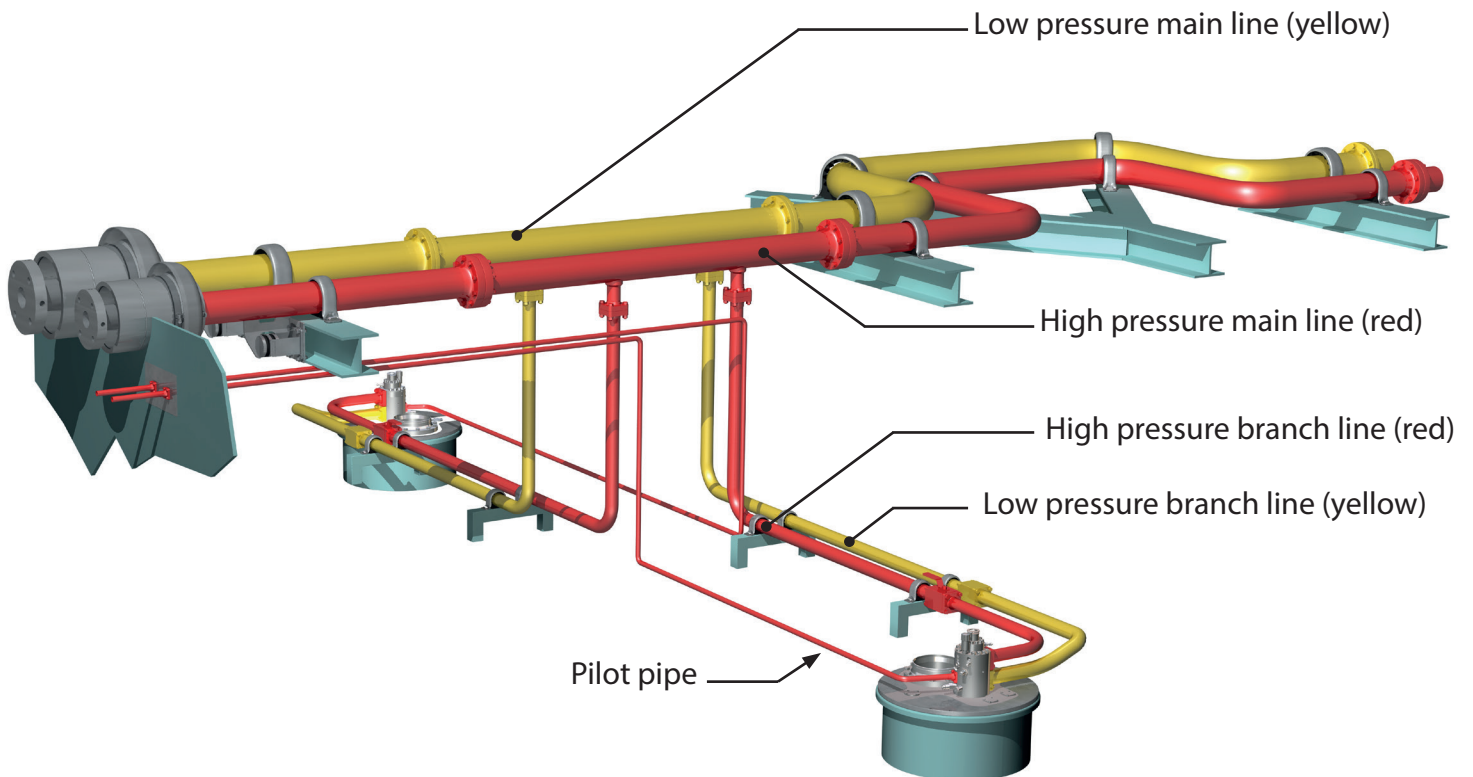


REPLACE PREVIOUS SB#24

Service bulletin #41



Maintenance/upgrading of
hydraulic piping system

Dear Customer!

Take care of your Maintenance – and stay operative

Maintenance of the hydraulic piping system on board

All systems on board a ship including the hydraulic piping system require maintenance, especially on deck where it is exposed to environmental conditions. If maintenance is not carried out properly, seawater in combination with temperature changes and exposure can have an adverse effect on the condition of the hydraulic piping. The best defense against these factors is to ensure that the pipes are properly painted.

General

The main hydraulic pressure line is normally made of carbon steel. The high and low-pressure branch pipes, pilot pipes and the main return line are made of stainless steel.

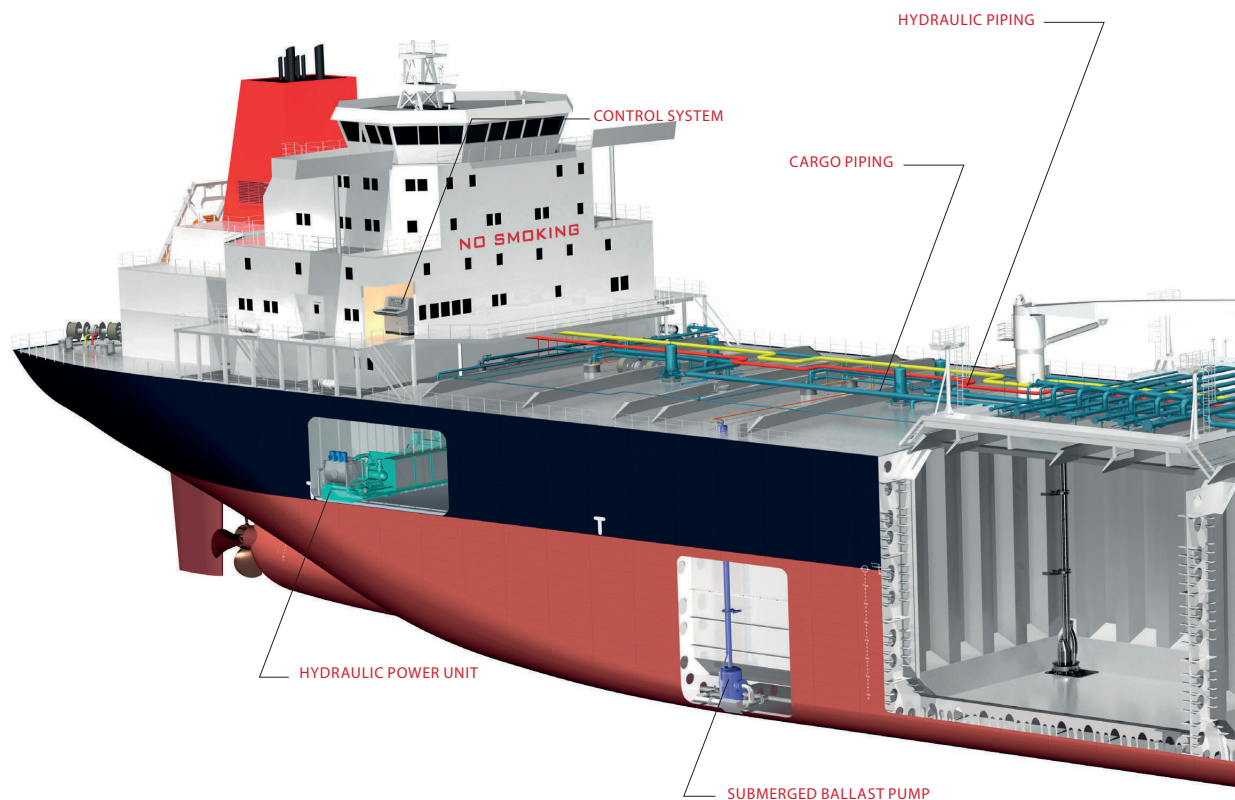
To ensure a long lasting piping system, it is important that the painting is well maintained. The paint should be checked on a regular basis. If any sign of cracks or wear is detected, repairs to be carried out without delay.

Carbon steel pipes

If the pipes start to show signs of corrosion, corrective action should be taken at first opportunity. The corroded area should be cleaned mechanically or chemically before applying new paint. A paint film thickness of approximately 360µm is recommended when a repair is done.

Note!

Review the Piping Service Manual aboard the vessel to verify the material quality of the actual piping system installed on board.



Stainless steel pipes

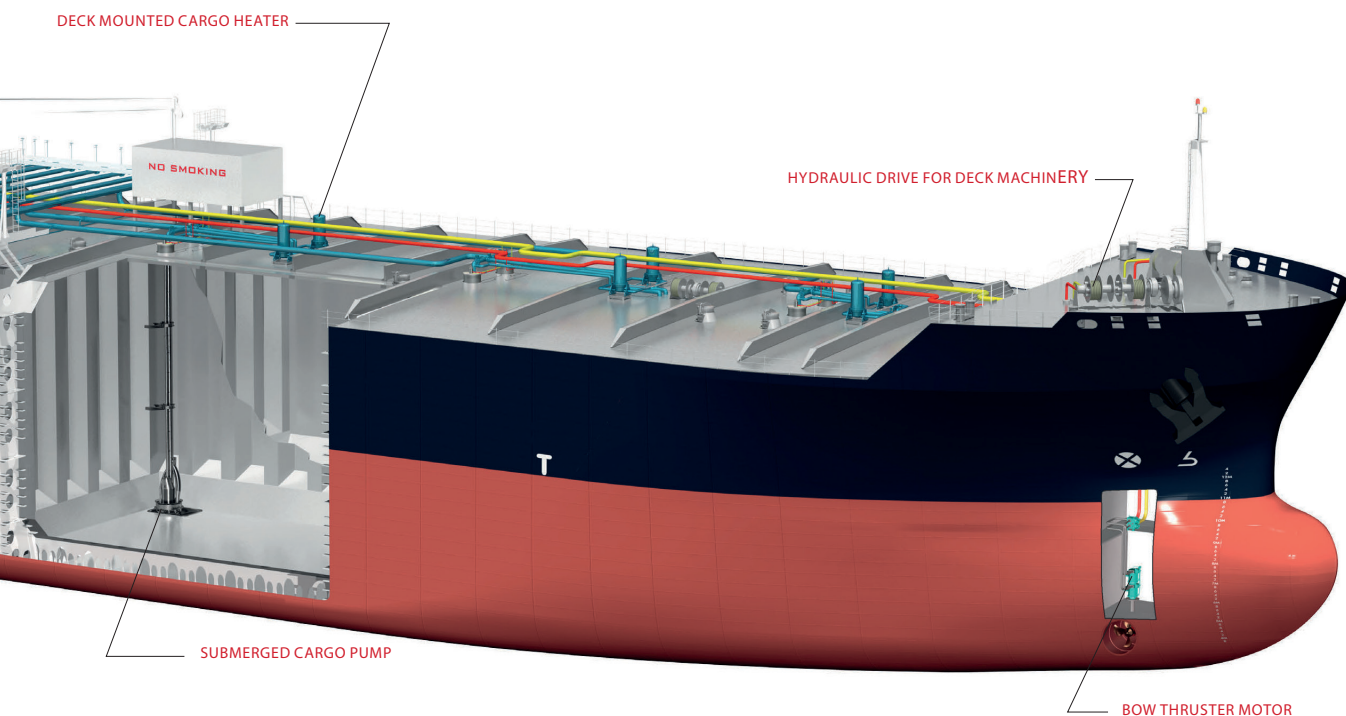
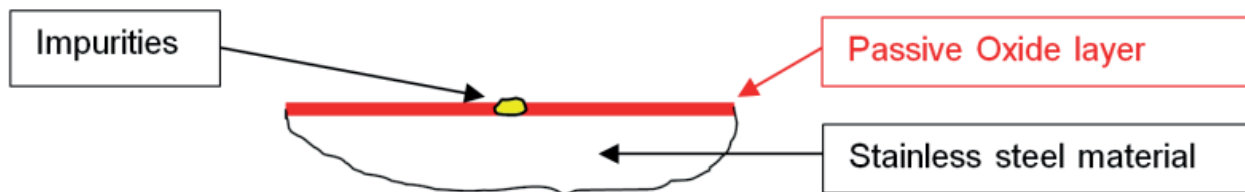
Framo require that all stainless steel pipes are painted before final installation on board. This will protect the pipes from impurities caused by welding splatter, grinding, etc. during the vessels construction period. It will also ensure that the pipes are well protected during the vessel's operation.

In cases where the pipes are not painted / protected during the construction period, the pipe surfaces must be properly cleaned. This is to remove any impurities, and to restore the protective oxide layer. A breakdown of this passive oxide layer may result in localized corrosion ex. galvanic corrosion between iron particles and the stainless steel surface which

may develop start of pitting corrosion.

Regular inspection and maintenance of unpainted stainless steel is necessary to avoid this pitting corrosion. If there is any sign of pitting corrosion, the pipes need to be cleaned immediately to avoid further development.

Contamination of the pipes is in many cases most easily removed chemically. Minor areas might be brushed with a stainless steel brush to remove the impurities.



Resilient pipe clamps

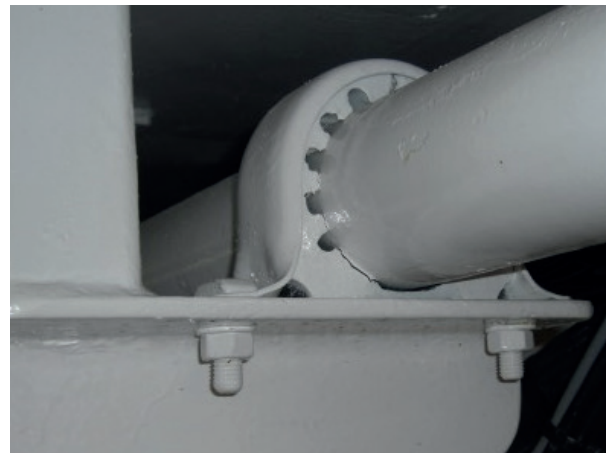
Framo resilient pipe clamps have been delivered with two different designs in the past 25 years. Clamps delivered up to 2007 are welded to the ship structure, while the clamps delivered from 2007 and later are of bolted type.

Painted or unpainted stainless steel clamp bodies shall be inspected and cleaned the same way as the stainless steel pipes.

Both designs consist of a stainless steel body in AISI316L (EN 1.4404) and a resilient rubber element between the clamp body and the pipe.



Pipe clamp type delivered before 2007



Pipe clamp type delivered from 2007 onwards

Note!

Pay special attention to the area in and around the pipe clamp zone. In this area the pipe will move axially due to thermal expansion and abrasion caused by the friction between the pipe surface and the rubber elements can over time cause the paint to wear out. The subsequent bare steel underneath the rubber then becomes exposed and thus can lead to corrosion.

If corrosion is detected, the clamp body and the rubber element must be removed. Clean the corroded pipe area properly, either mechanically or chemically. The pipe must then be repainted with recommended 360µm film thick-

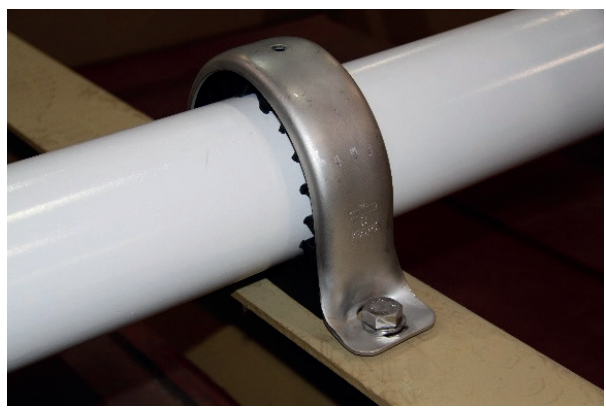
ness.

The lifting tool which is used to lift the pipe clear as shown in the following sequences can be easily fabricated on

Note!

Paint will not harm the flexible rubber element.

New clamp type, dismantle and re-installation sequence:



Resilient clamp to be removed for repainting of pipe clamp zone



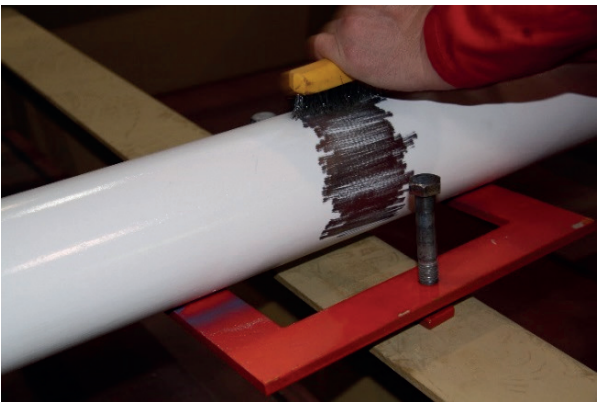
Remove the bolts and lift of the steel body



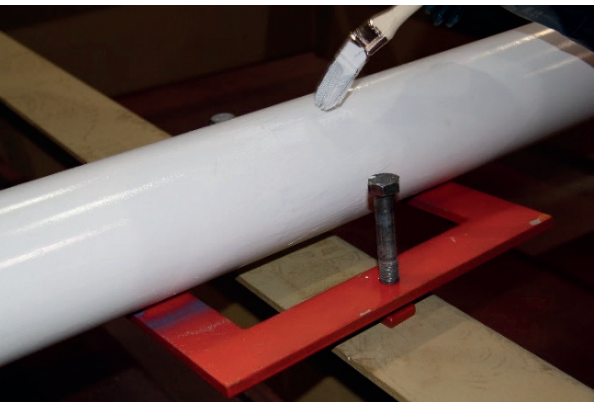
Place the lifting tool underneath the pipe, and lift the pipe off the rubber element by turning the bolts.



Once the pipe has been lifted, the rubber element can be removed



Visually verify the severeness of corrosion and take proper measures as required.



Apply paint to the surface. Apply a film thickness of approx. 360 µm



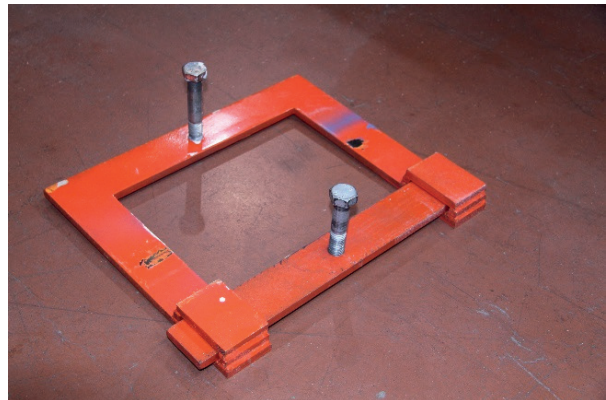
Let the paint dry. Check the flexible rubber element for wear/damages, and renew if necessary before re-installing.



Re-install the pipe clamp steel body.

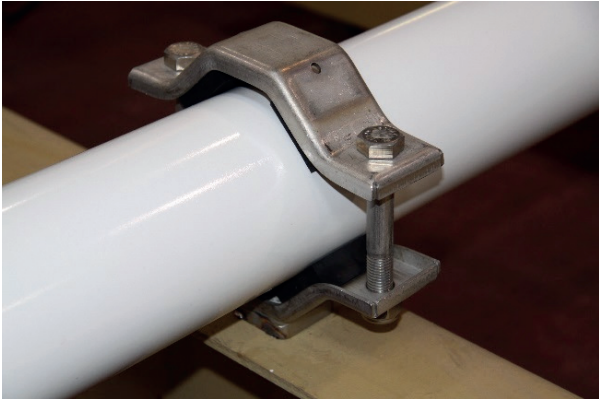


Tighten the bolts



Typical Lifting tool.

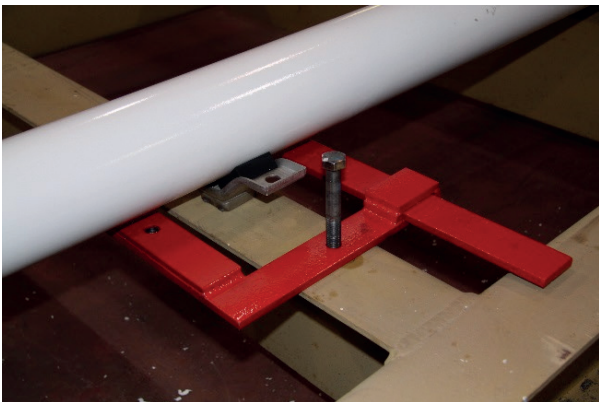
Old clamp type, dismantle and re-installation sequence



Resilient clamp to be removed for repainting of pipe clamp zone



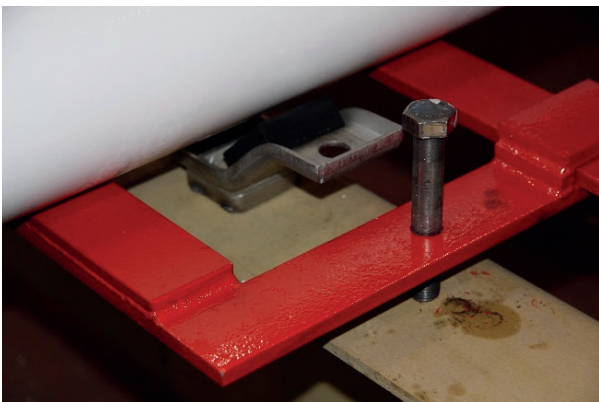
Remove the bolts, and lift of the upper steel body part. The lower part is welded to the structure.



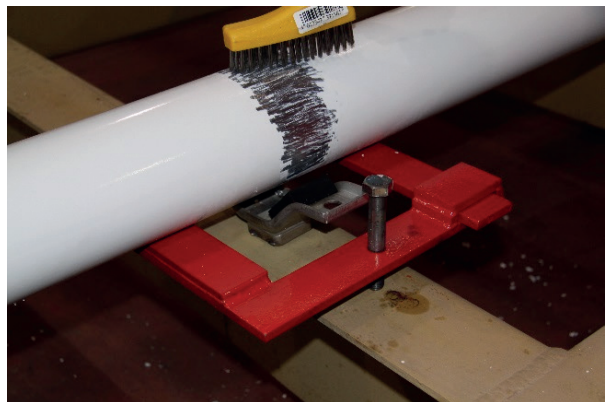
Place the lifting tool underneath the pipe.



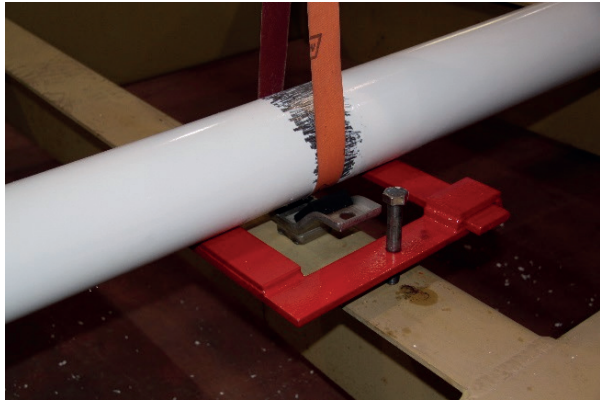
Lift the pipe off the rubber element by turning the bolts.



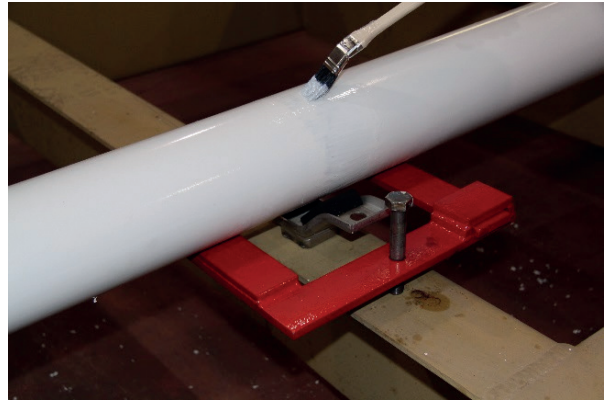
The pipe is lifted off the rubber blocks on the lower clamp body. Check the flexible rubber blocks for wear/damages, and renew if necessary before re-installing.



Visually verify the severeness of corrosion and take proper measures as required.



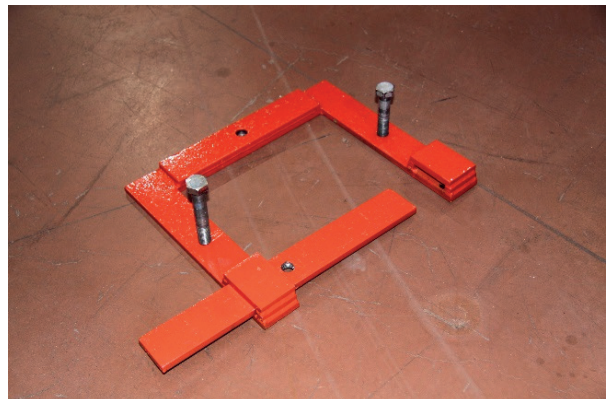
Use grinding paper to remove remaining paint/rust underneath the pipe



Apply paint to the surface. Apply a film thickness of approx. 360 μ m.



Re-install the upper clamp body. Tighten the bolts.



Typical Lifting tool

Retrofit of the hydraulic piping system.

General

If part of the hydraulic piping system is found to be in critical condition, replacement of pipe spools may be required

If this unfortunate situation occurs, Framo can assist in fabricating new pipe spools. For some ships, Framo have available "As Built" drawings. If such drawings are not available, Framo can offer our customers an on board survey. Our experienced engineers will take measurements and then prepare the "As Built" drawings for prefabrication of

pipe spools.

The new spools can then be manufactured and delivered on board as 'plug-and-play' thus reducing down time to an absolute minimum.

Pipe fabrication facilities

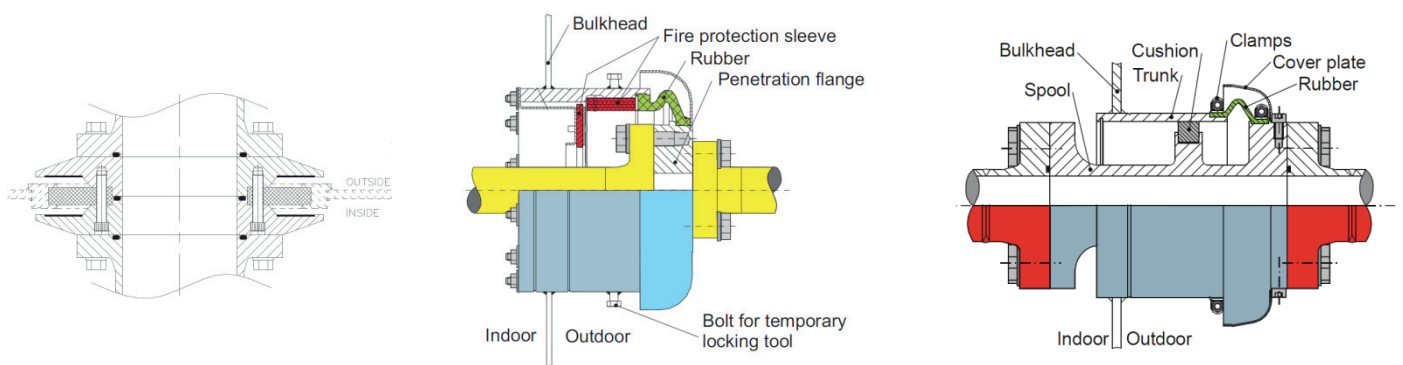
Framo have highly automated and modern pipe production facilities in Bergen, Rotterdam, Singapore and Houston, where single pipe spools to complete piping systems can be prefabricated in different material qualities.

Note!

Framo facilities only stock the Framo standard DIN piping

Bulkhead adapters

There are currently three types of bulkhead adapters found on the Framo hydraulic system:



1. Old type
(pre 2002)

2. New type - version-1
(2002 - 2012)

3. New type - version-2
(2012 - present)

The old type bulkhead adapters (pre-2002) are constructed of carbon steel material, thus periodic inspections should be carried out to check condition. Framo stock stainless steel bolt kits and complete adapter kits for upgrading of this type of adapters – kindly contact Framo for further details.

The two new type of bulkhead adapters are both produced in stainless steel material and will in general not require any maintenance. Painted or unpainted adapters shall be inspected and cleaned the same way as the stainless steel pipes.

Contact us:

For any further information or questions, visit our web site www.framo.com, or contact directly.

**FRAMO Services AS**

P.O. Box 44
NO-5329 Florvåg, Norway
Phone: + 47 55 99 92 00
service@framo.no

framo.com

FRAMO AS

P.O. Box 23, NO-5329
Florvåg, Norway
Phone: + 47 55 99 90 00
Telefax: + 47 55 99 93 80
E-mail: marine@framo.no

FRAMO do Brasil

Av. Presidente Vargas, 463
/19° andar, Rio de Janeiro
CEP 20071-003, Brazil
Phone: + 55 21 2507 7898
framobr@framobr.com.br

FRAMO Nederland

Edisonweg 18
P.O. Box 305
NL-3200 AH Spijkensisse
The Netherlands
Phone: + 31 181 619311
nederland@framo.no

FRAMO Middle East

Al Quoz Industrial Area
P.O. Box 21467
Dubai, United Arab Emirates
Phone: +971 4 886 1313,
dubai@framo.no

FRAMO Houston

3002 East 13th Street
La Porte, Texas 77571, USA
Phone: + 1 281 884 4800
houston@framo.no

FRAMO Fusa AS

Venjanaset
NO-5641 Fusa, Norway
Phone: + 47 55 99 96 00
marine@framo.no

FRAMO Singapore

17 Tuas View Circuit
Singapore 637575
Republic of Singapore
Phone: + 65 6210 2400
singapore@framo.no

FRAMO Holsnøy AS

Rosslandsvegen 933
NO-5918 Frekhaug, Norway
Phone: + 47 55 99 75 00
piping.marine@framo.no

FRAMO Nippon

Kotsu Building 5F, 15-5
Shinbashi, 5-chome
Minato-ku
Tokyo 105-0004, Japan
Phone: + 81 3 5776 2405
tokyo@framo.no

FRAMO Flatøy AS

Flatøyvegen 24
NO-5918 Frekhaug, Norway
Phone: + 47 55 99 94 00
oil&gas@framo.no

FRAMO Korea

Rm 608, Centum Sh Valley
35, Centum Dong – Ro
Haeundae – Gu, Busan
Korea, 612-020
Phone: + 82 51 743 6942/3
busan@framo.no

FRAMO Shanghai

Building No.5, 123
Lane 1165, Jin Du Road
Min Hang District, Shanghai
China 201108
Phone: + 86 21 6115 5000
shanghai@framo.no