152

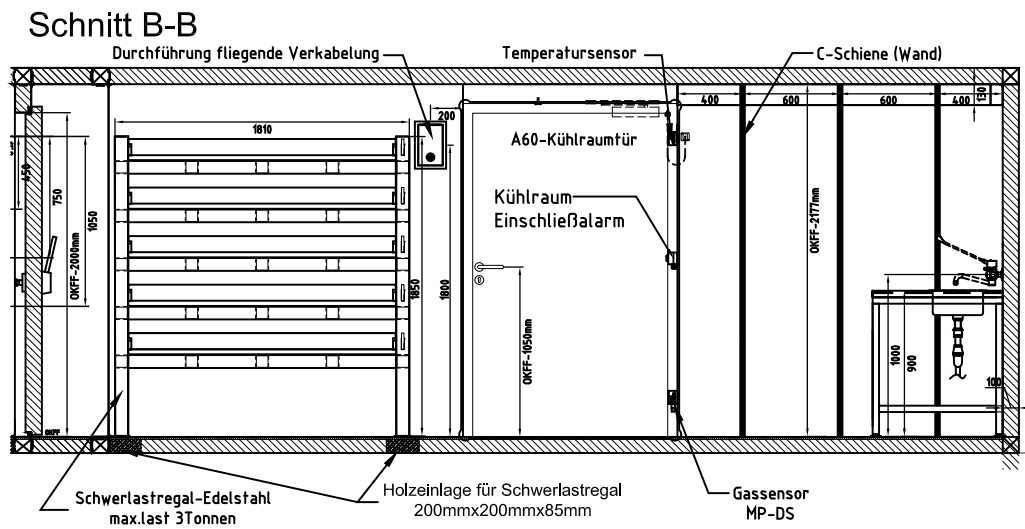
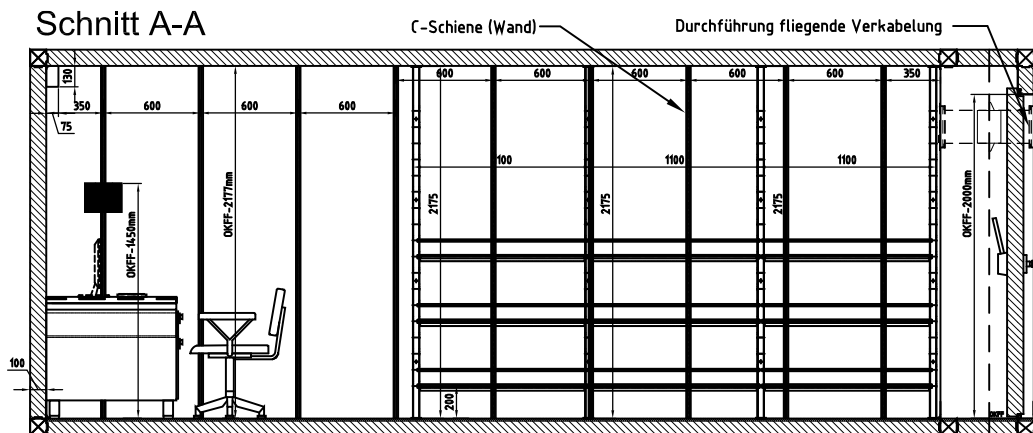
View:



8. Scientific work spaces
8.3. Overview Laboratories

153

View:



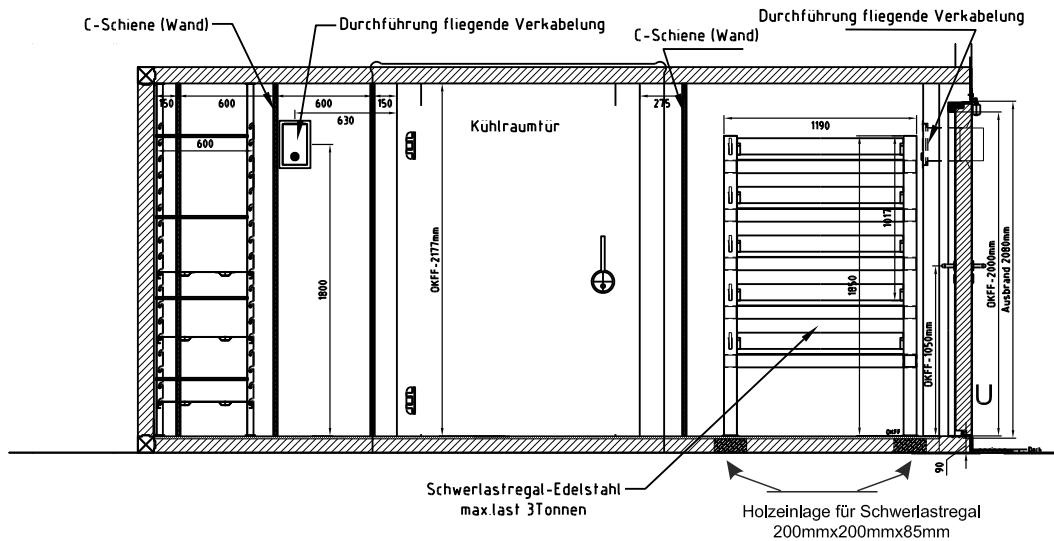


8. Scientific work spaces
8.3.Overview Laboratories

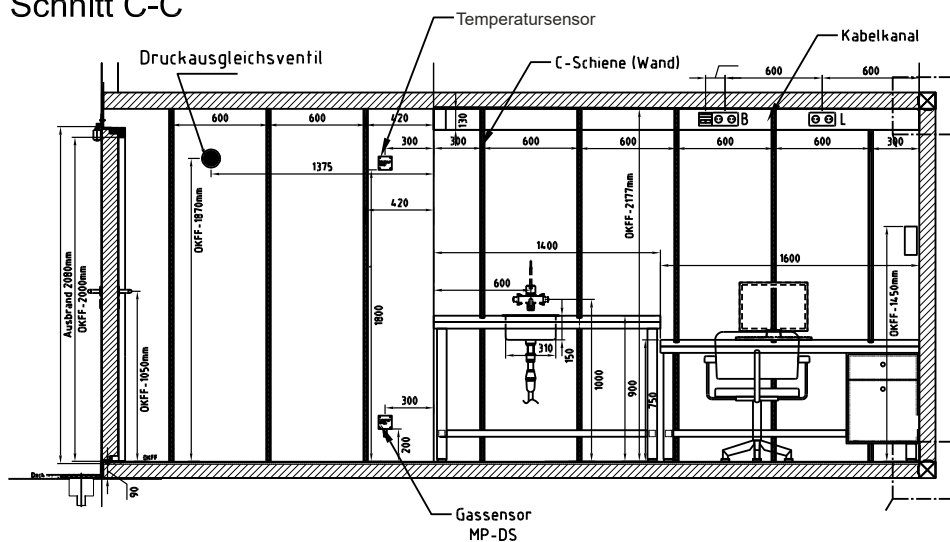
154

View:

Schnitt D-D



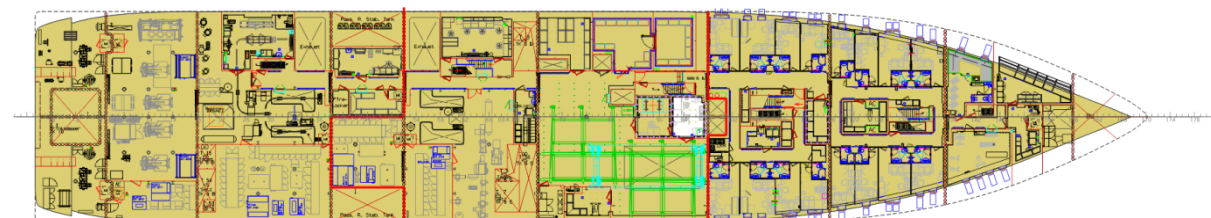
Schnitt C-C





8.3.19. Salinometer room

Location	Deck 02 (tween deck), Frame 86 – 92
Room-No.	241
Phone	514



Area (m²)	9	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase		Outlet	
Workplaces	2	Ground stud		Refrigerator +4°C	
Phone	x	LAN	12	Refrigerator -18°C	
Fresh water w / c	x	Single-core cable		Refrigerator -80°C	
Clean seawater	K	Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom	x	Drying oven	
Drains (basin)	1	Wall C-tracks	x	gimbal left off. table	
Lab wastewater		Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar		indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

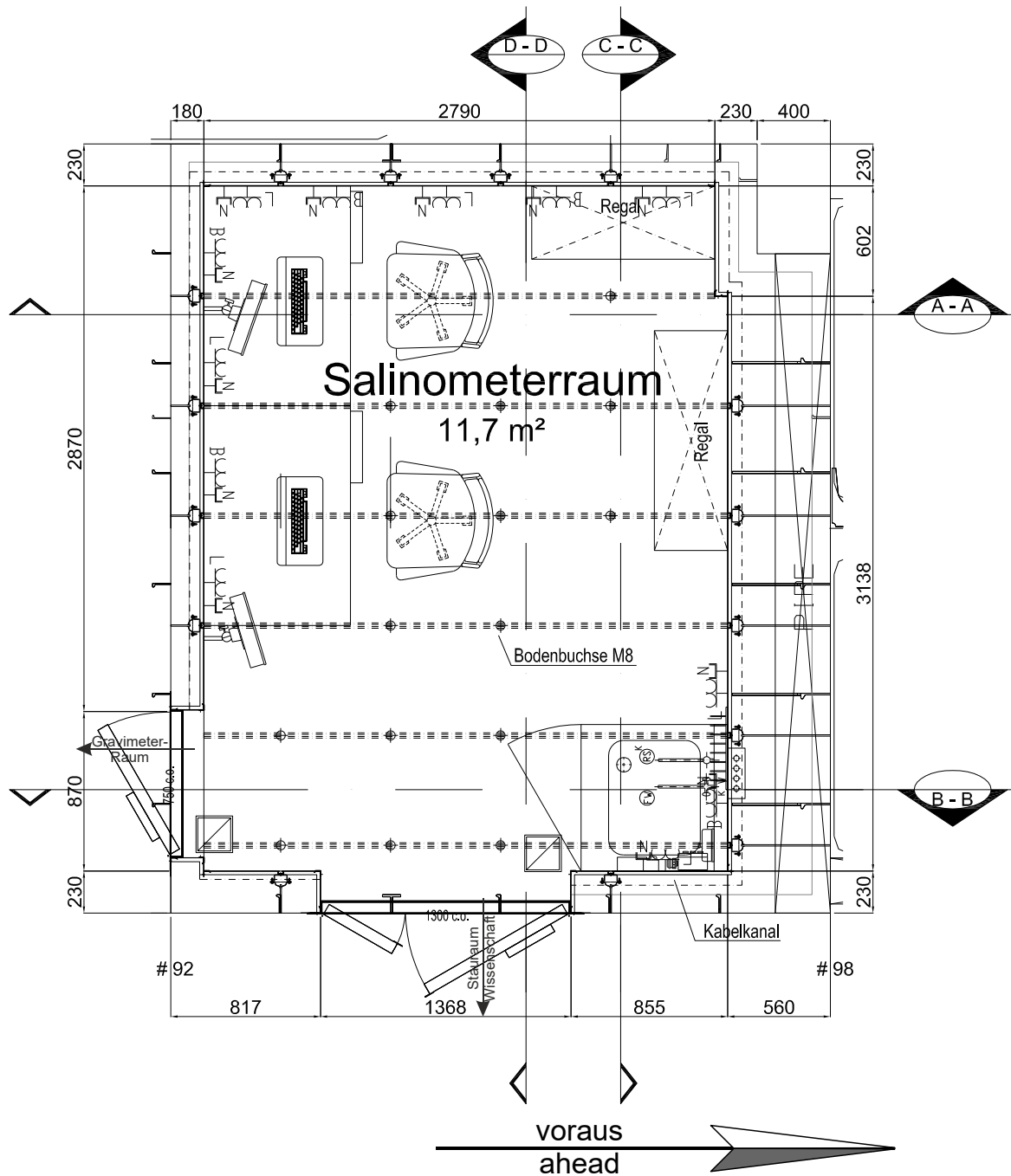
- Working on clean seawater



8. Scientific work spaces
8.3. Overview Laboratories

156

View:

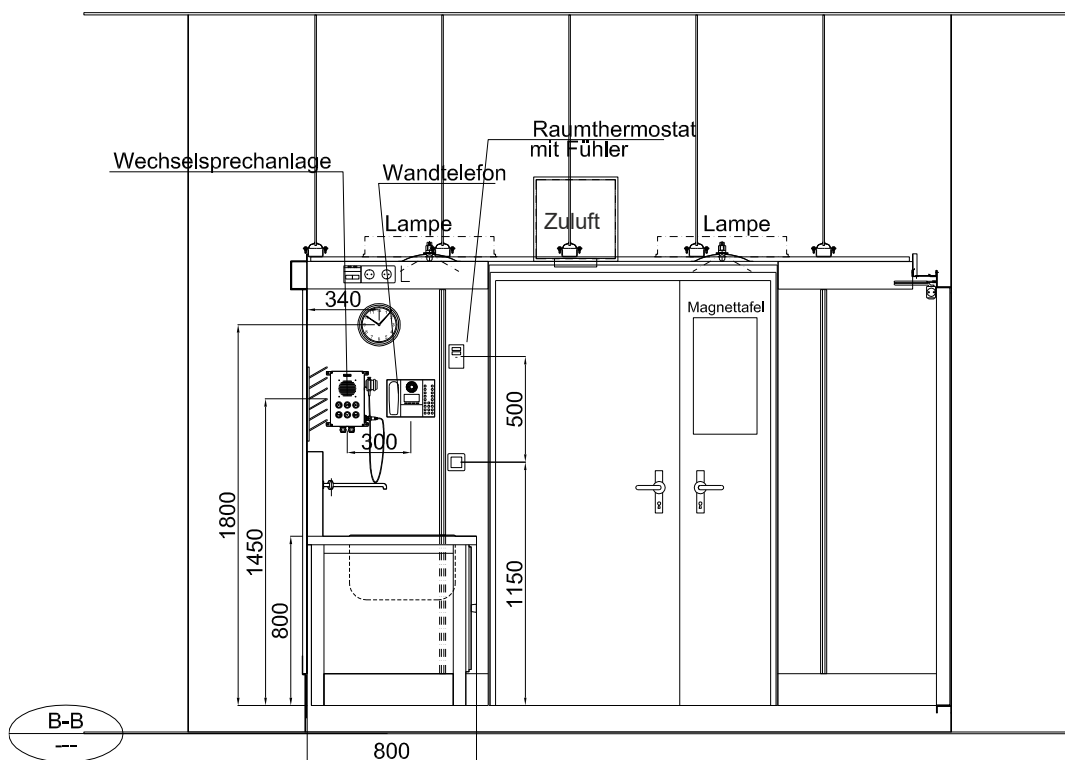
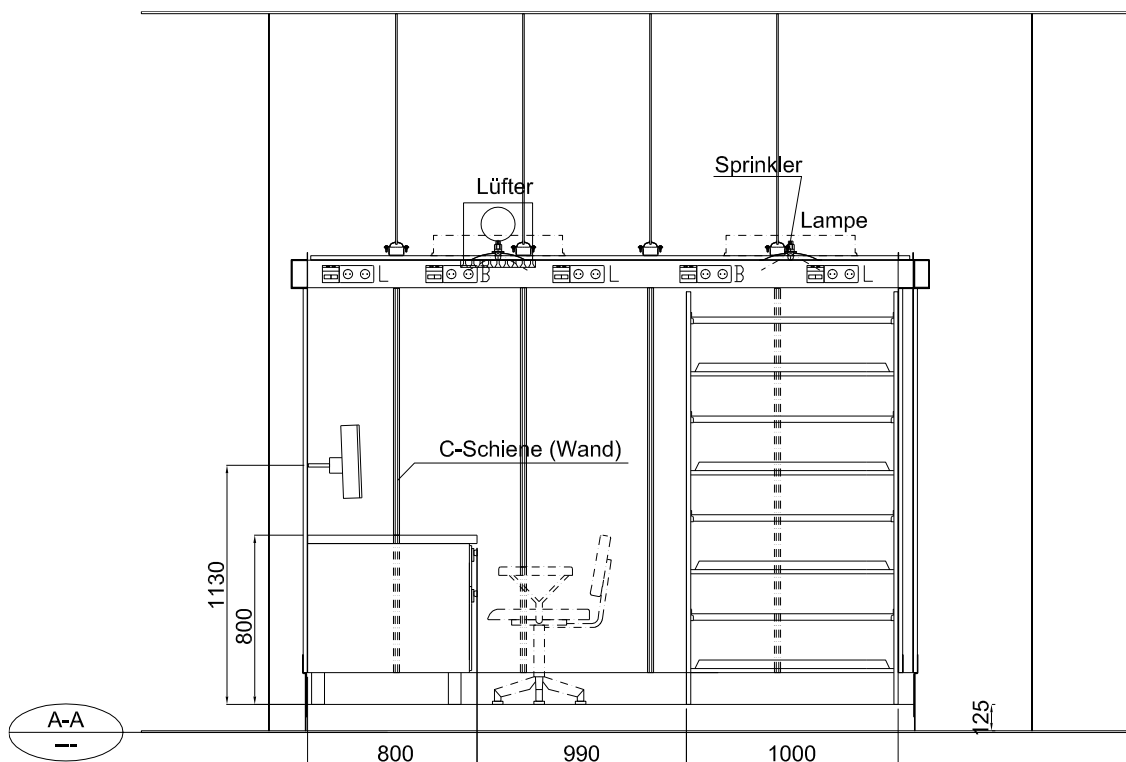




8. Scientific work spaces
8.3. Overview Laboratories

157

View:

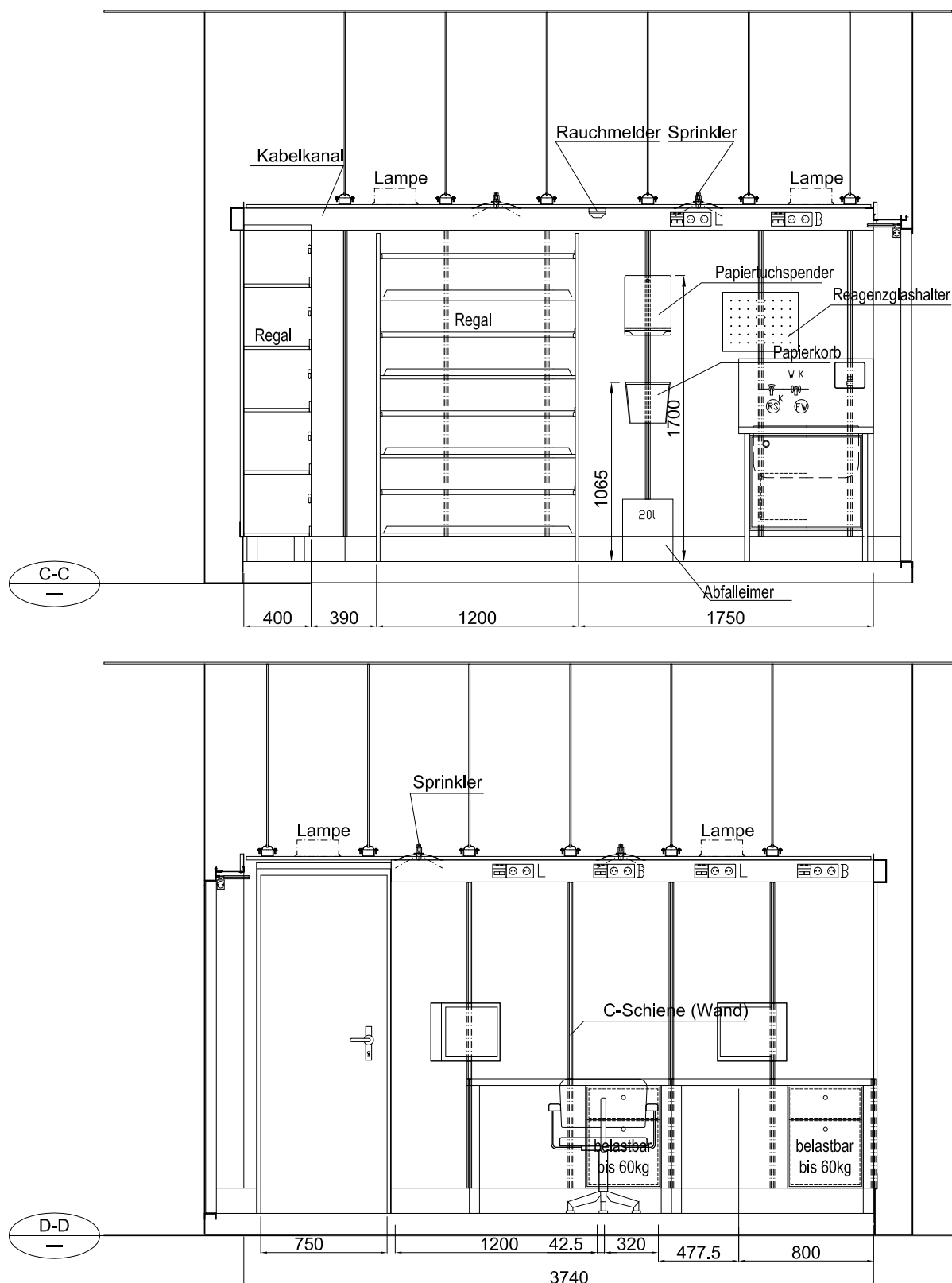




8. Scientific work spaces
 8.3. Overview Laboratories

158

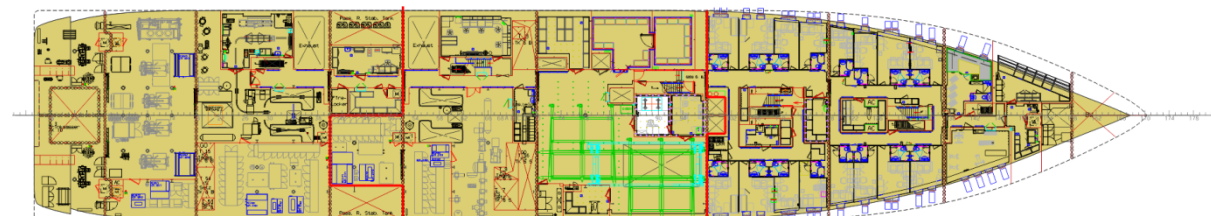
View:





8.3.20. Gravimeter room

Location	Deck 02 (tween deck), Frame 92 – 97
Room-No.	239
Phone	515



Area (m²)	8	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	
Workplaces	1	Ground stud	x	Refrigerator +4°C	
Phone	x	LAN	12	Refrigerator -18°C	
Fresh water w / c		Single-core cable		Refrigerator -80°C	
Clean seawater		Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom		Drying oven	
Drains (basin)		Wall C-tracks	x	gimbal left off. table	
Lab wastewater		Ceiling C-tracks	x	Ice maker	
Scuppers, directly		Ground socket	M8	GPS, ZDA, PPS directly	x
Working air 6 bar		indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C	x	Wall clock	x

Function definition:

- Working with Gravimeter

Equipment:

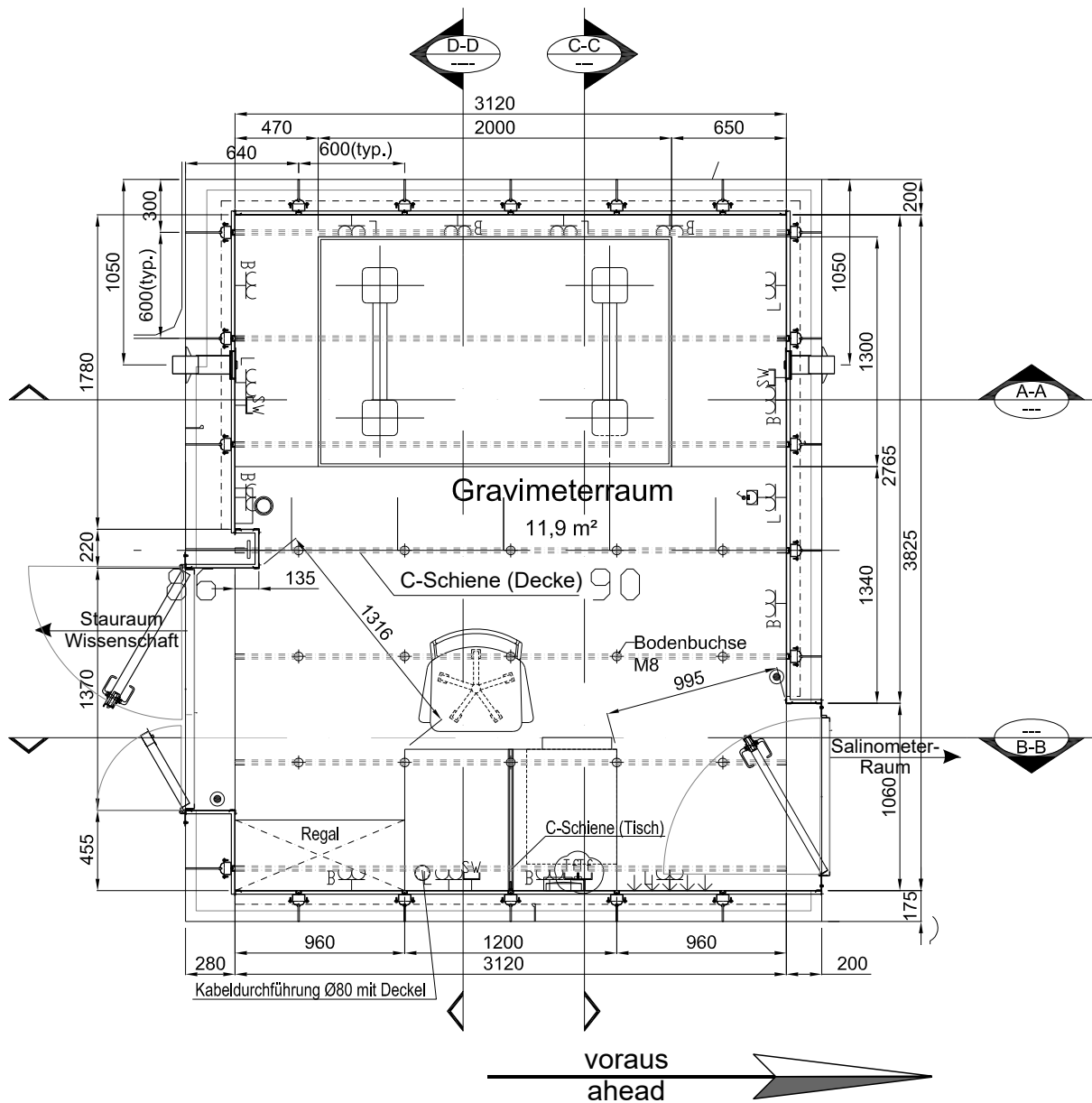
- Foundation for Gravimeter



8. Scientific work spaces
8.3. Overview Laboratories

160

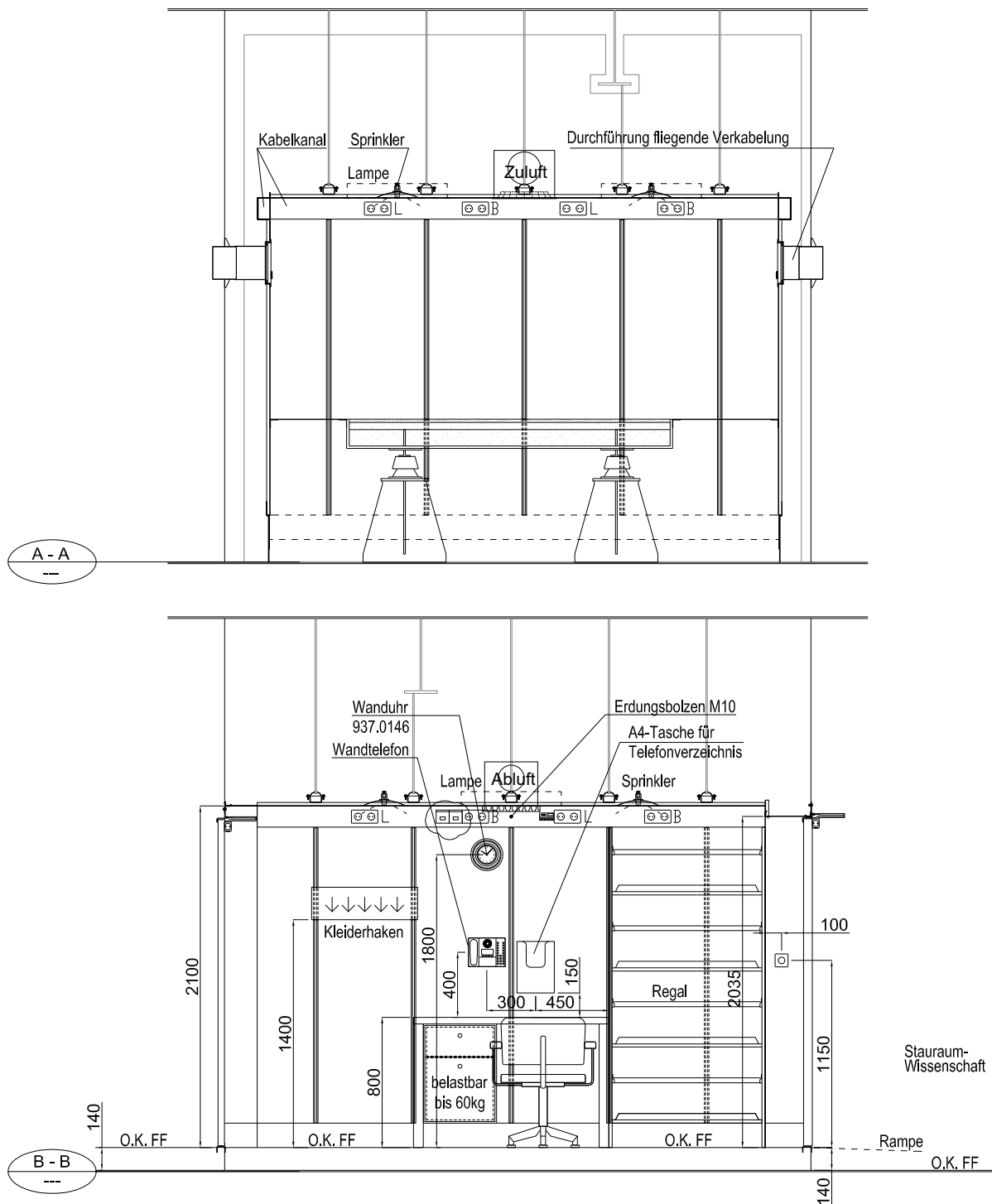
View:





8. Scientific work spaces
 8.3. Overview Laboratories

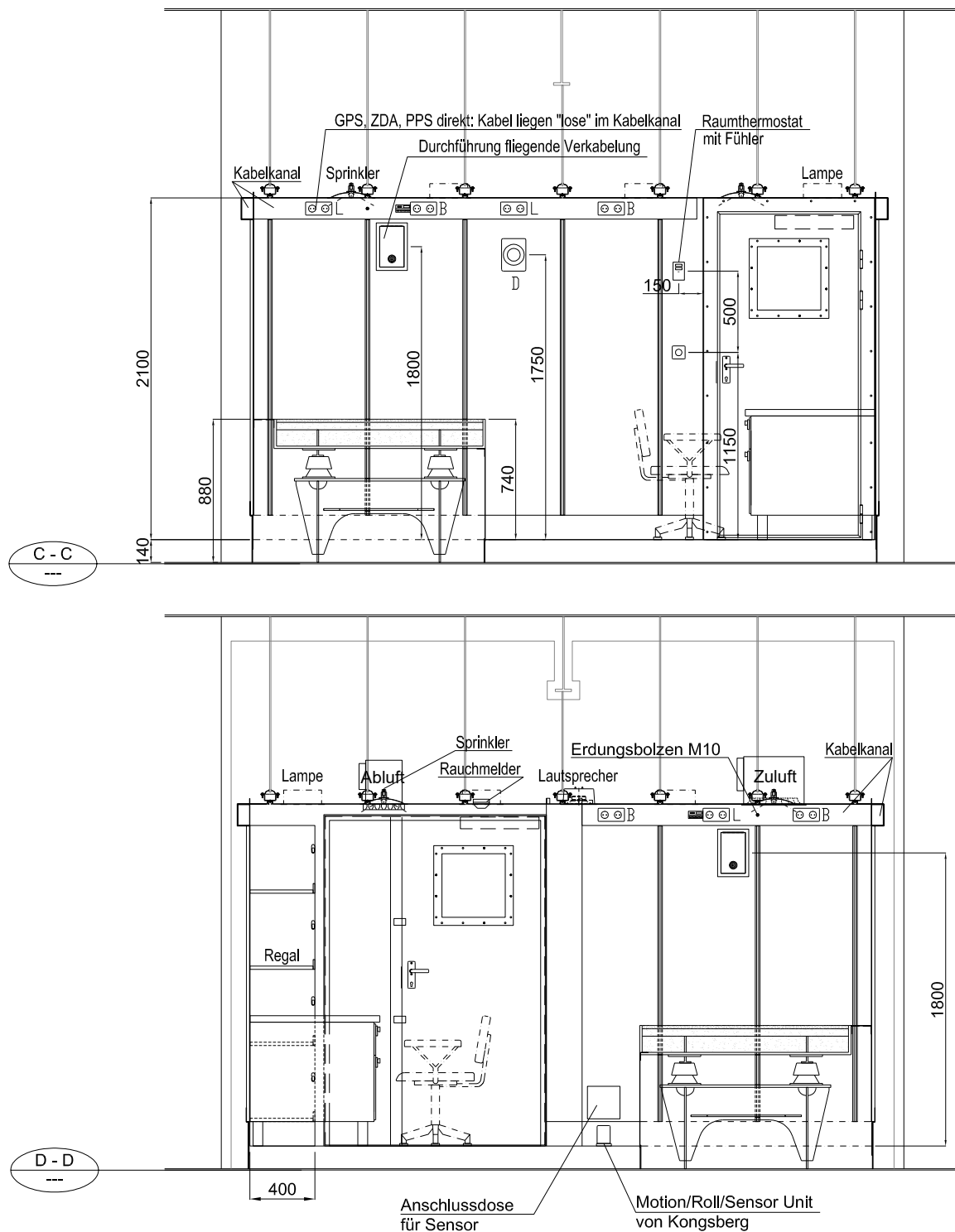
161





8. Scientific work spaces
8.3. Overview Laboratories

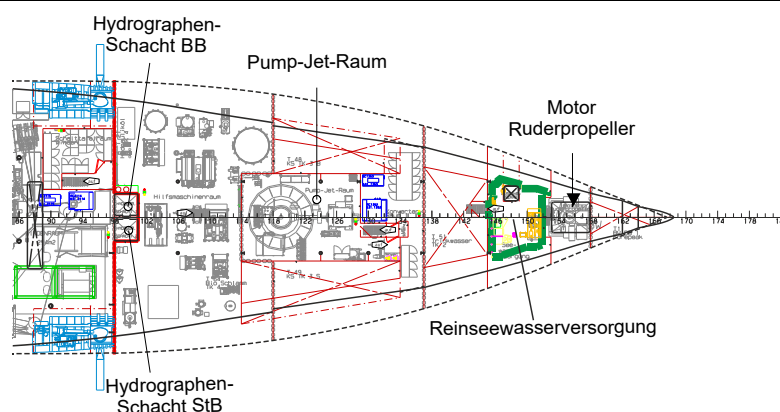
162





8.3.21. Clean SeaWater Lab (data collection and supply)

Location	Deck 01 (Tankdeck Mittschiffs), Frame 145 -- 151
Room-No.	101
Phone	209



Area (m ²)	12	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase	1	Outlet	
Workplaces	1	Ground stud		Refrigerator +4°C	
Phone	x	LAN	12	Refrigerator -18°C	
Fresh water w / c	x	Single-core cable		Refrigerator -80°C	
Clean seawater	K/M	Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom	x	Drying oven	
Drains (basin)	1	Wall C-tracks	X4	gimbal left off. table	
Lab wastewater		Ceiling C-tracks		Ice maker	
Scuppers, directly		Ground socket		GPS, ZDA, PPS directly	x
Working air 6 bar		indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C		Wall clock	

Equipment

- Clean seawater supply and data collection
- 2x Self-cleaning Monitoring Box (SMB)
- extending apparatus

Note on CleanSeaWater supply:

The plant was rebuilt in 2017 during the vessels stay in shipyard in Emden.

The original measurement technique (SBE21 / BBE fluorometer) was removed and replaced with two SMBs (**S**elfcleaning **M**onitoring **B**ox). The flow line for this SMB was completely decoupled from the other lines of the CleanSeaWater system for laboratory supply.

A new outlet was installed over which this line of the system discharges the seawater out-board after passing through the measuring device.

Since the SMBs can be removed from the system by their construction in a frame, the supply lines for seawater inlet, fresh water inlet, rinsing liquid, process water return and seawater return are each provided with a shut-off valve to prevent the leakage of remaining seawater from the system.



Note on SMB:

The Self-cleaning Monitoring Box (SMB) is a special form of flow-through system, similar to a FerryBox. It consists of a flow measuring section, fixed in an Item frame with PVC base plate and an Industrial Panel PC in an electronics housing.

The SMB measures the following standard parameters:

- Sound Velocity
- Conductivity
- Salinity
- chlorophyll
- Turbidity
- Pressure
- Flow

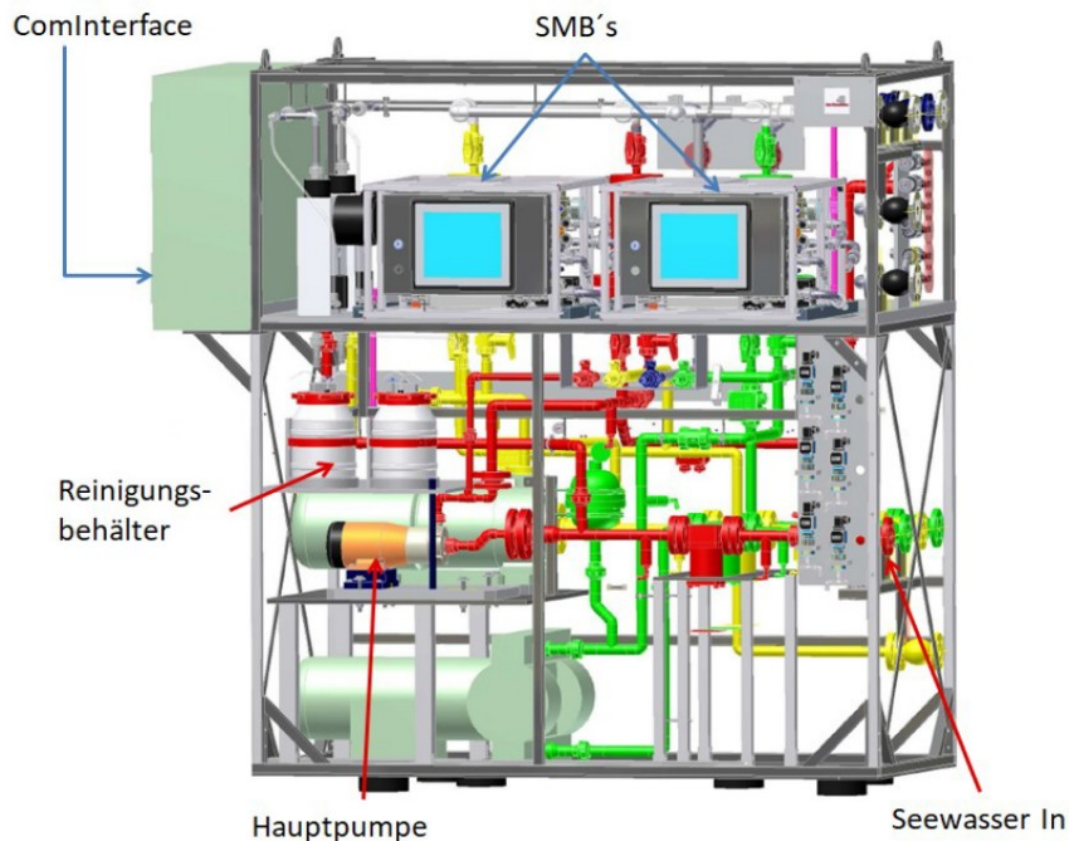
To ensure continuous data recording, two systems are coupled and controlled via a ComInterface.

The operation of the overall system is controlled so that one SMB continuously records data in the measurement cycle while the other system is being cleaned or remains in cleaning mode.

To ensure that the data is valid, the SMBs are controlled so that there is extensive parallel operation before switching the SMB.

The SMB is part of the complex CleanSeaWater system.

Structure of the plant





8.3.22. Clean SeaWaterLab (Sensors)

The SMB incorporates the following sensors for continuous data logging:

- MicroX SV - Sound Velocity from the company AML
- SBE 45 from the company Seabird (see chapter **13.9 Thermosalinograph**)
- FLNTU from the company Wetlabs

There are also sensors for housekeeping and for controlling the system:

- Pressure Cerabar PMP11
- Flow sensor Kobold MIK

8.3.23. Sound Velocity Sensor

AML MicroX SV - Sound Velocity

The SV Xchange™ sensor from AML Oceanographic is the only one Field-exchangeable sonic speed sensor of the oceanographic industry. Each sensor head contains embedded electronics, in which calibration coefficients are stored. The sensor heads can move from device to device without effects on accuracy are exchanged.



Technical specifications of the sensor:

Range	Accuracy	Precision	Resolution	Response Time
1375 -1625 m/s	+/- 0,025m/s	+/-0,006 m/s	0,001 m/s	47 µs

8.3.24. Fluorometer

WetLabs FLTNU

FLNTUS analog and serial (RS-232) output with 4000 Counting range, sensor operates autonomously as soon as it is supplied with voltage.



Properties

optical: haze

Wavelength	700 nm
Sensitivity	0.013 NTU
Range, typically	0-25 NTU

optical: fluorescence

Wavelength ex / em	470/695 nm
Sensitivity	0.025 µg / l Chl
Range, typically	0-50 µg / l Chl
Linearity (each)	99% R2

electrical:

Digital output	resolution 12 bit
RS-232 output	19200 baud

8. Scientific work spaces

8.3. Overview Laboratories

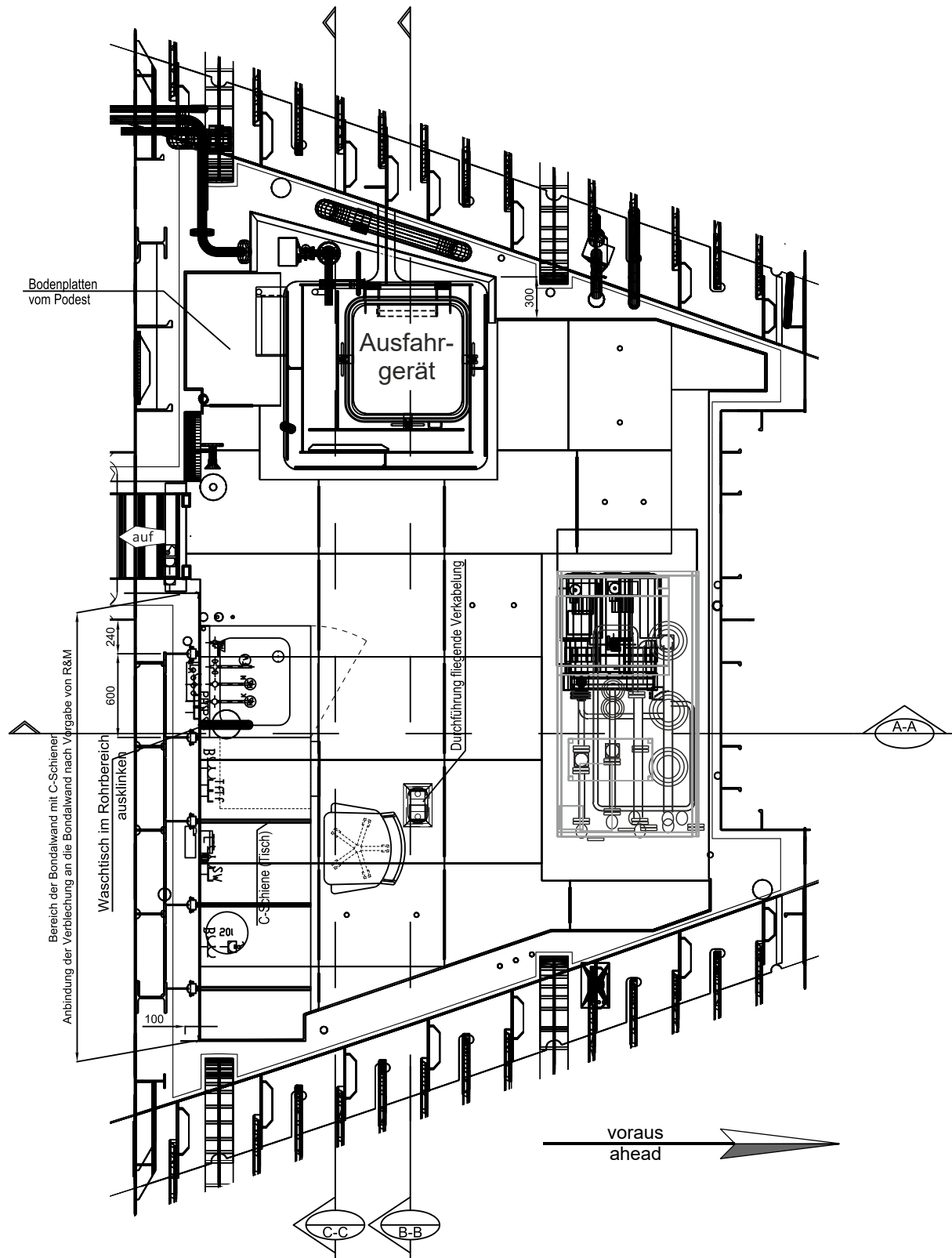
166

Analog output signal	0-5 V
Connector	MCBH 6MP
Input	7-15 VDC
Current consumption typically	60 mA
Power consumption, sleep mode	140 μ A
Current consumption, scraper active	140 mA
Sampling rate up to	8 Hz
Anti-fouling bio-wiper TM	integratetd

Structure of the plant



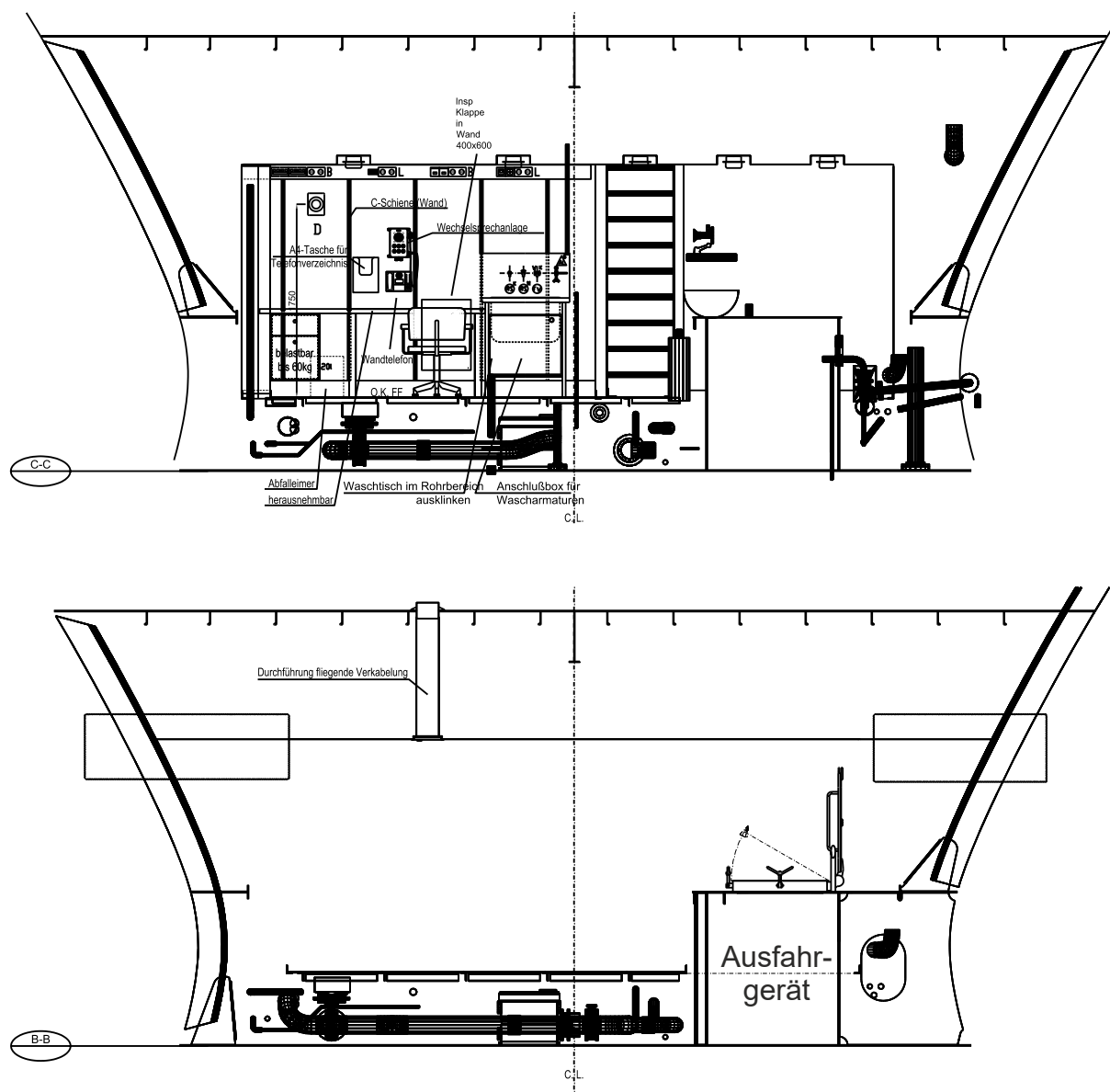
8.3.25. Clean SeaWaterLab (View)

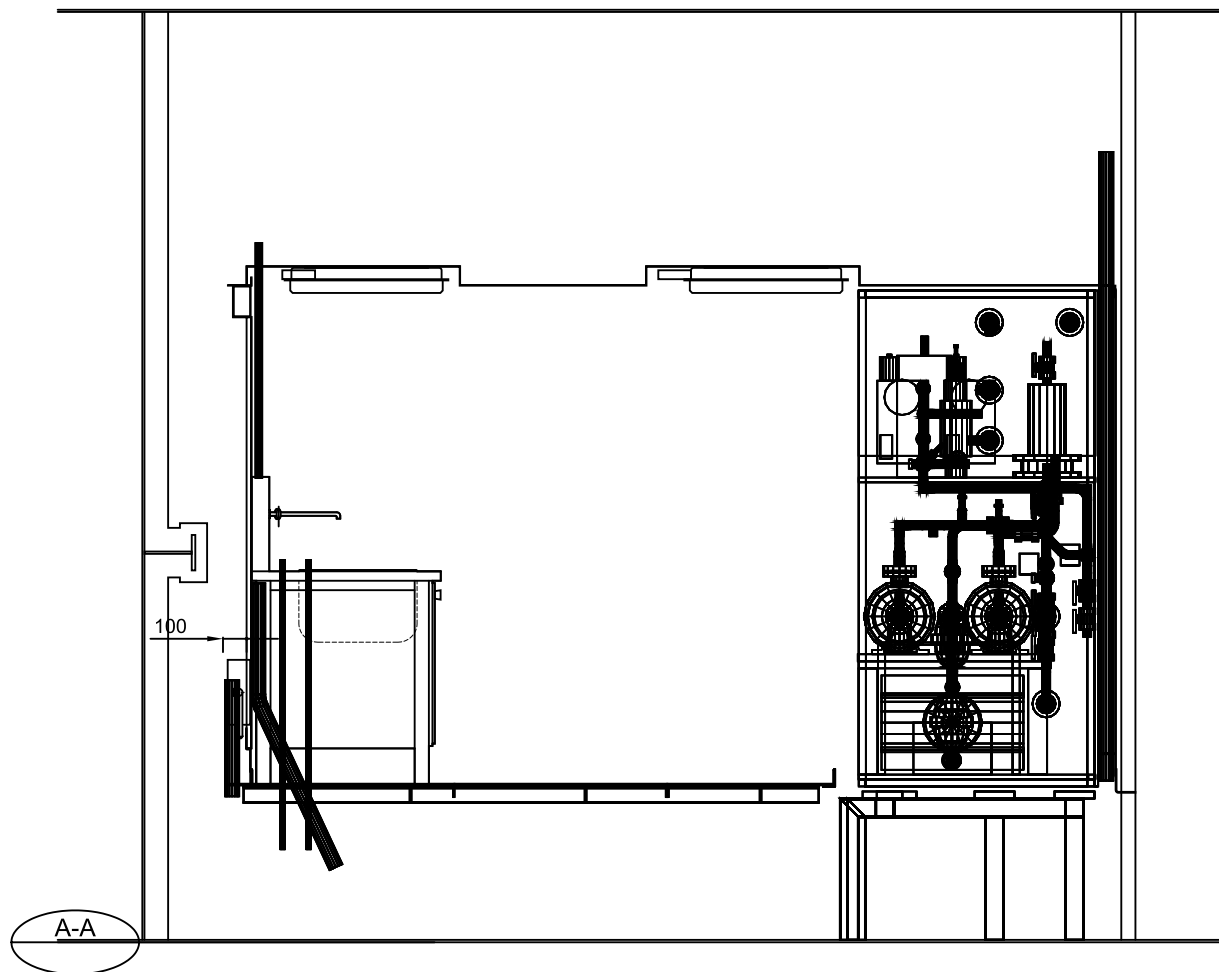




8. Scientific work spaces
8.3. Overview Laboratories

168





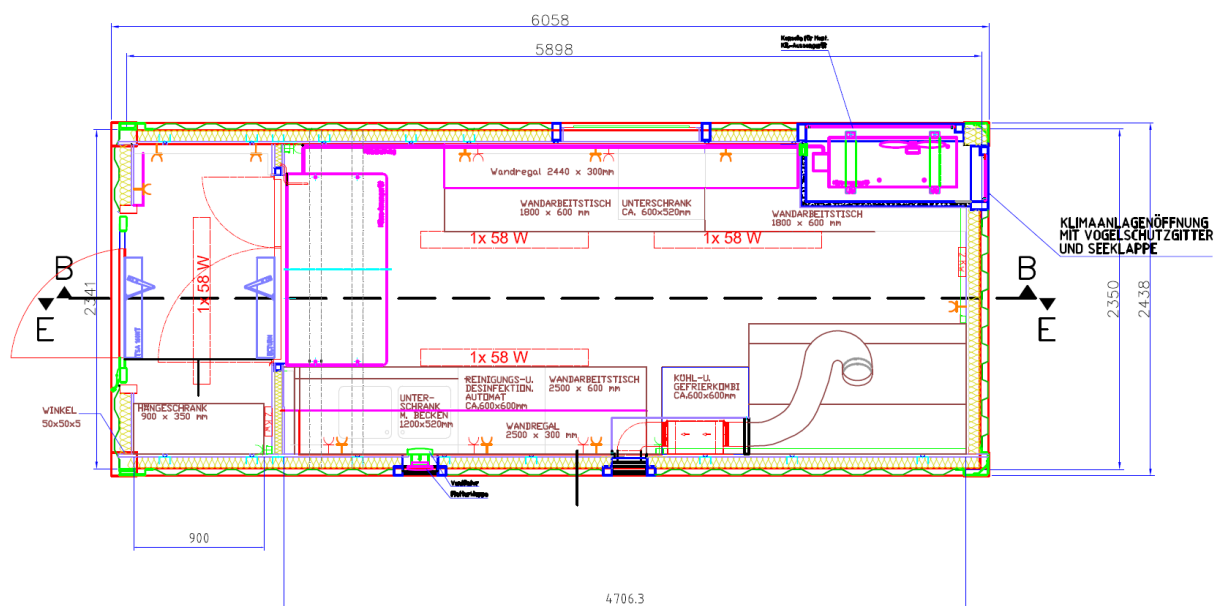


8.3.26. Isotopencontainer

Location	Deck 04 (1. Structure deck amidships), Frame 48 -- 58 Container storage areas 401-403
Room-No.	
Phone	441 (Container terminal box 3) 445 (Container terminal box 6)

The isotope container is permanently installed on the ship.

Top View



Isotopenlabor-Container

See next page for mor pictures



8. Scientific work spaces
8.3. Overview Laboratories

171



View from the front door into the container



View from the inside to the front door



TriCarb



Work area with laboratory dishwasher



Digistore cabinet



Anteroom



Water connections



Power supply



9. Other Rooms

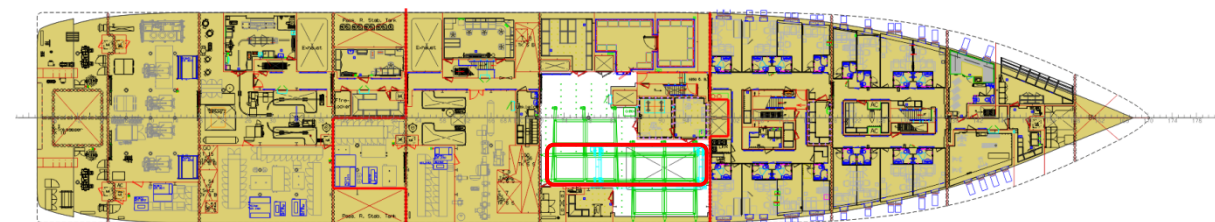
9.1. Storage space science

172

9. Other Rooms

9.1. Storage space science

Location	Deck 02 (tween deck), Frame 70 – 98
Room-No.	243
Phone	-

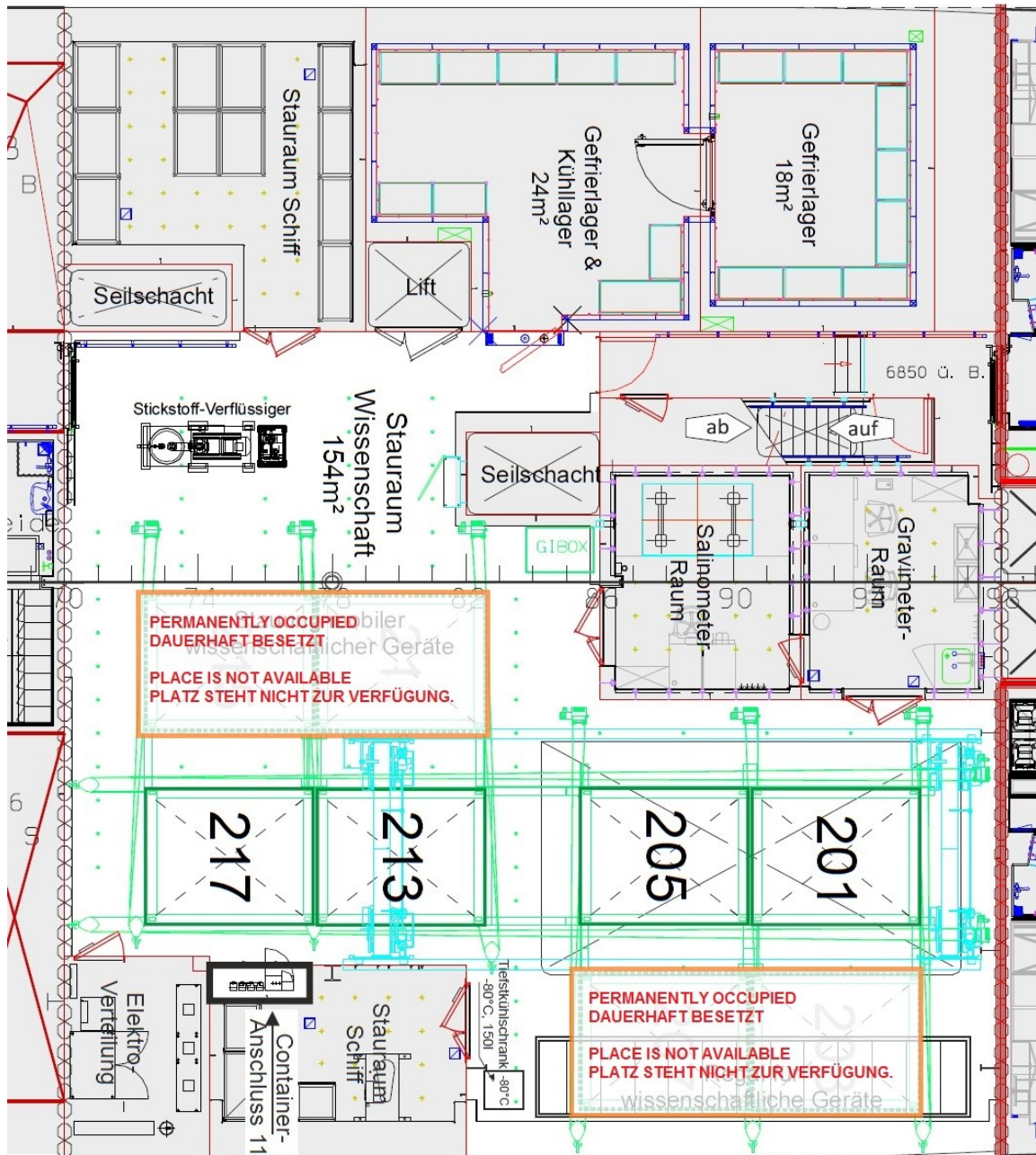


Area (m²)	160	230V/16 A Lab power UPS	x	Suction	
Door width in m	1,2	400V/ 32 A Three-phase	2	Outlet	
Workplaces	1	Ground stud		Refrigerator +4°C	0
Phone		LAN	12	Refrigerator -18°C	0
Fresh water w / c		Single-core cable		Refrigerator -80°C	1
Clean seawater		Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom		Drying oven	
Drains (basin)		Wall C-tracks		gimbal left off. table	
Lab wastewater		Ceiling C-tracks		Ice maker	
Scuppers, directly		Ground socket	M24	GPS, ZDA, PPS directly	
Working air 6 bar		indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power	x	indiv. Temperature 18-28°C		Wall clock	x

The scientific storage space is also used for the stowage of ships equipment.
Only the container storage spaces 201/205 and 213/217 are available for science (red encircled area)



Birdview





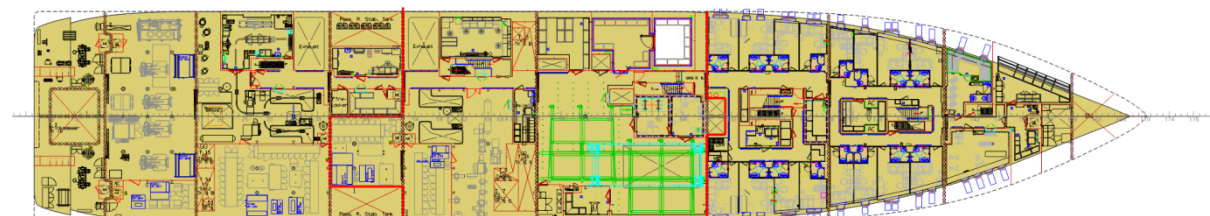
9. Other Rooms

9.2. Frozen storage -20 C

174

9.2. Frozen storage -20°C

Location	Deck 02 (tween deck), Frame 89 – 96
Room-No.	242
Phone	



Area (m²)	16	230V/16 A Lab power UPS		Suction	
Door width in m	1,2	400V/ 32 A Three-phase		Outlet	
Workplaces	0	Ground stud		Refrigerator +4°C	
Phone		LAN		Refrigerator -18°C	
Fresh water w / c		Single-core cable		Refrigerator -80°C	
Clean seawater		Multi cable / fiber optic		Lab dishwasher	
soft water		Intercom		Drying oven	
Drains (basin)		Wall C-tracks Aufputz	x	gimbal left off. table	
Lab wastewater		Ceiling C-tracks		Ice maker	
Scuppers, directly		Ground socket		GPS, ZDA, PPS directly	
Working air 6 bar		indiv. Temperature 0-28°C		GPS-Repeater	
230/16A power		indiv. Temperature 18-28°C		Wall clock	

Function definition:

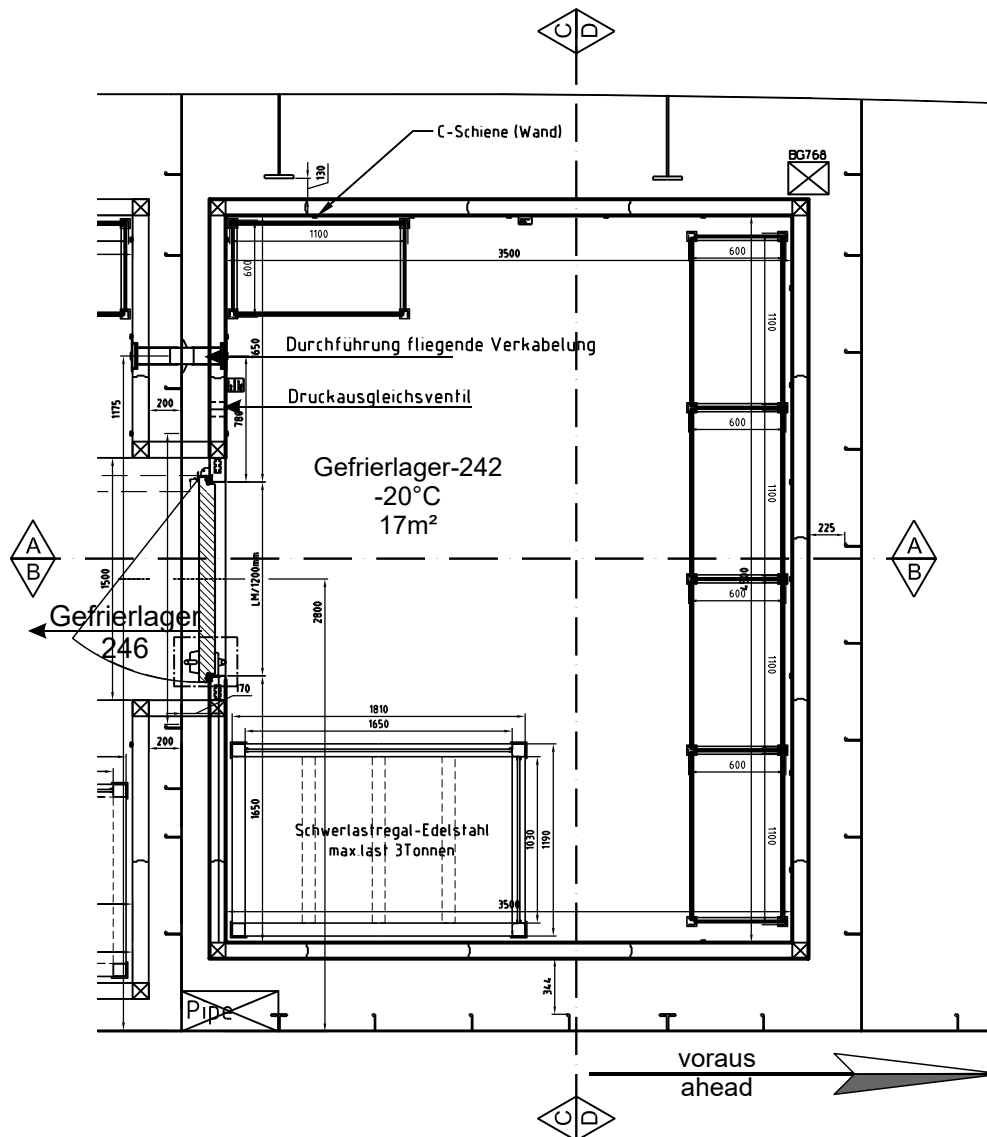
- The freezer / refrigerator stock serves as storage space for scientific asset.
- It is cooled to -20 ° C and with a finely adjustable temperature control with a control tolerance of ± 0.5 K

Equipment

- Shelves for conventional aluminum boxes

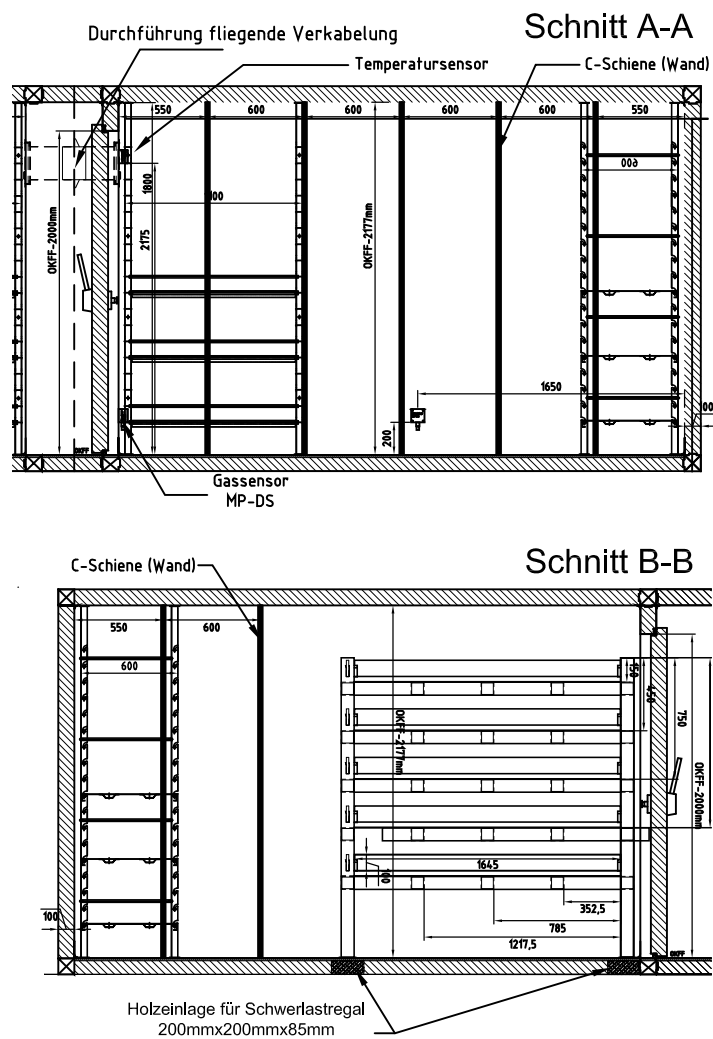


View





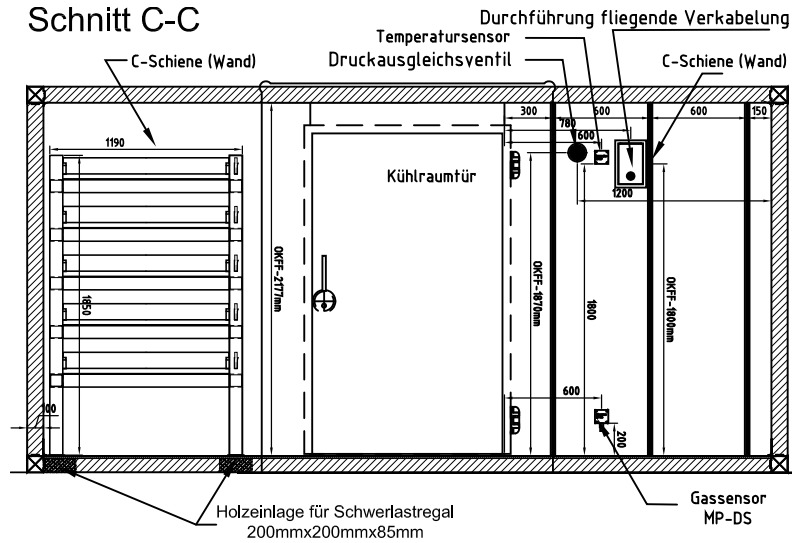
View



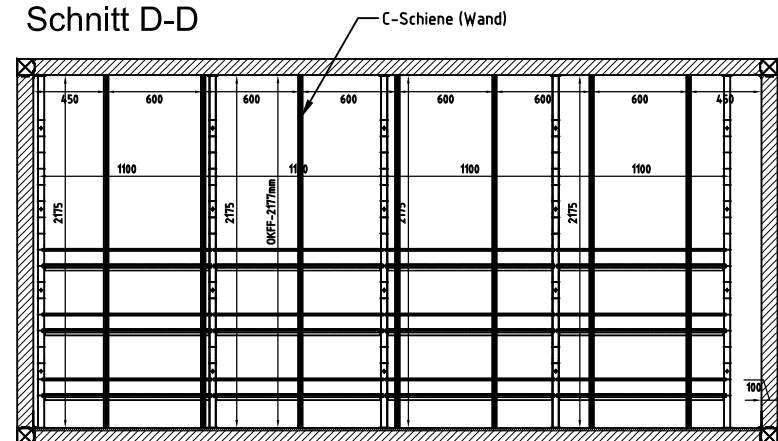


View

Schnitt C-C



Schnitt D-D



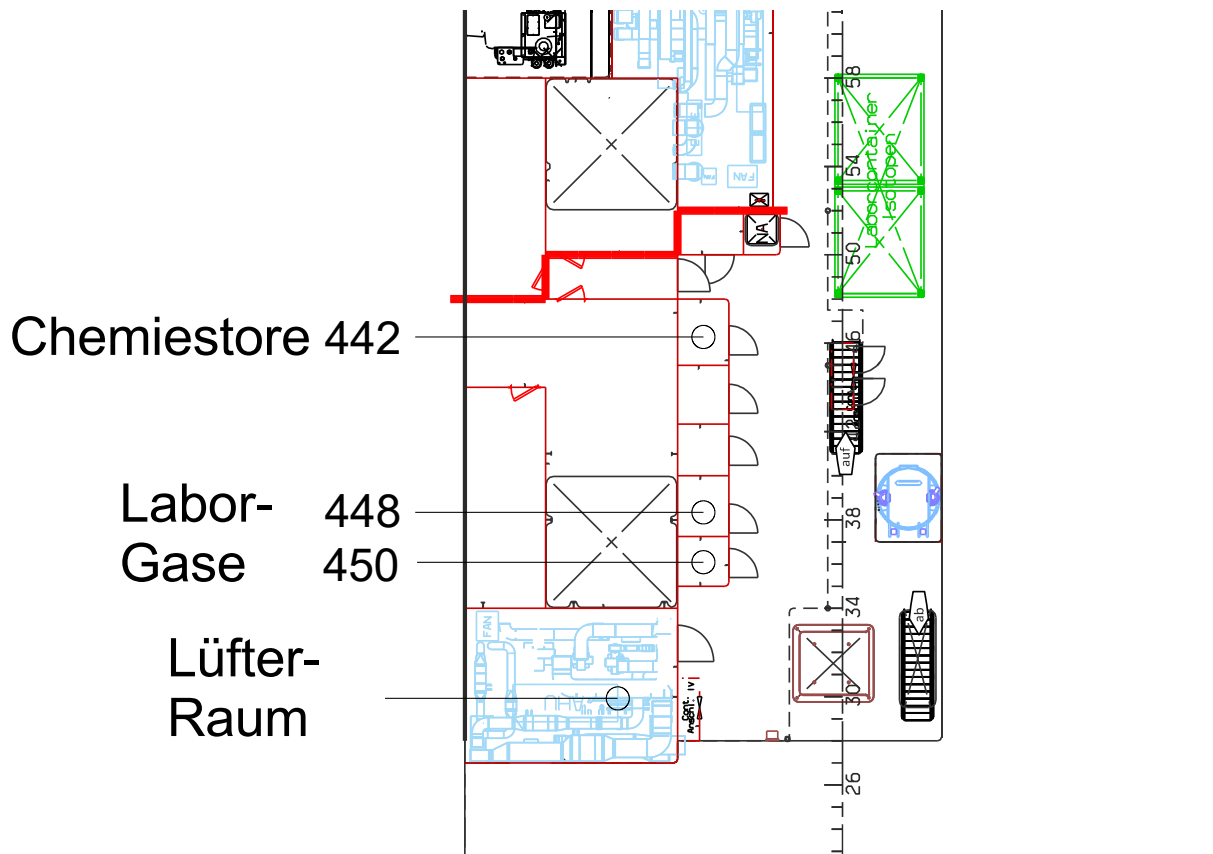
9. Other Rooms

9.3.Laboratory gas storage

178

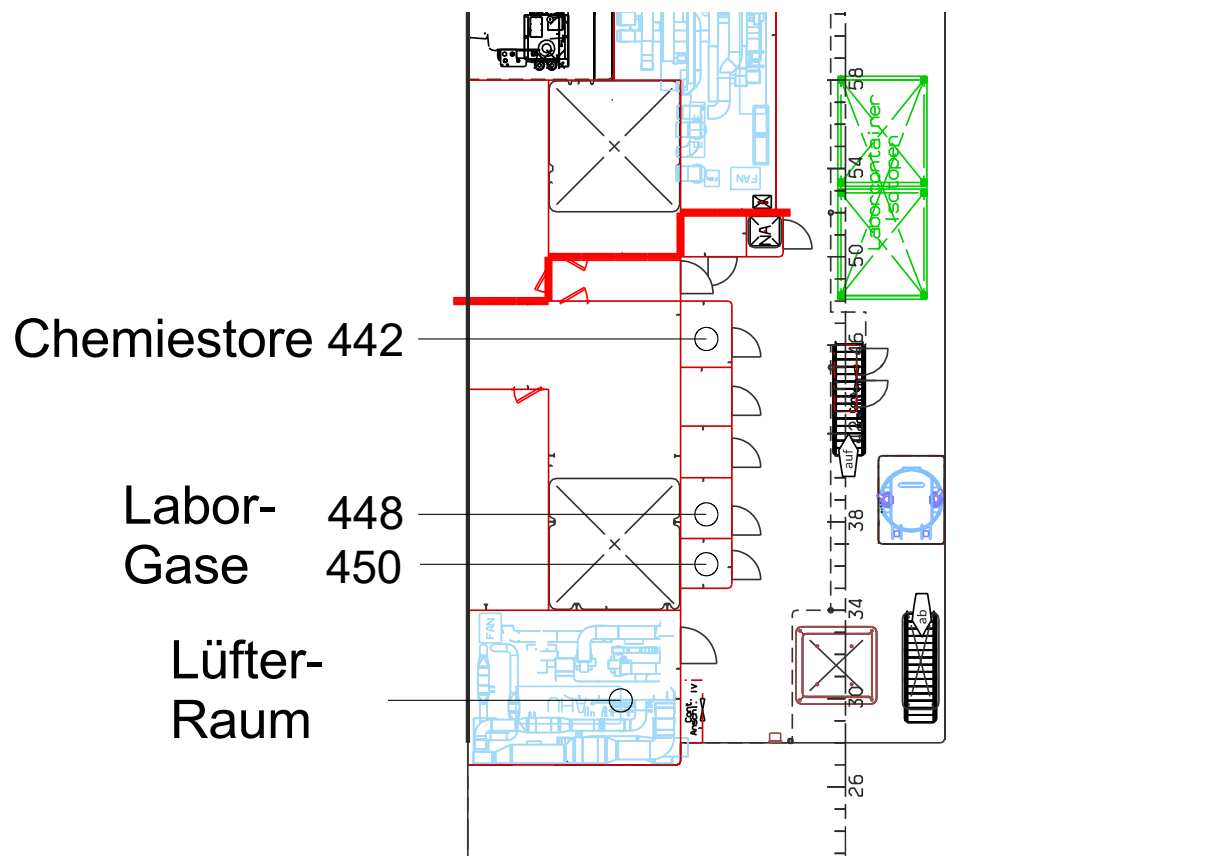
9.3. Laboratory gas storage

Location	Deck 04 (1. Structure deck), Frame 35 – 40
Room-No.	448; 450
Phone	
Room size	
Door width	0,85 m



9.4. Chemistry Store

Location	Deck 05 (2. Structure deck), Frame 45 – 52
Room-No.	552; 554; 556
Phone	
Room size	4,7 m²; 3,1 m²; 3,9 m²
Door width	0,85 m





10. Hydroacoustic Systems

10.1. Overview

180

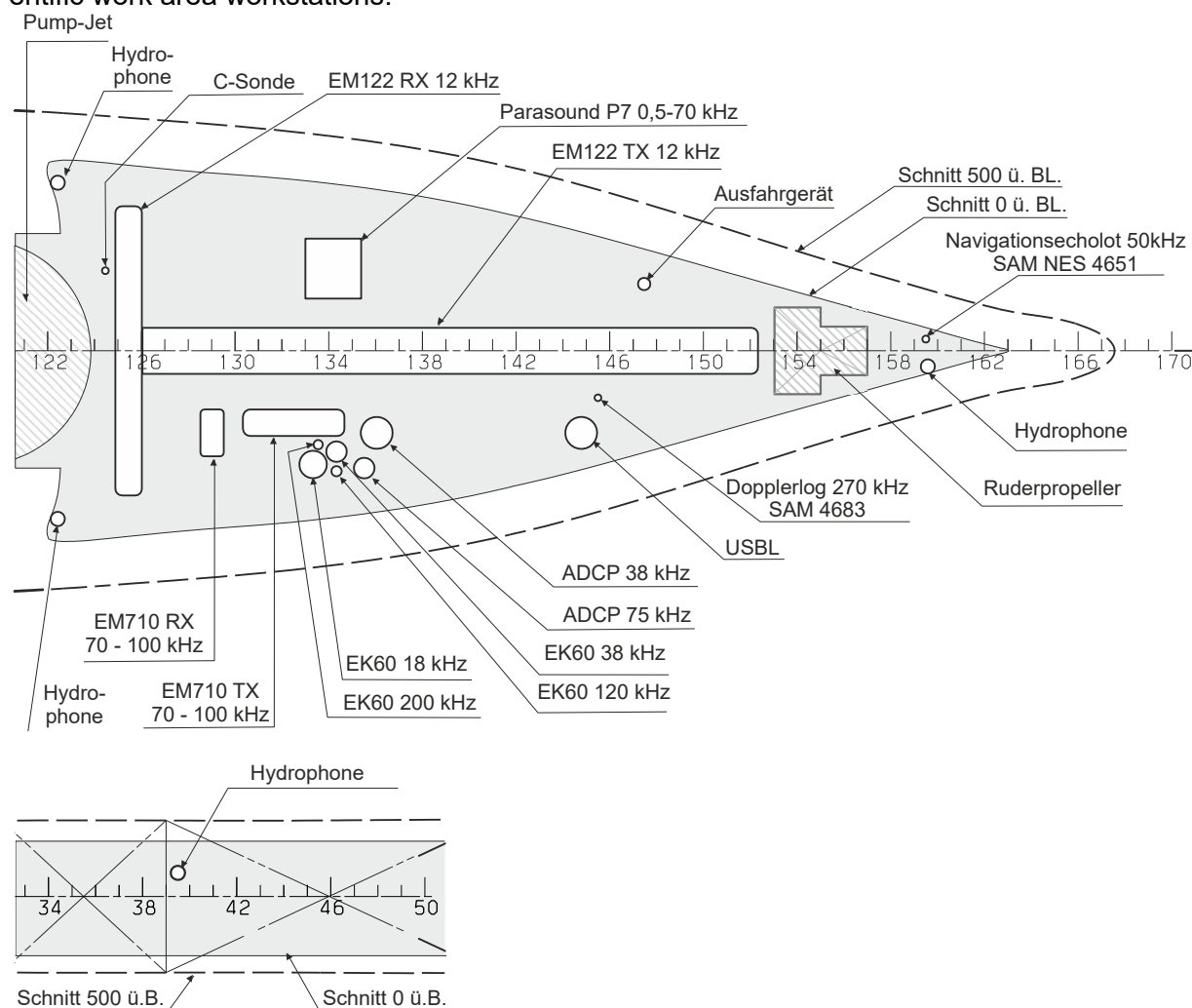
10. Hydroacoustic Systems

10.1. Overview

Permanently installed hydroacoustic systems

- Atlas PARASOUND DS P-70
- EM 122 Multibeam echo sounder - Kongsberg Maritime
- EM 710 Multibeam echo sounder - Kongsberg Maritime
- EK60 - Echo sounder for fisheries research - Kongsberg Maritime
- RD Instruments Acoustic Doppler Current Profiling / ADCP
- USBL / IXBLUE
- Dual-axis doppler speed log SAM 4683
- Atlas Navigations-echo sounder NES 4651
- EA 640 Intrinsic level measuring system

The data necessary for the operation of the Hydrographic tubes-acoustic systems converter (transmitter, receiver, processing electronics) are installed in the echosounder room. The operation is the navigation solders is from the bridge, the scientific plummets installed in scientific work area workstations.





10.2. Atlas PARASOUND DS P-70

The Parasound DS P-70 is a parametric deep-sea sediment echosounder.

Manufacturer	ATLAS HYDROGRAPHIC GmbH D 28211 Bremen, Germany http://www.teledynemarine.com
Depth range	10 m (under keel) – 11.000 m
Penetration depth	until 200 m depending on environmental conditions and sediment
Maximum pulse power	70 kW
Opening angle	4,5° x 5,0° (along x transverse)
Frequenzbereich:	
High frequency	18 – 33 kHz
Parametric frequency	0,5 – 6,0 kHz
Pulse length	0,17 – 25 ms

Features:

- Multi-pulse operation
- Multi-Beam ability
- **No** unmanned operation
- Water column analytical
- Barker, chirp or user-defined pulses

Motion stabilization:

- Roll $\pm 15^\circ$
- Pitch $\pm 10^\circ$
- Yaw $\pm 10^\circ$
- Heave Korrektur

Transmission P70: 245 (206) dB (primary/parametric)

Source Level

For more information, see <http://www.teledynemarine.com>



10. Hydroacoustic Systems

10.3. EM 122 multibeam echo sounder - Kongsberg Maritime

182

10.3. EM 122 multibeam echo sounder - Kongsberg Maritime

The EM 122 multibeam echo sounder is for the areal hydrographic surveying in deep waters.

Manufacturer	Kongsberg Maritime AS NO-3601 Kongsberg, Norway http://www.km.kongsberg.com
Beam-Opening Angle	0.5°x1°
Amount of Soundings per Beam	432
Max. Amount of Beams per Ping	2
Max. Amount of Soundings per Ping	864
Opening angle	max. 150°
Beam width	6 x depth, max 30.000 m, dependend on seabed
Main Frequency	12 kHz Frequencies in range 10.5 to 13.5 kHz are used to encode the various transmit sectors
Motion stabilization	- Roll $\pm 15^\circ$ - Pitch $\pm 10^\circ$ - Yaw $\pm 10^\circ$ - Heave Korrektur
Pulse-Form	CW and FM
Pulse-Length	2ms, 5ms and 15ms CW as up to 100ms FM

System	SL	NF1	PL@NF1	NF2	PL@NF2
Source level					
EM 122/124 0.5°	245	3.5 m	207	1749 m	180
Pressure level					
EM 122/124 0.5°	207	203	192	182	1331 m

For more information, see <http://www.km.kongsberg.com>



10. Hydroacoustic Systems

10.4. EM 710 multibeam echo sounder - Kongsberg Maritime

183

10.4. EM 710 multibeam echo sounder - Kongsberg Maritime

The EM 710 multibeam echo sounder is for the areal hydrographic surveying in waters up to 2,000 meters.

Manufacturer	Kongsberg Maritime AS NO-3601 Kongsberg, Norway http://www.km.kongsberg.com
Depth range	3 m (unter Schwinger) – 2.000 m
Number of Beams	288
Opening angle	max. 140°
Beam width	5,5 x depth, max 30.000 m
Frequency	70 - 100 kHz
Motion stabilization	- Roll $\pm 15^\circ$ - Pitch $\pm 10^\circ$ - Yaw $\pm 10^\circ$ - Heave Korrektur

Source level

System	SL	NF1	PL@NF1	NF2	PL@NF2
EM 710/712 0.5°	232	0.3 m	213	246 m	184

Pressure level

System	PL @1m	PL @10m	PL @100m	PL @1000m	R @180dB
EM 710/712 0.5°	208	198	185	142	183 m

For more information, see <http://www.km.kongsberg.com>



10. Hydroacoustic Systems

10.5.EK60 - Echo sounder for fisheries research - Kongsberg Maritime

184

10.5. EK60 - Echo sounder for fisheries research - Kongsberg Maritime

The Simrad EK60 is a scientific echo sounder, mainly for the Fisheries Research and analysis of the water column.

The operation can be carried out with up to seven frequencies in the range 18 to 710 kHz simultaneously.

Manufacturer Kongsberg Maritime AS
 NO-3601 Kongsberg, Norway
 <http://www.km.kongsberg.com>

Features:

- High dynamic range
- Raw data storage
- Low self-noise
- High ping rate
- Multi-frequency application for species identification
- Simultaneous transmission of all frequencies
- Remote control
- Storage and retrieval of personal settings
- Data server interface for raw data recording

For more information, see <http://www.km.kongsberg.com>

Note on calibration:

A basic calibration of the system was carried out when the ship was commissioned in 2014.

For a voyage-specific calibration, special setting parameters tailored to the measurement campaign must be known, which are used to calibrate or set the system.

The calibration is time-consuming (plan one day) and can only be done in port under optimal sea conditions and must be carried out by the user with the appropriate know-how.

The necessary calibration equipment (balls and rods) are on board.



10. Hydroacoustic Systems

10.6. RD Instruments Acoustic Doppler Current Profiler / ADCP

185

10.6. RD Instruments Acoustic Doppler Current Profiler / ADCP

The RD Instruments Acoustic Doppler Current Profiler (ADCP) Type Ocean Surveyor measures using the Doppler effect, the flow profile of the water column (direction and speed) from the moving ship.

There are each a 38 kHz and 75 kHz ADCP installed.

Manufacturer

Teledyne RD Instruments

Poway, CA 92064 USA

<http://www.rdinstruments.com>

	38 kHz Range	38 kHz Precision	75 kHz Range	75 kHz Precision t
Long Range Mode	800-1000 m	20 cm/s	560-700 m	16 cm/s
High Precisions Mode	730-780 m	10 cm/s	350-450 m	7 cm/s

For more information, see <http://www.rdinstruments.com>



10. Hydroacoustic Systems

10.7. USBL Sonardyne RANGER 2 ACOUSTIC POSITIONING SYSTEM

186

10.7. USBL Sonardyne RANGER 2 ACOUSTIC POSITIONING SYSTEM

Ranger 2 is an acoustic Ultra-Short BaseLine (USBL) positioning system for tracking underwater targets over long distances in the deep sea. The system calculates the position of an underwater target, e.g. an ROV, by measuring the distance and bearing from a transmitter-receiver mounted on the ship to an acoustic transponder on the target.

The positions of multiple underwater targets at different water depths can be detected virtually simultaneously.

Manufacturer Sonardyne International Limited
Blackbushe Business Park | Yateley | Hampshire GU46 6GD | UK
<https://www.sonardyne.com/> for further information

Properties

depth of deployment:	6000m
accuracy:	0.2% of 'slant range' (2 m at 1000 m object distance (transponder) to the Sonardyne transmitter under optimal conditions
Position-Update-Rate:	1 second, regardless of the water depth
Ausgabe-Telegramme:	Industrie Standard (NMEA0183, binary), u.a.: • \$PSONLLD - Sonardyne Lat, Long, Depth Report • \$PSONALL - Sonardyne General Position Report

10.7.1. Gyro USBL Transceiver (Transmitter/Receiver)

The Sonardyne Ranger 2 transmitter/receiver is permanently mounted on an extension device and is extended downwards beyond the ship's hull when in use. The end position of the active transducer surface is approximately 2.6 m below the ship's hull.

The following image shows the transceiver being extended in the shipyard.



When extended, the ship's speed is limited to 7 knots.

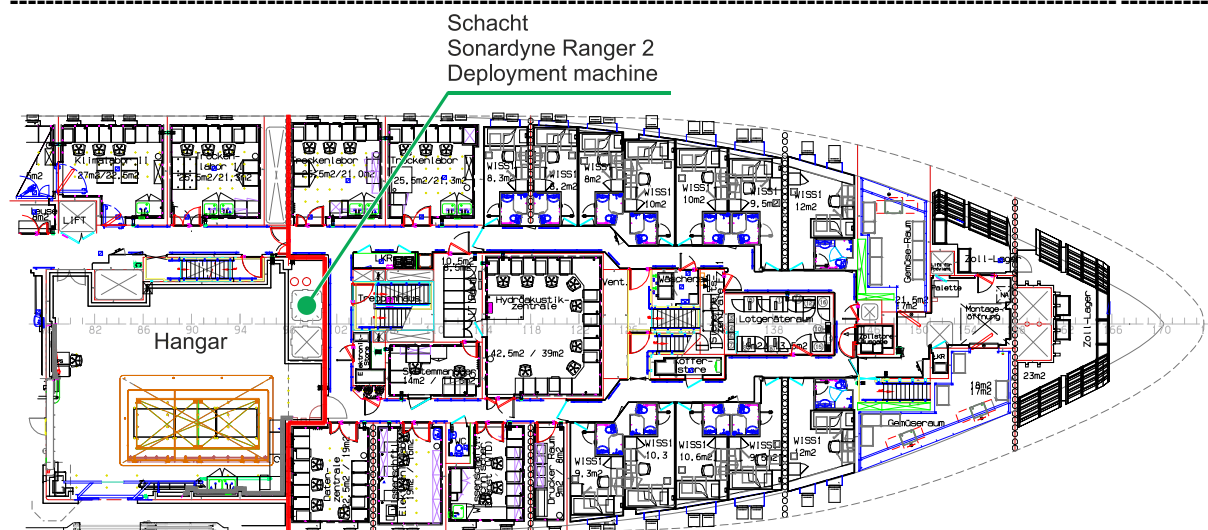
The acoustic transmitter/receiver combo, including the deployment device, is on the port side next to the big hydrographic shaft.



10. Hydroacoustic Systems

10.7. USBL Sonardyne RANGER 2 ACOUSTIC POSITIONING SYSTEM

187



10.7.2. Sonardyne Surface Equipment

Lfd.-Nr.	Stock Code	
1	8026-300	Marine Computer
2	8098-000-02	NSH - Navigation Sensor Hub
3	8142-000-01	HPT 7000 Gyro USBL Transceiver
4	8315-000-0002	iWAND (HPR) PORTABLE TESTER

10.7.3. Sonardyne Subsea Equipment (Transponder)

Lfd.-Nr.	Typ	Stock Code	Transducer	Housing Rating	Battery
1	WMT6	8190-000-7211	MF Omni	7000m	Li-Ion rechargeable
2	WMT6	8190-000-7211	MF-Omni	7000m	Li-Ion rechargeable
3	WMT6	8190-000-7212	MF Directional	7000m	Li-Ion rechargeable
4	WSM6+	8370-000-4112	MF Directional	4000m	NiMH rechargeable
5	RovNav 6+	8310-003-02	MF Omni	7000m	Li-Ion rechargeable
6	RovNav 6+	8310-00302	MF Omni	7000m	Li-Ion rechargeable



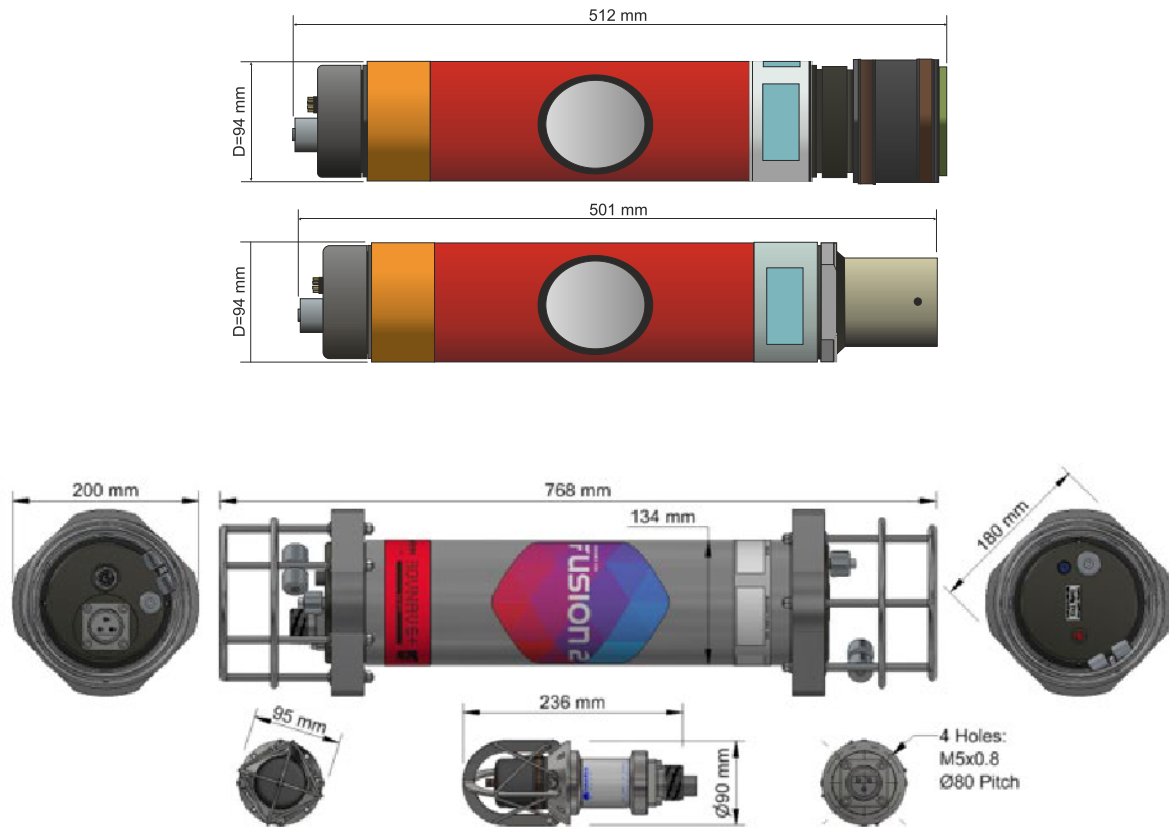
10. Hydroacoustic Systems

10.7. USBL Sonardyne RANGER 2 ACOUSTIC POSITIONING SYSTEM

188

10.7.4. The dimensions of the WMT6 transponders

- (MF Directional, top)
- (MF Omni, bottom):
- (MF Omni, extended, down)

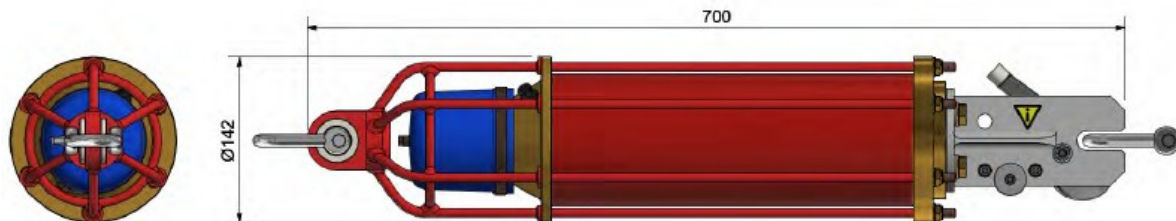




10.8. On-board Releaser

Two releaser types are available for the Sonardyne Ranger 2 system.

Typ: RT6-6000 LMF release



Weight in Air / Water:	20 / 15kg
Working Load Limit (4:1):	1275kg
Proof Load:	2550kg
Breaking Load:	5100kg
Maximum Safe Release Load:	1700kg

There is **also** the following equipment available on board:

1 x Recoverable Releaser

Manufacturer: IXBLUE
Type: RT 861 CS-R-TR
Weight: 26.5 kg
Weight in water: 18.5 kg
SWL: 2,500 kg
RL: 500 kg

Attention: This releaser cannot be interrogated or controlled by the Sonardyne system.

The IXBLUE releaser can only be triggered via the vessel's own hydrophone using a release unit brought by the scientific party (backup option for deployed IXBLUE or KUM releasers).



10. Hydroacoustic Systems

10.9. Dual-axis doppler speed log SAM 4683

190

10.9. Dual-axis doppler speed log SAM 4683

The SAM 4683 is a dual-axis doppler speed log.
It is part of the ship's navigation system.

Manufacturer	SAM Electronics GmbH Products Automation, Navigation and Communication D-22763 Hamburg, Germany http://www.sam-electronics.de
Bottom Track: Speed over ground	1 – 150 m
Water Track Speed through the water	from 3 m below keel
Speed measuring range	along: ± 40 kn transverse: ± 40 kn
Opening angle	3 x 5,3°
Frequency	270 kHz
Transmission power	up to 100 W (adjustable)
Installation location	Frame 145 Stb

The control panel is located on the bridge, repeater via the DVS DSHIP

For more information, see <http://www.sam-electronics.de>



10. Hydroacoustic Systems

10.10. SAM Navigational echo sounder NES 4651

191

10.10. SAM Navigational echo sounder NES 4651

The SAM navigational echo sounder NES 4651 is the water depth measurement. It is part of the ship's navigation system.

Manufacturer	SAM Electronics GmbH Products Automation, Navigation and Communication D-22763 Hamburg, Germany http://www.sam-electronics.de
Depth range	0,5 – 2.000 m $\pm$ 1%
Frequency	50 kHz
Transmission power	up to 1000 W RMS (adjustable)
Installation location	Frame 159 Stb

The control panel is located on the bridge, repeater via the DVS DSHIP

For more information, see <http://www.sam-electronics.de>



10.11. Hydrophone

Manufacturer

Kongsberg Maritime AS
NO-3601 Kongsberg, Norway
<http://www.km.kongsberg.com>

S4009isc Low noise hydrophone



KONGSBERG



Frequency range from 1 to 90 kHz

Low noise

High performance

Titanium housing

High dynamic range

Low self noise

Description

The S4009isc is an integrated underwater acoustic hydrophone system.

The hydrophone is designed with a 1-inch spherical sensor unit, and offers integrated pre-amplifier and cable driver circuitry.

The hydrophone housing is made of Titanium.

The interface is made using a 7-pin M-Series flange receptacle.

The S4009isc is available in two versions.

- with a bulkhead mounting plate,
- with a cable penetrator.

The S4009isc offers a high dynamic range. It uses balanced differential signal transmission, this allows you to use long low capacitance cables.

The self-noise of the S4009isc is very low, well below Wenz' minimum in the frequency range from 6 Hz to 90 kHz.

For calibration purposes, the S4009isc has a built-in calibration- and test input.

Please note:

The trigger box must be brought on board by the scientific team!



10. Hydroacoustic Systems

10.11. Hydrophone

193

Technical specifications

- Supply voltage: 18 to 30 Vdc
- Quiescent current drain: 70 mA
- Supply protection: Diode protection for reversed polarity and overvoltage
- Output protection: Sustains shorting of either output lead
- Sensitivity referred to output: -157 dB rel. 1 V/ μ Pa (@ 1 kHz and with high Z load)
- Output impedance: 110 Ω
- Frequency range: 1 Hz to 90 kHz (± 2 dB)
- Calibration input signal: Balanced with respect to ground
- Calibration input impedance: 1 k Ω
- Calibration input gain: -11 dB (@ 1 kHz)
- Maximum recommended operational depth: 1000 m
- Mechanical dimensions (including connector):
- Length: 24 cm
- Diameter: 4.3 cm
- Material in housing: Titanium, grade 2
- Material in connector shell (Souriau): Nickel aluminium bronze
- Insulation material over sensor: Neoprene rubber



11. Data Management

11.1. Networks and Servers

The on-board network is a star, "switched ethernet" on FOC basis.

The physical interface to the desktop PC is an RJ45 socket, the connection cables according to standard CAT5.

The network is divided into four sub-secured networks:

- Sensors
- MDS (measurement-data-server internally)
- Ship management
- Science

The following network services are available:

- DHCP
- DNS
- File Server services

The central database system is that of the company "WERUM Software & Systems AG" developed DavisShip system (short form, DSHIP 'or colloquially, DVS').

The DSHIP system consists of a powerful server with software for data import / export, back-up and management of networks. The server components are redundant to minimize data loss and worked in a client / server structure.

Wi-Fi is available in individual areas. Information is provided by the WTD on site.



11.2. Data acquisition and sensor systems

On the ship's sensors are installed to detect navigational, meteorological, hydro-acoustic and ship-specific data.

The list of sensors is "sensors" included in the Annex.

Standard interfaces of the sensors:

- NMEA 0183
- NMEA 2000
- LAN (TCP / IP and UDP)
- Device-specific serial ports

Serial data is converted by means of distributed on-board terminal servers and transmitted over the LAN interface to the server.

Sensors with a LAN interface (TCP / IP or UDP) to pass the data directly over the network their data to the server.



11. Data Management

11.3.11.3.

Data processing 196

11.3. 11.3. Data processing

- The data collected will be converted according to specific configuration in the actual measured parameter.
- Calculation of additional data derived from the measured variables
- Plausibility check with appropriate error status information from the sensors
- Preparation of data for online viewing
- Preparation of data for the standard and custom data export



11.4. Data distribution

11.4.1. Online-data in the laboratories

In the laboratories of the NMEA strings RMC, ZDA, PSXN23 and the 1 PPS signal in real time are available.

RMC - Recommended Minimum Navigation Information

1	2	3	4	5	6	7	8	9	10	11	12

\$--RMC,hhmmss.ss,A,llll.ll,a,yyyy.yy,a,x.x,x.x,xxxx,x.x,a*hh<CR><LF>

Field Number:

- 1) UTC Time
- 2) Status, V = Navigation receiver warning, P = Precise
- 3) Latitude
- 4) N or S
- 5) Longitude
- 6) E or W
- 7) Speed over ground, knots
- 8) Track made good, degrees true
- 9) Date, ddmmyy
- 10) Magnetic Variation, degrees
- 11) E or W
- 12) Checksum

ZDA - Time & Date - UTC, day, month, year and local time zone

1	2	3	4	5	6	7

\$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>

Field Number:

- 1) Local zone minutes description, same sign as local hours
- 2) Local zone description, 00 to +- 13 hours
- 3) Year
- 4) Month, 01 to 12
- 5) Day, 01 to 31
- 6) Universal Time Coordinated (UTC)
- 7) Checksum

PSXN23 – Roll, Pitch, Heave, Motion-Sensor MRU-5 im Binär-Format

Seatex MRU: EIVA 203

“q<length><type><RRRR><PPPP><HHHH>C” q is ASCII and the rest binary coded. RRRR and PPPP are given in radians and heave in m. As default roll is read from byte number 3, pitch from number 7 and heave from number 11. If needed, this can be changed in the INI file, where MRUrollIndex says where to find roll etc.



11. Data Management
11.4. Data distribution

198

The EM attitude format is a 10-bytes long message defined as follows

- Byte 1: Sync byte 1 = 00h, or Sensor status = 90h-AFh
- Byte 2: Sync byte 2 = 90h
- Byte 3: Roll LSB
- Byte 4: Roll MSB
- Byte 5: Pitch LSB
- Byte 6: Pitch MSB
- Byte 7: Heave LSB
- Byte 8: Heave MSB
- Byte 9: Heading LSB
- Byte 10: Heading MSB

where LSB = least significant byte, MSB = most significant byte.

All data are in 2's complement binary, with 0.01° resolution for roll, pitch and heading, and 1 cm resolution for heave.

- Roll is positive with port side up with $\pm 179.99^\circ$ valid range
- Pitch is positive with bow up with $\pm 179.99^\circ$ valid range
- Heave is positive up with ± 9.99 m valid range
- Heading is positive clockwise with 0 to 359.99° valid range.

Non-valid data are assumed when a value is outside the valid range.

The first synchronisation byte always assumed to be zero. The sensor manufacturers have been requested to include sensor status in the format using the first synchronisation byte for this purpose.

It is thus assumed that

- 90h in the first byte indicates a valid measurements with full accuracy
- any value from 91h to 99h indicates valid data with reduced accuracy (decreasing accuracy with increasing number)
- any value from 9Ah to 9Fh indicates non-valid data but normal operation (for example configuration or calibration mode)
- and any value from A0h to AFh indicates a sensor error status

Interface	RS422 -- 9600,8,N,1
Connector	D-SUB 9F
	Tx+ pin 2
	Tx- pin 5

1-PPS	H/L-edge 5V at 50 Ohm
Connector	BNC socket, 50 Ohm

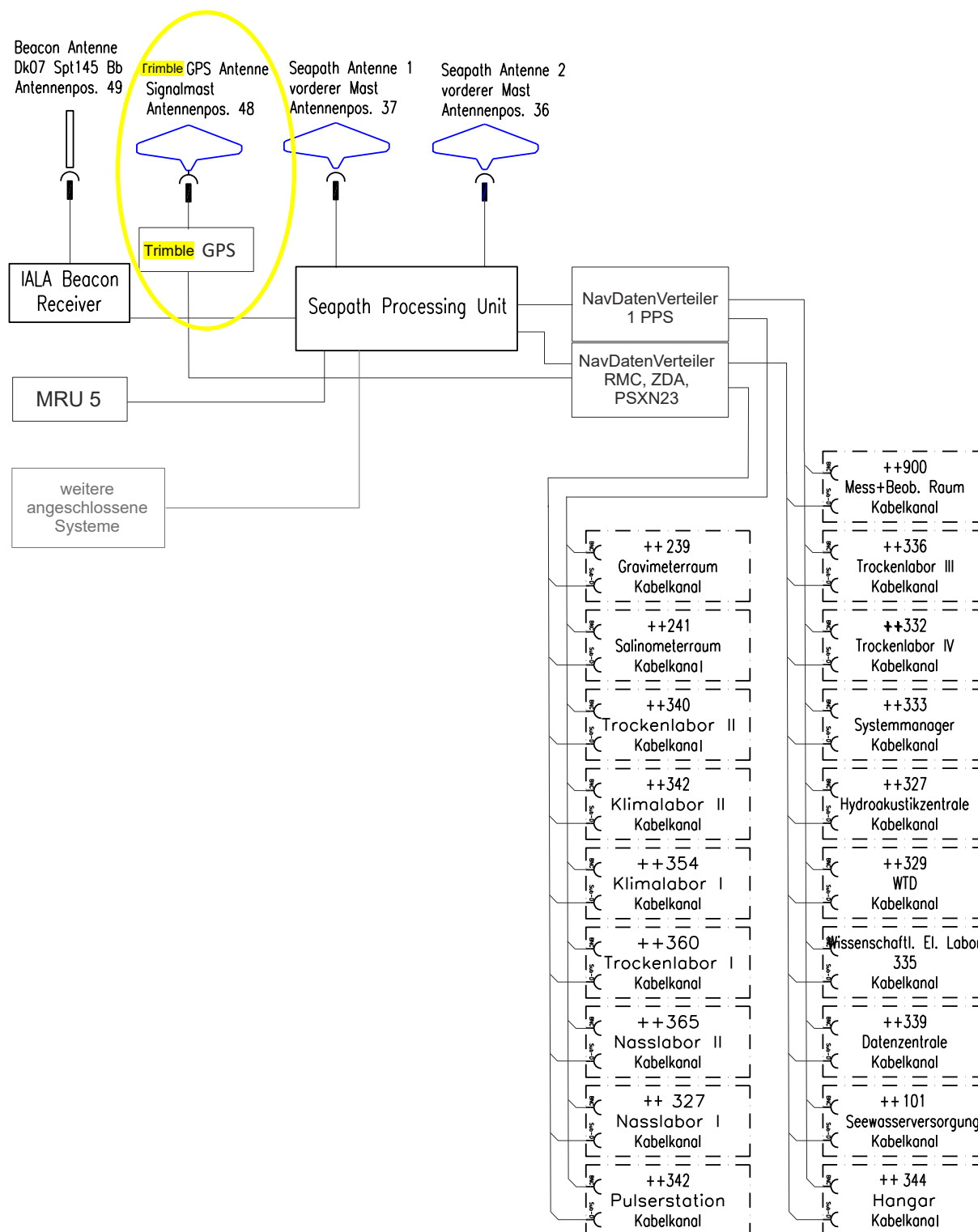


11. Data Management

11.4. Data distribution

199

11.4.2. Schematic representation of the navigation data online distribution





11.5. Online presentation

The data displayed by the system are the representation of all detected by the system and the currently edited data. They are scientists and crew alike available to visualize individual requests for information.

The online display consists of a fixed configuration and several pre-configured display windows. Furthermore, an individual design of the display surface part of the online display.

Fixed display

Independently of the selected display format, the following values are displayed continuously in a fixed configuration display window:

Vessel name, call sign, time with reference date (UTC), Text Travel, Travel-key data, way-point number, at TTG / time to go) and ETA as well as information about the print / log and data recording status.

Preconfigured display window

Individual display window

For customizing the display surface is a pool of various display screens as templates with alphanumeric and graphic displays are available, whose fields can be assigned to different channels

The free creation and editing of any number of display and print formats is done using the available digital measurement values including their graphical representation (bar chart, line chart, compass, direction / push-representation, track representation with coast lines, etc.) and free text blocks and frames. The digital measurement values are displayed with a measured value identifier, the actual measurement value and a unit. The respective display properties, such as font size, color identification / measurement / unit or background color can be selected freely.

Selection of some display modes:

- Up to three arbitrary measurement values in a line chart over a selectable time period from 1 minute to 24 hours, with the "past" values from the corresponding database are inserted automatically.
- Map display with / without coastlines worldwide in the following view:
 - Fixed map
 - Ship's position always in center
 - True Motion presentation with map change at 80% by extended display area
 - Automatic map zooming in meaningful different standards when traveling on a target point with representation from each bearing and distance
 - Manual adjustment of the scale
- STATIONS display in the following view:
 - Target in image center
 - Ship in center
 - Expected based
 - Scale representation of the ship contour based on the Centre Of Gravity
- The configured display surfaces (. Masks templates including channel occupancy) can be stored.



11. Data Management

11.5. Online presentation

201

-
- The mapping between mask position and channel / sensor at any time and at run-time dialog. The default assignments are stored in configuration files.
 - Same masks can be used multiple times, with different channel assignments used.
 - An individual mask selection and channel assignment must be saved under its own user account and reloaded. This user profile is then used as a standard or startup layout.
 - The display tool has not only a gradual dimming day / night switching.
 - There can be several display tools simultaneously and on different machines in operation. The individual windows can be displayed as icons and continue to receive the current values for display..
 - The windows are resizable. There are limits to a minimum size, which is defined by the type and number of display objects and the font.
 - The indicated values give the user any time the status (existence, validity, results of the plausibility check). This is done via color coding or graying of values.
 - The operation of the display system is possible with both mouse and keyboard (function keys).
 - All ads may be printed. In addition to a screen print individual windows can be selected and printed separately.



11.6. Data export

Online data interface

- The system provides configurable interfaces to the users to define their own NMEA - allows similar telegrams.
- The configured telegrams can be sent via TCP / IP and UDP.
- The transmission interval of these messages is configurable.
- The Telegram processes one or more times can be started on one and / or on different computers.
- Video images of scientific equipment (e.g. from ROV) and the vessel monitoring system can be displayed on all workstations

Offline data extraction

- Data extractions may be initiated by any client workstation.
- Access to the extraction tool via a Web browser.
- In the dialog of the destination files if necessary error responses (eg substitute values), the location and size limitations are the time domain, the channels, the time pattern and the desired data formats specified.
- The actual data extraction is asynchronous, batch oriented to the other user activities or advertisements. About the successful implementation of the selection order, the user will be informed by e-mail.
- As a result of the data extraction a description file with the settings and selections as well as a log file with any error messages are delivered next to the file with the actual values. All results are in ASCII format, so readable form. The values are displayed in tabular form. Each line all values of the selected channels are listed at the relevant time. The values of each line are separated by a definable separator (eg tab). This then allows easy processing of the data analysis tools (eg Excel).
- Export orders can be stored for each user and can be used at a later date from this user again.



11.7. Data backup

To ensure the entire system is a backup/recovery tool implemented.

11.8. Data archiving

- The system copies at regular configurable intervals and the stored sensor data of NMEA telegrams from the ring buffer in its own library devices.
- The archive units are swapped at the end of the journey section as a contiguous data archive on permanent storage medium (eg DVD, Blue-Ray disc, or external hard drive).

11.9. Scientific planning

For the planning and conduct of a research trip is an electronic tool for the station plans prepared.

- The program has an English interface.
- The program dynamically calculated taking into account the configurable ship speed, location and duration of the different planned Inserts the duration required for this purpose.
- The tool visualizes bathymetric maps in different projections and scales.
- The planned route of the expedition is visualized together with the bathymetric map.

11.10. Action Log

Is an electronic logbook available for the documentation of conducted scientific stations.

- The program has an English interface.
- The format of a station ID corresponds to a standardized format, as it is for example used by the DOD or AWI
- The storage of stations is supported by a database.
- Contextual information, such as Time of the station, ship's position, weather data, water depth and ship speed, winch data is received automatically via the DVS system.
- The list of to-use context data corresponding to the already used by AWI or DOD context data.
- Lack of context data can be added manually.
- Stored stations can be exported.
- The export format is used CSV-based and with end users, such as AWI or DOD tuned.
- The exported data is displayed in two lists (station protocol and operations of equipment and winches) as an Excel file

11.11. PC Workstations

Every laboratory has an MS Windows based PC workstation installed.

- DSHIP display
- MS Office package with Word, Excel and PowerPoint
- VLC Media Player
- Mozilla Firefox
- Internet access via C-band



12. Navigation systems

12.1. NACOS Platinum - Navigation and planning system

204

12. Navigation systems

12.1. NACOS Platinum - Navigation and planning system

Manufacturer	SAM Electronics GmbH Products Automation, Navigation and Communication D-22763 Hamburg, Germany www.sam-electronics.de
--------------	---

Model	NACOS Platinum ED 3200 G501
-------	-----------------------------

The navigation system "NACOS Platinum ED 3200 G501" consists of three multi-function workstations (MULTI PILOT) with applications for RADAR, ECDIS, web guide and CONNING further two jobs for ECDIS and two CONNING indicators on which, if necessary, the ECDIS will be shown.

Another MULTI PILOT, but without web guide is placed in a separate room (emergency bridge) to allow for failure of the main bridge (eg by fire) the safe return to port function (SRTP).

Each workstation includes a monitor (TFT), an operating unit (rolling ball and keyboard), and a computer for display and is housed in a separate console. The workstations are connected via intelligent node (switch) through an Ethernet ring. By using a special network protocol ensures that, if a ring segment through cable break or node failure, the remaining jobs continue to have connection.

Three radar antennas with integrated transceivers are connected via ethernet to the ring and provide radar images and track data to the four MULTI PILOT. The radar antenna in the front mast is connected to the switch in the equipment room directly with the MULTI-PILOT on the temporary bridge. From there, an emergency operation can be performed on failure of the network ring.

Three sensor data computer DCU 1, DCU 2, and 3 take DPU, parallel navigation on data from two GPS receivers and the Gyro. Furthermore, Doppler log, TV-log, as well as a wind gauge are connected. The sensor data calculator distribute the data in the ring for display on all workstations. The sensor data computers are connected redundantly. If one fails or a sensor fails, it will change automatically to the other. One of these three sensor data computer is on the temporary bridge and is also directly connected to the MULTI PILOT there.

A train management computer (TRACK PILOT) is also connected to the ring and can be selectively controlled by the operator of one of the three MULTI-PILOT. The train management computer receives the data of the next five waypoints from the route planning and controls the rudder accordingly. The route can be created and maintained on each workstation. Typically, this task is, however, on one of the two ECDISPILOTEN provided as a planning machine, done.



12. Navigation systems

12.1. NACOS Platinum - Navigation and planning system

205

A further sensor a AIS transponder is incorporated in the ring network. It provides objective data (position, MMSI, Name, ship type, etc.), which of the ships in the nearby area (typ. 10-20 NM) were sent out via VHF at all jobs. Conversely, the AIS transponder receives the system data of its own navigation system (position, velocity, etc.) for transmission to other ships in the vicinity.

In addition to the above-mentioned Components of the navigation system, which can be found in a similar configuration on other ships, additional features have been incorporated for the R/V SONNE:

1. Track data from an external planning system can be read in XML format.
2. The bearing data of an external radio direction finder are fed through one of the sensor data computer in the Ethernet ring and are available on each workstation.
3. A wave analyzer of the company WAMOS is connected through a firewall to the Ethernet ring and receives raw video from the radar to calculate wave height and direction.
4. Position and depth of unmanned submersibles are supplied as serial telegram on one of the sensor data computer in the Ethernet ring and are available on each workstation.



12. Navigation systems

12.2. Navigation sensors

206

12.2. Navigation sensors

DGPS 1 (Satellite navigation)	DGPS Antenna. MGL-4, Saab R4 Vers.II, (Deck 10) DGPS NAV Sensor, Saab R4, Version II, (Cards table) (D)GPS NAV Display, Saab R5, (Cards table)	SAAB
DGPS 2 (Satellite navigation)	DGPS Antenna. MGL-5, Saab R6 Vers.II, (Signal mast) DGPS NAV Sensor, Saab R4, Version III, (Cards table) (D)GPS NAV Display, Saab R6, (Cards table)	SAAB
DGPS Hand held	Hand held GPS receiver GPSMap 78s (Bridge)	GARMIN
SAT-Log SAAB R4	DGPS Ant. MGL-4, Saab R4 Vers.II, (Deck 10) DGPS NAV Sensor, Saab R4, Ver. II, (Cards table)	SAAB
magnetic compass	REFLECTA 1 Magnetic compass with magnetic probe	ANSCHÜTZ
Gyro	Gyro Standard 22 (equipment room)	ANSCHÜTZ
Gyro	Gyro Standard 22 (Safety center FZZ Deck 03)	ANSCHÜTZ
Radar 1	14 ft. Antenna;S-Band Signal mast	SAM
Radar 2	8 ft. Antenna;X-Band Signal mast	SAM
Radar 3	5 ft. Antenna;X-Band front mast	SAM
AIS-Transponder	GPS-Antenna Deck 07 UKW-Antenna front mast	SAM
radio direction finder	UKW radio direction finder RT-500-M (Bridge) H-Antenna for UKW radio direction finder RT- 500-M (front mast)	Rhotheta
NAVTEX	NAVTEX receiving set (Cards table) NAVTEX-printer 9528 (Cards table)	SAM Japan MARINA
Doppler-Log	SAM 4683 see " Hydroacoustic systems "	SAM
Navigation echo sounder	NES 4651 see " Hydroacoustic systems "	SAM



12.3. Dynamic positioning

Manufacturer

Kongsberg Maritime AS
NO-3601 Kongsberg, Norway
<http://www.km.kongsberg.com>

Model

K-Pos DP-11 ans cJoy

Modes

- DP
- green DP (positionieren in einem Bereich)
- Autoheading
- Autotrack
- Joystick-Operation



12.4. Radio Direction Finder

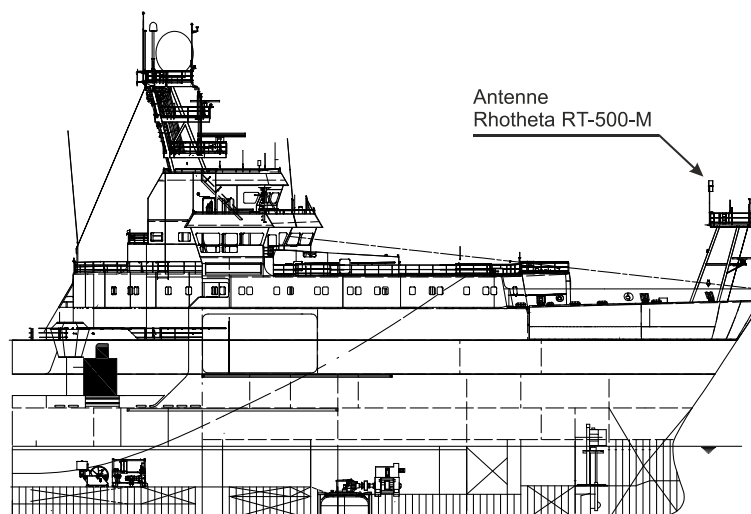
The RT-500-M is a high-performance direction finder. It can locate transmitters in a frequency range from 118 to 410 MHz. The direction determined is referenced to the antenna. One application is locating scientific equipment on the sea surface that is equipped with a corresponding transmitter.

Manufacturer RHOTHETA Elektronik GmbH
Dr.-Ingeborg-Haeckel-Str. 2
82418 Murnau
Tel.: +49 88 41 4879 – 0
Fax: +49 88 41 4879 - 15
www.rhotheta.com

Features

- Device: RT-500-M with option F5 (Fast Channel Scan)
- Marine Direction Finder
- Frequency range:
 - 118 MHz – 124 MHz (VHF Air Band)
 - 154 MHz – 163 MHz (VHF Marine Band)
 - 240 MHz – 246 MHz (UHF Air Band)
 - 400 MHz – 406.092 MHz (COSPAS-SARSAT)
 - 406.100MHz – 410 MHz (UHF FM Band)
- Sensitivity
 - VHF Air Band: $\leq 4 \mu\text{V/m}$ / $2.5 \mu\text{V/m}$
 - VHF Marine Band: $3 \mu\text{V/m}$ / $2 \mu\text{V/m}$
 - UHF Air Band: $6 \mu\text{V/m}$ / $4 \mu\text{V/m}$
 - COSPAS-SARSAT: $6 \mu\text{V/m}$ / $4 \mu\text{V/m}$
- Accuracy: $\leq 5^\circ$ RMS
- Display resolution: 1°
- Detectable modulated signals: A3E, F3E, A3X
- Minimum signal duration: ≤ 100 ms
- Polarisation: vertical

Antenna position



Control unit

The control unit is installed on the bridge (deck 8) in the main console, on the starboard side.



13. Other equipment and facilities

13.1. Ocean Floor Observation System (OFOS)

209

13. Other equipment and facilities

13.1. Ocean Floor Observation System (OFOS)

System integrator	iSiTEC GmbH
telemetry/electronic components	Bremerhaven
Conception/manufacture OFOS frame	„Leitstelle Deutsche Forschungsschiffe“ on the University of Hamburg
Depth of operation	down to 6000 meters
Connection to ship	over 18mm deep sea wire with combined coax and single mode fiber optic cable
Unit depth control	by lowering and heaving up the wire

UW unit

Dimensions OFOS frame	approx. 1650 mm (l) x 1330 mm (h) x 1250 mm (w)
Power supply	over the 18mm deep sea wire, using the coax cable transfer voltage: 600V AC transfer current: up to 1 A effective power: up to 400VA
Data transfer	over the 18mm deep sea wire using the single mode fiber optic cable Single-Mode-LWL
Video equipment of UW unit	1x SDI HD video camera (1080i, 720p) 1x network HD video camera (optional) 4x UW LED lamps 3x UW point laser
Photo equipment of UW unit	1x still camera (>30 MPixel) 2x flash 3x UW point laser, optional
Distance measurement to the ocean floor	1x altimeter
Sub position measurement	USBL system, SONARDYNE Ranger 2, fixed transponder, with power supply via UW unit

Deck unit

Installation location	Lab 333 „Wissenschaftliches Elektroniklabor“ Rack mounting
Safety precaution	Emergency stop switch, rack mounting Overcurrent protection system Isolation monitor (inner conductor//outer conductor to 3-layer armor)

Equipment of the Lab 333

Winch Drivers workplace	1x connection to winch control 1x CCTV display (winch, deck)
-------------------------	---



13. Other equipment and facilities

13.1. Ocean Floor Observation System (OFOS)

210

Operators workplace

1x altimeter information

2x operator stations

- visualization, control, video and data recording
- HD video liveview
- HD video broadcast (optional network camera)
- HD video recording (HDD)
- HD video recording (HDD) with overlaid ships data
- housekeeping data (voltages, temperature)
- switching of UW LED lamps (ON/OFF)
- dimming of UW LED lamps
- switching of point lasers
- altimeter measurements

Photo workplace

1x operator station

- live view of still camera
- still camera control
- manual still camera trigger
- intervall control of still camera trigger

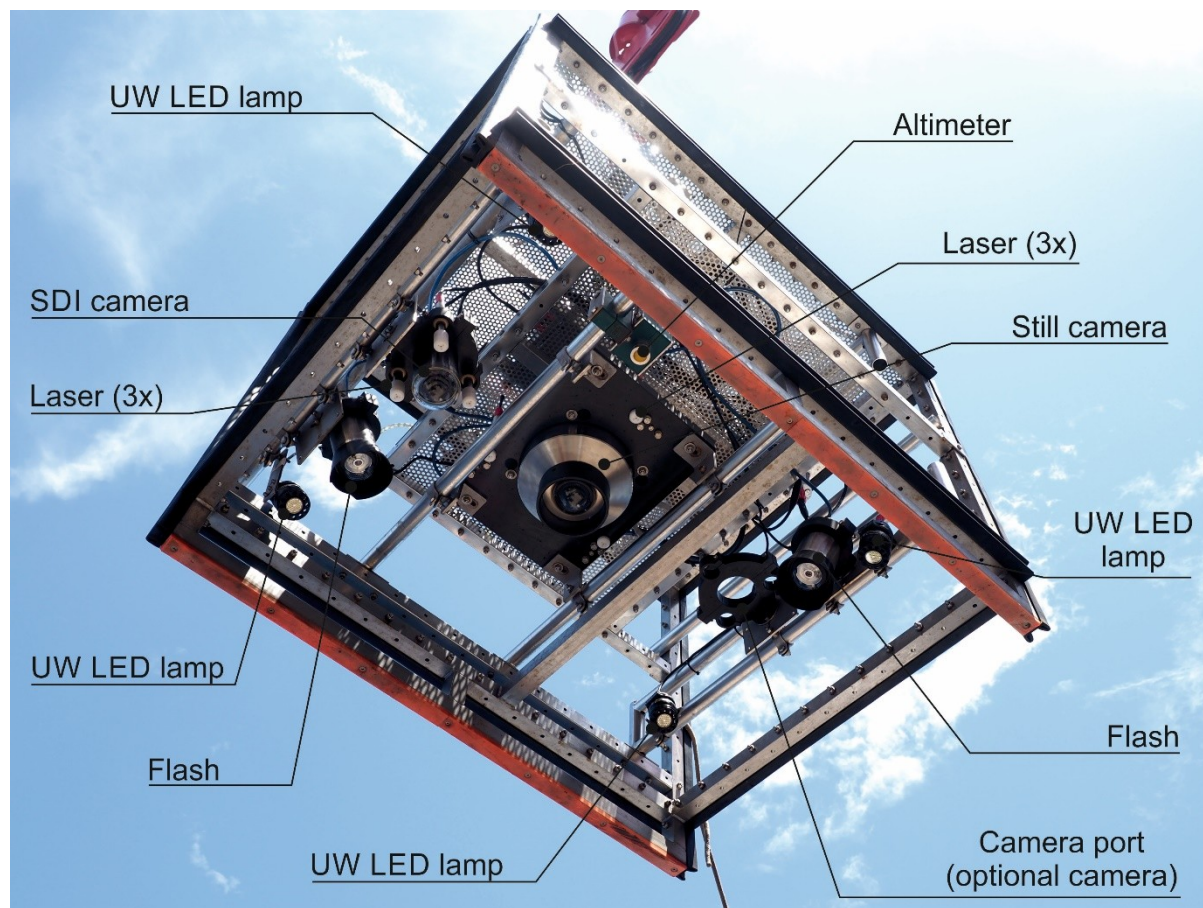
Rack

1x OFOS deck unit

2x recorder for video capture

video distribution over ships TV network

Bottom view of OFOS:

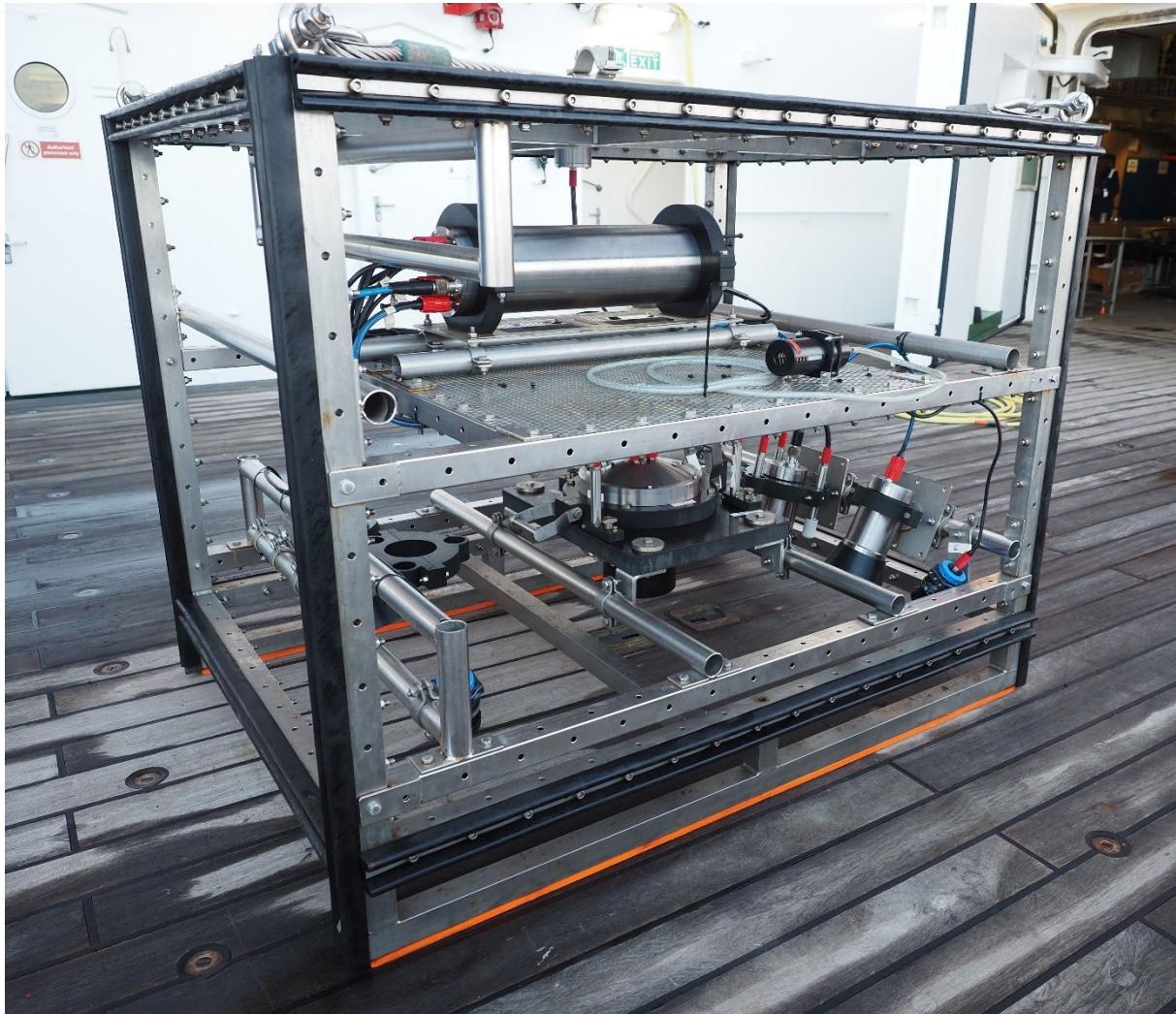




13. Other equipment and facilities
13.1. Ocean Floor Observation System (OFOS)

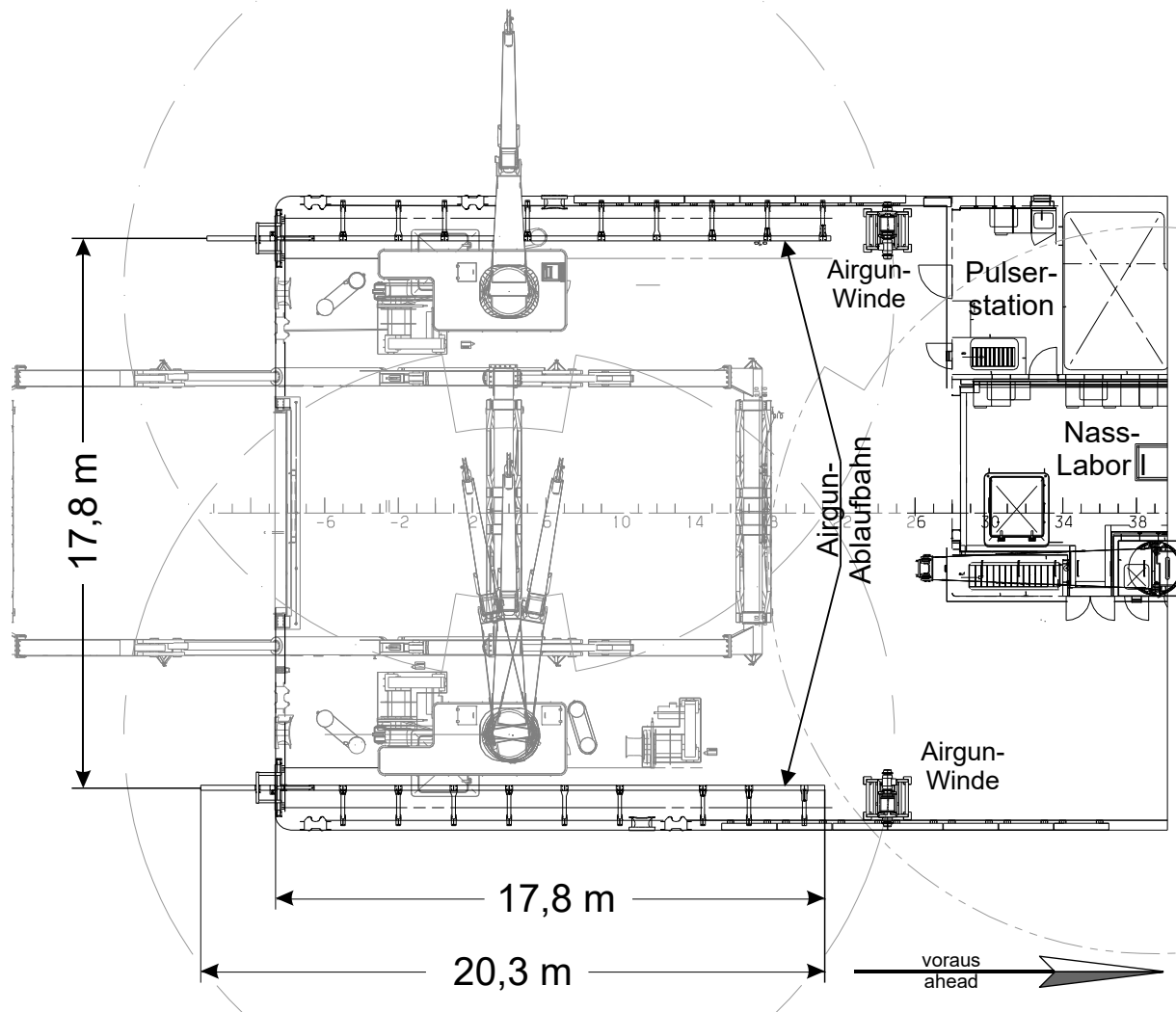
211

OFOS total view





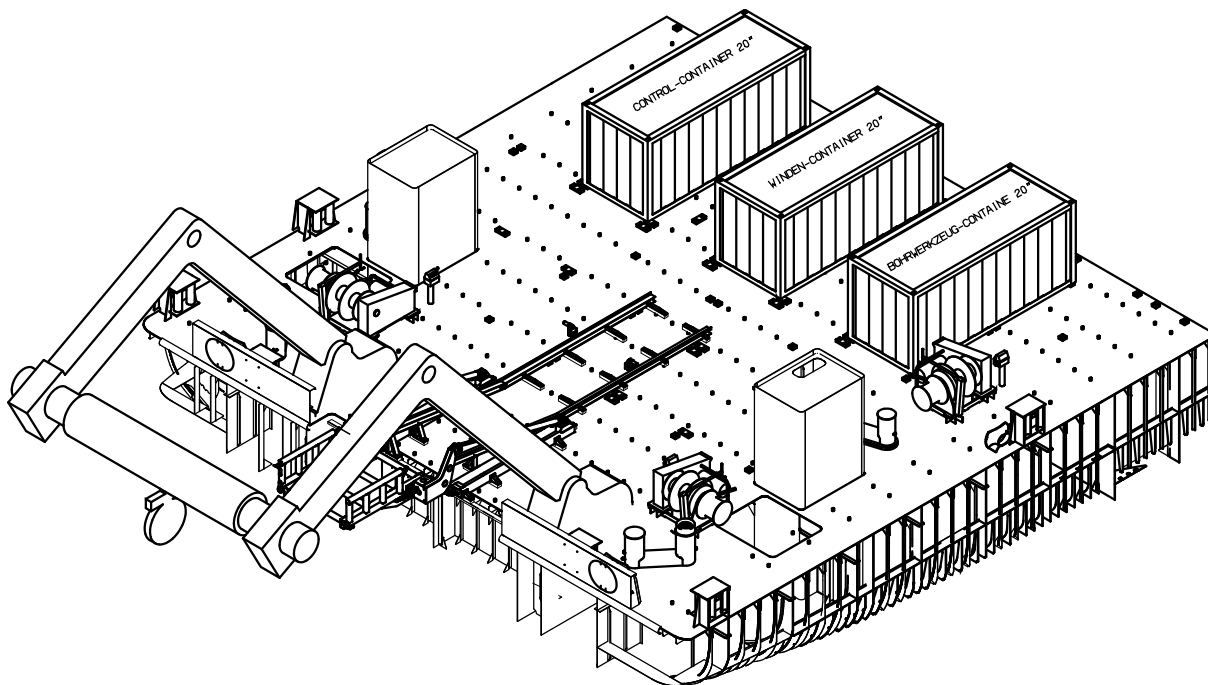
13.2. AirGun deployment rails



The AirGun winches are portable.
The cranes 3 (StB) and 4 (BB) are designed to outside suitable for towing.



13.3. Arrangement of MEBO 70 and 200

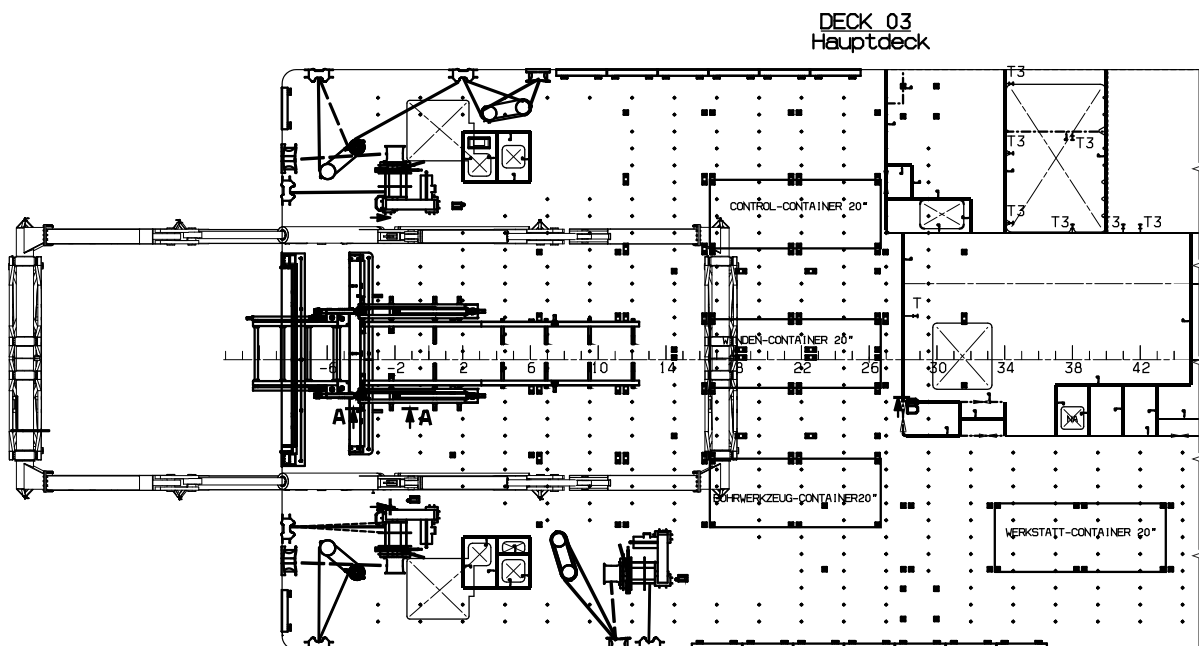
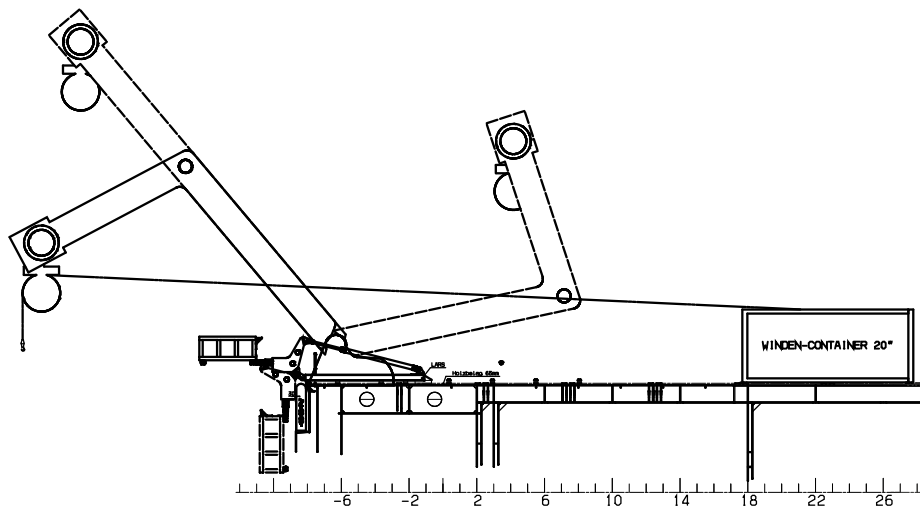


Arrangement MeBo 200 in the area of the A-Frame



13. Other equipment and facilities
13.3. Arrangement of MEBO 70 and 200

214



Device list MeBo 70 und 200

Nr.	Beschreibung	Größe	Gewicht	Stauplatz	Bemerkungen
1	MeBo 200 GEOU100038-7	20'	11 to	HD 360/370	
2	MeBo 200 Winde GEOU100041-1	20'	32 to	HD 330/340	
3	Aggregatecontainer	20'	12 to	HD 334/344	
4	Kontrollcontainer GEOU100039-2	20'	7 to	HD 315/317	
5	MeBo-Werkstattcont. GEOU100036-6	20'	9 to	HD 319/321	
6	Bohrcontainer GEOU100040-6	20'	12 to	HD 333/343	
7	LARS GEOU100040-6	20'	20 to	HD 360/370	Leercontainer auf 319/321 in zweiter Lage

Hinweis: Im Unterschied zu MEBO 200 entfällt bei MEBO 70 der Aggregatecontainer (Nr. 3).



13. Other equipment and facilities

13.4. Flying cabling

215

13.4. Flying cabling

The "flying cabling" is the temporary laying of cables and hoses between the laboratories and into the outer region of the vessel.

In the corridors are open cable trays installed to hold the lines up. The wall openings shall be kept closed when not in use, otherwise the breakthrough is closed with the existing refractory pad (closed state). Overcoming the decks via separate trays.

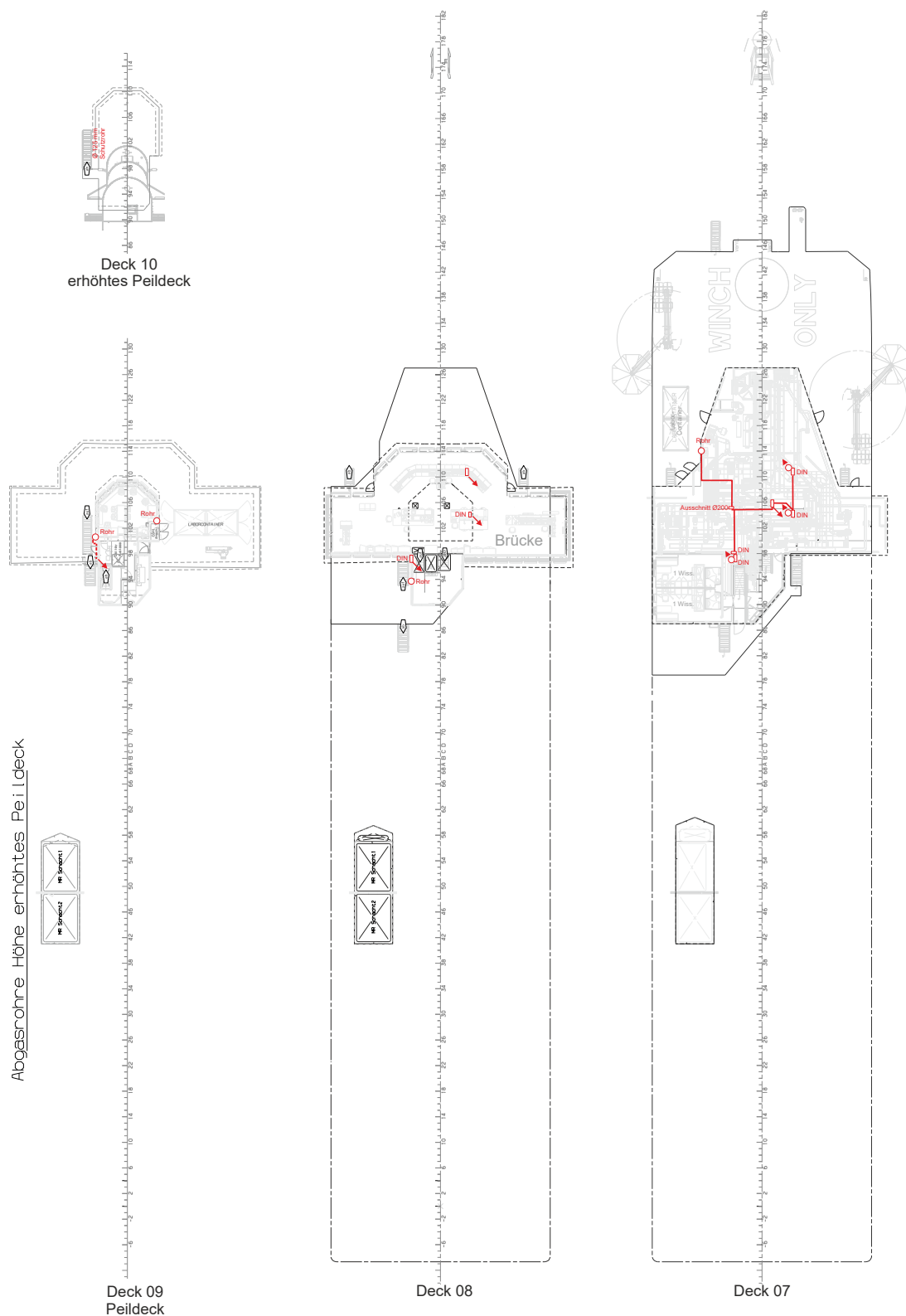
	Flying cabling -- U-shaped cable tray
	Flying cabling -- hook
DIN 	Port through the deck
DIN 	Port through the wall
Rohr 	Pipe with weather-tight closure
Bypass 	Port through the wall
Klappe 	Port through the wall
	Pipe upward with port
	Pipe up
	Pipe down



13. Other equipment and facilities

13.4. Flying cabling

216

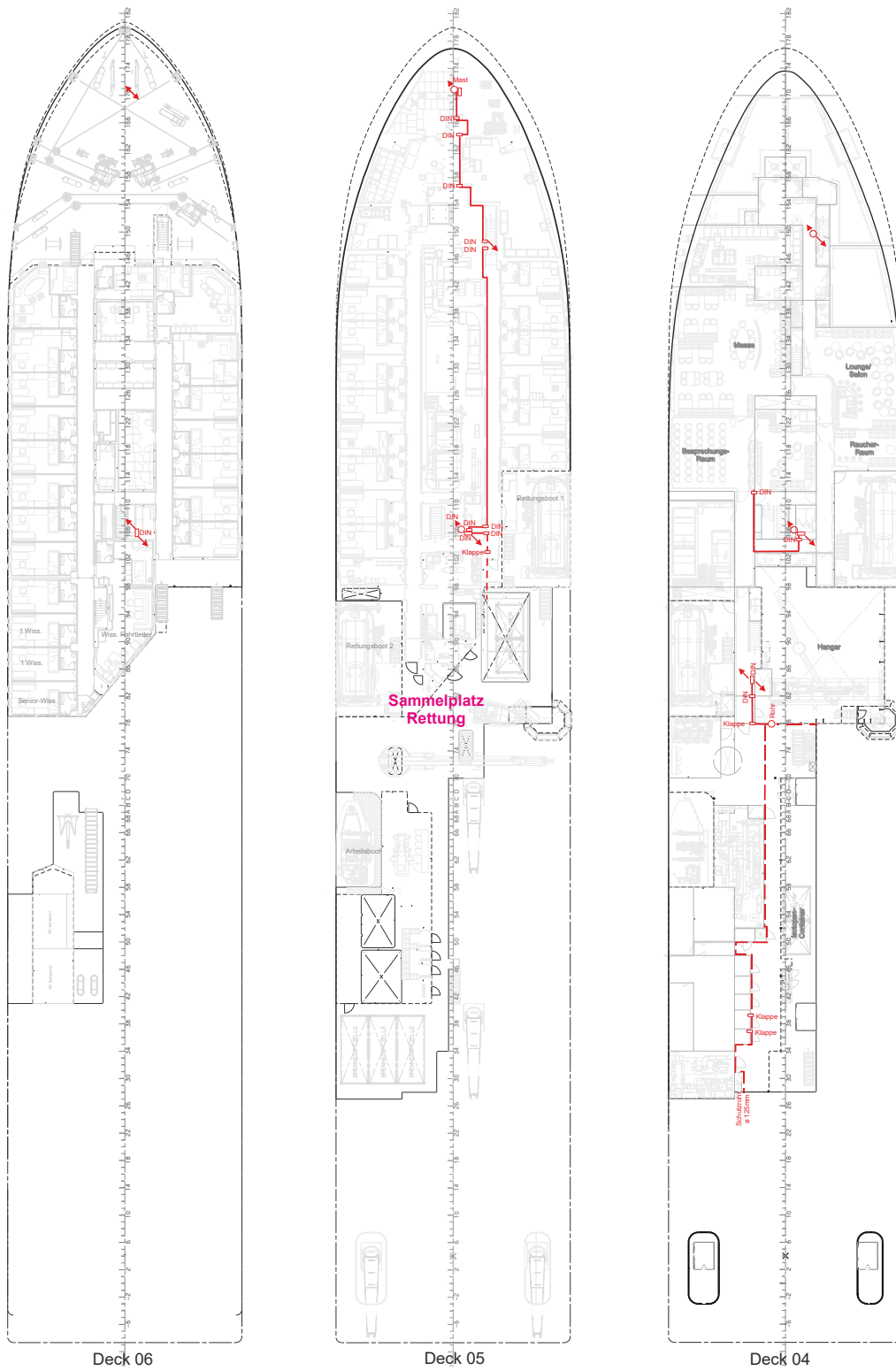




13. Other equipment and facilities

13.4. Flying cabling

217

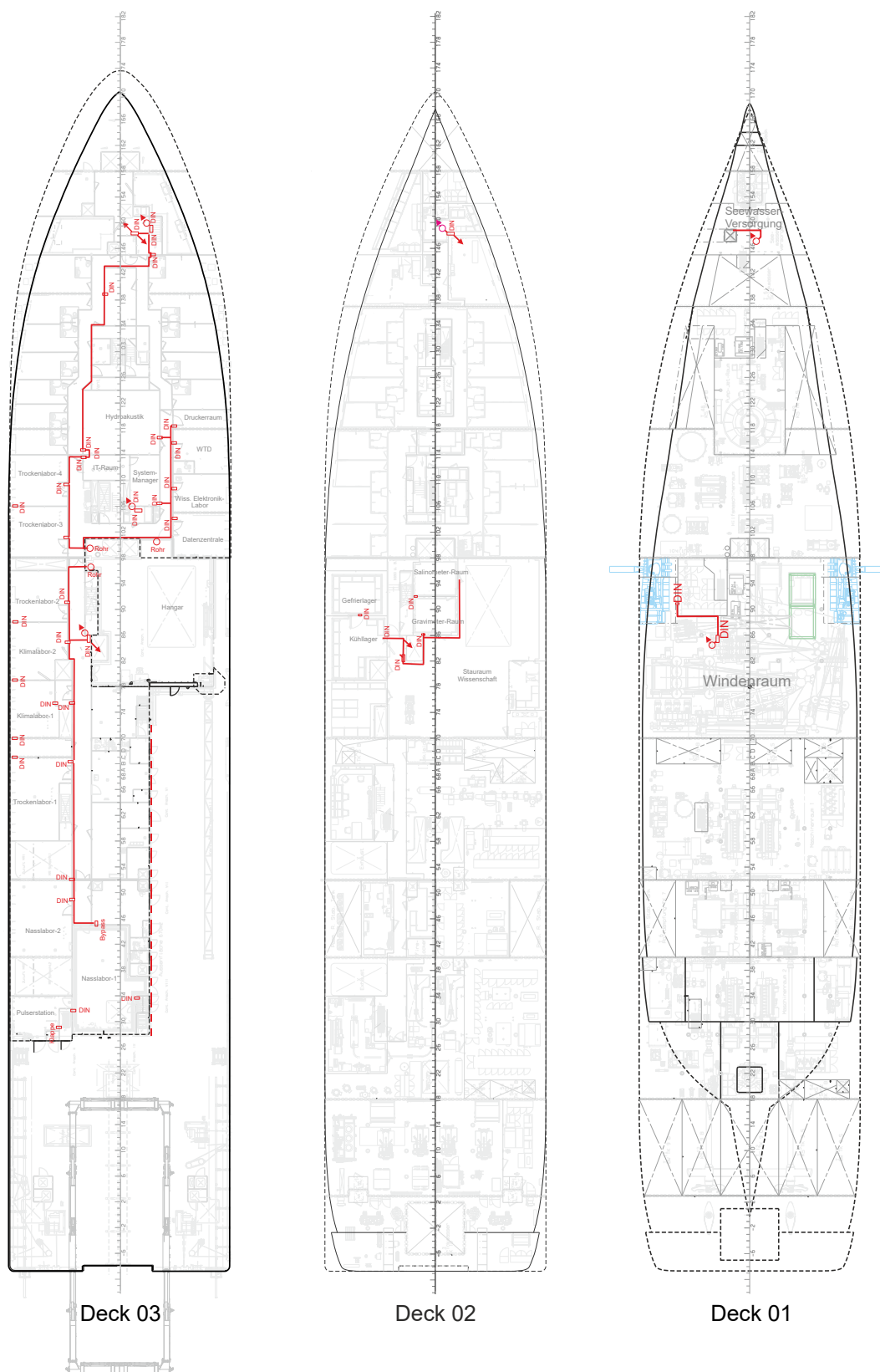




13. Other equipment and facilities

13.4. Flying cabling

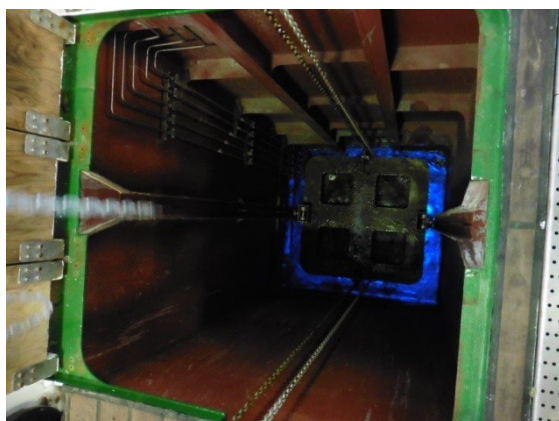
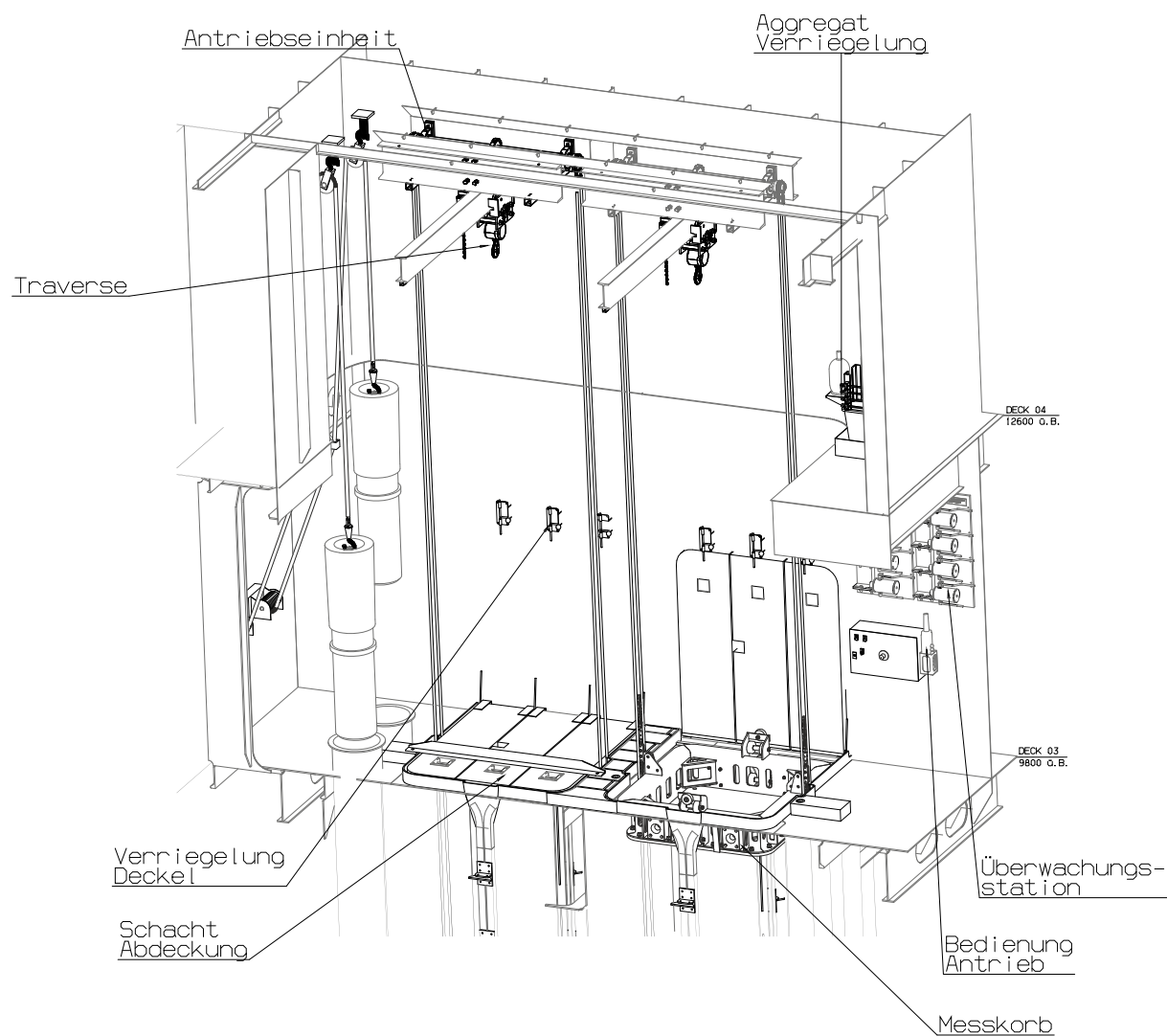
218



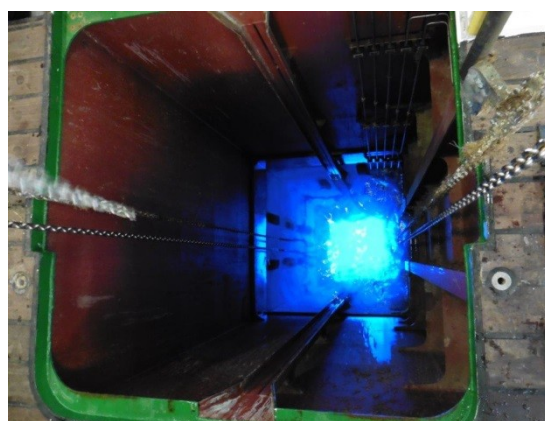


13.5. Hydrographic shafts

AUFBAU HYDROGRAPHENSCHAECHIE



Hydrographic shaft with deployed basket



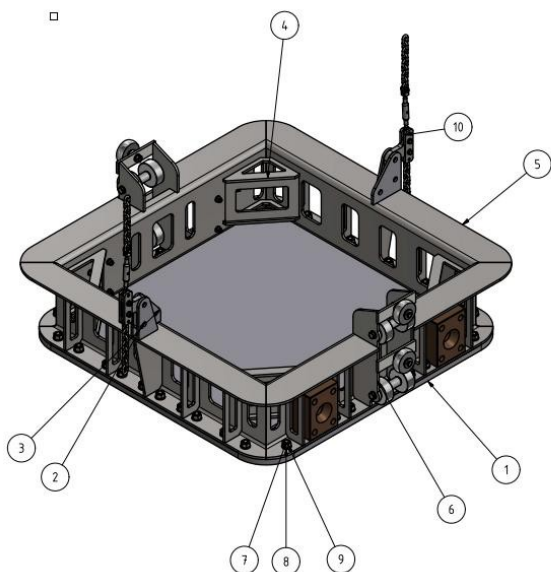
Hydrographic shaft without basket



13. Other equipment and facilities
13.5. Hydrographic shafts

220

13.5.1. Measuring basket



object	number	section
1	1	Base plate measuring basket
2	2	lashing 1
3	2	lashing 2
4	4	corner web
5	1	Base frame measuring basket
6	2	Role design Measuring basket
7	36	Hexagon bolt M20 x 60
8	36	U-disk
9	36	Hex nut
10	2	chain tensioner

The payload of the basket varies through the thickness of the base plate used.
The maximum mass of the base plate and payload (sensors, devices, etc.) is 625 kg

measuring basket 376.22 kg	base plate 25mm without stiffeners 324.68 kg	payload 300kg
measuring basket 376.22 kg	base plate 15 mm 194.8kg	payload 429kg plus any stiffeners, depending on the sensor
measuring basket 376.22 kg	base plate 10mm 129.87kg	payload 493kg plus any stiffeners, depending on the sensor



Basket



Winch above shafts



Shaft covers closed



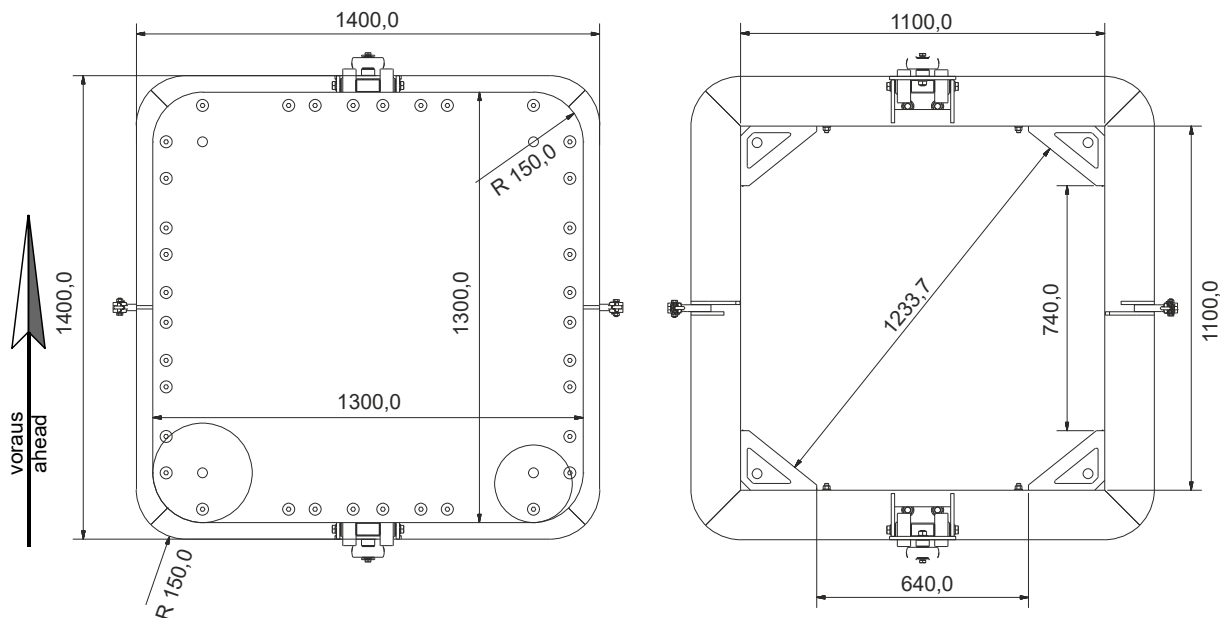
Shaft cover open



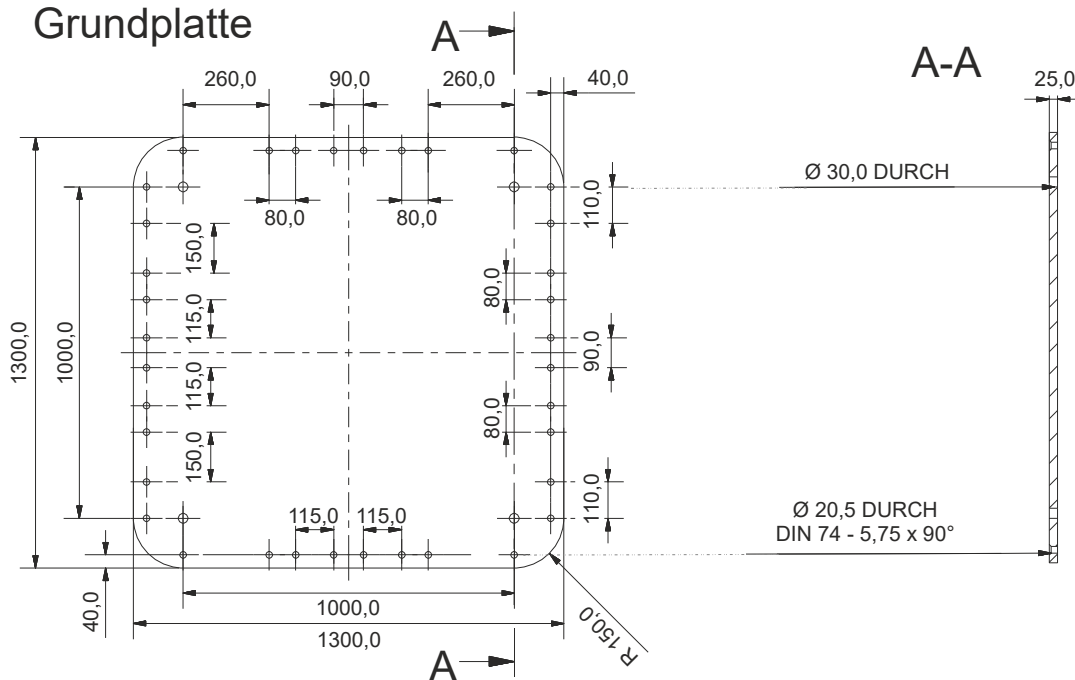
13. Other equipment and facilities
13.5. Hydrographic shafts

221

Messkorb



Grundplatte





13. Other equipment and facilities

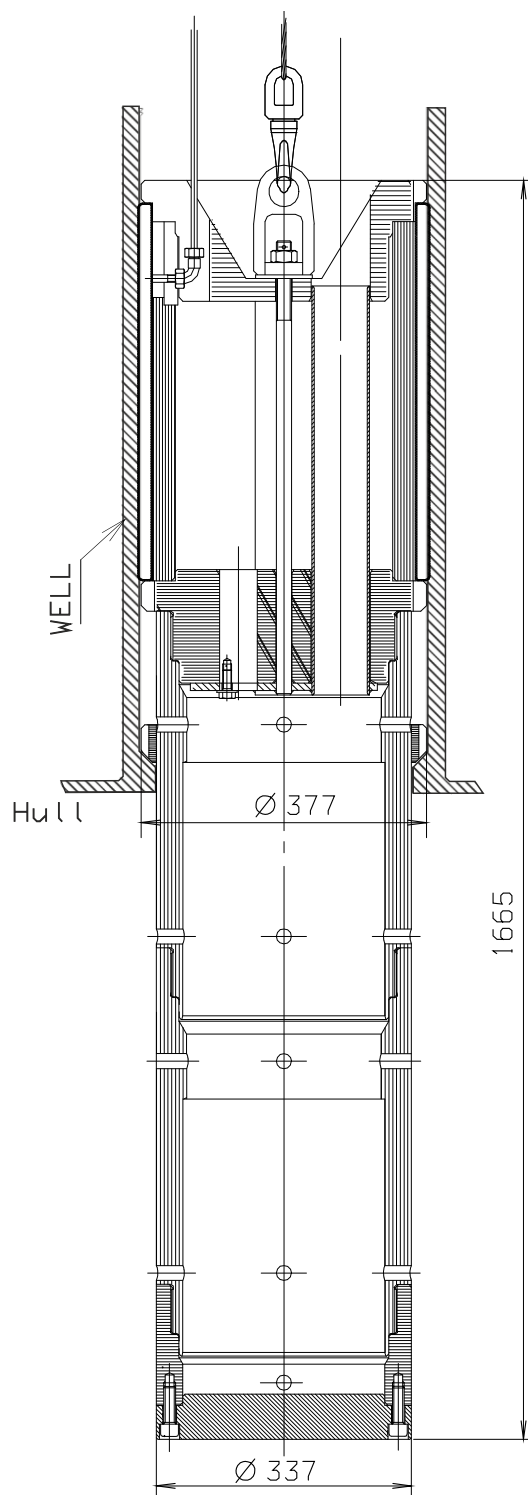
13.6. Hydrographic pipe -- Equipment rack for small devices

222

13.6. Hydrographic pipe -- Equipment rack for small devices

Ship speed

12 kn	35 cm extended
7 kn	100 cm extended



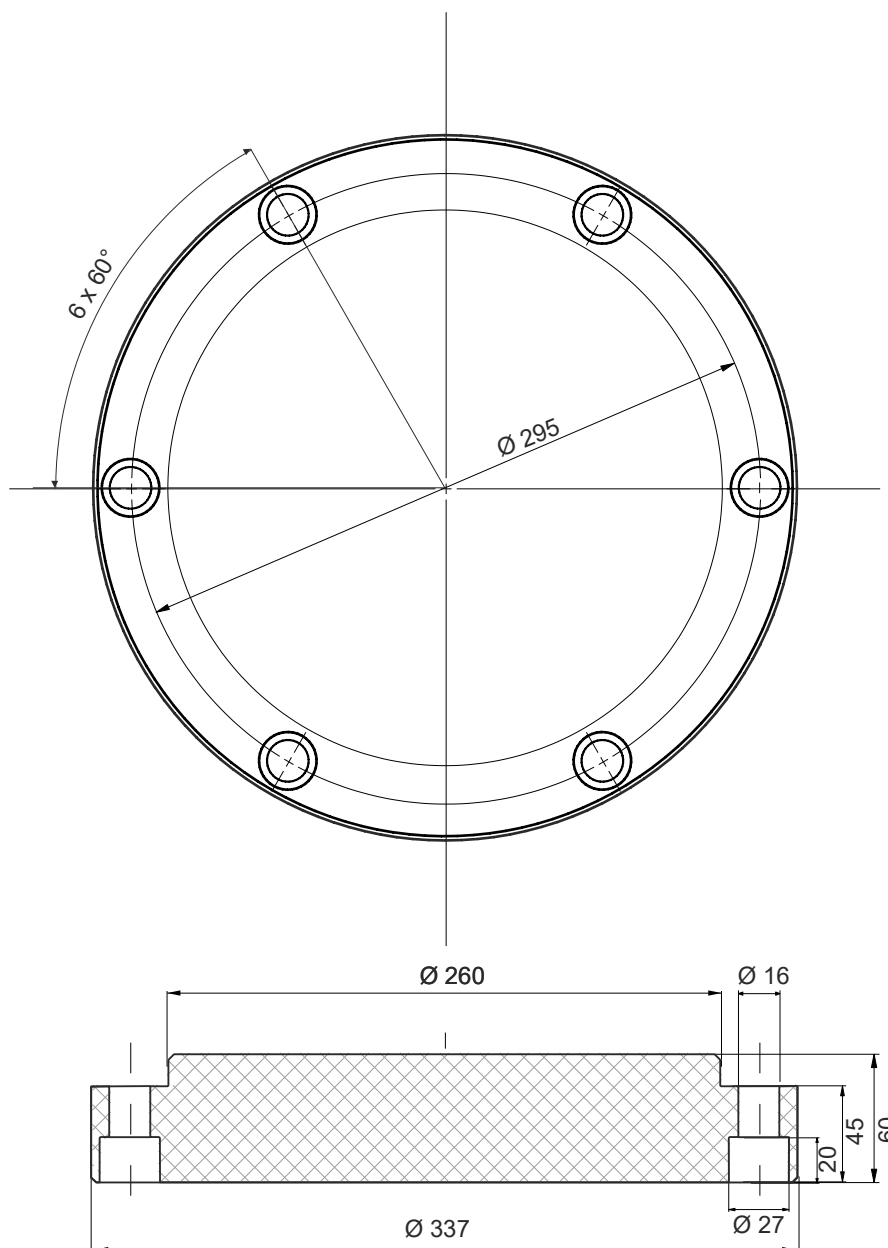


13. Other equipment and facilities

13.6. Hydrographic pipe -- Equipment rack for small devices

223

Hydrographic pipe -- Equipment rack for small devices





13. Other equipment and facilities
13.7. Extending apparatus

224

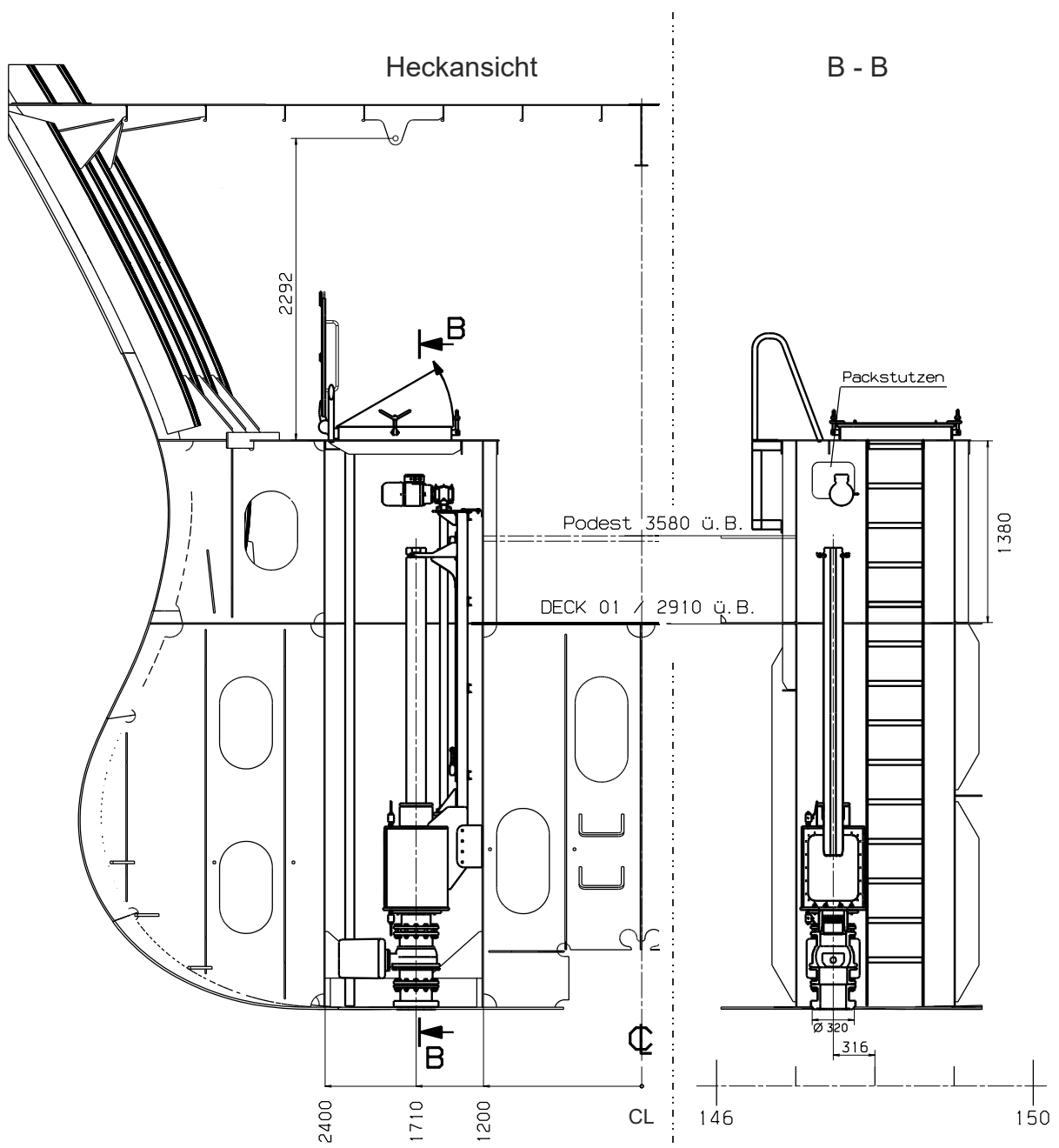
13.7. Extending apparatus

For insertion of probes and / or aspiration of seawater outside the boundary layer of the vessel a extending apparatus is installed

installation point Deck 01 (Tankdeck)
Room 101 " Sea water supply "
Frame 147/148, port 1710 mm from center line

deploying deep 700 mm

Max. speed
(extended) 12 kn





13. Other equipment and facilities

13.8. Freight elevator cargo space

225

13.8. Freight elevator cargo space

The Freight elevator connects the load compartment (deck 02) with the main deck (deck 03)

Payload: 500kg

Door width: 1300 mm

Light cabin width: 1280 mm

Door height: 2000 mm

Light cabin depth: 1250 mm



Goods lift (main deck level) closed



Goods lift (main deck level) open



13.9. CTD System

Manufacturer	Sea-Bird Electronic, Inc. Bellevue, WA 98005, USA
Model	SBE 911Plus with rosette water sampler 24 bottles of 10 liters
Board unit	SBE 11, installed in the data center
Sensors	2x Conductivity (SBE 4C) 2x Temperatur (SBE 3plus) 1x Druck (SBE 9plus) 2x Oxygen (SBE 43) 1x Altitude (Benthos PSA-916) 1x CHL/NTU (Wet Labs ECO) 1x PAR/Irradiance (Biospherical QCP2300) 1x Surface PAR (Biospherical QSR2200)
Responsibilities	The responsibility of the CTD system lies with the <i>"Controll station German Research Vessels"</i> at the University of Hamburg
Calibration	The sensors are routinely fed to the calibration





13. Other equipment and facilities
13.10. Underway-CTD (Ocienscience)

227

13.10. Underway-CTD (Ocienscience)

Manufacturer The Oceanscience Group
4129 Avenida de la Plata
Oceanside, CA 92056

Phone (760) 754-2400
Fax (760) 754-2485

<http://www.oceanscience.com>
info@oceanscience.com

With the Oceanscience UnderwayCTD© (UCTD), CTD profiles can be recorded while underway down to a maximum depth of approx. 1,000m, whereby the possible profile depth decreases with increasing ship speed.

Profiling Capability

	Vessel Speed					
	0kts	2kts	4kts	6kts	8kts	10kts
FREECAST	1500m	1100m	900m	700m	650m	600m
TOW-YO (no line on tail)	1000m	700m	550m	450m	400m	350m

The system is stored on board as standard and must be installed at the stern for use. It consists of the following main components:

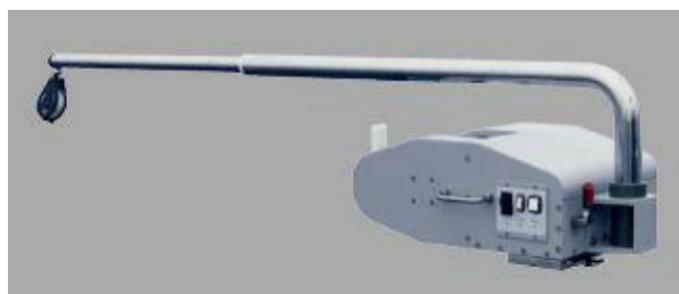
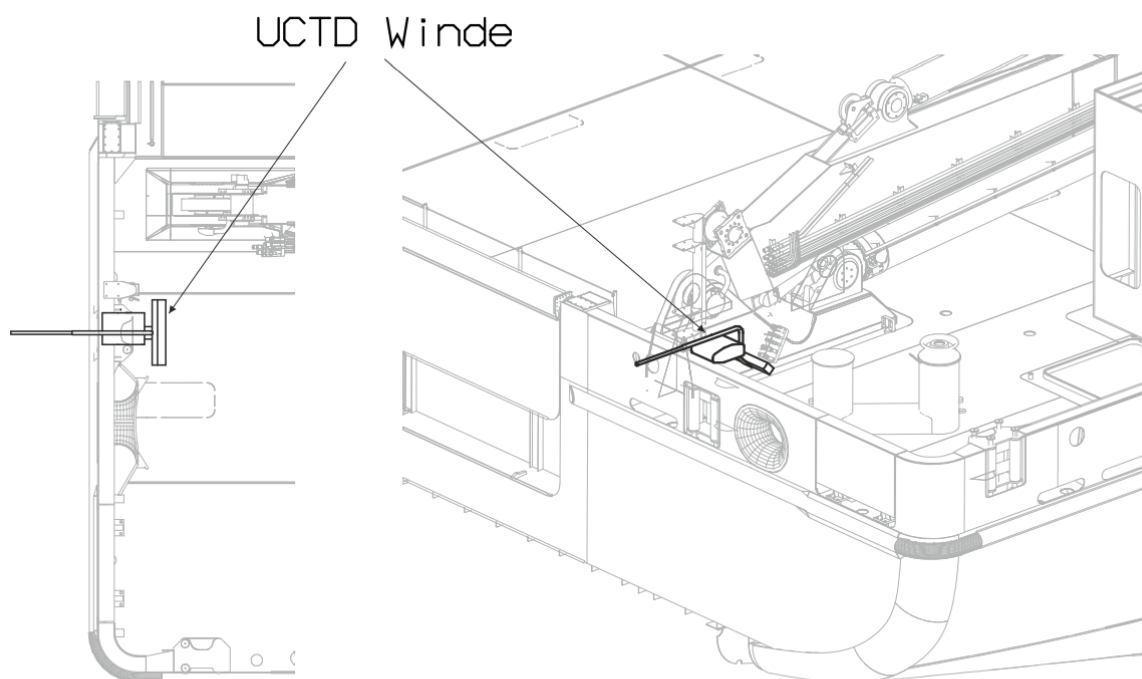
- Winch
- Probe Assembly
- Rewinder
- Davit
- Power Supply



The sensors are sent for calibration at regular intervals. A detailed user manual is available on board. This can be sent electronically if required.



Installation on vessels stern



Picture: <http://www.oceanscience.com>



13. Other equipment and facilities
13.11. Thermosalinograph

229

13.11. Thermosalinograph

installation point	Deck 01 (tank deck) Room 101 " Sea water supply
Model	2x SBE 45 Thermosalinograph in 2x SMB (see chapter 8.3.21 CleanSeaWaterlab)
Manufacturer	Sea-Bird Electronic, Inc. Bellevue, WA 98005, USA http://www.seabird.com

Thermosalinograph

Conductivity and Temperature SeaBird SBE45

	Temperature (° C)	Conductivity (S / m)	Salinity (PSU)
Range	-5 to +35	0 to 7	-
Accuracy	± 0.002	± 0.0003	± 0.005
Stability	0,0002	0,0003	0,003
Resolution ²	0.0001	0.00001	0.0002
Supply voltage	8 - 30 VDC		
Weight	3.7 kg		



² resolution

Typical RMS noise with fixed resistances on temperature and conductivity Inputs:

N Cycles*	Temperature (°C)	Conductivity (S/m)	Salinity (PSU)	Sound Velocity (m/s)
1	0.000190	0.000014	0.00027	0.00066
2	0.000170	0.000010	0.00016	0.00057
4	0.000150	0.000005	0.00015	0.00055
8	0.000087	0.000005	0.00009	0.00033
16	0.000078	0.000004	0.00007	0.00025

* NCycles = number of measurements average per sample



13. Other equipment and facilities
13.12. Sound profile probe

230

13.12. Sound profile probe

Manufacturer AML OCEANOGRAPHIC LTD
A300-2261 Keating Cross Rd
Victoria BC V8M 2A5
Canada
T: 250-656-0771
<http://www.AMLoceanographic.com>

Type AML-3 LGR (titanium housing, max. depth up to 6000 m)
Modularly equipped with:

- X2change™ Sound Velocity
- CT•X2change™ Conductivity & Temperature
- P•X2change Pressure



Sensor-data

	Sound Velocity	Conductivity	Temperature	Pressure
Range:	1375 – 1625 m/s	0 to 90 mS/cm	-5°C to +45°C	0 - 6000 dBar
Precision (±)	0.006 m/s	0.003 mS/cm	0.003 °C	0.03 % FS
Accuracy (±)	0.025 m/s	±0.01 mS/cmT	±0.005 °C	0.05 % FS
Resolution	0.001 m/s	0.001 mS/cmT	0.001 °C	0.02 % FS
Response Time	20 ms	25 ms	100 ms	10 ms
Notes	Time of flight	Combined Conductivity & Temperature	Combined Conductivity & Temperature	Piezoresistive
Max Depth	6000 m	6000 m	6000 m	6000 m

AML-3 LGR (Logger Version)

Sensor port capacity	3 (TFS SONNE: SVP, C&T, P)
GPS	N/A
Wifi	N/A
Data communications	USB-C
Housing material	Titan
Depth rating	6000 m
Weight in Air	2.5 kg
Weight in water	1.9 kg
Cage	MTL-M0639-M
Diameter	76 mm
Length	398 mm
Internal storage	29 GB
Sample trigger	• Time (Sample rate) • Pressure increment • Sound Velocity increment Continious
Communication & post-processing software	Sailfish



13. Other equipment and facilities
13.13. Fluorometer

231

13.13. Fluorometer

installation point	Deck 01 (tank deck) Room 101 " Sea water supply", Frame 145 -- 151
Model	FluoroProbe (Submersible Spectrofluorometer with Automatic Algae Class and Chlorophyll Analysis)
Manufacturer	biological • biophysical • engineering bbe moldaenke Wildrosenweg 3 24119 Kronshagen / Germany phone (+49) 431 38040-0 fax (+49) 431 38040-10 e-mail info@bbe-moldaenke.de http://www.bbe-moldaenke.de

FluoroProbe Specifications

Measurands	total chlorophyll [$\mu\text{g chl-a/l}$]
Chlorophyll	0 - 200 $\mu\text{g chl-a/l}$
Measurement procedure	spectral fluorometry
Resolution	0.05 $\mu\text{g chl-a/l}$
Transmission	0 - 100%
Water temperature	-2 - +40°C
Housing material	reinforced carbon fibre/V4A steel
Weight	4.5 kg
Dimensions (H x D)	450 x 140 mm
Voltage	12 V
Battery capacity	3900 mAh
Operating time	10 h - 30 days
Memory capacity	2 million datasets
Interface	RS485



13. Other equipment and facilities
13.14. Working boat

232

13.14. Working boat

Location Deck 05 (2. Structure deck) Frame 80 StB

Manufacturer: Hatecke GmbH
Am Ruthenstrom 1
21706 Drochtersen
<http://www.hatecke.de>

Model RB450CSFF
Maße 5,15 x 2,13 x 1,75 m
Capacity 6 Persons
Weight 780 kg
(with equipment, engine 56 kW, 40 l fuel)

		RB450CSFF principal dimensions: Over all: 5,15 x 2,13 x 1,75 m Capacity: 6 Persons Weight (with inventory, 75 hp engine, 40 l fuel): 780 kg																																																																																											
<table border="1"> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>REV.</td> <td>ALTERATION</td> <td>ALT. No.</td> <td>Date</td> <td>DESIGNED</td> <td>CHECKED</td> </tr> </table>		4						3						2						1						REV.	ALTERATION	ALT. No.	Date	DESIGNED	CHECKED	<table border="1"> <tr> <td colspan="2">Approved by:</td> <td colspan="2">Appr. date:</td> <td colspan="2">Appr. Ref. No.:</td> </tr> <tr> <td colspan="2">Hatecke GmbH Am Ruthenstrom 1 21706 Drochtersen Germany</td> <td colspan="2"> </td> <td colspan="2"> 04/13/9152-0 04/13/9152-40 email@hatecke.de www.hatecke.de </td> </tr> <tr> <td colspan="6">GENERAL ARRANGEMENT</td> </tr> <tr> <td colspan="6">RB450CSFF</td> </tr> <tr> <td>Scale</td> <td>1:25</td> <td>Owner</td> <td colspan="2">Neptun Werft</td> <td>Remarks</td> </tr> <tr> <td>Drawn</td> <td>U.B.</td> <td>Yard</td> <td colspan="2">Neptun Werft</td> <td>Rescue Boat</td> </tr> <tr> <td>Date</td> <td>14 May 2011</td> <td>Hull</td> <td colspan="2">1530</td> <td></td> </tr> <tr> <td>Examined</td> <td></td> <td>Project/Type</td> <td colspan="2">RB45CSFF</td> <td>Draw. No.</td> </tr> <tr> <td>Ex. date</td> <td></td> <td></td> <td colspan="2"></td> <td>GRB45CSFF-004</td> </tr> <tr> <td colspan="6">NOTICE: This drawing and the information it contains are the property of HATECKE GmbH, Am Ruthenstrom 1, 21706 Drochtersen and may not be reproduced or used in part or in whole for any purpose except by written permission of this company.</td> </tr> </table>		Approved by:		Appr. date:		Appr. Ref. No.:		Hatecke GmbH Am Ruthenstrom 1 21706 Drochtersen Germany				04/13/9152-0 04/13/9152-40 email@hatecke.de www.hatecke.de		GENERAL ARRANGEMENT						RB450CSFF						Scale	1:25	Owner	Neptun Werft		Remarks	Drawn	U.B.	Yard	Neptun Werft		Rescue Boat	Date	14 May 2011	Hull	1530			Examined		Project/Type	RB45CSFF		Draw. No.	Ex. date					GRB45CSFF-004	NOTICE: This drawing and the information it contains are the property of HATECKE GmbH, Am Ruthenstrom 1, 21706 Drochtersen and may not be reproduced or used in part or in whole for any purpose except by written permission of this company.					
4																																																																																													
3																																																																																													
2																																																																																													
1																																																																																													
REV.	ALTERATION	ALT. No.	Date	DESIGNED	CHECKED																																																																																								
Approved by:		Appr. date:		Appr. Ref. No.:																																																																																									
Hatecke GmbH Am Ruthenstrom 1 21706 Drochtersen Germany				04/13/9152-0 04/13/9152-40 email@hatecke.de www.hatecke.de																																																																																									
GENERAL ARRANGEMENT																																																																																													
RB450CSFF																																																																																													
Scale	1:25	Owner	Neptun Werft		Remarks																																																																																								
Drawn	U.B.	Yard	Neptun Werft		Rescue Boat																																																																																								
Date	14 May 2011	Hull	1530																																																																																										
Examined		Project/Type	RB45CSFF		Draw. No.																																																																																								
Ex. date					GRB45CSFF-004																																																																																								
NOTICE: This drawing and the information it contains are the property of HATECKE GmbH, Am Ruthenstrom 1, 21706 Drochtersen and may not be reproduced or used in part or in whole for any purpose except by written permission of this company.																																																																																													



13. Other equipment and facilities
13.15. Fast Rescue and working boat

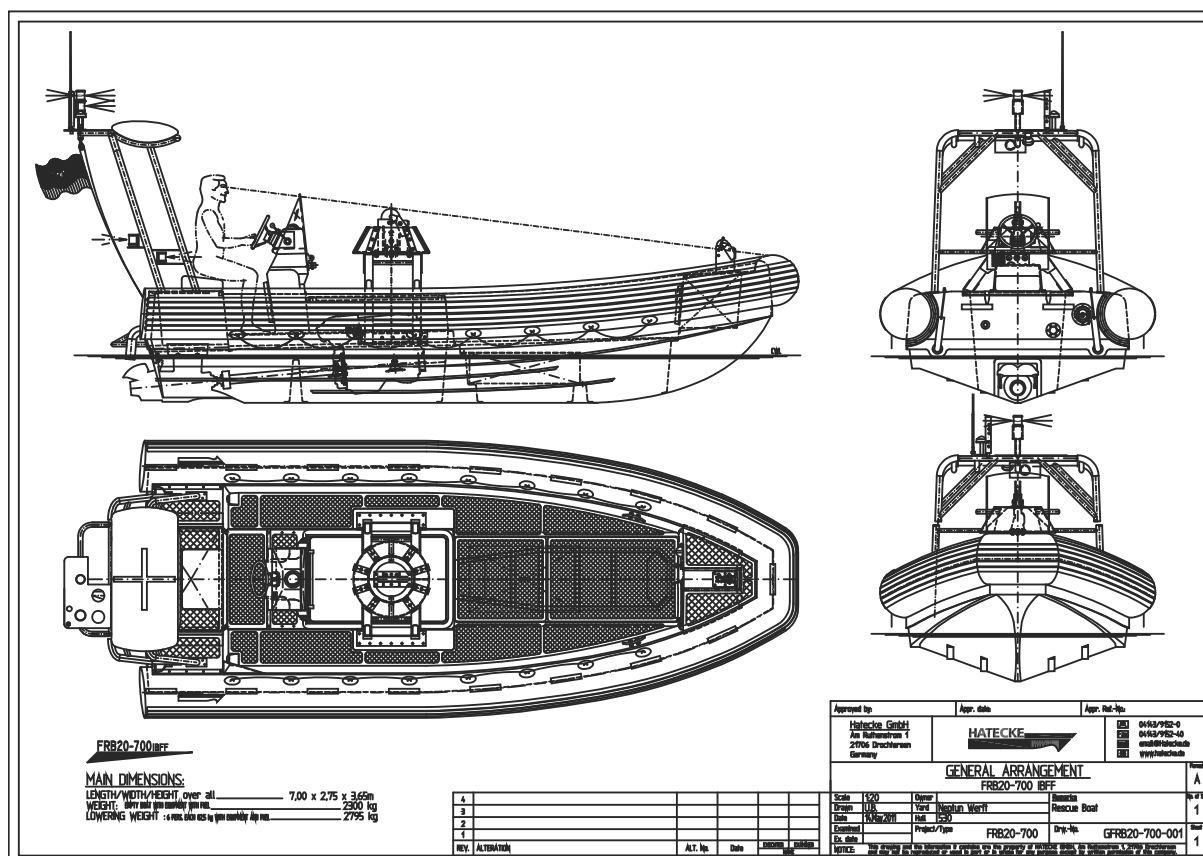
233

13.15. Fast Rescue and working boat

Location Deck 04 (1. Structure deck) Frame 64 port

Manufacturer: Hatecke GmbH
Am Ruthenstrom 1
21706 Drochtersen
<http://www.hatecke.de>

Model FRB20-700 IBFF
Maße 7,00 x 2,75 x 3,65 m
Capacity 6 Persons
Lowering weight 2795 kg
(with equipment and 6 persons)





13.16. Nitrogen liquefaction plant

installation point	Deck 2 (tween deck) Storage space science
Model	StirLITE
daily output	60 l
tank capacity	200 l
Manufacturer	Stirling Cryogenics BV, Science Park Eindhoven 5003, 5692 EB Son, The Netherlands Tel.: +31 (0)40 2677 300, Fax: +31 (0)40 2677 301, info@stirlingcryogenics.com , http://www.stirlingcryogenics.com





13.17. Milli-Q-Device

13.17.1. Merck Millipore Integral 10

Installation point	Deck 3 - Drylab 1
Manufacturer	Merck Millipore
Typ	Integral 10
Production rate daily	240 Liter
Productquality	Clean Water Typ II acc. EP und USP and CLSI® - CLRW
Flowrate on EPod	0,05 – 2 Liter/min
Storage Tank	60 Liter



13.17.2. Merck Milli-Q IQ7005

Installation point	Deck 3 – Drylab 4
Manufacturer	Merck Millipore
Typ	Milli-Q IQ7005
Flowrate	5 Liter/Hour
Productquality	Cleanest Water Typ 1 out of Q-POD-extraction unit; Clean Water Typ 2
Storage Tank	25 Liter





13. Other equipment and facilities

13.18. Laborwasser (Destillat)

236

13.18. Laborwasser (Destillat)

Available in following labs

Deck 3 (Main deck)

- Drylab 1
- Drylab 2
- Drylab 3
- Drylab 4
- Wetlab 2
- Climate Lab 1



Distillate tap



13.19. Deepest Freezers

13.19.1. Deepest Freezer 35 Liter

Installation point	Deck 3 (Main deck) - Drylab 4 - Wetlab 1
Manufacturer	National Lab GmbH
Typ	ProfiLine Pegasus PLPE 0486
Volume	35 Liter
Cooling capacity	max. -80°C General operating range: -40°C ~ -80°C
Internal dimen. (BxTxH mm)	330 x 355 x 300mm



13.19.2. Deepest Freezer 37 Liter

Installation point	Deck 3 (Maindeck) - Wet Lab 2
Manufacturer	Nordic Lab
Volume	Benchtop freezer ULT U35
Cooling capacity	37 Liter max. -86°C General operating range: -60°C ~ -86°C
Internal dimen. (BxTxH mm)	439 x 271 x 433mm





13.19.3. Deepest Freezer 549 Liter

Installation point	Deck 2 (Tweendeck) – Scientific cargo hold
Manufacturer	Thermo Scientific TSX40086FA
Volume	549 Liter
Cooling capacity	max. -86°C General operating range: -40°C ~ -86°C
Internal dimen. (BxTxH mm)	2 drawer each 700 x 580 x 640mm



13.19.4. Tiefstkühlschrank 394 Liter

Installation Point	Deck 2 (Tweendeck) - Salinometer Lab -
Manufacturere	National Lab GmbH Thorbi® Primus TPU4586DCC
Volume	394 Liter
Cooling capacity	max.: -86°C General operating range: -40°C ~ -86°C
Internal dim. (BxDxH mm)	3 drawer each 467 x 597 x 242mm 1 drawer 467 x 597 x 244mm 1 drawer 467 x 597 x 245mm





13.20. Flake Ice machine

Installation point Deck 3 (Main deck)
 - Wetlab 1

Manufacturer Brema
Typ GB 903 HC
Ice stock 30 Kg
Ice production 113 Kg / 24 hours



Flake Ice machine



13. Other equipment and facilities

13.21. Laboratory Dishwashers

240

13.21. Laboratory Dishwashers

Installation points

Deck 3 (Main deck)

- Drylab 3

- Wetlab 2

Manufacturer

Miele Professional

Typ

G 7883 stainless steel

Design

below table, 60cm width

Programs

10 Standard cleaning- / disinfection programs





13.22. Digistorien Cabinets

Installation points	Deck 3 (Main deck) - Wetlab 1 - Wetlab 2 - Draylab 1 - Drylab 4
Manufacturer	Cryo Technik
Typ	VHA 1200
Work area	1200 x 600 mm
Hood	class I (chem) EN 12469





13. Other equipment and facilities
13.23. Heat Cabinets

242

13.23. Heat Cabinets

Installation points	Deck 3 (Main deck) - Drylab 1 - Drylab 4 - Wetlab 1 - Wetlab 2
Manufacturer	Thermo Scientific
Typ	LUT 6050
Inner Dimen. (BxHxT mm)	435 x 500 x480
Volume	105 Liter
Set-temperature	250°C
Time heating up to 250°C	< 70 Minutes
Intended use	For drying and baking liquid coating materials. For example, paints whose solvents can form explosive mixtures with air.
NOT intended use	Dust must not be heated in this dryer, which can reach explosive concentrations when swirling. The dryer must not be used to heat liquids in closed containers or containers. No pyrotechnic substances or substances that are prone to exothermic reactions may be introduced into the device. Health-endangering materials and substances may due to leaks in the inner container especially in the Door area not be introduced.
Installatio point	Deck 3 (Main deck) - Scientific electronic lab
Manufacturer	Thermo Scientific
Typ	OGH 60
Inner Dimens. (BxHxT mm)	328 x 480 x389
Volume	61 Liter
Set Temperature	50°C bis 330°C
Time heating up to 150°C	< 25 Minutes
Intended Use	The Heratherm heating and drying cabinets are Laboratory equipment for thermal engineering Applications. The devices allow exact regulation of the temperature in the interior. Heat treatment of samples or goods with working temperatures from 50 ° C to 330 ° C, e.g. for drying, aging, analyzing, digesting, stoving, oxidizing, reducing and preheating. Heratherm heating and drying cabinets are for installation and operation in the following Intended for use: • heat treatment, • Drying of goodsBestimmungswidriger



NOT intended Use

The Heratherm heating and drying ovens should not be loaded with substances that overburden the ability of available laboratory equipment and personal protective equipment to provide adequate protection for users and third parties

No samples containing hazardous chemical substances may be processed which may be released into the ambient air due to leaks in the device or may be corrosive or otherwise damaging to parts of the Heratherm heating and drying cabinet.

To avoid the risk of explosion, the heating and drying oven must not be loaded with fabrics, substances or liquids as samples which:

- easily flammable or explosive,
 - whose released vapors or dusts in combination with air form flammable or explosive mixtures,
 - release the poisons,
- Create a humid atmosphere,
- form dusts,
 - cause exothermic reactions,
 - intended for pyrotechnic purposes.





13. Other equipment and facilities

13.24. Refrigerators

244

13.24. Refrigerators

Installation points Deck 03 (Main deck)

- Wetlab 1
- Wetlab 2
- Drylab 1
- Drylab 2
- Drylab 4
- Data

Manufacturer	Liebherr
Typ	FK 3640
Inner Dimens. (BxHxT cm)	47 x 145,2 x 44
Volume	333 Liter
Temperature range	+2°C bis +10°C

Installation points Deck 3 (Main deck)

- Drylab 3
- Hangar
- Measuring and observation room

Manufacturer	Liebherr
Typ	FKU 1800
Inner Dimens. (BxHxT cm)	51,3 x 70,2 x 44,1
Volume	180 Liter
Temperature range	+2°C bis +10°C





13. Other equipment and facilities

13.25. Deep Freezers

245

13.25. Deep Freezers

Installation points	Deck 3 (Main deck) - Wetlab 1 - Wetlab 2 - Drylab 1 - Drylab 2 - Drylab 3 - Drylab 4
Manufacturer	Liebherr
Typ	LGUex 1500
Inner Dimens. (BxHxT cm)	45,4 x 66,3 x 45
Volume	139 Liter
Temperature range	-9°C bis -26°C





13.26. Mobile Cabin for Rock Saw

Location Deck 3 (Main Deck), Wet Laboratory 1

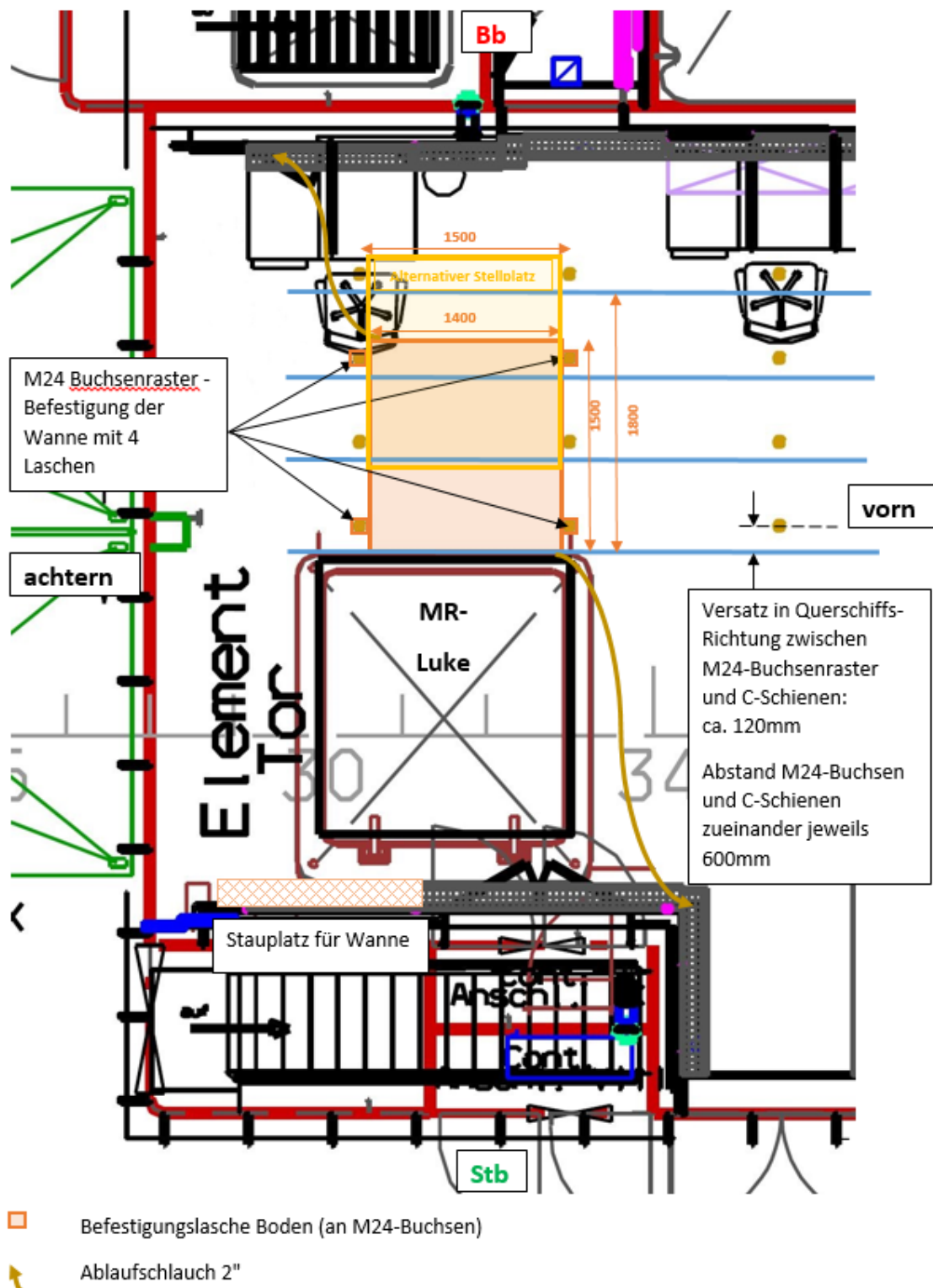
Manufacturer KULA, Ottersberg (near Bremen), Germany

Dimensions approx. 2000 x 1500 x 2000mm (L x B x H)





Location sketch



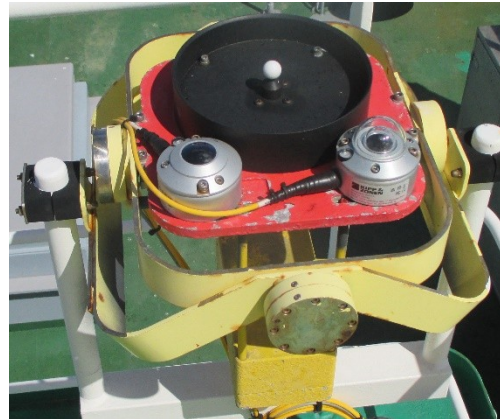
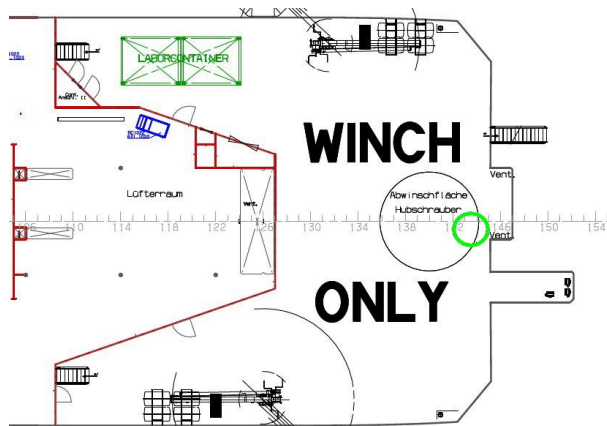


14. Meteorology

14.1. Global Radiation Sensors

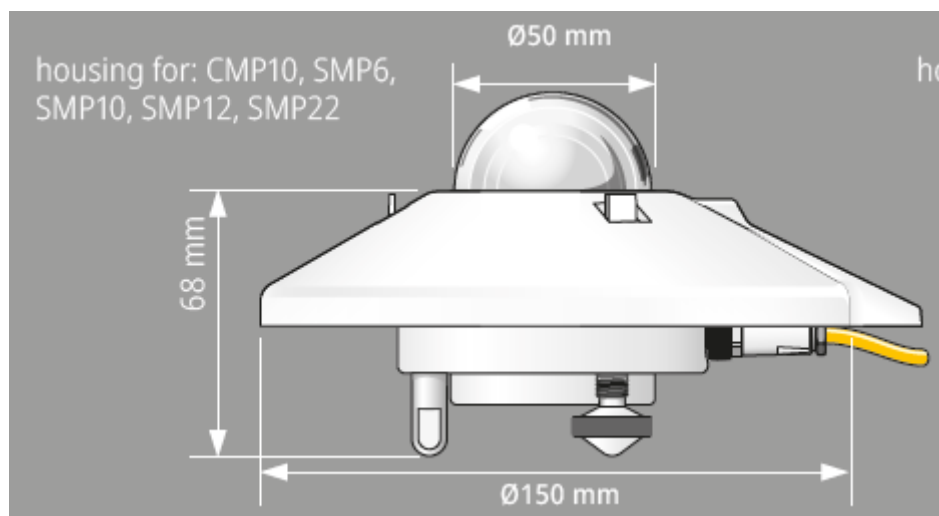
Meteorological radiation measuring instruments for recording shortwave and longwave atmospheric radiation as well as photosynthetically active radiation (PAR).

Location Deck 07 (4th Superstructure Deck), Frame 144, Starboard



14.1.1. Pyranometer

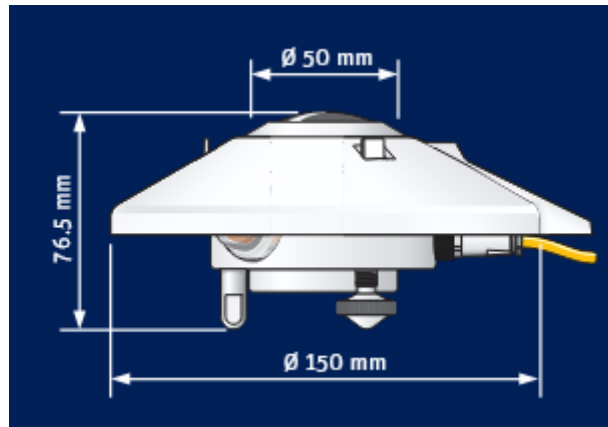
Manufacturer	Kipp & Zonen (OTT HydroMet)
Type	SMP10-V
Classification	Spectrally Flat Class A
Measurement Range	400 bis 4000W/m ²
Spectral Range (20% points)	270 bis 3000nm
Spectral Range (50% points)	285 bis 2800nm





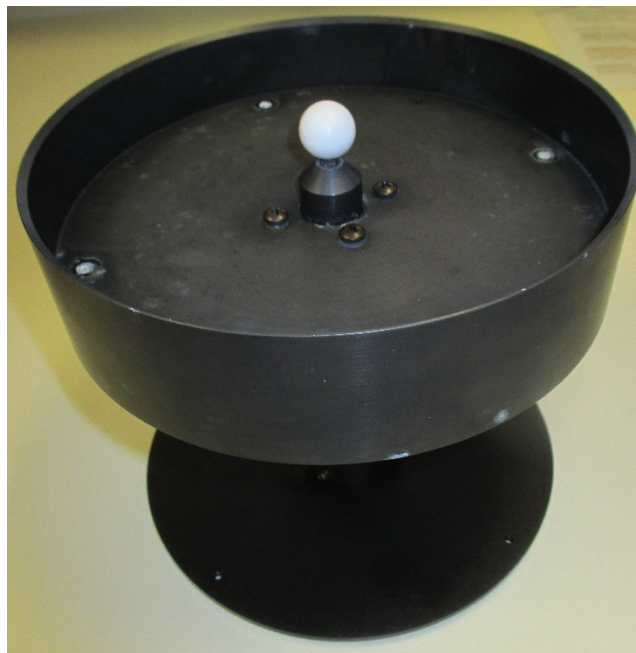
14.1.2. Pyrgeometer

Manufacturer	Kipp & Zonen (OTT HydroMet)
Type	SGR4-V
Measurement Range	0 bis 1000W/m ²
Spectral Range (50% points)	4500 bis 42000nm



14.1.3. Quantum Scalar Irradiance PAR Sensor

Manufacturer	Biospherical Instruments Inc.
Type	QSR-2150
Measurement Range (PAR Dynamic Range)	1,4x10 ⁻⁵ bis 0,5 µE/(cm ² * sec)
Spectral Range	400 bis 700nm





15. Communication

15.1. Alarms and emergency calls

Alarms and emergency calls

The alarm audibly via the public address system and means of Typhon.

7x short – 1x long (repeated) ...

short – long (repeated)

General alarm

Posing at the master station deck 05 (2 superstructure deck)

Alarm to abandon the ship

Posing at the assigned lifeboat

Emergency calls ship internally

In an emergency, the bridge and the port is to inform the officer on duty.

Emergency calls via:

- Working channel intercom Science
- Working channel of the hand-held radios
- Telephone
- Wechselsprechanlage Intercom ship guide

Fire alarm

Cold room and sauna confining alarm

Alarm button in rooms with visual alarm display and acknowledgment before the rooms.

The alarm will be forwarded to the bridge.

Hospital- Alarm

Alarm button in the hospital with visual / audible alarm to quittierender the 2nd officer or Doc.

The alarm will be forwarded to the bridge.



15.2. External Communications

E-mail externally

see [#General information](#)

Telefon und Fax

see [#General information](#)

Internet

Internet via the C-band system is available throughout the ship via WLAN and Ethernet (RJ45).

The provider guarantees a transfer rate of 1.024 Mbps from ship to shore and 2.56 Mbps from shore to ship. An increase in bandwidth can be requested in advance of the voyage.

The maximum transfer rate is 2.56 Mbps for uploads and 7.68 Mbps for downlinks.

The bandwidth is shared by all users (scientists and crew).

In addition, scientists have access to a pro-rata monthly total data volume of 600 GB via Starlink via WLAN. The distribution of this data volume among the scientific participants is the responsibility of the chiefscientist.



15.3. Internal Communication

Telephone

All rooms are equipped with telephone.

Intercom Science

Principle of the system:

- No main intercom station
- All participants have equal rights
- Any number of participants can take part in a conversation group
- Each participant can join the group themselves
- All stations work with a microphone and talk button
- An announcement can be made to all stations from the bridge console, regardless of their switch position.
- One channel of the handheld radios can be integrated into communication via intercom

Intercom master and officers

For the scientists only use it for emergencies.

Public address system

The public address system is paging entire ship or sub-groups (corridors labs, etc.) designed.

15.4. TV-Monitoring

The camera system is used for visual monitoring of the winches and the working areas of the deck.

In the port mode, the TV system used to monitor the vessel as part of ISPS.



16. Life on board

16.1. Generally used rooms

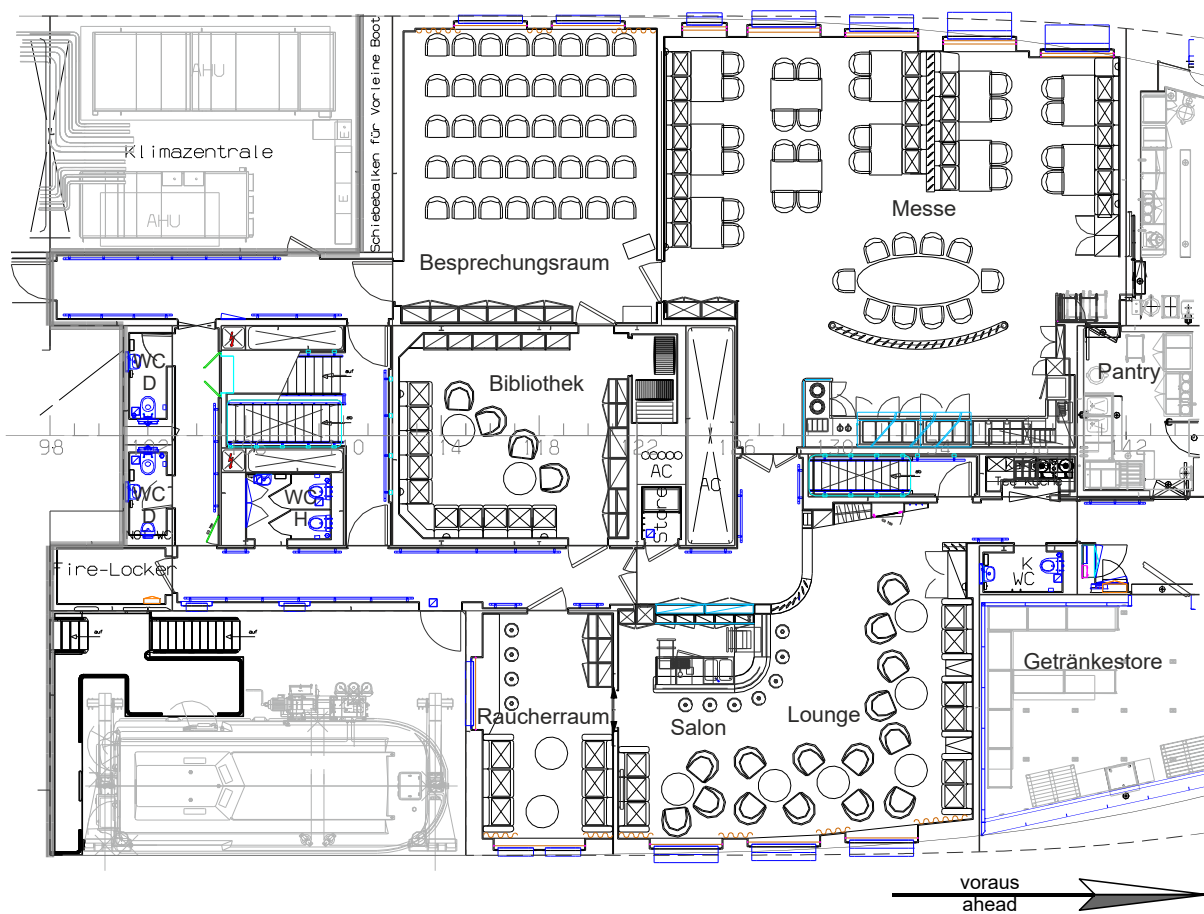
16.1.1. Mess room, lounge, lounge, library, smoking room

Location 1. Structure deck
Frame 110 – 142

Mess room, lounge, library lounge, smoking room and meeting room are central rooms for meetings.

The Mess room is shared by crew and scientists.

The food expenditure is self-service.





16. Life on board

16.1. Generally used rooms

255

16.1.2. Sauna and fitness room

Location

Deck 02 –tween deck
Frame 137-145

Room-No.

Sauna

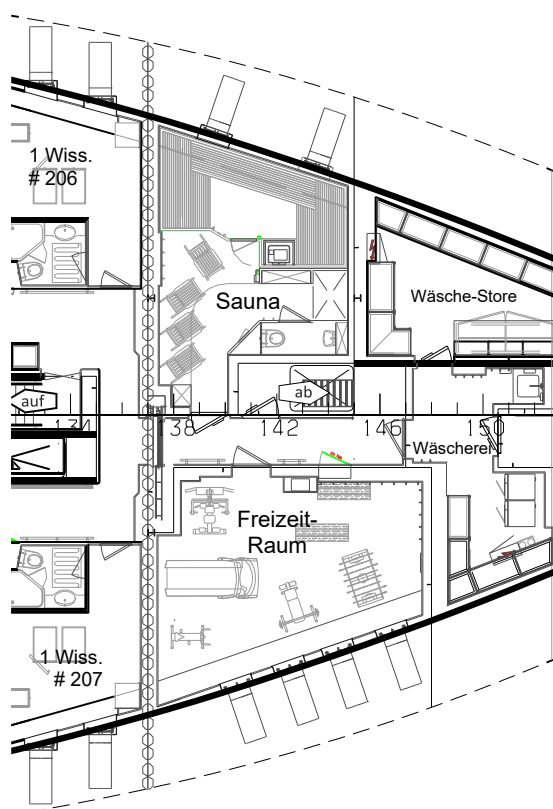
Fitness room

Phone

Room size

20 m²

23 m²



16. Life on board

16.1. Generally used rooms

256

16.1.3. Laundry

For the scientific cruise participants is ever a laundry equipped with washing machines and dryers in the residential area of "Science" on deck 02 (steerage) and 03 deck (main deck) are available.

16.1.4. Luggage storage

For the scientific cruise participants is ever a luggage storage in residential facilities "science" on deck 02 (steerage) and 03 deck (main deck) are available.



16. Life on board

16.2. Hospital und medizinische Einrichtung

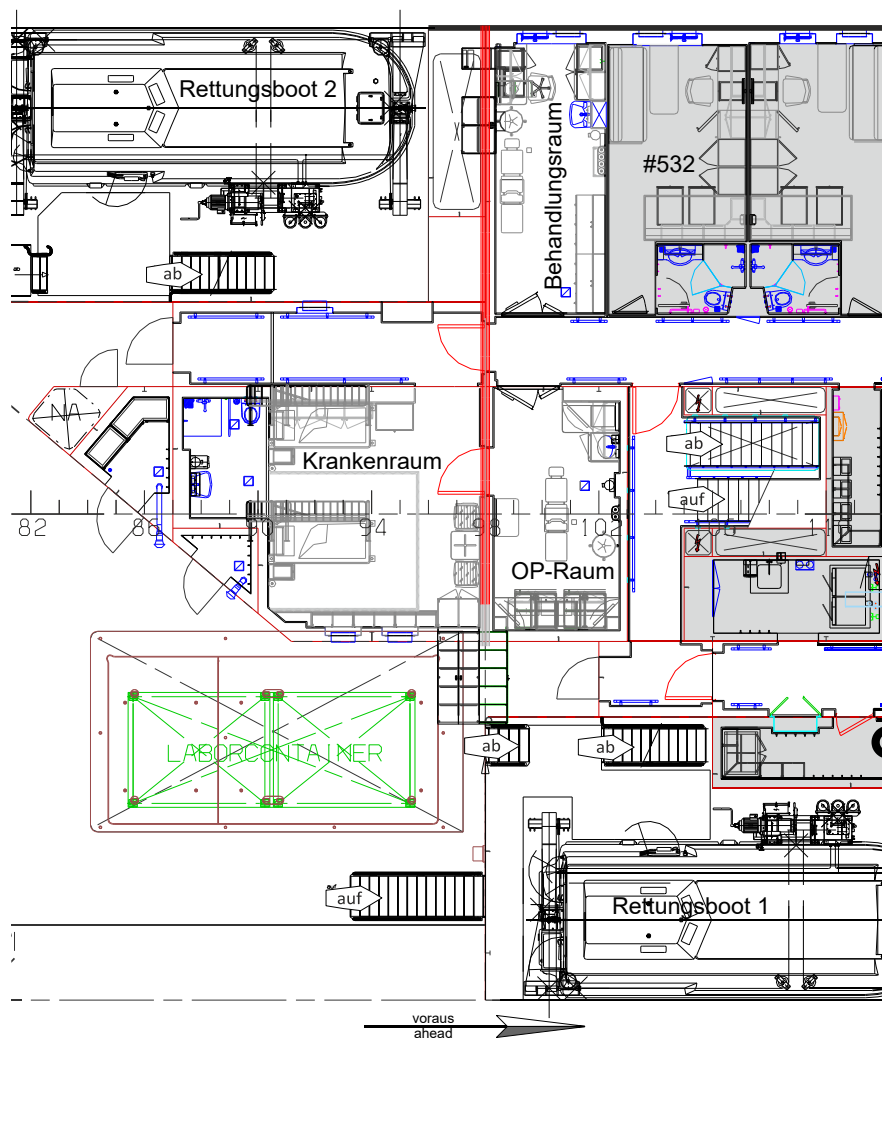
257

16.2. Hospital und medizinische Einrichtung

Location

1. Structure deck BB
Frame 90 – 103

	Room-No.	Phone
Ambulance	536	112
OP-room	534	114
Sick room	538	115



16. Life on board

16.3. Sale of goods on board

258

16.3. Sale of goods on board

On board, drinks (soft drinks, beer, wine and spirits), tobacco, sweets and toiletries can be purchased in limited quantities and selections.

Payment is either in cash or by debit and credit card in the currency EURO.



16. Life on board

16.4. Smoking on board

259

16.4. Smoking on board

Smoking is allowed inside the ship only in the "smoking room"; on deck only in front of the hangar (in bad weather exceptionally also in the hangar near the door), provided that scientific measurements are not affected.

The illegal smoking within the ship leads to the triggering of a fire alarm, as all chambers and public areas are protected by ceiling smoke detectors.