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1. Description

The FRAMO antiheeling system is based on one or more reversible propeller pumps, which operate at full efficiency in both directions between PS and SB heeling tanks.

The pumps is controlled by a PLC based Control system which also includes the heeling sensor (inclinometer). Connected to the Control system is one or more operator terminals from which manual operation are conducted, and all operational parameters are decided.

Additional equipment as pump starter, one or two butterfly valves for installation in the crossover line and level sensors for the heeling tanks are included to an extent agreed in the contract.

2. Purpose

The FRAMO antiheeling system is designed to maintain the vessels horizontal position or determined heeling angle during loading/unloading. It may also be used to compensate for heavy and constant transverse wind and unequal supply consumption in open sea. Due to the response time it is unsuitable as rolling compensation system during sea voyages.

3. Operation, preventive maintenance and repair

The FRAMO antiheeling system is designed for long life and reliable operation provided the following operational limitations are observed

- the pump has a power demand curve rising towards closed discharge, while the pump motor normally is designed for duty point +10% only. This means that when starting the system, the valve must start opening 3 sec. before the pump is started

- to avoid breaking of starting current the pump shall be operated for at least 5 sec. before it is stopped

- when stopping the system, pump stop signal and valve close signal shall be given simultaneous

- the antiheeling pump shall be completely stopped and the valve completely closed for 5 sec. before the system is restarted in the same – or the opposite direction

- only 30 starts/hour are allowed

- the valve close/open functions must be linked to the pump stop/start functions, individual manual operation of the pump and valve without any connection is not allowed except as an emergency solution

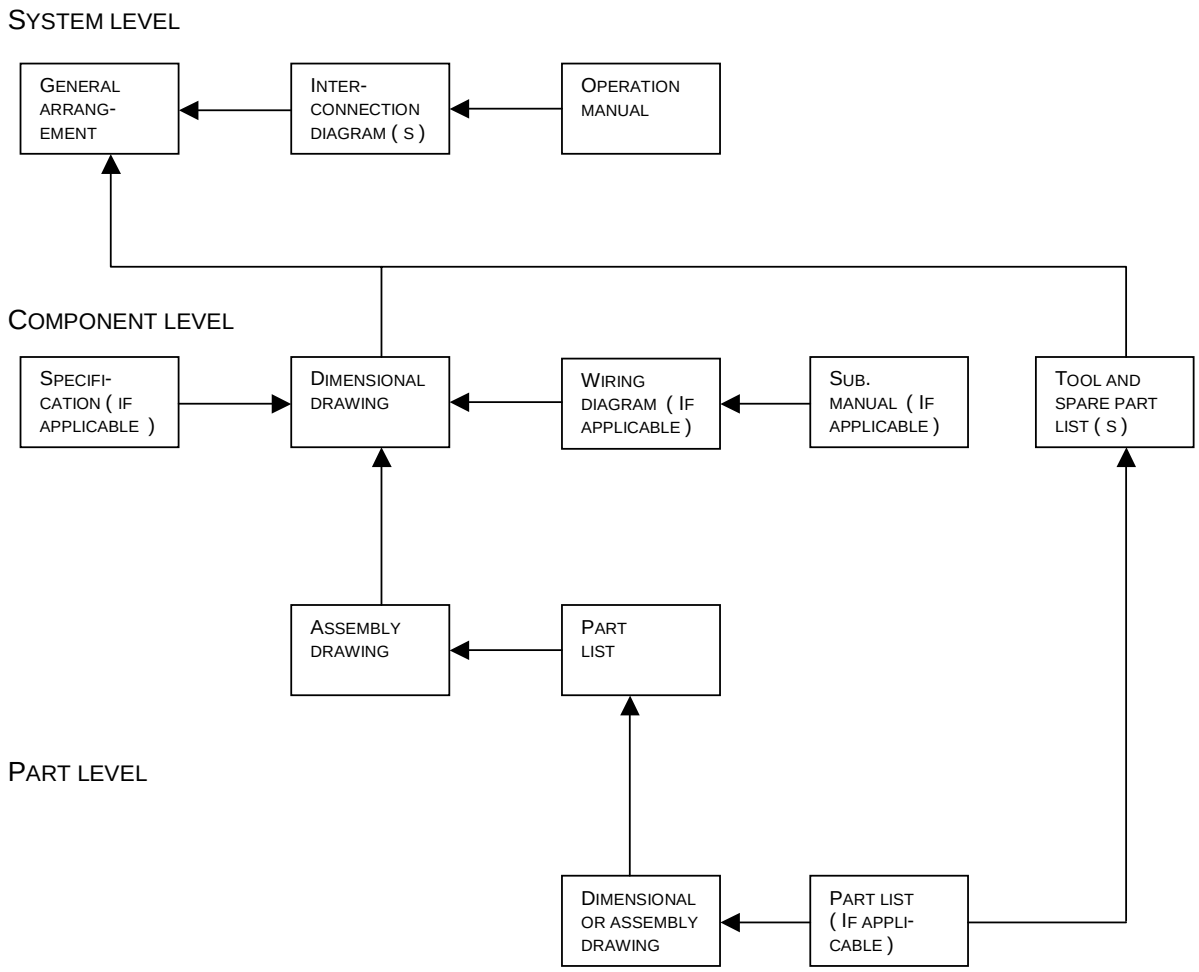
- any other valve in the heeling line must be fully open before the system is started.

All above points are taken care of by the FRAMO antiheeling, control system which includes several modes of manual and automatic operation, for details refer to the system operation manual. For control system supplied by others it is essential that above operational limitations are taken care of.

Preventive maintenance is limited to change of the pump gear oil and anode and regreasing of the pump motor bearings (dependant of motor type and size), refer to the pump sub. manual. The most common repair operations are described in the relevant sub. manual. Fore more extensive repair operations, damages and spare parts, address the most convenient of the FRAMO worldwide service network stations listed under clause 7 of this document.

4. Arrangement of drawings, part lists and sub.manuals

The drawings, specifications, part lists and sub.manual are arranged from the General Arrangement (FRAMO scope of supply) according to the diagram below.



5. Safety

The maximum heeling angle the system can accept is 8°. At that angle the system stops and it is only possible to restart to compensate that angle.

In all operator terminales and also in the pump starter there are emergency stop switches, which when operated stop the system independent of the PLC.

Manual interference with pump/motor, butterfly valve and inside of electric components is dangerous and shall only take place when all power (electric, hydraulic, pneumatic) is disconnected and safeguarding against accidental reconnection is provided.

6. Guarantee conditions

The FRAMO guarantee extends over the period stated in the contract. It covers damages due to poor design or workmanship and hidden material weaknesses in all components included in the scope of supply and also failures made by personnel employed or hired by FRAMO. It do not cover damages due to inproper handling, installation and operation or poor maintenance when the equipment is the responsibility of others. Nor are consequential damages or economic losses originating from breakdown in the equipment delivered by FRAMO covered.

7. Service network

FRANK MOHN SERVICES AS
P.O. Box 44 Slåtthaug
N-5851 Bergen
Norway

Telephone: 47 55 99 92 00
Spares dept.
Service dept.
after 1600 hrs: 47 946 84570
Telefax: 47 55 99 93 82
E-mail: fms.marine@framo.no

FRANK MOHN NEDERLAND BV
Edisonweg 18
P.O. Box 305
NL-3200 AH Spijkenisse
The Netherlands

Telephone: 31 181 619 311
Telefax: 31 181 611 193
E-mail: fm.nederland@framo.no

FRANK MOHN HOUSTON INC
1802 West D Street
La Porte, Texas 77571-4601
USA

Telephone: 1 281 471 7920
Telefax: 1 281 842 5450
E-mail: postbox@framohou.com

FRANK MOHN SINGAPORE (PTE) LTD
17 Tuas View Circuit
Singapore 637575
Republic of Singapore

Telephone: 65 210 2400
Telefax: 65 210 2401
E-mail: fm.sin@framo.no

FRANK MOHN NIPPON K.K.
5-15, Shinbashi 5-chome
Minato-ku
Tokyo
Japan 105-0004

Telephone: 81 3 5776 2405
Telefax: 81 3 5776 2406
E-mail: fmnippon@framo.co.jp

CHANG SAN ENGINEERING CO. LTD.
(Frank Mohn Korea)
Rm. 309 Yachting Center Bldg.
No. 1393, Woo-Dong, Haeundai-Ku
Pusan, Korea

Telephone: 82 51 743 6942/3
Telefax: 82 51 743 6944
E-mail: fmsk@ppp.kornet2f.net

Frank Mohn China Ltd.,
Shanghai Representative Office
Unit 804A, Pine City
8 Dong An Road
200032 Shanghai
CHINA

Telephone: 86 21 6443 8845
Telefax: 86 21 6443 8846
E-mail: fmcnsh@public7.sta.net.cn

Frank Mohn Do Brasil Ltda.
Av.Presidente Wilson,
231/15° Andar,
Rio de Janeiro / RJ
BRASIL

Telephone: 55 21 544 2040
Telefax: 55 21 544 2041
E-mail: framobr@framobr.com.br