

# MARIA S. MERIAN



## Manual

Status January 2021



### Changes to manual

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## **Foreword to the users of the ice bar research ship MARIA S. MERIAN**

### **Information**

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<http://www.io-warnemuende.de/miscell/merian/>  
<http://www.briese.de> (under Research Shipping/Maria S. Merian)

**Title picture** © Klaus von Bröckel

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### 3 Ship's Data

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#### 3 Ship's data

Ship-building yard:	Kröger Shipyard, Schacht-Audorf
Year of manufacture:	2003 / 2005
Build number:	1566
Class:	GL + 100 A5 E3* with freeboard 3.013 m Nav-OC DP1 special ship, equipped for transporting containers, + MC E3 AutRP 50 % "Blauer Engel" (Blue Angel) * Hull E4 / Polar Code PC 6
Certified in accordance with:	ISO 9001:2000, ISO 14001 (environment) and ISM
Total length:	94.76 m
Length between perpendiculars:	86.51 m
Overall width:	19.20 m
Draught:	6.5 m (max. 7.0 m)
Height of main deck:	2.5 m
Total height:	38 m
Measurement according to London agreement:	5,573 BRZ
Unladen weight of ship:	4,493 t
Scientific payload:	150 t
Speed:	15 kn maximum; normal 12.5 kn
Sphere of action (at 12 kn):	7,500 NM
Service life on sea:	35 days
Crew:	23
Scientists / technicians:	23
Temperature range – air:	-30° - +45 °C
Temperature range – water:	-2° - +35 °C
'clean ship':	48 hours

## **4 Machinery**

**4-1**

### **4 Machinery**

The entire machinery (main diesel with generators, pumps and switch panel room) is redundantly arranged in two machine rooms and also redundantly as far as the funnel. In the event of a fault in one of the machine rooms with half of the systems, the second half is always still fully functional.

Drive systems (diesel-electric):

2 SCHOTTEL POD drives type SEP-2 (can be rotated by 360°) each with 2050 kW/  
2780 A with 242 rpm

1 SCHOTTEL bow jet pump-jet type SPJ-320 RD (can be rotated by 360°) with  
1900 kW (bollard pull 125 kN) with 320 rpm

Power generation:

2 MAN B&W diesel generators type 8L21/31 each with 1600 kW, restricted to 1500 kW  
(with 1000 rpm) and 1875 kVA (690 V)

2 MAN B&W diesel generators type 6L21/31 each with 1200 kW, restricted to 1100 kW  
(with 1000 rpm) and 1375 kVA (690 V)

Emergency power unit:

1 MAN AVK diesel generator with 263 kW (with 1500 rpm) and 315 kVA (400 V)

Stabilising systems:

- |                            |   |
|----------------------------|---|
| - whilst underway (>4 kn): | Fin stabilisation system (Blohm & Voss) with active, retractable fins (6.8 m <sup>2</sup> )             |
| - on station:              | Tank stabilisation system (Rolls-Royce Interling Products) – optimum fill volume = 263 m <sup>3</sup> ) |

### 5.1 Ship's crew (maximum)

Function	Quantity
Captain	1
Leading officer	1
1st officer	1
2nd officer	1
Leading engineer	1
2nd engineer	1
3rd engineer	1
Electrician	1
Electronics engineer	1
System operator	1
Chef	1
Chef's mate	1
Steward(ess)	1
Boatswain	1
Deck fitter	1
Ship's mechanic (deck)	7
Ship's mechanic (machine)	1
(On-board doctor	1) (only on trips far from the coast without SAR cover)
<b>Total:</b>	<b>23 (24)</b>

Comment: The crew usually consists of 23 (24) persons. The entire deck crew (including the boatswain) consists of 8 persons. The working hours on board in accordance with STCW 95 / ILO 180 normally 10 hours per day, and must not exceed 72 hours per week. The day shift lasts from 6-18 hours and should be used for station work with work-intensive devices.

## **5.2 Scientific crew**

The scientific crew (user groups) have 14 cabins with a total of 23 (22)\* beds available to them. All cabins are equipped with a shower and a toilet:

9 twin cabins:

1st superstructure deck: cabin number: 6204, 6208, 6210  
Main deck: 4207, 4210, 4211, 4212, 4214, 4215

5 single cabins

1st superstructure deck: cabin number: 6215 (expedition leader)  
Main deck: 4201, 4202\*, 4205, 4206

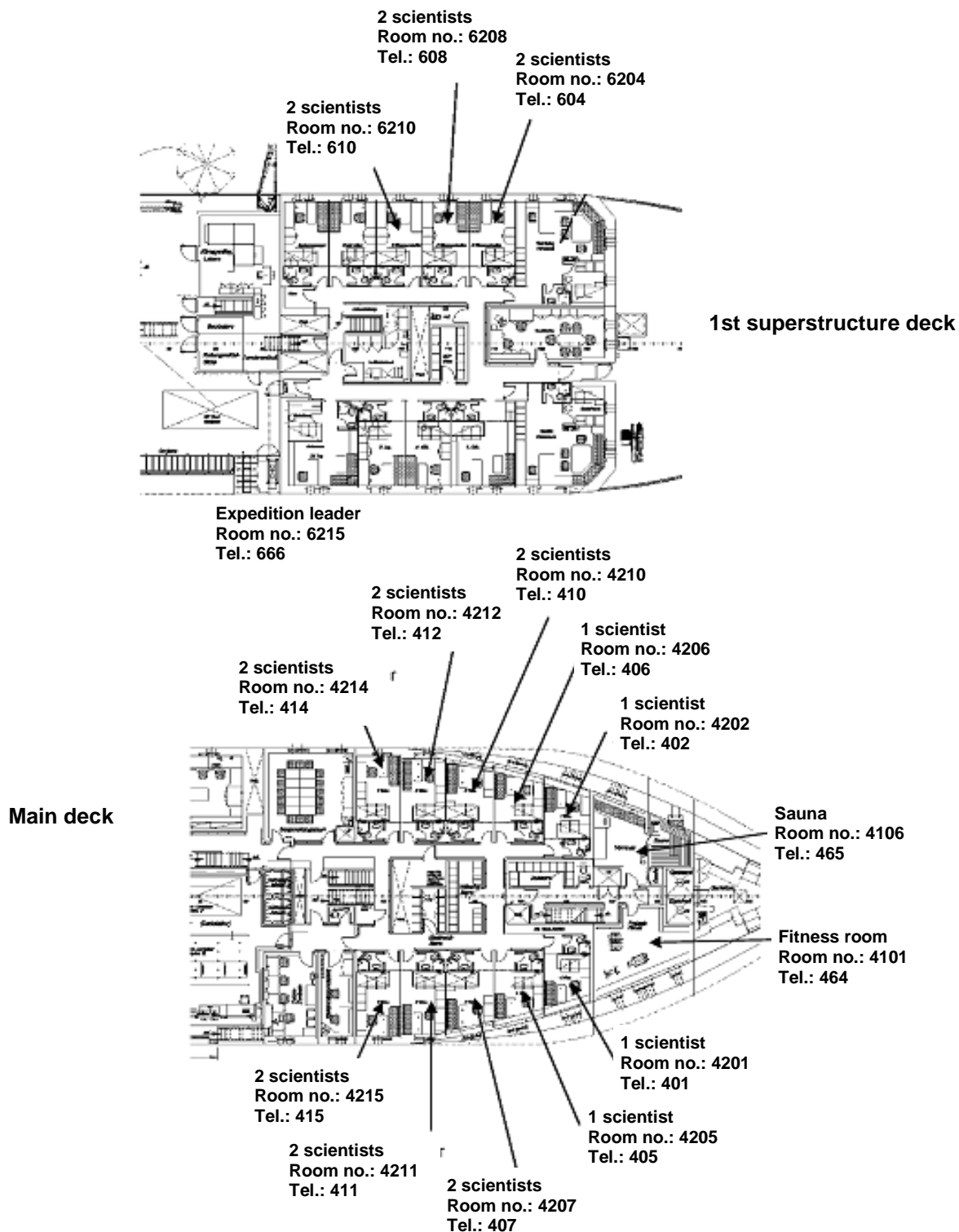
See cabin plan

\*) If a doctor is on board for trips far from the coast without SAR cover; defined for each research trip within the scope of the MSM coordination meetings.



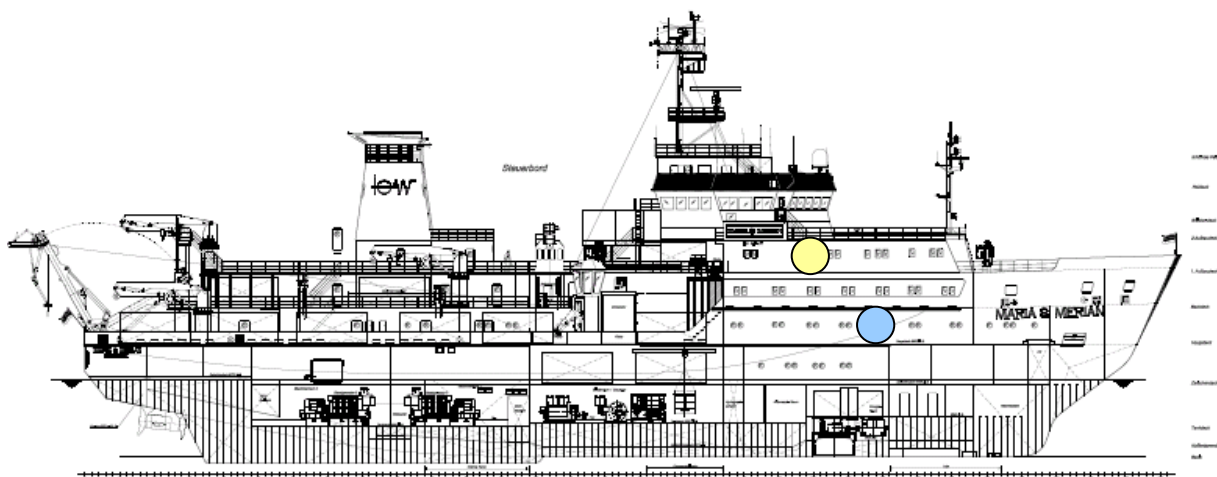
### 5.3 Science cabins

#### Science cabins



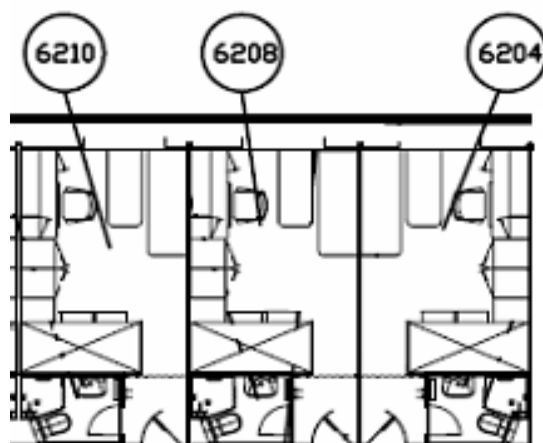
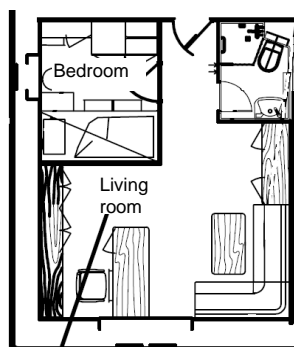
#### 5.4 Cabin occupancy plan

14 cabins (5 single cabins and 9 double cabins) with a total of 23 bunks are available on board the FS 'Maria S. Merian' for accommodating the scientists. The cabins are on the 1st superstructure deck ("yellow" zone) at the outer port side and on the main deck ("blue" zone) on both outer sides of the ship.



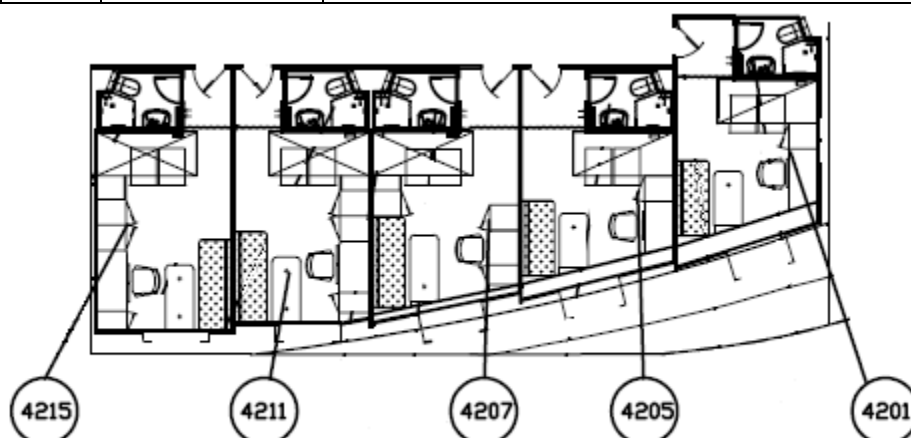
1st superstructure deck			
Cabin		Title / first name, surname	Telephone
6215	Expedition leader(s)		666
6204	Top bunk		604
	Bottom bunk		
6208	Top bunk		608
	Bottom bunk		
6210	Top bunk		610
	Bottom bunk		

1st superstructure deck  
("yellow" zone), rear  
starboard



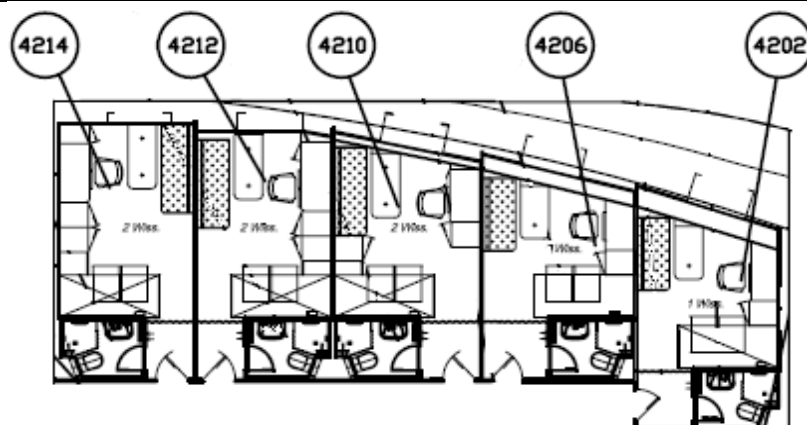
1st superstructure  
deck ("yellow" zone),  
front port

Main deck (starboard)			
Cabin		Title / first name, surname	Telephone
4201	Single bunk		401
4205	Single bunk		405
4207	Top bunk		407
	Bottom bunk		
4211	Top bunk		411
	Bottom bunk		
4215	Top bunk		415
	Bottom bunk		



Main deck ("blue zone"), starboard

Main deck (port)			
Cabin		Title / first name, surname	Telephone
4202	Single bunk	<b>!Reserved for on-board doctor, if present!</b>	402
4206	Single bunk		406
4210	Top bunk		410
	Bottom bunk		
4212	Top bunk		412
	Bottom bunk		
4214	Top bunk		414
	Bottom bunk		

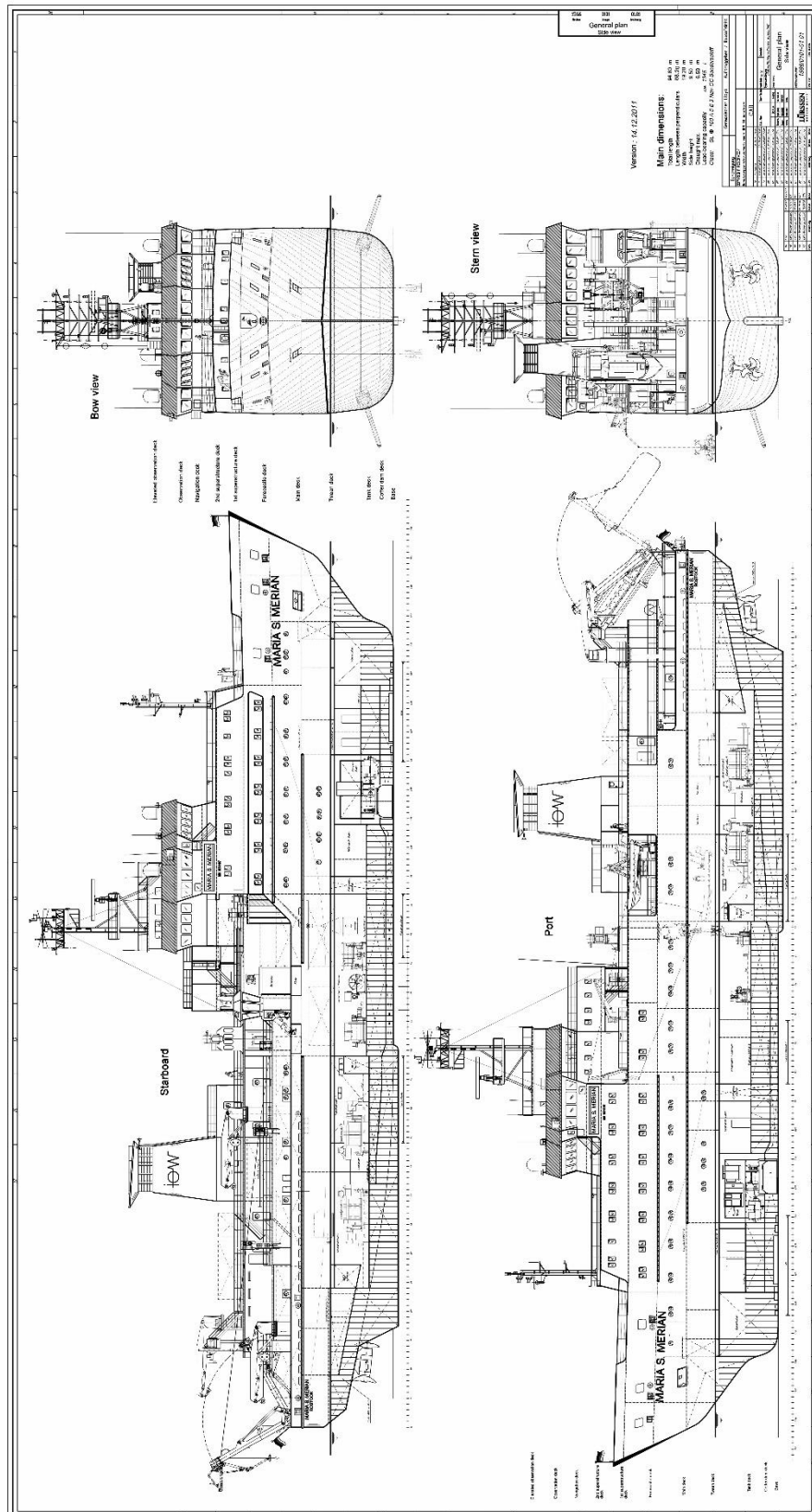


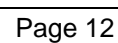
Main deck ("blue zone"), port

## 6 Ship's plans

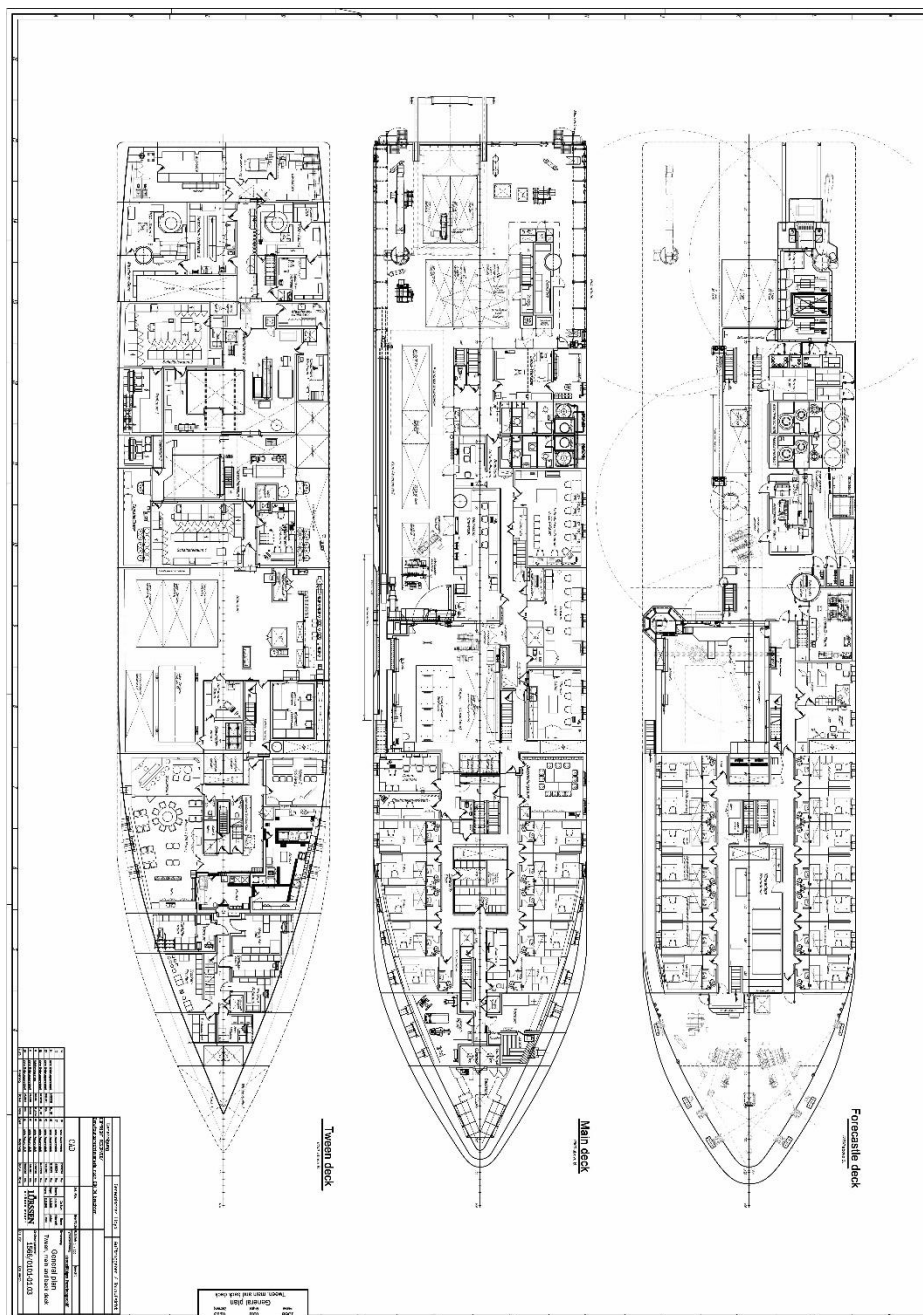
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### 6.1 General plan

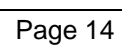








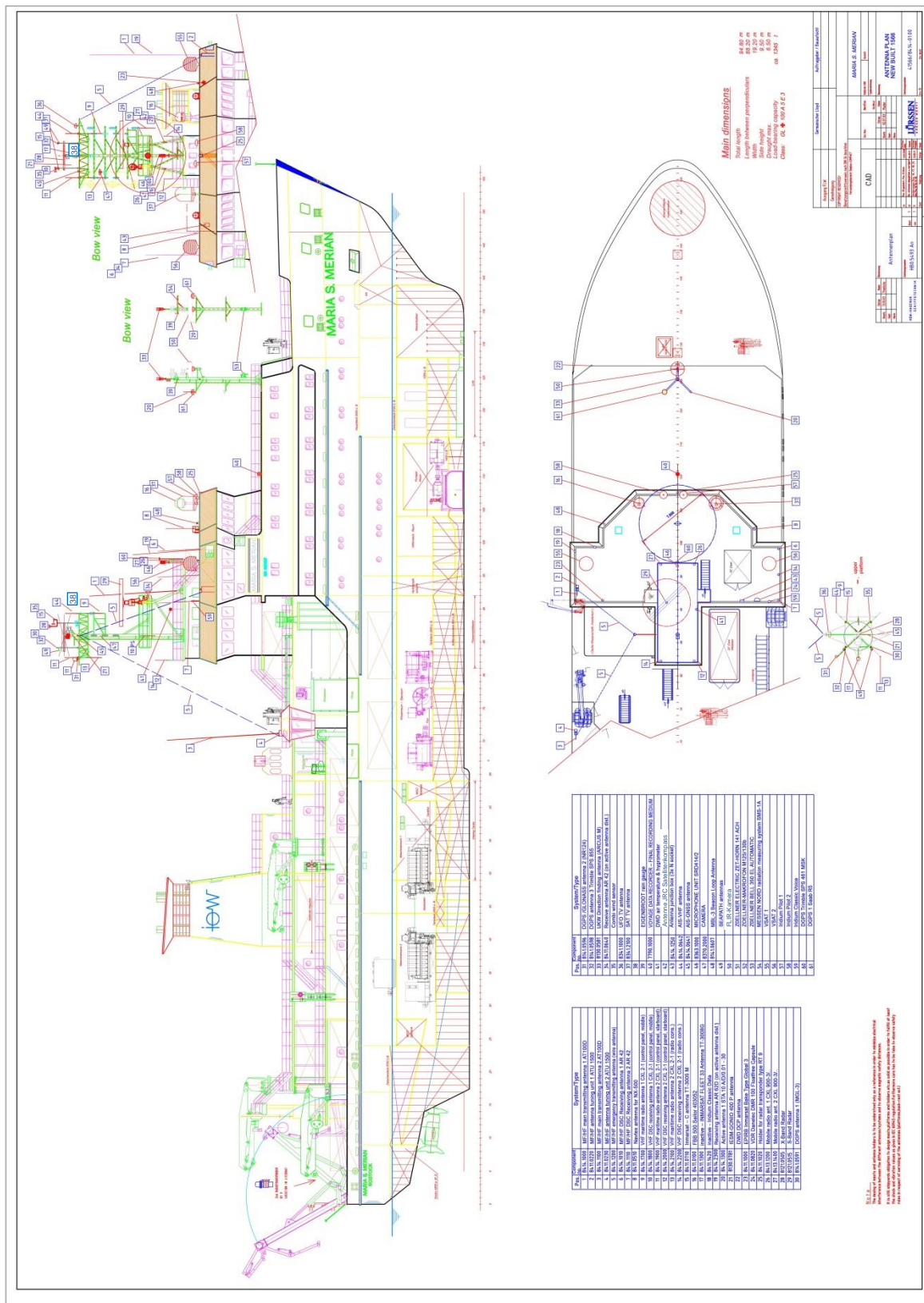




## 6 Ship's plans

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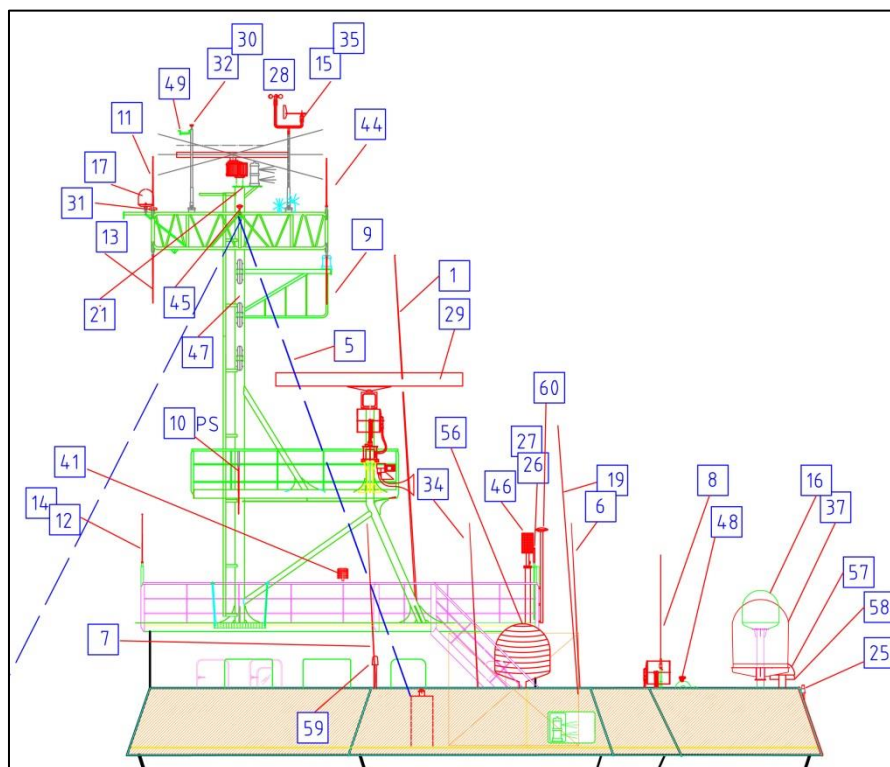
### 6.2 Antenna arrangement



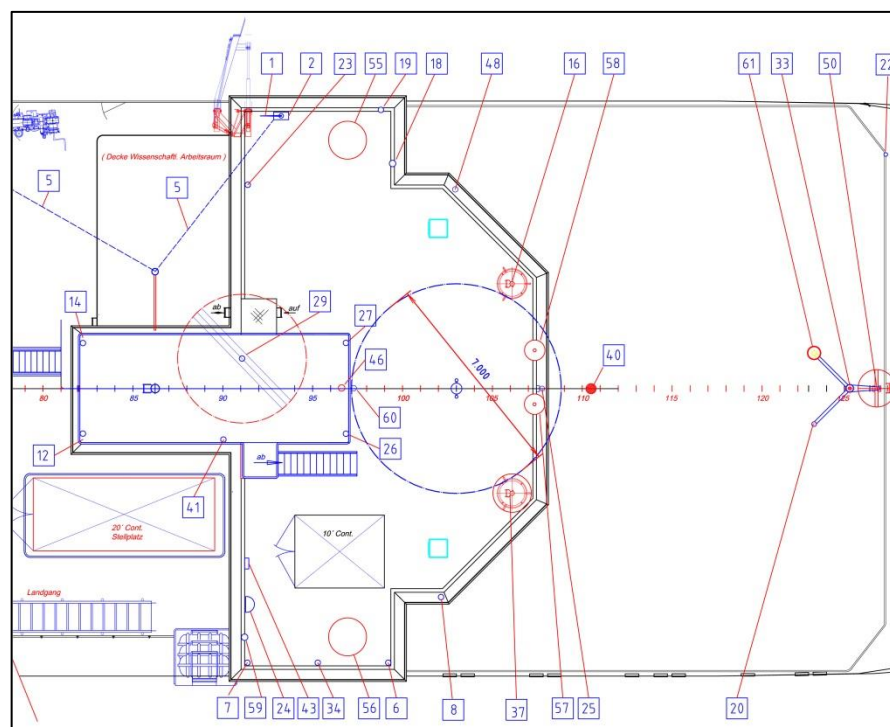
## 6 Ship's plans

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### Side view



### Top view

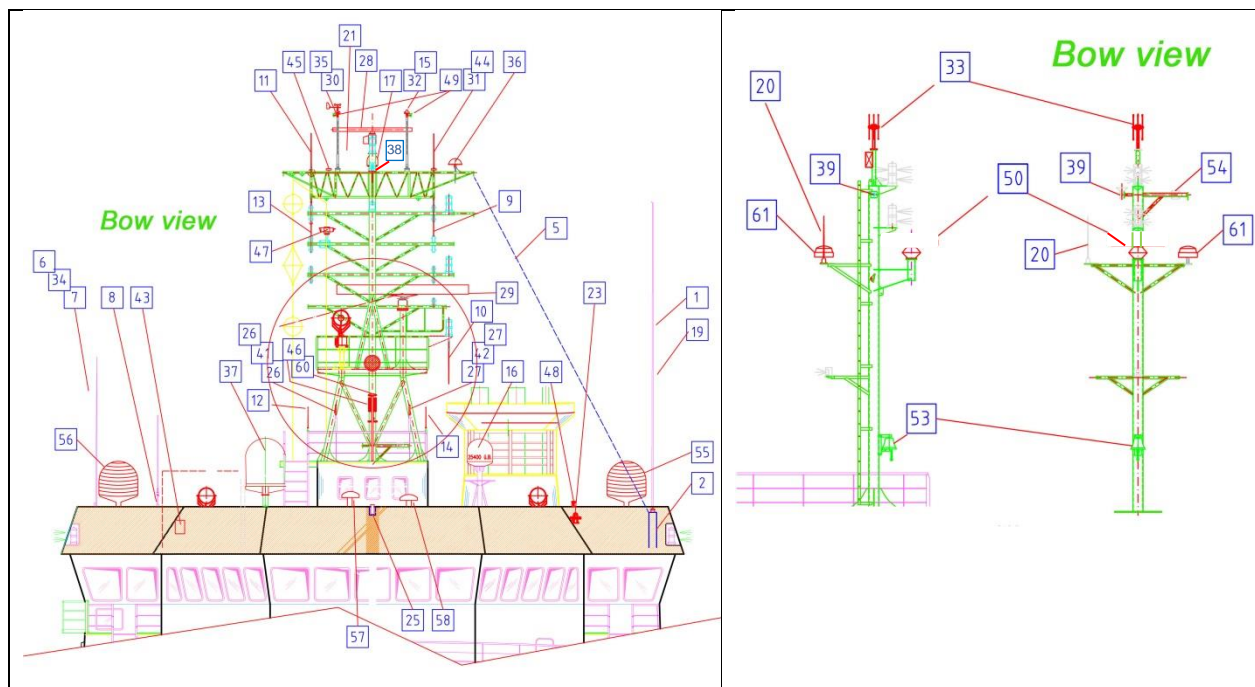




## 6 Ship's plans

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### View from bow



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3	84.14.1100	MF/HF main transmitting antenna 2 AT100D
4	84.11.0230	MF/HF antenna tuning unit 2 ATU 1500
5	84.14.1200	MF/HF emergency transmitting antenna (wire antenna)
6	84.14.1010	MF/HF DSC Receiving antenna 1 AR 42
7	84.14.1110	MF/HF DSC Receiving antenna 2 AR 42
8	84.11.0510	Navtex antenna for NX-500
9	84.14.1700	VHF maritime radio antenna 1 CXL 2-1 (control panel, middle)
10	84.14.1800	VHF DSC receiving antenna 1 CXL 2-1 (control panel, middle)
11	84.14.1900	VHF maritime radio antenna 2 CXL 2-1 (control panel, starboard)
12	84.14.2000	VHF DSC receiving antenna 2 CXL 2-1 (control panel, starboard)
13	84.14.2100	VHF maritime radio antenna 2 CXL 2-1 (radio cons.)
14	84.14.2200	VHF DSC receiving antenna 2 CXL 2-1 (radio cons.)
15	84.11.0710	Inmarsat – C antenna TT-3005 M
16	84.11.0100	FBB 500 Sailor 403052
17	84.11.1300	inactive – INMARSAT FLEET 33 Antenna TT-3008G
18	84.11.1420	inactive – Iridium Classic Data
19	84.14.2300	Receiving antenna AR 62D (on active antenna dist.)
20	84.14.1300	Active antenna 1 STA 10 A/D/0.01 - 30
21	8130.0781	IESM-GONIO 400 P antenna
22		DWD DCP antenna
23	84.11.1000	EPIRB Inmarsat Bake Type Global 3
24	84.11.0820	VDR Danelec DMR 100 Floatfree Capsule
25	84.11.1020	Holder for radar transponder type RT 9
26	84.13.1200	Mobile radio ant. 1 CXL 900-3/..
27	84.13.1400	Mobile radio ant. 2 CXL 900-3/..
28	8121.0505	X-Band Radar
29	8121.0515	S-Band Radar
30	814.1.0591	DGPS antenna 1 (MGL-3)

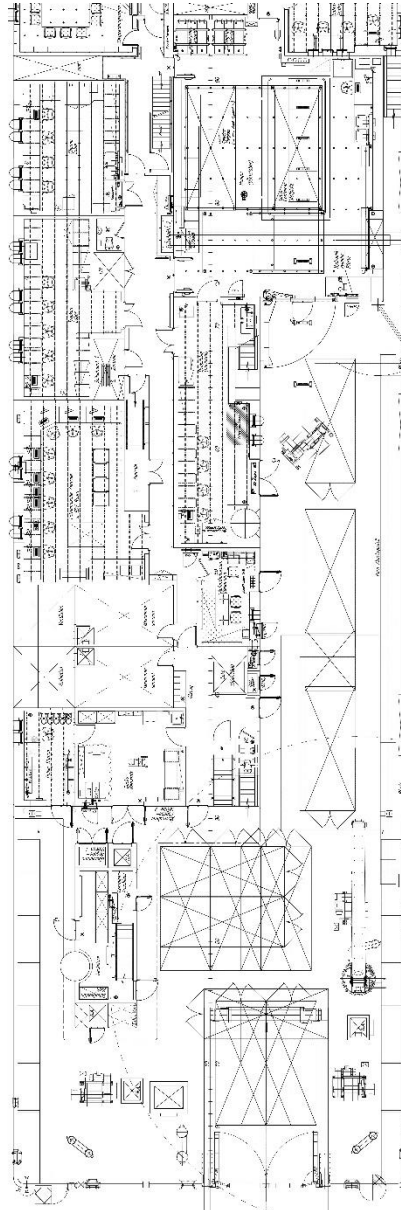
Pos.	Component no.	System/Type
31	814.1.0596	DGPS /GLONASS antenna 2 (NR124)
32	814.1.0598	DGPS antenna 3 Trimble SPS 855
33	8130.0581	VHF direction finding antenna (ARCUS M)
34	84.11.0640	Receive antenna AR 42 (on active antenna dist.)
35		Combi wind sensor
36	8341.1000	UFO TV antenna
37	8341.2100	SAT TV antenna
38		Antenne JRC Satellitenkompass
39		EIGENBRODT rain gauge
40	7790.1000	VOYAGE DATA RECORDER – FINAL RECORDING MEDIUM
41		DWD air temperature & hygrometer
42		
43	84.14.1250	Antenna junction box (3x N socket)
44	84.14.0642	AIS-VHF antenna
45	84.14.0641	AIS-GNSS antenna
46	8363.1000	MICROPHONE UNIT SRD414/2
47	8370.2000	CAMERA
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49		SEAPATH antennas
50		FLIR-Kamera
51		ZOELLNER ELECTRIC ZET-HORN 141 ACH
52		ZOELLNER-MAKROFON M125/130b
53		ZOELLNER BELL 350 EL AUTOMATIC
54		MESSER NORD radiation measuring system SMS-1A
55		VSAT 1
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57		Iridium Pilot 1
58		Iridium Pilot 2
59		Iridium Classic Voice
60		DGPS Trimble SPS 461 MSK
61		DGPS 1 Saab R5

## 6 Ship's plans

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### 6.3 Working deck (arrangement)

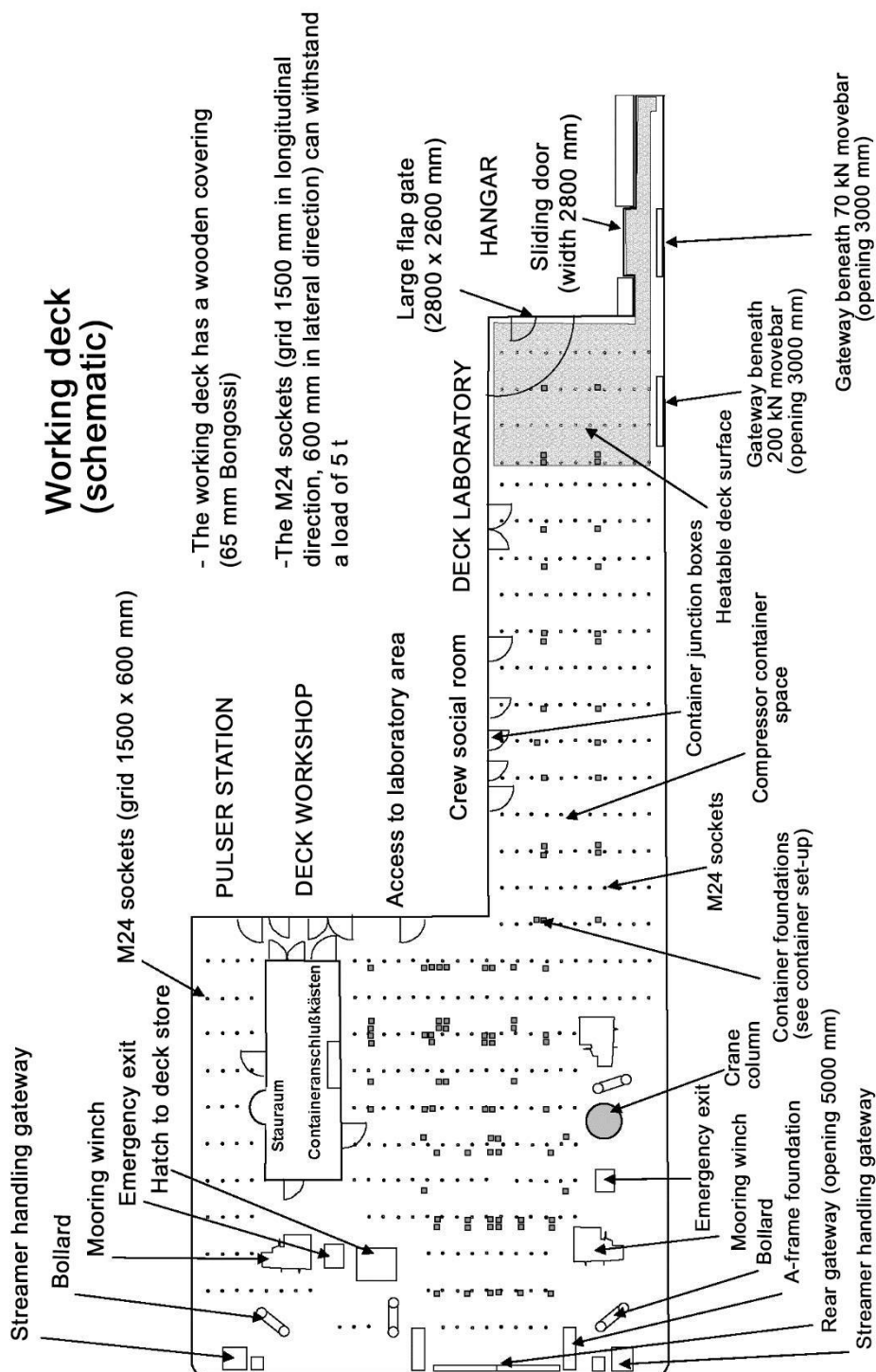
Working deck (arrangement)



## 6 Ship's plans

6-9

### 6.4 Working deck (schematic)





## 7 Container

7-1

### 7.1 Container spaces

The containers can only be stowed away using the on-board lifting gear in some cases.

The three deck cranes can each only lift 5 t. They can lift 10 t if used together, but can then no longer cover the entire deck. The observation deck must be loaded using external equipment.

The 200 kN movebar can transport containers weighing up to 12.5 t into the cargo hatch (1st superstructure deck) and therefore into the hangar and the scientific storage space (tween deck).

Note concerning deployment of cooling containers: Temperatures of up to 45 °C can occur in the scientific storage space for long periods. Cooling containers must therefore be equipped with coolant 134 A or the older coolant R12. Coolants such as R22, R 404 A and R 407 C are not in a position to transfer the required cooling power at high outside temperatures. Coolant R11 is no longer approved and may not be brought on board.

The information shown below relates to 10' containers. Accessibility must be taken into consideration when storing 10' containers. Access is not always possible. 20' containers are always accessible.

#### Observation deck:

Number of 10' spaces: 1  
Weight load: 20 t

#### 1st superstructure deck:

Number of 10' spaces: 6 (or 3\*20') – of which 2 on the cargo hatch  
Weight load: 10 t per 10' space

#### Forecastle deck:

Number of 10' spaces: 2 (or 1\*20')  
Weight load: 10 t per 10' space

#### Main deck:

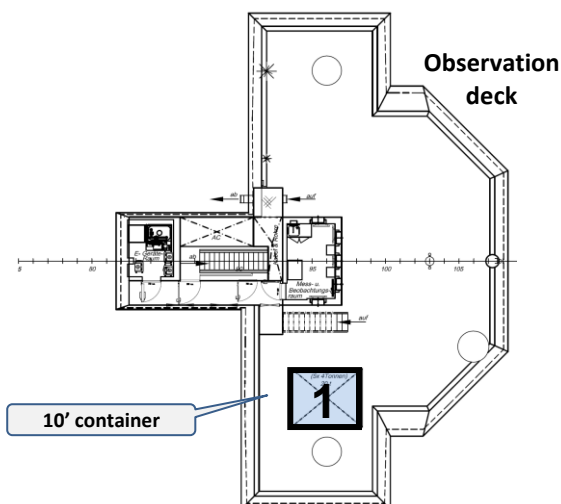
Number of 10' spaces: max. 25, of which 13 in second layer at the rear and 4 in the hangar, quite variable on the whole, midships or abeam of ship depending on the storage location (see figure showing container storage locations),  
Number of 'oversize': 1 place for compressor containers (then fewer 10' containers)  
Weight load: 15 t per 10' space, 30 t for LMF compressor containers  
Two 20' containers (or two 10' containers) can be stored in the 2nd layer and are accessible from the aft deck.

#### Tween deck (scientific storage space):

Number of 10' spaces: 10 locations (or 5 x 20') – when storing 10 10' containers, not all are accessible  
Weight load: 10 t per 10' space

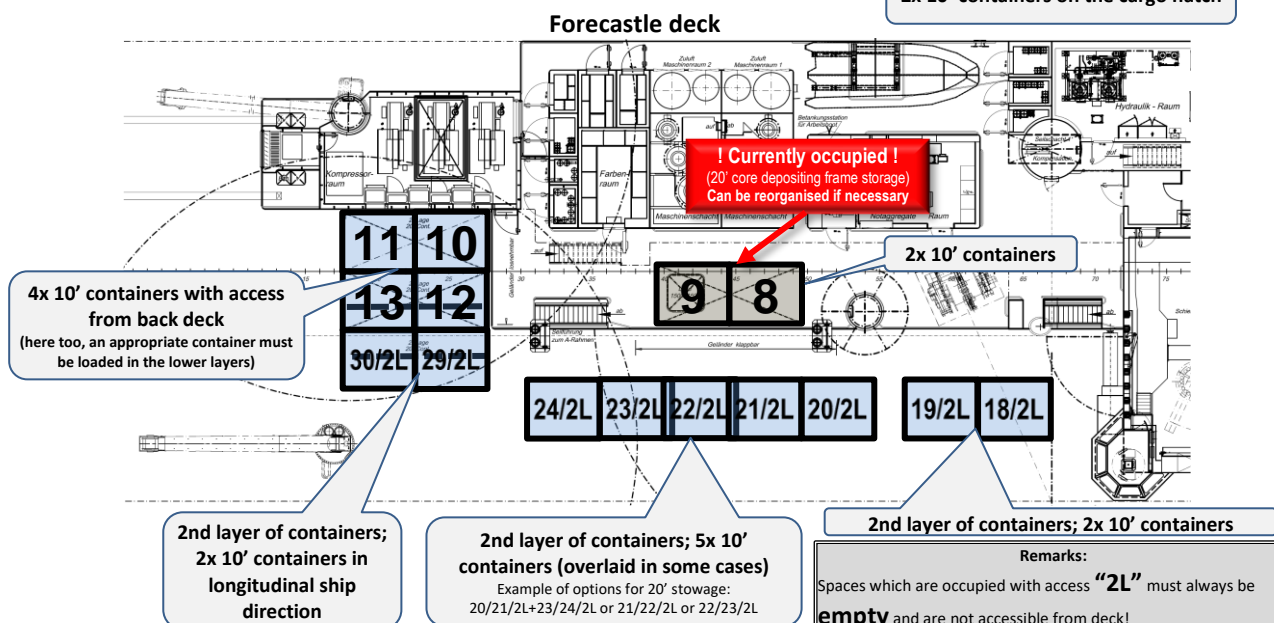
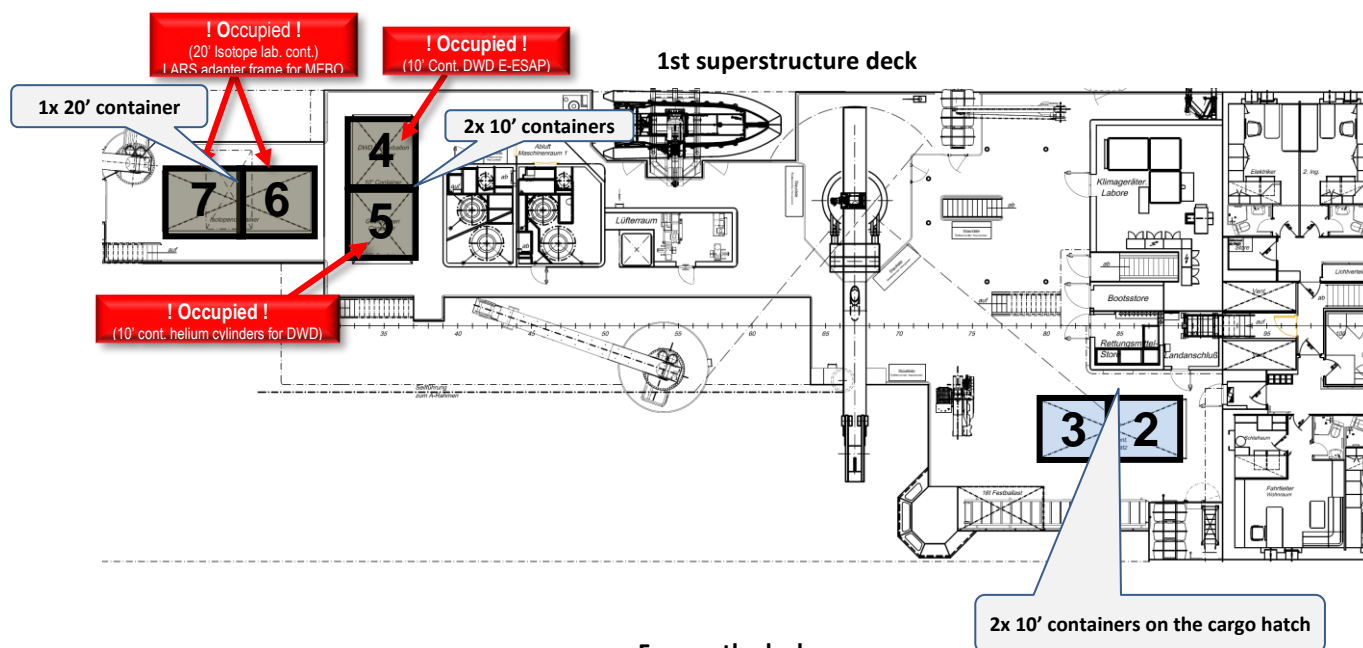
## 7 Container

7-2

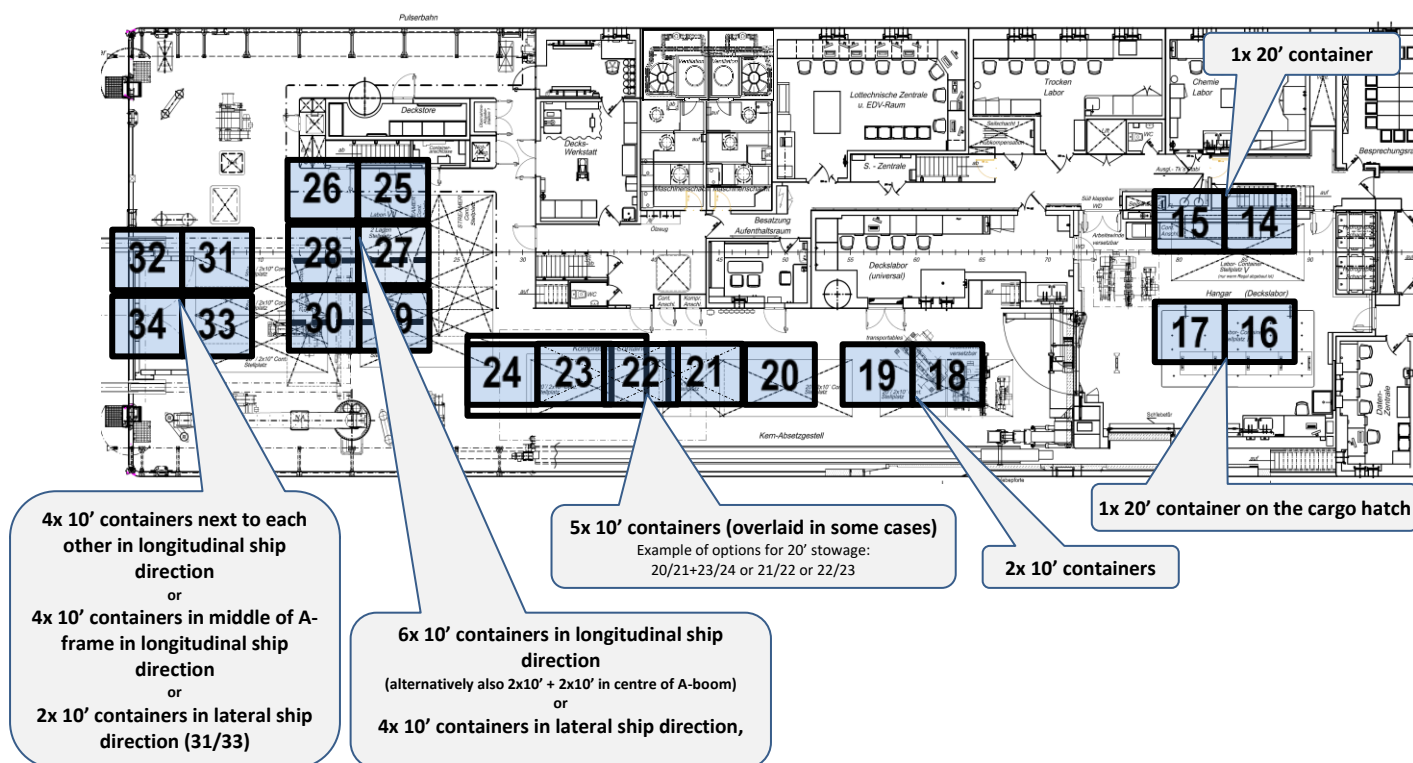


### Remarks:

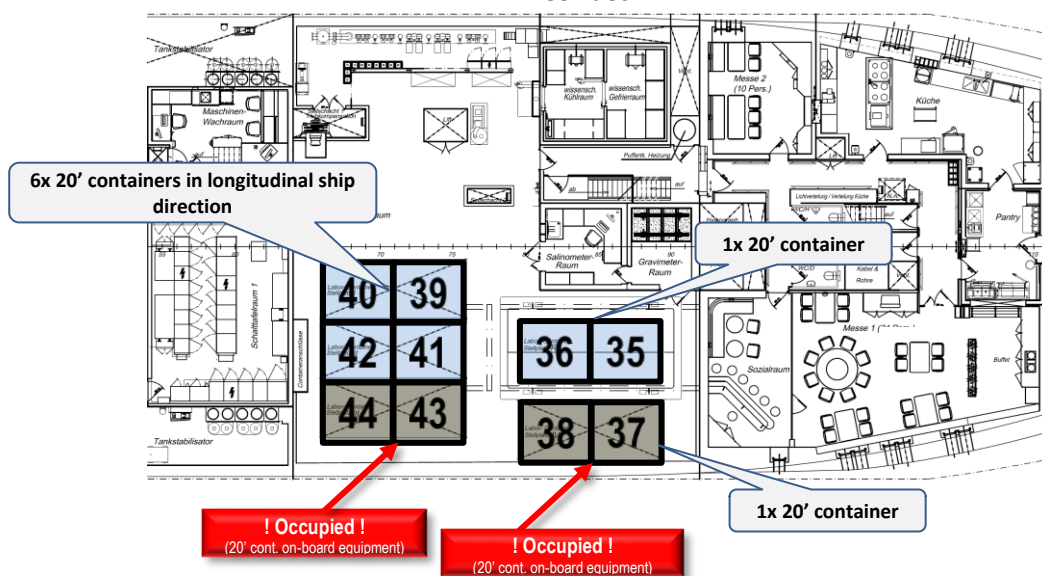
- for 2x 10' containers, 1x 20' container can be stored. The deck load on the main deck is therefore: **15 t per 10' grid** (i.e. **30 t for a 20' container**). On all other decks: **10 t per 10' grid** (i.e. **20 t per 20' container**).
- The junction box for laboratory containers is in the scientific storage space on the main deck (central and aft), on the back deck (central) and on the observation deck
- Not all junction boxes are equipped with all connections (see figure "Container junction boxes")



Main deck



Tween deck



## 7 Container

7-4

### 7.2 Container junction boxes

#### Observation deck – niche Sp1

Electrical:	
230 V 50 Hz on-board power supply (white)	2
230 V 50 Hz laboratory power supply (red)	2
400 V 50 Hz three-phase current (CEE) 32 A	1
400 V 50 Hz three-phase current (CEE) 16 A	1

Water and air supply and disposal:	
Service fresh water	1
Service sea water	1
Compressed air 0-10 bar	2

Communication:	
Socket to data distribution system from measuring and observation room	2

#### 1st superstructure deck – niche S1A4

Electrical:	
230 V 50 Hz on-board power supply (white)	2
230 V 50 Hz laboratory power supply (red)	2
400 V 50 Hz three-phase current (CEE) 32 A	1

Water and air supply and disposal:	
Fresh water cold/hot (drinking water)	1
Service fresh water	1

#### 1st superstructure deck - Dockside connection room

Electrical:	
400 V 50 Hz three-phase current 400 A; open copper rails with drill holes for cable shoes	1

#### Back deck – niche SB6

Electrical:	
230 V 50 Hz on-board power supply (white)	2
230 V 50 Hz laboratory power supply (red)	2
400 V 50 Hz three-phase current (CEE) 32 A	1

Water and air supply and disposal:	
Fresh water cold/hot (drinking water)	1
Service fresh water	1
Service sea water	1
Compressed air 0-10 bar	2

## 7 Container

7-5

### Main deck – Hangar

(Connections can be found in the container junction box and in the vicinity of the laboratory area (front starboard))

#### Electrical:

230 V 50 Hz on-board power supply (white)	2
230 V 50 Hz laboratory power supply (red)	2
400 V 50 Hz three-phase current (CEE) 16 A	1
400 V 50 Hz three-phase current (CEE) 32 A	2

#### Water and air supply and disposal:

Fresh water cold/hot (drinking water)	1
Service fresh water	1
Service sea water	1
Pure sea water (rotary pump)	1
Pure sea water (membrane pump)	1
Compressed air 0-10 bar	2

#### Communication:

Data distribution system socket	4
Antenna socket (radio / TV / video)	1
CCTV video socket	2
BNC socket, clock pulse generator	1
Connection for all discharger winches	1
Mobile fire alarm	2
Laboratory container monitoring	1
(Connection to machine room monitoring)	

### Main deck midships container junction box

#### Electrical:

230 V 50 Hz on-board power supply (white)	6
230 V 50 Hz laboratory power supply (red)	6
400 V 50 Hz three-phase current (CEE) 16 A	2
400 V 50 Hz three-phase current (CEE) 32 A	2
400 V 50 Hz three-phase current (CEE) 63 A	1
400 V 50 Hz three-phase current (CEE) 125 A	1

#### Communication:

Data distribution system socket	2
Science intercom	1
CCTV video socket	2
Connection for all discharger winches	1
Telephone	1

## 7 Container

7-6

### Main deck midships compressor junction box

Water and air supply and disposal:	
Fresh water cold/hot (drinking water)	1
Compressed air 250 bar	1
Compressed air 15 bar	1
Fuel flow and return	1+1
Cooling sea water flow and return	1+1
Condensation drain	1
Over-production line (compressed air) towards the outside	1

### Main deck – aft

Electrical:	
230 V 50 Hz on-board power supply (white)	6
230 V 50 Hz laboratory power supply (red)	6
400 V 50 Hz three-phase current (CEE) 16 A	2 (2 occupied by DWD container and isotope container)
400 V 50 Hz three-phase current (CEE) 32 A	4 (of which 2 occupied by DWD container and isotope container)
400 V 50 Hz three-phase current (CEE) 63 A	2
400 V 50 Hz three-phase current (CEE) 125 A	1
400 V 50 Hz Three-phase current (CEE) 200 A	1
Earthing bolt to ship's ground M10	1
Circuit breaker 400 A for ROV connection; open copper rail 12 mm drill hole for cable shoes	1
Water and air supply and disposal:	
Laboratory waste water	1
Waste water	1
Compressed air 0-10 bar	1
Communication:	
Data distribution system socket	4
Science intercom	2
CCTV video socket	2
Connection for all discharger winches	1
Telephone	2
Mobile fire alarm	3
Laboratory container monitoring (connection to machine monitoring system)	2



## 7 Container

7-7

### Tween deck – scientific storage space

#### Electrical:

230 V 50 Hz on-board power supply (white)	8
230 V 50 Hz laboratory power supply (red)	8
400 V 50 Hz three-phase current (CEE) 16 A	1
400 V 50 Hz three-phase current (CEE) 32 A	5

(Power supply also for mobile working winch (main deck space below 200 kN movebar and in hangar) and for mobile horizontal capstan (main deck space below 200 kN movebar))

#### Water and air supply and disposal:

Fresh water cold/hot (drinking water)	4
Service sea water	5
Pure sea water (rotary pump)	4
Pure sea water (membrane pump)	4
Compressed air 0-10 bar	5

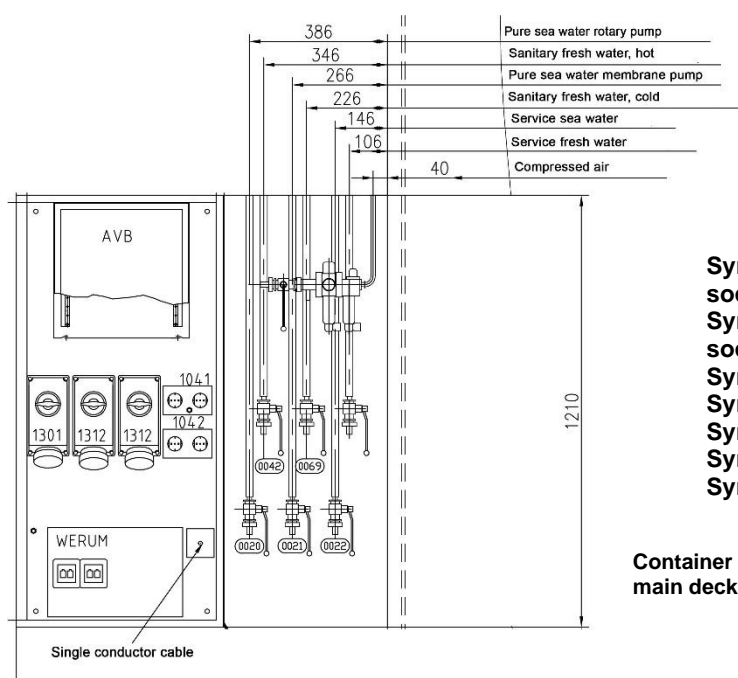
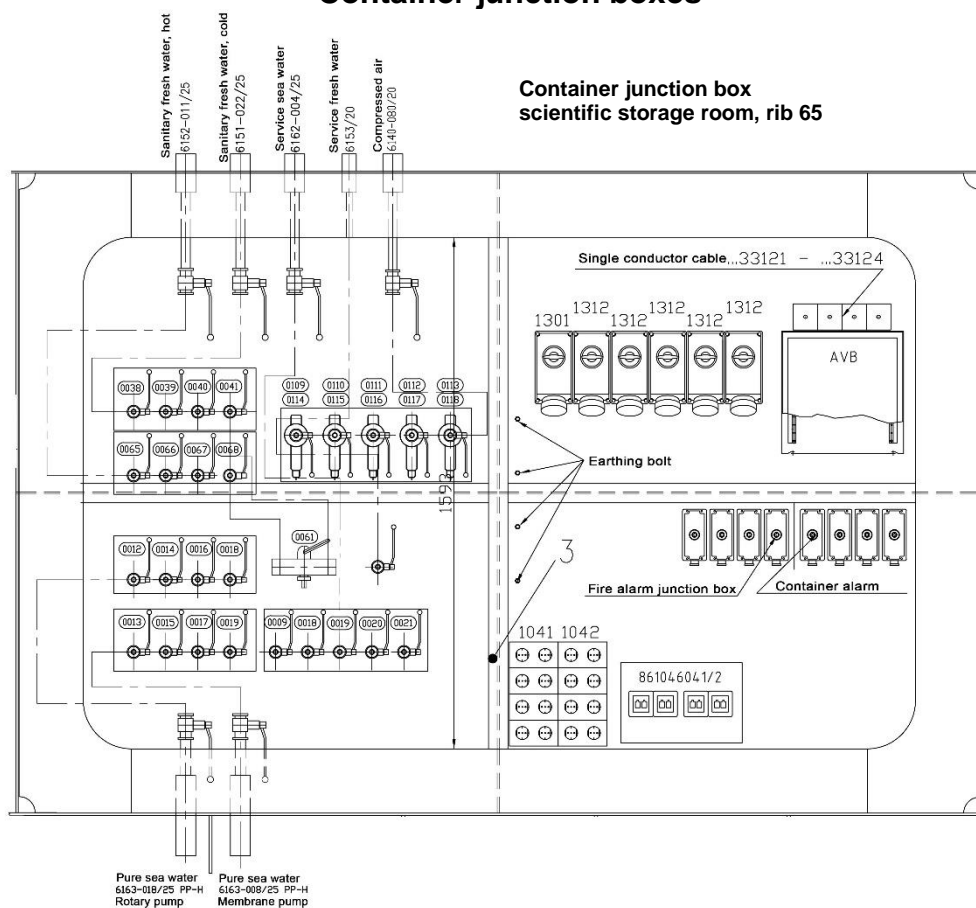
#### Communication:

Data distribution system socket	6
Science intercom	2
CCTV video socket	3
Connection for all discharger winches	1
Telephone	2
Fire alarm	4
Container monitoring	4

#### Electrical CEE socket connection types:

up to and including 63 A:	3L+N+PE, 5-pin, 6 o'clock
over 63 A (125 A, 200 A):	3L+PE, 4-pin, 6 o'clock

## Container junction boxes



### Key

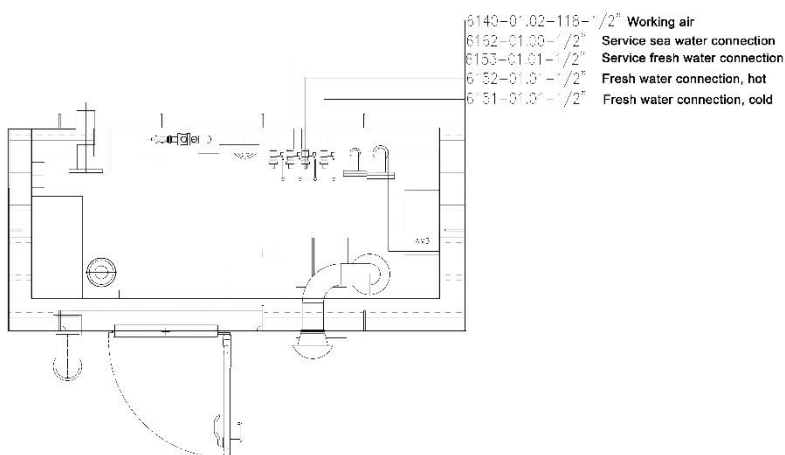
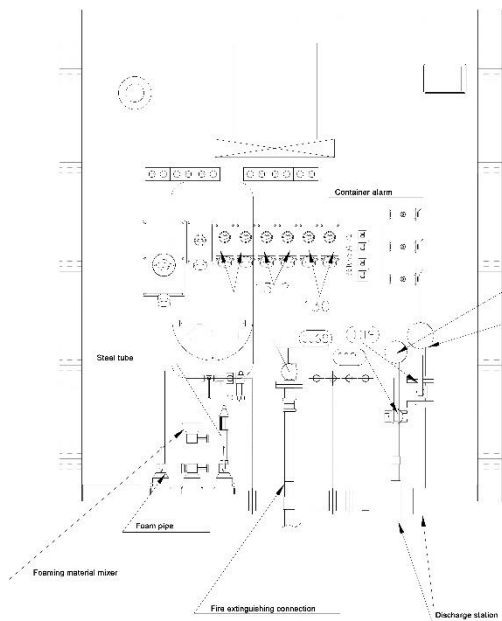
- Symbol 1043 = On-board power supply sockets 250 V / 16 A
- Symbol 1044 = Special power supply sockets 250 V / 16 A
- Symbol 1301 = Socket 400 V / 16 A
- Symbol 1312 = Socket 400 V / 32 A
- Symbol 1313 = Socket 400 V / 63 A
- Symbol 1324 = Socket 400 V / 125 A
- Symbol 1325 = Socket 400 V / 200 A

**Container junction box  
main deck, rib 79-80**

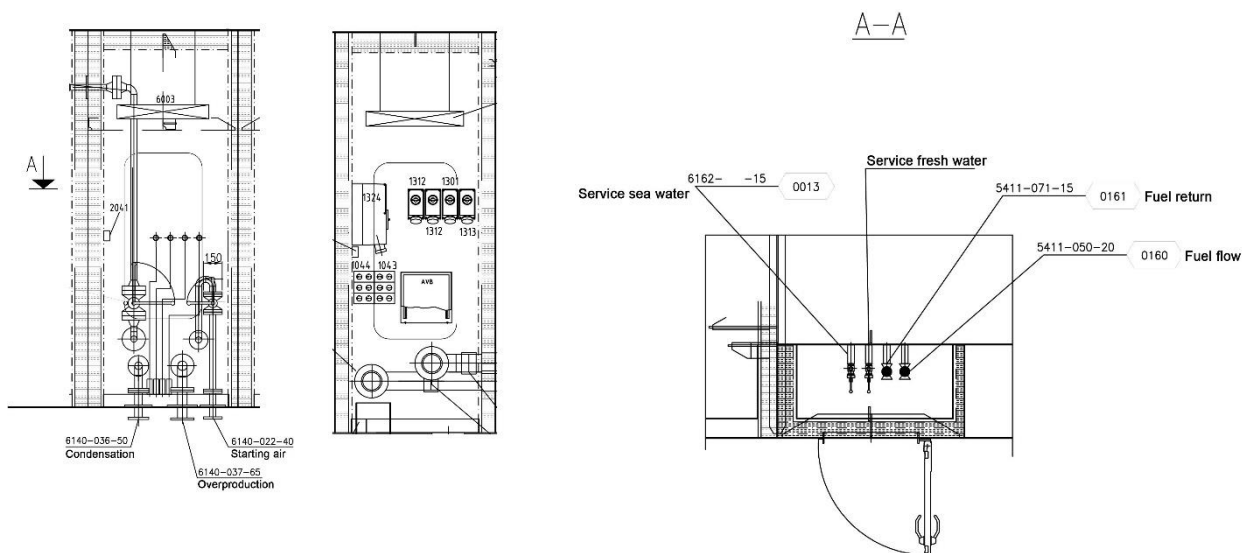
**7 Container**

**7-9**

**Container junction box  
main deck, rib 22-26**



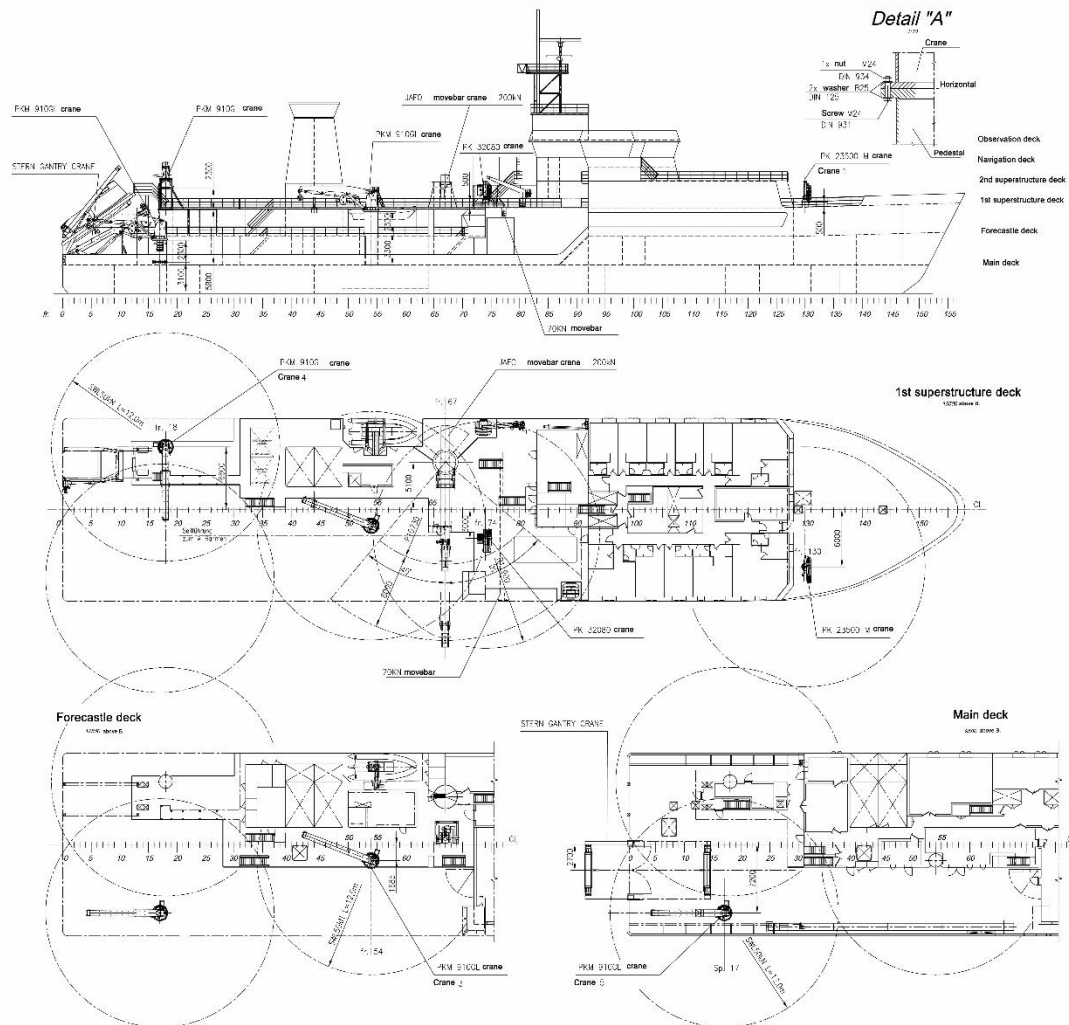
**Container junction box  
main deck, rib 40-44  
for compressor container**



## 8 Lifting gear

8-1

### 8.1 Arrangement and working range of lifting gear



**8-2**

Side view

8000 NORMAL INBOARD OPERATIONAL/STOWED POSITION

3900

4500

8100

5415

220

750

FOR 'A' FRAME & BASE ASSEMBLY SEE DRG. No. 2664-00

INBOARD

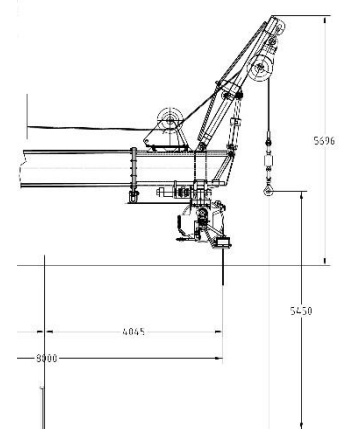
OUTBOARD

Technical drawing of a building section, showing a cross-section of a structure. The drawing includes structural details, dimensions, and labels such as "1070 SW" and "1070 SE". The drawing is oriented vertically, with the top of the structure at the top of the page. The drawing shows a central core and two side wings. The central core is a vertical column, and the side wings are horizontal structures extending from the core. The drawing includes structural details such as beams, columns, and walls. Dimensions are indicated by lines and numbers. Labels "1070 SW" and "1070 SE" are placed near the top of the structure. The drawing is a technical drawing, likely a cross-section, showing the internal structure of a building.



## 200kN movebar

As crane	
Slewing range:	50° front to 40° stern
Load-bearing capacity:	125 kN (SWL)
Max. headroom:	approx. 15 m
Remark:	Container transport in hatch possible
Operation:	Winch console, vendor's tray type (radio controlled)



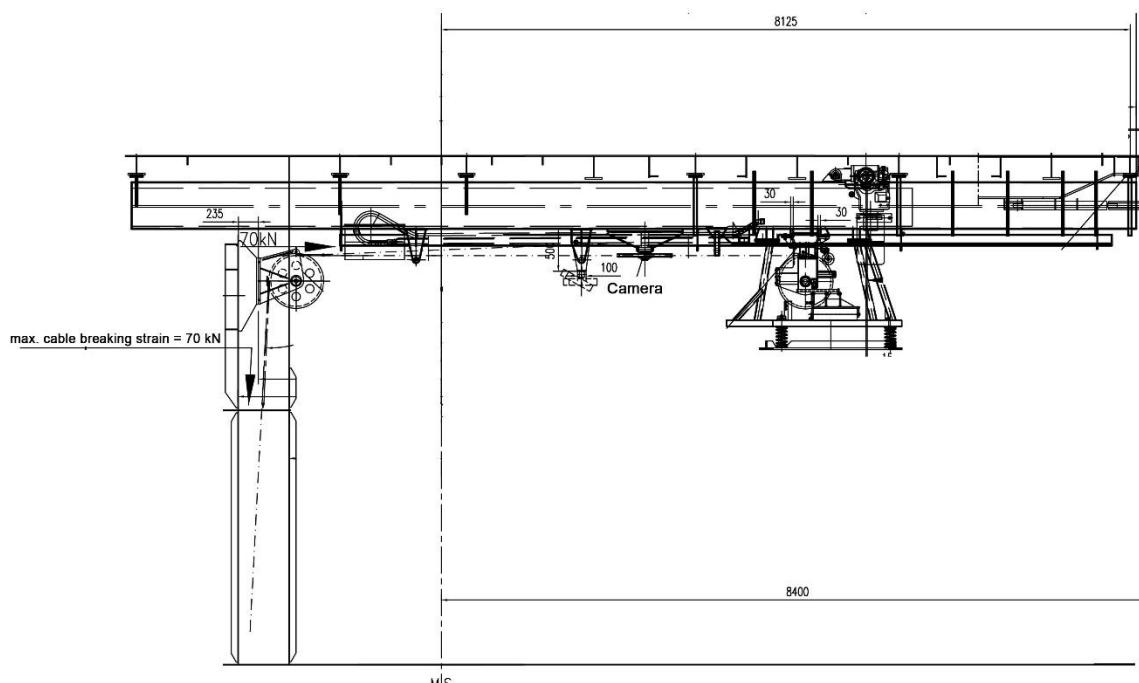
## 8 Lifting gear

8-4

### 8.4 Small movebar (70 kN)

#### 70 kN movebar

#### View from stern



Location:	In hangar
Design:	Electrically extendible boom guided in rudder with automatic rope length compensation when extending and retracting
Working range:	4.0 m inboard to 4.0 m outboard
Load capacity:	70 kN
Clearance:	approx. 4.5 m
Other:	Guide roller with pressure roller with docking facility for multiple water samplers for transport without swinging
Comment:	The large sliding gate can be closed in the extended condition
Operation:	Winch console, vendor's tray type (radio controlled)

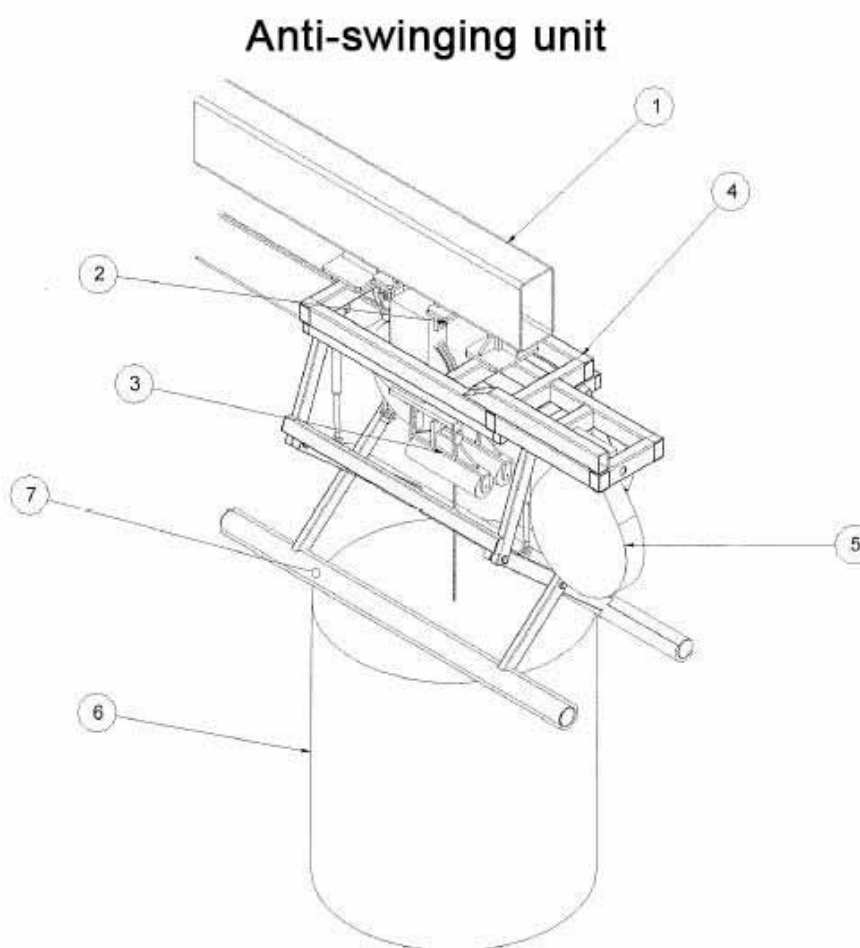
## 8 Lifting gear

8-5

### 8.4.1 Anti-swinging unit

The 70 kN movebar in the hangar is equipped with an anti-swinging unit made by Elbe Hydraulik GmbH in order to ensure that a multiple water sampler (e.g. the on-board CTD rosette) can be transported without swinging before and after use in water.

The scissor-like arrangement of the damping elements with the 2.6 m long bar forms a unit with the support frame for the 5 t head pulley sheave and can be extended 77 cm downwards in order to pick up the rosette and fix it for transportation. Four hydraulic cylinders dampen the swinging movement and the raising and lowering of the scissor arms. The distance between them changes at the upper edge of the rosette by approx 45 cm in each case (caution with protruding probes such as the PAR sensor!).



Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1		Crane girder profile
2	1		Roller suspension
3	2		Roller
4	1		Roller frame
5	1		Tilting roller
6	1		Water supply
7	1		Anti-swinging unit

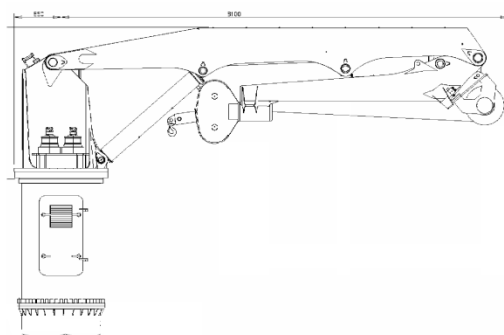
## 8 Lifting gear

8-6

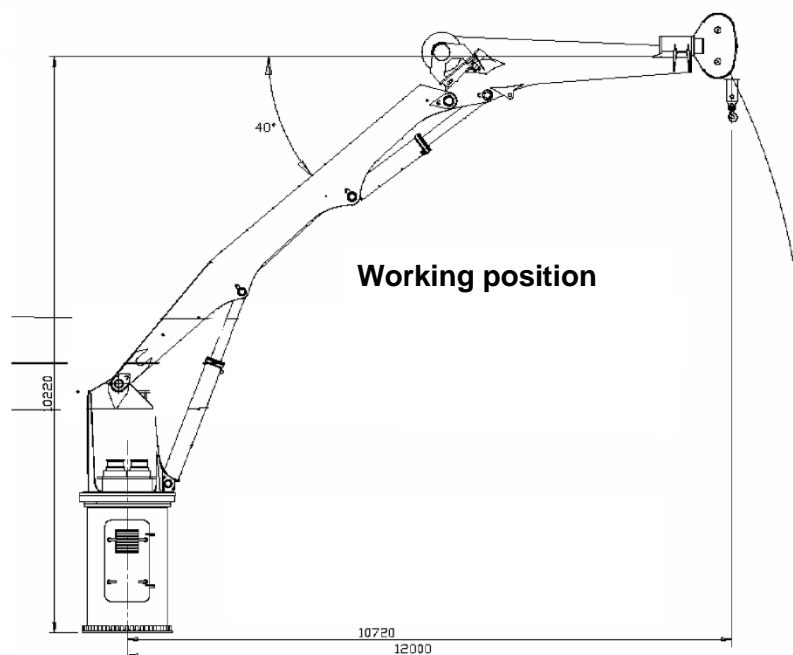
### 8.5 Working cranes (crane 3-5)

#### Working crane – 50 kN

General:	Three identical work cranes for "offshore" operation (up to 2 m (swh) wave height)
Location:	Back deck, midships (crane 3) 1st superstructure deck port aft (crane 4) Main deck starboard aft (crane 5)
Design:	Fully hydraulic articulated crane arm
Load-bearing capacity:	50 kN unclamped diagonal pull (45°) 40 kN
Working area:	12.0 m
Headroom:	Approx. 14 m
Remark:	All movements can be made simultaneously
Operation:	Vendor's tray type (radio controlled), crane control

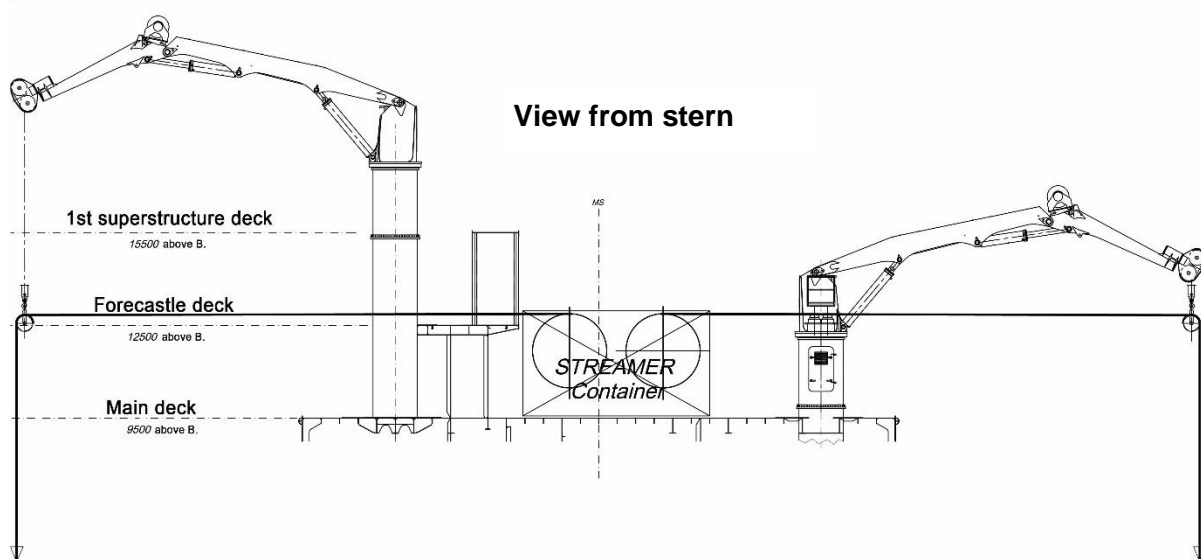
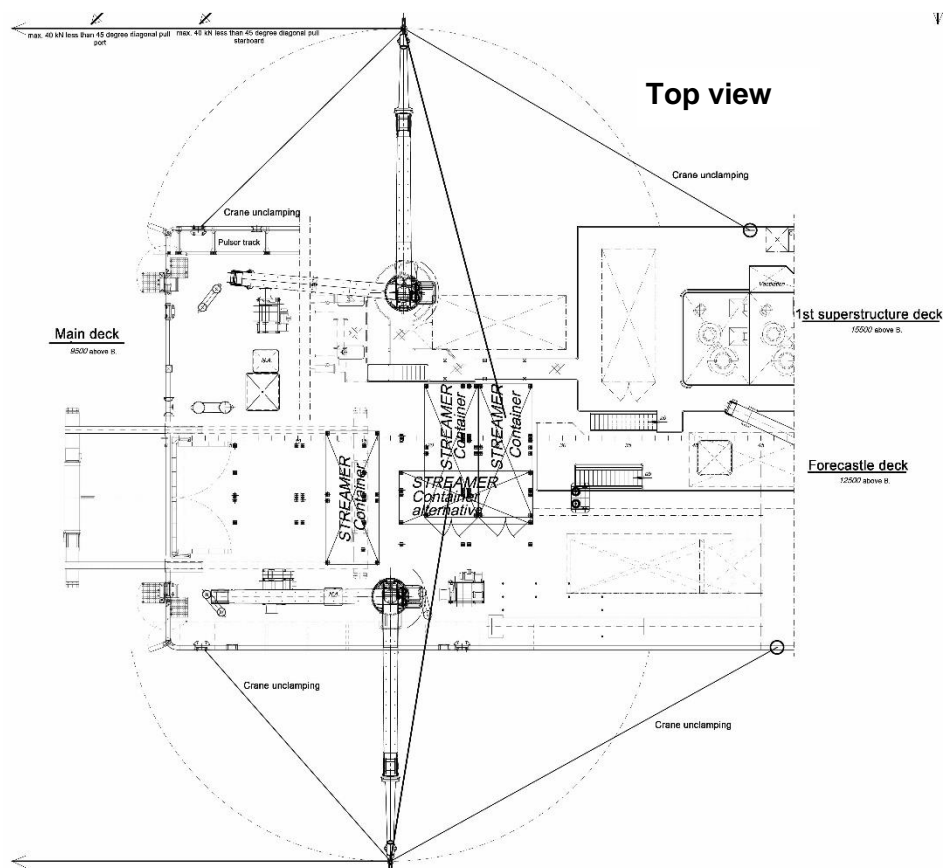


**Damming position**



**Working position**

### Crane 4 and 5 unclamped for streamer deployment



## 8 Lifting gear

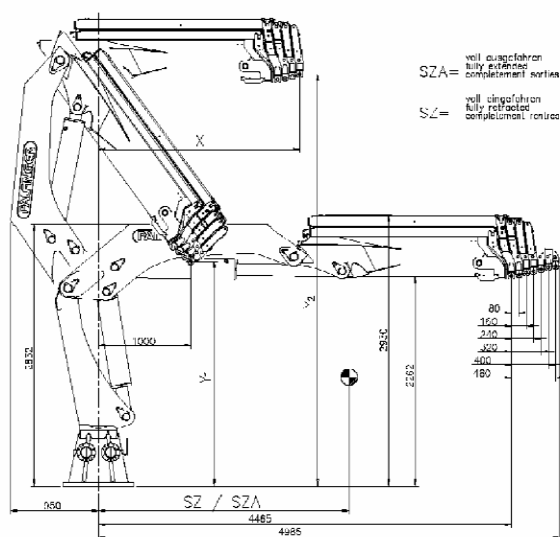
8-8

### 8.6 Assistance crane (crane 2)

#### Assistance crane

Starboard

Design:	Fully hydraulic articulated arm crane with 4 hydraulic extending arms
Location:	1st superstructure deck port (next to hatch)
Load-bearing capacity:	Port operation: 19.5 kN "Offshore" operation: 25 kN
Working area:	Port operation: 11.9 m "Offshore" operation: 6.0 m
Headroom:	Approx. 8.0 m above working deck
Operation:	Vendor's tray type (radio controlled), crane control position

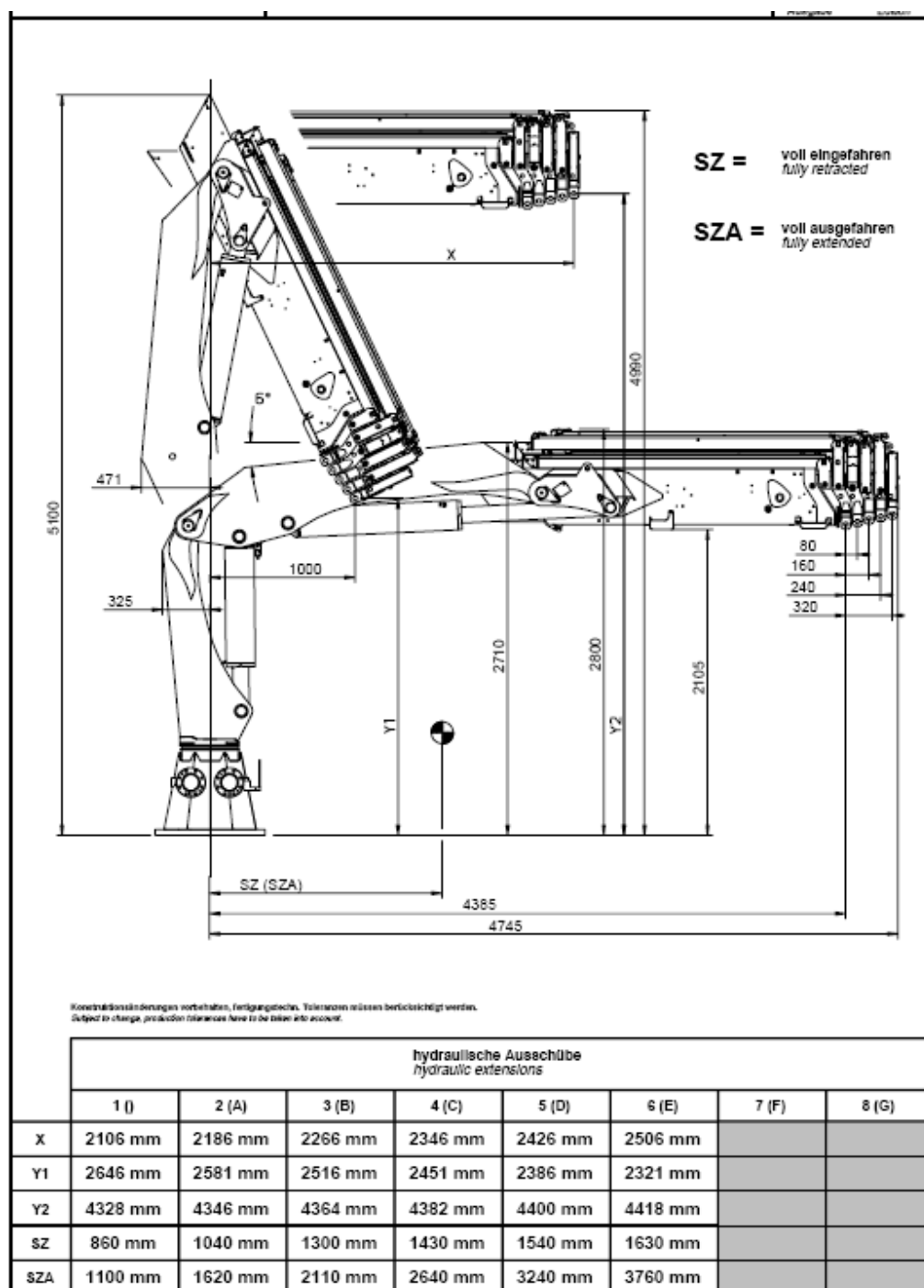


Hydraulic extensions				
	2(A)	3(B)	4(C)	5(D)
X	1830	2010	2090	2100
Y1	2724	2628	2531	2434
Y2	4401	4419	4437	4457
SZ	1251	1422	1564	1670
SZA	1090	2254	2034	3370



### 8.7 Provision crane (crane 1)

Design:	Fully hydraulic articulated arm crane with 6 hydraulic extending arms
Location:	1st superstructure deck foreship starboard
Load capacity:	12.56 kN
Working range:	12.40 m
Operation:	Vendor's tray type (radio remote controlled), crane control
Comment:	The crane is used to load the provision hatch on the 1st superstructure deck; foreship centre



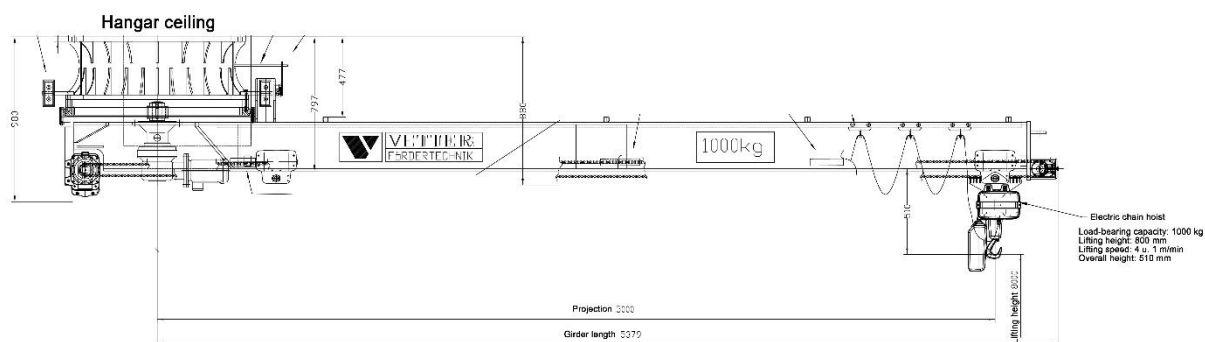
## 8 Lifting gear

8-10

### 8.8 Hangar overhead rotary crane

#### Rotary crane

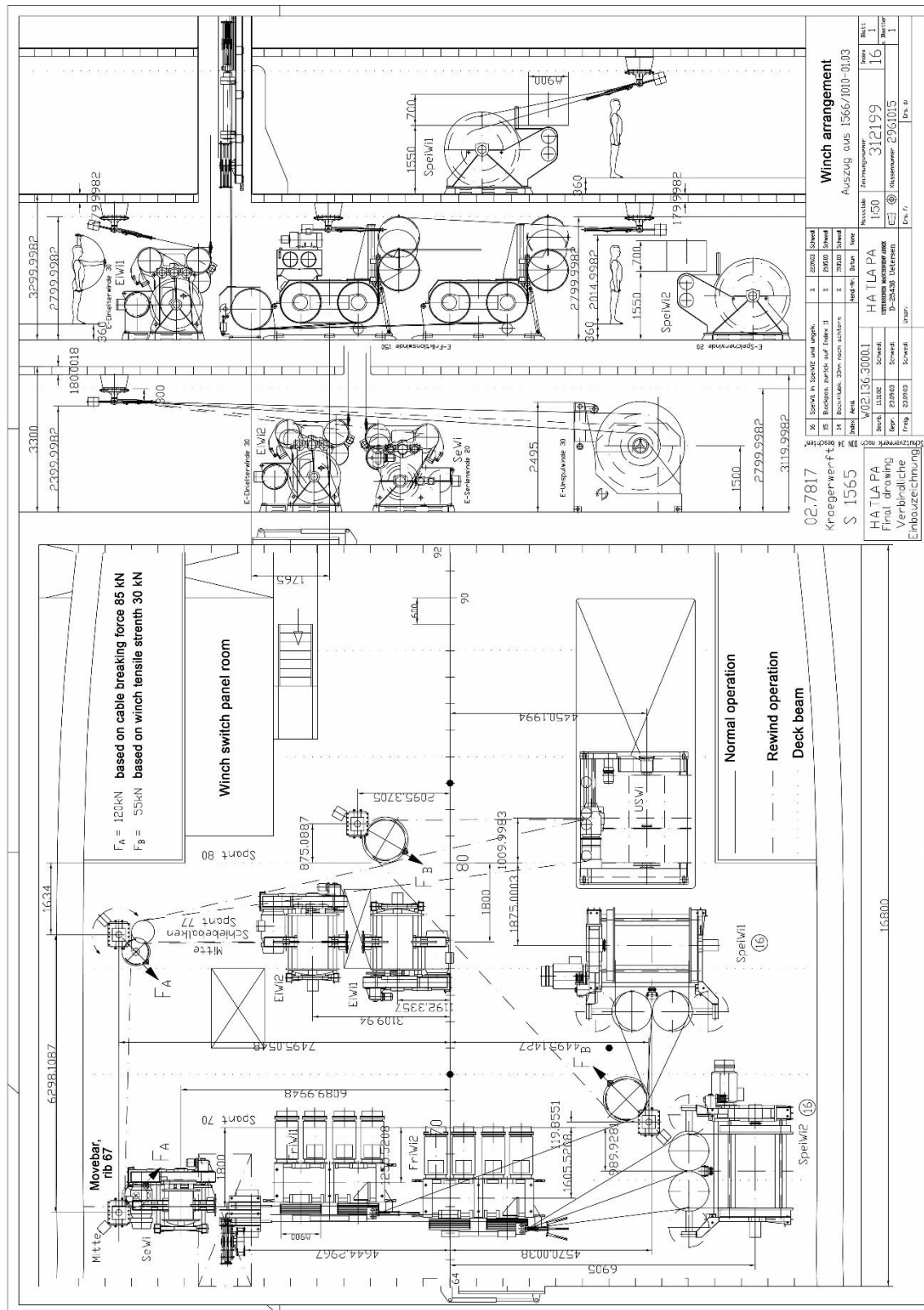
Design:	Suspended slewing crane with electric chain hoist
Location:	Hangar above hatch
Slewing range:	136°
Load-bearing capacity:	10 kN
Working area:	5.0 m
Headroom:	8.0 m
Remark:	Transport of devices and equipment in hangar Transport of devices and equipment between hangar and scientific storage room



## 9 Scientific winch system

9-1

### 9.1 Winch room



## **9 Scientific winch system**

**9-2**

### **9.2 Scientific winches**

#### **9.2.1 Friction winches 1 + 2**

Colour: Blue – friction winch 1  
Green – friction winch 2  
Rope speed: 0 - 1 m/s (max. up to 2 m/s)  
Rope diameter: 18 mm  
Nominal tension: 150 kN  
Comment: For wire ropes, single conductor cables and fibre-optic cables

#### **9.2.2 Storage winch 1 + 2**

Colour: Blue – storage winch 1  
Green – storage winch 2  
Drum volume: 7,200 m with 18 mm Ø  
Rope speed: 0 - 1 m/s (max. up to 2 m/s)  
Tensile strength: 20 kN (in 1st rope layer)  
Comment: Storage winch 1 can also operate friction winch 2 if necessary, and storage winch 2 can operate friction winch 1.

#### **9.2.3 Discharger winch 1 + 2**

Colour: Yellow (discharger winch 1)  
Violet (lilac) (discharger winch 2)  
Cable diameter: 11 mm  
Drum volume: 6,200 m  
Rope speed: 0 - 1 m/s (max. up to 2 m/s)  
Tensile strength: 30 kN (middle rope layer)  
Comment: Normal operation: both discharge winches –  
rope shaft 2 (70 kN movebar)  
Emergency operation: both discharge winches –  
rope shaft 1 (200 kN movebar)

#### **9.2.4 Standard winch**

Colour: Brown  
Cable diameter: 8 mm Ø (6 mm if necessary)  
Drum volume: 3,000 m  
Rope speed: 0 - 1 m/s (max. up to 2 m/s)  
Tensile strength: 20 kN (middle rope layer)

## **9 Scientific winch system**

**9-3**

### **9.2.5 Working winch (mobile)**

Colour:	Red
Cable diameter:	11 mm
Drum volume:	6,000 m
Rope speed:	0 - 1 m/s (max. up to 2 m/s)
Tensile strength:	50 kN (middle rope layer)
Location:	Back deck next to 200 kN movebar
Possible spaces:	Main deck below 200 kN movebar Hangar below 70 kN movebar

### **9.2.6 Rewinding winch**

Colour:	Grey
Usage:	For winding and unwinding all wires/cables of all other winches of different lengths and diameters
Possible drum size:	900 to 2,000 mm long and 2,000 mm Ø
Max. drum volume:	7,200 m with 18 mm Ø
Rope speed:	0 – 1 m/s (depending on tensile strength)
Max. tensile strength:	48 kN

### **9.2.7 Horizontal capstan (mobile)**

Colour:	Red
Usage:	Anchoring work
Tensile strength:	25 kN
Rope speed:	0 – 1 m/s
Possible spaces:	Main deck below A-frame Main deck below 200 kN movebar

### **9.2.8 Frapping winch (200 kN movebar)**

Cable diameter:	22 mm
Drum volume:	100 m
Rope speed:	0 – 0.5 m/s (lower rope layer)
Tensile strength:	50 kN (lower rope layer)

### **9.2.9 Auxiliary winch (A-frame)**

Cable diameter:	22 mm
Drum volume:	100 m
Rope speed:	Switchable 0 – 0.5 m/s (lower rope layer) or 0 – 1.0 m/s
Tensile strength:	50 kN (lower rope layer) or 25 kN at double speed

## **9 Scientific winch system**

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**9-4**

### **9.2.10 Other winches**

- Auxiliary winch for bringing in the air pulser at the outer edge of the pulser station (25 kN).
- Mobile electric cable pulls (four) for positioning the containers in the scientific storage space.



## **9 Scientific winch system**

**9-5**

### **9.3 Cables and wires**

All load information in tons is rounded to 100 kg.

The cables' own weight in the water has been taken into consideration.

All safe working loads correspond to 25 % of the breaking load.

The safe working length is the length until the last layer on the drum, including the distance to the stern boom. **The current lengths can be found in the respective valid "Merian checklist" on the home page of the Leitstelle Deutsche Forschungsschiffe (German Research Fleet Coordination Centre)!**

#### **9.3.1 18 mm fibre glass hybrid cable from Rochester**

Single-conductor wire, storage winch 2 (**green**),  
maximum possible length 7,300 m, with a safe working length of 6,880 m

#### **9.3.2 18 mm Drakoflex**

Standard wire, storage winch 2 (**blue**),  
maximum possible length 7,400 m, with a safe working length of 6,980 m

#### **9.3.4 11 mm Drakoflex**

Standard wire for (mobile working winch **red**), currently not wound on, since a single-conductor wire has been wound on here (however, there is a spare wire, length 6,300 m on board and can be wound on provided that a requirement notification is issued in good time using an MSM checklist).

#### **9.3.5 11 mm Coax cable,**

Single-wire conductor, single-conductor winch 1 (**yellow**), single-conductor winch 2 (**violet**), working winch (**red**),  
each with maximum possible length 6,300 m, with a safe working length of 5,940 m

#### **9.3.6 6 mm steel wire<sup>\*)</sup>**

Standard wire for standard winch (**brown**), max. possible length 3,300 m, safe working length 3,050 m; not wound on at present

#### **9.3.7 8 mm Technora rope**

Artificial rope for standard winch (**brown**), max. possible length 3,000 m, safe working length of 2,750m is currently wound on.

\*) The 6 mm wire can be wound onto the standard winch (brown) provided that notification is provided in good time (as part of the coordinator meeting).

## **9 Scientific winch system**

**9-6**

### **9.4 Winch measuring system**

Usage:	The winch measuring system records the values of the rope length, rope speed and rope tension for both rope winches, friction winches, single conductor winches and for the standard winch and the working winch. When doing this, it checks for adherence to the affected limit values (by means of pre-alarms or emergency stop), displays the measured data in real time and exports them into the DSHIP data distribution system (and therefore into the database).
Manufacturer:	SAM Electronics
Displays:	Bridge (server and printer), winch console (client), sounder room (client), large working deck display (rope length only) and all 27 workplace PCs (APCs) (via DSHIP display)
Protocol:	TCP/IP
Data storage:	Server (bridge), DSHIP database
Limit entry:	Before reaching the defined limits, pre-alarms are triggered (heaving: pre-alarm zero = stop before rope zero position; veering: pre-alarm lower = set distance in relation to working length). Automatic stop function when the set limits are reached.

## 9 Scientific winch system

9-7

### 9.5 Connecting plug

All cables of the single-conductor winches and the fibre-optic cable of green storage winch 2 terminate in the server room. Here a 'patch panel' is installed from which the required distribution of the transmitted signals using Lemosa 3e connectors to the individual laboratories (sounder room, dry laboratory, hangar, server room), the electronic workshop, the scientific work room (1st superstructure deck) and the container connections (main deck aft and centre, and storage room on the tween deck) takes place.

[This currently only applies to the single conductor winches; the signals of the fibre-optic cable should be distributed shortly (using flying cables to begin with) (e.g. in the sounder room and in the server room)]

Usage: Underwater connectors are fitted to the "wet" end of the 11 mm coaxial cable (single conductor winches 1 and 2) which make it possible to make measuring device/probe electrical connections (e.g. CTD, multi-network).

Manufacturer: Sea Connections Systems Ltd.

Types: Standard SUBCONN IL-2-F (screw connection: DLSA-M)

Mating connector on the appliance: Standard SUBCONN IL-2-M (screw connection: DLSA-F)

Mating connector at the on-board CTD: Micro-SUBCONN MCIL-2-MSW (screw connection: MCDLS-F)  
An adapter (IL-2-M on MCIL-2-FSW) for using the CTD is present on board.

Plug assignments: Core 2 (white) is the signal line – core 1 (black) is ground

The plug connection for the fibre glass hybrid cable is a Gisma series 40 standard connection. 1 fibre optic single mode fibre is connected, plus coax screen and centre.

Exact Gisma designation of connector:	Series BR40 standard
Ship side:	40.06.3.06.2.00
Device side (scientific)	40.00.3.06.2.10

The assignments are as follows (see also diagram on next page):

3 = Fibre-optic cable (active fibre)

**6 = Unoccupied**

1 = Center Coax

2 = Center Coax

4 = Screen Coax

5 = Screen Coax

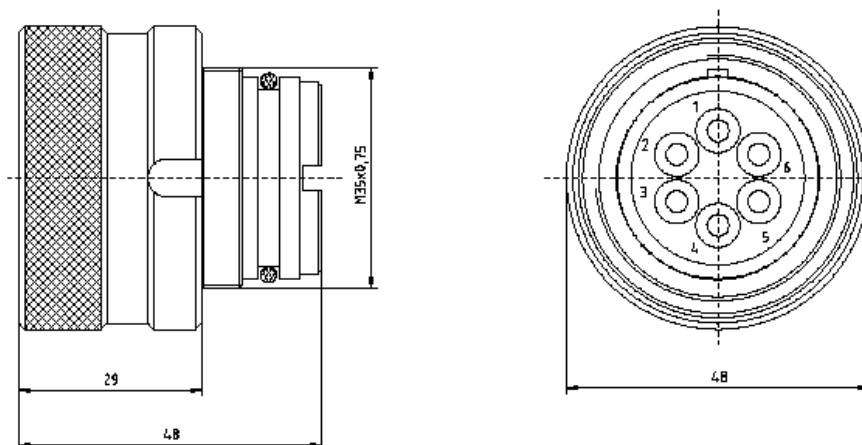
Remark: The cable only contains a coaxial connection. In order to increase flexibility, screen and centre have each been connected to pins by means of simple bridging inside the Gisma connector.

## 9 Scientific winch system

9-8

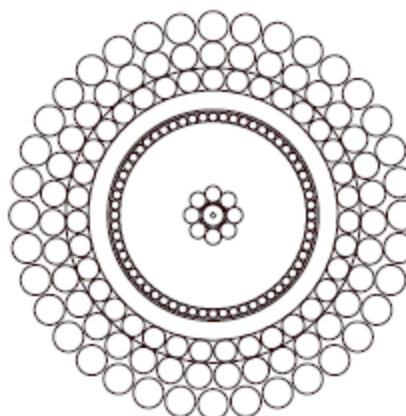
### Characteristic features of the fibre-optic cable (top) and the Gisma connector (bottom)

Gisma connector:



Fibre-optic cable (characteristics):

Description	Inch	mm
<b><u>OPTIC WAVEGUIDE</u></b>		
Fbr: 8.3/125/250 µm SMF	0.010	0.25
Bfbr: Hytrel®	0.038	0.97
Belt: Nylon	0.046	1.17
<b><u>CONDUCTOR</u></b>		
8/0.0285" (3.29 mm²) HD Cu	0.103	2.62
<b><u>INSULATION</u></b>		
LDPE	0.330	8.38
<b><u>RETURN</u></b>		
60/0.0159" (7.69 mm²) HD Cu	0.362	9.19
Tape: Cu/Poly	0.371	9.42
<b><u>BELT</u></b>		
HDPE	0.439	11.15
<b><u>STRENGTH MEMBER</u></b>		
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.

## 9 Scientific winch system

9-9

### Fibre-optic cable (characteristics):

PERFORMANCE CHARACTERISTICS		
Nominal Values @ 20°C	Metric	English
<u>PHYSICAL</u>		
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
<u>MECHANICAL</u>		
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
<u>ELECTRICAL</u>		
Voltage Rating	3,000 V	3,000 V
dc Resistance		
inner cdr	5.67 $\Omega$ /km	1.73 $\Omega$ /kft
outer cdr	2.56 $\Omega$ /km	0.78 $\Omega$ /kft
Insulation Resistance		
inner cdr - outer cdr	24,000 M $\Omega$ •km	80,000 M $\Omega$ •kft
outer cdr - armor	1,200 M $\Omega$ •km	4,000 M $\Omega$ •kft
Capacitance	105 pF/m	32 pF/ft
Characteristic Impedance		
@ 1 MHz	50 $\Omega$	50 $\Omega$
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
<u>OPTICAL</u>		
Attenuation Rate		
@ 1310 nm	0.45 dB/km	
@ 1550 nm	0.30 dB/km	

## **10 Laboratories and scientifically used rooms**

**10-1**

(1) The arrangement of the laboratories and the other scientifically used rooms is shown in the figure entitled 'Laboratory location plan'.

(2) The size, set-up and equipment of the individual laboratories and the scientific rooms are shown in illustrations that are based on the shipyard set-up drawings. The front is shown on the right-hand side of the illustrations, and aft on the left!

(3) The room temperature in each laboratory room can be regulated individually ( $\pm 1\text{ }^{\circ}\text{C}$ ), and to  $+15$  to  $25\text{ }^{\circ}\text{C}$  ( $\pm 0.5\text{ }^{\circ}\text{C}$ ) in the salinometer and gravimeter room. Some laboratory rooms also have underfloor heating because they are above cool tanks, and therefore have two room thermostats.

(4) The electrical supply (on-board power supply: white sockets; stabilised laboratory power supply: red sockets) and the network communication are installed in surrounding cable ducts on the walls at the top.

(5) All laboratories (including hangar, sounder room, server room) and the conference room and the electronics workshop are equipped with TV/radio/video antenna sockets, and also with connecting sockets for the CCTV monitoring system (except the server room). In all laboratories and the pulser station there are also BNC sockets (in/out) for the clock pulse generator 1 PPS signal (1 pulse per second); it is also planned to connect the '1 pulse per nautical mile' signal there. The above-mentioned statements do not apply to the salinometer room, the gravimeter room and the scientific refrigeration room. In the dry laboratory there is also an RS 232 connector of the Motion Reference Unit (MRU) for receiving the ship movement data (roll, pitch, heave, yaw; see chapter 14.5 'Seapath 200').

(6) In the hangar, the deck laboratory, the dry laboratory, the sounder room and in the electronic workshop, signals of the winch grinding rings (currently only applies to the single conductor winches) can be received, which have to be distributed accordingly on the patch panel in the server room beforehand.

Connections for winch control can be found in the sounder room and the hangar, from where an extension cable has been routed into the server room.

On previous trips, this made it possible to control camera-guided sampling, observation and measuring devices (e.g. OFOS, TV gripper, TV MUC, Lander) from the server room without problems (using patch panel, CCTV and DVS). This method also benefited from the proximity to the Posidonia control unit.

(7) A pure water system (MIELE Professional G7895 water purifier) with a conductance measuring module and an automatic cleaning and disinfecting system (MIELE Professional G7883) is available in the chemical laboratory. The ion exchanger supplies conductivity values  $<2\text{ }\mu\text{S/cm}$  with new/regenerated water demineralisation cartridges (E310). The automatic laboratory glass cleaner fulfils the conditions of prEN ISO 15883-1 (thermal disinfection at  $80\text{ }^{\circ}\text{C}$  / 10 min) and HBV ( $90\text{ }^{\circ}\text{C}$  / 5 min), but not sterilisation.

(8) A Milli-Q system (Milli-Q<sup>®</sup> Reference A+ system housing with Millipak<sup>®</sup> filter) is available in the chemical laboratory. The water supply comes from the water purifier. Resistance  $18.2\text{ M}\Omega\cdot\text{cm}$  at  $25\text{ }^{\circ}\text{C}$ ; TOC  $\leq 5\text{ ppb}$ ; particles  $>0.22\text{ }\mu\text{m}$   $<1\text{ particles/mL}$ ; bacteria  $<0.1\text{ KBE/mL}$ ; flow rate  $0.05\text{--}2\text{ L/min}$

(9) The pure sea water supply for the laboratories (including hangar) is usually provided via two suction points in the shaft bottom of the extending apparatus from a water depth of about 6.2 to 6.80 m. Under certain circumstances, the pure sea water can also be sucked in at the starboard side or from the front from a water depth of about 2.5 m. The pure sea water can be transported using a rotary pump and/or a membrane pump.



## **10 Laboratories and scientifically used rooms**

## **10-2**

(10) As well as the small drying cabinets integrated in the fume cupboard in the deck and chemical laboratory, bigger ones are also available. The drying cabinets are Sanyo model MOV-212. The internal dimensions are: 730 x 645 x 870 mm with a usable volume of 157 ltr. The temperature can be adjusted in steps of 10 °C, from +5 – 250 °C.

(11) The floors are resistant to sea water and chemicals (brand name: Bolidt). The floor covering is raised at the walls by 150 mm all round (exception: conference room). There is an elevated floor in the sounder/IT room. The floor in the gravimeter room is tiled. All floors are designed for loads of up to 500 kg/m<sup>2</sup>.

(12) The general deck clearance height is 2.15 m (see individual drawings for exceptions). The deck height is less in some cases below ventilation openings, lamps and fire detectors.

(13) The laboratory doors generally have a clearance width of 1.2 m (2-leaf: 800 and 400 mm). The height of the doors is at least 1.95 m.

(14) C-rails are installed flush in the walls, ceilings and table tops as a securing system. The C-rails are at intervals of 600 mm. They run along the ceilings in the longitudinal ship direction, from top to bottom in the walls and in line with the wall C-rails in the table tops. The C-rails are designed for tensile force of 1 kN per running metre. Limited quantities of self-clamping sliding nuts (M8 thread) with springs which can be used and removed from any location on the C-rails and ring bolts and eye bolts are on board. The C-rail system is earthed.

(15) There are grid sockets in the floor surfaces as an attachment system, which are not in the gangway area and do not have any permanent installations. The grid sockets have an M8 thread and can be loaded with 1 kN per socket. The spacing is 600 x 600 mm. The sockets are flush with the wall and ceiling grid. The sockets are closed off with threaded pins.

(16) All furnishings are made from salt water-resistant timber with table tops made from 20 mm plastic (Trespa). The frame construction consists of stainless steel square tubes. All furniture is attached to the C-rail system and the floor sockets, and can easily be removed.

(17) All laboratory rooms are equipped with waste paper baskets and magnetic boards.

## **10 Laboratories and scientifically used rooms**

**10-3**

### **10.1. Laboratory waste system**

The entire grey and black water from all toilets, showers, washbasins etc. (but not from the laboratory rooms) is mechanically and biologically cleaned and passed through micro-filtration membranes. This produces service water with similar quality to fresh water, which can be re-used on board (e.g. for the rope washing systems).

In order to prevent this extremely sensitive sewage treatment system from being disabled by slightly biologically or chemically contaminated waste water or undesirable introduction of interfering substances, no laboratory drains are connected to the sewage treatment system. In a normal case, all waste water from the laboratory rooms is discharged outboard. This basically takes place via storage tanks, i.e. no waste water is discharged directly outboard but is first collected in storage tanks and then pumped outboard when the opportunity presents itself. This means that the laboratory waste water system is more or less permanently in "clean ship mode" (= normal condition). The laboratory system is divided into two different systems in order to do this:

(1) All waste water from the scuppers and about half of the water from the laboratory sinks can be stored temporarily in the **'clean-ship' tank**. This system has normal pipelines.

(2) The waste water from the other half of the laboratory sinks can be stored temporarily in the **laboratory waste water tank**. This special **laboratory waste water system** is made from inert plastic, so that the system cannot be damaged in the event of unintentional introduction of weak acids and/or alkalis or possible accidents.

For the scientific users on board, this means that all work with chemicals should take place over and at the sinks that are connected to the **laboratory waste water system**. However, under no circumstances does this mean that any kinds of chemical can be disposed of there (see chapter 17. Waste disposal).

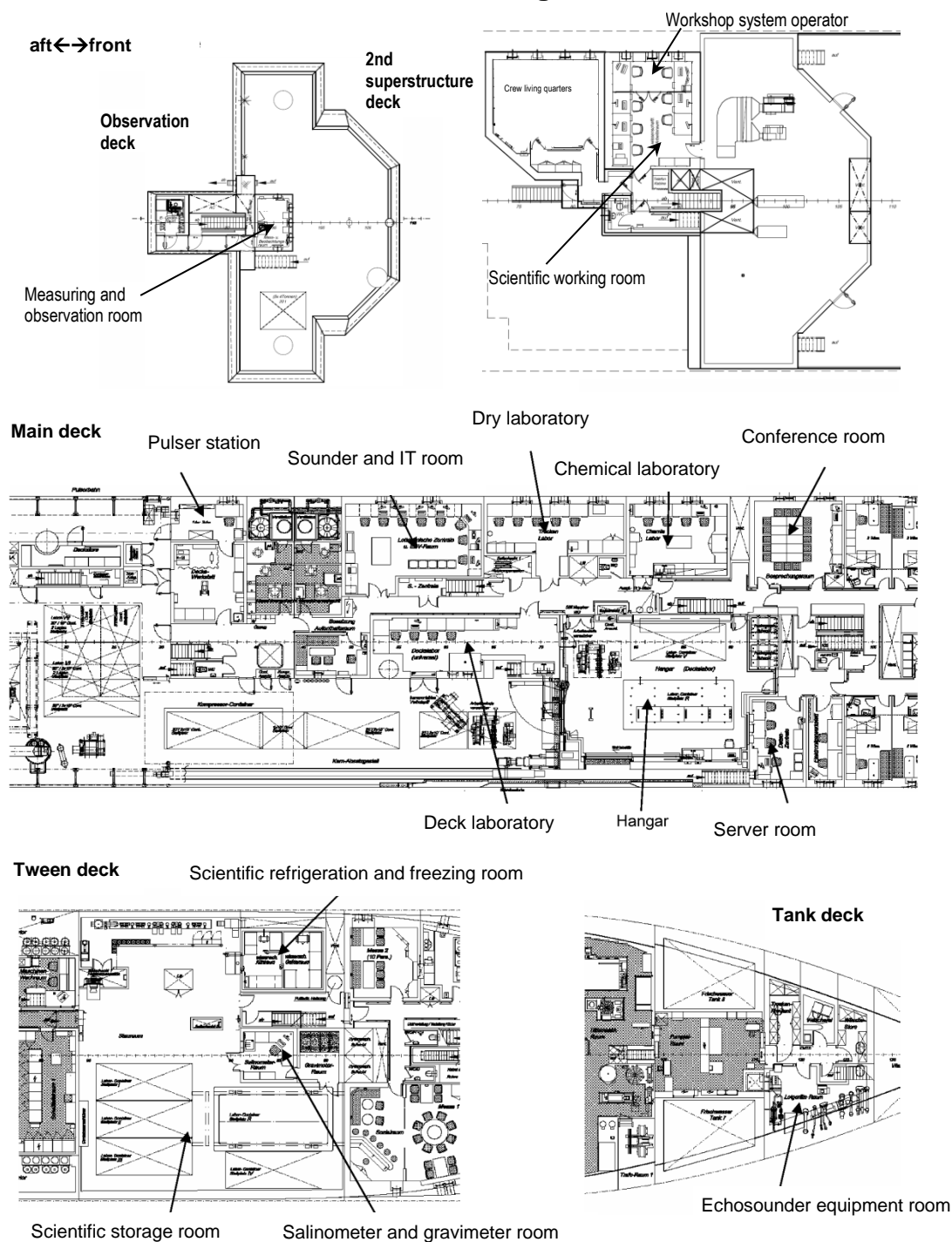
All work that involves a continuous discharge of water (e.g. for cooling purposes) should take place over the normal sink. The discharge of large quantities of sediment into the sinks must be avoided. There are two separate sinks specially for sediment in the hangar, and a sink unit in the deck laboratory.

## 10 Laboratories and scientifically used rooms

10-4

### 10.2 Arrangement of laboratories and scientifically used rooms

#### Laboratories – arrangement

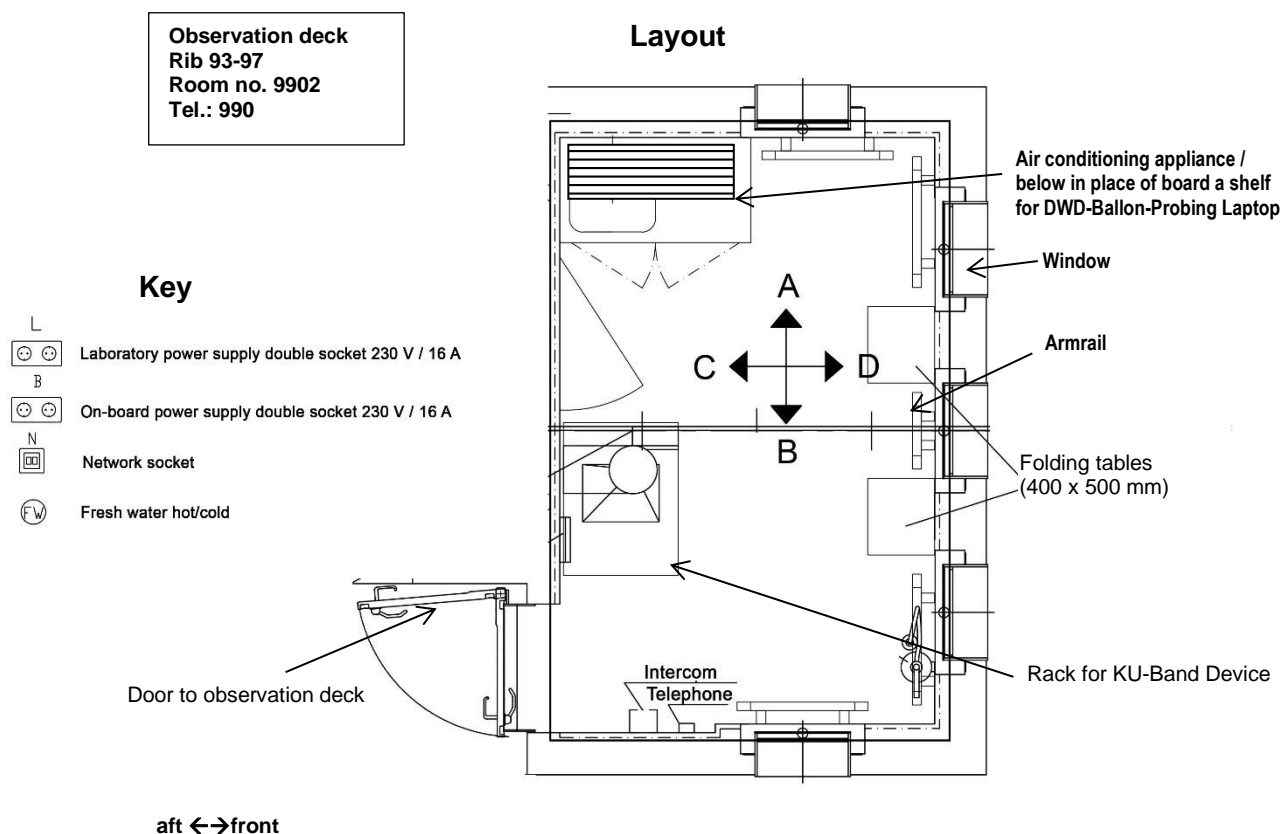


## 10 Laboratories and scientifically used rooms

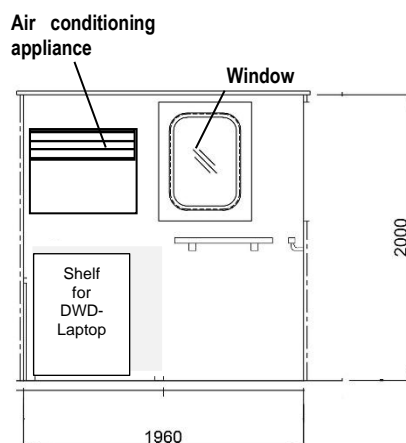
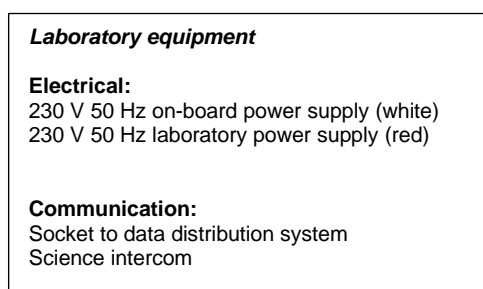
10-5

### 10.3 Measuring and observation room

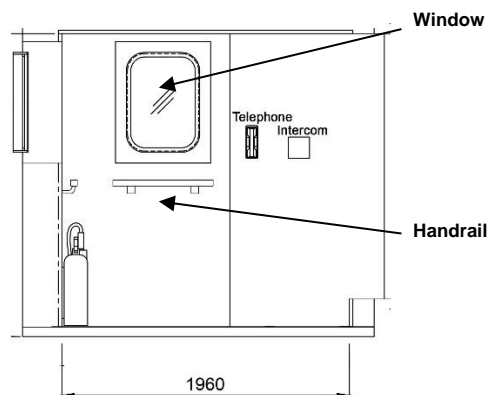
#### Measuring and observation room



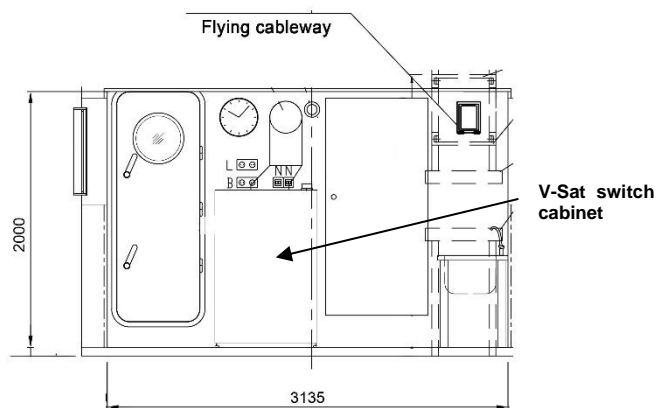
#### VIEW A



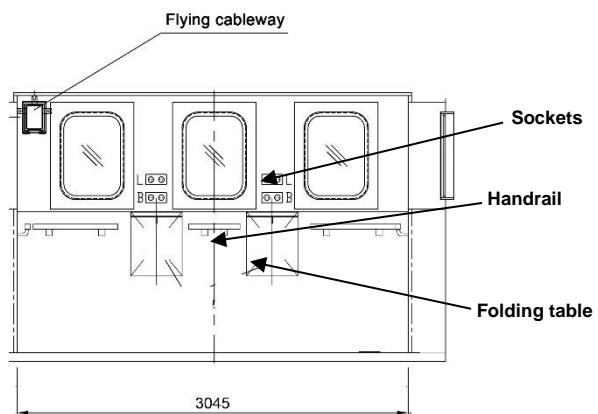
**VIEW B**



**VIEW C**



**VIEW D**



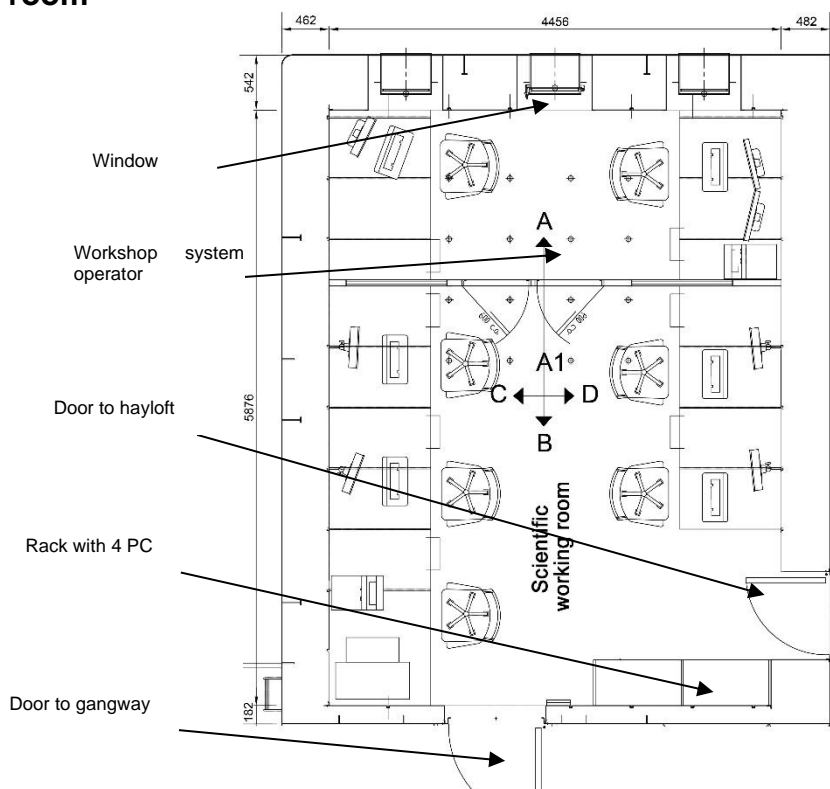
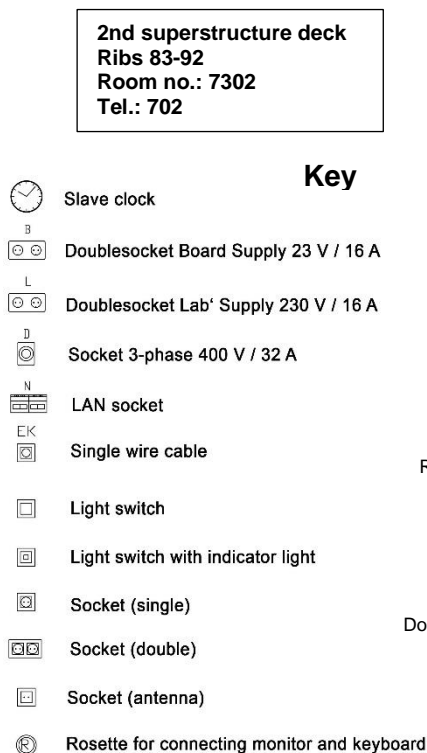
## 10 Laboratories and scientifically used rooms

10-7

### 10.4 Scientific working room

#### Scientific working room

#### Layout



#### Laboratory equipment

##### Electrical:

230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)  
400 V 50 Hz three-phase current (CEE) 32 A

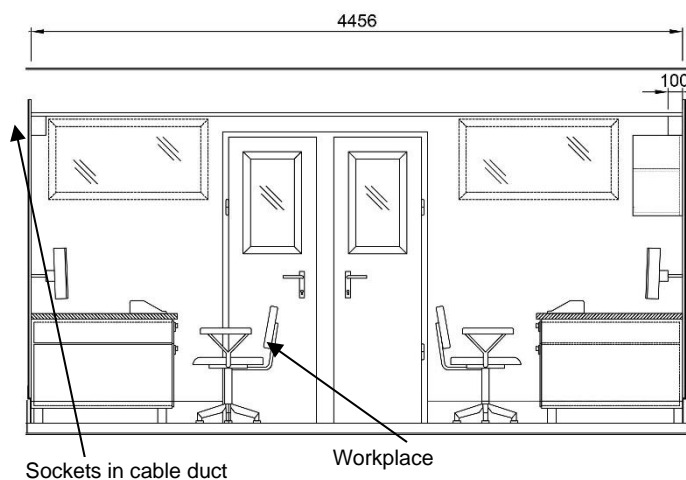
##### Communication:

Socket to data distribution system  
Science intercom  
Antenna socket (radio / TV / video)  
CCTV video connecting socket  
BNC socket, clock pulse generator  
Connection for all discharger winches

##### Other:

5 PCs with monitor  
A4 copier/printer/scanner  
Laser printer, monochrome, A4  
Laser printer, colour, A4  
Laser printer, colour, A3

#### VIEW A

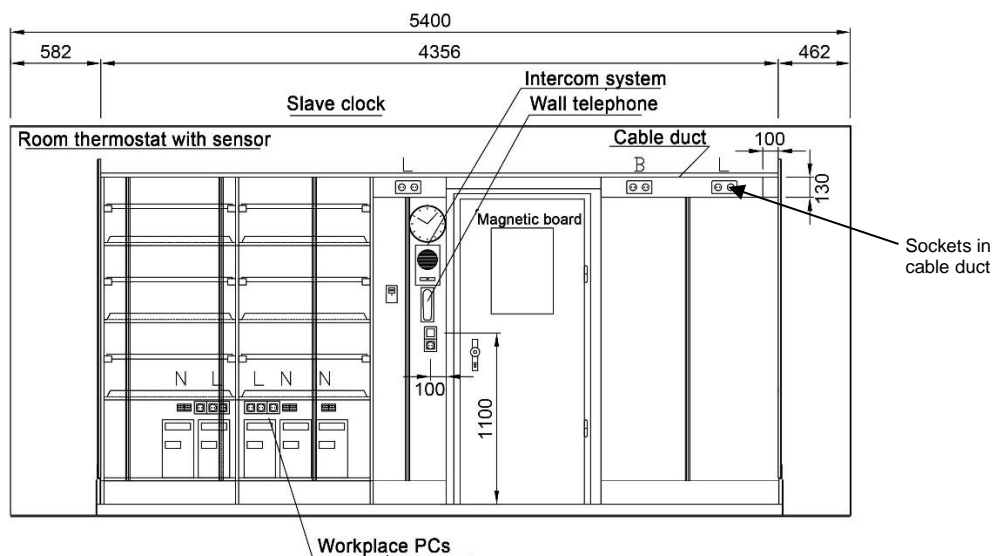




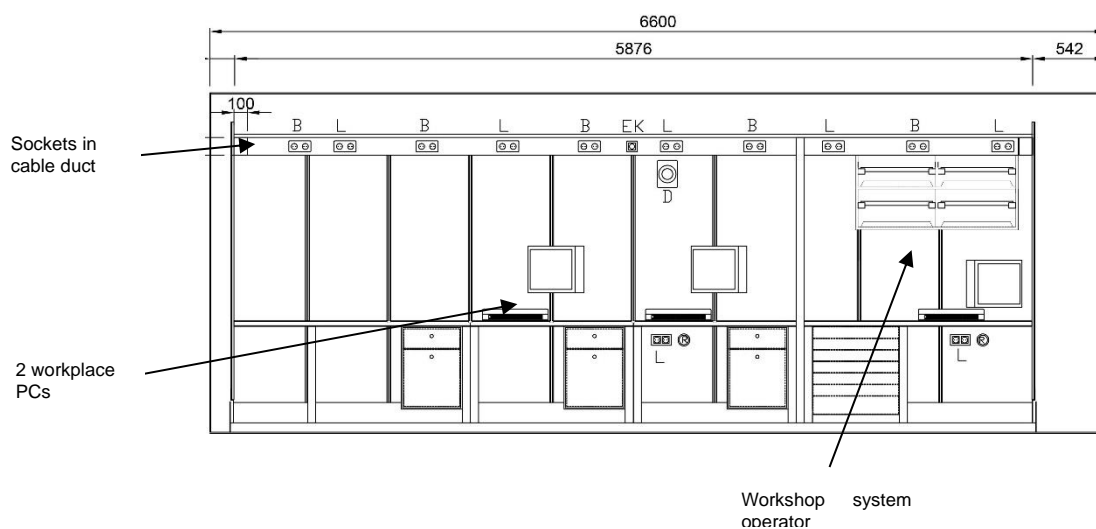
## 10 Laboratories and scientifically used rooms

10-8

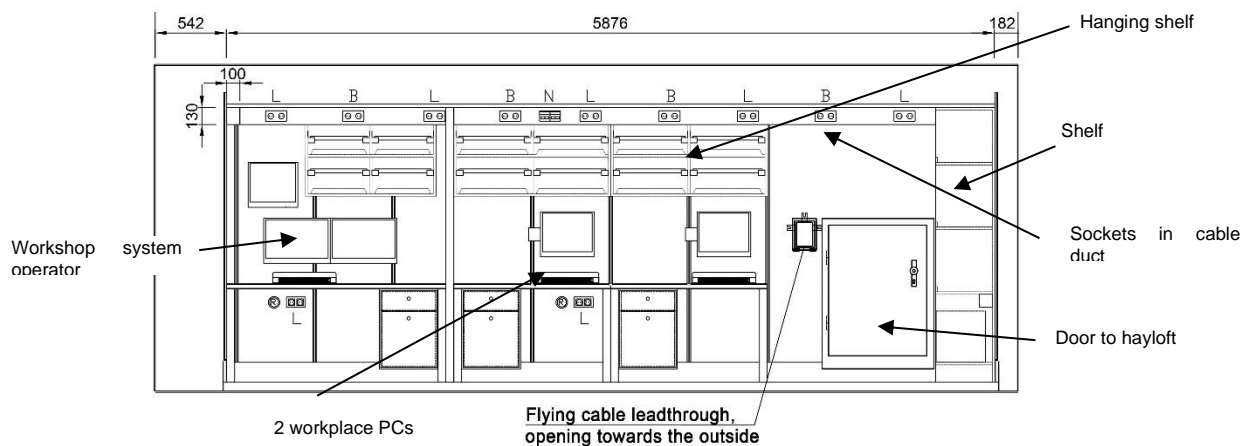
### VIEW B



### VIEW C



### VIEW D



## 10 Laboratories and scientifically used rooms

10-9

### 10.5 Conference room













#### Conference room

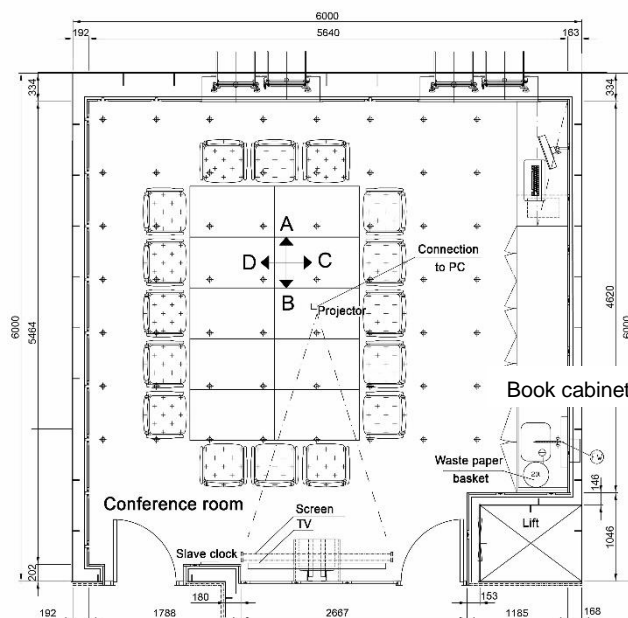
Main deck, port  
Ribs 92-102  
Room no.: 4216  
Tel.: 416

**Attention:** The conference room can also be used as a dry laboratory

#### Layout

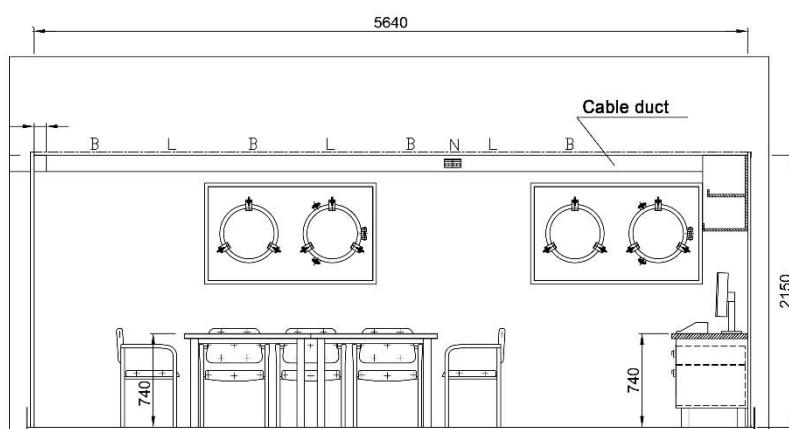
#### Key

-  Chair model as sampled
-  Wempe slave clock, diam. 210 mm
-  On-board power supply double socket, 230 V / 16 A
-  Laboratory power supply double socket, 230 V / 16 A
-  Network/LAN connection socket
-  Three-phase current 400 V / 32 A socket
-  Fresh water hot/cold
-  Light switch
-  Data distribution system connecting socket for projector to PC
-  Antenna socket
-  Socket (single)
-  Socket (double)



aft ← → front

#### VIEW A



Electrical:  
230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)  
400 V 50 Hz three-phase current (CEE) 32 A  
Water and air supply and disposal

Disposal:  
Fresh water cold/hot (drinking water)

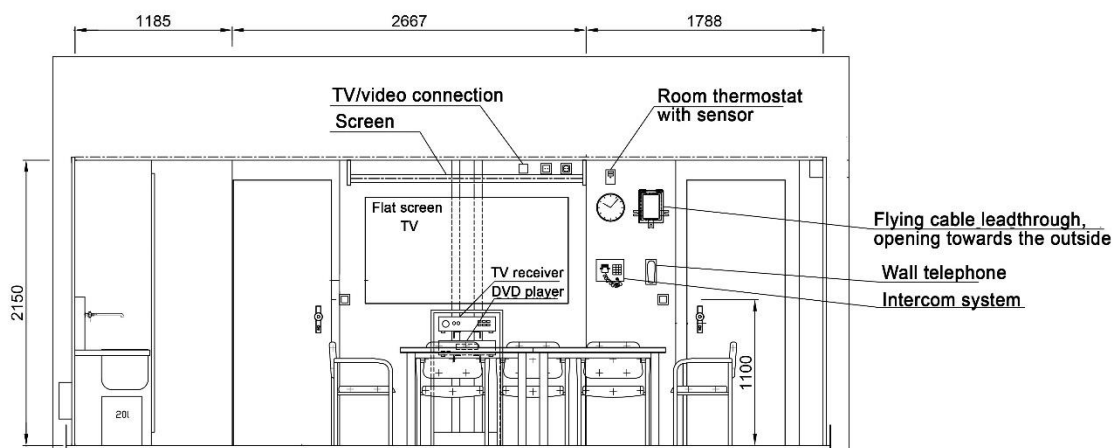
Communication:  
Socket to data distribution system  
Science intercom  
Antenna socket (radio / TV / video)

Other:  
PC with monitor  
Provision lift to galley

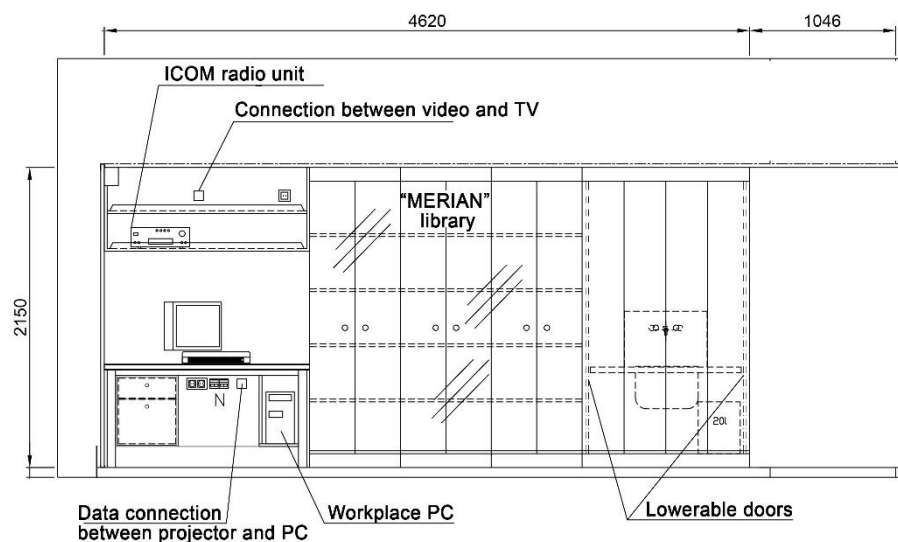
**10 Laboratories and scientifically used rooms**

**10-10**

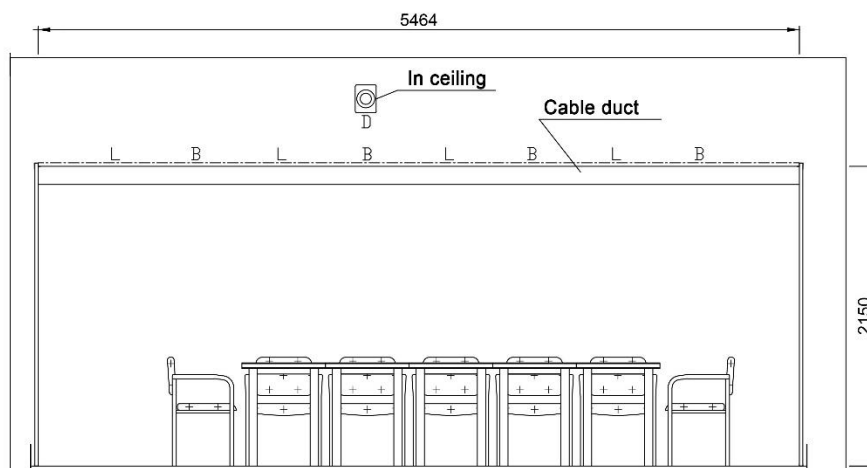
**VIEW B**



**VIEW C**



**VIEW D**



## 10 Laboratories and scientifically used rooms

10-11

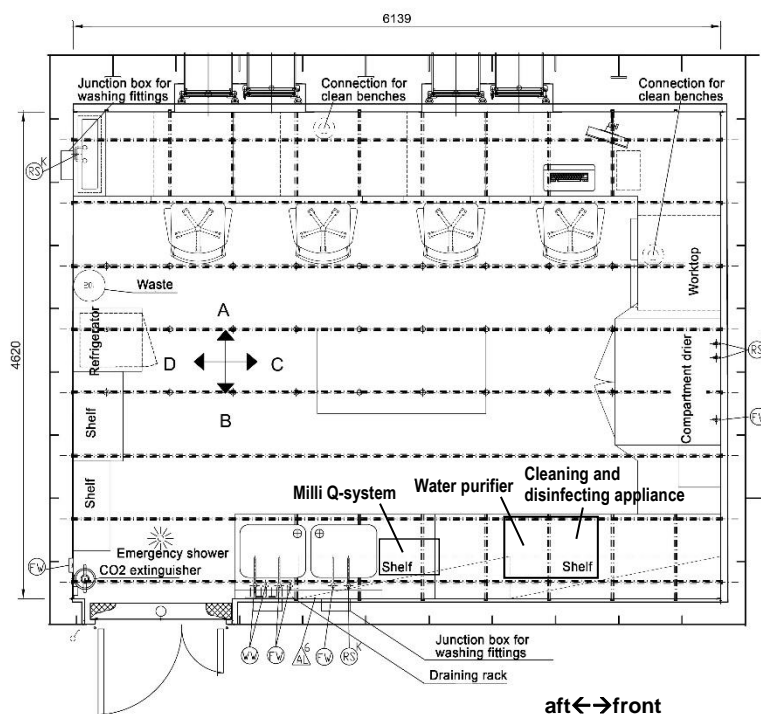
### 10.6 Chemical laboratory

Main deck, port  
Ribs 79-90  
Room no.: 4302  
Tel.: 432

#### Chemical laboratory

#### Layout

- Key**
- Wempe slave clock, 20804/ T
  - On-board power supply double socket, 230 V / 16 A
  - Laboratory power supply double socket, 230 V / 16 A
  - Three-phase current 400 V / 32 A socket
  - Network/LAN connection socket
  - Fresh water hot/cold
  - Pure sea water K
  - Soft water
  - Working pressure 6 bar
  - Antenna socket
  - Socket (double)
  - Light switch
  - Container/laboratory CCTV video connecting socket
  - Single conductor cable
  - BNC socket, clock pulse generator



#### Laboratory equipment

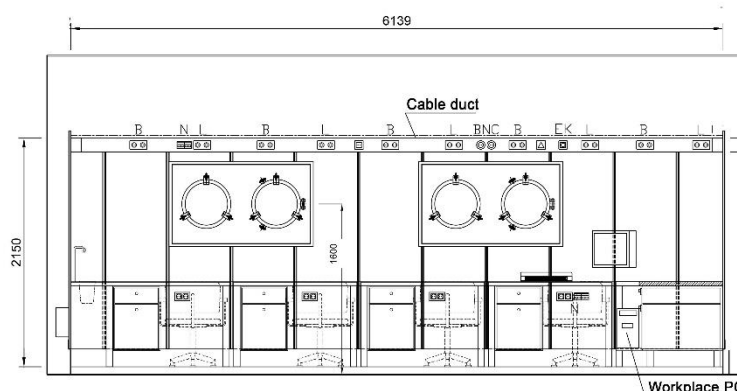
**Electrical**  
230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)  
400 V 50 Hz three-phase current (CEE) 32 A

**Water and air supply and disposal**  
Fresh water cold/hot (drinking water)  
Soft water (pore osmosis)  
Pure sea water (rotary pump)  
Laboratory waste water  
Scupper (outboard runoff)  
Compressed air 0-10 bar  
Air suction ventilator unit

**Communication**  
Socket to data distribution system  
Science intercom  
Antenna socket (radio / TV / video)  
CCTV video connecting socket

**Other:**  
Chemical hood  
Compartment drier  
Refrigerator (+4 °C)  
Freezer (-18 °C)  
Miele G7895 water purifier  
Milli Q reference  
Cleaning and disinfecting appliance, Miele Prof.G7883 CD  
Freezer (-18 °C)  
PC with monitor

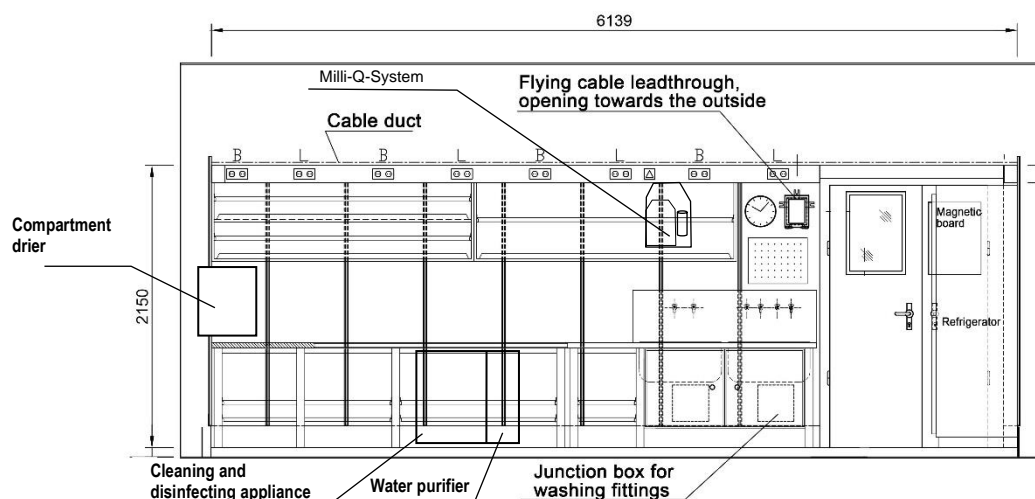
#### VIEW A



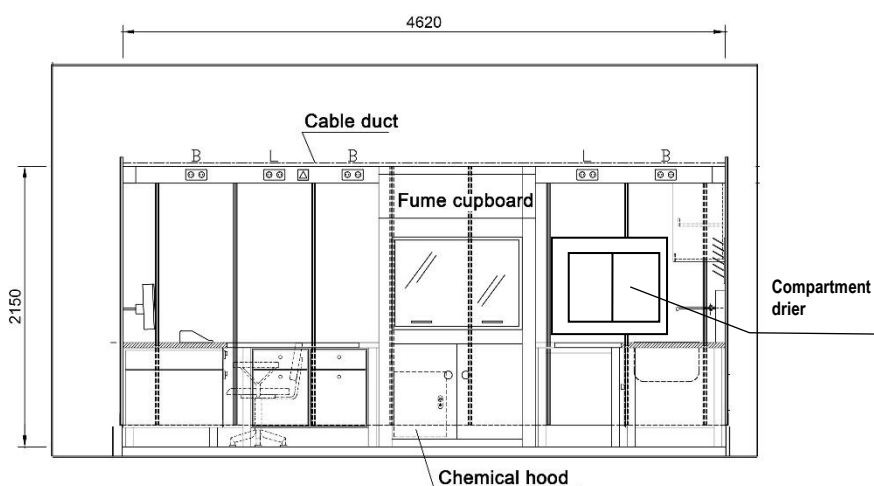
**10 Laboratories and scientifically used rooms**

**10-12**

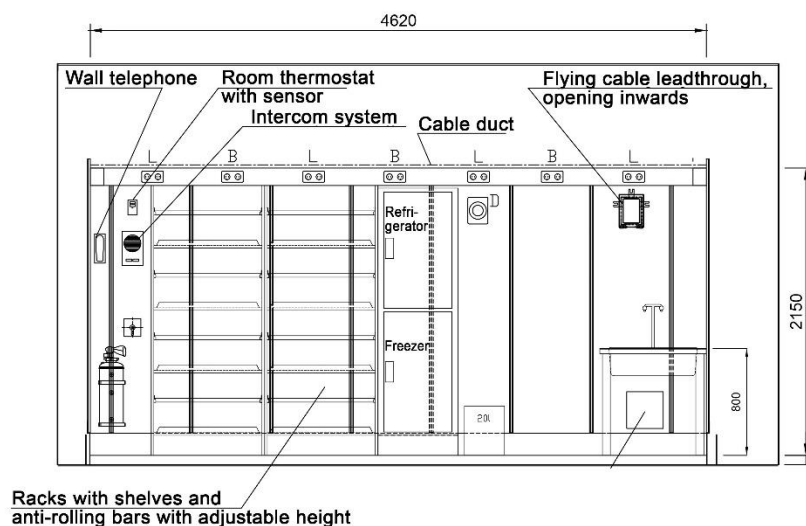
**VIEW B**



**VIEW C**



**VIEW D**



















## 10 Laboratories and scientifically used rooms

10-13

### 10.7 Dry laboratory

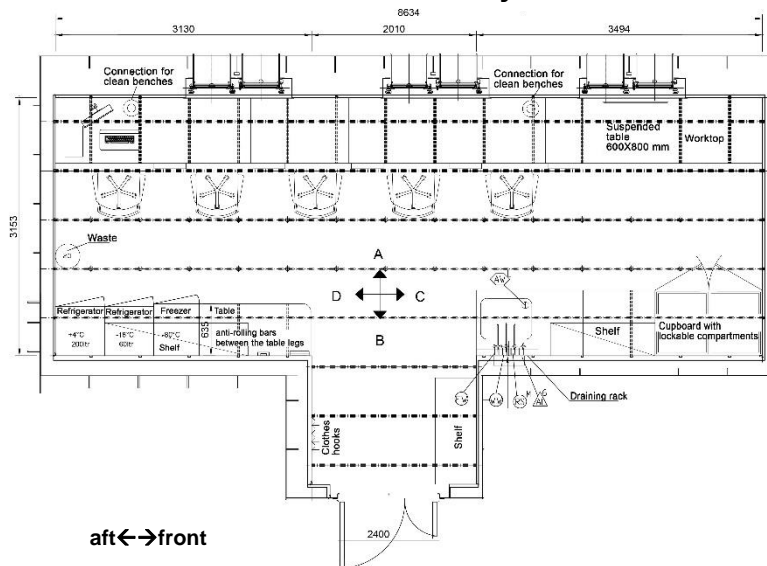
#### Key

Main deck, port  
Ribs 64-79  
Room no.: 4308  
Tel.: 438

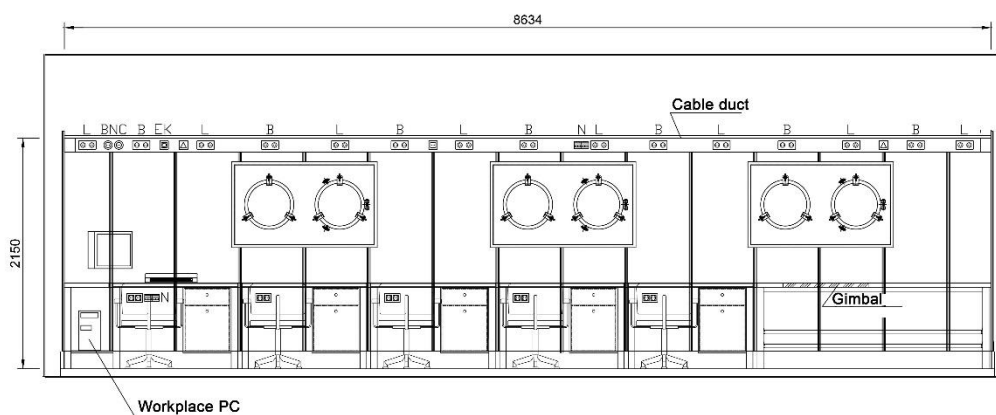
-  Wempe slave clock, 20804/ T
-  On-board power supply double socket, 230 V / 16 A
-  Laboratory power supply double socket, 230 V / 16 A
-  Three-phase current 400 V / 32 A socket
-  Network/LAN connection socket
-  Single conductor cable
-  Fresh water hot/cold
-  Pure sea water M
-  Soft water
-  Working pressure 6 bar
-  Laboratory waste water
-  Light switch
-  Antenna socket
-  Socket (double)
-  Container/laboratory CCTV video connecting socket
-  BNC socket, clock pulse generator

#### Dry laboratory

#### Layout



#### VIEW A



#### Laboratory equipment

##### Electrical:

230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)  
400 V 50 Hz three-phase current (CEE) 32 A

Water and air supply and disposal  
Fresh water cold/hot (drinking water)  
Soft water (pore osmosis)  
Pure sea water (membrane pump)  
Laboratory waste water  
Scupper (outboard runoff)  
Compressed air 0-10 bar  
Air suction ventilator unit

##### Communication:

Socket to data distribution system  
Science intercom  
Antenna socket (radio / TV / video)  
CCTV video connecting socket  
BNC socket, clock pulse generator  
Connection for all discharger winches

##### Other:

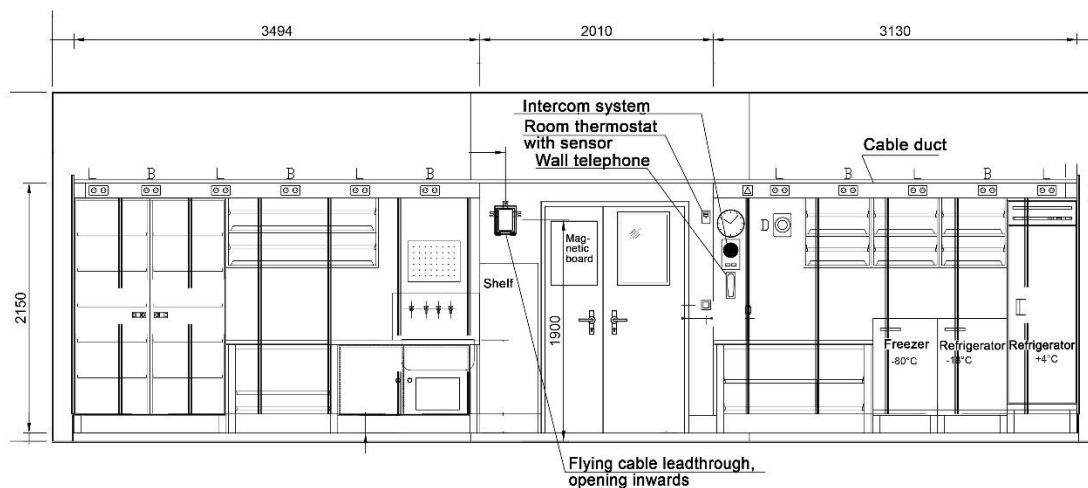
Refrigerator (+4 °C)  
Freezer (-18 °C)  
Freezer (-80 °C)  
Crushed ice maker  
PC with monitor  
Anti-rolling table (600X800 mm)



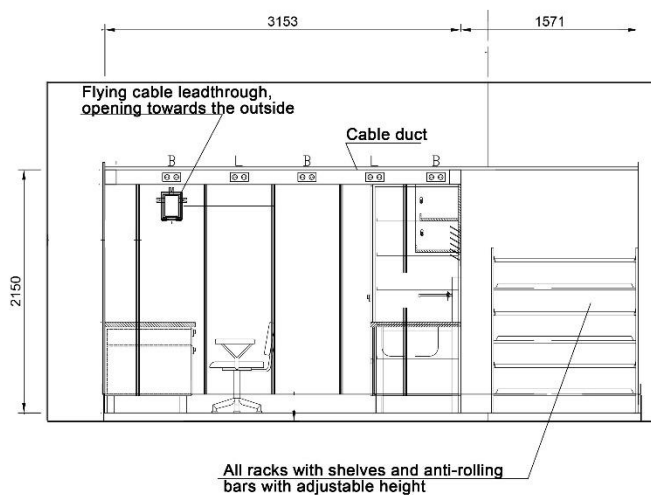
**10 Laboratories and scientifically used rooms**

**10-14**

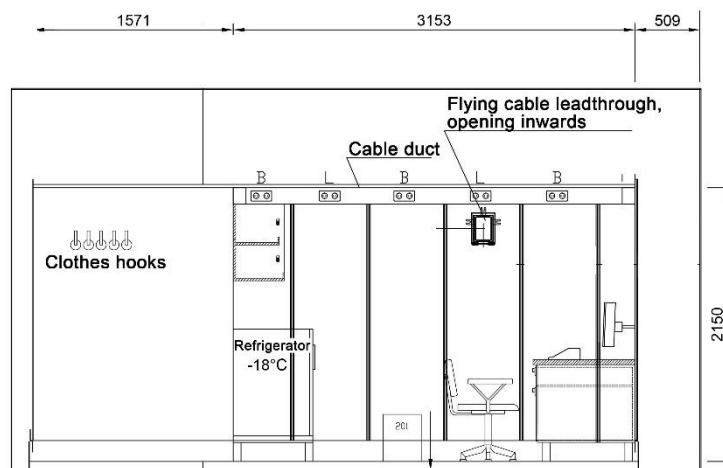
**VIEW B**



**VIEW C**



**VIEW D**



## 10 Laboratories and scientifically used rooms

10-15











### 10.8 Sounder room

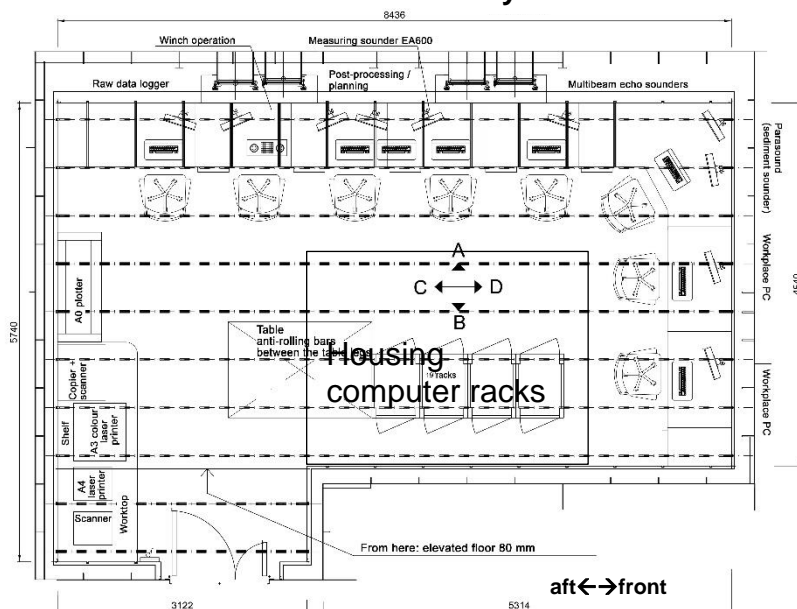
Main deck, port  
Ribs 49-64  
Room no.: 4404  
Tel.: 404

### Sounder and IT room

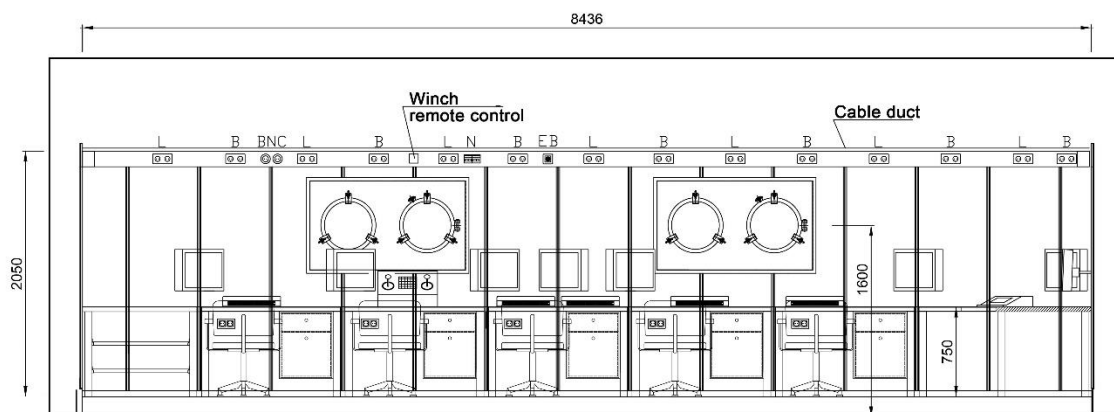
#### Layout

#### Key

-  Wempe slave clock, diam. 187 mm
-  On-board power supply double socket, 230 V / 16 A
-  Laboratory power supply double socket, 230 V / 16 A
-  Three-phase current 400 V / 32 A socket
-  Network/LAN connection socket
-  Single conductor cable
-  Earthing bolt
-  Light switch
-  Antenna socket
-  BNC socket, clock pulse generator



#### VIEW A



#### Laboratory equipment

**Electrical:**  
230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)  
400 V 50 Hz three-phase current (CEE) 32 A  
Earthing bolt to ship's ground M10

**Communication:**  
Socket to data distribution system  
Science intercom  
Antenna socket (radio / TV / video)  
CCTV video connecting socket  
BNC socket, clock pulse generator  
Connection for all discharger winches

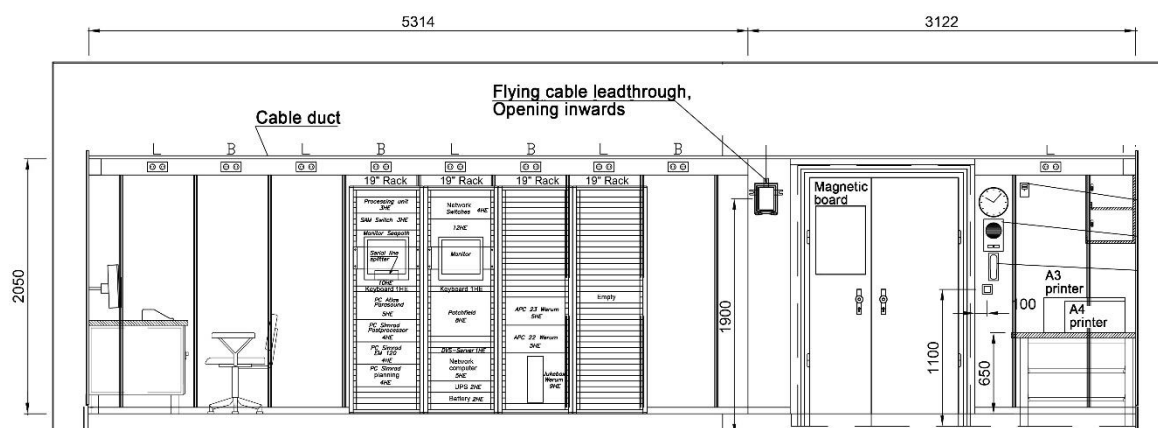
#### Other:

Deep sea multibeam echo sounder (operation, display)  
Shallow water multibeam echo sounder (operation, display)  
Parasound sounder (operation, display)  
Vertical sounder with pinger sounder (operation, display)  
PC with monitor  
A4 copier/printer/scanner  
ACDC PC  
Laser printer, monochrome, A4  
Laser printer, colour, A4  
Laser printer, colour, A3  
A0 plotter

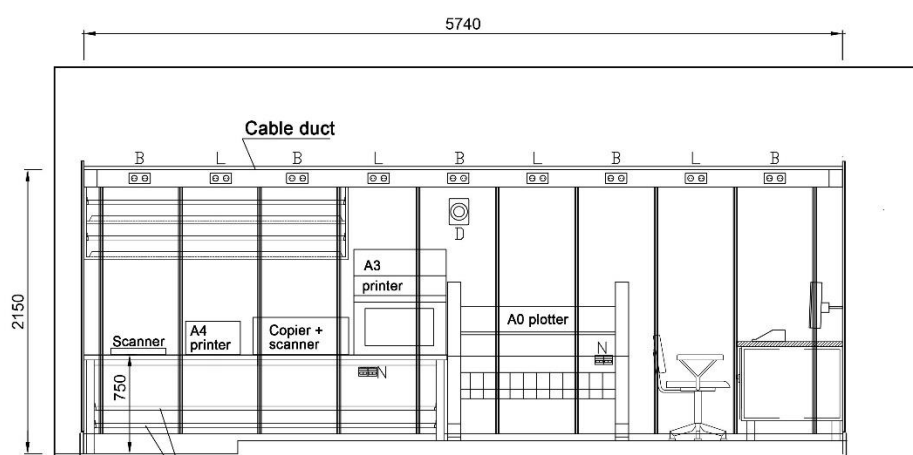
## 10 Laboratories and scientifically used rooms

10-16

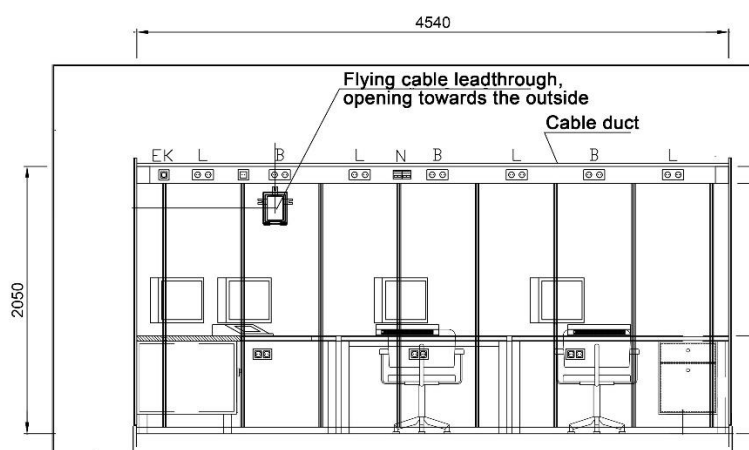
VIEW B



VIEW C



VIEW D



## 10 Laboratories and scientifically used rooms

10-17

### 10.9 Seismic compressor system

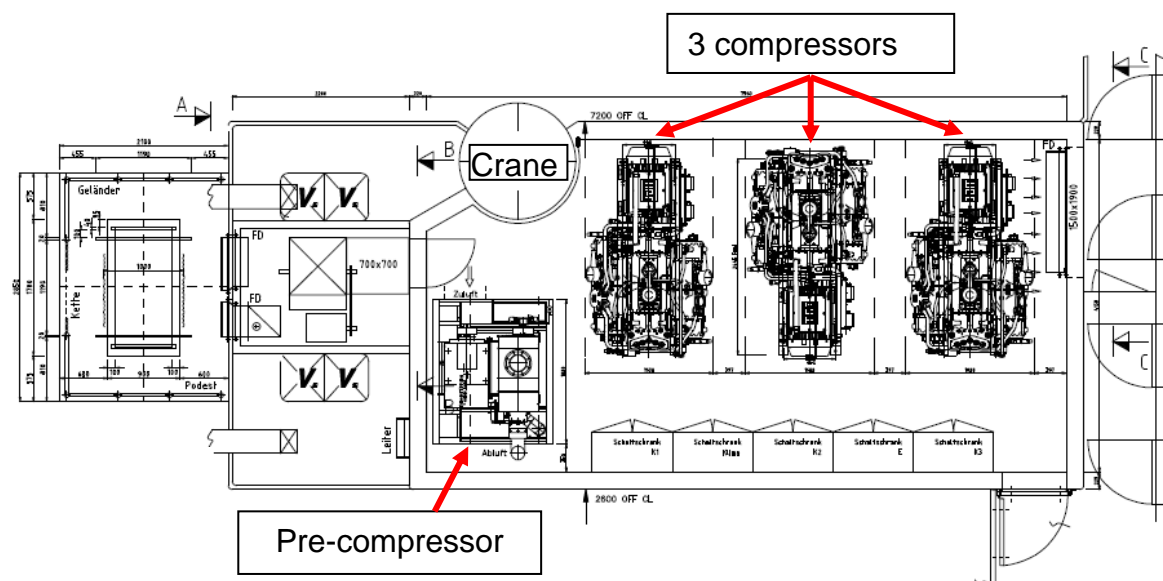
The fixed compressor system which was installed during the shipyard period in 2010 is on the back deck on the port side at the rear in a newly erected room (previously space 8/9 for the isotope laboratory container, which is now on the roof of the compressor building; 1st superstructure deck, under the same number.

The fixed system consists of three identical compressors of type WP6442 and an upstream pre-compressor. In this way, the compressor system can provide an air volume of up to 37.5 m<sup>3</sup>/min (intake volume) with 207 bar of end pressure. For air requirements that go beyond this, a mobile compressor with 10 m<sup>3</sup>/min with 207 bar can be added to the system, installed in a 20' standard container.

The maximum air volume **with a mobile compressor** is then 47.5 m<sup>3</sup>/min.

This container can be placed in either spaces **20/21** or spaces **23/24**.

#### Top view of compressor building, back deck:



#### Performance data for SAUER AIR COMPRESSOR –‘WP6000 SERIES’ WP6442

Capacity as per DIN 1945/ISO 1217	: 600 m <sup>3</sup> /h
Working pressure	: 207 bar (g)
Air outlet temperature/delta t (compared to cooling water)	: 10 °C
Residual oil content at air-outlet	: < 5 mg/m <sup>3</sup>
Max. ambient temperature	: + 5 °C up to + 55 °C

All capacity data with +/-5 % tolerance related to 20 °C and 1013 mbar!

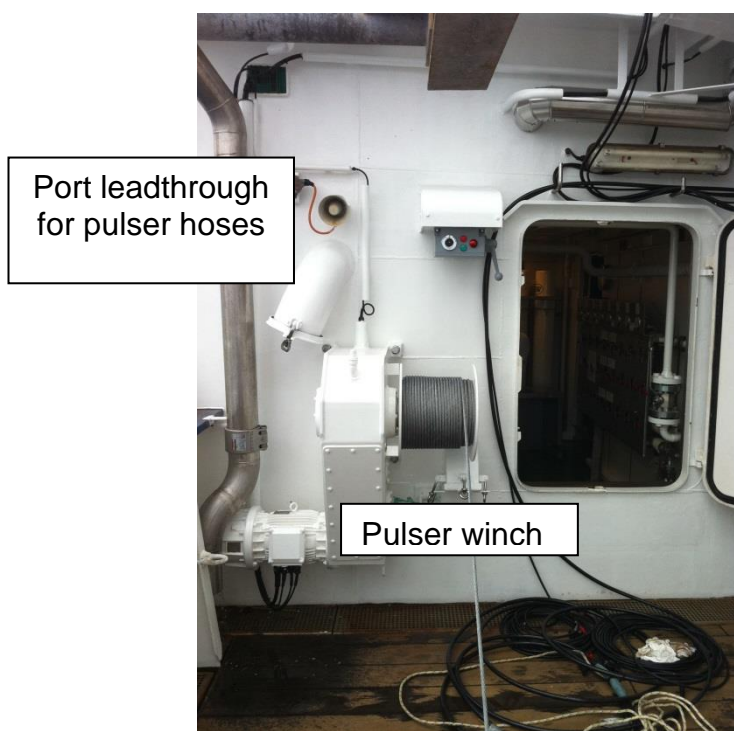
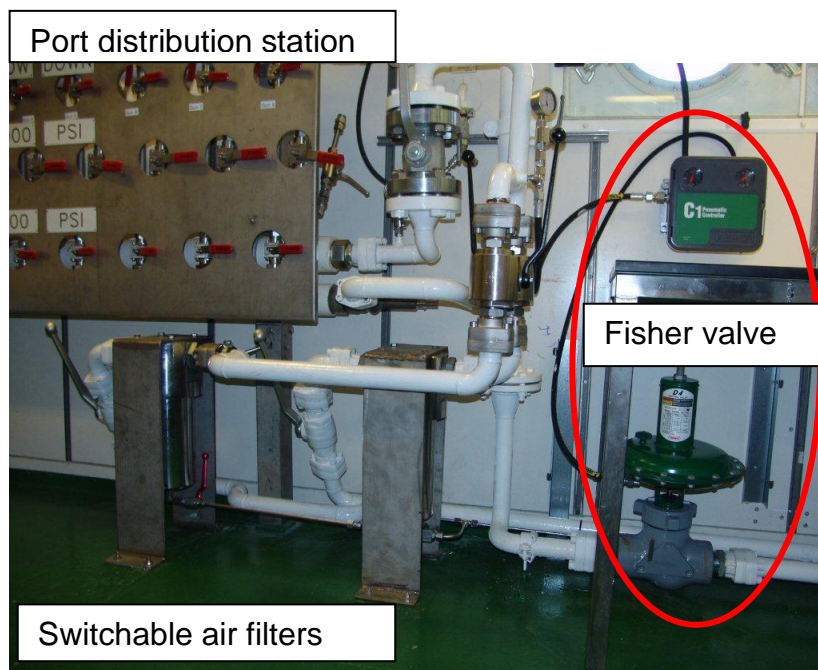
## 10 Laboratories and scientifically used rooms

10-18

### 10.9.1 Pulser station

The pulser station which has always been located at the port side at the rear on the main deck has been equipped with a 2nd distributor station, 10 buffer air pressure cylinders, 2 air filters and the so-called Fisher control valve.

A frequency-controlled and therefore continuously variable new pulser winch has been attached on the outside left next to the entrance door to the pulser room.

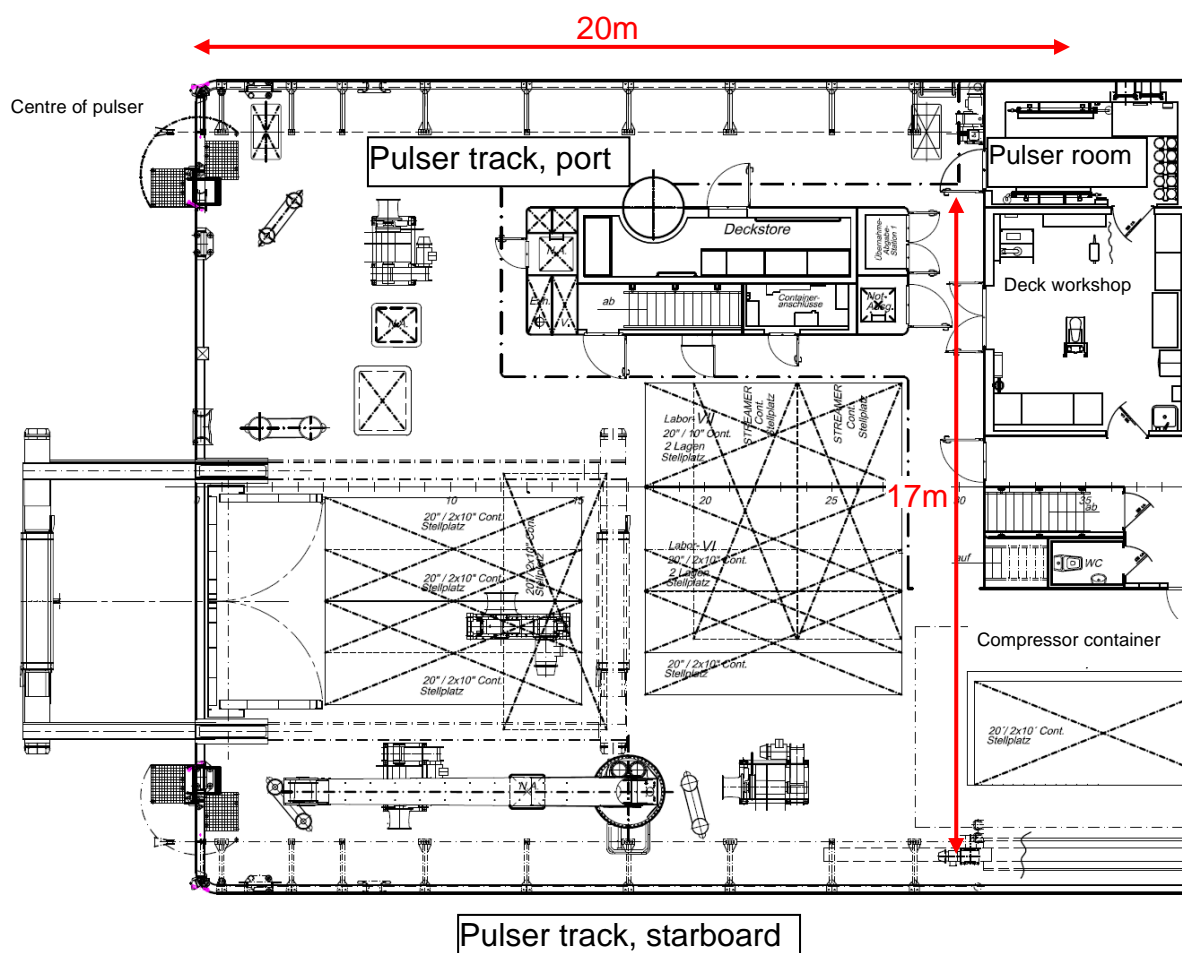


## 10 Laboratories and scientifically used rooms

10-19

In order to supply the air guns which are attached to the starboard pulser track, HD air hoses are required that are approximately **17 m longer**. The hoses are led out of the room via a curved pipe that is attached on the right above the door to the pulser room, and led abeam from the centre of the ship in an elevated half-shell made from metal to the starboard pulser track, supported at a sufficient height above the deck.

### Distances to pulser station:





**Air quantity graduation:**

m³/min	Performance range	Compressor 1			Compressor 2			Compressor 3			Blower
		40 Hz	50 Hz	60 Hz	40 Hz	50 Hz	60 Hz	40 Hz	50 Hz	60 Hz	
6.5	350 kW				Standby			Standby			
8.0					Standby			Standby			
10.0					Standby			Standby			
13.0								Standby			
14.5	550 kW							Standby			
16.0								Standby			
18.0								Standby			
20.0								Standby			
21.0											
23.0											
24.0											
26.5	800 kW										
28.0											
30.0											
37.5											

In order to be able to adapt the delivery quantity to the respective requirements of the air guns in a better way, the compressors can run at different speeds.

This results in tighter graduation of the individual delivery quantities.

Operation with a blower is only possible with 3 compressors at 60 Hz for technical reasons.

This results in a jump in the delivery quantity of 7.5 m³/h.

**Leistungsstufen Seismic container**

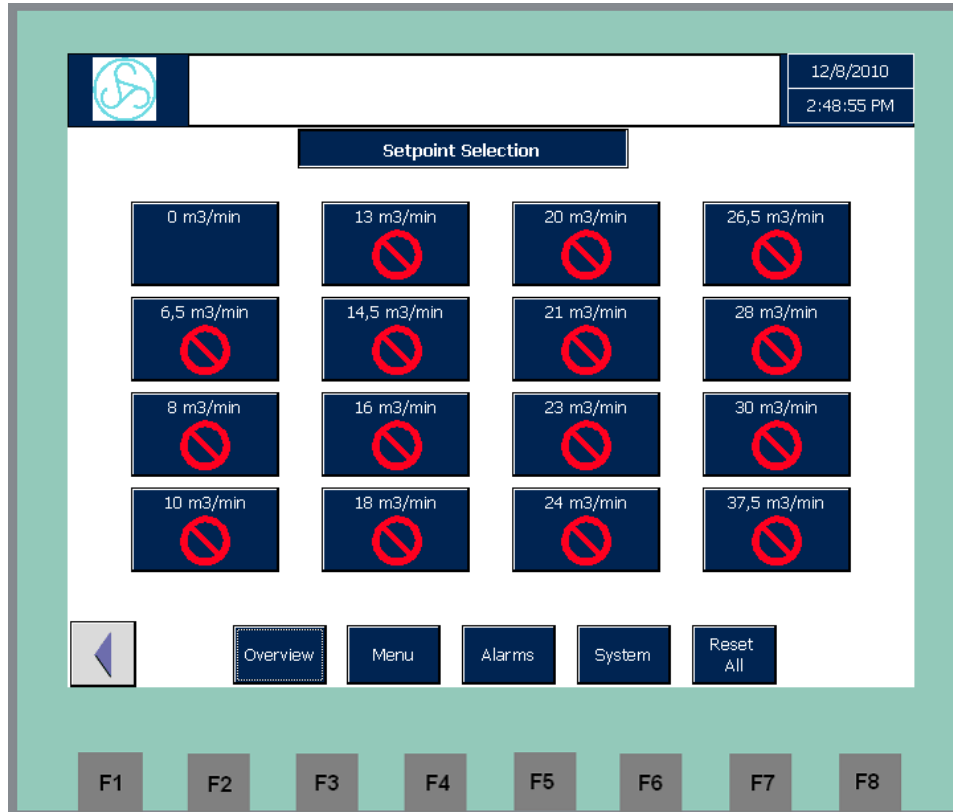
m³/min	Performance range	Compressor Container 1x WP6		
		40 Hz	50 Hz	60 Hz
6.5	116 kW - 128 kW			
8.0	145 kW - 156 kW			
10.0	172 kW - 186 kW			

If the mobile compressor container is used, a maximum of **47.5 m³/min** of air can therefore be provided.

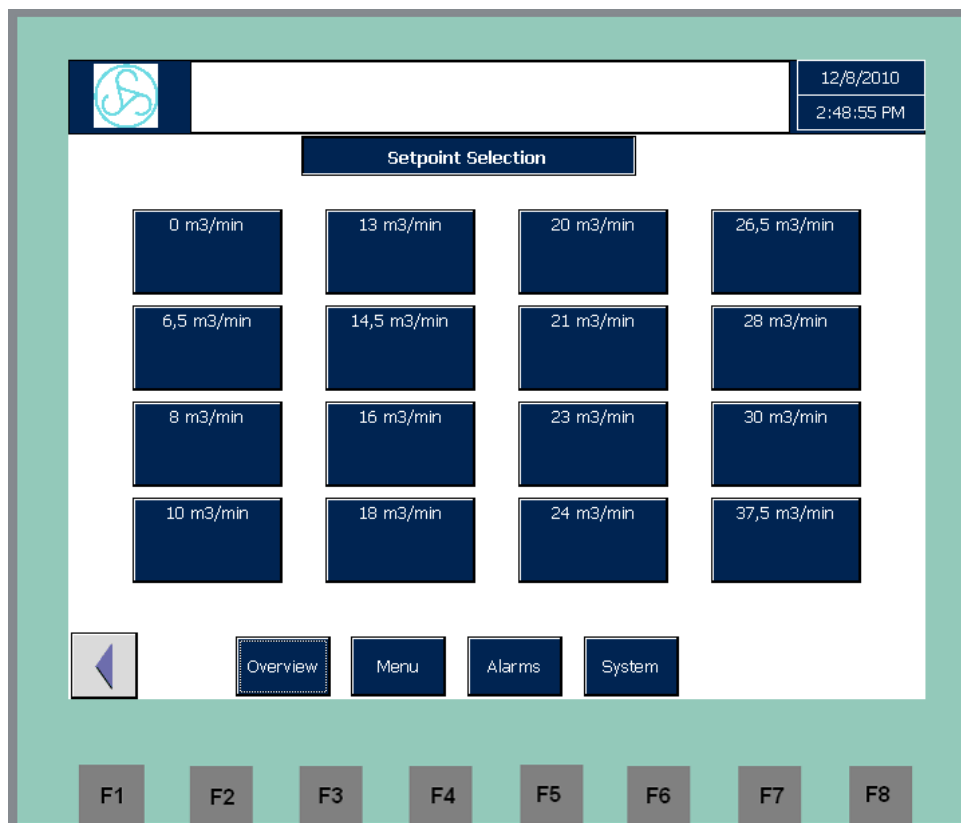
The required air quantities can be preselected using a **touchscreen monitor** in the pulser station by the users after consulting the leading engineer. Pressure control takes place via appropriate settings at the "Fisher valve".

If the air quantities are blocked due to lack of electrical power, a red prohibition symbol appears. In this case, more on-board power must be requested from the leading engineer.

Display shows ***"Selection blocked"***, because insufficient electrical power is available.



Display shows ***"Full air quantity selection"*** possible



## 10 Laboratories and scientifically used rooms













10-23

### 10.10 Server room

#### Server room

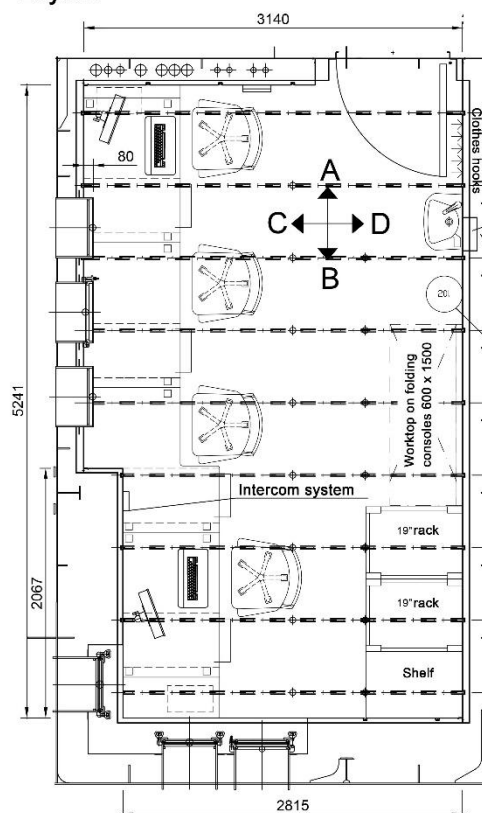
Main deck, starboard  
Ribs 92-98  
Room no.: 4223  
Tel.: 423

#### Key

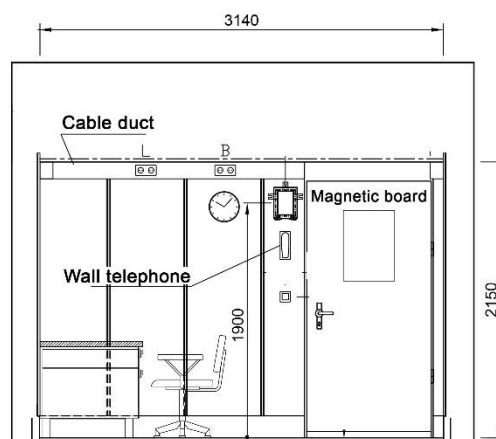
- |   |   |   |                                   |
|---|---|---|-----------------------------------|
|  | Wempe slave clock, diam. 187 mm                     |  | Fresh water hot/cold              |
|  | On-board power supply double socket, 230 V / 16 A   |  | Light switch                      |
|  | Laboratory power supply double socket, 230 V / 16 A |  | Antenna socket                    |
|  | Three-phase current 400 V / 32 A socket             |  | Socket (double)                   |
|  | Network/LAN connection socket                       |  | BNC socket, clock pulse generator |
|  | Single conductor cable                              |   |                                   |
|  | Earthing bolt                                       |   |                                   |

aft ← → front

#### Layout



#### VIEW A



#### Laboratory equipment

Electrical  
230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)

Water and air supply and disposal:  
Fresh water cold/hot (drinking water)

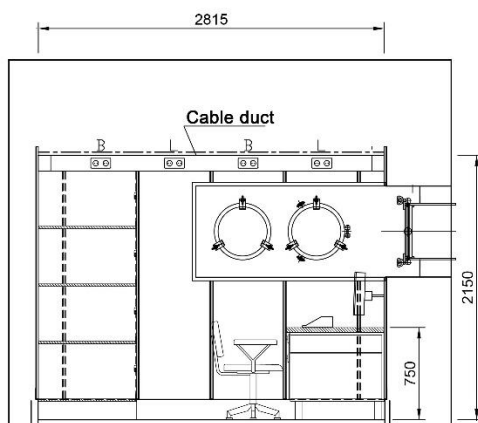
Communication:  
Socket to data distribution system  
Science intercom  
Antenna socket (radio / TV / video)  
CCTV video connecting socket  
BNC socket, clock pulse generator  
Connection for all discharger winches  
Fibre-glass hybrid cable connection

Other:  
PCs with monitor  
Laser printer, colour, A4  
ADCP location  
Laser printer, colour, A4  
CTD computer and operation  
Wave height measuring device (display, operation)

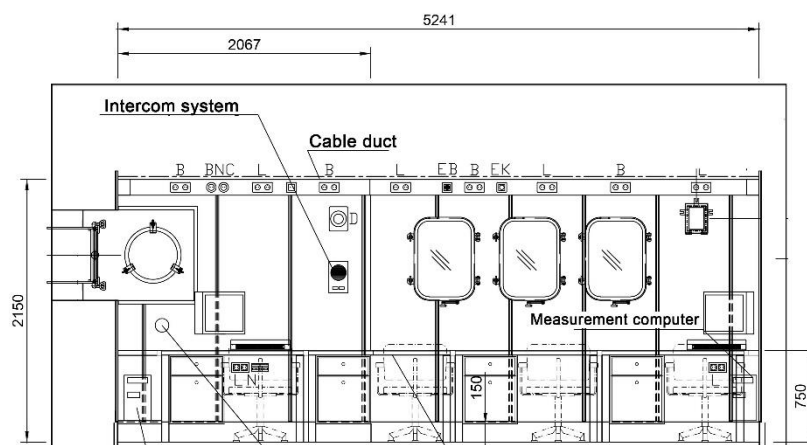
## 10 Laboratories and scientifically used rooms

10-24

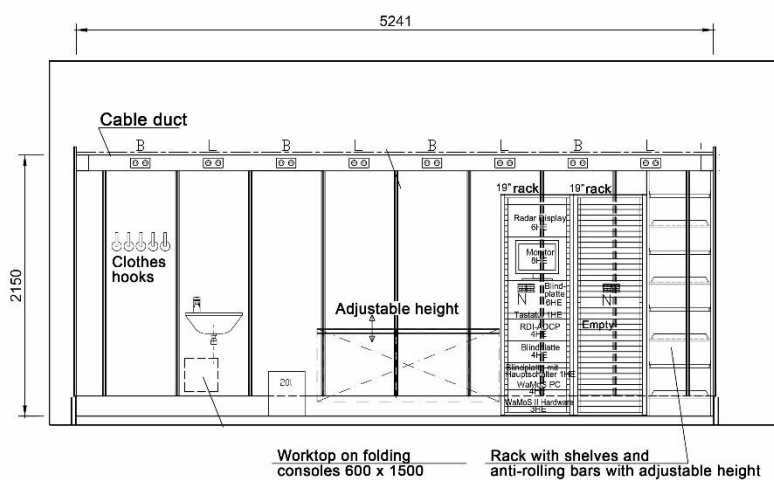
**VIEW B**



**VIEW C**



**VIEW D**



## 10 Laboratories and scientifically used rooms

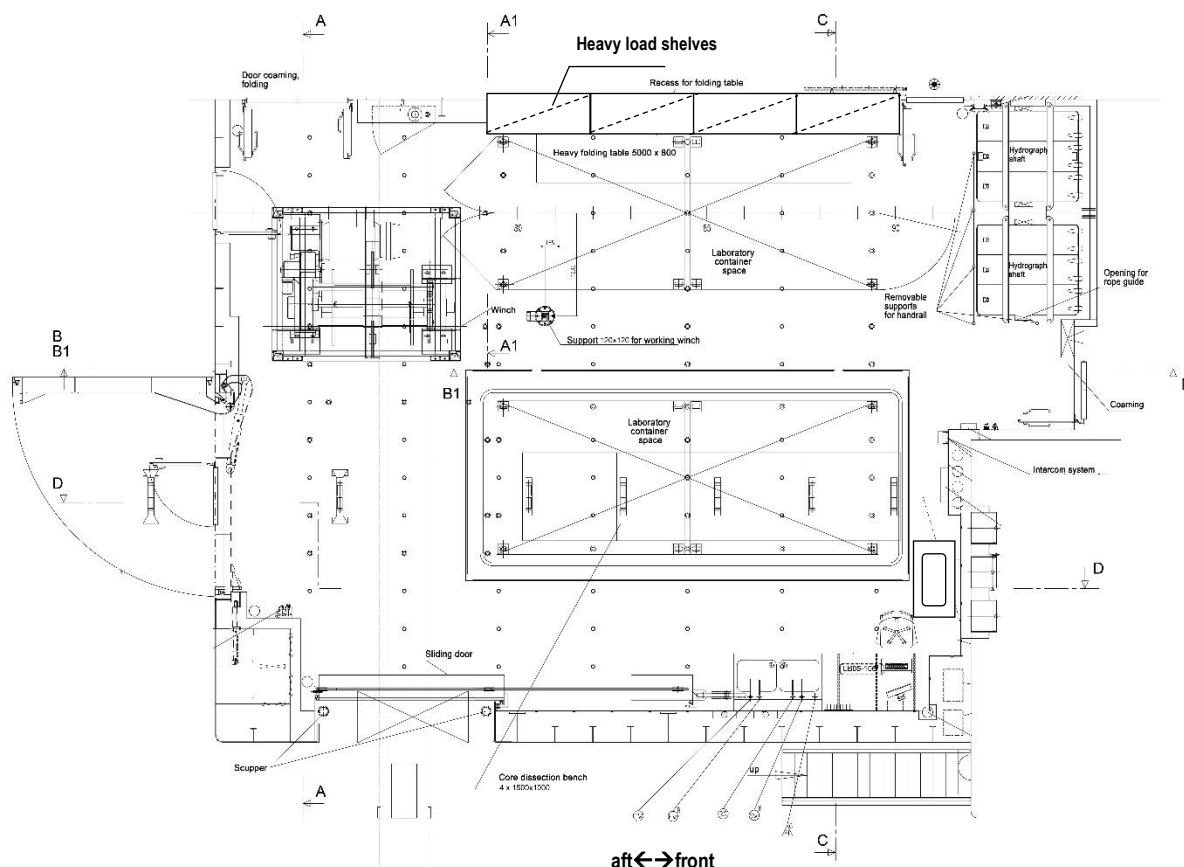
10-25

### 10.11 Hangar

#### Hangar

Main deck  
Ribs 72-95  
Room no.: 4301  
Tel.: 431

#### Layout – Main deck



#### Key

##### Laboratory equipment

##### Electrical:

230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)  
400 V 50 Hz three-phase current (CEE) 32 A

Water and air supply and disposal  
Fresh water cold/hot (drinking water)  
Service fresh water (3/8)  
Soft water off (pore osmosis)  
Service sea water  
Pure sea water (rotary pump)  
Pure sea water (membrane pump)  
Laboratory waste water  
Scupper (outboard runoff)  
Laboratory compressed air 0-10 bar

##### Communication:

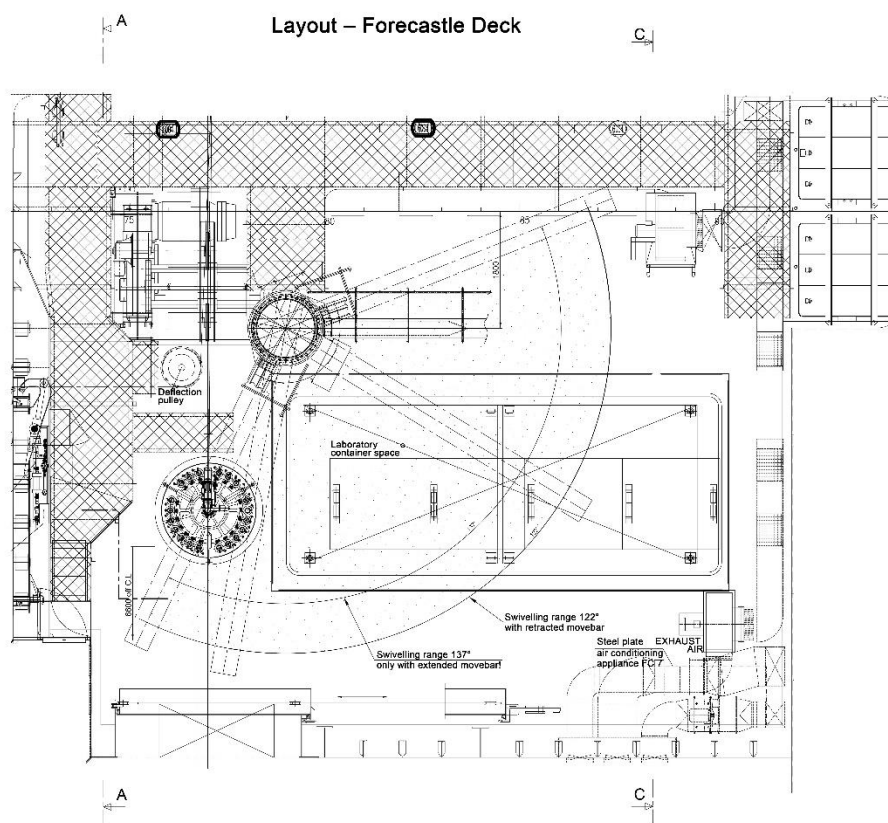
Socket to data distribution system  
Science intercom  
Antenna socket (radio / TV / video)  
CCTV video connecting socket  
Connection for all discharger winches

##### Other:

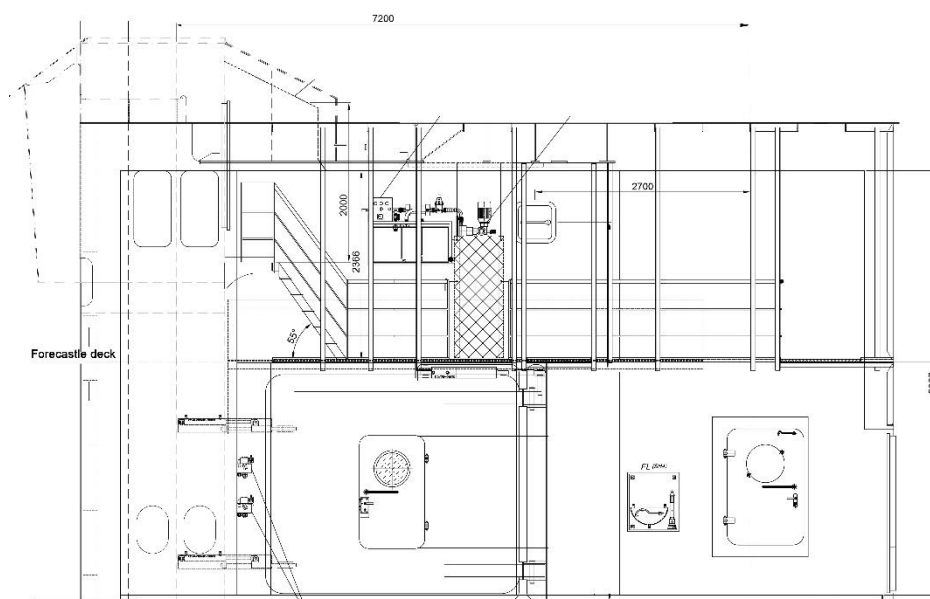
PC with monitor  
Waterborne sound measuring probe  
Container connection box  
Core dissection bench  
Small movebar (70 kN)  
Floor sockets (1500 x 600 mm)  
Large door to working deck  
Sliding door to bulwark

- B On-board power supply double socket, 230 V / 16 A
- L Laboratory power supply double socket, 230 V / 16 A
- D Three-phase current 400 V / 32 A socket
- N Network socket
- FW Fresh water hot/cold
- RS Pure sea water
- FV Service fresh water
- SW Service sea water
- A6 Working pressure 6 bar





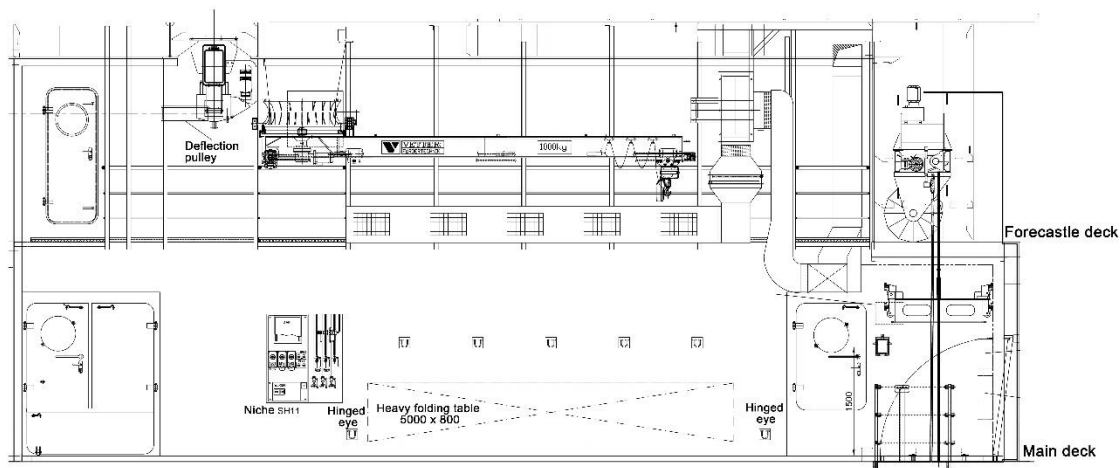
Section A-A



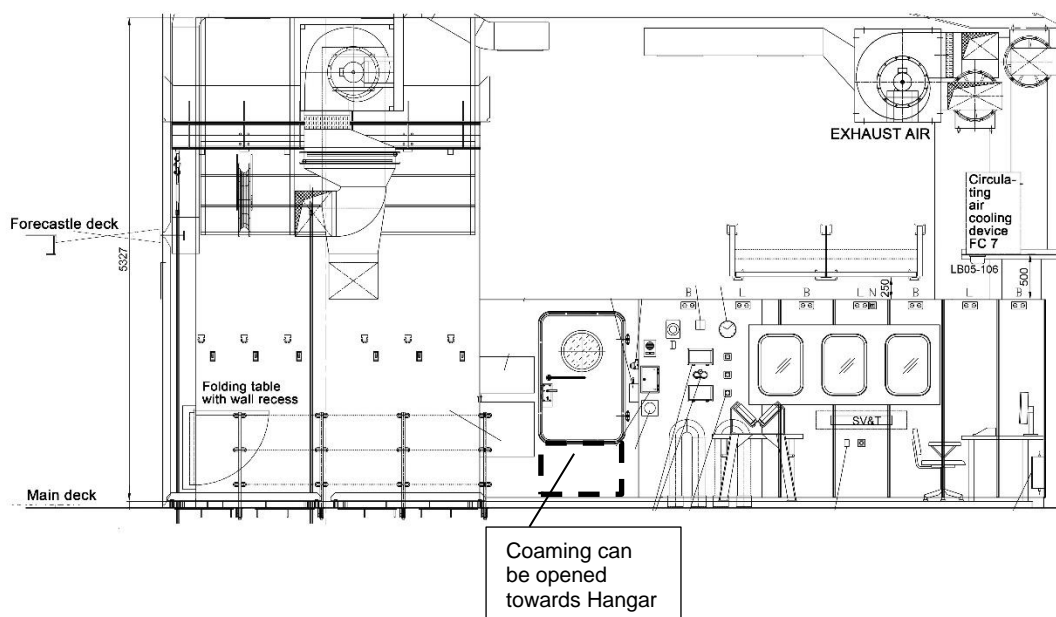
## 10 Laboratories and scientifically used rooms

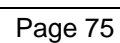
10-27

Section B-B



Section C-C

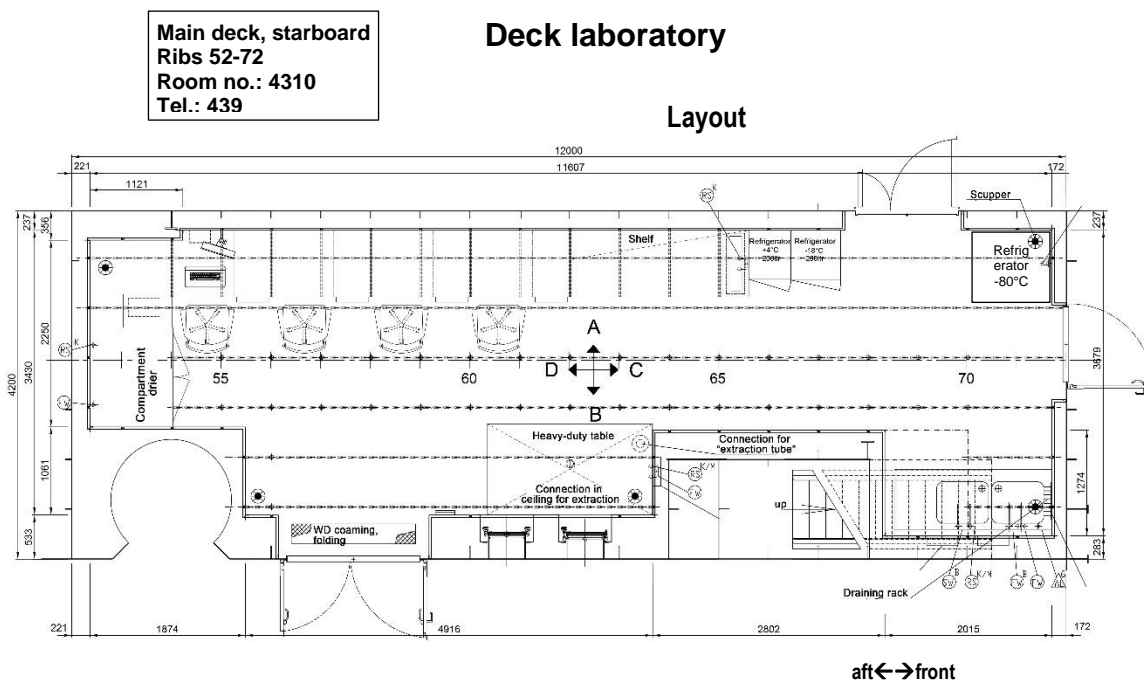




## 10 Laboratories and scientifically used rooms

10-29

### 10.12 Deck laboratory



#### Laboratory equipment

##### Electrical:

230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)  
400 V 50 Hz three-phase current (CEE) 32 A

##### Water and air supply and disposal:

Fresh water cold/hot (drinking water)  
Service fresh water (3/8)  
Soft water off (pore osmosis)  
Service sea water  
Pure sea water (rotary pump)  
Pure sea water (membrane pump)  
Laboratory waste water  
Scupper (outboard runoff)  
Compressed air 0-6 bar

##### Communication:

Socket to data distribution system  
Science intercom  
Antenna socket (radio / TV / video)  
CCTV video connecting socket  
Connection for all discharger winches

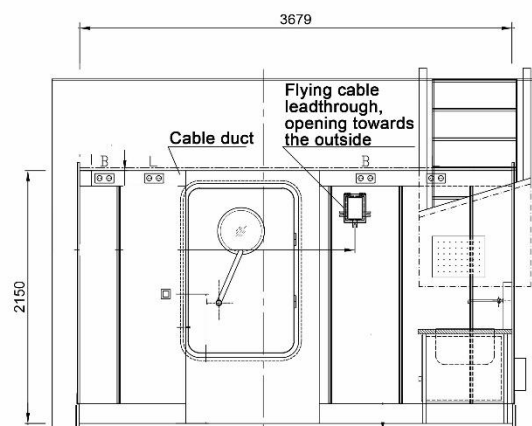
##### Other:

Chemical hood  
Compartment drier  
Refrigerator (+4 °C)  
Freezer (-18 °C)  
Air suction ventilator unit  
PC with monitor  
Freezer -80 °C  
Heavy-duty table with water supply and drain

#### Key

	Wempe slave clock, 20804/ T		On-board power supply double socket
	Service fresh water		Laboratory power supply double socket
	Pure sea water		Three-phase current 400 V / 32 A socket
	Service fresh water		Network/LAN connection socket
	Working pressure 6 bar		Fresh water hot/cold
	Light switch		Single conductor cable
	Antenna socket		Socket (double)
	BNC socket, clock pulse generator		Container/laboratory CCTV video connecting socket

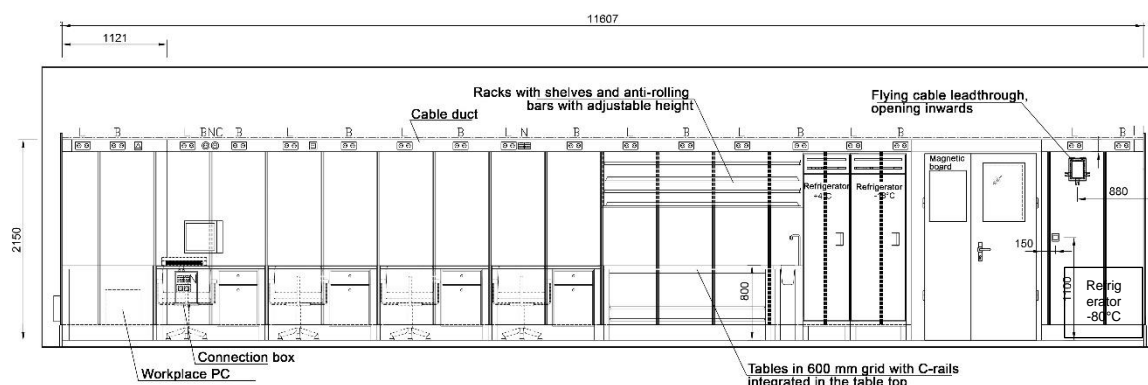
#### VIEW C



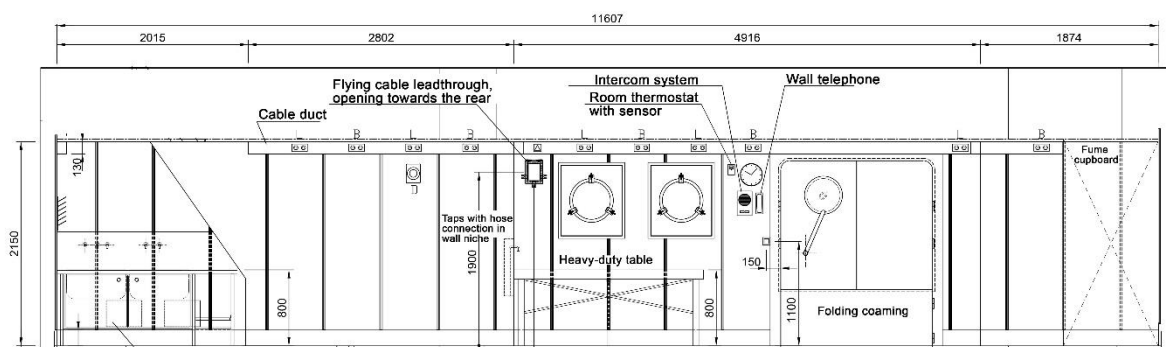
**10 Laboratories and scientifically used rooms**

**10-30**

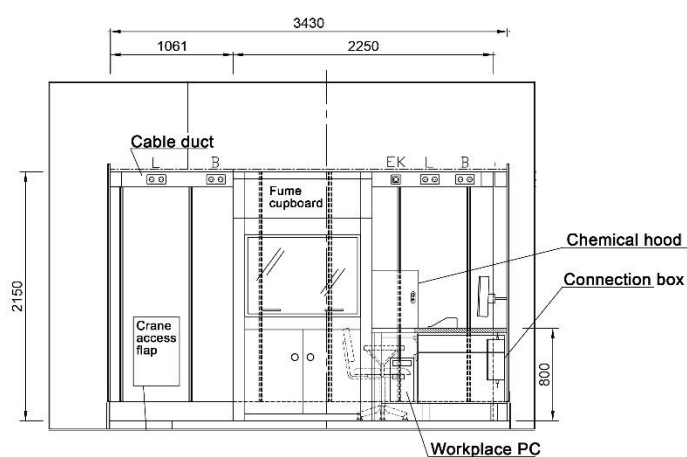
**VIEW A**



**VIEW B**



**VIEW D**



## 10 Laboratories and scientifically used rooms

10-31

### 10.13 Scientific refrigeration and freezing room

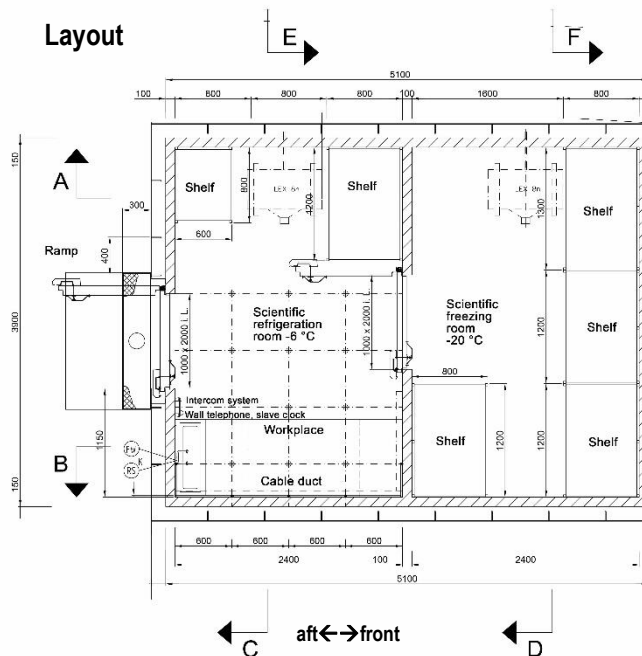
#### Scientific refrigeration and freezing room

Tween deck, port  
Ribs 981-90  
Room no.: 3308  
Tel.: 338

The scientific refrigeration room can be used as a laboratory.  
It can be cooled to  $-6^{\circ}\text{C}$  ( $\pm 0.5^{\circ}\text{C}$ ).

The scientific freezing room can be cooled to  $-20^{\circ}\text{C}$  ( $\pm 0.5^{\circ}\text{C}$ ).

The temperature is set at the ship side by the machine personnel.



#### Key



On-board power supply double socket

B



Laboratory power supply double socket

L



Network socket

N

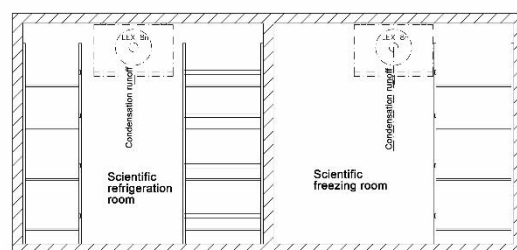
#### VIEW A

#### Laboratory equipment

Electrical:  
230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)

Water and air supply and disposal:  
Fresh water cold/hot (drinking water)  
Pure sea water (membrane pump)  
Laboratory waste water

Communication  
Socket to data distribution system  
Science intercom

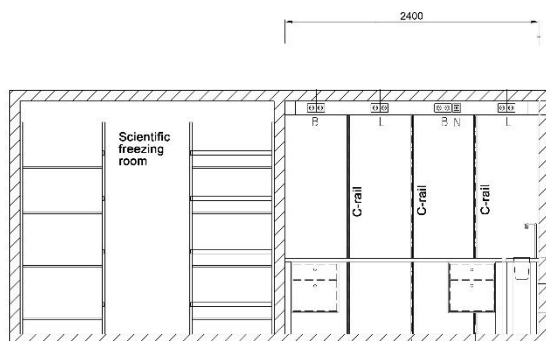




## 10 Laboratories and scientifically used rooms

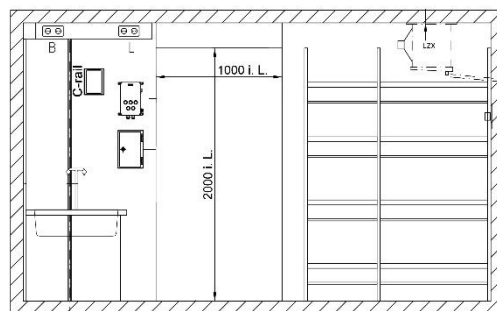
10-32

VIEW B



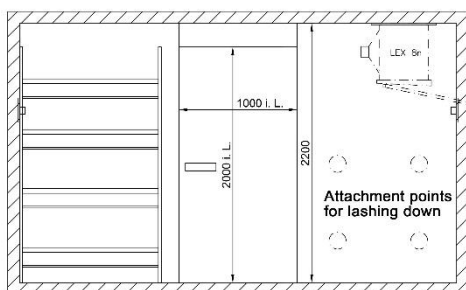
VIEW C

Scientific cold room



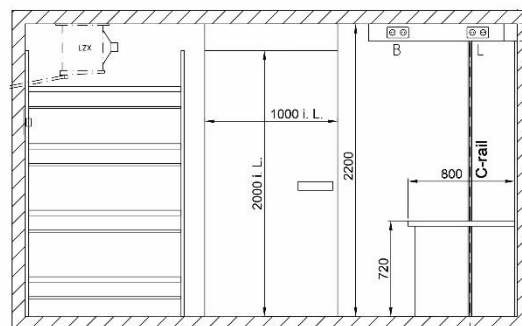
VIEW D

Scientific freezing room

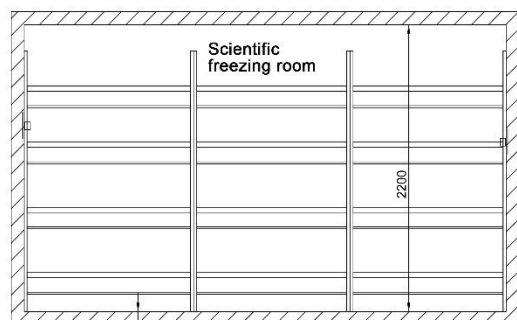


VIEW E

Scientific refrigeration room



VIEW F

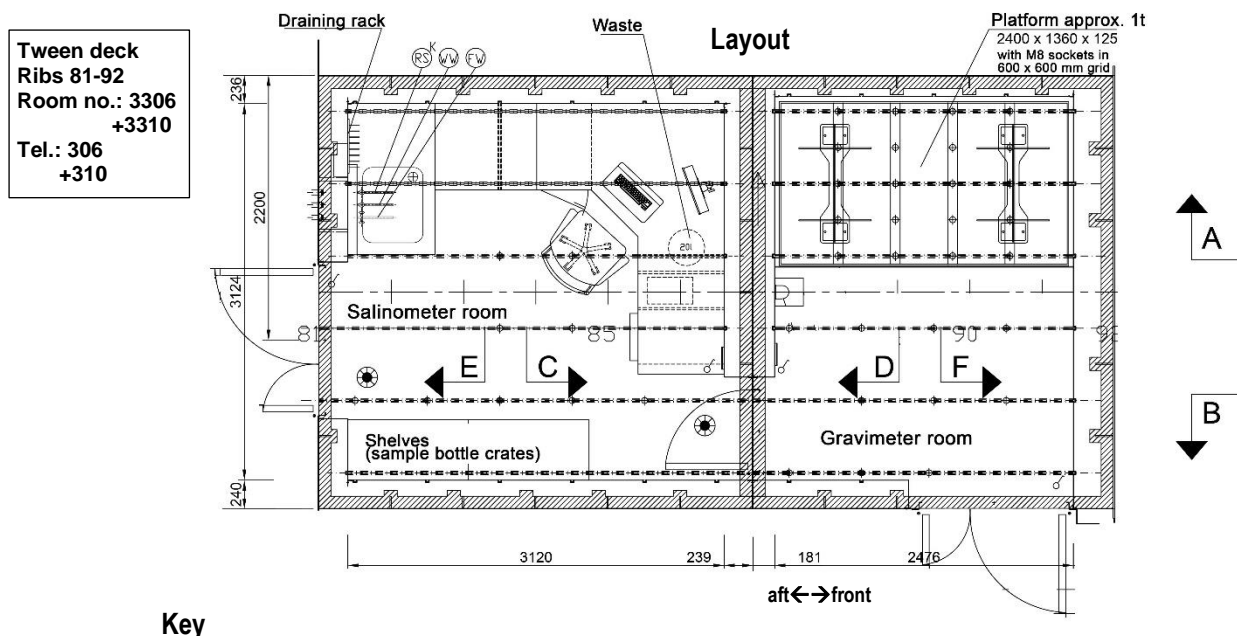


## 10 Laboratories and scientifically used rooms

10-33

### 10.14 Salinometer and gravimeter room

**Note:** Control range of air conditioning for both rooms: 15...25 °C!



#### Salinometer room

##### Laboratory equipment

##### Electrical:

230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)  
400 V 50 Hz three-phase current (CEE) 32 A

Water and air supply and disposal:  
Fresh water cold/hot (drinking water)  
Pure sea water (rotary pump)  
Laboratory waste water  
Scupper (outboard runoff)

##### Communication:

Socket to data distribution system  
Science intercom  
Antenna socket (radio / TV / video)

##### Other:

PC with monitor  
Temperature control  $\pm 0.5$  °C

#### Gravimeter room

##### Laboratory equipment

##### Electrical:

230 V 50 Hz on-board power supply (white)  
230 V 50 Hz laboratory power supply (red)  
400 V 50 Hz three-phase current (CEE) 16 A

##### Communication

Socket to data distribution system  
Science intercom

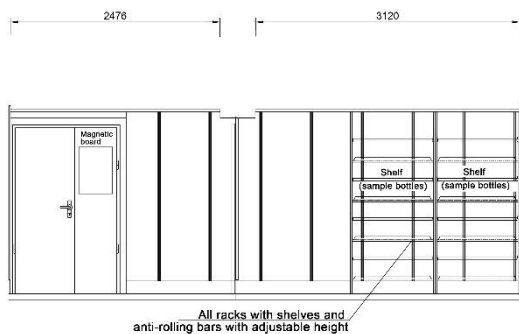
##### Other:

Temperature control  $\pm 0.5$  °C  
Low-vibration platform (M8 sockets)

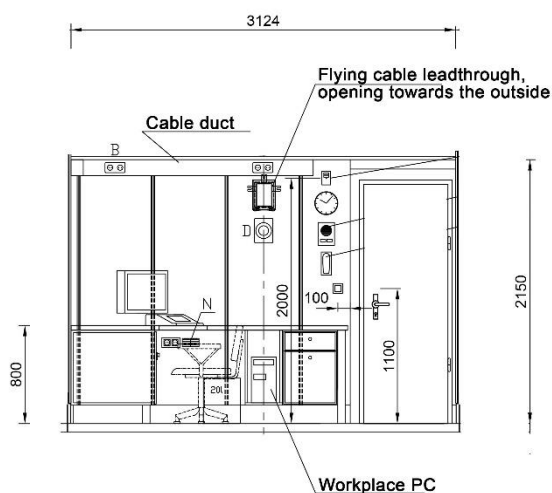
## 10 Laboratories and scientifically used rooms

10-34

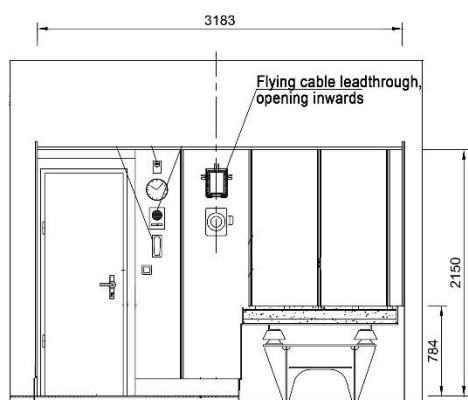
**VIEW B**



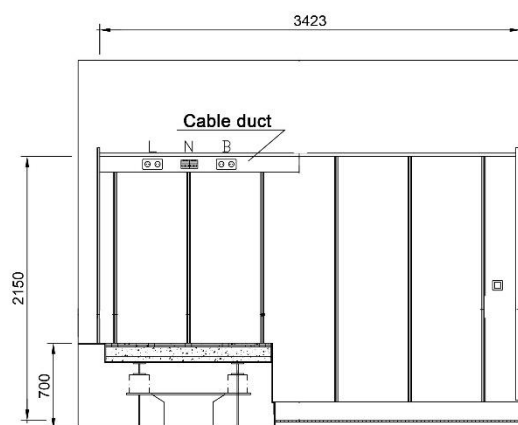
**VIEW C**



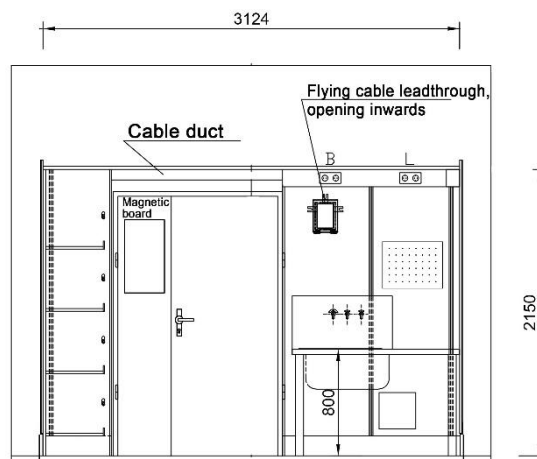
**VIEW D**



**VIEW F**



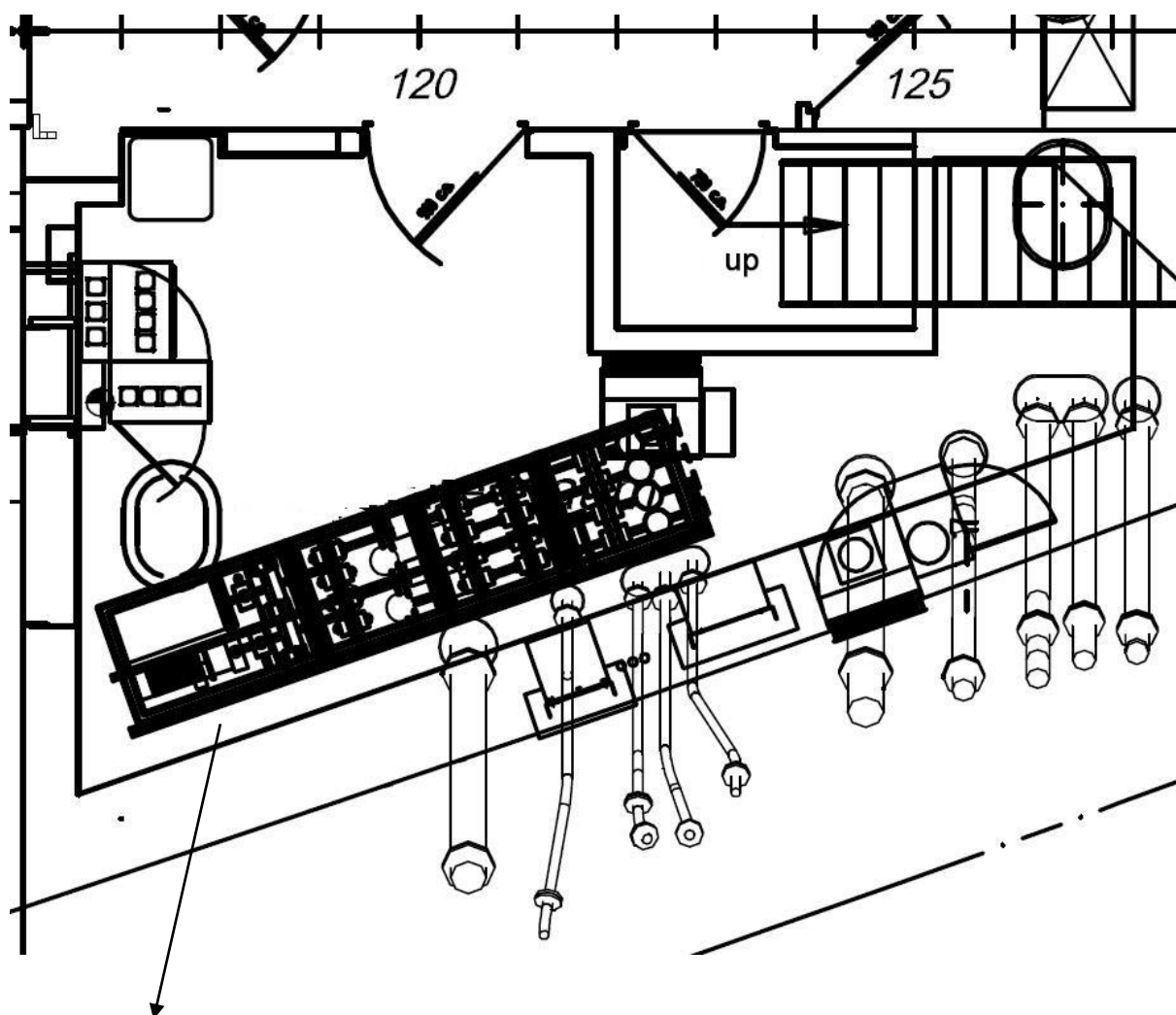
**VIEW E**



## 10 Laboratories and scientifically used rooms

10-35

### 10.15 Echosounder equipment room



#### PureSeaWater system

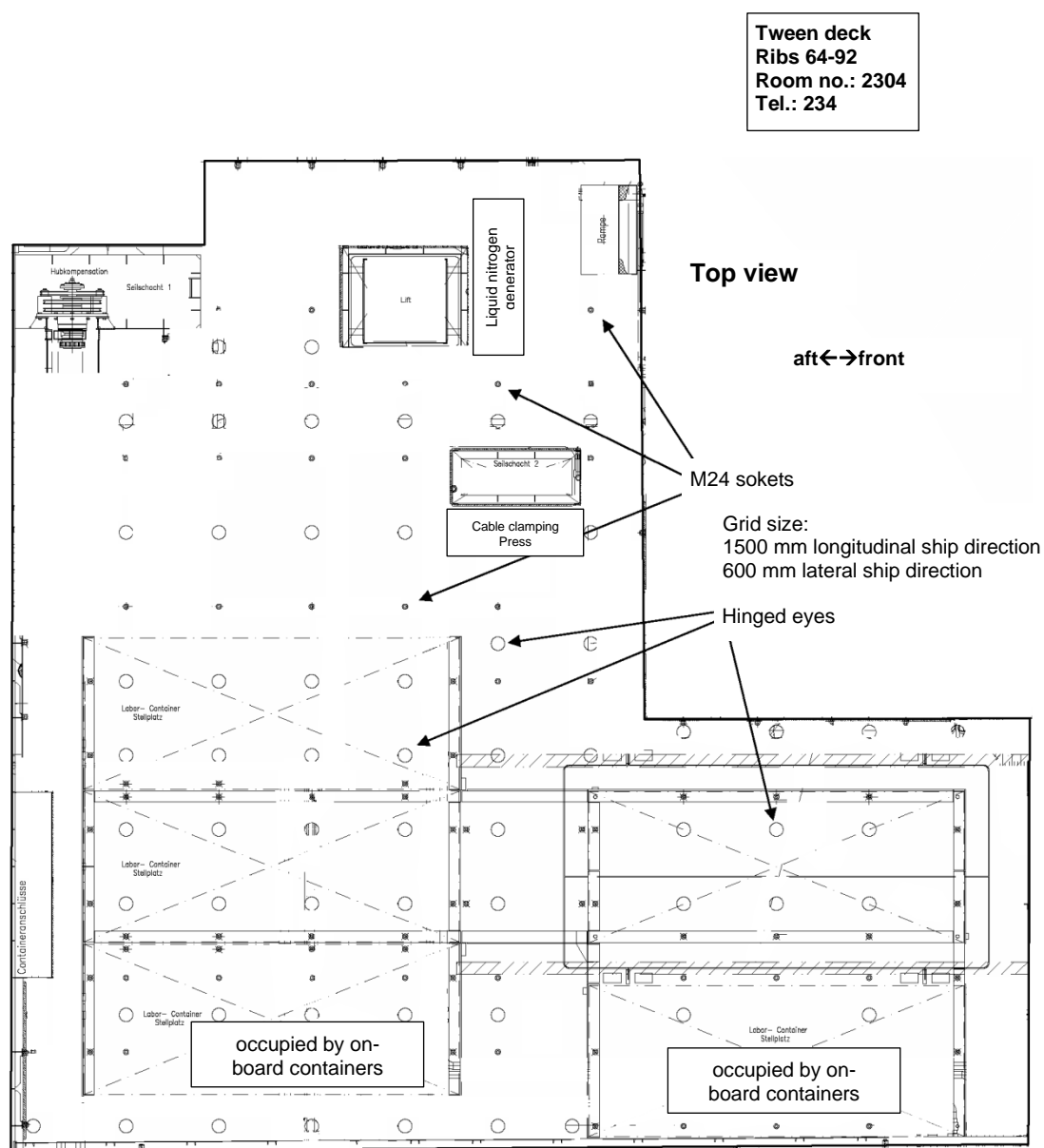
As well as the pure sea water system, the connecting switch boxes of the cables coming in from the individual sounding oscillators (EA600; EM122, EM712 and Parasound) are accommodated in this room.

## 11 Other rooms

11-1

### 11.1 Scientific storage room

#### Scientific storage room



Architectural section drawing of a building facade showing a series of vertical air ducts. The drawing includes a top elevation with structural details and a bottom elevation with dimensions. The dimensions at the bottom are: 1220, 1265, 1000, 1305, 1335, 1305, 1305, 1000, 1000, 1265, 1265, 1305, 1305. A label "Centre supports between air ducts" is at the bottom right.

The drawing is a technical layout of a lift shaft. On the left, a vertical section labeled 'Rope shaft 1' shows a series of horizontal layers. To its right is a large rectangular area representing the shaft floor, divided into several vertical sections by dashed lines. A horizontal line runs across the middle of this area. At the bottom, a dimension line with tick marks is labeled with the numbers 65, 70, 75, and 80. Two callout lines point from text labels at the bottom to specific features in the drawing: one points to a circular component in the rope shaft area, and the other points to a small square feature on the shaft floor.

Rope shaft 1

Lift compensation arrangement expanded since 2012

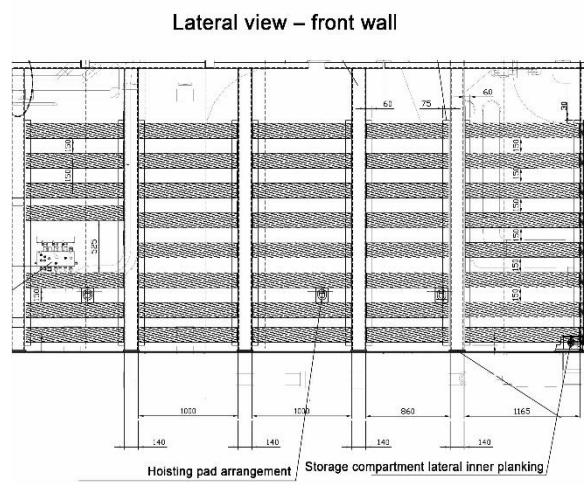
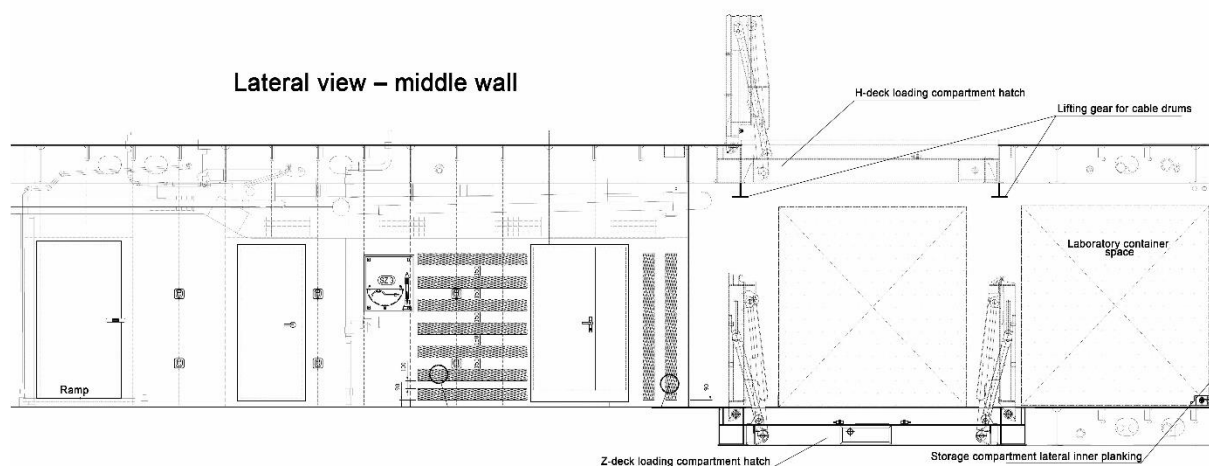
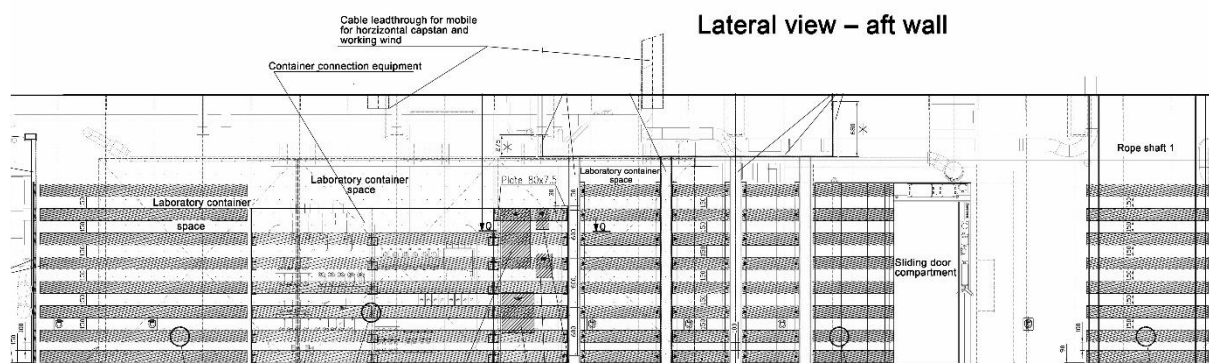
Hoisting pad arrangement

Technical drawing of a hoisting pad arrangement. The drawing shows a side view of a structure with multiple horizontal layers. On the left, there is a section labeled "Lifting gear for cable drums" with a circular detail. On the right, there is a section labeled "Hoisting pad arrangement" with a circular detail. The drawing includes various dimensions and structural details.



**11 Other rooms**

**11-3**





## 11 Other rooms

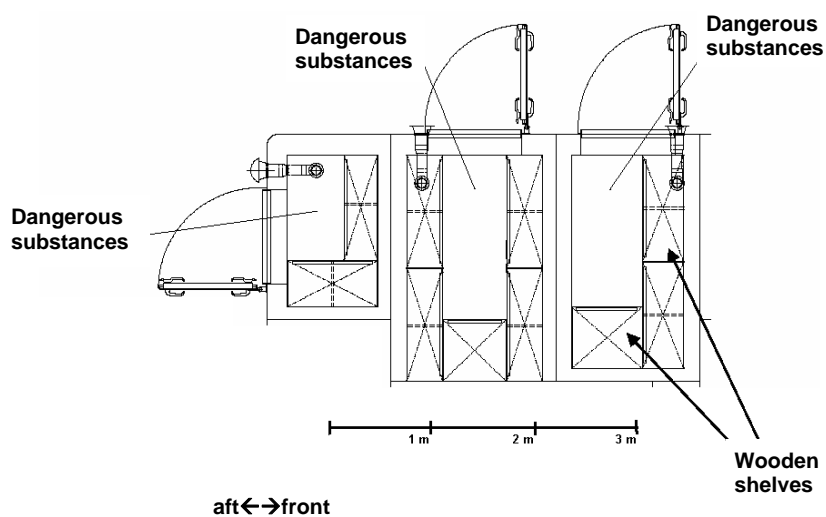
11-4

### 11.2 Storage spaces for hazardous materials

#### Storage spaces for hazardous materials

Forecastle deck, port  
Ribs 32-39  
Room no.: 5502 +  
5504 + 5506

Top view



#### Remark

The three storage rooms are on the forecastle deck right in the stern (rear) at the port side (left).

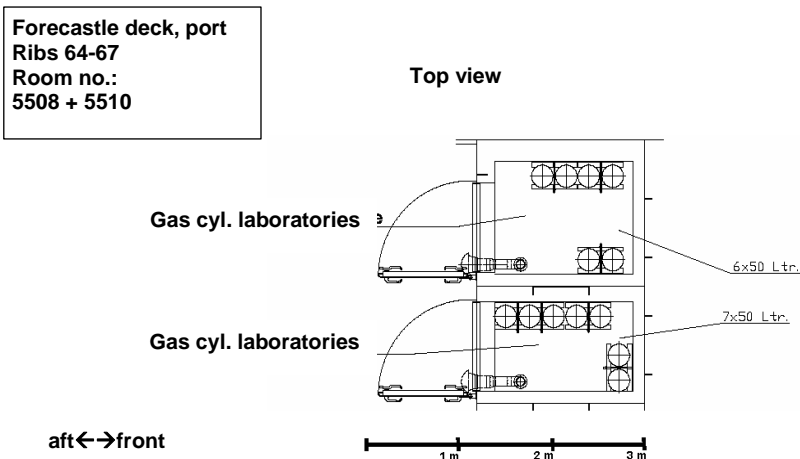
Hazardous materials may only be stored with the agreement of the crew (1st officer).

## 11 Other rooms

11-5

### 11.3 Scientific gas cylinder rooms

#### Scientific gas cylinder rooms



#### Remark

The two scientific gas cylinder rooms are on the forecastle deck at the port side (left) in front of the standby boat.

All laboratories can be supplied from the two scientific gas cylinders via the "flying cableways".

## **12 Hydro-acoustic systems**

## **12-1**

The Maria S. Merian has nine fixed hydro-acoustic systems and also four mobile systems which can be installed as required. The enclosed diagram shows the arrangement of the individual components. These are:

- Atlas PARASOUND DS P-70 (parametric sediment echo sounder, 'Sub-Bottom Profiler')
- Kongsberg (Simrad) EM122 (12 kHz deep sea multibeam echo sounder, 50-11000 m water depth)
- Kongsberg (Simrad) EM712 (40 - 100 kHz shallow water multibeam echo sounder, 3 - 3600 m water depth)
- Kongsberg (Simrad) EA600 (vertical sounder / multi-frequency sounder: 12 kHz)
- Kongsberg (Simrad) pinger sounder (in interaction with EA600/12 kHz)
- Kongsberg (Simrad) EN250 (50 kHz navigation sounder up to approx. 800 m water depth)
- Applied Microsystems SVplus (sound profile probe, up to water depth of 2000 m)
- Applied Microsystems SV&T (sound velocity probe with temperature sensor)
- Lookhead Martin Sippican deck unit and launcher (all probes possible, only Tzp XSV on board)
- SONARDYNE (USBL underwater positioning system)
- RD Instruments flow profile sounder / ADCP (Acoustic Doppler Current Profiler) 75 kHz fixed installation; 38 kHz mobile in starboard sounding shaft
- Atlas DOLOG 20 (Doppler Log); cannot be used if the 75 kHz ADCP is in operation

A mobile hydrophone is installed at the hydraulic extension unit ('Asparagus'), see chap. 15.7 and 15.8.

Two Kongsberg workstations with SIS are available for the EM122 and EM712. Each of the two workstations can be connected to one of the two sounders.

16 detailed sea maps can be displayed on the APC-35 "Planning Station" with the Global Mapper software (ENC and ARCS). Routes and 'mattresses' for areas to be mapped or other profile types (e.g. OFOS) can be defined using the Global Mapper and transferred to the bridge. The transfer to the bridge is also possible from Global Mapper installations which have been brought on board. More detailed instructions can be found on the Intranet page.

The use of a 12 kHz pinger for certain sampling devices requires switching over at the oscillator/transducer of vertical sounder EA600, which is why the EA600 for 12 kHz and the pinger sounder cannot be used in parallel. Alternatively, the Posidonia system can be used for pinger deployment if the vertical sounder is to be actively used.

Another operating PC is available on the bridge for PARASOUND on which Parasound with the full scope of functionality is available.

The EM122 and EM712 can be accessed from the computer using VNC. The numerical depth values of all sounders can be displayed online (1 Hz frequency) on any workplace computer (APC) connected to the Werum data distribution system (DSHIP) in any laboratory, and therefore also exported from the database over any required time period.

## **12 Hydro-acoustic systems**

## **12-2**

All scientific sounding systems obtain data for compensating the heading (yaw), rolling movement, lifting movement and pitch of the ship from the 'Motion Reference Unit' (MRU) via the Kongsberg 'Seapath 320' system (chap, 13.5) and are therefore essentially unaffected by the movements of the ship.

The EN 250 navigation sounder on the bridge is primarily responsible for providing the depth beneath the keel, and can therefore not be used for scientific purposes. The same applies to the speeds supplied by the DOLOG 20. However, unlike the ADCP and Posidonia, all of the parameters for these two sounders are entered into the DSHIP database and can therefore be exported.

The ADCPs (38 kHz and 75 kHz) are operated from the sounder room or from any computer using VNC. The Posidonia system is operated from the server room, and the parametrisation of the SVP sound profile probe and the data transfer of the measured sound profile (and the online values of the SV+T probe, i.e. the C-Keel and the C-Mean) from there to all sounding systems in the sounder room. The so-called 'measuring computer' is available for this purpose. Alternatively, sound profiles can also be supplied by the on-board (or external) CTD and made available to the echo sounders and Posidonia.

The Sippican system is operated from the pulser station, and the data is provided on a network drive in the IT centre.

In October / November 2017 a new underwater positioning system of the SONARDYNE brand was installed in the portside moonpool in Emden (see also 12.9).

The system consists of the following components:

- Hydraulic extension unit, installed in the former portside moonpool, to be operated from the topside of the moonpool and "remote" at the bottom of the moonpool and from the bridge (normal operation),
- Ranger 2 Gyro USBL HPT 7000,
- 2x transponder WSM 6+, 4000m,
- 2x transponder WMT, 7000m,
- 1x transponder WMT with remote transducer, 7000m.

The speed of the ship should not exceed 6-7 kn with the system deployed (e.g. when moving the ship to a neighbouring station); in ice-covered regions it may only be extended on station in order to trigger anchorings, for example (the shafts must always be closed during travel).

It is not worthwhile using the 38 kHz ADCP whilst the PARASOUND is in operation due to the neighbouring frequency (see below).

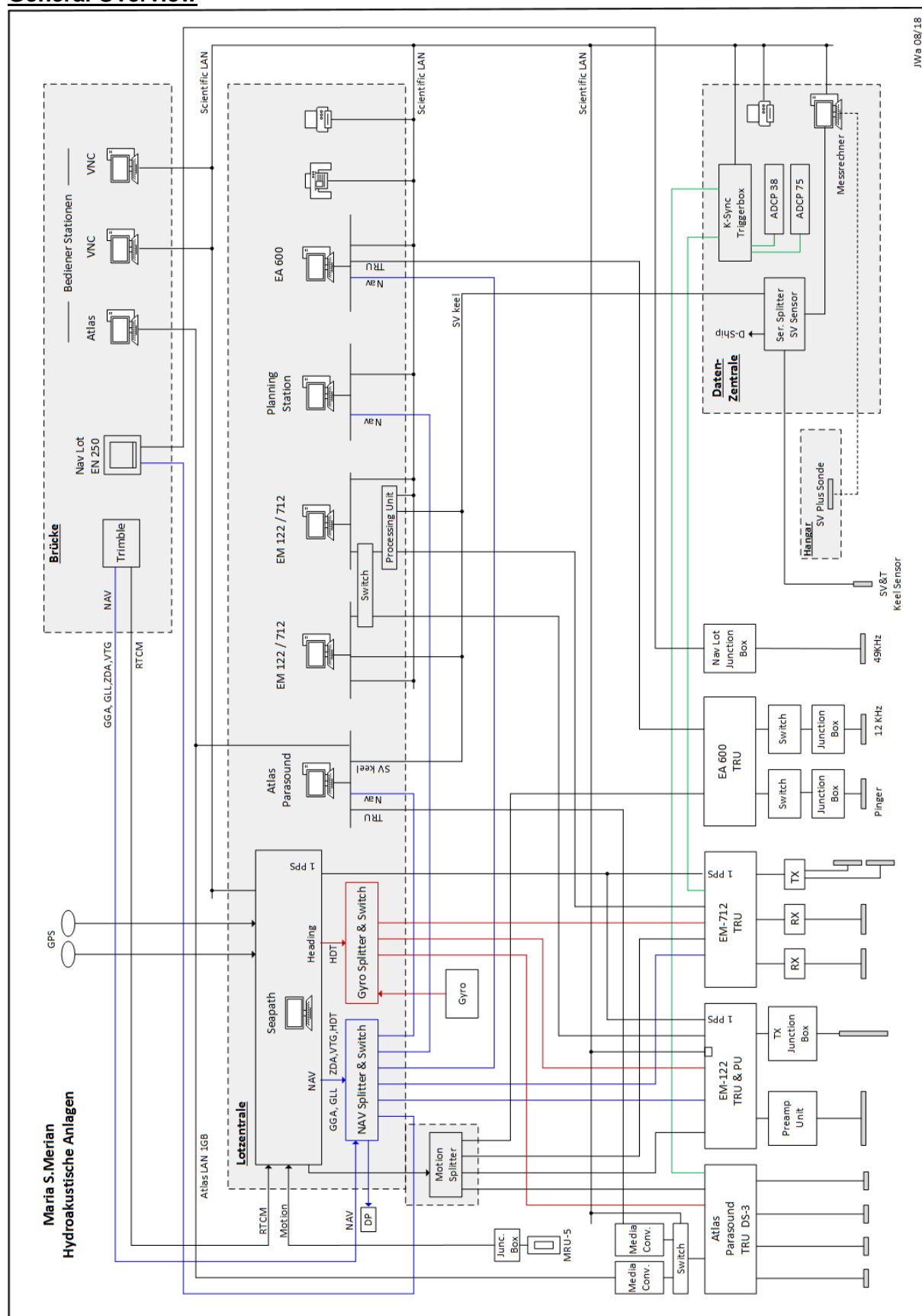
It is not worthwhile using the 75 kHz ADCP whilst the DOLOG is in operation on the bridge for the speed measurements due to the neighbouring frequency (see below). It must therefore be ensured that the Satlog is used instead of the DOLOG in this case.

A hydrophone is permanently fitted to the extension unit.

## **12 Hydro-acoustic systems**

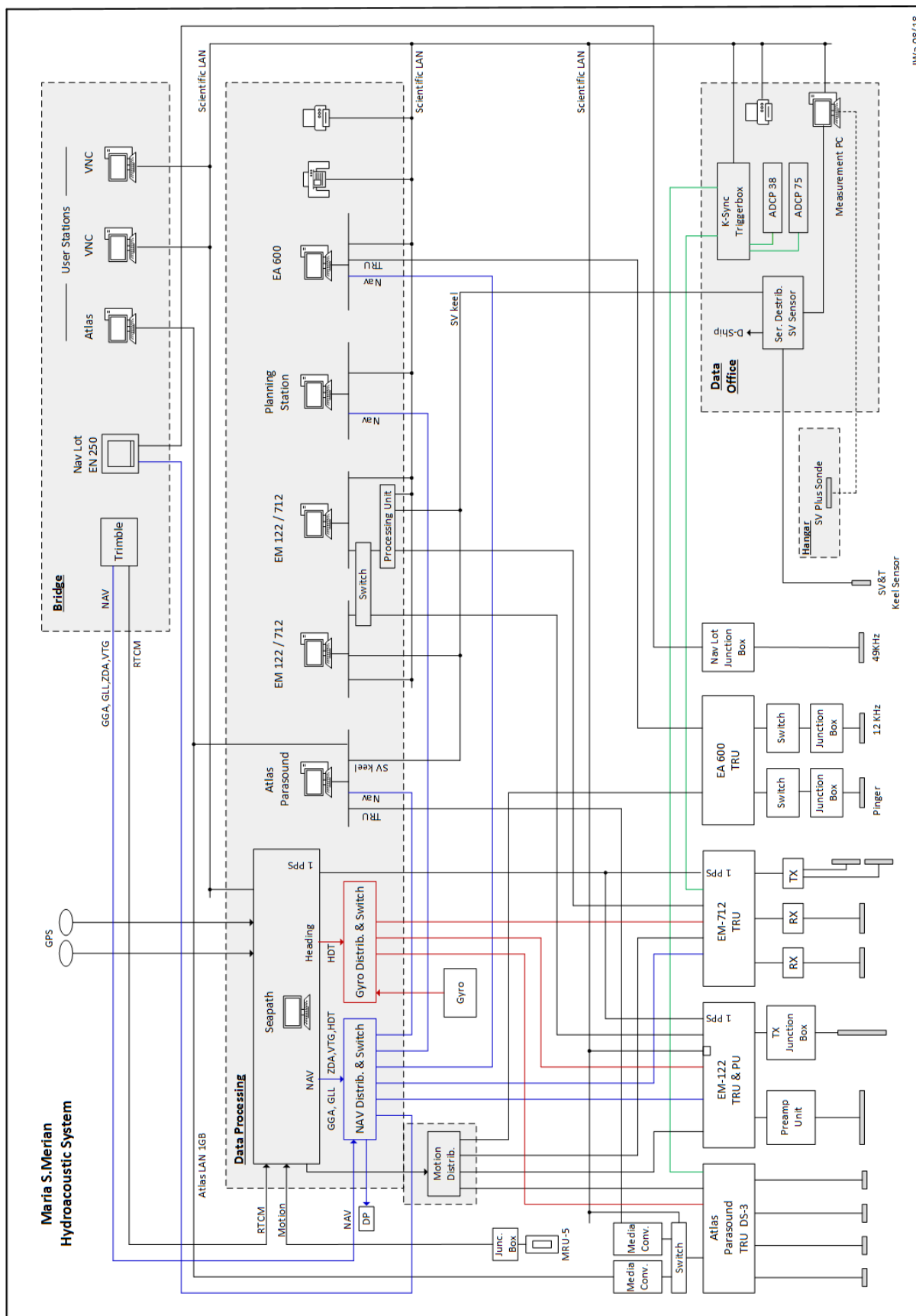
**12-3**

## General Overview



## 12 Hydro-acoustic systems

12-4



## 12 Hydro-acoustic systems

12-5

### 12.1 Parametric sediment echo sounder (Atlas PARASOUND DS P-70)

Location: Operator stations in the sounder room and on the bridge.

Technical Data:

Maximum pulse output:	70 kW
Opening angle:	4.5°
Ground penetration:	Up to 200 m (depending on sediment and ambient conditions)
Depth range:	10 m (below keel) -11000 m
Max. ship speed:	12 kn (8 kn optimum)
Frequencies:	
Primary high frequency 1:	18...33 kHz
Primary high frequency 2:	18.5...39 kHz
Secondary low frequency:	0.5...6 kHz
Secondary high frequency:	36.5...40 kHz
Primary low frequency:	3...12 kHz

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

**Source Level**

### 12.2 Deep sea multibeam echo sounder (Kongsberg EM 122)

Location: Operator station in the sounder room

Technical Data:

Main working frequency:	12 kHz (varies from 11.25 to 12.60 kHz for sector coding)
Beams:	191/Ping
Opening angle:	2x2°
Beam spacing:	Constant angle or constant distance
Cover:	<=130°
Depth range:	20...11000 m
Depth resolution:	10...40 cm
Pulse lengths:	2 ms 5 ms 15 ms

System	SL	NF1	PL@NF1	NF2	PL@NF2
Source level					
<b>EM 120/122/124 2°</b>	236	3.5 m	210	110 m	195
Pressure level					
<b>EM 120/122/124 2°</b>	236	3.5 m	210	110 m	195

Ice window damping: -5db +/- 2 db



## 12 Hydro-acoustic systems

12-6

### 12.3 Shallow water multibeam echo sounder (Kongsberg EM 712)

Location: Operator station in the sounder room

Technical Data:

Working frequency:	40 – 100 kHz
Beams:	1,600/Ping
Opening angle:	0.5 x 0.5°
Beam spacing:	constant angle or constant distance
Cover:	max. 140°
Depth range:	3 ... 3,600m
Pulse lengths:	0.2 – 2 ms

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

#### Important note!

Particularly as far as the shallow water multibeam echo sounder (EM712) is concerned, from a scientific point of view it must be noted that with a large opening angle ( $> 2 \times 50^\circ$ ) using the SVPlus probe, the water sound profile must be measured at regular intervals. This ensures that no abrupt vertical offset by 0.5-1.5 m is produced in the bathymetry signals of the outer beams. In this respect it is strongly advisable to record sound profiles such as this on a daily basis (even several times per day in brackish water areas and with strong currents).

## **12 Hydro-acoustic systems**

**12-7**

### **12.4 Vertical sounder / multi-frequency sounder / pinger sounder (Kongsberg EA600)**

Location: Operator station in the sounder room

Technical Data:

Working frequencies:	12 kHz
Pulse lengths:	16 ms
Opening angle:	12/16/60°
Max. transmission power:	2000 W
Maximum depth:	10000 m

### **12.5 Navigation sounder (Kongsberg EN250)**

Location: Bridge

Technical Data:

Frequencies:	24 kHz 50 kHz
Depth range:	10...800 m

### **12.6 Flow profile sounder/ ADCP (Acoustic Doppler Current Profiler)**

Location: Sounder room

Technical Data:

Manufacturer:	RD Instruments
Working frequency:	75 kHz & 38 kHz
Maximum depth for bottom track:	950 m
Speed range:	max. 22 kn
Ping rate:	0.7 Hz

**Attention:** Because of the neighbouring frequency, the ADCVP sounder can only be used if the Atlas Doppler Log (DOLOG 22, 79 kHz) on the bridge is switched off. Alternatively, the Satlog must be used to determine the speed above ground and through the water in this case.

## **12 Hydro-acoustic systems**

**12-8**

### **12.7 SVplus (sound profile probe)**

Location: Hangar (operator station: measuring computer, server room)

Technical Data:

Manufacturer: Applied Microsystems Ltd.	
Maximum depth:	2000 m
Temperature range:	-2...+32 °C
Sound velocity	1400...1570 m/s
Weight in air:	9.1 kg
Weight in water:	3.5 kg

New point:

Sippican System

Location: Pulser station, aft deck

Technical Data:

Manufacturer: Lookhead Martin

Maximum depth: depending on probe

Possible probes: XSV, XBT, XCTD, XBP

ATTENTION: only XSV kept on board

### **12.8 SV&T (fixed sound probe with temperature sensor)**

Location: Hangar

Technical Data:

Manufacturer: Applied Microsystems Ltd.	
Temperature range:	-2...32 °C
Sound velocity:	1400...1550 m/s

## 12 Hydro-acoustic systems

12-9

### 12.9 Sonardyne (USBL underwater positioning system)

In October / November 2017 a typical hydraulic extension unit of type **"7950 Through-Hull Transceiver"** fitted with **"Ranger 2 GyroUSBL 7000 Transceiver"** was installed in the portside moonpool.

In the retracted condition, the Ranger 2 head is accessible by a special sea chest for maintenance and replacement purposes via a so-called sea box with upstream shut-off valve.

The system is operated "remotely" from the bridge by the navigator who is on duty. However, local operation is also possible for maintenance purposes.

In the extended condition, the speed of the ship must be limited to a maximum of 7 kn in order to avoid damaging the extension unit and the transceiver.

Location of evaluation unit: Server room

#### Technical Data:

Manufacturer:	Sonardyne
Transceiver frequency range:	19 - 34 kHz
Accuracy:	Range better than 15 mm Heading 0.04 to 0.1° Pitch & Roll 0.01° Heave 5 cm or 5 %
Transceiver range:	up to 7,000 m
Accessories:	2 wideband mini transponders (WMT, MF, direc 7,000 m) \$PTSAG (NMEA telegram) ASCII (.dat-file)
Export formats:	OFOS / TV gripper (OFOP) CTD rosette JAGO submersible and ROV / AUV
Application examples:	Positioning the anchorings



Sonar head in sea box



Extension unit

## **12 Hydro-acoustic systems**

**12-10**

### **12.10 Pinger sounder (EA600)**

Location: Operator station in the sounder room

Technical Data:

Max. water depth: > 2000 m

Operation via EA600 / 12 kHz (passive mode)

Attention: The 12 kHz pinger must be provided by the scientific crew!

### **12.11 Atlas DOLOG 22 (Doppler Log)**

Location: Bridge

Technical Data:

Working frequency:	79 kHz
Transmit power:	100 W
Speed measuring range:	Longitudinal: -5...+30 kn Lateral: -5...+5 kn
Depth range:	Ground reference: 1...approx. 600 m Water reference: from approx. 30 m
Accuracy:	0.01 kn (cm/s) or 0.2 %
Opening angle:	7°x9° (longitudinal) 10°x7° (lateral)
Swivel angle (against vertical):	32°

## 13 Data management system (DavisShip Version 3)

13-1

### 13.1 Overview

The DavisShip system (data collection, distribution and storage system, short form DSHIP) from Werum Software & Systems AG acts as a central database system for recording the data from many scientific sensors. Meteorological and ship-specific data such as wind, course, speed etc. is also recorded.

The system was successfully upgraded to version 3 during the shipyard period in April 2017.

Overall, the data from approximately 250 individual sensors is stored. Database extracts can be obtained from any ship's APC or personal computer via the Web interface.

The hardware consists of the terminal servers distributed around the ship, which record the sensor data via serial interfaces and forward it to the two DSHIP servers via the network. The DSHIP servers are installed in the server racks in the sounder room.

The DSHIP system also provides other services. These including the sending of NMEA telegrams, providing an action log for recording the procedures on stations and the "DSHIP WEB" for recording an arbitrarily selected group of sensor data on any ship's APC and all personal computers connected to the network (display on Smartphones and tablets is also possible via WLAN).

The DSHIP WEB contains a comprehensive **Mapviewer** for viewing the tracks which have been covered and the next waypoints. In the Mapviewer it is also possible to display the position of deployed Posidonia transponders on the map.

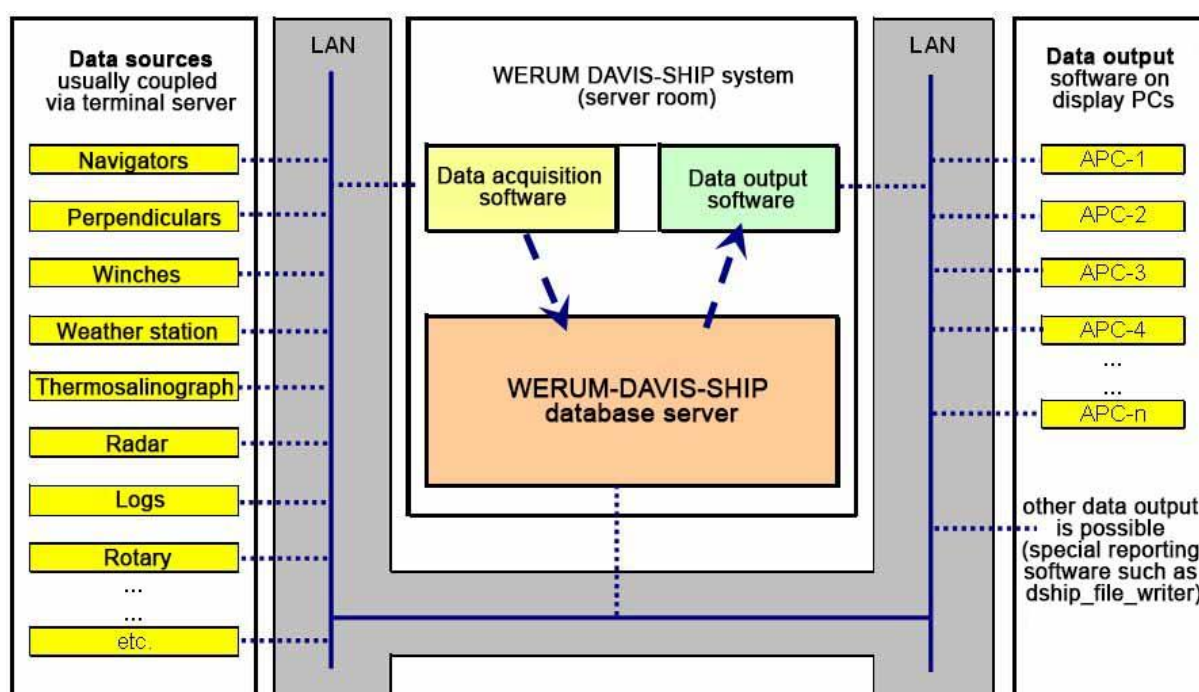


Figure 1: Basic design of the data management system on FS "Maria Sybilla Merian"

## **13 Data management system (DavisShip Version 3)**

**13-2**

### **13.2 DSHIP WEB**

The DSHIP WEB is used to display the current values of all sensors on the different terminal devices. A device with a Web browser is all that is needed to use DSHIP Web. This means that DSHIP WEB can be used by the ship's own computers and also personal devices such as computers, laptops, Smartphones or tablets.

A prerequisite is a connection to the ship's network, either by cable or WLAN.

The DSHIP WEB can be displayed by calling up address **<http://dship1:8080/dship-web/>**.

After calling up the address you are asked for a user name and password. The user name is **wiss** with password **12345**.

Within DSHIP WEB, "pages" can be opened or created for displaying sensor data. Several pages can be summarised in a "working area". Several "displays" of type alphanumeric displays, action log activities, action log events, bar graph, compass, direction thrust, XT graph and XY graph can be put together in any configuration.

A wide range of configured pages are available. This can be adapted at any time and saved under your own name, making access from other devices at a later date possible. Individual displays, pages and working areas can be saved.

After logging on using the above-mentioned link, an empty work area is displayed. On board the ship, links are available on the Intranet page which link directly to the overview page. Other pages can also be opened from there.



### 13 Data management system (DavisShip Version 3)

13-3

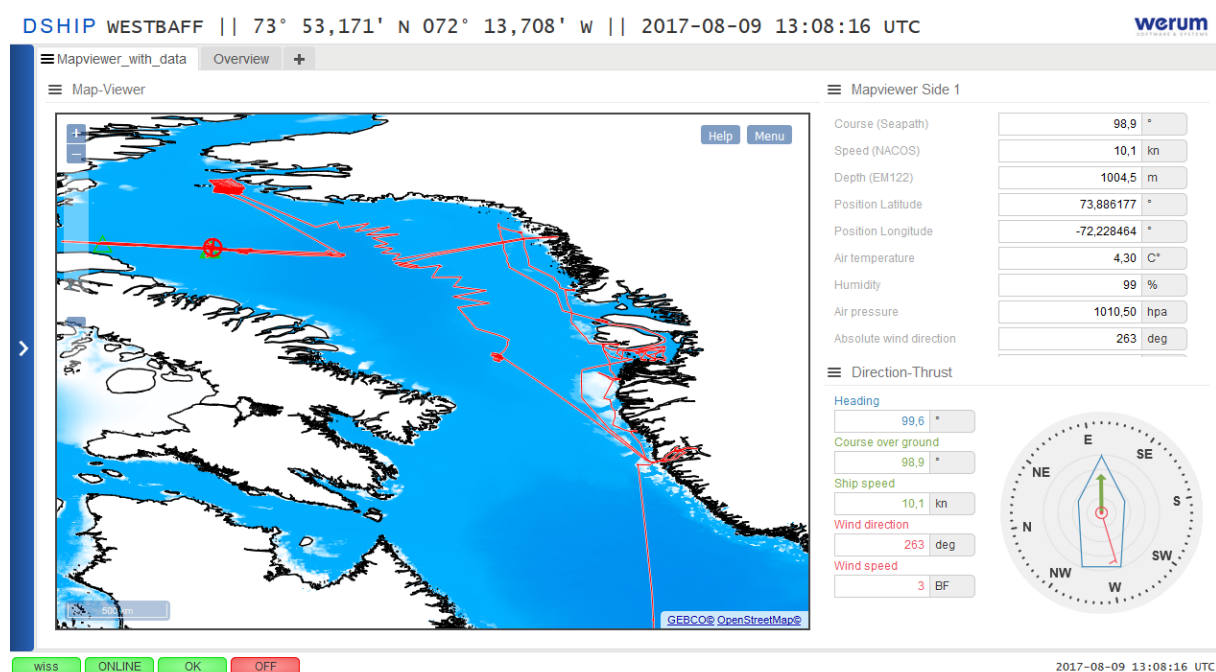


Figure: Shows the predefined page "Mapviewer\_with\_data". This page contains a display of type Map-Viewer, Alphanumeric and Direction-Thrust.

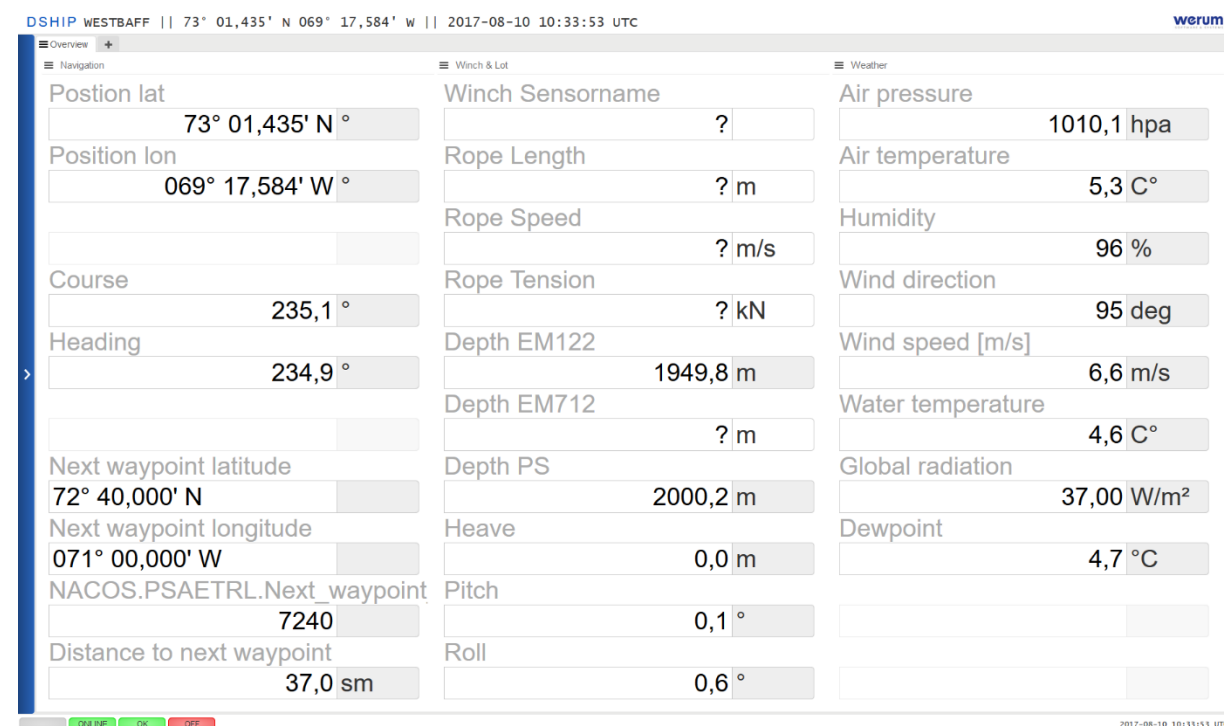


Figure: Shows the predefined page "Overview". This page contains 3 displays of type Alphanumeric.

If a device is not currently supplying data (e.g. because it has been switched off), a question mark ("?") is output in the relevant display fields.

## 13 Data management system (DavisShip Version 3)

13-4

### 13.3 Main menu

The main menu of DSHIP WEB is hidden behind the blue bar at the left-hand edge of the window. If you click it, it opens up.

In the main menu the user can log in and out, change the display language from German to English, create a new working area, open a working area, switch to DSHIP Extraction or open the user manual.

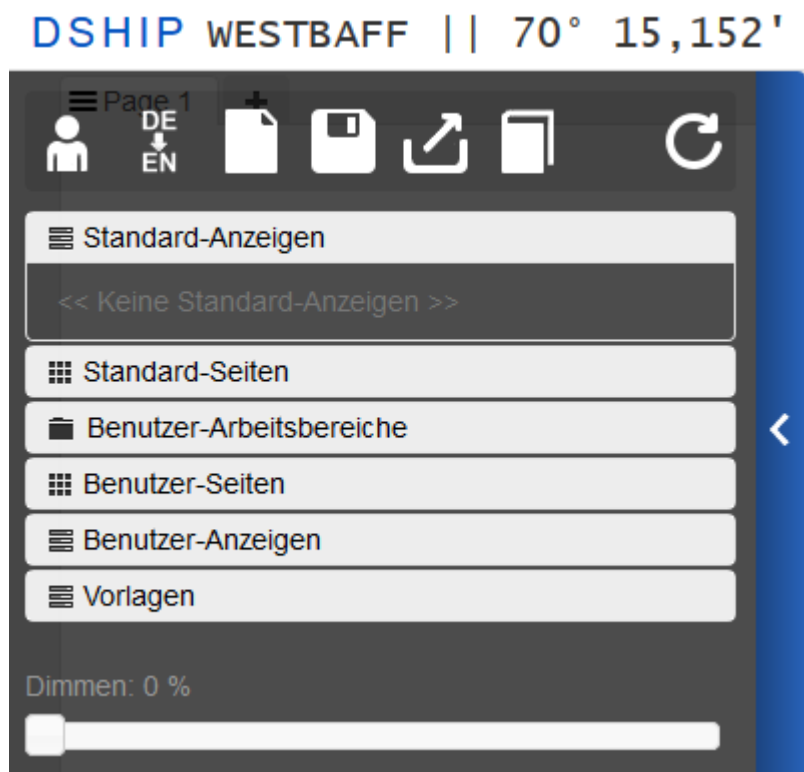


Figure: Shows the DSHIP WEB menu

The displays and pages which are available on board can be found in the "Standard-Anzeigen" (Standard Displays) and "Standard-Seiten" (Standard Pages) areas.

Work areas, pages or displays which you have created yourself or adapted can be found in the relevant "Benutzer-Arbeitsbereiche" (User Work Areas), "Benutzer-Seiten" (User Pages) and "Benutzer-Anzeigen" (User Displays) areas.

Empty displays for putting together an entire page are stored in the "Vorlagen" (Templates) area.

The display can be darkened using the movebar at the bottom edge.

### 13.4 Pages

A **page** is an area that takes up the entire browser window, which can be filled with displays.

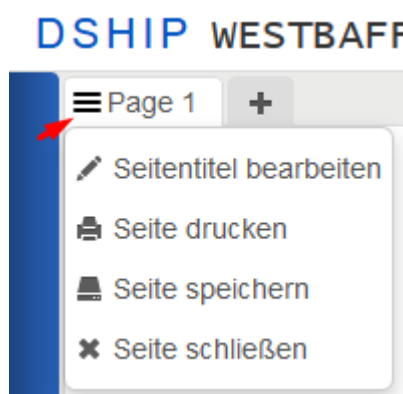
If you click on the “+” button, a new empty page will be displayed.



*Figure: An additional empty page can be created with the + button at the end of the row of tabs for the opened pages.*

In order to open an existing page, the menu must be opened up by clicking on the blue bar at the left-hand edge of the window. The pages which the user created and saved can be found here in the “Benutzer-Seiten” (User Pages) areas. The pages made available by the ship can be found in the “Standard-Anzeigen” (Standard Pages) area.

In order to give a new page a name or change the name of an existing page, click on the 3 bars next to the page title, which opens the page menu.



*Figure: Each page has its own menu*

#### Page menu entries

Menu item	Function
Seitentitel bearbeiten (Edit page title)	Change page title
Seite drucken (Print page)	Print out the page
Seite speichern (Save page)	Save the page under “Benutzer-Seiten” (User Pages), and existing pages with the same title are overwritten if necessary.
Seite schließen (Close page)	Closes the page, and existing changes are discarded if they have not been saved.

### 13.5 Display

**Displays** display the sensor values or make a graph available.

Displays that can be inserted into an empty page or into an empty area on a page can be found in the "Vorlagen" (Templates) area in the main menu. Clicking on a display inserts it into the page.

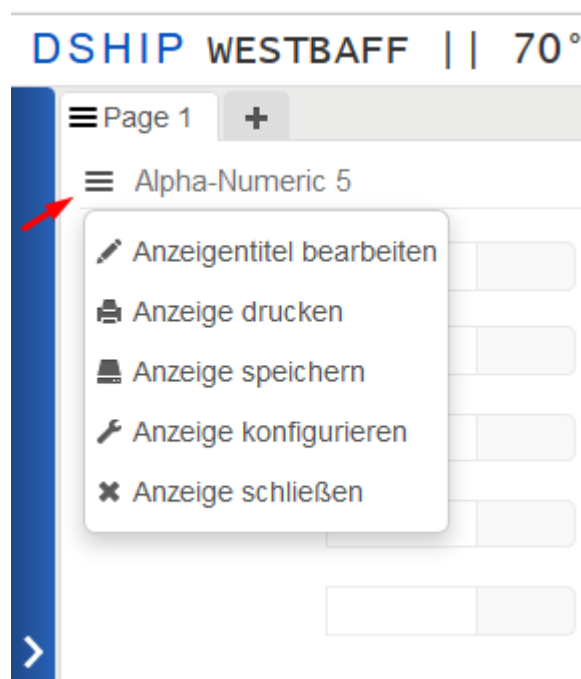


Figure: Each display has a menu

#### Entries in the display menu

Menu item	Function
Anzeigentitel bearbeiten (Edit display title)	Change display title
Anzeige drucken (Print display)	Send display to printer
Anzeige speichern (Save display)	Save the display under "Benutzer-Anzeigen" (User Displays), and existing displays with the same title are overwritten if necessary.
Anzeige konfigurieren (Configure display)	Makes it possible to edit the sensors shown in the display.
Anzeige schließen (Close display).	Closes the display, and existing changes are discarded if they have not been saved.

If you click on "Anzeige konfigurieren" (Configure displays) in the display menu, the displays go into configuration mode. A spanner is displayed behind each widget in configuration mode.

### 13 Data management system (DavisShip Version 3)

13-7

If you click on "Anzeige konfigurieren" (Configure displays) in the display menu, the displays go into configuration mode. A spanner is displayed behind each widget in configuration mode.

Depth 1476,1 m 

Figure: A widget shows the depth. The display is in configuration mode.

The sensor value displayed in the widget can be selected by clicking on the spanner.

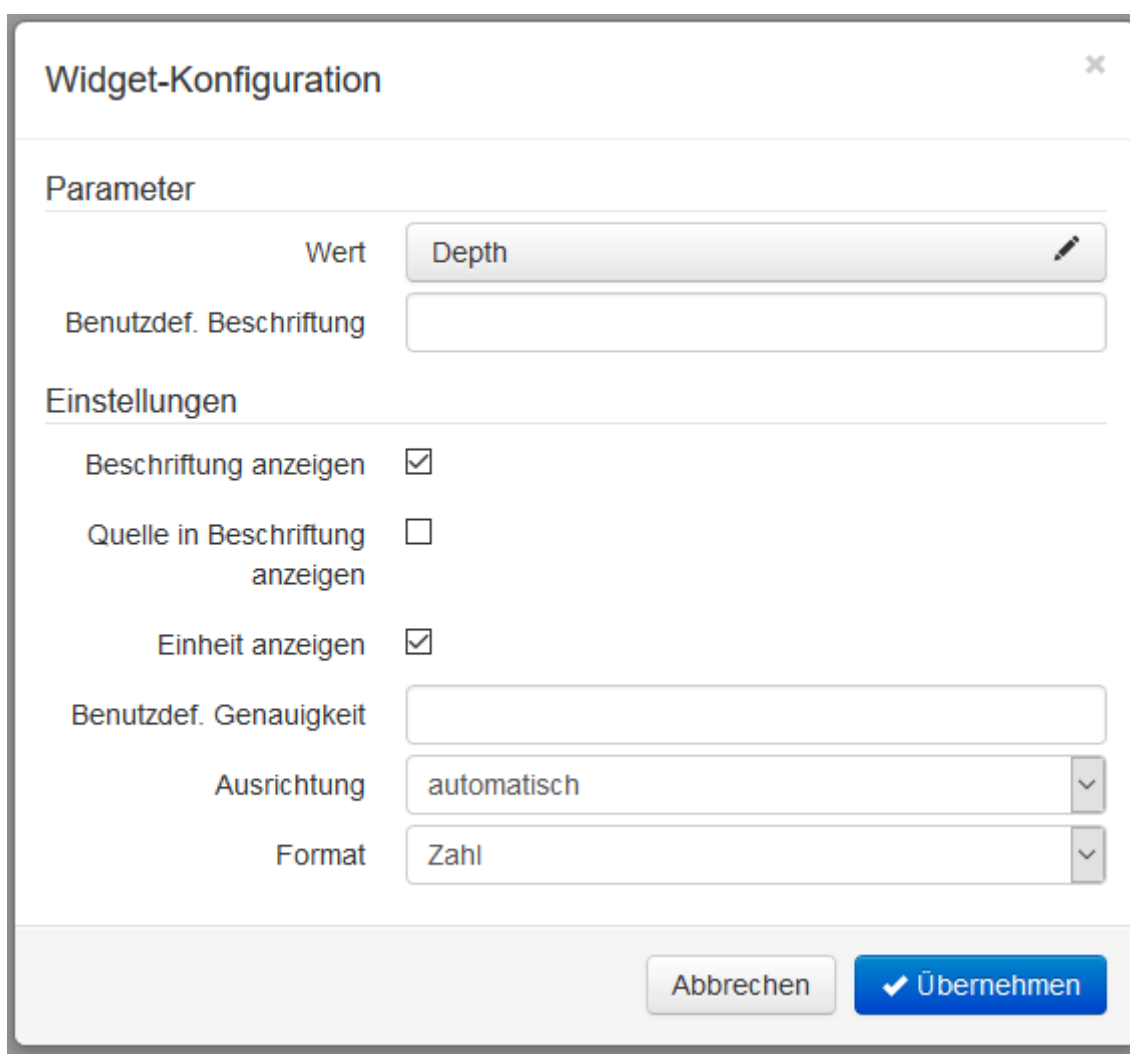


Figure: The "Widget Konfiguration" (Widget Configuration) makes it possible to select the sensor value to be displayed.

The sensor and its possible subordinate value are displayed in the "Parameter" upper area by clicking on "Wert" (Value).

A sensor value that is selected under "Wert" (Value) brings suitable settings for the lower area "Einstellungen" (Settings) with it, but these can still be adapted.

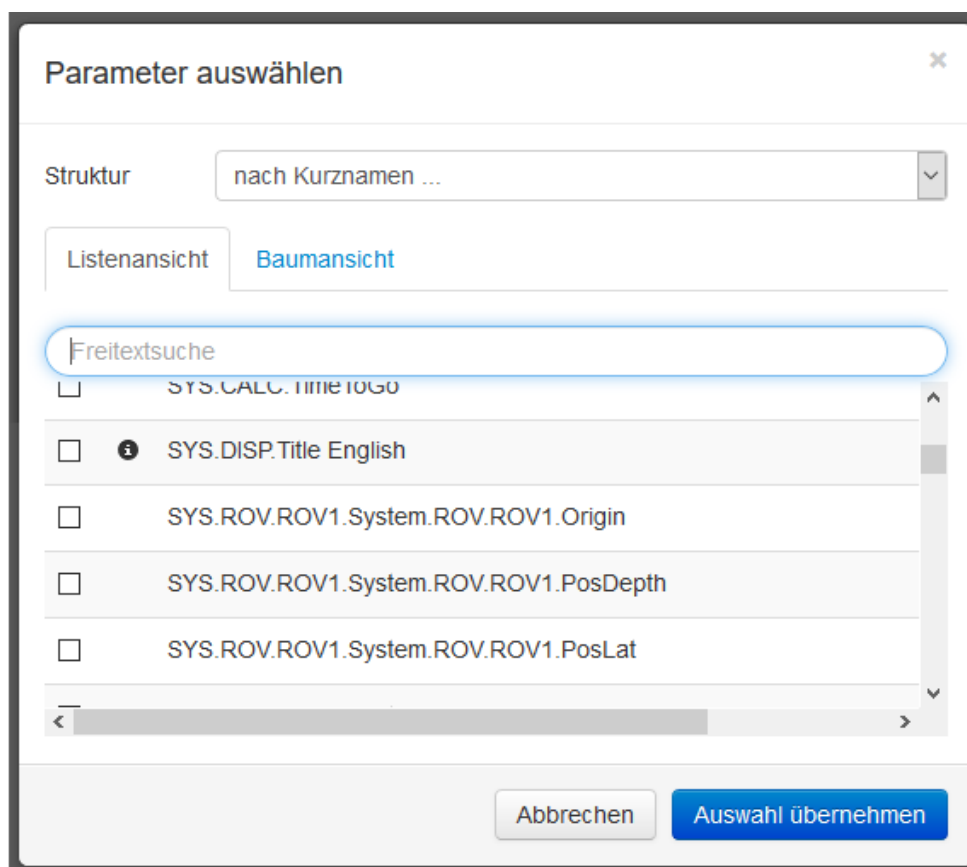
### 13 Data management system (DavisShip Version 3)

13-8

Option	Function
Wert (Value)	Clicking on the field opens the "Parameter auswählen" (Select parameters) dialogue for selecting a sensor value.
Benutzerdef. Beschriftung (User-def. lettering)	Overwrites the name of the sensor value with an arbitrary text.
Beschriftung anzeigen (Display lettering)	If active, the name of the sensor value is displayed.
Quelle in Beschriftung angeben (Display source in lettering)	Displays the active source for sensor values with several sources.
Benutzerdef. Genauigkeit (User def. accuracy)	Overwrites the number of decimal places stored in the sensor value.
Ausrichtung (Orientation)	Specifies what the sensor value is oriented to.
Format	Switches the display between decimal and degrees/minute for position data.

The "Parameter auswählen" (Select parameters) dialogue provides 4 view options for making it easier to find sensor values.

1. according to devices ... in the list view
2. according to devices ... in the list view
3. according to short names ... in the tree view
4. according to short names ... in the tree view



*Figure: The "Select parameter" dialogue in which according to short names ...in the list view*

The search can be made considerably easier by using the "Free text search" field. Some values have an information icon which provides information about possible statuses of the value.

The following individual devices and systems (sensors) are available:

Device name	System name	Description
DGPS1	DGPS1	GPS system DEBEG 4428
DGPS2	DGPS2	GPS system DEBEG 4100
Doppler Log	DoLog	Doppler Log
EA600	EA600	3-frequency single-beam echo sounder
EM-Log	EM-Log	EM Log DEBEG 4675
EM 712/122	EM-Sounder	Shallow water/deep sea multibeam echo sounders
Fluorometer	Fluoro	Fluorometer
GPS-EPIRB	Epirb	Emergency buoy
Global radiation	GR	Global radiation meter
Gyro	Gyro	Gyro compass (FOG)
Inmarsat	SatCom	Satellite communication
Leica 500	Leica	DGPS measuring system
NACOS	NACOS	Navigation communication system
Nav-Lot	Nav-Lot	Navigation sounder
Parasound	PS	Parametric sediment echo sounder



### 13 Data management system (DavisShip Version 3)

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Rainmeter	Rain	Rain meter
SV&T C-Keel	Ckeel	Water sound probe
SV&T C-Mean	Cmean	Mean water sound speed
Seapath 320Seapath	DGPS/Attitude system	(Roll, pitch, heave)
Reinseewasser	RSWS	Surface water measurements (Thermosalinograph)
Wamos	Wamos	Wave height measuring system
Weatherstation	Weather	DWD weather station
Wempe	Wempe	Central clock system
Winch	Winch	Research winches

Only one value can be selected for each widget and accepted using the "Apply selection" button.

#### Working areas

A working area consists of several pages and is useful if the same pages are used at regular intervals.

In order to start a new working area without any pages or save a working area that has been put together, the main menu at the left-hand edge of the window is needed.



*Figure: The menu entries which are needed to create and save a working area.*

A new working area is created using the left-hand symbol in the red border, and the current working area is saved under "User Working Areas" using the diskette icon.

### **13.6 Network**

The network contains three separate networks in accordance with the construction regulation.

Other networks have also been set up for the server and the WLAN. This requirement is implemented using logically separate networks with intermediate switches. These switches also look after the routing of the network packages.

A network with a star design is used to implement the network requirements. Servers, switches, the patch panel and the UPS are installed in a 19" cabinet in the sounder room. This is where all network connections come together.

All network cables from the tank deck to the main deck are brought together in the sounder room, where they are connected to the patch panels.

All network cables from the tween deck to the observation deck have been brought together on the 1st superstructure deck in a space-saving sub-distribution installed in the light distribution system.

The fibre-optic double fibres which have been routed for connecting the network sockets with the sub-distribution are duplicated so that the respective spare cable can be used in the event of damage.

All of the active components are combined in the network cabinet in the sounder room. The incoming fibre-optic cables are routed in splice boxes and distribution boxes, from where they are connected to the respective switches via patch cables. The installed switches are Layer 3 switches, making it possible to route network packets on the basis of the IP address. The required logical separation of the three networks and any other networks such as navigation or bridge can therefore be achieved by configuring these switches without the need for additional hardware.

The network speed on board is 1 Gbit/s.

A DNS/DHCP server is also needed on board the ship to operate the network. In order to safeguard the functionality of the network in the event of a power supply failure, all active components are supplied with power by a UPS system. The UPS is designed for a holding time of approx. 20 minutes at full load. A total of 92 network sockets have been installed. Dado-trunking switches have been used which provide a fibre optic uplink and 4 x RJ45 connections. Since these are active components, a 230 V power supply is present at the installation location of these dado trunking switches.

WLAN is available in most areas of the ship. The WLAN only differs from the cable network due to having a connection that is slower in some cases (when copying large quantities of data).

### **13 Data management system (DavisShip Version 3)**

**13-12**

Key data of network:

Protocol: TCP/IP  
Physical connections: RJ45/WLAN (in most areas of the ship)

Several criteria must be fulfilled in order to connect personal computers to the network:

Operating systems: Windows, Mac OS, Linux, Android, iOS, Free/BSD, ...  
If the operating works on shore in a "normal" network, it will also work on board.

Physical connection: The device should have an RJ45 connection. If it doesn't, it is strictly advisable to bring an appropriate adapter to USB.  
Alternatively the WLAN can be used, but in this case slower speeds and spatial restrictions can be expected (affects the transmission of larger quantities of data).

Virus checker and updates: The computers and laptops must have a virus scanner with current signatures.  
The Windows updates must be up to date.

The ship's computers installed in the laboratories and working areas are equipped with a comprehensive range of software:

Software: Windows 10 Pro or Windows 7  
Microsoft Office 2013 or 2016  
Adobe Acrobat 7.0 Pro / X / Pro  
Google Chrome  
Mozilla Firefox  
Python  
Perl  
SBE Data Processing  
BB-Tools ADCP Processing  
Globalmapper 16 (network licence)  
OpenCPN  
GMT  
Windows Media Player  
VLC Player  
IrfanView  
Notepad++  
Links to DSHIP WEB display  
Kaspersky virus scanner

Peripherals: 2 A4/A3 colour laser printer/copier  
1 A3 colour inkjet printer  
1 A0 colour plotter  
2 A3 colour scanner  
2 A4 colour printer

### **13 Data management system (DavisShip Version 3)**

**13-13**

Set up **VLANs**:

In order to keep sensitive data from certain network segments apart, the individual segments have been configured as VLANs. All VLANs which have been set up can access the **"Server" VLAN**. However, direct communication between VLANs is not possible, which prevents unauthorised data access between different VLANs.

The **'Ship' VLAN** (network 101) networks all crew systems.

All of the ship's APCs (DSHIP display clients) are combined in the **'wiss' VLAN** (network 103) (e.g. in the scientific work room, the hangar, the server room, the deck laboratory, the dry laboratory, the chemical laboratory, the sounder room and the salinometer room). All connections for personal computers belonging to the scientists are also on this network.

The **'Devices/Sensors' VLAN** (network 104) includes all computers and terminal servers which receive the measurement data from the many sensors and forward it to the DSHIP system (e.g. the Echolot operator stations and display clients and the measuring computers in the server room).

The **'Server' VLAN** (network 100) contains the servers which are available to everyone. Computers from all other VLANs can use data and services from servers from this VLAN. Accordingly, the printers of this VLAN can also be used from other VLANs (via DNS/DHCP server). The exchange of data always takes place via dedicated services; however, a direct connection between the other VLANs and the 'Server' VLAN is not possible.

#### **Laptops and user PCs**

All network sockets on board are in the form of 4-way sockets and can be used locally as standard 10/100/1000 RJ45 plug-in connections for connecting computers. It must be noted that each of these 4-way sockets only makes it possible to incorporate the connected PCs in one of the 5 VLANs, since the sockets have a fixed connection to one of the VLANs. In other words: The IP address of the PC must therefore be within the VLAN address range assigned to the socket!

24-port access switches are available at neuralgic points with a great deal of data traffic. Here the individual ports must be assigned to the networks arbitrarily by the system operator.

There is a DHCP server on board. This automatically assigns certain (unique) network addresses to connected PCs which should be used (wherever possible). If the (personal) PC to be connected is set to DHCP, the computer automatically receives an appropriate IP address and also receives the important addresses of the gateway, the DNS server and the WINS server.

In each case you then have access to the VLAN into which you have been "pigeon holed" and also to the "100" VLAN. However, the network browser (network environment) of a 'Windows' PC only lists computers that are in the same VLAN. If you want to make a connection to a PC (or server) in the "100" VLAN, this can only be done by directly entering the UNC name (e.g. \\storage1\\public\_wiss). Once it has been set up, this connection is then permanently available under the selected drive letter.

## **13 Data management system (DavisShip Version 3)**

**13-14**

### **Storing data in the network**

A 6TB share is available on the server for central storage of scientific data (public\_wiss). All scientific trip participants have full access to this. The crew only have read access.

The data is copied to a backup system at 24-hour intervals.

## **13 Data management system (DavisShip Version 3)**

**13-15**

### **13.7 The IOW ReiseAssistant**

***No longer installed on board permanently but only on IOW trips !!***

The ReiseAssistant ("Travel Assistant") is used on board the IOW research ships "Professor Albrecht Penck" and "A. v. Humboldt" (decommissioned in 2004 in favour of the 'Maria S. Merian') and on the majority of suitable German research ships on IOW trips. The ReiseAssistant is a software package which supports the performance of research trips in many ways. The basic functionality of the ReiseAssistant includes:

- Easily recordable, usable display of current on-board information such as the ship's position (graphical map display of the deployment area with display of ship's tracks, target positions (stations)), weather, soundings, surface water temperature etc.
- Online data from the DVS (DVS generally stands for Data Distribution System) is stored in a text table in the background when required in accordance with the user's specifications.
- Printouts of journals, map displays, texts etc.
- Use of station databases for planning and carrying out trips (station databases are planning aids. They contain information about planned stations (geographical position, water depth, planned work, references to other projects etc.). There are usually more stations in a station database than the number of stations that are processed during a trip).
- The automatic keeping of a station journal (kept on the DOMINATOR PC; but it can then also be viewed by other clients (contains the location, time, operator name and a comment field for each processed station at the beginning and the end)).
- The automatic keeping of deployment and device journals (these contain the current reference data such as the station name, location, time, operator name, comment at the beginning and end, and other information if required; these journal files are kept on all PC's on which (device) deployment takes place).
- At the same time as the production of the journal entry (deployment and device journals), it is possible to call up software for data acquisition on the respective PC; when doing this, station information can be passed to the program which has been called up by the ReiseAssistant (the SeaBird software for the CTD probe is addressed in this way).
- Support for the user in performing measurement data processing that is regularly required (data conversion, graphical display).
- Suitable routines can be incorporated for administration and backing up measured data.

Apart from the fact that the Werum DVS 'dShip' supplies the majority of ship-related data to the IOW ReiseAssistant system installed on board, no further interaction takes place between "dShip" and the ReiseAssistant system. The ReiseAssistant system does not need to be activated in order for dShip to function properly. However, the ReiseAssistant requires dShip to be functional.

The use of the IOW ReiseAssistant is therefore not mandatory. However, it is advisable to at least use the ReiseAssistant for trips with frequent use of CTD, since it makes many routine steps easier or takes them over when working with the CTD probe (and the water sampler rosette), and therefore contributes to improving the quality of the data.

## **13 Data management system (DavisShip Version 3)**

**13-16**

In order to protect the basic functionality of the ReiseAssistent system, a permanently available system kernel has been set up on board. In order to do this, a “small” information processing system is formed by the Windows server, the Dominator PC and the CTD Client PC. A comprehensive range of prepared display windows is ready on each ReiseAssistent PC under the same user interface. Depending on the defined role of the PC, there is also the keeping of journals and log files and the carrying out of measurements and the preparation of measured data.

Since the devices on board the FS Merian include Seabird CTD probes, the computers required to operate them have been set up in the server room (there is visual contact from the server room to the hangar and therefore the deployment location of the probe(s)).

### **13.7.1 CTD Client PC**

The CTD Client PC has been set up on board exclusively for CTD measurements. As well as the basic functionality of the ReiseAssistent which has already been mentioned, the CTD Client also has the following tasks:

- Organising the work with the CTD, simultaneously keeping the deployment and device journal (place and time of beginning and end of deployment, beginning and end of series, remarks on progress).
- Starting the CTD software
- For data registration with provision and handover of parameters to the probe software.
- For subsequent post-treatment (conversion of raw data using a batch file).



## 13 Data management system (DavisShip Version 3)

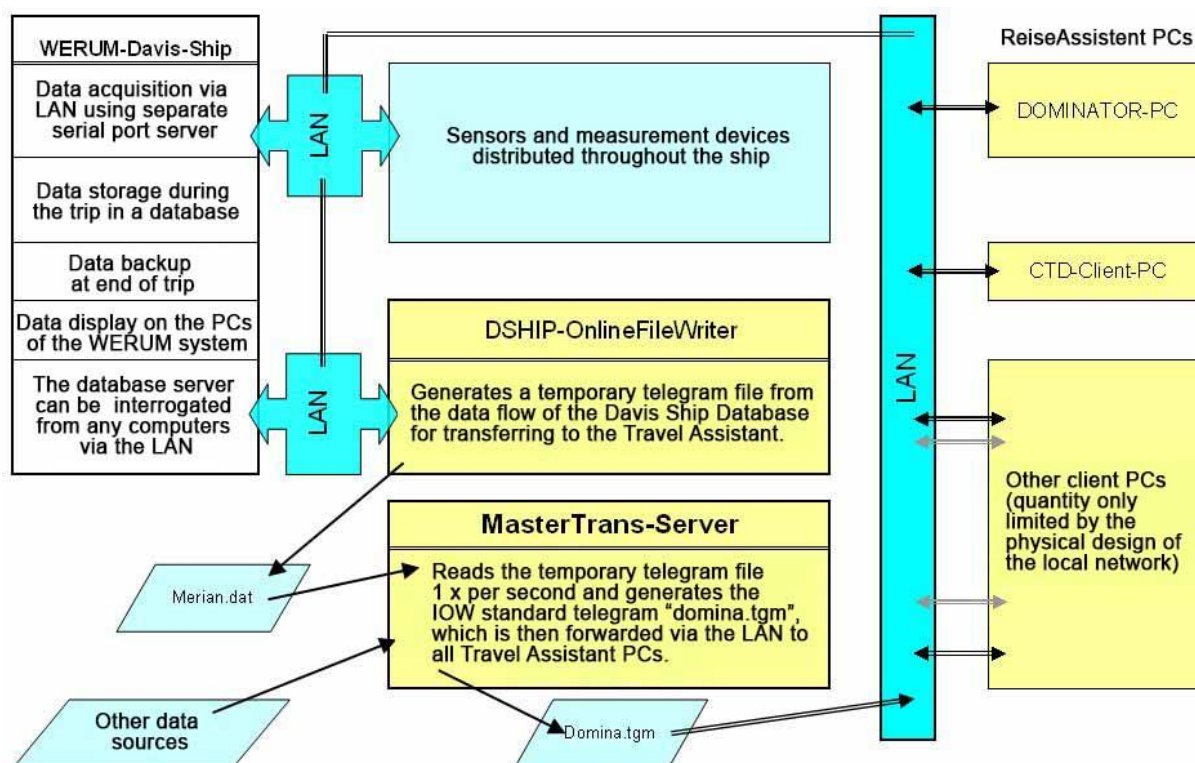
13-17

- Starting of software for graphical display of the measurement results (Excel 2003 is currently being used to do this; Excel workbook "SBEPROF.XLS" with a comprehensive range of sample diagrams is available for the standard output).
- Printing out results
- 'BTL' files (BTL = bottle file, text file containing information about water samplers).
- 'CNV' files (CNV = converted file, text file containing converted CTD data (default: metre steps).
- Various diagram displays (profiles, TS diagrams, DO-S diagrams etc.).

### 13.7.2 Other client computers on board

As well as the computers listed above, the on-board system can include other PCs equipped with the trip program, which have access to the central data telegram via the local network.

The measurement software of certain devices can be connected to the ReiseAssistent of these PCs in the same way as the CTD software and started from there. All other services such as keeping a journal or data backups can be used when doing this. A client configuration is often used, which only acts as a data/information display and does not have any local device operation.



Incorporation of computer of IOW Trip Assistant system into the on-board system of FS Merian.

## 13 Data management system (DavisShip Version 3)

13-18

### 13.7.3 Data list

The table lists all DVS data channels which are currently used by the ReiseAssistent system. The inclusion of other (also 'non-DVS') channels can be realised at configuration level fairly easily (a condition here is the the availability of the measured data in a telegram file (that is always up to date) in the ship's network to which the Windows server has access.

No.	Channel Name	Dimension	Explanation
1	A_Datum.UTC	UTC	date Wempe clock
2	A_Zeit.UTC	UTC	time Wempe clock
3	R_Reise	\$	cruise code
4	Phase	\$	label for cruise part
5	StatDB	\$	station(s) database name
6	StatBez	\$	station name (from database)
7	SyncNo	\$	station index (since cruise begin)
8	StationNr	\$	station number (index from DVS)
9	Status	\$	current cruise mode
10	GPS_Länge.DEZ	ggg,DECIMAL	longitude (deg, decimal)
11	GPS_Breite.DEZ	gg,DECIMAL	latitude (deg, decimal)
12	GPS_Fahrt	Kt	speed over ground
13	GPS_Kurs	deg	course over ground
14	Log	Kt	speed in water (log)
15	Kreisel	deg	heading (gyro)
16	StatTim		elapsed time on station
17	Depth_1	m	depth from system sounding (selected from DVS)
18	Depth_2	m	depth from EA600 (12 kHz)
19	Depth_3	m	depth from EA600 (38 kHz)
20	Depth_4	m	depth from EA 600 (200 kHz)
21	Depth_5	m	depth from EM 120/1002 (12 kHz)
22	Depth_6	m	depth from EM 1002 (95 kHz)
23	Depth_7	m	depth from Parasound (PHF)
24	Depth_8	m	depth from Parasound (SLF/PLF)
25	Depth_9	m	Nav-Lot
26	MET_WindRi_wahr	deg	true wind direction
27	MET_WindGe_wahr	Kt	true wind speed
28	MET_WindRi_rel	deg	relative wind direction
29	MET_WindGe_rel	Kt	relative wind speed
30	MET_LuTemp	°C	air temperature
31	MET_WaTemp	°C	water temperature
32	MET_Feuchte	%	humidity
33	MET_Luftdruck	hPa	air pressure
34	SMS_GS	W/m <sup>2</sup>	solar global radiation (GS)
35	SMS_IR	W/m <sup>2</sup>	Infrared radiation (IR)
36	SMS_PAR	μE/(s*m <sup>2</sup> )	PAR radiation (PA)
37	SMS_TE	°C	temperature of radiation sensor (TE)
38	TSG_Tmp	°C	in-situ surface temperature

## 13 Data management system (DavisShip Version 3)

13-19

### 13.7.4 Data list

No.	Channel Name	Dimension	Explanation
39	TSG_Sal	PSU	surface salinity
40	TSG_SoV	m/s	surface sound velocity
41	RAIN_Tr		rain vertical
42	RAIN_Se		rain lateral
43	SurfCurDir	deg	surface current direction
44	SurfCurSpeed	m/s	surface current speed
45	SignWavHght	m	significant wave height
46	WaveMinPer	sec	min wave period
47	WavePeakDir	deg	wave peak direction
48	WavePeakDir1	deg	wave peak direction (system 1)
49	WavePeakDir2	deg	wave peak direction (system 2)
50	WavePeakLen	m	wave peak length
51	WavePeakLen1	m	wave peak length (system 1)
52	WavePeakLen2	m	wave peak length (system 2)
53	WavePeakPer	sec	wave peak period
54	WavePeakPer1	sec	wave peak period system 1
55	WavePeakPer2	sec	wave peak period system 2
56	Lot_SV_CTD	m/s	last measured mean sound velocity (CTD)
57	Lot_SV_Lot	m/s	sound velocity at echo sounder(s)

Table: (DVS) data channels accessible via the ReiseAssistent

## **14 Navigation systems**

**14-1**

### **14.1 Navigation and planning system**

ECDIS (manufacturer: SAM Electronics)  
Location: Bridge

Planning Station (APC-35) with Global Mapper 16 and route transfer to the bridge in the sounder room

### **14.2 Global Positioning System (GPS)**

A total of four GPS devices are available on the bridge:

GPS1: DGPS R5 Supreme (manufacturer: SAAB)  
GPS2: SATLOG DEBEG 4100 (manufacturer: SAM Electronics)  
GPS3: Seapath 200 (manufacturer: Kongsberg SeaTex AS)  
GPS4: Trimble GPS SPS855 (manufacturer: Trimble)

Accuracy: 1-5 m (depending on the weather and current conditions)

### **14.3 Differential GPS (DGPS)**

The Trimble SPS855 on the bridge receives correction data via the OmniSTAR System worldwide. The correction data is made available to the Seapath 320 and the Trimble SPS461. The correction data can also be distributed to personal GPS systems on request.

The OmniSTAR correction data makes resolution of less than one decimetre possible with appropriate receivers.

#### **14.3.1 Trimble SPS461 exclusively for science**

A Trimble SPS461 is available for free configuration by the scientists. In order to avoid failures and erroneous configurations, all changes must be agreed with the system operator.

## **14 Navigation systems**

**14-2**

### **14.4 GPS position sensor**

See next chapter **14.5 Seapath**; it is integrated in this system; not on board MSM as a separate device.

### **14.5 Seapath**

Manufacturer: Kongsberg SeaTex AS

Type: Seapath 320

Function: 2 single frequency 12-channel GPS receiver for position and heading

Accuracy: (in combination with MRU)	Position:	with RTK 0.05-0.15 m (without RTK 0.7-1.5 m)
	Speed:	0.03-0.07 m/s
	Roll, pitch:	0.03°
	True heading:	0.075°
	Heave:	0.05 m

Measuring interval: up to 100 Hz

### **14.6 Dynamic positioning**

Manufacturer: ALSTOM Power Conversion Ltd., Rugby (UK)

Type: ADP 11, Class 1, A-series (V.2) stand-alone simplex DP System

Interfaces: Gyro compass (2 pcs.), VRU (MRU), GPS (all except GPS1), Doppler log, weather station (wind direction and speed)

Operator station: Bridge (with 3 docking stations)

Accuracy: On station optimum approx. 0.2 m (depending on DGPS service and weather and current conditions)

### **14.7 Electromagnetic airspeed measuring system (EM log)**

Manufacturer: SAM Electronics

Type: DEBEG 4675 Electromagnetic Speed Log

Speed range: -5 ... +25 kn

Accuracy: Speed  $\leq$  0.1 kn  
Distance travelled  $\leq$  0.1 %

## 14 Navigation systems

14-3

### 14.8 Fibre-optic compasses

#### 1.5 Technical Data

##### Performance (under all conditions)

Heading  $\leq 0.7^\circ$  secant latitude\*

Roll / pitch angle  $\leq 0.5^\circ$

Rate of turn  $\leq 0.4^\circ/\text{minute}$

x / y rate  $\leq 0.4^\circ/\text{minute}$

\*Secant latitude =  $\frac{1}{\cosine\ latitude}$

##### Range

Heading  $0^\circ$  to  $360^\circ$

Roll & pitch  $\pm 45^\circ$  ( $\pm 180^\circ$  with reduced accuracy)

Rates (X,Y,Z)  $\pm 90^\circ/\text{sec.}$

##### Settling Time

Static conditions  $\leq 30$  minutes

Sea conditions  $\leq 45$  minutes

Rate of turn  $\leq 4$  minutes

##### Environmental Conditions

In accordance with EN 60945

(IEC 945+A1)

Ambient temperature

Operation  $-15^\circ\text{C}$  to  $+55^\circ\text{C}$

Storage  $-35^\circ\text{C}$  to  $+70^\circ\text{C}$

## 15 Other devices / systems

15-1

### 15.1 CTD system

RV "Maria S. Merian" is equipped with a complete CTD system as backup for scientific systems. Regardless the deckunit and control panel can also be used by scientific groups for their own brought on board CTD systems.

The operation and the quality control of the data recording is in the responsibility of the scientific users.

Type: Seabird SBE911plus with SBE-32 water sampler, equipped with 24 OTE bottles, 10L

Max. Depth of use: 6800m (without PAR sensor)

Sensors and devices in detail:

Typ	max Depth	Dual/Single	Informationen
SBE-11plus (Deckunit)	-	-	installed in data center
SBE-9plus (Underwater Unit)	6800m	Single	0 bis 10000 psia pressure sensor
SBE-3plus (Temperature)	6800m	Dual	-5° bis 35°C
SBE-4C (conductivity)	6800m	Dual	0 bis 70 mS/cm
SBE-5T (Pump)	6800m	Dual	-
SBE-43 (Oxygen)	6800m	Dual	120% of surface saturation
WETLabs ECO FLNTU(RT)D	6000m	Single	Fluorescence & Neph. dampening
PAR Lightsensor	<b>1000m</b>	Single	on request (please note max depth) Clarify availability at coordination meeting.
PAR Lightsensor	<b>2000m</b>	Single	on request (please note max depth) Clarify availability at coordination meeting.
Benthos PSA-916		Single	Bottom distance sensor



The picture shows the Merian-CTD in use.



## **15 Other devices / systems**

**15-2**

### **15.1.1 CTD workplace for data recording and analysis**

In the data center a PC is available for working with the CTD probe. This one is equipped with Seabird Seasafe V7.22 software, Data Processing V 7.22 and MS Office XXX software. The data can be made available for the scientists via the ship network.

Connected to the deck unit is, among other things, the 'Surface PAR' sensor of the global radiation meter in the foremast. By this the CTD probe equipped with a PAR sensor can be used for PAR profiles (PAR: photosynthetically active radiation).

## **15 Other devices / systems**

**15-3**

### **15.2 Deep freezers**

Manufacturer: SANYO MDF-C8V

Temperature range: up to -80 °C

Cooling compartment dimensions: 48 x 37 x 40 cm

Locations:

Dry laboratory and deck laboratory (in the corner between the exit to the hangar and the service corridor).



## **15 Other devices / systems**

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**15-4**

### **15.3 Air gun launchway**

The ship has an air gun launchway at both sides (starboard and port). If they are not going to be needed for a lengthy period, both launchways are stored in a 20' open top container and kept on shore if necessary.

For this reason, notification of the need for air gun launchways on board must be given in good time during the coordination meetings for the respective travel blocks.

## 15 Other devices / systems

15-5

### 15.4 Seismic compressor container (20') **NOT LMF container !**

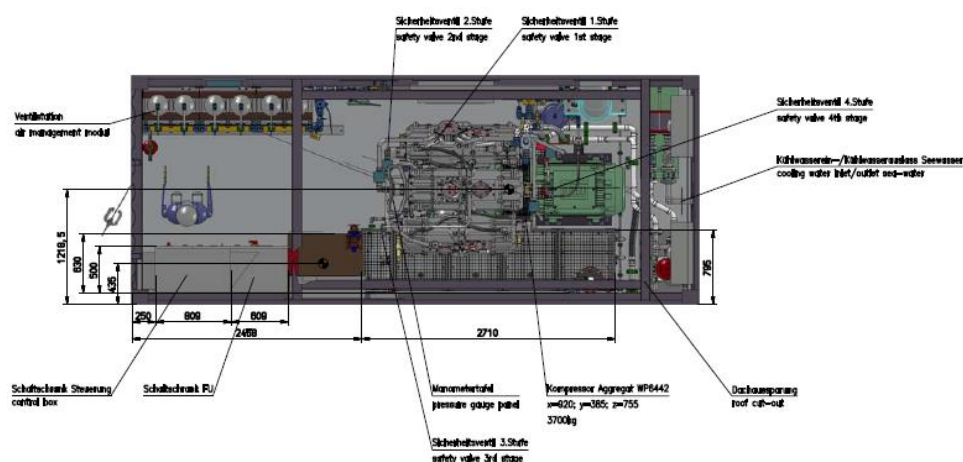
see also *Chapter 10.9 Seismic compressor system, pg. 10-17*

#### Compressor container 'Coordination centre 1'

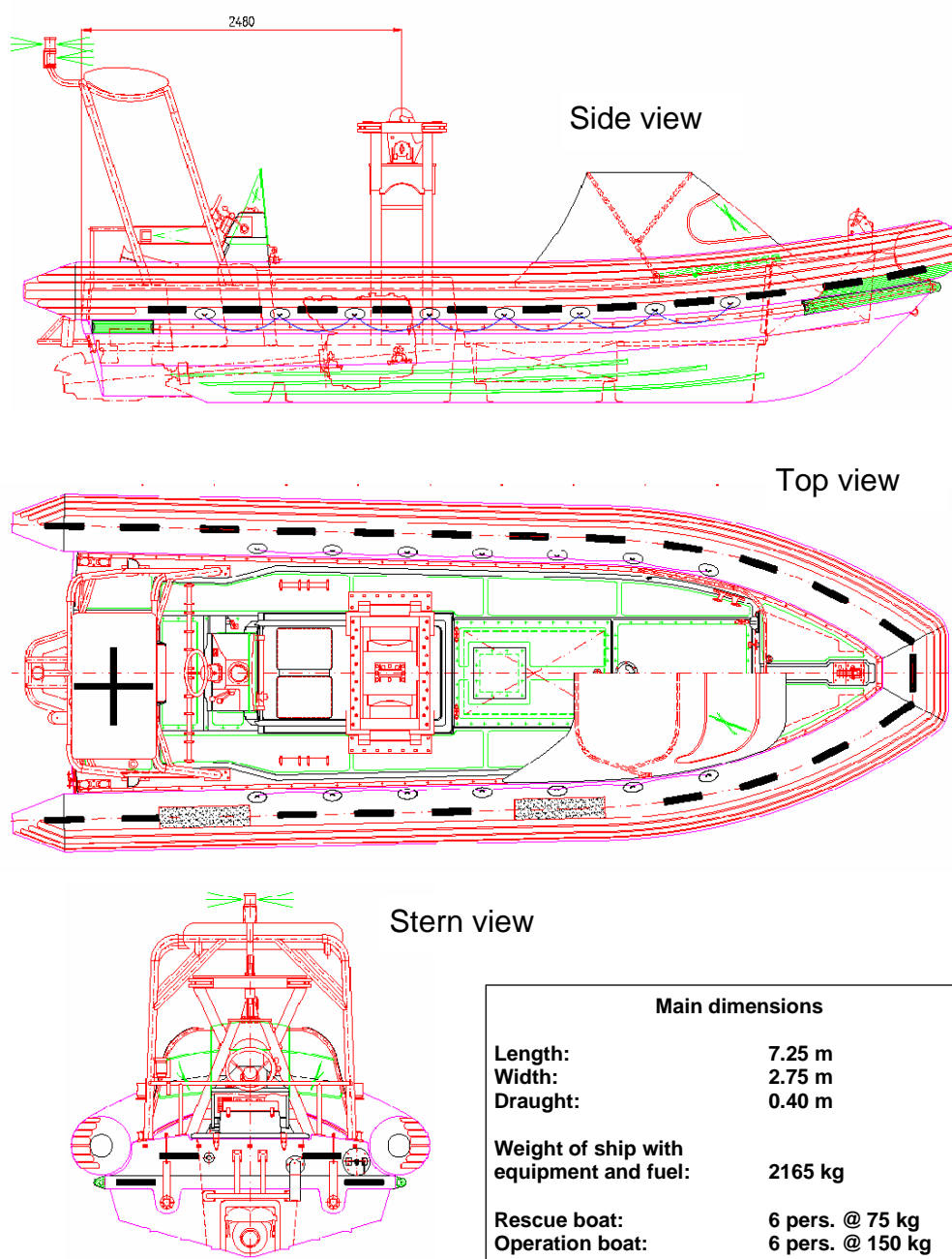
**Cont. No.:**  
**ROEU 010 012-4**  
**20' standard size**



#### Top view



**15.5 Fast Rescue Boat**

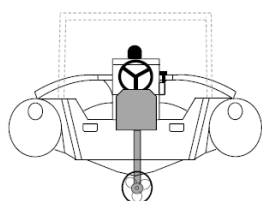
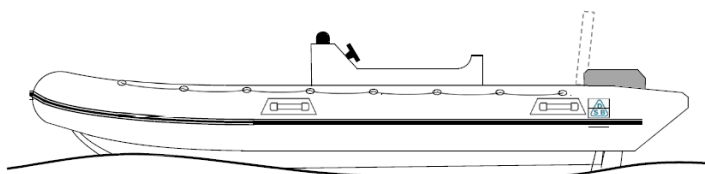
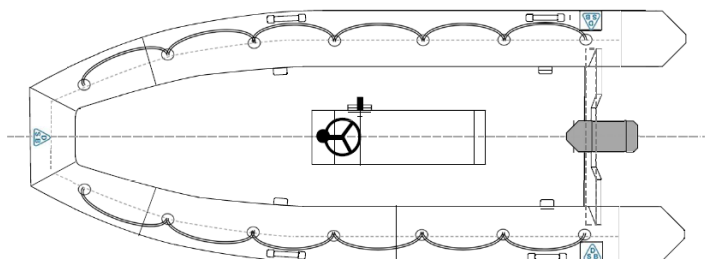


## 15 Other devices / systems

15-7

### 15.6 Working inflatable boat

There is a DSB-6.5 SR working inflatable boat on board for supporting the science (e.g. bringing out and hauling in gliders etc.).



Picture  
Working inflatable boat in stowage position.



The inflatable boat is equipped with a 60 HP Yamaha 4-stroke outboard motor. It is stored on the roof of the cabin annex behind the bridge at the port side, and can be moved quickly and easily using auxiliary crane no. 2 (hangar roof).

## **15 Other devices / systems**

**15-8**

### **15.7 Extension unit**

Usage: Hydraulic universal extension unit for attaching hydro-acoustic converters (hydrophones) and the like. The exchange can take place with the ship afloat, provided that the diameter is <135 mm.

Manufacturer: Hoppe Bordmesstechnik GmbH

Operation: Extended/retracted by bridge personnel

Installation location: Tank deck (behind echosounder equipment room)

Extension depth: 600 mm below lower edge of keel (total of 1340 mm)

Clearance width of extension tube: 135 mm (sufficient for AM 121 oceano-acoustic modules, for example)

Maximum probe length: 250 mm

Maximum ship speed with unit extended: **4 kn**

The extension unit is currently equipped with a hydrophone.

Picture  
"Asparagus" with hydrophone



### **15.8 Hydrophone (Data)**

1. A hydrophone is fixed to the extension unit ("asparagus"):  
Transducer: ITC-3013AG with 4 mm banana connector
2. Mobile hydrophone (IXSEA TT801):  
Transducer: PET 801P-30  
Connector (socket) : Sourian 85102E 14-12S 5044 (on TT801)  
Connector (plug): Sourian 85108E 14-12P 5044 (on PET801)



## **15 Other devices / systems**

**15-9**

### **15.9 Isotope Container (<sup>14</sup>C-Container)**

Owner: Leibniz Institute for Baltic Sea Research, Warnemünde

Size: 20" Laboratory container

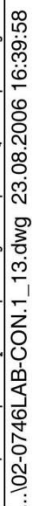
Location: Laboratory container **space 8/9**, 1st superstructure deck, aft (on roof of compressor building)

Usage: Laboratory container for handling radioactive materials and sources. The container should be on deck for measuring operation !!!

Safety: Following completion of the work with radioactive substances and cleaning of the container, wipe tests **MUST** be carried out! A record of these wipe tests is kept. One copy of this record (forms on board) goes to the next person in charge of safety (to be filed in the log book for the isotope container), to the chief and to Mr Rabsch (Leibniz Institute for Marine Science, Kiel). The next person responsible for safety must retest the wipe test values passed on to him by his predecessor when taking over the container as any possible contamination will otherwise be blamed on him.

If there are any special questions concerning container equipping / usage, please contact the German Research Ship coordination centre.

There is a 10' empty container on board in **space 05** for intermediate storage of isotope waste.



## **15 Other devices / systems**

**15-11**

### **15.10 Hydrograph shaft**

Installation location: Hangar

Quantity: 1 (one)

Clearance width: 1,300 mm

Usage: Measuring basket for universal use for installing sensors, samplers and other scientific appliances. An adapter plate (see illustration of measuring basket) which is screwed on underneath the measuring basket is used as an appliance carrier.

Drive: Electric lifting unit, can be veered and heaved. The measuring basket is hydraulically locked in the lowest position.

Clearance width in measuring basket: 750 x 750 mm (diagonal to ship's direction of travel)

Height of measuring basket: 325 mm

Hook height, lifting unit above hangar floor: approx. 4.0 m

Deck clearance, hangar: 6.0 m

Height from ship's floor to floor of hangar: 9.5 m

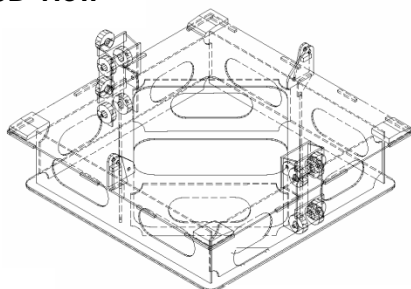
#### **Important notes concerning use of hydrograph shafts:**

The sounding shaft must always be kept closed using the provided closing basket during the transit journey to / from the research area.

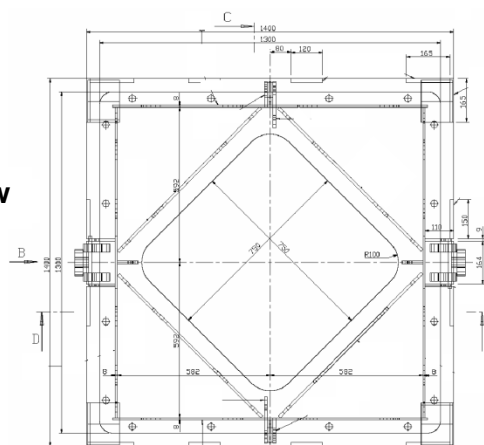
In the research area, the ship may travel with the shaft open under normal weather conditions up to a speed of approx. 12.5 kn.

## Measuring basket for hydrograph shaft

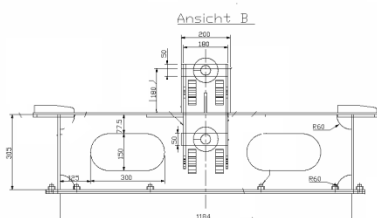
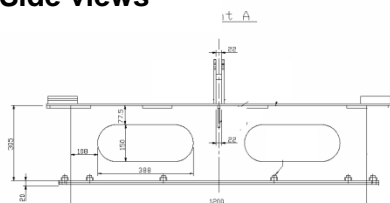
3D view



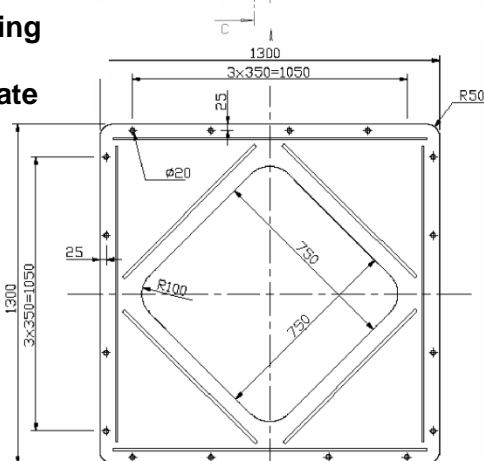
Top view



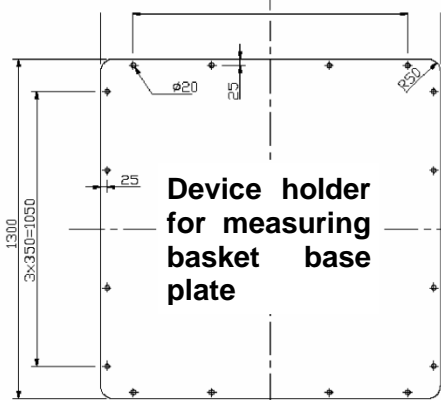
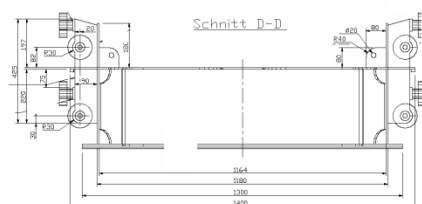
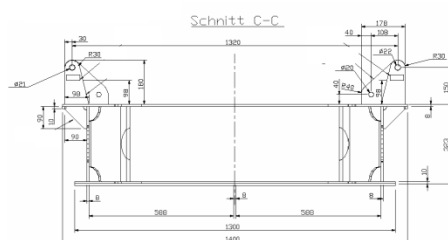
Side views



Measuring  
basket  
base plate



Sections



Device holder  
for measuring  
basket base  
plate

## 15 Other devices / systems

15-13

### 15.11 Core stacking frame

Usage: Safe and simple bringing of different core unloading appliances with possible core lengths of up to approx. 24 metres on or off the ship.

Note: The core stacking frame is only on board if requested and if it is not used it will be removed.

Manufacturer: Hydrowerkstätten GmbH Kiel

Load capacity: Load capacity of frame max. 6 t

Construction: Steel square tube construction with hot-dip galvanised surface.

Constituents: 1 weights set holder

Dimensions: L = 1,820 mm, W = 900 mm, H = 900 mm, weight 450 kg

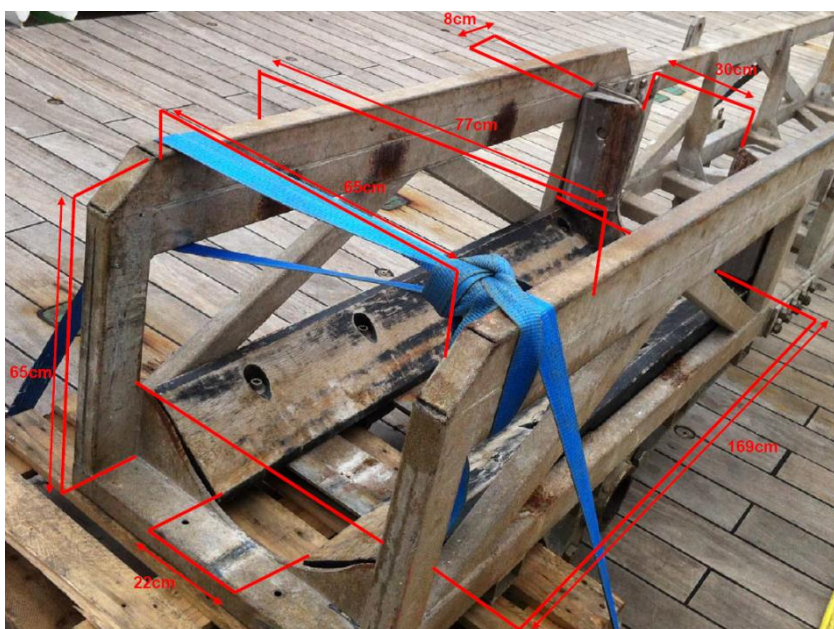
4 core box / core pipe sensor frame, individual dimensions:  
L = 5,700 mm, B = 800 mm, H = 750 mm), individual weight 550 kg

1 end frame with swing arm and wheels, dimensions:  
L = 1,200 mm, B = 1,074 mm, H = 770 mm, weight: 250 kg

If the core stacking frame is not going to be needed for a lengthy period, it is stored in a 20' container that is kept on shore if necessary in order to save space.

For this reason, notification of the need for the core stacking frame on board must be given in good time during the coordination meetings for the respective travel blocks (checklist MSM).

Picture  
Weights set holder with  
dimensions



## **15 Other devices / systems**

**15-14**

### **15.12 Flying cableways**

Usage: "Flying Cableway" is the name for the facility for connecting all laboratories, scientifically used rooms (e.g. gas cylinder rooms) and decks (outer and inner) with each other using flying cables and/or hoses without leaving doors open, for example.

Clearance width: 200 x 150 mm with wall, bulkhead and deck breakthroughs

Gangway area: 100 x 50 mm (aluminium rails)

Deck area: 100 X 50 mm (hooks made from stainless round bars)

Closure: Galvanised steel covers in some cases (walls, bulkhead, decks)  
All cushions made from non-flammable material

Comment: An overview of the "flying cableways" of this ship is hung in the gangway area of the laboratories on the main deck.

Attention: The openings must ALWAYS be closed with the non-flammable cushions for fire safety reasons, even if there are cables and hoses in the opening.

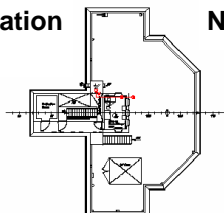
All installed cables and hoses must be removed after each trip.

**Attention:** the "flying cableways" are shown in **RED** in the illustration

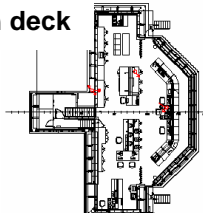


## Flying cableways

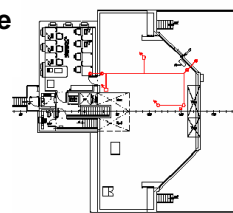
Observation deck



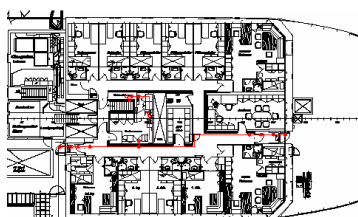
Navigation deck



Superstructure deck



1st superstructure deck



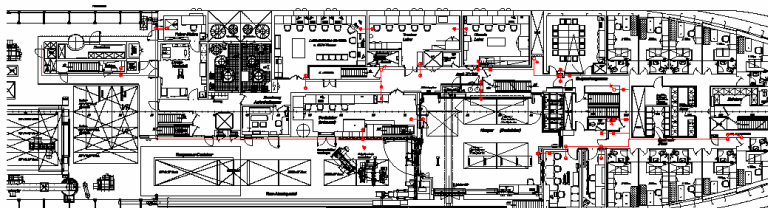
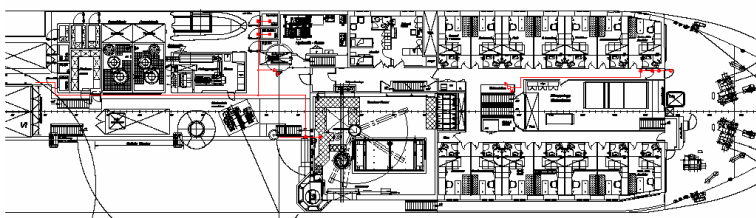
Attention: cableway entries in RED

Because of the “flying cableways”, all laboratories, scientifically used rooms and decks (outer and inner) can be interconnected. The openings are 200 x 150 mm in size.

### Key

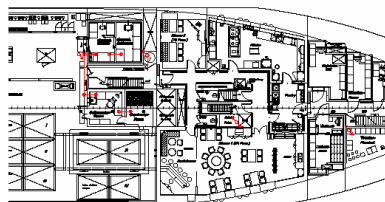
- Kabelkanal Ende / End of cable duct
- ↗ Kabelkanal nach oben / Cable duct leading to deck above
- ↘ Kabelkanal nach unten / Cable duct leading to deck below
- ↕ Kabelkanal nach oben/unten / Cable duct leading to deck above/below
- Schottdurchbruch / Crossing bulkhead

Forecastle deck

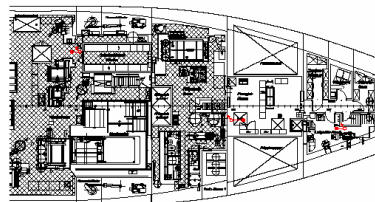


Main deck

Tween deck



Tank deck





## **15 Other devices / systems**

**15-16**

### **15.13 Goods lift**

Usage: The goods lift connects the winch room (tank deck), the scientific storage room (tween deck) and the gangway area of the laboratories to the hangar (main deck, ribs 73-76).

It can be operated with lift trucks and Euro pallets, but is not high enough for a standard lattice box.

**For this reason, big, high or heavy equipment items must be taken to their intended location for the trip via the hangar cargo hatch before departure. This is only conditionally permitted at sea and requires the captain's permission.**

Load capacity: 500 kg

Depth: 1,300 mm

Height: 1,200 mm

Width: 1,000 mm

## 15 Other devices / systems

15-17

### 15.14 Laboratory dishwasher

**Type:**

MIELE cleaning and disinfecting appliance G7883 CD

**Location:** Chemical laboratory, on left next to water purifier, direction of foreship



## **15 Other devices / systems**

**15-18**

### **15.15 Soft water and water purifier**

The fresh water is produced using 2 ROCHEM reverse osmosis systems. Each system produces 15m<sup>3</sup> of fresh water in 24 hours.

The fresh water that is produced (pure water) is known as PERMEATE. This permeate has conductivity of between 650 and 1000 µS/cm.

**NO** distillate is produced on the Merian.

The “untreated” permeate is also known as soft water.

The soft water is automatically led to a tank with a capacity of 250 litres.

The soft water goes from this tank to the laboratories via a pressure tank.

The following soft water taps can be found in the laboratory area:

Chemical laboratory:	2 locations
Dry laboratory:	1 location

There is also a Miele water purifier in the chemical laboratory (model G 7895) for providing a tap for **fully demineralised** water. A Milli-Q (model reference) has also been installed. The system is fed by the water purifier.

The soft water is demineralised here.

When doing this, it must be noted that the non-recyclable resins of the water purifier must be replaced after no more than 1000 litres of flow. There are 4 spare packs of non-recyclable resin on board.

If a bigger quantity of non-recyclable resin is required for a trip, it is advisable to bring it on board.

This is the following product.

Non-recyclable resin E 315 ( 20 ltr.)  
Art. no. 69431501 D  
Manufacturer: Miele



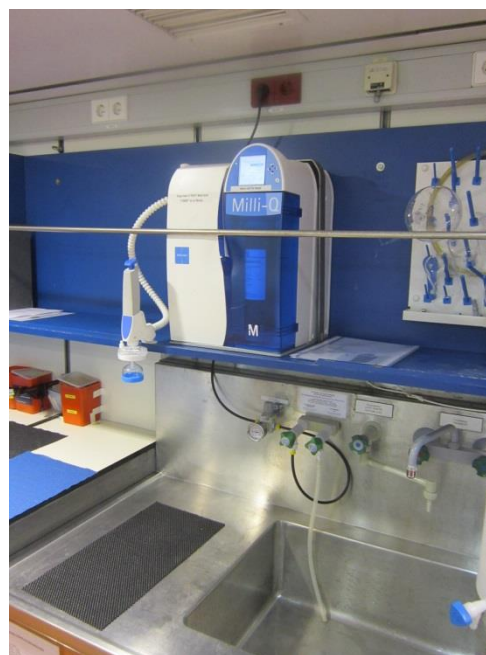
## **15 Other devices / systems**

**15-20**

### **15.16 Milli-Q Reference system**

A Milli-Q Reference system is installed above the laboratory sink in the shelf.

Picture: Milli-Q reference



#### **Data for system:**

Type: Milli-Q reference  
Manufacturer: Millipore SAS, France

Water preparation takes place with:

1. Q-Gard T2 pack
2. UV lamp with 185 nm and 254 nm
3. Quantum polishing pack TEX cartridge
4. POD Pack Millipak Express 0.22 µm

Quality of the Milli-Q water:

The water taken from a POD unit has the following characteristics:

- Resistance 18.2 MOhm.cm at 25 °C
- TOC ≤ 5 ppb
- Particles >0.22 µm\*\* < 1 particle/mL
- Bacteria\*\* < 0.1 KBE/mL
- Pyrogens\* < 0.001 Eu/mL
- Ribonucleases\* < 0.01 ng/mL
- Deoxyribonucleases\* < 4 pg/µL
- Flow rate\*\* 0.05 – 2 L/min
- (\*) With BioPak® ultra filtration module (not available on board)
- (\*\*) With Millipak® filter or BioPak ultra filtration module

The ultra-pure water can be drawn off by hand, or an exactly preset quantity can be dispensed.



## **15 Other devices / systems**

**15-21**

### **15.17 Crushed ice maker**

**Type:**

MIGEL ice line KF75

Volume: approx. 20 l; production rate unknown

Location: Dry laboratory, next to sink, direction of foreship



## **15 Other devices / systems**

**15-22**

### **15.18 Ground point**

A ground point is fitted towards the outside to the deck in the **deck laboratory** on the left next to the double door.





## **15 Other devices / systems**

**15-23**

### **15.19 Liquid nitrogen generator**

MSM has had a fixed nitrogen generator installation since 24.08.2009:

Type: StirLIN-1 MiniLIN

Manufacturer: Stirling Cryogenics & Refrigeration BV, Netherlands

Supply tank capacity: 200 ltr

LN2 production: 5 ltr/hr.

Installation location: Scientific storage room, tween deck between goods lift and entrance to scientific refrigeration room.



## **15.20 Pure sea water system in echosounder equipment room**

### **Preliminary remarks:**

The pure sea water supply and measuring system on the FS Maria S. Merian was completely revised in 2010. The system that was originally installed during construction had many problems and deficiencies.

The high intake locations were particularly problematic (air intake / occurrence of icing) and because of the pipe routing and the pressure situation that was difficult to control, reactions occurred time and time again between the laboratory supply system and the pure sea water measuring system for salt content, temperature and chlorophyll fluorescence.

Of course, the subsequent redesign of a fixed intake and pipeline system has its limits, particularly with regard to the available intake points.

However, it was possible to equip the ship with two additional intake points (deep 1 and deep 2) at a water depth of approx. 6.2 to 6.8 m, depending on the draught of the ship, which now supplement the unfavourable flat intake locations from a water depth of approx. 2.3 to 2.6 m (4.2 m above basic) in the foreship and at the starboard side.

For normal operation it is advisable to use these deep intakes exclusively for both the laboratory supplies and the pure sea water measuring system supply. The high intakes are only used for a certain time for special requirements and under special conditions (no ice, calm water, ship stationary or only moving slowly).

The new pure sea water supply system has been integrated with a new sea water measuring system to form a complex system in the echosounder equipment room.

When doing this, special attention was paid to having as much automation of all water supplies and the routing thereof as possible, and on having a design that was as redundant as possible, starting with redundant intake points and pipe routing to the laboratory outlets and the flow measuring systems with redundant sensor systems. New types of valve and venting systems provide air bubble-free water flows.

With regard to the water supply, it is possible to choose between rotary and membrane pumps for the laboratory supplies and the flow measuring systems.

All manual or remote settings are made by the machine personnel after consulting the scientists. All of the current settings and changes are reproducibly documented in the DVS.

Because of the redundant approach with multiple routes and multiple sensor systems, a wide range of operating options is available for the new pure sea water supply and measuring system. Above all, pure sea water can be led into the laboratories and the flow sensor groups via a supply branch, whereas the other supply branch is located in an automated cleaning process. Among other things, this makes it possible to make a regular automatic switch from a supply branch that is gradually becoming soiled to a freshly cleaned branch,

## 15 Other devices / systems

15-25

with certain transition times so that the laboratories and measuring systems are continuously supplied via automatically regenerating infeeds.

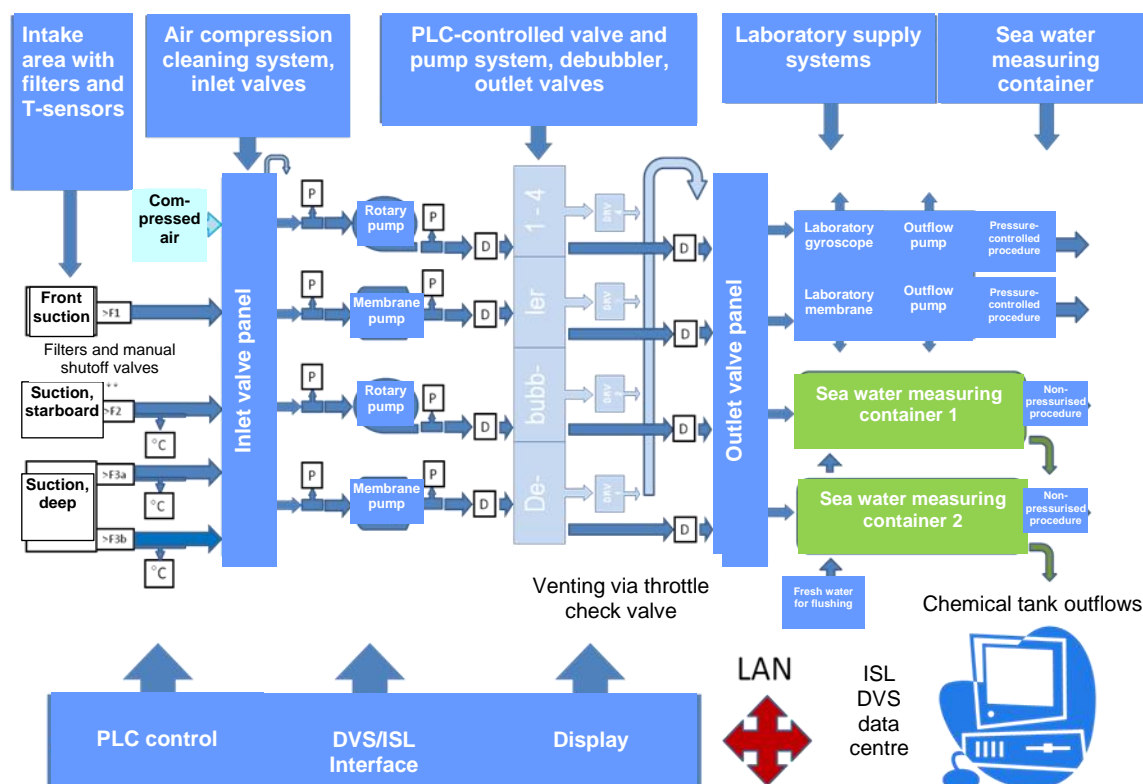
The branch which is currently active is unaffected by the cleaning procedures in the passive branch. The timing of the automated cleaning and changeover procedures is adjustable within a wide range (1 h to 24 h).

If the automatic cleaning as far as the respective passive intake (with compressed air) is not wanted, the laboratories and measuring systems can also be operated separately via separate intakes. However, this results in certain restrictions for the flow measuring systems. These only carry out certain internal interim cleaning operations and pipe cleaning up to the intake has to be initiated manually, which is why this type of operation is only recommended for exceptional cases.

### The pure sea water supply and measuring system from 09/2010:

(From Rochem, developed by IOW-MT/Briese)

#### Block diagram:



## 15 Other devices / systems

15-26

During the revision of the entire pure sea water supply system of FS Maria S. Merian in 2010, the entire pure sea water measuring system was redesigned. It was integrated with the new sea water supply system to form a complex system in the echosounder equipment room.

Depending on the operating mode, the new pure sea water measuring system supplies the following surface water measurements to the DVS more or less continuously at one second intervals:

Deep 1 intake inlet temperature 6.2 - 6.8 m	(°C, SBE 38, flagged as valid if deep 1 active)
Deep 2 intake inlet temperature 6.2 - 6.8 m	(°C, SBE 38, flagged as valid if deep 2 active)
Starboard intake H inlet temperature 2.3 – 2.8 m	(°C, SBE 38, flagged as valid if starboard H active)
Internal temperature	(°C, SBE 45 thermosalinograph, device of current system flagged as valid)
Internal conductance	(S/m, SBE 45 thermosalinograph, device of current system flagged as valid)
Salt content	(PSU, SBE 45 thermosalinograph, device of current system flagged as valid)
Internal acoustic velocity, calculated	(m/s, SBE 45 from Ti, Si)
Internal acoustic velocity, measured	(m/s, smart SVT, control variable)
Acoustic velocity at current intake, calculated	(m/s, SBE 45 from Ta, Si)
Chlorophyll A (µg/l,	FLNTUS, WetLabs with shutter and bio-wiper)
Nephelometric Turbidity (NTU,	FLNTUS, WetLabs with shutter and bio-wiper)

Two intake points (deep 1 and deep 2) at a water depth of approx. 6.2 – 6.8 m are provided for normal operation. However, in exceptional cases the more unfavourable flat intake points (water depth of approx. 2.3 - 2.5 m, risk of icing, air inclusion) in the foreship and starboard can also be manually selected.

During the development of the pure sea water measuring system, special attention was paid to having as much automation of all water supplies and the routing thereof as possible, and on having a design that was as redundant as possible, starting with redundant intake points and pipe routing to double flow systems in the form of replaceable mini-measuring containers with their own PLC control. With regard to the water supply, it is possible to choose between rotary and membrane pumps for the laboratory supplies and the flow measuring systems.

Features of the RSW rotary pumps: max. approx. 50 ltr/min (3.2 bar), approx. 90 ltr/min (2.5 bar)

Features of the RSW membrane pumps: max. approx. 20 ltr/min (3.2 bar), approx. 30 ltr/min (2.5 bar)

The entire system is controlled by a higher-order PLC which is connected to the ship's machine controller and the DVS.

## 15 Other devices / systems

15-27

All manual or remote settings are made by the machine personnel after consulting the scientists. All measuring data that occurs is stored in the DVS database at one second intervals. All of the current settings and changes are reproducibly documented in the DVS. The data and the operating statuses can be displayed on any of the ship's PCs with special DVS templates.

Because of the redundant approach with multiple supply routes and redundant flow measurement modules, a wide range of different operating options is available. Above all, pure sea water can be led to a flow sensor group via a supply branch, whereas the other branch, including intake and mini-measuring container, is in a fully automatic cleaning process. Among other things, this makes it possible to make a regular automatic switch from a supply branch that is gradually becoming soiled to a freshly cleaned branch, with certain transition times resulting in almost continuous data acquisition via more or less independently regenerating water supplies.

The branch which is currently active is unaffected by the cleaning procedures in the passive branch. The timing of the automated cleaning and changeover procedures is adjustable within a wide range (1 h to 24 h).

The following illustrations show the design of the overall system and recommended settings for the system in alternating operation via the two deep intakes.

Recommended settings for the system in alternating operation via the two deep intakes:

Recommendations for setting the MSM RSW (MC1/2 alternating operation)			Less soiling	Slight algae soiling in surface area	Average soiling	Heavy soiling	Extreme soiling
	<b>Settings I SWMC</b>	Mode	<b>"24/8/8</b>	<b>"24/6/3</b>	<b>"12/4/1</b>	<b>"6/1/10 min</b>	<b>"3/1/5 min</b>
"01	<b>Operation until general cleaning</b>	min	1440 <b>24 h</b>	1440 <b>24 h</b>	720 <b>12 h</b>	360 <b>6 h</b>	180 <b>3 h</b>
"21	<b>Measuring operation time until short cleaning</b>	min	480 <b>8 h</b>	360 <b>6 h</b>	240 <b>4 h</b>	60 <b>1 h</b>	60 <b>1 h</b>
"22	<b>Warm-up before general cleaning</b>	sec	20	20	20	20	20
"23	<b>Parallel operation when changing over</b>	sec	400	400	400	400	400
"24	<b>Measuring operation detection at DVS delay</b>	sec	180	180	180	180	180
"25	<b>Triggering time for FLNTU at DVS</b>	min	480 <b>8 h</b>	180 <b>3 h</b>	60 <b>1 h</b>	10 <b>10 min</b>	5 <b>5 min</b>

### **The redundant sea water mini-measuring container**

The core of the actual flow measurement are the sea water measuring containers, also known as mini-measuring containers. These were designed as compact, replaceable and independently functioning units. They are identical and contain their own power supply, the entire measuring sensor systems, a chlorine bleach cleaning system and a fresh water rinsing system. They can be actuated via a control panel or external control lines and carry out certain operating modes such as standby, general cleaning, short cleaning and flow measuring operation. They can therefore be operated separately for commissioning and maintenance, or carry out commands integrated in the system from the higher-order controller. The integrated measuring sensors are equipped with their own intelligence, and are programmed in such a way that they output their data independently of the controller at one-second intervals, provided that they are supplied with power. For the bio-optic sensors (Chili / NYU) an interval can also be specified after which the integrated Kupfers Hutter/BioWiper (wiper) is operated and mechanically cleans the optical windows. This interval is also specified by the main PLC, and the triggering of the measuring devices by the DVS is realised in accordance with this specification.

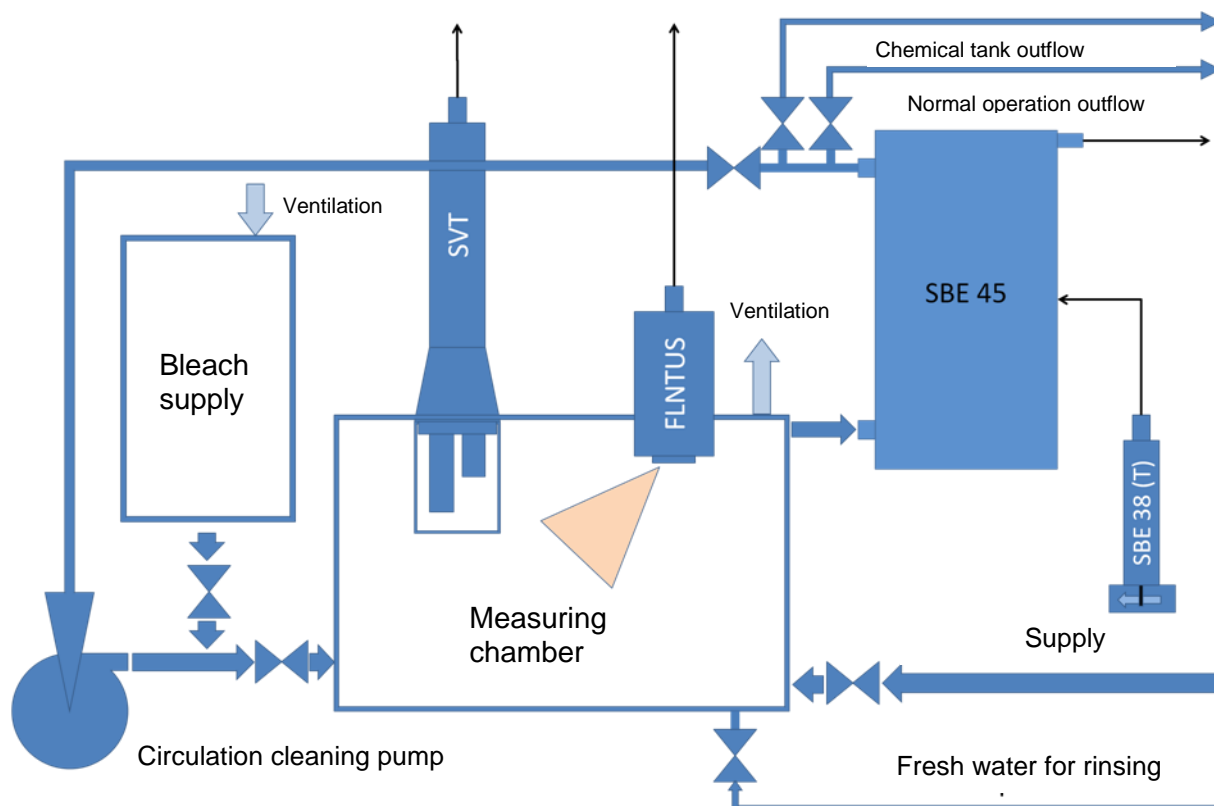
As a special feature, the DVS monitors the measured and calculated acoustic velocity of the flow water and issues alarm signals in the event of major deviations, which provides more or less automatic quality control.

## 15 Other devices / systems

15-29

### Sea water measuring container / mini-measuring container

#### Design diagram



Only internationally proven, intelligent and programmable sensors with a digital output have been selected as the flow measuring sensor system for the mini-measuring containers.



## 15 Other devices / systems

15-30

The following devices are used individually at the intake points and in the mini-measuring containers:

### Digital Oceanographic Thermometer SBE 38

With RS-232 Interface

Sea-Bird Electronics, inc.  
13431 NE 20th Street  
Bellevue, Washington 98005 USA

Measurement Range	-5 to +35 °C
Initial Accuracy	+/- 0.001 °C
Typical Stability	0.001 °C in 6 months
Resolution	0.00025 °C
Calibration	-1 to +32 °C
Response Time	500 milliseconds

### Flow temperature / flow conductivity / flow salt content, acoustic velocity (calculated):

SBE 45 MicroTSG  
Thermosalinograph  
**Conductivity and Temperature Monitor**  
with RS-232 Interface

Sea-Bird Electronics, inc.  
13431 NE 20th Street  
Bellevue, Washington 98005 USA

Parameters	Temperature (°C)	Conductivity (S/m)	Salinity PSU
Measurement Range	-5 to +35	0 to 7	
Initial Accuracy	0.002	0.0003	0.005
Typical Stability (per month)	0.0002	0.0003	0.003
Resolution	0.0001	0.00001	0.0002

## 15 Other devices / systems

15-31

### Acoustic velocity probe (control sensor)

Smart SVTX

AML Oceanographic Ltd.  
2071 Malaview Avenue  
Sidney, B.C. Canada V8L5X6

SV				
Range	Precision	Accuracy	Resolution	Response
1375 to 1625 m/s	+/- 0.006 m/s	+/-0.025 m/s	0.001 m/s	47 microseconds
T				
Range	Precision	Accuracy	Resolution	Response
-2 to +32 °C	+/- 0.003 °C	+/- 0.005 °C	0.01 °C	100 milliseconds

## **15 Other devices / systems**

**15-32**

### **15.21 Test basin for glider preparation**

A removable water basin with dimensions of 6 m x 2.5 m x 1.5 m is available on board MSM for glider and float preparation.

The basin can be set up in a variable way using the so-called “deck socket grid” on the working deck (main deck).

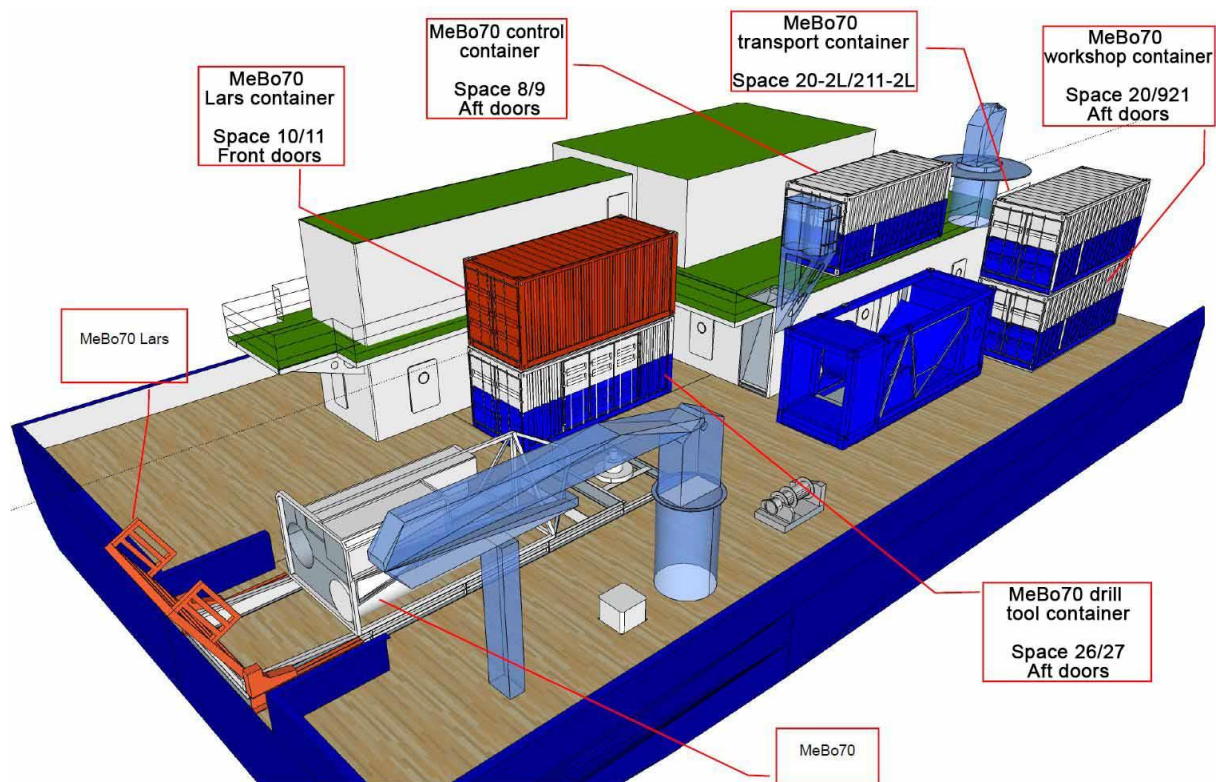
Notification of the need for this basin should be provided in good time using the “checklist”.



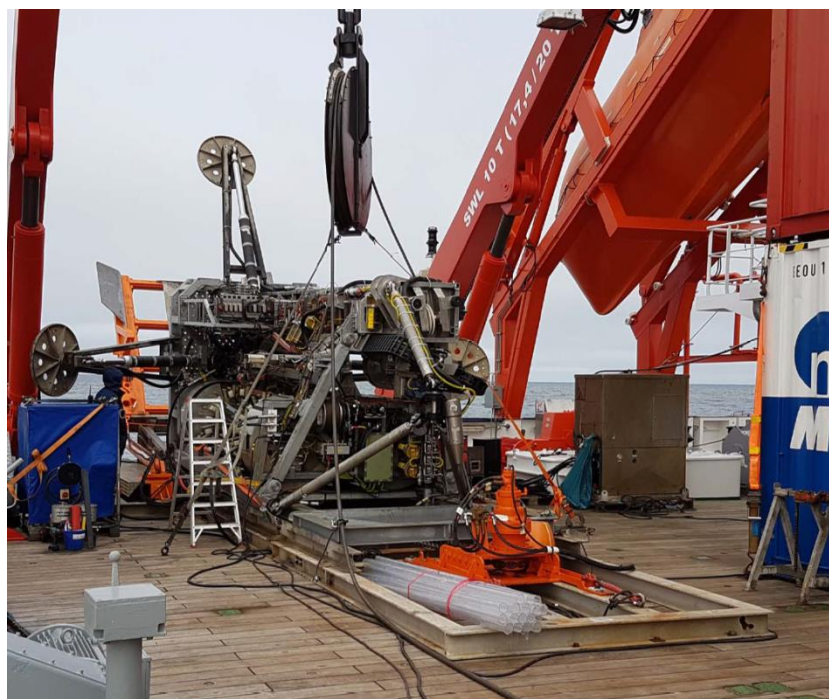
## 15 Other devices / systems

15-33

### 15.22 MeBo 70



### Adapter frame with LARS and MeBO 70



## **15 Other devices / systems**

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**15-34**

### **15.23 MeBo 200**

**Under development**



## **16 Communication**

**16-1**

### **16.1 Scientific intercom**

**Usage:** The scientific intercom system is used for direct communication in a maximum of three independent voice circuits of which one can be selected (broadcast system, everyone can hear, addressee must be called). You can speak into a handheld microphone (also possible with 25 m extension cable) or in handsfree mode. Handheld radio devices are therefore no longer needed during station work (example: laboratory – winch console – bridge).

Connections between two or more telephone points can be made by selecting the same circuit. The telephone points are installed in all user-relevant locations and on deck in waterproof boxes (see below).

**Locations:** All laboratory rooms (including hangar, server room, sounder / IT room)

Bridge

Captain's cabin

Expedition leader's cabin

Winch console

Scientific working room

Conference room

Electronics workshop

Echosounder equipment room

Salinometer room

Gravimeter room

Pulser station

Machine watch room (MWR)

Working deck – aft

Working deck – midships

Container connection boxes (5 pieces)

Scientific storage room

## 16 Communication

16-2

### 16.2 Telephone system

Deck	Room no.	Room designation	Telephone number
Observation deck	9902	Measuring and observation room	902
Bridge	8200	Bridge	111
Bridge	8200	Bridge radio console	112
Bridge	8200	Bridge PC station	114
2nd superstructure deck	7302	Scientific working room	702
2nd superstructure deck	7308	System operator	708
2nd superstructure deck	7310	Electronic engineer	710
1st superstructure deck	6200	Ship's office	600
1st superstructure deck	6202	Chief engineer	444
1st superstructure deck	6203	Captain's quarters	333
1st superstructure deck	6204	2nd scientist	604
1st superstructure deck	6205	Leading officer	555
1st superstructure deck	6208	2nd scientist	608
1st superstructure deck	6209	1st Officer	609
1st superstructure deck	6210	2nd scientist	610
1st superstructure deck	6211	2nd Officer	611
1st superstructure deck	6213	Converter room	613
1st superstructure deck	6214	2nd Engineer	614
1st superstructure deck	6215	Expedition leader	666
1st superstructure deck	6218	Electrician	618
1st superstructure deck	6300	Climate equipment room laboratories	622
1st superstructure deck	6301	Dockside connection	601
1st superstructure deck	6400	Ventilator room	621
Navigation deck	5200	Living quarters air conditioning system	500
Navigation deck	5201	Ship's mechanic	501
Navigation deck	5203	Ship's mechanic	503
Navigation deck	5204	Ship's mechanic	504
Navigation deck	5205	Ship's mechanic	505
Navigation deck	5206	Fitter	506
Navigation deck	5207	Ship's mechanic	507
Navigation deck	5209	Ship's mechanic	509
Navigation deck	5210	Ship's mechanic	510
Navigation deck	5211	Ship's mechanic	511
Navigation deck	5212	3rd engineer	512
Navigation deck	5213	Bosun	513
Navigation deck	5214	1st Cook	514
Navigation deck	5218	Steward(ess)	518
Navigation deck	5220	Cook's mate	520
Navigation deck	5301	Winch console	531
Navigation deck	5302	Treatment room	999
Navigation deck	5304	Hospital	534
Navigation deck	5306	Hydraulic room	536
Navigation deck	5308	Emergency equipment room	538
Navigation deck	5309	Seismic compressor room	539



## 16 Communication

16-3

Deck	Room no.	Room designation	Telephone number
Main deck	4101	Leisure room	464
Main deck	4106	Sauna anteroom	465
Main deck	4201	1 x scientist	401
Main deck	4202	1 x scientist	402
Main deck	4205	1 x scientist	405
Main deck	4206	1 x scientist	406
Main deck	4207	2 x scientists	407
Main deck	4210	2 x scientists	410
Main deck	4211	2 x scientists	411
Main deck	4212	2 x scientists	412
Main deck	4214	2 x scientists	414
Main deck	4215	2 x scientists	415
Main deck	4216	Conference room	416
Main deck	4217	Electronics workshop	417
Main deck	4223	Server room	423
Main deck	4301	Hangar	431
Main deck	4302	Chemical laboratory	432
Main deck	4308	Dry laboratory	438
Main deck	4310	Deck laboratory	439
Main deck	4401	Crew lounge	441
Main deck	4404	sounder / IT room	404
Main deck	4500	Deck workshop	450
Main deck	4502	Pulser station	452
Main deck	4503	Container connection 1	453
Main deck	4604	Container connection 2	454
Main deck	4604	Container connection 3	455
Main deck	4902	Bunker station	492
Tween deck	3207	Pantry	307
Tween deck	3208	Kitchen	308
Tween deck	3209	Mess 1	309
Tween deck	3213	Social room (bar)	313
Tween deck	3216	Mess 2	316
Tween deck	3306	Salinometer room	306
Tween deck	3308	Scientific refrigeration room	338
Tween deck	3310	Gravimeter room	310
Tween deck	3312	Scientific storage room	312
Tween deck	3312	Container connection 4	314
Tween deck	3312	Container connection 5	318
Tween deck	3401	Switch panel room 1	341
Tween deck	3402	Machine watch room	222
Tween deck	3500	Machine room 2	350
Tween deck	3505	Switch panel room 2	355
Tween deck	3506	Machine workshop 1	356
Tween deck	3602	Electrician workshop	362
Tween deck	3605	Welding workshop	365

<b>Deck</b>	<b>Room no.</b>	<b>Room designation</b>	<b>Telephone number</b>
Tween deck	3607	POD room 1 (starboard)	<b>367</b>
Tween deck	3608	POD room 2 (port)	<b>368</b>
Tween deck	3609	Store room (starboard)	<b>369</b>
Tween deck	3612	Waste incineration & stores	<b>363</b>
Tank deck	2203	Echosounder equipment room	<b>203</b>
Tank deck	2204	Laundry	<b>204</b>
Tank deck	2205	Auxiliary engine room	<b>205</b>
Tank deck	2208	Pump jet room (TD - Equip.)	<b>208</b>
Tank deck	2208	Pump jet room (TD - Tanks)	<b>209</b>
Tank deck	2302	Winch switch panel room	<b>232</b>
Tank deck	2304	Winch room	<b>234</b>
Tank deck	2400	Machine room 1	<b>240</b>

## 16 Communication

16-5

### 16.3 Ship-shore / shore-ship connections

**Call sign:** DBBT

**Telephone no.** +870 773 929 863 (Inmarsat Fleet Broadband 500)\*  
+88 1631 814 467 (Iridium)\*  
+49 171 6975433 (GSM, mobile radio), in port only  
**+49 491 91979023 (V-Sat)\***

**Notes:** The numbers marked with \* can only be reached if the bridge is also occupied (i.e. continuously at sea – only occasionally in port during the period from 08.00 to 17.00 hrs.).

The new telephone number via the **VSAT system** is made available by a Swedish provider. For this reason, the national dialling code of Sweden must be used. In comparison to conventional satellite connections, this is the cheapest voice connection by far.

**Fax numbers:** +870 783 157 643 (Inmarsat Fleet Broadband 500)

**Ship's e-mail:** merian@merian.briese-research.de

**E-mail:** Every participant on the trip (including the captain and the ship's crew) received an individual e-mail address, consisting of the first letter of their first name, a dot and their surname; e.g. Hein Mueck will receive the address:

[h.mueck@merian.briese-research.de](mailto:h.mueck@merian.briese-research.de)

The expedition leader will also be given an official e-mail account:

[chiefscientist @merian.briese-research.de](mailto:chiefscientist @merian.briese-research.de)

Each participant should install their password in their account.

E-mails can be sent and received from any workstation PC and from private notebooks (e.g. from the living cabins) (via POP3, IMAP e.g. with MS Outlook, Mozilla Thunderbird). The default limit is 500 kB; (chief scientist: 2 MB), but can be increased by request. The system operator is responsible for e-mail communication.

E-mail communication takes place continuously **every 15 minutes** with VSAT operation.

## 16 Communication

16-6

In the event of V-Sat system **failure** and **north of approx. 70°N**, e-mail communication is only possible via Iridium Open Port (backup system). Because of the significantly slower data rate (max. 128 KBit/s) and the associated long transmission times and **high cost**, the limit is restricted to 50 kB for all users on this system.

In any case, the expedition leader or system operator must be notified before sending large e-mails (volume of 50 kB or more), not least because of the costs that are incurred.

The changeover of the V-Sat system to the Iridium Open Port backup system is announced by the SysOp.

### Telephone calls, if an Internet connection is available:

In the KU band coverage area via V-Sat (i.e. for as long as Internet access is available) it is possible to make private telephone calls to shore at extremely low cost from the wall telephone installed in your cabin (or any other telephone on board).

In order to do this, the 2nd nautical officer issues personal PIN codes to the value of 25 USD at the beginning of every trip. Additional PIN codes can be purchased if this is used up.

Three telephone calls (Voice over IP) can take place at once. If no line is free, you get the usual engaged tone.

Precise instructions for using the current on-board telephone system are provided to the scientists during their familiarization at the beginning of the scientific cruise.

The instructions and price tables are also available on the intranet site and can be viewed at any time. The costs of the first issued pin (per research trip) are paid by the Briese shipping company / Leitstelle. All other pins purchased on board must be paid to the 2nd officer at the end of the cruise (cash or EC / credit card).

Calls to shore on the individual telephones is **NOT** possible and also **NOT** desirable (time difference etc.)

Outside the KU band coverage, see following paragraph.

**Telephone calls if an Internet connection is not possible or unavailable:**

A Iridium telephone is available in the telephone box next to the scientific working room (2nd superstructure deck) for private calls 24 hours per day. PIN code numbers with talk time of approx. 30 minutes can be purchased from the 2nd nautical officer.

Manually connected calls from the bridge are only possible in urgent exceptional cases. Official calls from there must be arranged with the expedition leader and the captain. Telephone calls can be made to the outside world directly over all lines from the expedition leader's cabin.

**Incoming fax messages:**

Incoming faxes are received by the bridge.

**Internet access:**

Because of the restricted data rate of 1024/256 KBit/s for the entire ship, it is not possible for everyone on board to surf the net with their PCs. A regulation for this is being prepared.

E-mail traffic is only possible using POP3/SMTP and IMAP from any computer on the ship's network.

Web access is possible via a PC in the scientific working room and in the expedition leader's cabin.

It depends on whether considerate use of the **bandwidth resource** by all users whether Internet access remains functional.

**Virus problem:**

With regard to optimum data supply and data processing in all areas on board, all participants on the trip must ensure that all official or private data carriers brought on board (PCs, laptops, external hard drives, USB sticks, CDs/DVDs etc.) are free of viruses.

Since it is not possible to examine the above-mentioned data media for all new boarders for viruses for time and data protection reasons, the duty of care in this respect lies with the persons concerned (new boarders).

Proof of intent or negligence in this respect may result in sanctions by the ship's management (e.g. confiscation of data media, shutdown of network access in the living cabins), particularly if there is a serious effect on the optimum supply of data on board

## **16 Communication**

**16-8**

Since viruses, Trojans etc. can spread quickly and uncontrollably via the ship's VLAN, particularly from data media that are not permanently connected, and become active again at a later date, all participants on the trip are expected to voluntarily check before the start of the trip that all data media which are going on board are free of viruses using suitable, up to date and effective virus scanning programs.

The system operator can make random checks of the data media that are brought on board in the presence of the owner.

## **16 Communication**

**16-9**

### **16.4 PC workstations**

There is a PC in each laboratory and each scientifically used room except the cooling and freezing room and the gravimeter room. There are 4 PCs in the scientific working room.

The computers are connected with the other laboratory rooms via the network, making seamless data transfer with other computers is possible.

The DVS display PCs installed in the laboratory rooms can also be used for normal PC applications.

Network: Ethernet connection 100/1000 Mbit/sec, TCP/IP

Connection: External computers can be connected to the network in the laboratories and living cabins via the connections described in chapter 12. The participants should bring their own network cables and/or adapters if possible. Cables can also be borrowed on board.

Software: The DVS display PCs have Windows 7 software as standard. External software can be installed after consulting the system operator.

The computers installed in the computer room are also equipped with Office 2013/2016 (Word, Excel etc.), graphics software, scanner software and CD-ROM burner software (see chapter 13).

Accessories: Colour scanner, DVD/CD-ROM burner, colour printer, laser printer, plotter.

**Attention!!** Although the computer software is regularly checked for viruses, no guarantee of freedom from viruses can be given! Please check your own software.



## **16 Communication**

**16-10**

### **16.5 TV monitoring system (CCTV)**

#### **Description:**

This is used to monitor all important working areas of the ship, particularly the winches and the working deck.

All external cameras are equipped with standard 0.05 Lux sensitivity in order to improve light sensitivity in darkness.

The mast camera, the working deck camera and the closed back camera are equipped with a zoom/focus lens and a swivelling and tilting head. Both movebars at the aft port side and on the tank deck in the winch room, discharge winch 2 and the standard winch (2 cameras, optionally switchable), both storage winches and discharge winch 1 are monitored by a total of 10 wide-angle cameras (fixed installations). Both friction winches are also monitored by a camera with a zoom/focus lens (adjustable on site as required).

The cameras are together in a microprocessor-controlled video crossbar with integrated control panel, arranged in the AVB rack in the converter room on the 1st superstructure deck, and make long-term recordings on a networkable *DIVAR* HDD recorder. The system was extended in June 2008.

Each camera image, including the possible remote control functions, can be requested as often as required depending on operations, selected at any of the specified remote control panels and displayed on the associated monitor/output together with the camera number and the installation location in plain text.

An integrated video sequencer function also makes it possible to have an automatic, sequential display of each camera image in a predefined order and time interval on a selected monitor for each control panel.

The system is monitored on the front bridge console (port side), the starboard console, the winch console and in the crew watch room.

Two arbitrary images can be preselected for distribution via appropriate video connection sockets in the chemical laboratory, the dry laboratory, the desk laboratory, the hangar and sounder / IT room (via bridges from the dry laboratory) and via four container connections to the laboratory containers from the front bridge console (output 06 & 07). The required monitors are on board.

Further details can be found in the CCTV Monitoring System documentation.

## **16 Communication**

**16-11**

### **16.6 ARGOS radio direction finder**

Manufacturer: SERPE-IESM

Type: GONIO 400

Description: The device is used to take bearings on and locate scientific devices equipped with ARGOS transmitters.

The direction finding equipment consists of a receiver, an antenna with pre-amplifier and a reference PTT.

The antenna is mounted on the radar mast and can be easily removed.

The reference PTT (Platform Transmitter Terminal) must be mounted in accordance with the operating instructions during operation.

The direction finder has two tasks:

- Analysis of ARGOS PTT and Sarsat Epirb (Emergency Positioning Indicating Radio Beacon) data
- Direction finding of ARGOS PTT and Sarsat Epirb transmissions.

Installation location: Bridge

Antenna position: Main mast, height approx. 29 m

Frequencies: 401.650 Mhz  
406.025 MHz

Accuracy:  $\pm 15^\circ$

More details can be found in the IESM GONIO 400, ARGOS and SARSAT Direction Finder documentation.

## **16 Communication**

**16-12**

### **16.7 Arcus-M VHF radio direction finder**

Description: The ARCUS M VHF radio direction finder is used to provide a direct, accurate-to-side display of the direction of arrival of direction finding transmitters in the VHF maritime radio range and on the civil aviation radio emergency frequency 121.5 MHz, in combination with an H-Adcock direction finding antenna, which is mounted on the foremast.

The direction finder is also used on the ship to located research devices, for which reason it has different channel programming (software version V1.4). These are channels Ch30L, Ch31L, Ch32L and Ch33L.

Installation location: Bridge

Antenna position: front mast, mast tip approx. 21.5 m high

Frequency: 156.025 - 158.000 MHz in 25 kHz steps  
158.000 - 158.950 MHz in 50 kHz steps  
160.625 - 162.600 MHz in 25 kHz steps  
162.600 - 163.550 MHz in 50 kHz steps

The following frequencies are programmed differently from the pattern shown above:

154.575 MHz instead of 157.500 MHz  
159.475 MHz instead of 157.550 MHz  
160.725 MHz instead of 157.600 MHz  
160.775 MHz instead of 157.650 MHz

The emergency frequency 121.500 MHz can also be located

Beacons which fall into the 25 KHz grid should be used in future.

Other:	Modulation types F3E, A3E (121.5 MHz) Digital direction-finding angle display: 4-digit, 0.5° resolution Pseudo-analogue, 10° resolution Scan operation via 10 channels possible
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The transmitter must have the following data:

Transmit frequencies:	see above
Transmit duration:	2 seconds
Repeat rate:	15 seconds
Transmit power:	100 mW
Modulation type:	NBFM
Modulation frequency:	1 kHz
Frequency swing:	5 kHz

More details can be found in the ARCUS M VHF marine radio direction finder documentation

## **17 Ship's waste**

**17-1**

### **17.1 Waste treatment / disposal**

The ship has a certified *Garbage Management Plan* which regulates the treatment of waste and must be adhered to.

Notices on board provide information about the contents of the garbage management plan.

#### **Waste separation**

Separate collecting containers can be found around the ship, including those for glass, metal/cans, cardboard/paper, plastics, waste containing oil and residual waste.

Since cardboard and paper can be treated in the ship's shredding and briquetting system (adherence to "Blue Angel" criterion), cardboard and paper should be separated completely if possible in order to minimise the quantity of other waste.

#### **Waste disposal**

No waste must be thrown overboard under any circumstances!

Cardboard and paper are compacted in the shredding and briquetting system and properly disposed on shore when the ship docks.

Since the storage capacity on board is limited, care should be taken to keep waste to a minimum.

#### **Packaging**

When scientific equipment is being packed, please use materials which are easy to shred.

#### **Batteries**

Used small batteries and rechargeable batteries from normal ship's operations are collected on board and disposed of on shore in accordance with regulations.

Larger quantities of used batteries within the scope of scientific operations (e.g. after seismic trips) can be properly stored on board until the next port is reached, but then have to be disposed of properly in the same way as the chemicals which have been brought on board, either on shore in the port or taken with you onto shore.

## **17 Ship's waste**

**17-2**

### **17.2 Chemicals**

All chemicals which you bring on board must be removed from the ship again at the end of the trip and taken for disposal. Appropriate proof must be provided.

Solid and liquid chemicals must be disposed of properly, e.g. after return transport.

With larger quantities the following must be taken into account:

- The chemicals must be collected in plastic canisters, sorted according to material
- Return transport together with the scientific equipment by the user, taking the IMDG regulations into consideration with regard to designation and packaging

The following documents are required:

- Safety data sheet for each substance: to be obtained from the manufacturer
- Certification concerning hazardous goods (responsible declaration)
- Container packing certificate labelling with IMDG label:
- for container marking: 4x large labels
- Container marking: 2x large labels

## **18 Automatic DWD weather station**

**18-1**

### **18.1 Sensors and their locations on board**

#### **Wind direction**

Supplied by Thies. Output format: The sensor outputs an 8-bit gray code depending on the wind direction. The resolution is in steps of 2.5°.

The sensor swivels upwards and is therefore at the uppermost point of the radar mast.

This location is relative free of wind turbulence and should therefore provide neutral wind results.

#### **Wind speed**

Supplied by Thies. Output format: The sensor outputs a frequency which is dependent upon the strength of the wind. The frequency is in the range from 0-800 Hz. This results in a wind strength of 0-40 ms. The position of the sensor on board is the same as that of the wind direction sensor.

The wind calculation is vectorial.

#### **Air temperature**

Supplied by Friedrichs Temperature-dependent resistance PT-100.

Four-conductor principle. Accuracy in accordance with 1/3 DIN B or EN60751. The location is on the elevated observation deck. The temp. sensor and the humidity sensor are installed in a Friedrichs labyrinth hut.

#### **Air humidity**

Supplied by Rotronic. The sensor outputs a voltage level which is dependent on the humidity. Measurement range 0-100 % corresponding to 0-100 mV. The location is also on the elevated observation deck.

#### **Water temperature**

Supplied by Friedrichs: PT-100 weld-in plunger. Accuracy in accordance with 1/3 DIN B. The temperature is measured in the water box, approx. two metres below the water line, in the echosounder equipment room.

#### **Air pressure**

Supplied by AIR. Smallest measurable air pressure change 0.1 Hpa. Data output via RS-232 interface. Accuracy 0.5 Hpa max. deviation over the entire measuring range. Data repeat rate 10 sec. Calculation takes place in accordance with QFN (air temperature included in air pressure calculation). The sensor is installed in the central data recording unit of the on-board weather station. This is in the converter room. In order to avoid possible interference such as overpressure or underpressure caused by equipment such as air conditioning systems on the ship, the air pressure sensor has a separate air inlet which is outside the ship.

## **18 Automatic DWD weather station**

**18-2**

### **18.2 Data management and distribution**

The central data recording unit (MILOS 500) produces various data telegrams from the sensor data that is collected.

#### **DWD Synop telegram**

This telegram contains the DWD weather data, encrypted in accordance with WMO specifications. This consists of hourly averages of the measured weather data. This telegram is generated once per hour and sent via the DWD transmitter on board via Meteosat. The relevant antenna is at the top end of the observation mast. Additional data transmission e.g. via Inmarsat does not take place.

#### **On-board data network data telegram**

See interface specification. DWD --- WERUM

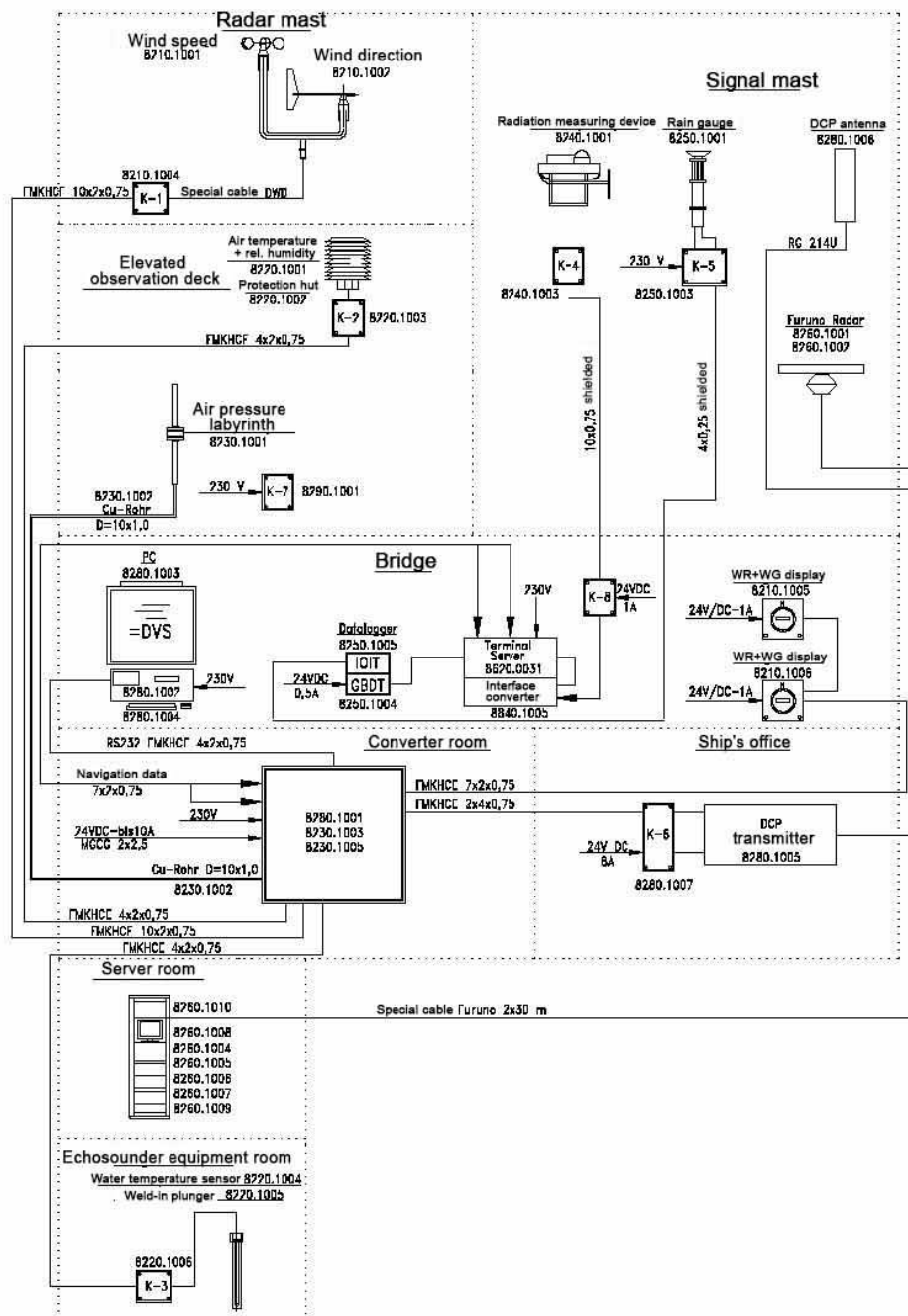
#### **On-board weather station and on-board PC data telegram**

Another exchange of data takes place between the on-board PC on the bridge and the data recording unit of the on-board weather station. The exchange of data is used to display the weather data on the on-board weather PC and also for entering visual observations.

This data telegram is DWD-internal and does not correspond to any popular standard, and is not intended for use by external users.



## Weather station – schematic diagram



### **Intranet**

The on-board Intranet has an extremely clear and structured design, and provides answers / information on the following important topics / questions, among other things:

- **Safety**
- **Social**
- **Global Mapper**
  - *Load workspace with nautical maps*
  - *Importing routes into the Global Mapper*
  - *Send route to bridge*
- **Frequent error messages when “surfing” the Internet**
- **Allow network connections with Bitdefender**
- **How do I connect to the network?**
- **How can I access network releases?**
- **Handling of large emails (ship → shore)?**
- **How does the ship’s email system work?**
- **How can I print?**
- **How does the telephone work?**

### **Safety**

The safety officer provides comprehensive **safety instruction** before the start of each trip. **Safety regulations and ship’s rules** are displayed in all cabins, and should be read carefully by everybody.

Two **alarms** that you should be aware of beforehand require all persons on board to go to the collection point (1) or the free-fall rescue boat (2) immediately (preferably in protective clothing, with head covering and life vest):

**(1) General alarm: Seven short tones and one long tone (in sequence)**

**(2) Abandon ship: One short tone and one long tone (in sequence)**

**Safety drills** take place at the beginning of the trip and during the trip. Participation in the all safety events is **mandatory** for everyone on board.

**(More information on the subject of “Safety” and “Behaviour on board” can be found in a clear slide presentation with the name “FamiliarizationMSM”, which can be called up on the ship’s Intranet. The safety officer will point this out to new user groups during the prescribed “Instruction”).**

## **Health**

The following applies to all trips, irrespective of the location: A **blood type pass** or **emergency pass** and, if present, an **allergy pass** should be taken on board for your own safety and for quick attention in emergencies. Vaccination certificates are required by the port health authorities of many countries. It is therefore generally necessary for you to carry the **proof of vaccination** with you. The limited stocks of the on-board pharmacy cover the necessary emergency and standard medication. Participants who have to take medication regularly should bring the necessary medication in **sufficient quantities**. The **Maria S. Merian** does not have a **ship's doctor** on board. Taking your own precautions, such as a preventive visit to the dentist's, are an important part of trip preparations.

## **Radio / music**

The radio programme which has been selected and stored on the bridge can be received in all cabins and in the laboratory rooms as soon as you switch on the rotary control.

## **TV**

The TV programme can be received in the mess rooms and in the conference room. Televisions are available there. The programmes are provided by a self-readjusting satellite system as long as the ship is traveling inside the satellite covers.

## **DVD + Video**

DVDs and videos can be played in the messes and the conference room.

## **Batteries**

Clock, camera and other important batteries have the characteristic of always stopping working at sea. The spare batteries on board are intended for ship's operations. Please bring sufficient spare batteries with you. Old batteries are collected on board and disposed of in line with regulations.

## **Glasses**

Many things can and are repaired on board, but a spare pair of glasses is certainly more becoming.

### **Washing machine**

On the front tank deck (below the provision loads) there are two washing machines and two driers, which are available round the clock. The washing machines are operated with a liquid dosing system. Please clean the fluff filter of the dryer after use. The crew are available to answer questions at all times.

### **Quarters**

If nobody is present in the cabin the door should be left open whilst we are at sea. For safety reasons, the cabin should never be locked whilst at sea. However, in port the cabins should be locked because external personnel are on board. Cabin keys can be collected from the responsible officer against a signature.

There are no cabin personnel aboard **Maria S. Merian**. **Cleaning work** during the trip and particularly at the end of the trip must therefore be carried out by yourself. It is therefore advisable not to enter the cabins wearing dirty clothing and work shoes!

### **Conference room**

The conference room can be used at any time for talks, meetings, workshops and for leisure time (e.g. television, videos, card games). The room should be prepared for the respective use by the scientists themselves, i.e. the table arrangement and seating should be adapted in good time (chap. 9.5), the presentation facilities should be tested using a notebook connection to the respective projector, the television and video system should be adjusted etc. Help is available from electronics specialists and system operators if necessary

### **ID's**

Please bring a **passport** and any **visas** which may be necessary! In order to make entry arrangements easier, it is advisable to hand your passport to the responsible officer upon arrival. The immigration authorities come on board for every entry. Passports must be shown if required. Waiting authorities and wakened trip participant are not always pleasant.

### **Library**

The library on MSM is in a constant state of development. Anyone who would like to find out about the contents of the on-board library in more detail before setting off on the trip can obtain information on the coordination centre web site. Of course, anyone is welcome to leave books that they finished reading on board and therefore add to the library.

### **Magazines / newspapers**

The daily newspaper "Die Welt" can be called up on the Intranet daily as an e-paper. Otherwise the supply of magazines and newspapers on board is not very good. Many of the crew members are often on board for months and would even look forward to reading older issues and "booty" from the aircraft.

### Meal times

The scientists and officers eat in the large mess hall, where the food is also dished out. You must not enter the mess hall in dirty work clothing, overalls or work shoes, and smoking is not permitted. The small mess hall is reserved for the remainder of the crew.

The following meal times apply:

<b>Meal times</b>	<b>at sea</b>	<b>in port</b>
Breakfast:	07:30 – 08:30 hours	07:30 – 08:00 hours
Lunch:	11:30 – 12:30 hours	11:30 – 12:00 hours
Dinner:	17:30 – 18:30 hours	17:00 – 17:30 hours
Coffee break:	10:00 – 10:20 hours and 15:00 – 15:20 hours	

Please do not turn up for meals at the last minute. Warm food can be set aside for watch keepers / station personnel by request.

### Canteen

Cigarettes, drinks, sweets and nibbles are available from the stewardess during the trip. For customs and safety reasons, the bringing of alcohol and cigarettes on board is forbidden without the captain's permission.

### Fastening materials

Since the majority of walls are made from metal, magnets with many different designs have proven to be the very good for securing plans, notes and other information material, and they are therefore always in great demand (which cannot be met on board). The users should therefore bring a sufficient quantity with them. Magnets can be purchased from stationer's shops. Adhesive strips and adhesive tape leave residue on the walls and damage the paintwork.

### Payment for canteen and telephone

A card reader is available on board which accepts EC cards and all of the most popular credit cards (Master Card, Visa etc.), meaning that "**cashless**" payments can be made.