

FMV**TECHNICAL SPECIFICATION****Local Communication Network for
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TECHNICAL SPECIFICATION

Local Communication Network for the Offshore Diving System onboard HMS Belos III

**Approved by
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Naval Department**


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1 GENERAL

The Contractor shall fulfill each requirement marked *M* in the margin. The following marks have been used:

Mandatory: Requirements that must be complied with; indicated in the specification in the column on the left hand side (*Type*) with an *M*

1.1 Scope

This specification and annexes contain requirements for a New Local Communication Network for the Offshore Diving System (CN-ODS) onboard the Auxiliary Ship HMS Belos III of the Swedish Armed Forces.

- 1 The requirements founded in this Technical Specification (TS) and in its annexes: Management Requirements (MR), Logistical Requirements (LR) and System Safety Requirements (SSR), encompass all aspects of the CN-ODS during its lifetime with regard to function, safety, documentation, logistics, training and quality.

With reference to paragraph 1.2, which displays a short description of the sub-networks composing the CN-ODS at the moment, two alternative actions are requested:

Alternative 1

- i.* The actual *Pressure Chambers Sub-Network (TS 1.2 A)* needs a total revision and upgrade with the requisites presented in TS 4.1.
- ii.* The actual *Service/Life Support Sub-Network (TS 1.2B)* needs to be integrated with the new *Pressure Chambers Sub-Network (TS 4.A)* with requisites in TS 4.1.1
- iii.* The actual *Divers Sub-Network (TS 1.2C)* needs to be integrated with the new *Pressure Chambers Sub-Network (TS 4.A)* with requisites in TS 4.1.1
- iv.* The actual *Linkage Sub-Network (TS 1.2D)* needs to be integrated with the new *Pressure Chambers Sub-Network (TS 4.A)* with requisites in TS 4.1.1

Alternative 2

The same actions of point *i* and point *iv* but point *v* instead of point *ii* and *iii*

- v.* Modification and integration of the actual *Service/Life Support Sub-Network (TS 1.2B)* and the *Divers Sub-Network (TS 1.2C)* into the new unified *Service and Diving Sub-Network (TS 4.B)* in accordance with requisites presented in TS 4.2



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1.2 Description

This specification contains neither a description of the Offshore Diving System (ODS) where the Communication Network will be installed, nor a description of the communication network actually in use. The ODS will be available for inspection by the Tenderer onboard HMS Belos III, in the dates and terms presented in the Enquiry document.

However, in order to give an overview of the entire system, the text of this specification will refer to Image 1 where a schematic representation of the ODS onboard of HMS Belos III is displayed. The scheme does not respect scale, relative position or dimensions neither of the Ship nor of the Offshore Diving System.

The actual communication network can be roughly divided in four sub-networks:

- A. Pressure Chambers Sub-Network:** it takes care of all the internal communication between the Chambers Control Terminal and the Pressure Chambers.
- B. Service/Life-Support Sub-Network:** it connects different areas of the ODS and in particular the areas/rooms related with the pressure chambers life support.
- C. Divers Sub-Network:** it connects the Diving System Center with all the areas involved in manned and unmanned diving activities (such as, among others: chambers control, diving bell container, diving bell, hangar and deck).
- D. Linkage Sub-Network:** it connects the ODS with other important nodes of the Ship Main Communication Network.

1.3 Definitions

Abbreviation	Explanation
FMV	Swedish Defence Materiel Administration
CE	Conformité Européenne (CE marking)
CEN	Comité Européen de Normalisation (European Standard)
FREJ 88	Swedish Armed Forces Supply Registration System
FSD	Swedish Defence Standard
MIL-STD	US Military Standard
SweAF	Swedish Armed Forces
URF	Submarine Rescue Vehicle
RD	Spare parts
UE	Replaceable units

1.3 Definition cont.

Abbreviation	Explanation
CN-ODS	Communication Network for the Offshore Diving System
PC-SN	Pressure Chambers' Communication Sub-Network
SD-SN	Service and Diving Communication Sub-Network
LN-SN	Linkage Communication Sub-Network

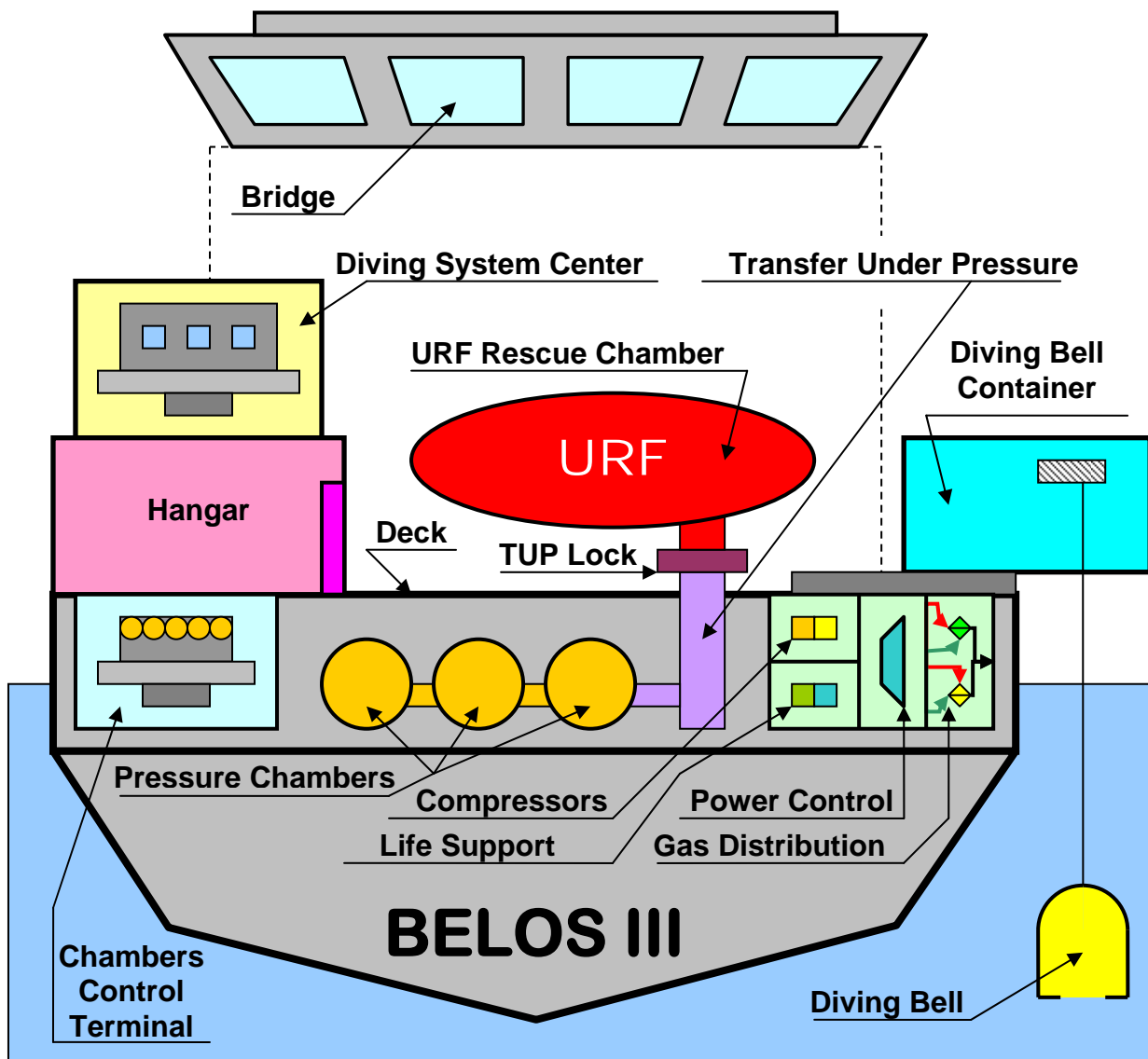


Image TS 1: Schematic of the Offshore Diving System onboard HMS Belos III



1.4 Applicable Standards

The latest revisions of the following documents shall apply. All applicable standards within mentioned standards below shall be governed; any deviation shall be notified by the Tenderer.

Standard	Remarks
SS-EN ISO 9001	Quality management systems - Requirements
DNV-OS-E402	Offshore Standard DNV-OS-E402, Offshore Standard for Diving Systems (2004)
DNV-OS-D201	Offshore Standard DNV-OS- D201, Electrical installations
DNV-OS-D202	Offshore Standard DNV-OS- D202, Automation, Safety and Telecommunication systems
DNV-RP-E401	Recommended Practice DNV-RP-E401, Survey of Diving Systems (2007)
DNV-OSS-302	Offshore Service Specification DNV-OSS-305, Rules for Certification and Verification off Diving System
FSD A4702: 116E	Right of ownership sign (crown mark)
FSD 0246E	Signs with bar code 3 of 9 (code 39)
M7740-784861	M7740-784861 H SystSäkE, System Safety Manual
MIL-STD-882C	System Safety Program Requirements
MIL-STD-1629A	Procedures for Performing a Fault Modes, Effect and Critical Analysis
91/155/EEC	Safety Data Sheet Directive

1.5 Complying with requirements

Type	Number	Requirement
M	TS 1.4.1	The Tenderer is responsible to ensure that the CN-ODS complies with all applicable Swedish law.
M	TS 1.4.2	In the event of inconsistencies between requirements in this specification, Swedish laws are governing over applicable standards; FMV shall be notified in order to clarify these issues.
M	TS 1.4.3	Should the Tenderer feel any doubt with regard to interpretation of any documentation supplied by FMV including this specification, FMV shall be notified in order to clarify these issues.
M	TS 1.4.4	The Tenderer is responsible to ensure that all requirements in this specification are fulfilled including requirements that specify detailed design.



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1.6 Equipment references

Following equipment and documentation will after request be available for inspection at FMV premises Tre Vapen, Stockholm or can be shipped as electronic information on CD/DVD:

- M7740-784861 H SystSäkE, System Safety Manual (in English, CD)

2 TO BE SUBMITTED IN TENDER

Type	Number	Requirement
M	TS 2.1	The Tenderer shall provide a detailed technical description (incl. general arrangement and drawings) of the CN-ODS in the tender.
M	TS 2.2	The Tenderer shall provide a list with statement of compliance according to technical specification of the CN-ODS in the tender.

3 GENERAL REQUIREMENTS

3.1 General

Type	Number	Requirement
M	TS 3.1.1	The functionality and design of the CN-ODS shall be in accordance with OFFSHORE STANDARD DNV-OS-E402, OFFSHORE STANDARD FOR DIVING SYSTEMS.
M	TS 3.1.2	The functionality and design of the CN-ODS shall be in accordance with OFFSHORE STANDARD DNV-OS-D201, Electrical Installations.
M	TS 3.1.3	The functionality and design of the CN-ODS shall be in accordance with OFFSHORE STANDARD DNV-OS-D202, Automation, Safety and Telecommunication systems.
M	TS 3.1.4	The CN-ODS shall be certified in accordance with OFFSHORE SERVICE SPECIFICATION DNV-OSS-305, RULES FOR CERTIFICATION AND VERIFICATION OF DIVING SYSTEMS.
M	TS 3.1.5	The design of the CN-ODS shall be based on proven technology and, to the extent possible, use standardized products/components.
M	TS 3.1.6	The design shall be such that essential components can easily be replaced if needed.
M	TS 3.1.7	The CN-ODS shall be designed and constructed to have a technical lifetime of fifteen (15) years (the lifetime is calculated from the date FMV has approved the delivery).
M	TS 3.1.8	The CN-ODS shall be designed and constructed for regular use of two hundred (200) operational days per year. Within operation the usage can be up to twenty four (24) hrs per day with a maximum of



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		ten (10) consecutive days.
M	TS 3.1.9	Materials in all components shall be rot-proof, corrosion-resistant and not to be affected by seawater, oil or fungal attacks.

3.2 Ambient Conditions

Type	Number	Requirement
M	TS 3.2.1	The CN-ODS shall retain its functionality during the following outdoor ambient conditions: <ul style="list-style-type: none"> • Relative Humidity up to 100% • Min/max temperature -20/50 °C (-25/55 °C < 16 hours) • Noise levels map as presented in Annex N
M	TS 3.2.2	The CN-ODS shall retain its functionality during the following indoor ambient conditions (halls, control terminals, rooms): <ul style="list-style-type: none"> • Relative Humidity up to 100% • Min/max temperature 15/30 °C (5/45 °C < 16 hours) • Noise levels map as presented in Annex N
M	TS 3.2.3	The CN-ODS shall retain its functionality inside pressurized environments (chambers, TUP tunnel, URF-RR) during the following ambient conditions: <ul style="list-style-type: none"> • Relative Humidity up to 100% • Min/max temperature: 15/30 °C • Noise levels map as presented in Annex N • Pressure up to 36 bar • Gas mixture: <ul style="list-style-type: none"> ○ Oxygen up to 23% ○ Helium up to 97% ○ Nitrogen up to 85%
M	TS 3.2.4	The CN-ODS shall retain its functionality during the following mechanical stresses: <ul style="list-style-type: none"> • Vertical Acceleration FP/LCG 20/10 m/s² • Roll ±30° < 5 s • Pitch ±7° < 2,5 s • Static lateral inclination ±15° • Static frontal inclination (trim) ±5°



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M	TS 3.2.5	<p>The CN-ODS shall retain no harm if stored during the following ambient condition and mechanical stresses:</p> <ul style="list-style-type: none"> • Roll $\pm 40^\circ < 6$ s • Pitch $\pm 10^\circ < 2,5$ s • Temperature up to $+55$ °C < 72 hours
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4 SYSTEM REQUIREMENTS

The new communication network (CN-ODS) could be roughly divided in the following sub-networks (point B only in case the Alternative 2 will apply):

- A. Pressure Chambers Sub-Network:** it takes care of all the internal communication between the Chambers Control Terminal and the Pressure Chambers together with the TUP Tunnel and URF Rescue Chamber.
- B. Service and Diving Sub-Network:** it connects both the Diving System Center and the Chamber Control Terminal with all the areas involved during manned and unmanned diving activities (such as, among others: chambers hall, diving bell container, diving bell, hangar, deck, compressor room, life support room).
- C. Linkage Sub-Network:** it connects the ODS with other important nodes of the Ship Main Communication Network.

4.1 Pressure Chambers Sub-Network (PC-SN)

Type	Number	Requirement
M	TS 4.1.1	The PC-SN shall be integrated inside the CN-ODS allowing communication with all its sub-networks without interference.
M	TS 4.1.2	The PC-SN shall connect the Pressure Chambers Control Terminal to all the chambers and locks in the pressure chambers complex.
M	TS 4.1.3	The PC-SN shall not interfere with the chambers emergency communication network already installed.
M	TS 4.1.4	The PC-SN shall not diminish the actual number of wired clients, both in the control terminal and in the chambers.
M	TS 4.1.5	The PC-SN shall allow the diving leaders to steer and coordinate the communication to all users from the Pressure Chamber Control Terminal Console.
M	TS 4.1.6	The PC-SN shall allow the terminal operator to establish a broadcast communication from the control terminal to any of the chambers.



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M	TS 4.1.7	The PC-SN shall allow the terminal operator to establish a point to point (not broadcasted) communication from the control terminal to any of the clients in the chambers whenever needed.
M	TS 4.1.8	The PC-SN shall allow communication between the control terminal to the Diving System Center.
M	TS 4.1.9	The PC-SN shall allow communication between the control terminal and the Transfer Under Pressure Tunnel.
M	TS 4.1.10	The PC-SN shall allow communication between the control terminal and the Transfer Under Pressure docking lock (on deck).
M	TS 4.1.11	The PC-SN shall allow communication between the control terminal and URF Rescue Chamber when URF is docked to the TUP Tunnel.
M	TS 4.1.12	The PC-SN shall allow maximum mobility of the operators at the control terminal while operating at the console.
M	TS 4.1.13	The PC-SN shall allow maximum mobility of users operating inside the TUP tunnel.
M	TS 4.1.14	The PC-SN shall allow maximum mobility of users operating inside URF Rescue Chamber when URF is docked to the TUP Tunnel.
M	TS 4.1.15	The PC-SN shall allow maximum mobility of operators working with the Transfer Under Pressure docking lock located on deck.
M	TS 4.1.16	The PC-SN shall be able to connect up to three (3) mobile users simultaneously.
M	TS 4.1.17	The PC-SN shall grant communication quality despite surrounding environmental noise levels displayed in Annex N.
M	TS 4.1.18	The PC-SN shall grant communication quality despite external electromagnetic interference.
M	TS 4.1.19	The PC-SN shall grant communication quality to users exposed to chambers condition seen in TS 3.2.3 (i.e. provide voice unscrambling for given pressures and gas mixtures), indoor condition as in TS 3.2.2 and mechanical condition as in TS 3.2.4.
M	TS 4.1.20	The PC-SN shall not interfere with any other wired or wireless communication networks installed on Belos III.
M	TS 4.1.21	The PC-SN shall not interfere with <u>any</u> other electronic equipment (such as: sensors, radars, sonars, positioning, remote operating units and so on) installed onboard Belos III (in accordance with <i>Offshore Standard DNV-OS-D202 Ch.2 Sec.4 B900</i>).



4.2 Service and Diving Sub-network (SD-SN) (Alternative2)

Type	Number	Requirement
M	TS 4.2.1	The SD-SN shall be integrated inside the CN-ODS allowing communication with all its sub-networks without interference.
M	TS 4.2.2	The SD-SN shall be able to connect users operating in and moving across the following areas: <ul style="list-style-type: none"> • Pressure Chamber Control • Pressure Chamber Hall • Compressor Room • Gas Distribution Room • Life Support Room • Power Control Room • Diving System Center • Diving Bell Container • Hangar • Deck • Cranes
M	TS 4.2.3	The SD-SN shall allow the diving leaders to steer and coordinate the communication to all users from the Diving System Center Terminal Console.
M	TS 4.2.4	The SD-SN shall allow the diving leaders to steer and coordinate the communication to all users from the Pressure Chamber Control Terminal Console.
M	TS 4.2.5	The SD-SN shall grant communication quality despite surrounding environmental noise levels displayed in Annex N.
M	TS 4.2.6	The SD-SN shall grant communication quality despite external electromagnetic interference.
M	TS 4.2.7	The SD-SN shall grant communication quality to users exposed to environmental condition presented in TS 3.2.1, TS 3.2.2 and TS 3.2.4
M	TS 4.2.8	The SD-SN shall be integrated without interference with the wired communications from the diving center to the diving bell.
M	TS 4.2.9	The SD-SN shall allow maximum mobility of the operators in the Diving Center while operating at the console.
M	TS 4.2.10	The SD-SN shall be able to connect all mobile users through at least two (2) distinct communication channels.

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M	TS 4.2.11	The SD-SN shall be able to connect up to twelve (12) mobile users simultaneously.
M	TS 4.2.12	The SD-SN shall allow at least 2 (two) mobile users to be able to wear protection helmets while connected to the network.
M	TS 4.2.13	The SD-SN shall not interfere with the point to point wired communication network already installed.
M	TS 4.2.14	The PC-SN shall not interfere and be compatible with the emergency communication network already installed.
M	TS 4.2.15	The SD-SN shall not interfere with any other wired or wireless communication networks installed on Belos III.
M	TS 4.2.16	The SD-SN shall not interfere with <u>any</u> other electronic equipment (such as: sensors, radars, sonars, positioning, remote operating units and so on) installed onboard Belos III (in accordance with <i>Offshore Standard DNV-OS-D202 Ch.2 Sec.4 B900</i>).