UniRo 400-1600S

User Manual

Guldager
Wise Water Treatment

Table of Contents

1. Introduction

1.1 User Manual

This user manual is applicable for UniRo 400-1600S plants. Guldager A/S has aimed to provide an adequate survey and thorough information about the use of this plant. The user manual should be read carefully, before the plant is put into service. Please note, that the enclosures at the rear of this manual give important information about copyright, guarantee etc. as well as safety directions.

Should you have questions to this manual or the use of the plant after reading this material, please do not hesitate to contact us:

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1.2 Technical Description

The UniRo plants make use of the reverse osmosis (RO) filtration principle, by which water is passed at high pressure through a membrane, only water molecules can pass through the membrane, as all salts will be separated from the clean water. Almost 100% of the dissolved salts are retained and even micro organisms, bacteria and pyrogenes are retained. The pure water (permeate) is lead to a reservoir tank, from where it is pumped to the place of consumption.

The RO plants are used in following places:

- Car washing plants
- Humidification in e.g. printing houses
- Central heating stations
- Boiler gauge and steam production
- Dish washers
- Other processes, where limestone and mineral salts cause problems

2. The Plant

2.1 Standard application

This plant is only intended for demineralization of water. Any other application is considered non-standard. Guldager A/S is not responsible for damages caused by such application, please see Appendix B.

2.2 The Water Quality

The inlet raw water must be of drinking water quality and the temperature must not exceed 30°C. Further, the inlet raw water for the RO plant must not exceed the following values:

Fe^{+++}	0.10 mg/l
Mg^{++}	0.50 mg/l
TDS	1000.00 mg/l
Cl_2	0.10 mg/l
Mn^{++}	10.00 mg/l
Silt index	3.00 mg/l
$KMnO_4$	0.00 mg/l

If there is any doubt about the quality of the water, a water analysis must be available.

2.3 The construction of the plant

The raw water is led to a high pressure pump and further into the membrane. Where the water is now dispersed in concentrate, which is led to the drain, and permeate which is lead to the reservoir tank. The permeate is pumped to the place of consumption. See figure 1.

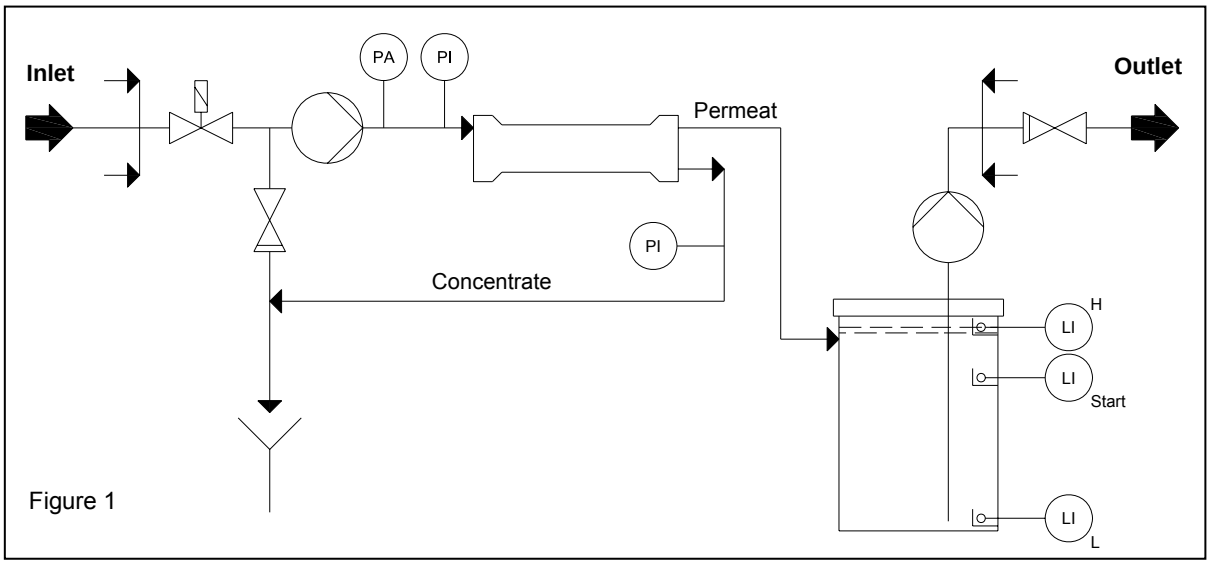


Figure 1

2.4 Location & Clearance Distance

It is extremely important that the temperature in the room does not exceed 30°C in order to ensure continued, efficient functioning of the plant. However, if this is not possible, the plant will have to be modified according to this during production.

In order to enable installation of the plant and replacement of membranes, certain min. distances around the plant, are required. Please see table 1.

Model	400S	800S	1200S	1600S
Height from floor to ceiling	2,30 m	2,30 m	2,30 m	2,30 m
Free space to the left	0,60 m	0,60 m	0,60 m	0,60 m
Free space to the right	0,75 m	0,75 m	0,75 m	0,75 m
Free space at the back	0,10 m	0,10 m	0,10 m	0,10 m
Free space in front	0,50 m	0,50 m	0,50 m	0,50 m

3. Plumbing and Heating Installations

3.1 Fundamental Safety Instruction

According to the directive for machinery, Guldager A/S must inform, that before work is begun, everybody is under the obligation to read the fundamental safety instructions, see Appendix B in this user manual.

3.2 Water Connections

- The plant requires an inlet water pressure of min. 2 bars and max. 7 bars.
- The piping to the plant must be min. ¾".
- A bypass should be mounted on the inlet, in order to enable service. See below.

1. *)Vacuum non-return valve, see details below
2. Check valve, inlet
3. Check valve, bypass
4. Check valve, outlet

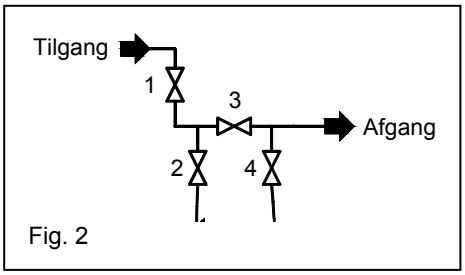


Fig. 2

*Figure A.
If your non-return valve resembles fig. A, it must be placed in a vertically position, min. 150 mm above the following installation.

*Figure B.
If your non-return valve resembles fig. B, it can be mounted directly on the inlet to the plant, from where backflow is possible.

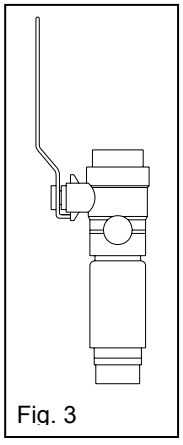


Fig. 3

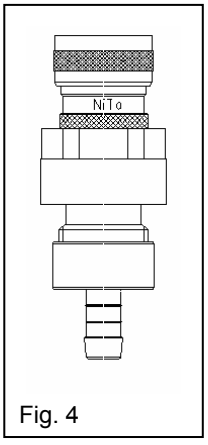


Fig. 4

- The temperature of the water must not exceed 30°C.
- The water connections to the plant must comply with the current regulations.

- The reservoir tank is connected to the product pump with min. ¾" stainless/PVC pipe or flexible hose. A shutdown valve is to be mounted on the reservoir tank (included in the delivery). See below illustration.

Please Note!

It is recommended to establish a permanent connection between the product pump and the reservoir, if the distance is more than 2 m.

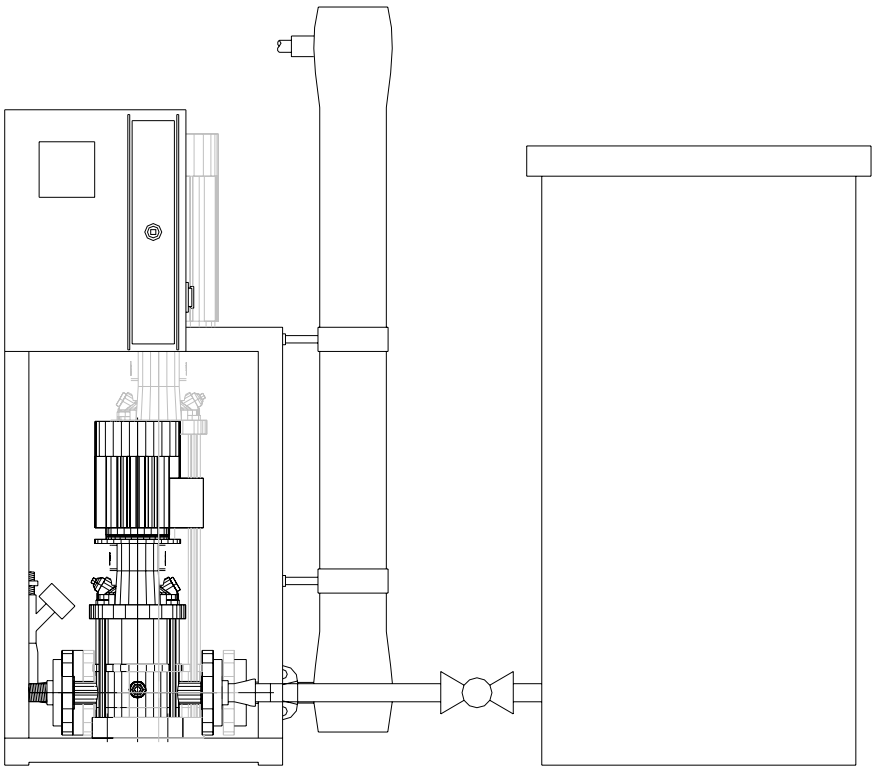


Figure 5

4. Electrical Installation

4.1 Fundamental Safety Regulations

According to the directive for machinery, everybody is under the obligation to read the fundamental safety regulations, before work is begun, see Appendix B in this user manual.

4.2 Connections

Tension:	3 x 400 Volt
Main fuse:	13 Amp.
Max. electricity consumption:	2.7 kW
Connection:	3 x phase earth

Internal connection to level control is mounted:

Clamp 11 – Yellow	Wire 3	(Start)
Clamp 12 – Red	Wire 1	(Stop)
Clamp 13 – Green	Wire 4	(Reservoir empty)
Clamp 20 – Blue	Wire 2	(C common)

Output relay for start of booster pump (potential free switch):

Clamp 21 –

Clamp 22 –

Alarm input from external: 24 V

Clamp 16 –

Clamp 20 –

Alarm output for external (potential free switch):

Clamp 23 –

Clamp 24 – output **NO**

Clamp 25 – output **NC**

4.3 Clamps

400 V			
Clamp	**Internal No.**		
1	7	L1	Motor high pressure pump
2	8	L2	Motor high pressure pump
3	9	L3	Motor high pressure pump
Pe#	Pe#		
5	10	L1	Motor high pressure pump
6	11	L2	Motor high pressure pump
7	12	L3	Motor high pressure pump
Pe#	Pe#		
24V			
Clamp	**Internal No.**		
9	20	MV1	Solenoid valve NC, Inlet
10	23	MV2	Solenoid valve NO, Bypass
11	30	STA	Start sensor tank
12	31	STO	Stop sensor tank
13	32	TOM	Empty sensor tank
14	33	LW	Low water supply
15	36	PP	Pressure switch product pump
16	37	EX	External Stop signal
-17	-	0 Volt	
-18	-	0 Volt	
C 19	42+	”+ 24 VDC	
C20	42+	”+ 24 VDC	
21	50	K3	Output for booster pump
22	51	K3	Output for booster pump
23	52	K4	Output for external alarm
24	53	K4	Output for external alarm NO
25	54	K4	Output for external alarm NC

5. Actuation

The UniRo plant has been tested and adjusted with a standard factory setting. Therefore, it is necessary to check and possibly change the setting in order to adapt the plant to local proportions.

1. Make sure that all electricity and water installations are carried out as described in paragraphs 3 and 4.
2. Before actuation of the UniRo plant, the pre-treatment/softening unit, if installed, must be actuated. See relevant installation instruction.
3. Disconnect the green wire in clamp 13 (product pump is disconnected). The wire must not be in touch with frame, this will burn out the fuse.
4. Turn on the inlet water.
5. Turn on 400 Volt power supply. Display shows **Out of operation**.
6. Press  and display shows **Auto operation?** Press 
7. Display shows **Alarm Empty Reservoir**.
8. Now, the plant is in Auto operation, and will start/stop after level control.

Please Note!

By leakages upon actuation, the plant is to be shut down the following way.

Press  the plant will stop and display shows **Out of operation**. Press  and afterwards  to restart the plant in auto operation.

5.1 Start-up of Plant

See descriptions of abbreviations in paragraph 7.6.

1. The inlet solenoid valve **MV1** opens upon signal from start level **STA**. If a booster pump is mounted **K3,** this will start contemporarily with **MV1.** The membrane housing is filled with water, and the membrane is rinsed with low water pressure. Display shows **Rinsing**.

- Make sure that water flows from both permeate and concentrate hose before the high pressure pump starts.

2. After 60 seconds the high pressure pump will start and with that the production of RO water. Alarms for low water supply **LW,** external stop signal **EX** (if mounted), conductivity **LA** (option) and permeate flow **PF** (option) are active contemporarily with start of the high pressure pump. Display shows **Plant in operation**.
3. The reservoir is filled with RO water. When the water level reaches level stop **STO**, the high pressure pump stops, and after 30 seconds the inlet solenoid valve shuts off **MV1**. Display shows **UniRo STB** (standby).

When the production of RO water has stopped and the reservoir tank been filled, the product pump must be ventilated:

1. Press  to disconnect power to the pumps. Use a small adjustable wrench and unscrew the little hexagonal bleed screw on the upper part of the product pump a little bit. After ventilation of the pump, the bleed screw is tightened.
2. Mount the green wire in clamp 13.
3. Restart the plant by pressing  display shows **Auto operation**. Press  .
   Create consumption in order to start the product pump.
4. The product pump is controlled by the pressure switch. I.e. by drop of pressure, the pump will start and deliver water for consumption. By stop, the pump is preset with a time delay of 30 sec. The pressure switch is preset to start/stop the pump by pressure above/below 4 bars.

Please note! To prevent the pump from ”oscillating” the time delay can be changed from 0 sec. to 59.59 min. This can be done in manual setting **Timer 4**, see paragraph 7.4.4.

5.2 Resetting <u>all</u> inputs by start-up:

1. Press and hold  for 4 sec. Press  until display shows **System**. Press  .
2. Press  until display shows **Clear MB & MI**. Press  twice.

6. Service and Maintenance

6.1 Inspection, service and maintenance

We recommend a yearly service inspection. Prior to this, the personnel working with the plant must be informed.

6.2 Cleaning of the plant

The plant must be kept cleaned. Please note, that the water supply must be turned off, and the main switch disconnected before separation and repair of pressurized equipment.

6.3 Operation

The UniRo plant is put in operation in the following way:

1. Press  . Display shows **Auto operation**.
2. Press  the plant is now in auto operation and will produce RO water according to requirement.

Please note!
By leakages upon actuation, the plant can be shut down, see paragraph 6.3.

6.3.1 The plant will start up after the following

See descriptions of abbreviations in paragraph 7.6.

1. The inlet solenoid valve **MV1** opens upon signal from start level **STA**. If a booster pump is mounted **K3,** this will start contemporarily with **MV1.** The membrane housing is filled with water, and the membrane is rinsed with low water pressure. Display shows **Rinsing**.
2. After 60 seconds the high pressure pump will start and with that the production of RO water. Alarms for low water supply **LW,** external stop signal **EX** (if mounted), conductivity **LA** (op-

tion) and permeate flow **PF** (option) are active contemporarily with start of high pressure pump. Display shows **Plant in operation**.

3. The reservoir is filled with RO water. When the water level reaches level stop **STO,** the high pressure pump stops, and after 30 seconds the inlet magnetic valve shuts off **MV1**. Display shows **UniRo STB** (standby).

6.4 Alarms

Display	Cause	Resulting effect
ALARM! INLET PRESSURE	Low inlet pressure	Stops high pressure pump immediately, and shuts down inlet valve with set duration of rinse after stop of high pressure pump.
ALARM! RESERVOIR EMPTY	Empty tank	Stops product pump immediately, and by option, bypass valve is opened. *Will reset after 1 minute upon activation of level sensor.*
ALARM! EXTERNAL	External	Stops high pressure pump immediately and shuts down inlet valve with set duration of rinse after stop of high pressure pump.
ALARM! CONDUCTIVITY Condition: Measured value is above indicated value	Conductivity	Stops high pressure pump immediately and shuts down inlet valve with set duration of rinse after stop of high pressure pump.
ALARM! Performance Condition: Flow has dropped 10% compared to rated value.	Permeate flow	None
ALARM! Thermal error F1	Thermal relay High pressure pump	Stops high pressure pump immediately and shuts down inlet valve with set duration of rinse after stop of high pressure pump.
ALARM! Thermal error F2	Thermal relay product pump	Stops product pump immediately and opens bypass valve by option.

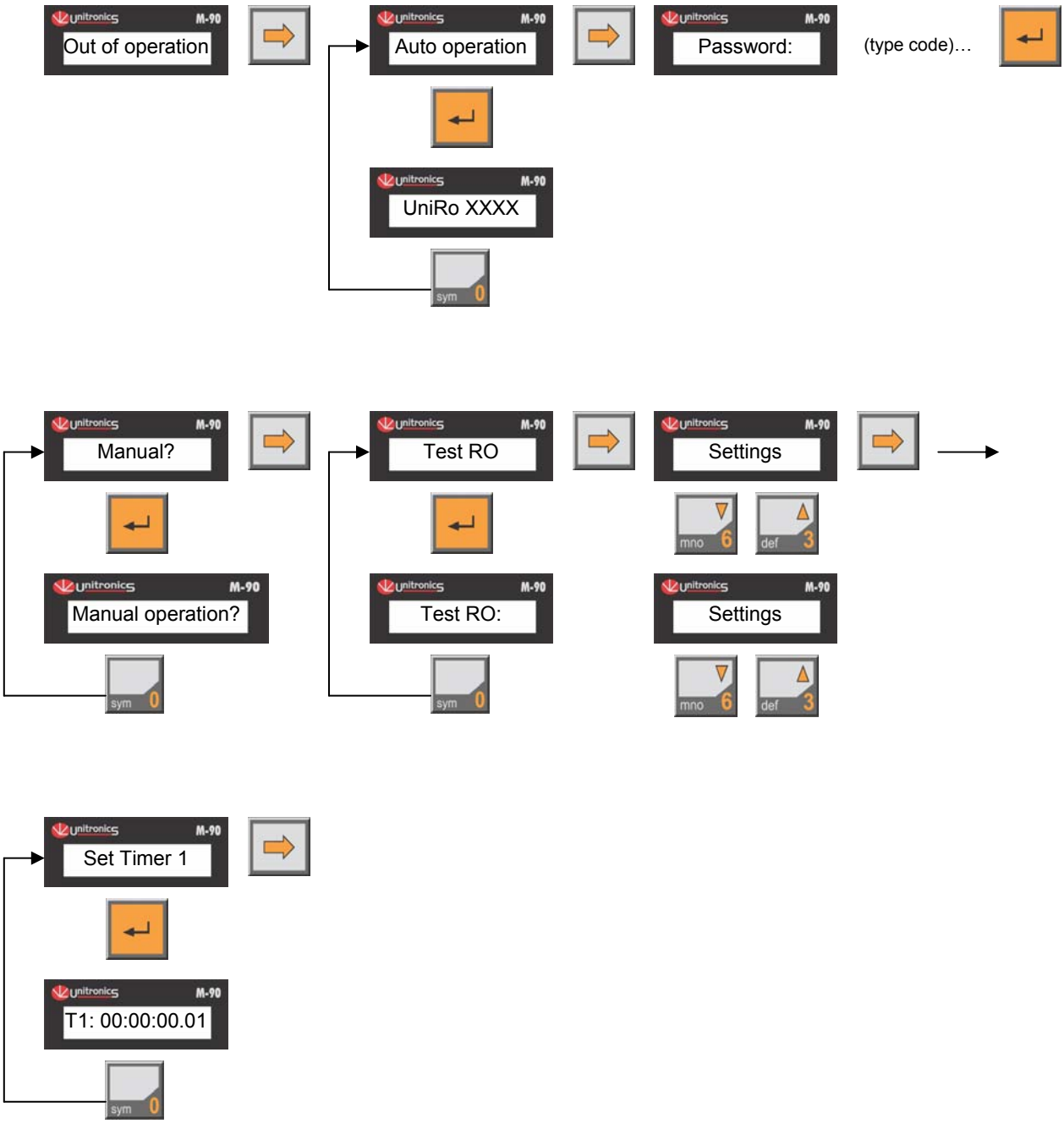
Please Note!

If an alarm stops the high pressure pump, the plant must either be shut down or restarted by pressing  .

7. Setting of Program

7.1 Program

The various displays of the program are shown below. Only authorized personnel from Guldager should make changes in the program.



7.2 Manual Operation

When the plant is in manual operation the individual output can be operated via the operating panel. To set output press  contemporarily with the No. key. Output is reset by pressing only the No. key.

Key 1: K3 - Booster pump
Key 2: MV1 - Inlet solenoid valve
Key 3: PH - High pressure pump
Key 4: LP - Product pump
Key 5: MV2 - Bypass solenoid valve (option)
Key 6: K4 - Alarm output

7.3 Test RO

Test the program in order to check the operations by production of RO water.

1. Booster pump starts, and inlet solenoid valve opens
2. After 1 minute the high pressure pump starts
3. High pressure pump runs for 1 minute
4. After 30 sec. the inlet solenoid valve shuts off, and booster pump stops
5. When display shows **Test RO**, press  display shows **Test RO: STOP**
6. To start the test press  display shows **Test RO: Running**
7. To terminate test press  display shows **Test RO: STOP**

7.4 Settings

Press  and  to use the various functions in the settings menu. Following functions are possible:

- To choose from possible options
- To change the alarm limit for conductivity and flow
- To reset operating time for pumps
- To reset number of starts of solenoid valve
- To reset alarms

7.4.1 Flow meter and conductivity Off/On

Press  to activate (ON) and  to disconnect (OFF).

7.4.2 Alarm for conductivity and flow

1. Press  to enter the settings menu
2. Enter required value ####, e.g. 0100 = 100 l / 100 µS
3. Press  to terminate

7.4.3 Resetting

- Operating time: High pressure pump
- Operating time: Product pump
- Number of: Starts
- Alarm: Empty reservoir tank
- Alarm: External
- Alarm: Conductivity
- Alarm: Performance
- Water meter counts to 30.000 m^3
- Factor 0 (Water meter above 30.000 m^3)

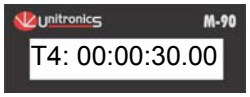
Press ↵ to see number of inputs. Press 0 to reset or indicate new value. Press ↵ to terminate.

7.4.4 Set Timer

1. Press ⇨ to move forward to 

2. Enter code ↵ 

3. Press ⇨ until display shows the relevant timer No.
4. E.g. 

↵ Enter 

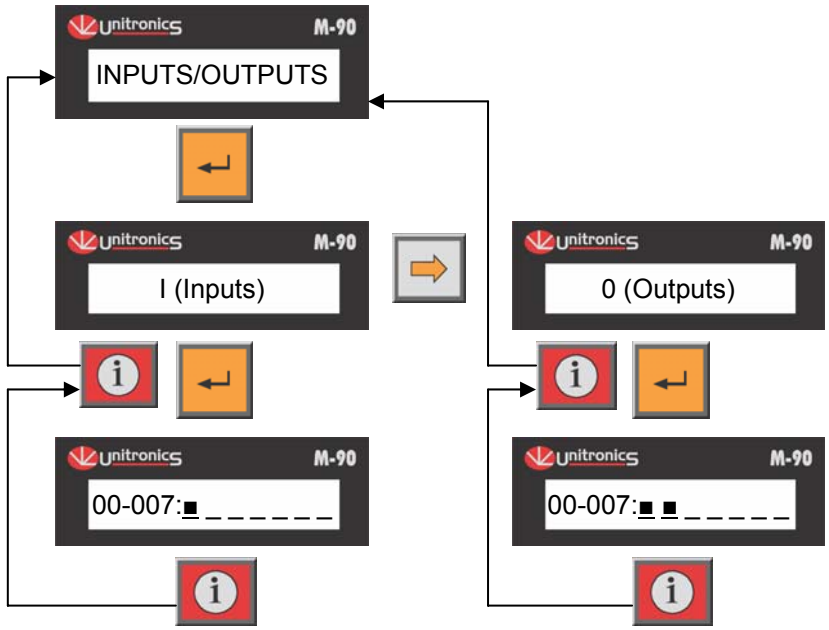
(See paragraph 7.10 for Timers).
5. Enter the required value: e.g. 00:00:40.00 = 40 sec. ↵
6. Press +/- . to revert to start display 

7.5 Information key

ⓘ Using this key, you can navigate through the main menu to reach the category of data you require. Selecting a category opens a submenu.

- INPUTS/OUTPUTS
- MB/MI/SB/SI - (only MI is used)
- Timers
- System

Press and hold ⓘ for 4 seconds.



The presence of a highlighted rectangle in the display indicates that the status is currently positive (on).

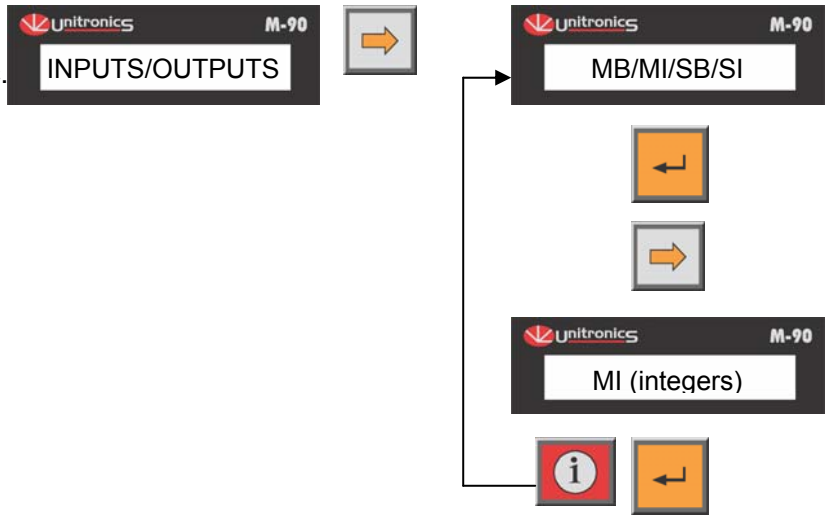
7.6 Inputs/Outputs

Input	Description	
0	STA	Start sensor tank
1	STO	Stop sensor tank
2	TOM	Empty sensor tank
3	LW	Low water supply, pressure switch
4	F1	Thermal alarm, high pressure pump
5	F2	Thermal alarm, product pump
6	PP	Pressure switch, product pump
7	EX	External Stop signal

Output	Description	
0	MV 1	Inlet solenoid valve NC
1	Q1	High pressure pump
2	Q2	Product pump
3	MV 2	Bypass solenoid valve NO
4	K3	Booster pump
5	K4	Alarm – system

7.7 Presentation of encoded data (MI)

Press and hold  for 4 sec.



Enter MI-number (see paragraph 7.8) or use the arrow keys. 

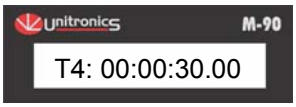
7.8 MI-numbers

MI 0	Alarm limit, conductivity	**MI 17**	Text list f/main menu
MI 1	Minimum flow limit	**MI 18**	Text list f/operation display
MI 2	High pressure pump, operating time	**MI 19**	Password
MI 3	Product pump, operating time	**MI 20**	Conductivity – Input
MI 4	LWA alarm	**MI 21**	Frequency f/flow meter
MI 5	Empty tank alarm		
MI 6	Number of starts	**MI 24**	Conductivity value 0 -200 µS
MI 7	External alarm	**MI 25**	Time Oscillator HP
MI 8	Conductivity alarm	**MI 26**	Time Oscillator PP
MI 9	Output alarm	**MI 27**	1 l Oscillator
MI 10	Water meter (up to 30.000 m^3)	**MI 28**	1.000 l Oscillator
MI 11	Water meter factor (above 30.000 m^3)	**MI 29**	Text initiator

7.9 Display of timed data

1. Press and hold  for 4 sec. 




2. Enter timer number ##  display shows current time. E.g. 

3. Press  to revert to a previous entry in the program.

7.10 Timers

Time indicated in: Hours: Minutes: Seconds: 100/sec.

T1	Booster pump, pre start-up	00:00:00:01
T2	Time of rinsing, start-up	00:01:00:00
T3	Time of rinsing, shutdown	00:00:30:00
T4	Off-delay - Product pump	00:00:30:00
T5	Off-delay - Low water supply	00:00:10:00
T6	Off-delay – Empty Tank	00:01:00:00
T7	On-delay – Conductivity alarm	00:00:10:00
T8	On-delay – Permeate flow alarm	00:00:10:00
T9	Max. Run booster pump	00:00:15:00
T10	Max. time of aperture MV 1	00:00:15:00
T11	Max. Run high pressure pump	00:00:10:00
T12	Max. Run product pump	00:00:10:00
T13	Max. time of aperture MV 2	00:00:10:00
T14	Max. time of activation, alarm	00:00:10:00
T15	Reset LWA	00:00:15:00
T16	Max. test run, high pressure pump	00.00:01:00

Appendix A. General Information

Copyright

This user manual is intended for buyers of UniRo plants only. All copyrights belong to the company Guldager A/S. Replication is allowed for internal use only. This permission applies for the safety directions exclusively. Copying of drawings, diagrams and spare parts lists is NOT allowed.

Guarantee and Responsibility

Guldager A/S guarantees all the mechanical and electrical parts of the plant as well as its mechanical construction for a period of 12 months. This guarantee is valid from the date of transfer. Within this period all parts that can not be used because of faulty construction, defective material, or defective accomplishment are repaired or replaced.

Guldager A/S cannot be held responsible for damages caused by the delivery after the transfer:

a. on real property or movables that occur while the delivery is in the buyer's possession.
b. on products, which have been produced by the buyer, or on products, of which these are a part, or for damages on real property or movables, caused by these products as a consequence of the delivery.

Under no circumstances, the supplier can be held responsible for loss of profits, or other financial consequential losses.

Staff Obligations

Before work is started, anyone working with this plant, is under the obligation to

- observe the basic instructions for working security and prevention of accidents.
- read Appendix B.
- read the safety instructions and warnings from other supplies connected to the plant.

Fulfilment of CE-labelling

If Guldager A/S is to have status as producer, this plant is only to be installed by trained and authorized staff in accordance with the ”standard application” of the plant and in order to meet the demands in the European Parliament and Counsel directive No. 98/37/EF (Machine directive), directive No. 97/23/EF (pressurized equipment), directive No. 73/23/EØF (low voltage directive) and directive No. 89/336/EØF (EMC directive). Consequently, only Guldager A/S can confirm conformity with the directives in a ”Declaration of Conformity” and place the CE-label for control purposes of the authorities.

In any other case Guldager A/S is solely producer of the “original plant", which is to be considered as single components after alterations. The responsibility for the plant including all legal consequences is thus transferred to the company or installation business which has carried out the alterations. the plant. It is important to stress, that a new, complete technical dossier with updated estimation of risk, list of components etc. should be prepared, once the plant has undergone changes.

By changes of the construction, use of other components, or safety relevant components, the "Declaration of Conformity" no longer applies.

Appendix B. Fundamental Safety Regulations

Observe the Instructions

In order to ensure correct and safe handling of the plant, and to make sure that it will work to the utmost without interruption, it is important to possess knowledge of the fundamental safety regulations and instructions.

This appendix lists the most important precautions for a correct and safe handling of the plant. This user manual with its safety regulations, including the company's internal safety regulations, must be observed by anyone, working with or near the plant.

The user manual must be stored in visible distance in the area, where the operators control the plant, and safety regulations and warnings must be placed close to the plant on a permanent and visible spot.

The Company's Obligations

The company is under the obligation only to let personnel, who meet with the following demands, work with and around the plant, i.e. personnel who has

- been instructed in the use of the plant.
- read this appendix about fundamental safety regulations.

Inspection of the Plant

On demand, the employer must take care that the device undergoes a safety inspection. This, however, must be done at least once a year. The inspection is to be carried out by an expert and a report on the inspection results must be written.

An expert is defined as somebody, who, on the basis of his professional education and knowledge, possesses thorough knowledge of the tool in question, and is familiar with the relevant national, occupational, safety regulations, regulations for the prevention of accidents, directives, safety rules, and technical rules, which have been generally approved (i.e. DIN norms, VDE

rules) to such an extend that he/she is able to estimate the safety condition of the tool. These demands are met by Guldager's technicians and by employees with similar education.

Dangers by Handling the Plant

This plant has been constructed according to the present technological development and the present technical safety rules. In spite of this, by unskilled use, situations that are dangerous to the operator and others and damages to the plant and other damages on material may occur.

The plant is only to be used according to the standard application, see section 2.1, and in good and safe condition.

Defects, which have an influence on safety, e.g. leaks on pressurized parts and other similar elements of danger, must be repaired immediately in a professional, correct manner.

Remaining Risks

In spite of all safety precautions, protective outfit and the optimal organizational precautions, damage on material or even personal injuries cannot be excluded.

Should an accident occur, Guldager must be informed. In order to minimize potential remaining risks or completely eliminate these through technological progress, we aim to react to even the smallest irregularity within the terms of our duty to supervise our plants.

Appendix C. Declaration of Conformity

Declaration of Conformity

Konformitätserklärung

I henhold til maskindirektivet 98/37/EØF, Bilag II, A
According to the following directive: Machinery 98/37/EØF, Encl. II, A
gemäß den Richtlinien für Maschinen 98/37 EG, Anlage II,A

Guldager A/S
Hejrevang 1-3,
3450 Allerød

erklærer på eget ansvar at følgende produkt
declare, under own responsibility, that the following product:
bestätigt unter Eigenverantwortung, dass das folgende Produkt:

Produkt: UniRo

(navn, type eller model, parti, portion eller serienummer, eventuelt kilde og antal emner)
(name, type or model, part, batch, or serial number, source, if any, and number of subjects)
(Name, Typenbezeichnung oder Modell, Partie, Portion oder Seriennummer, evtl. Quelle und Stückanzahl)

som er omfattet af denne erklæring, er i overensstemmelse med følgende standard(er) eller andre normative dokument(er)
which is covered by this declaration, complies with the following standard(s) or other normative document(s)
umfaßt von dieser Konformitätserklärung, in Übereinstimmung mit den folgenden Richtlinien oder anderen normativen Dokumenten ist.

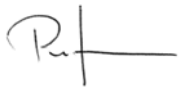
EN 1050, EN 292-1, EN 292-2, EN 292-2/A1, EN 1708-1, EN 418, EN 954-1, EN 60439-1, EN 60204-1
(titel og/eller nummer samt udgivelsesdato for standard eller andre normative dokumenter)
(title and/or number and date of publication of standard or other normative documents)
(Titel und /oder Nummer sowie Erscheinungsdatum für Standards oder andere normativen Dokumente)

i henhold til bestemmelserne i Direktiv: Maskindirektivet (98/37/EØF), Trykbærende udstyr (97/23/EØF), Lavspændingsdirektivet (73/23/EØF) og EMC-direktivet (89/336/EØF)
As stated in the requirements of the following directives: Machinery (98/37/EF), Pressurised Equipment (97/23/EF), Low Voltage Electrical Equipment (73/23/EØF), and EMC (Electromagnetic Compatibility, 89/336/EØF)
gemäß den Bestimmungen der folgenden Richtlinien: Maschinen (98/37/EWG), Druckgeräte (97/23/EWG), elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen (73/23/EWG) und die elektromagnetische Verträglichkeit (89/336/EG).

Leverandørerklæringer er indhentet fra vore underleverandører – alle komponenter overholder nedenstående direktiver
Statements from sub-suppliers have been asked for – all components observe the directives mentioned below
Lieferantenerklärungen wurde von unseren Zulieferanten eingeholt – alle Komponente erfüllen die nachfolgenden Direktiven.

73/23/EC, 89/336/EC, 89/392/EC, 97/23/EF
(overensstemmelseserklæring, oversigt over normative dokumenter, direktiver og standarder benyttet til konstruktion af lev. komponenter)
(declaration of conformity, review of normative documents, directives, and standards used for construction of delivered components)
(Konformitätserklärung, Übersicht über normative Dokumente, Direktiven und Standards benutzt zur Konstruktion der gelieferten Komponenten)

Allerød, 24-02-2004 Per Jensen



(udstedelsessted og dato) (navn og underskrift eller tilsvarende identifikation af bemyndiget person)
(Place, date) (name, and signature of subscriber)
(Ort, Datum) (Name und Unterschrift des Unterzeichners)