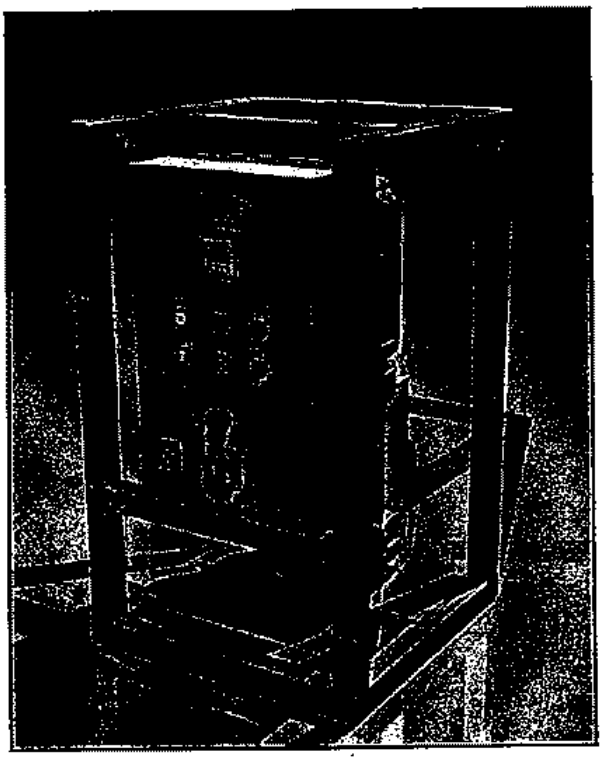
Analysis of the homogenizer for ship fuel
original photos and other comments (text) is our

Wilhelmsen Ships Equipment

Operation manual

U.F.H. Reducer/Improver



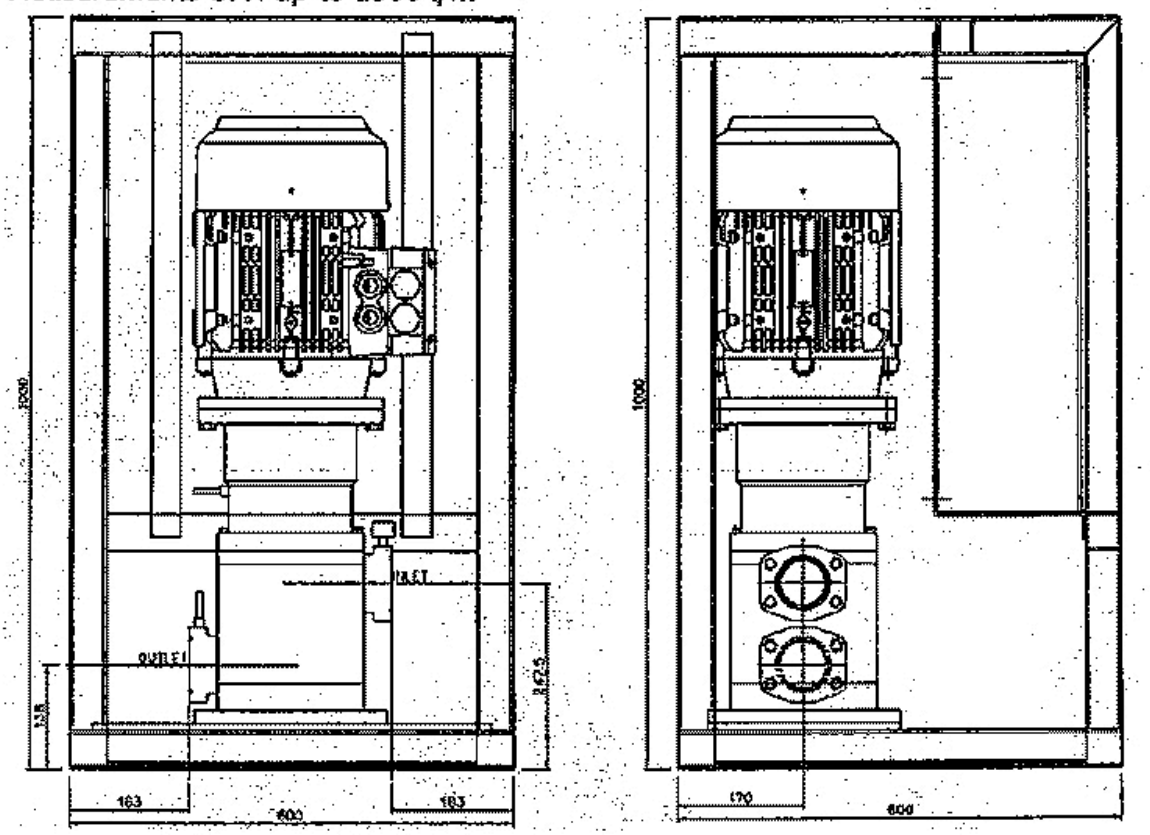
Revision1
Date of issue: 03/04/2008

design in the frame (module) - this design UFH similar to our TRGA

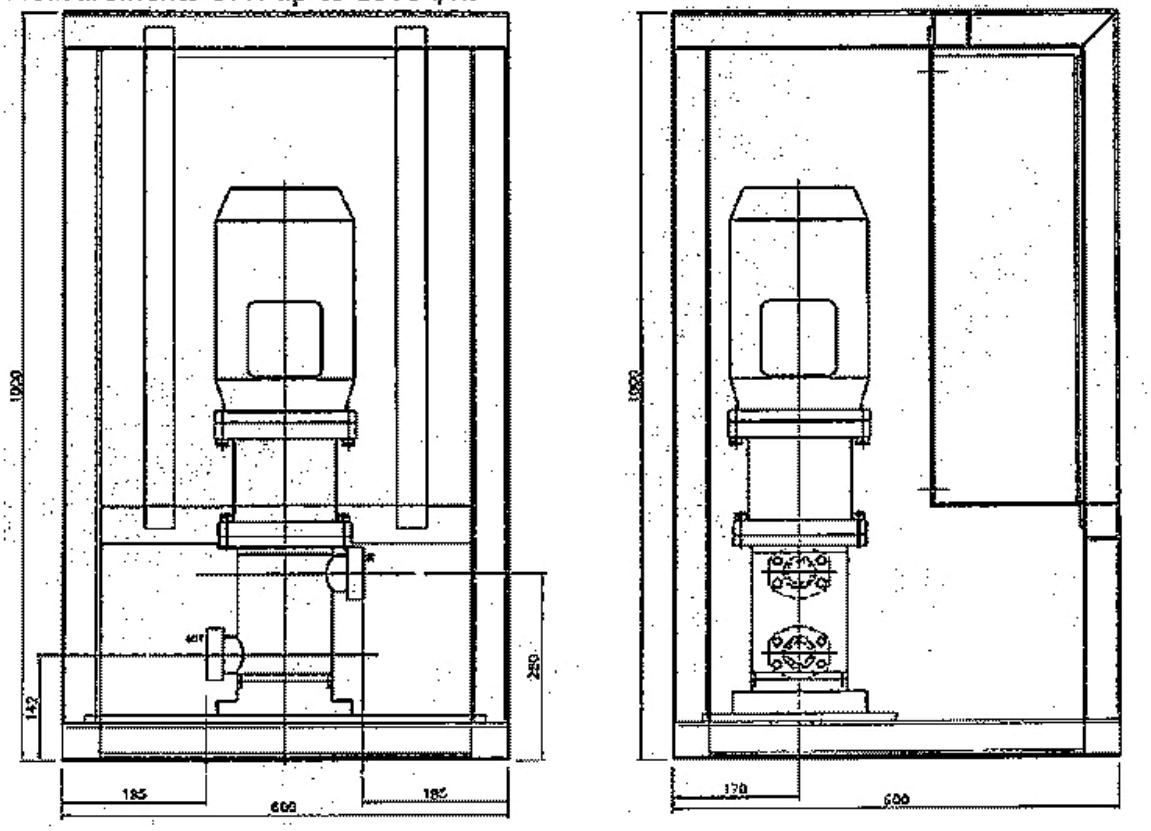
Content: Page

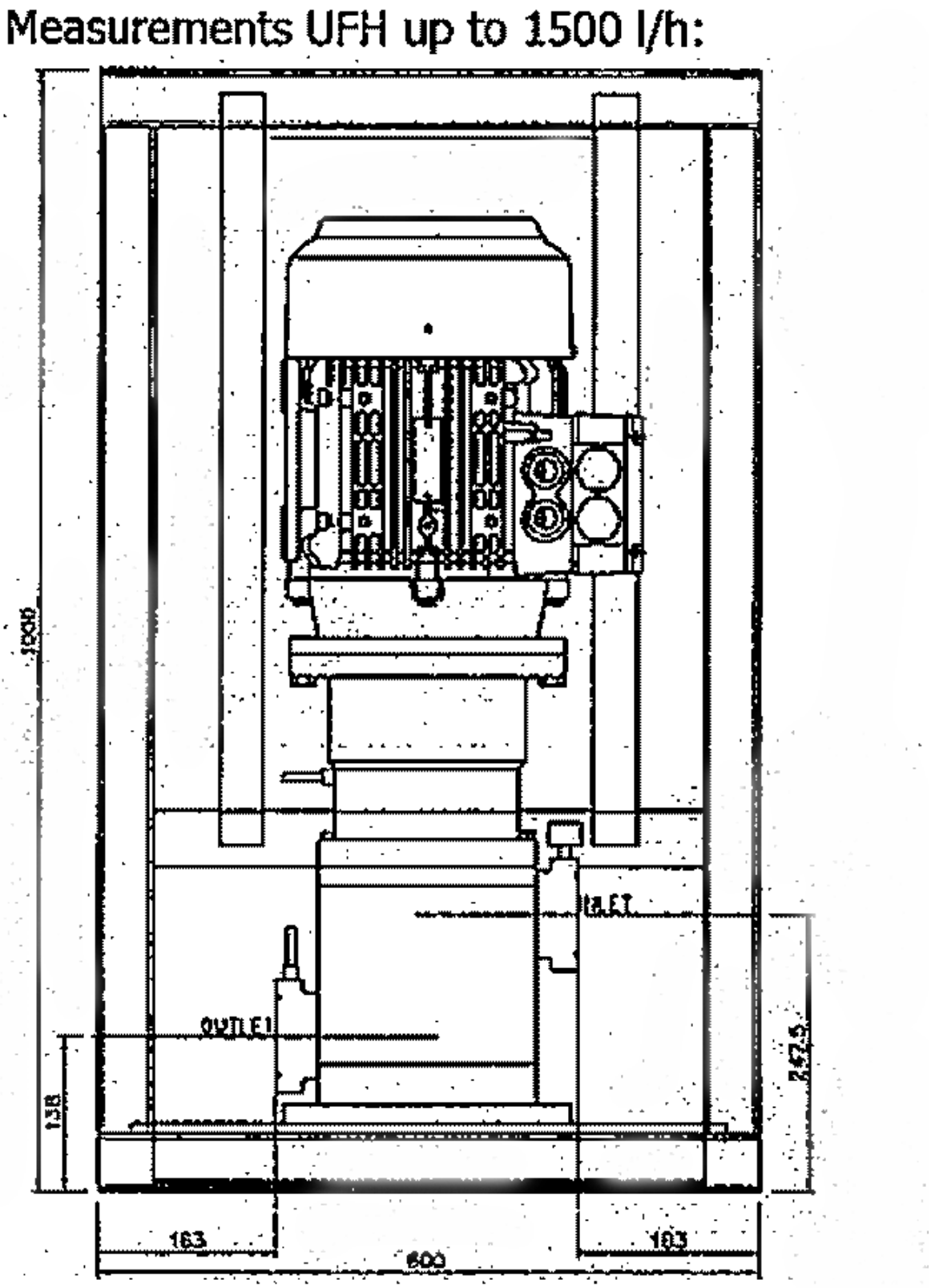
Introduction of the U.F.H. Reducer & Improver.

Measurements UFH up to 1500 l/h:



Measurements UFH up to 1500 l/h:





Rotary homogenizer with connection flange.

Disadvantages.

One small impeller diameter (rotor homogenizer), outdated design, low productivity.

Approximate rotor diameter is 240 mm (not enough for the cavitations process it is done to reduce the e-motor power).

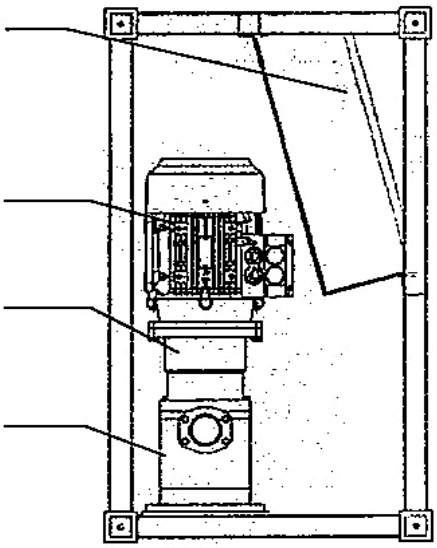
The UFH Reducer & Improver consists of the following basic parts:

Control panel:
Contains all electrical parts necessary to run the Reducer / improver and protect the F.I.D. against overloading or running dry.

E-motor:
Drives the F.I.D.

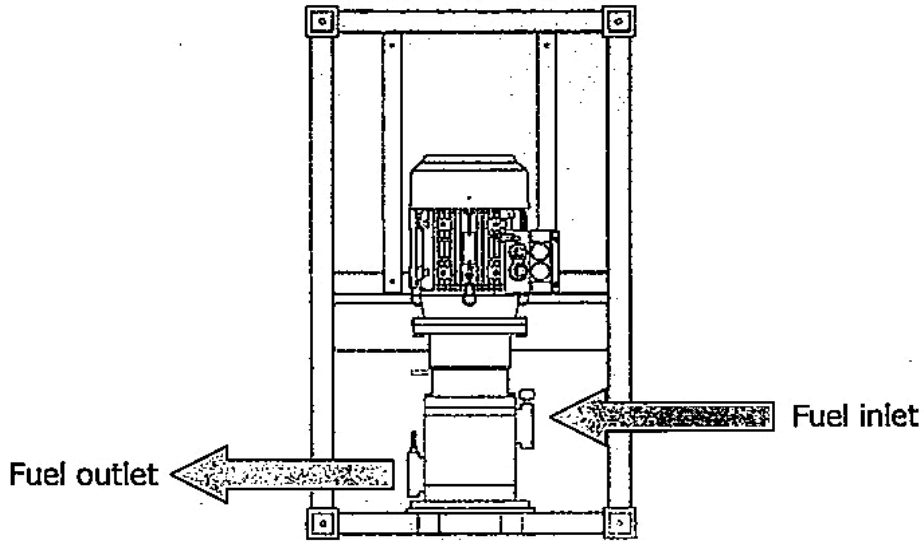
Magnetic coupling:
Connects the F.I.D. to the E-motor

Fuel **I**mprovement **D**evice



Direction of medium

The fuel must flow through the UFH Reducer / Improver as shown below, the upper connection on the F.I.D. is always the inlet, The lower connection is always the outlet. Also the Inlet and outlet are specified on the flanges themselves.



Design features - use control panel on the device frame, the use of magnetic coupling

The UFH Reducer & Improver consists of the following basic parts:

Control panel:
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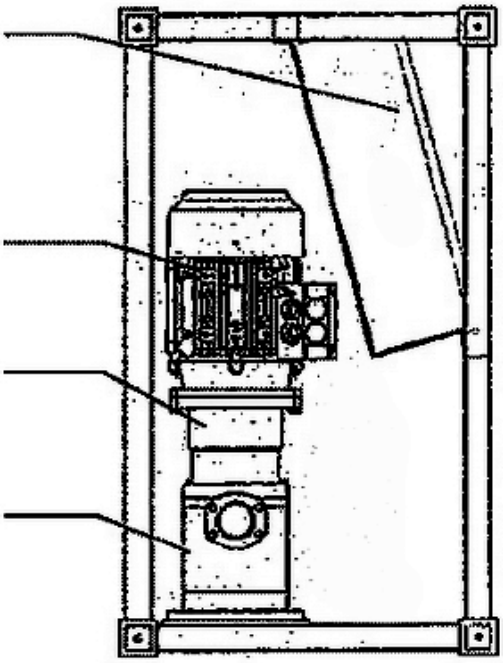
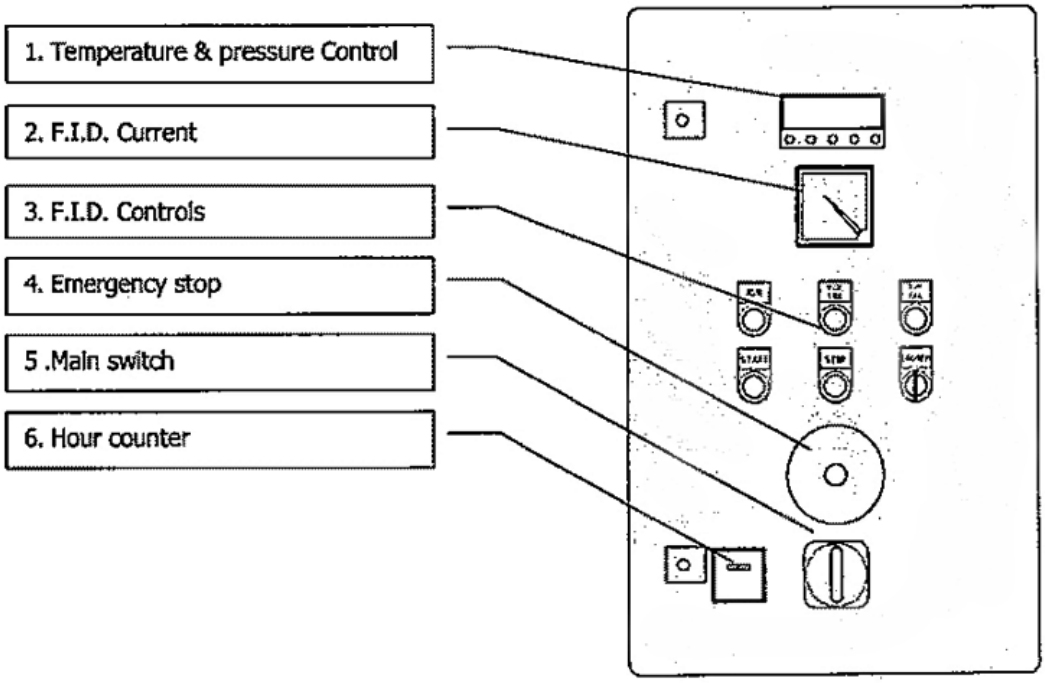


Direction of medium

magnetic clutch is used for "soft start"
and the insulation of the electric motor on the temperature of processed fuel

Module gomogenizatorm TRGA does not require sensor "control the temperature and pressure - enough to have the gauges on the inlet and outlet of the module TRGA, which is not as sensitive to temperature (when used with a special pump for high temperatures)

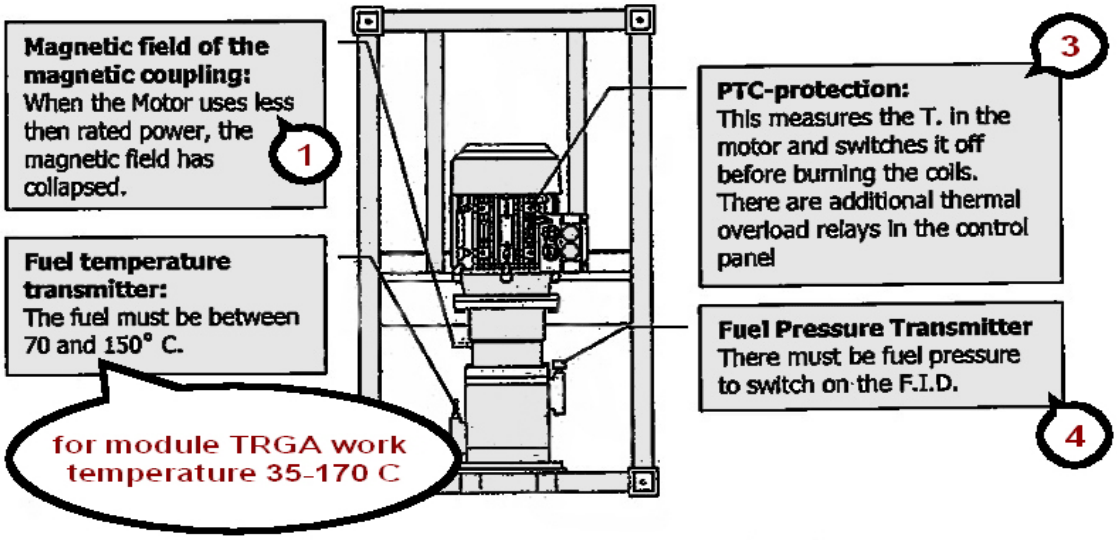
Layout of the control panel:



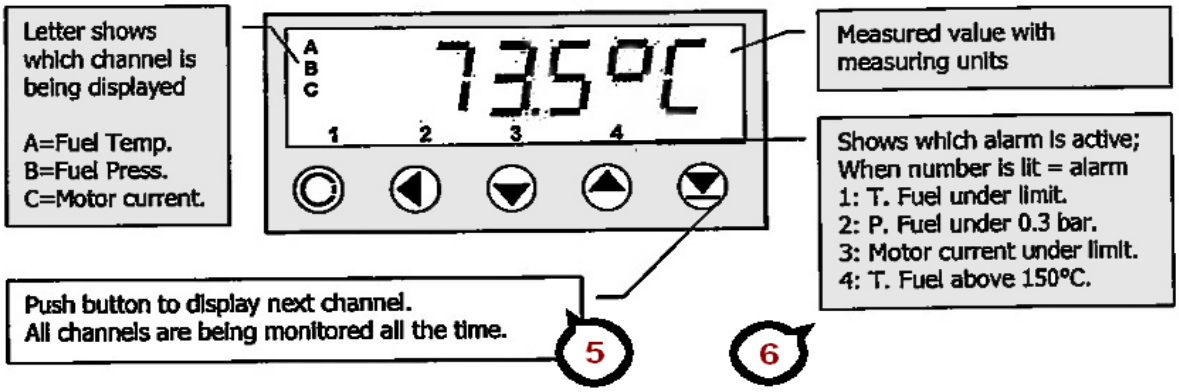
1. Temperature and pressure controller: This device checks the fuel temperature, fuel pressure and also the current drawn by the E-motor, if any of the values exceed the programmed set points, the F.I.D. switches off and will not start up unless the measured values are back to normal.
2. On the Current meter you can check the power consumption of the F.I.D. For nominal values see page 8
3. The Controls: there are three lights, two pushbuttons and a switch.
   - The Start and stop button Start and stop the F.I.D.
   - The white "Running" lamp lights up when the F.I.D. is running,
   - The red "Fault" lamp lights up when the E-motor is using more amps then is should or when the motor is running too hot.
   - The red "Temp/Press. fault" lights up when the fuel temperature or pressure is not OK, or when the E-motor uses less then rated power (which indicates loss of magnetic field in the coupling.)
   - The switch allows you to switch between local or remote control.
4. Emergency stop. The F.I.D. will stop immediately when this button is hit. To reset it, turn the button as the arrow on the button indicates.
5. Main switch, this turns the power to the UHF Reducer/Improver on and off.
6. The hour counter shows the total running hours of the F.I.D.
   When receiving a new UHF this counter will not be at zero because it was tested at the factory.

Protections on the F.I.D.

The Fuel Improvement Device is protected against overloading or running dry.
This is done by the following protections:



All measured values are read by a controller in the control panel.
The controller looks like this:

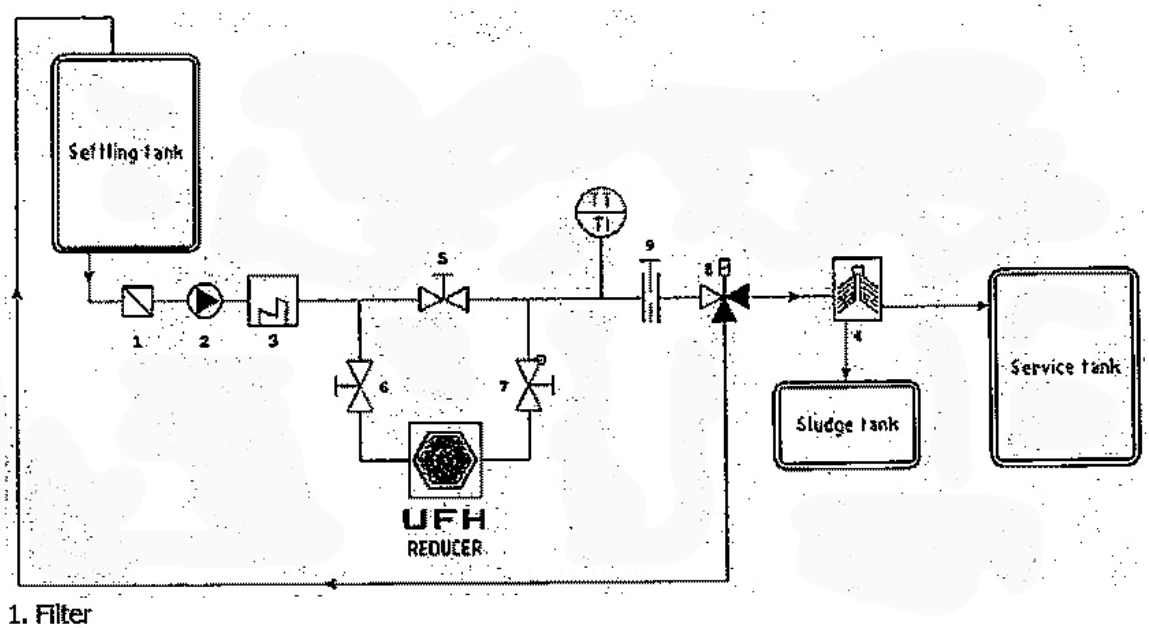


Difference between module TRGA and module UFH

1. Module TRGA has no electro magnetic clutch and can not be damaged when the supply voltage.
2. Module TRGA have a wider temperature operating range. TRGA module may begin processing fuel from the fuel flow point (app 35 C).
3. The same.
4. Module UFH starts work with external pressure more than 0.3 Bar, so it needs the external pump. Module TRGA no requires no external pressure. Or a separate homogenizer TRGA can operate in passive mode from the external pump without motor.

Installation of the U.F.H. as Reducer

Following diagram shows where in the fuel system the UFH Reducer should be installed. The UFH Reducer is provided with SAE counter flanges.
It is NOT allowed to weld the UFH Reducer to the floor, only use the provided mounting brackets to secure the UFH Reducer to the floor/wall.



1. Filter
2. Fuel pump
3. Heater
4. Separator
5. Reducer bypass, screw down valve
6. Reducer inlet valve, screw down valve
7. Reducer outlet valve, screw down non return valve
8. 3/2-way valve
9. Preset valve

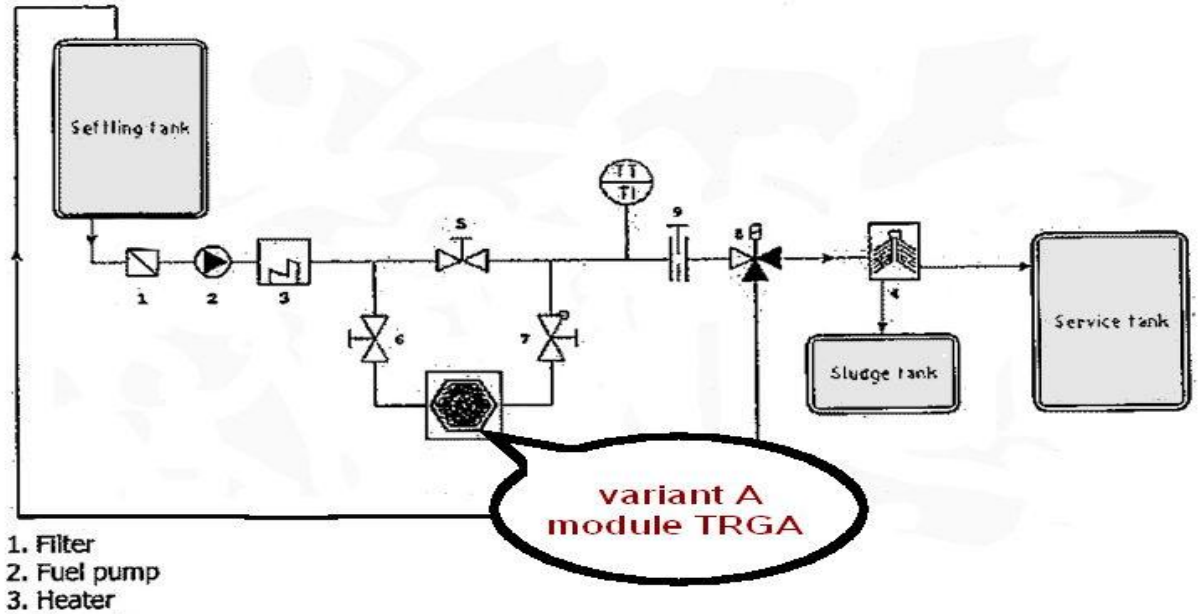
When the UFH Reducer is not running the fuel flows trough the F.I.D., the valves don't have to be adjusted when the UFH Reducer is not running.

Note: To prevent oil spray or oil leakage onto hot surfaces. The inlet and outlet flange is to be screened or otherwise suitable protected, if applicable.

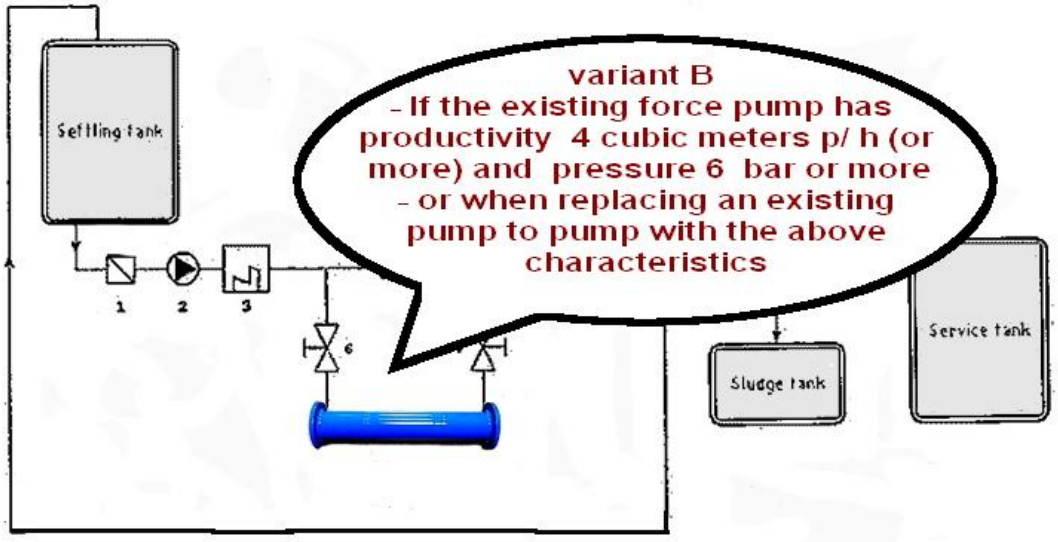
- The UFH Reducer must be installed between the heater and the 3/2 way valve of the HFO separator and is in by pass.
- The UFH Reducer and the piping are (E)traced.
- The UFH Reducer is earthed.
- The feed pump running contact(s) is (are) connected on the terminal strip X2* in this way the UFH Reducer can only started if a fuel pump is running.
- Connect the common alarm of the UFH Reducer (terminal strip X3*) in series with the common alarm of the separator.
  The reason is that in case of an UFH Reducer alarm, which cannot be reset , the separation time has to be set back to the standard interval.

*see Electrical schematics for terminal numbers

alternatives using a homogenizer TRGA



1. Filter
2. Fuel pump
3. Heater
4. Separator
5. Reducer bypass, screw down valve
6. Reducer inlet valve, screw down valve
7. Reducer outlet valve, screw down non return valve
8. 3/2-way valve
9. Preset valve



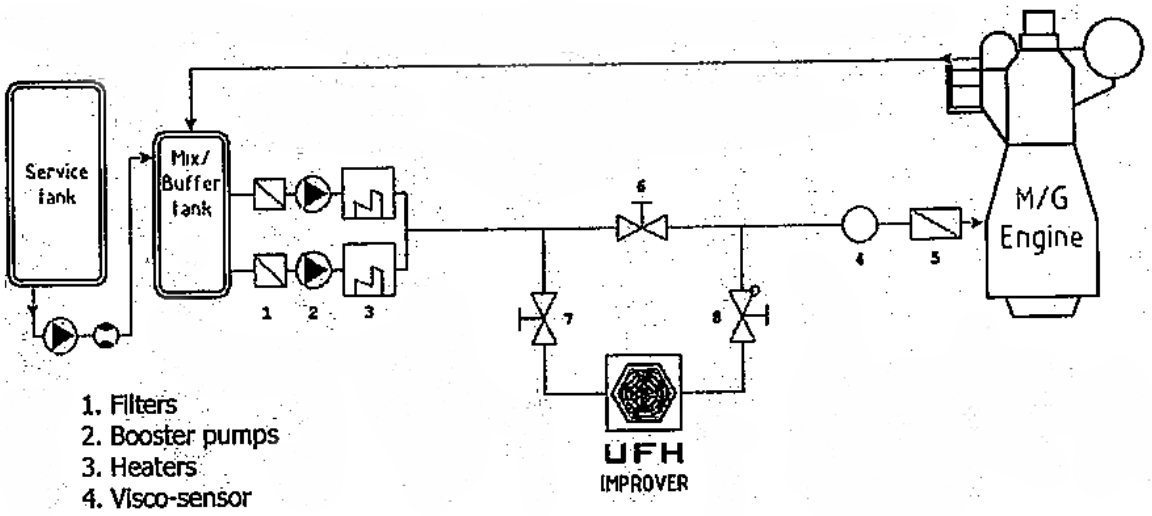
1. Filter
2. Fuel pump
3. Heater
4. Separator
5. Reducer bypass, screw down valve
6. Reducer inlet valve, screw down valve
7. Reducer outlet valve, screw down non return valve
8. 3/2-way valve
9. Preset valve

If use variant B it need to replace force pump with a more powerful and no other pumps and electric motors is not require. Variant C - to install the module TRGA in a separate special line of recycling tank for fuel oil.

Improver

Installation of the U.H.F. as Improver

Following diagram shows where in the fuel system the UFH Improver should be installed. The UFH Improver is provided with SAE counter flanges.
It is NOT allowed to weld the UFH Improver to the floor, only use the provided mounting brackets to secure the UFH Improver to the floor/wall.



1. Filters
2. Booster pumps
3. Heaters
4. Visco-sensor
5. Fine filter
6. Improver bypass, screw down valve
7. Improver inlet valve, screw down valve
8. Improver outlet valve, screw down non return valve

When the UFH Improver is not running the fuel flows trough the F.I.D., the valves don't have to be adjusted when the UFH Improver is not running.

Note: To prevent oil spray or oil leakage onto hot surfaces. The inlet and outlet flange is to be screened or otherwise suitable protected, if applicable.

- The UFH Improver must be installed between the heaters and the viscosity sensor and the unit must be in bypass
- The UFH Improver and the piping are (E)traced
- The UFH Improver is earthed
- The feed pump running contact(s) is (are) connected on the terminal strip X2* in this way the UFH Improver can only started if a fuel pump is running.
- Connect the common alarm of the UFH Improver (terminal strip X3*) to the general alarm system

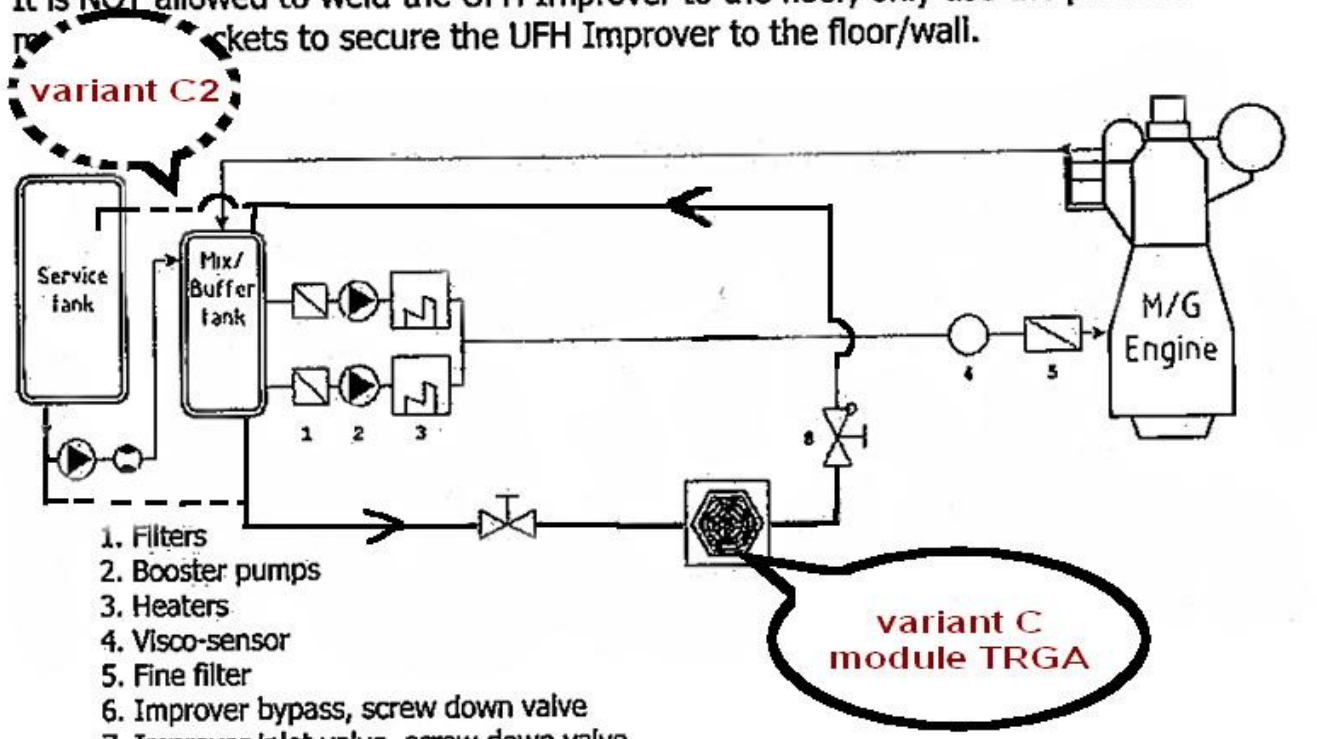
*see Electrical schematics for terminal numbers

alternatives using a homogenizer TRGA

U.F.H. Reducer / Improver operation manual

Installation of the U.H.F. as Improver

Following diagram shows where in the fuel system the UFH Improver should be installed. The UFH Improver is provided with SAE counter flanges.
It is NOT allowed to weld the UFH Improver to the floor, only use the provided r[illegible]kets to secure the UFH Improver to the floor/wall.



1. Filters
2. Booster pumps
3. Heaters
4. Visco-sensor
5. Fine filter
6. Improver bypass, screw down valve
7. Improver Inlet valve, screw down valve
8. Improver outlet valve, screw down non return valve

<u>Option C</u> - to install the module TRGA in a separate special line of recycling for fuel oil (day tank or buffer tank).

Module TRGA may be install parallel to the existing fuel line and does not prevent it

Technical parameters of UFH

U.F.H. Reducer / Improver operation manual

First start up and start up after longer stand still

- There is electrical power to the control panel.
- All electrical connections are made and checked by authorized personnel
- All fuses in the control panel are on.
- Open the inlet and outlet valve as well as the by pass valve.
- Start a fuel supply pump and heat up the system and slowly close the bypass valve in order to have full flow through the UFH.
- If the red lamp on the right side is off, you have fuel pressure and temperature to start the UFH.
- Check the rotation of the UFH, there is an arrow on the side of the top of the motor which indicates the direction of the motor. Quickly start and stop the UFH Improver and look at the fan at the top of the motor to make sure it is turning the right way.
- When the unit has not run for a longer time, let the fuel flow through the UFH Improver for 6-8 hours.

Check the electrical load during starting up period, this will be:
4 – 4,5 Amp. for a 4,0 KW motor,
9 -11 Amp. for a 7,5 KW motor.

UFH Model	KW at (400V, 50Hz)	Amp max / running (400V, 50Hz)	KW (460V, 60Hz)	Amp max / running (460V, 60Hz)
015	4.0	10/5.5	4.8	10.5/5.8
045	7.5	19/11	9.0	19.6/10.9
090	7.5	27.5/15.3	9.0	28.7/15.9
120	11.0	27.5/15.3	13.2	28.7/15.9
300	22.0	55/30.5	26.4	57.4/31.9

After start and running for ca. 2 mins, stop the UFH Improver and after 2 min. restart. This process may need to be repeated for max. 3 times. In case that after these three times the current is still below the mentioned Amp. stop the UFH Improver and report to IPCO Power fts BV.
In all cases the needle of the Amp. meter must be steady after starting up.

If the Amperage is/stays below :
3 Amp. for a 4 KW E- motor,
7 Amp for a 7,5 KW E- motor
9 Amp. for a 11 KW E- motor, stop the UFH Improver and report to IPCO Power fts BV.

Technical parameters TRGA

Check the electrical load during starting up period, this will be:
4 – 4,5 Amp. for a 4,0 KW motor,
9 -11 Amp. for a 7,5 KW motor.

UFH Model	KW at (400V, 50Hz)	Amp max / running (400V, 50Hz)	KW (460V, 60Hz)	Amp max / running (460V, 60Hz)
015	4.0	10/5.5	4.8	10.5/5.8
045	7.5	19/11	9.0	19.6/10.9
090	7.5	27.5/15.3	9.0	28.7/15.9
120	11.0	27.5/15.3	13.2	28.7/15.9
300	22.0	55/30.5	26.4	57.4/31.9

So UFH model (015 or 1500 liters per hour) = 4.0 kW (400 V 50 Hz)
UFH model (045 or 4500 liters per hour) = 7.5 kW (400 V 50 Hz)
TRGA model (5000 liters per hour) = 4.0 kW (380 V 50 Hz)

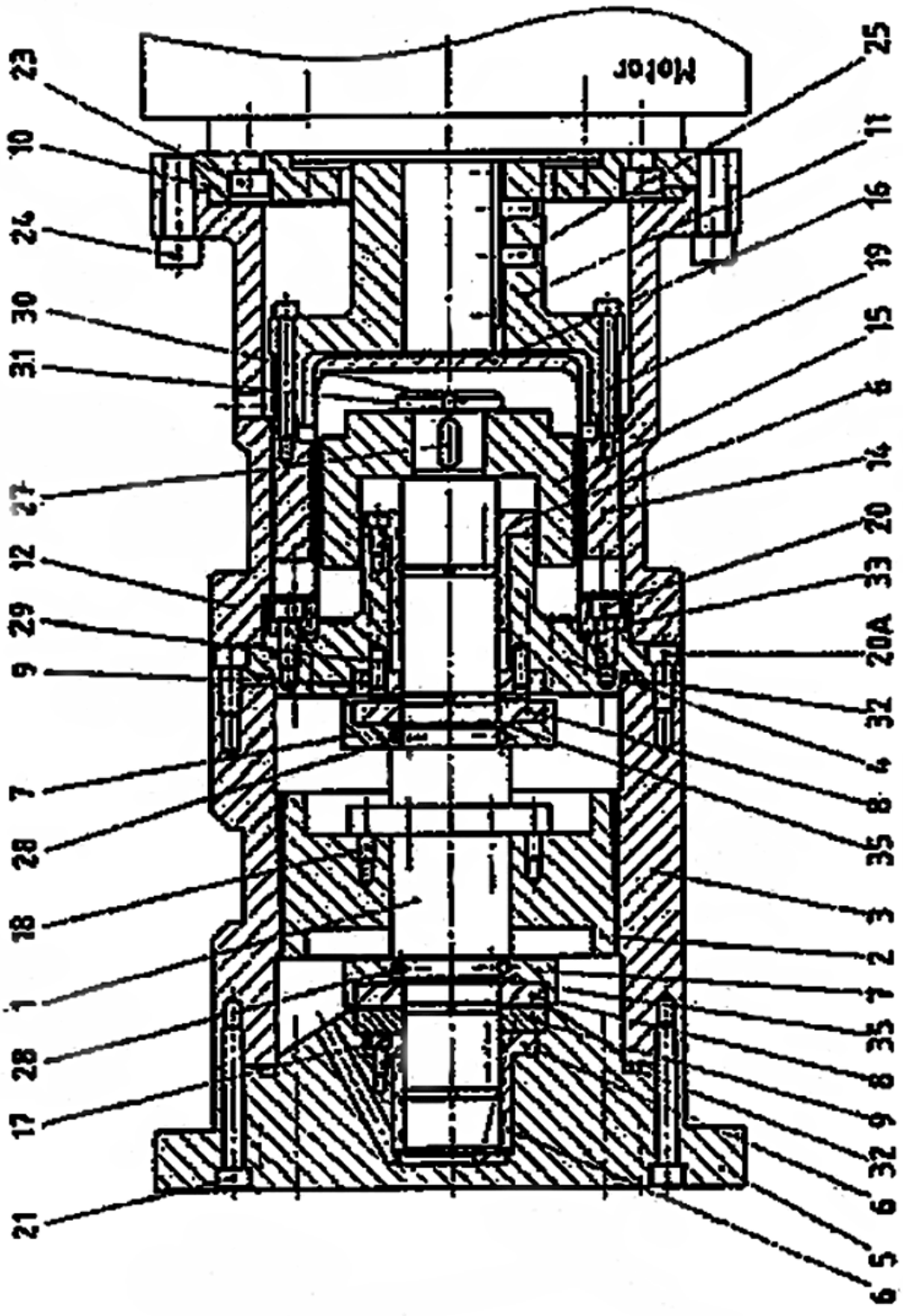
UFH model (300 or 30 000 liters per hour) = 22 kW (400 V 50 Hz)
TRGA model (300 or 18-24 000 liters per hour) = 7.5 kW (380 V 50 Hz)

minimum working temperature for UFH = 70 C (in documentation) and 90 C in presentation
www.wilhelmsen.com/services/maritime/companies/wts/AboutUMS/Documents/UFH_rev02_net%20100323.pdf

minimum working temperature for TRGA = 35-45 C

U.F.H. Reducer / Improver operation manual

Assembly drawing



are magnified images of
omogeniser with its rotor
Before homogenising the
asphaltenes (the black

http://www.ipcopower.com/fts/fts.htm - rotor design is very delicate and prone to deterioration (destruction) that confirms a copy of the documentation.

The ROI for the Reducer is now calculated on 301 days as for the Improver this is calculated on 242 days.

We can offer you both the Reducer and the Improver with a discount, giving the respective prices:

- Cube Reducer - € 24.500,00 – in stead of € 26.125,00
- Cube Improver - € 26.500,00 – in stead of € 28.750,00

Furthermore, in the solidification of oil in a homogenizer - the device should washed for 6-8 hours (TRGA unit can work (after the secondary filter) 540 days, and easy to clean the ship by unqualified personnel)

- Check the rotation of the UFH, there is an arrow on the side of the top of the motor which indicates the direction of the motor. Quickly start and stop the UFH Improver and look at the fan at the top of the motor to make sure it is turning the right way.
- When the unit has not run for a longer time, let the fuel flow through the UFH Improver for 6-8 hours.

Check the electrical load during starting up period, this will be:

UFH homogenizer has no pumping effect
and requires a supplementary pump with a pressure of not less than 3 Bar.

rotary homogenizers have another drawback - they are difficult to scale.

An increase in productivity (throughput), it consume a lot of energy and it is not proportional with its productivity.

More details here -
http://www.wilhelmsen.com/services/maritime/companies/wts/AboutUMS/Documents/UFH_rev02_net%20100323.pdf

a lot of parts (components) - an expensive device in production

item	Description	Quantity	Part No.
1	Rotor Shaft	1	C200-001
2	Rotor	1	C200-002
3	Stator	1	C200-003
4	Bearing support K	1	C200-004
5	Bearing support F	1	C200-005
6	Bearing Bush	2	C200-006
7	Support ring	2	C200-007
8	Thrust disc	2	C200-008
9	Thrust disc	2	C200-009
10	Motor flange	1	C200-010
11	Drive part Magn. Coupl.	1	C200-011
12	Lantern	1	C200-012
13	Flange	1	C200-013
14	Magnet 1	1	C200-014
15	Magnet 2	1	C200-015
16	Magnet housing	1	C200-016
17	Hexagon socket bolt	6	DIN912-M5x12-Zn
18	Hexagon socket bolt	6	DIN912-M6x16
19	Hexagon socket bolt	4	DIN912-M6x50-Zn
20	Hexagon socket bolt	8	DIN912-M8x20-Zn
20A	Hexagon socket bolt	6	DIN912-M8x25-Zn
21	Hexagon socket bolt	6	DIN912-M8x60-Zn
22	Hexagon socket bolt	8	DIN912-M8x70-Zn
23	Hexagon socket bolt	4	DIN912-M10x25-Zn
24	Hexagon socket bolt	4	DIN912-M12x35
25	Threaded pin	2	DIN912-M8x20
27	Slotted pin	1	DIN6885-A-8x7x20
28	Pin	4	DIN ISO 8734-4m6x18-A
29	Pin	4	DIN ISO 8734-6m6x12-A
30	Shaft nut	1	KM6-M30x1.5
31	Security ring	1	ICF-30
32	O-ring	2	145x5 Vi 500/FPM 80
33	O-ring	1	110x4 Vi 500/FPM 80
34	O-ring	2	62x2 Vi 500/FPM 80
35	Retaining ring	2	DIN 471-40x1.75

reconditioning or cleaning - are impossible on board ship, and requires trained professionals. Replacement of the rotor - requires spare parts and stand for balancing.

TRGA homogenizer can be dismantled and cleared in 1 hour a technician of average skill

repair requires a large amount of spare parts

U.F.H. Reducer / Improver operation manual

Maintenance/Repairs

Open the unit after approx. 8000 hours for service and/or cleaning purposes.
Make sure you have all necessary tools and replacement parts* before you start.
Open bypass valve, close in and outlet valves, drain the unit and lift off the motor.
Open the F.I.D. and;

- Check the condition of bushes
- Clean the rotor of the F.I.D.
- Clean the magnet housing
- Clean the inner and outer magnets
- Replace all O-rings (see partslist) incl. O-ring in SAE flanges.
- Handle the thrust discs with care!
- Clean all parts with preferably diesel oil or petroleum.

* see page 10 for replacement parts

UFH has high price. TRGA modlul – is cheaper

The ROI for the Reducer is now calculated on 301 days as for the Improver this is calculated on 242 days.

We can offer you both the Reducer and the Improver with a discount, giving the respective prices:

- Cube Reducer - € 24.500,00 – in stead of € 26.125,00
- Cube Improver - € 26.500,00 – in stead of € 28.750,00

En attente des coordonnées Tel. A/R et mail

IPCO Power fts BV
Spinel 400 - 3361 LG Dordrecht (NL)
PO Box 1163 -3300 BD Dordrecht (NL)
Tel.: +31 (0)78-6521866
Fax: +31 (0)78-6521867

LOUIS DREYFUS ARMATEURS
28 Quai Gallieni
92158 Suresnes Cedex
France

3911 - S1080067

Attn.: Monsieur Michael GERMAIN

Dordrecht, 26 May 2008

Subject: Fuel Treatment System
Our reference: IFTS270320081v2-LDA

Dear Monsieur GERMAIN,

With reference to your email of Friday May 23rd and our telephone call of today, please find enclosed our renewed calculations based on your input.

The ROI for the Reducer is now calculated on 301 days as for the Improver this is calculated on 242 days.

We can offer you both the Reducer and the Improver with a discount, giving the respective prices:

- Cube Reducer - **€ 24.500,00** – in stead of € 26.125,00
- Cube Improver - **€ 26.500,00** – in stead of € 28.750,00

Unfortunately we can not give a discount on installation costs, while the majority of this amount represents labour costs. However installation can be done by or on behalf of the customer. Commission will be executed by us on a rate of € 1.250,00 per day, excl. travel and accommodation expenses.

We trust that we have offered you with this a reasonable quotation.

We remain at your disposal for any additional information you might require, and looking forward in meeting the next step.

Yours sincerely,

IPCO Power fts BV

André Sluimer
Managing Director

Quotation

Reference	IFTS270320081v2-LDA
Date	26 May 2008
Customer	**LOUIS DREYFUS ARMATEURS** **Suresnes Cedex , France**
Supplier	**IPCO Power fts BV** **Dordrecht, Netherlands.**

Quoted equipment:

CUBE Reducer - 1 unit(s)

budget Price **€ 24.500,00 (each)** in stead of € 26.125,00

CUBE Improver - 1 unit(s)

budget Price **€ 26.500,00 (each)** in stead of € 28.750,00

Installation

budget price **€ 7.000,00 (per unit)**

Prices The above mentioned prices are excluding applicable Value Added Taxes (VAT), and/or legal or Governmental surcharges if applicable, forwarding, insurance and are for delivery ex our works.

Terms of payment

I	50%	of the purchase value after receipt of written order from customer and/or an signed order confirmation within 5 working days. After receipt of this prepayment supplier will commence its production.
II	50%	of the purchase value must be in our bank account the day before shipment.

delivery time is too long ... we can manufacture the module TRGA within 4-8 weeks

Excluded Deliveries

- Works and related drawings of the location
- Site preparation and site design costs
- Piping and installation preparation
- Packing
- Assembly at the location
- Commissioning at side
- Travel , lodging and expenses

Delivery Terms

The delivery time is 12 weeks after written order confirmation and clarification of all technical and commercial details.

Validity of offer

This offer is valid for 6 weeks after issue date.

Maintenance

IPCO Power fts BV offers an optional maintenance contract. This contract makes sure that downtime and attention of own personnel is reduced to a minimum. The indicative charges applicable to such a contract are:

- Basic fee per normal working day € 1.250,00
  - Weekends and holidays excluded.
- Travel, lodging and expenses are on customers charge.

This offer assumes inclusion of scheduled maintenance services only.

Warranty

The warranty period shall be 12 months after commissioning of our equipment however not longer than 18 months after delivery.

Miscellaneous

This price indication and delivery terms have been issued for information and discussion purposes only and does not constitute an offer from the Supplier nor an obligation of the Supplier to supply the equipment and related services.

This letter has been construed on estimated figures available to the Supplier; Final delivery terms are subject to final purchase agreement between Customer and Supplier on the scope and terms and conditions and final documentation.

IPCO Power fts BV General Terms and Conditions shall apply to the deliveries made by the Supplier.

compare with TRGA homogenizer :

So UFH model (015 or 1500 liters per hour) = 4.0 kW (400 V 50 Hz)
UFH model (045 or 4500 liters per hour) = 7.5 kW (400 V 50 Hz)
TRGA model (5000 liters per hour) = 4.0 kW (380 V 50 Hz)

UFH model (300 or 30 000 liters per hour) = 22 kW (400 V 50 Hz)
TRGA model (18-24 000 liters per hour) = 7.5-10 kW (380 V 50 Hz)

compare TRGA homogenizer - maximum pressure – up to 40 Bar

IPCO

Technical specification

Mechanical part:

CUBE System	FID Type	Capacity l/h	Product	Temperature	Pressure Min./Max.
CUBE Reducer	FID 045	4.500	IFO 380	Min. 90 °C	1/3 bar
CUBE Recycler	not requested				
CUBE Improver	FID 120	12.000	IFO 380	Min. 90 °C	1/7 bar
CUBE Injector	not requested				
CUBE Blender	not requested				

Above is mounted in a frame with the dimensions according the drawing, colour RAL7016 powder coated.
The connections are including SAE counter flanges.

Electrical part:

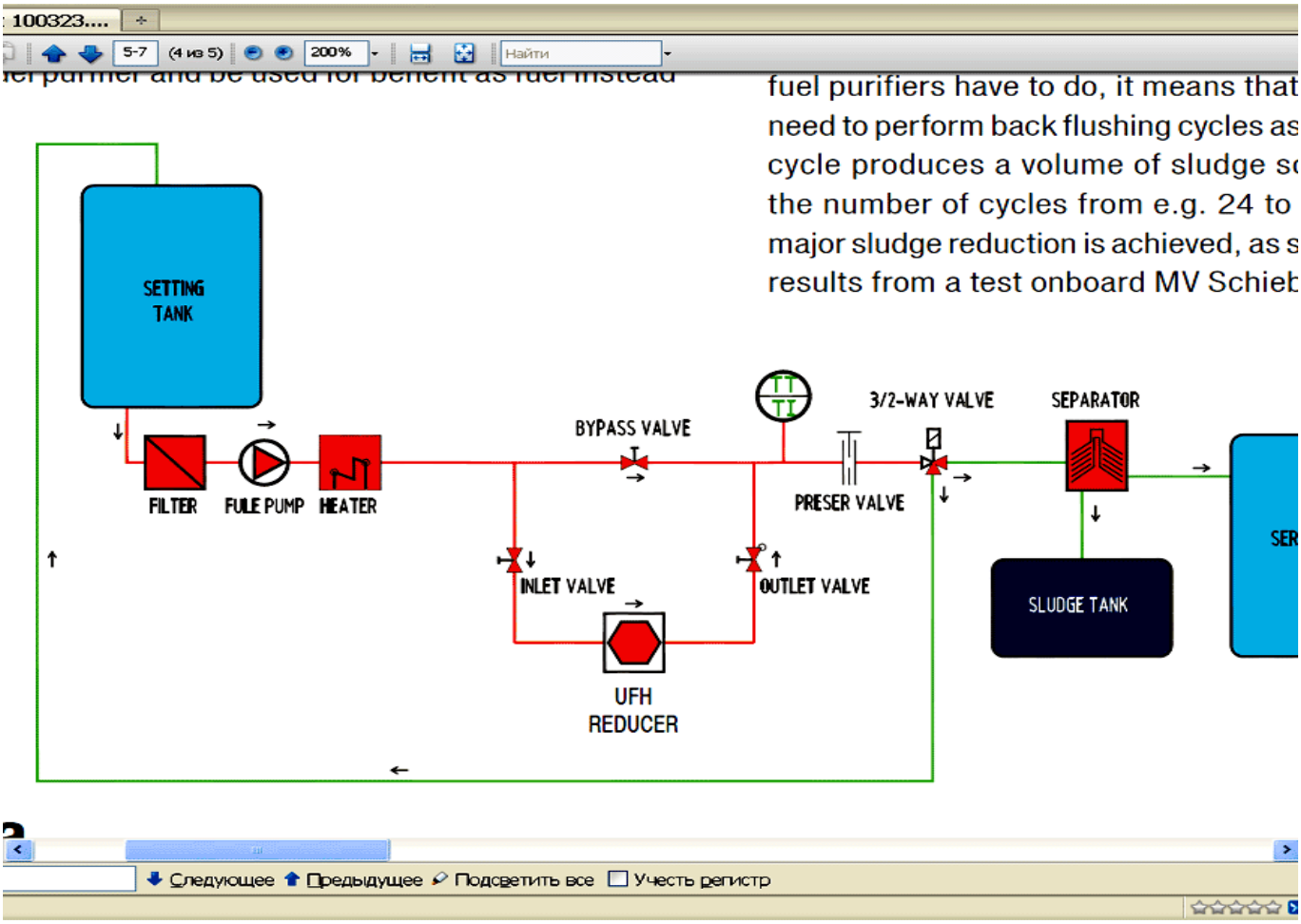
CUBE System	FID Type	Voltage VAC	Control voltage VAC	Frequency Hz	Power kW	Protection Class
CUBE Reducer	FID 045	400/460	230	50/60	4/4,8	IP54
CUBE Recycler	not requested					
CUBE Improver	FID 120	400/460	230	50/60	11/13	IP54
CUBE Injector	not requested					
CUBE Blender	not requested					

Please note:

IPCO Power fts BV preserves the right to change or improve the components specified in this quotation against similar or better components without prior notifications.

TRGA capacity 5 cubic meters per hour needs 4 kW
TRGA capacity 12 cubic meters per hour needs 7 kW

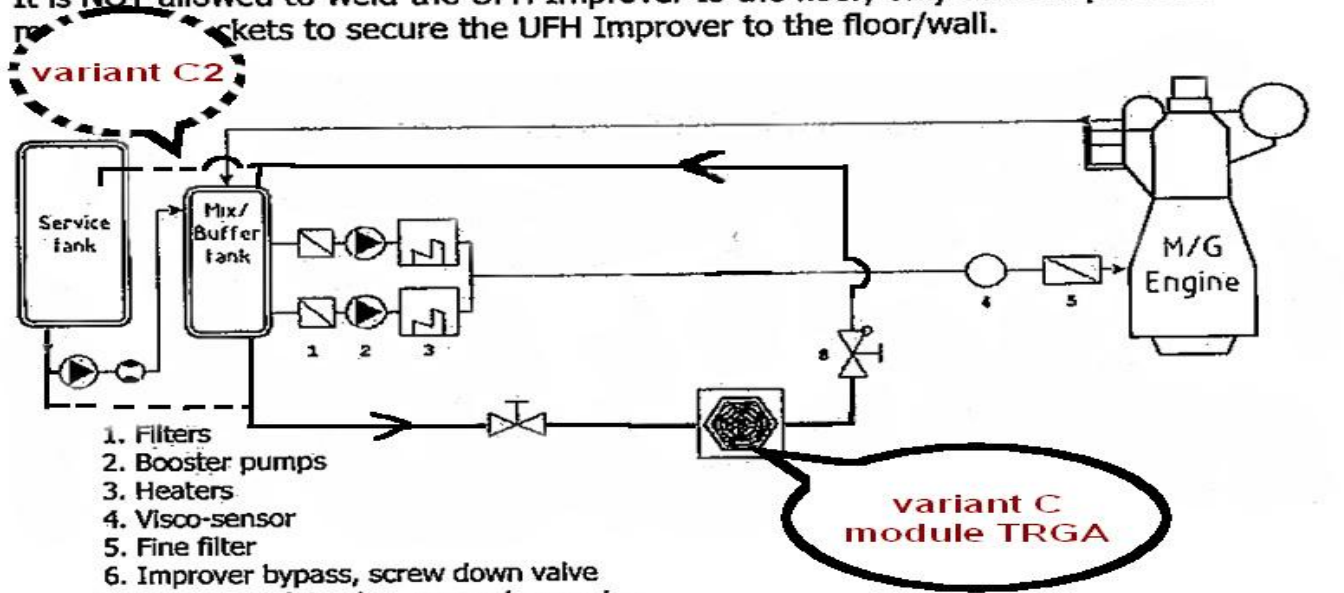
scheme using a homogenizer UFH is very similar to our scheme TRGA, this suggests that we are well qualified, too



U.F.H. Reducer / Improver operation manual

Installation of the U.H.F. as Improver

Following diagram shows where in the fuel system the UFH Improver should be installed. The UFH Improver is provided with SAE counter flanges.
It is NOT allowed to weld the UFH Improver to the floor, only use the provided r... ckets to secure the UFH Improver to the floor/wall.



1. Filters
2. Booster pumps
3. Heaters
4. Visco-sensor
5. Fine filter
6. Improver bypass, screw down valve
7. Improver inlet valve, screw down valve
8. Improver outlet valve, screw down non return valve

This analysis was performed on the text of technical documents, using official documents from the manufacturer of homogenizers UFH

09 April 2011 Andrew Ruban