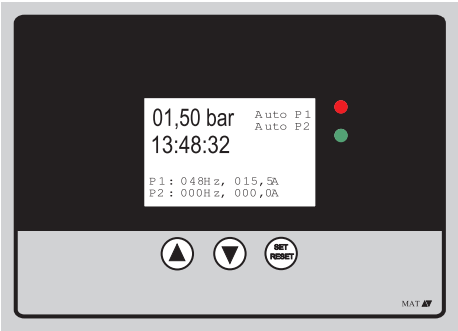
MARH

1-4 pumps
pressure

Instruction manual	Execution: pressure
Type: MARH	S-No.: _____

System controller for 1- 4 pumps Software version 2.05 (xxx) Stand 21.03.2023



Execution:	pressure control
	pressure switch
	limit controller
	limit switch
	level controller
	level switch
	temperature controller
	temperature switch
	flow regulator
	vacuum regulator
	Vacuum differential controller
	Pressure differential controller
	A temperature difference controller
	Fire-fighting mode
	SD Data logger
	Modbus 485 RTU
Option:	GSM / RS232
Inverter:	E2000

content **page**

1. General information about the pump regulator

This product complies with the latest technology and is constantly being developed and improved. The device has undergone extensive testing after manufacture and therefore functions flawlessly. To ensure optimum function, read and observe this operating manual.

2. Safety and warning instructions

Before installing and commissioning the pump regulators, please read these operating instructions carefully and observe all warning and safety instructions. Always keep this manual in easy reach near the pump regulator.

definition

Warning !
Failure to observe the safety instructions can result in serious or even life-threatening bodily injury or substantial material damage!

Caution !
Failure to follow these instructions can result in serious or life-threatening bodily injury or material damage!

Notice !
Failure to follow these instructions may cause malfunction of the system!

The pump controller works with dangerous electrical voltages and controls dangerous rotating mechanical parts. The installation, commissioning and maintenance of this system may only be carried out by qualified personnel who are familiar with the operation. Be especially careful when automatic restart is activated. To prevent injuries due to possibly uncontrolled restarting of the motors after power failure, deactivate the automatic restart in case of doubt. During repairs or maintenance work, make sure that the system can not be switched on again by others! The built-in frequency converters have capacitors that carry dangerous high voltage even after switching off the power supply. Therefore wait at least 5 minutes after switching off the mains voltage before working on the device. Care must be taken that no live parts are touched. Do not work on the controller,
when mains voltage is applied. Earth the motors at the connections provided for this purpose.

If the provisions of the regional energy suppliers require a residual current device, it must
the on-site RCCB for frequency converter operation is an **all-current sensitive / selective RCD (RCD) circuit breaker type: B, B + with rated current 300mA.**

Make sure that the input voltage matches the voltage entered on the nameplate. All pump regulators are tested for dielectric strength and insulation resistance. Before the insulation measurement on the pump system, z. Eg during the inspection, the pump controller and the sensors must be disconnected!

The regulations of the electrical installation and the regional energy suppliers must be observed!

Environmental influences such as high temperatures, high humidity are to be avoided as well as dust, dirt and aggressive gases. The installation site should be well ventilated, not exposed to direct sunlight. Do not apply mains voltage to the sensor terminals or to the control terminals. Enter the operating signals Manual / 0 / Auto via the selector switch or via the control of the external contacts and not by switching on or off a mains or motor contactor. To ensure that your control system operates safely and reliably, all relevant safety regulations, such as: B. accident prevention regulations, regulations, VDE regulations, etc. are observed. Since these regulations are handled differently in the German-speaking countries, the user must observe the respective conditions applicable to him. The manufacturer can not exempt the user from the obligation to follow the latest safety regulations

The technical data and descriptions in this manual have been prepared to the best of our knowledge and belief. However, product enhancements are ongoing, so the manufacturer reserves the right to make such changes without notice. The manufacturer can not be held liable for errors in the operating instructions. Warranty is provided within the Federal Republic of Germany and within the statutory warranty period and applies only to the product itself and not for any consequential damage or damage or cost incurred by the occurrence of a warranty claim to others. Plants or system parts arise. The operator must in any case ensure that a failure or defect of the product can not lead to further damage.

3. Pump controller

This pump controller works as pressure controller fully automatically, depending on demand.

The speed of the pump (s) is infinitely variable with frequency converter operation. The actual value in the system is determined by means of a sensor. A PI controller adjusts the actual value to the set point. When operating with contactor or soft starter, the pump (s) are switched on and off as required. The pump controller can be parameterized and must be adapted to the respective operating conditions. The parameters are displayed in plain text.
Commissioning is menu-driven. During commissioning, some data must be entered to ensure smooth operation of the system. It should be done by a knowledgeable person.

Advantages of pump control

- almost constant control value
- Continuous adjustment of pump performance to changing operating conditions
- Energy saving in frequency converter operation
- no integrated memory required for frequency converter operation
- less mechanical wear of the pumps

Design of the pump regulation

- the pump (s) must be designed according to the plant / requirement
- the integrating memory must be properly sized and set correctly.
- The pump (s) must have hydraulic capacity (s) of 10 - 20% in order to be able to control.
- For submersible pumps, the minimum frequency must be limited to 30..35Hz (Hydrodynamic bearing) (See information from the manufacturer of the engine.
- For underwater pumps a power reduction of approx. 5..10% can be assumed

Use of GSM monitoring

If you have installed a GSM modem (terminal), you can monitor the pump controller.
Depending on the technical design, different commands are available to you.
Make sure the antenna is well aligned for proper wireless network connection.
Make sure that the power supply is always active together with the pump regulator.
You need a registered SIM card. There are 3 users allowed as phonebook entry.

Use of Modbus data transmission

If you have installed the mode interface, you can monitor the pump controller or
Query data in the registers. Depending on the technical design, different data are available to you. You can reset the controller via the Modbus interface. There is no remote adjustment.
Make sure that the power supply is always active together with the pump regulator.

Installation and assembly of the controllers

Environmental influences such as high temperatures, high humidity are to be avoided as well as dust, Dirt and aggressive gases. The installation site should be a well-ventilated place not exposed to direct sunlight.
Due to the heat convection, the frequency converter controller must have at least
Cm15 cm away from side walls or other facilities.
The permissible temperature range of + 5 ° C to + 30 ° C must not be fallen below or exceeded.
Do not install the frequency converter controller near heat radiating equipment

Assembly of the pump control

Depending on the design of the control, a metal wall cupboard or a metal cupboard is built.
The wall cabinet has 4 holes for wall mounting the control cabinet. For sole mounting stud bolts are recommended on which the control cabinet is hung. Mounting dimensions: See manufacturer data sheet ....
The cupboard is delivered and set up with 200mm base. Pay attention to a secure position and ensure good ventilation on site. Mounting dimensions: See manufacturer data sheet ....

Construction of a control system with integrated storage tank (expansion tank)

A back flow preventer with spring force is absolutely necessary and can be installed in the suction line in front of the pump or in the pressure line behind the pump! If the check valve is installed in the suction line, an expansion vessel must be installed on the pressure side. Otherwise, an expansion tank can be installed if necessary. the system is operated with an expansion vessel, the expansion vessel must be pre-pressed in the unpressurised state. The prepress pressure must be checked regularly.
The height of the prepress pressure is approx .: start pressure minus 0.50 bar

Environmental conditions:

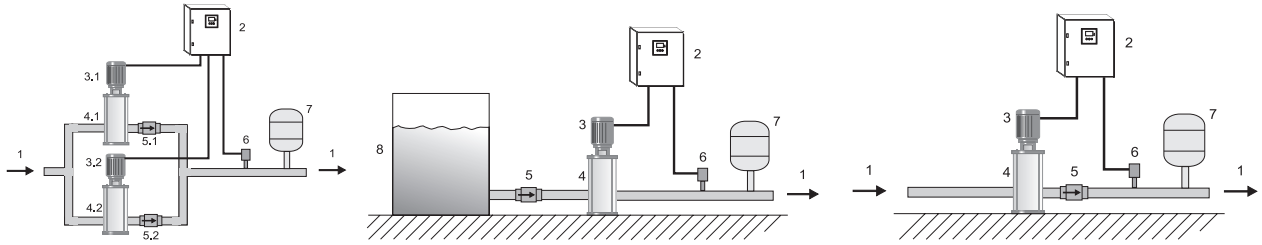
Ambient temperature:	+ 5 ° C - + 35 ° C
Humidity:	0- 95% non-condensing
Altitude:	1000m, 1% reduction / 100m
Vibration:	maximum 0.5g
Type of protection:	see type plate
Technical data:	see type plate

Construction of a pump system

A back flow preventer is mandatory and can be placed in the suction line in front of the pump or in the Pressure line to be installed behind the pump! If the back flow preventer is installed in the suction line, an integrated storage tank is required. Otherwise install an expansion vessel as required.

1 flow direction	5 back flow preventer
2 regulator	6 pressure sensor
3 Motor	7 expansion vessel
4 pump	8 template tank

Examples:



Operation of the pump system with integrated storage tank (expansion vessel)

If the system is operated with an integrated storage tank, the integrating storage tank must be pre-pressed in the unpressurised state. The prepress pressure must be checked regularly.

The height of the prepress pressure is: Starting pressure minus 0.50 bar.

Example:	set start pressure:	4.00 bar
	pre-press integrating storage to:	3.50 bar

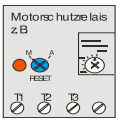
Booster systems (DEA)

Booster systems are fully cased and wired pumping systems. With them, the installation effort is minimal - connection to the existing pipe network, mains voltage and commissioning. The controller is set at the factory for these systems.
These operating instructions refer only to the electrical control of the system, therefore, if necessary, consult the operating instructions of the pump (s).

4. Electrical connection of the controller

Make sure that the input voltage is on the nameplate
registered voltage corresponds. Be sure to observe the supply voltage and terminal assignment!
The installation, commissioning and maintenance of the drives may only be carried out by
a person skilled in the art of pumping.
Use shielded cable! Connect the shield to the earthing clamps in the control cabinet and to the pump!
For submersible motor pumps, connect the shield to ground potential near the pump.
Do not apply mains voltage to the sensor or control terminals.
Do not manipulate the sensor signal!
Do not connect other consumers to the 24V supply!
The used sensor 4..20mA, is connected to the respective terminals!
The respective pin assignment can be found in the wiring diagram.
All pump regulators use 4..20mA sensors.
The pin assignment can be found in the wiring diagram.
If the motor cable is longer than 50 meters, it is recommended to install a motor choke / sine filter.
Check the correct connection of the mains, sensor and control cables.

Set motor protection

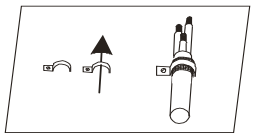


The pump controller has a monitoring function for the motor current. The motor rated current when frequency converter operation is set in the menu. For designs with soft starter or contactor, the rated motor current is set on the motor protection relay or on the soft starter. See the respective operating instructions which are always enclosed with the documents.

Cable connection

The cable to the motor, the sensor cable and the cables for the external contacts must be provided with shielded cable (80%) and connected to the shielding brackets according to the opposite principle. If EMC cable glands are used, they must be connected to the screen according to the manufacturer's instructions.

Only with proper installation of the screen, a trouble-free operation is guaranteed!
Umbrellas and earth are two different connections. Never use the shield as a grounding!

connection example  with shield bracket.

power connection

The pump regulators have a mains connection of 230 / 400V 50 / 60Hz or 230V 50 / 60Hz.
See type plate of the pump regulator. Operating the controller with / without RCCB is of depending on the respective regulations. The protection takes place with fuses of characteristic C.
The size of the fuse can be found on the rating plate of the pump regulator.

Digital inputs pump controller

Depending on the versions, different numbers of digital inputs are available. The digital inputs have their own potential with reference to "CO". It is used low voltage. When transferring signals from external systems, the potential must be disconnected via a relay contact. The digital inputs can be set as normally closed or normally open in the "Messages" menu and can be assigned different functions. Each function except "Reset" can only be assigned once. Functions see menu "Messages"

Digital outputs pump controller

Depending on the versions, different numbers of digital outputs are available. The digital outputs with orange terminals are floating relay outputs. The outputs may be charged with 24VDC-1A or 230VAC-1A.
For signal transmission on external systems with high power, the potential must be implemented via a relay. The digital outputs can be set as normally closed or normally open in the "Messages" menu and can be assigned different functions. Each function can only be assigned once. If the total power of the controller is greater than 5.4kW, output 98 / N is always blocked for the panel fan. Functions see menu "Messages"

Digital frequency inverter outputs

For controllers with frequency inverters, depending on the version, there are different numbers of converter relays available. These relay outputs are not always routed to the terminal block. The inverter relays are potential-free and may be charged with 24VDC-1A or 230VAC-1A. For signal transmission to external systems with high power, the signal must be implemented via a relay. The inverter relays can be set as normally closed or normally open in the "Messages" menu and can be assigned different functions. Each function can only be assigned once. Functions see menu "Messages"

Analog inputs (transducer)

Depending on the versions, different numbers of sensor inputs are available. The analog inputs have their own potential. The signal is always 4-20mA. Only passive sensors with 24VDC supply can be used. If active sensors are to be used, our converter "HO.xx" must be used. For long sensor lines or for signal transfer from external systems, the signal must be disconnected via a potential converter. Each function can only be assigned once. Functions see menu "Basic" + "Sensor"

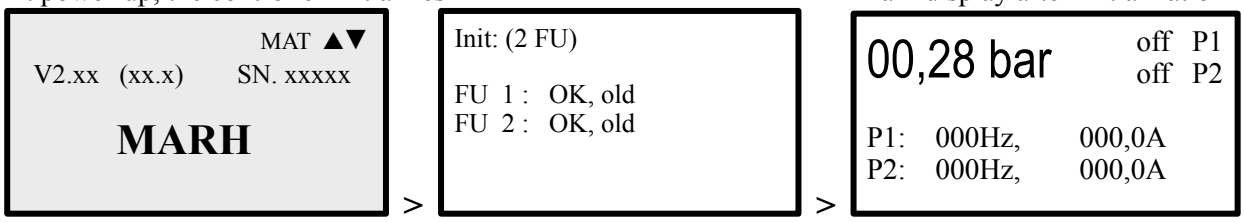
motor connection

The motor must be connected according to the output voltage. See type plate of the pump regulator. Clamp the motor on star or triangle. See nameplate of the engine. The direction of rotation of the motor determines the frequency converter. Direction of rotation can be set in the "Motor" menu.
For controls with soft starter or contactor, the direction of rotation must be adjusted by reconnecting.
Depending on the design of the control, PTC thermistors can be connected.
Before switching on the mains voltage again check all connections for correctness!

5. First switch on - Initial setup

Example: double system

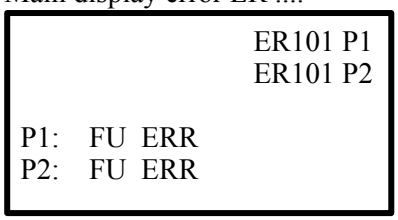
At power-up, the controller initializes



Main display after initialization

If the initialization goes wrong, there is an error message. With ER101 the frequency inverters can not be reached. Check the Modbus connection / mains voltage of the frequency inverter.

Main display error ER ....

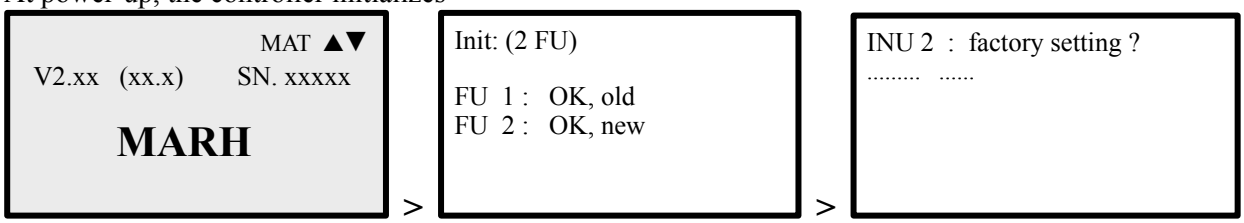


The system is now set to "AW" = active change.
If the system setting is to be changed, this must be done in the base menu.

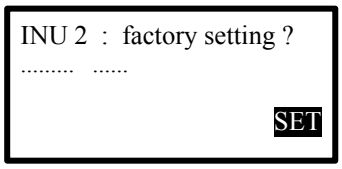
5.1 Switching on the system after changing the frequency inverter

Example: Double system with new INV 2

At power-up, the controller initializes

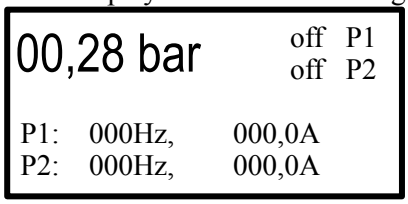


Attention ! Confirm within 20s, otherwise the frequency converter will not be parameterized!



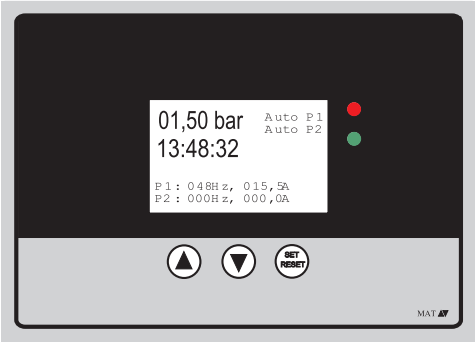
Confirm the factory setting with the SET RESET "Set" button

Main display after commissioning.



6. panel Description

Control panel with four -line **LCD display** for parameters and operating data:



The backlight can be switched off with a delay.

The **arrow keys**
Select the functions (scrolling),
Enter / change data.

The **SET / RESET - keys**
Storing input data,
Error acknowledgment

The red LED flashes when warning.
The green LED flashes with inactive control

The red LED will light up if a fault occurs.
The green LED is lit when the control is active.

Display with different symbols and values

Active main display with "external" / "internal" set point specification status

01,50 bar 00.50 bar P1: 000Hz, 000,0A P2: 000Hz, 000,0A ..... Pumps off	00,00 bar 13:48:32 P1: 000Hz, 000,0A P2: 000Hz, 000,0A ..... Pumps off	01,50 bar 27°C P1: 000Hz, 000,0A P2: 000Hz, 000,0A ..... Pumps off
01,50 bar 01.50 bar P1: 000Hz, 000,0A P2: 000Hz, 000,0A ..... Pumps off	01,50 bar 13:48:32 P1: 000Hz, 000,0A P2: 000Hz, 000,0A ..... Pumps off	01,50 bar 105 cm P1: 000Hz, 000,0A P2: 000Hz, 000,0A ..... Pumps off

These icons are displayed depending on the function in the display.

GSM is active: A mobile network connection exists.

GSM is inactive: There is no mobile network connection.

In addition, the alarm lamp lights up and the display shows "no mains".

Modbus is active: Currently, data is being queried
Modbus is inactive: Currently no data is requested

Analog set point: The set points are specified via the "Poti" input.

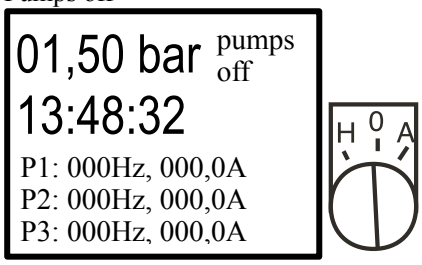
Test mode (fire extinguishing) is active: All monitoring functions are inactive!

< > The arrow <is the front sensor, the arrow> is the rear sensor. (Only active with differential controller)

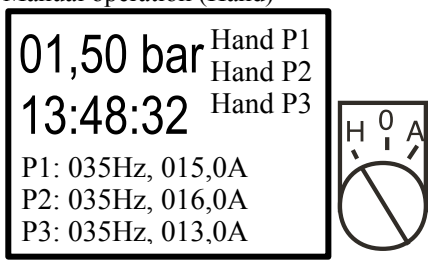
operating displays

Display: status, pressure, speed, current or active / inactive

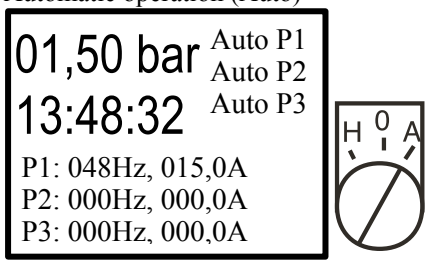
Pumps off



Manual operation (Hand)



Automatic operation (Auto)

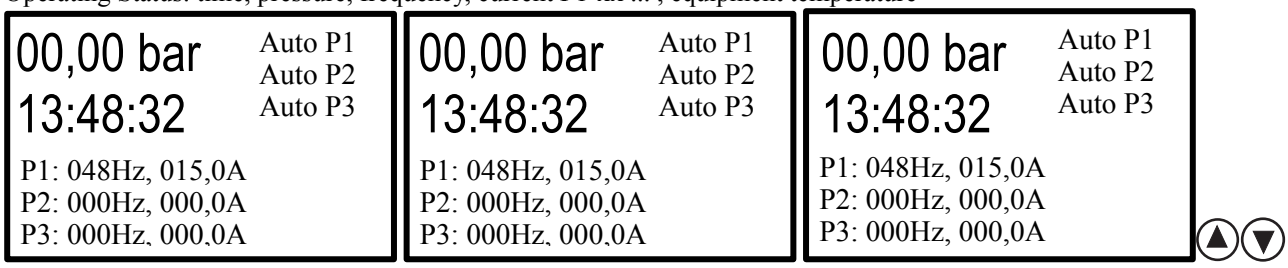


Select operating displays

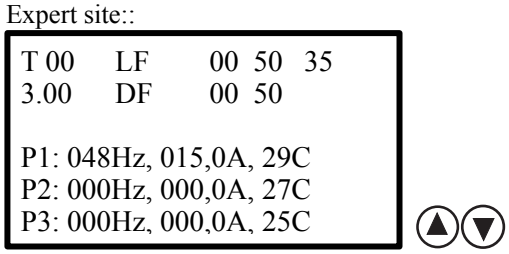
With the ▲ arrow key, the next screen is displayed.
Pressing the same arrow key the next screen is displayed.
Use the ▼ arrow key, the previous screen is displayed.
If the display is "hours of operation" is displayed and the ▲ arrow key is pressed,
so you get to the error memory.
From the fault memory of the **SET / RESET** button must be pressed to return to the initial display.

active messages

Operating Status: time, pressure, frequency, current P1-xx ... , equipment temperature

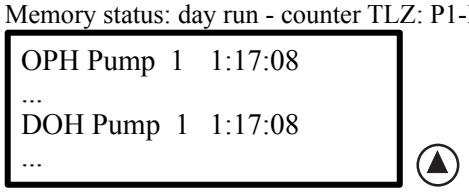


Expert site::

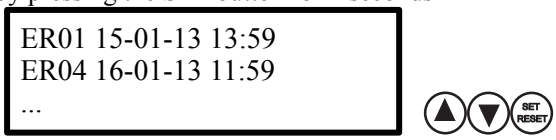


memory messages

Memory status: Hour meter BST: P1-Px
Memory status: day run - counter TLZ: P1-Px



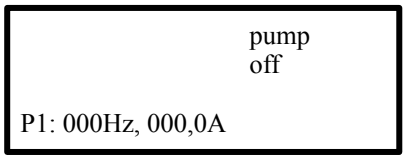
Fault memory: 1 - x with date stamp from the last 1-16 error. For each error, the pressure and pump status are stored on an extra page. Switch over by pressing the SET button for 2 seconds



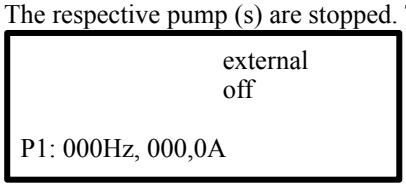
Between the displays operation can be changed with the arrow keys ▲ and ▼.

Information displays

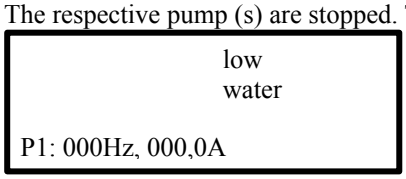
Pumps off
The MA controller is switched off. The message "Pump Off".



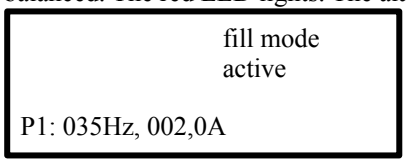
External off
The MA controller is connected via an external input. If the connection is open, the message "External Off" appears. The respective pump (s) are stopped. The red LED lights. The alarm relay is not activated.



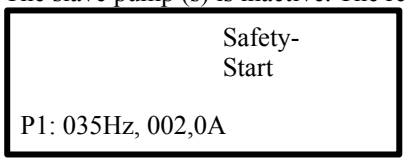
External low water
The MA controller is connected via an external input. If the connection is open, the message "low water" will appear. The respective pump (s) are stopped. The red LED lights. The alarm relay switches.



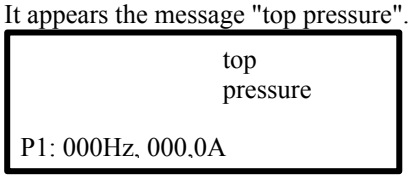
Fill in active
If the "under-pressure" to be active, the MA-regulator is operated in fill mode until the pressure for the first time is balanced. The red LED lights. The alarm relay is not activated.



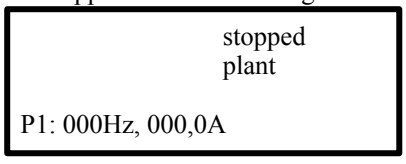
Safe Start is active
If the function "Safe Start" to be selected, the MAR controller is operated in fill mode. The master pump is active. The slave pump (s) is inactive. The red LED lights. The alarm relay is not activated.



Top pressure
The current pressure is above the set upper pressure. The MA controller controls off to prevent a further rise in pressure. It appears the message "top pressure". The red LED lights. The alarm relay is not activated.



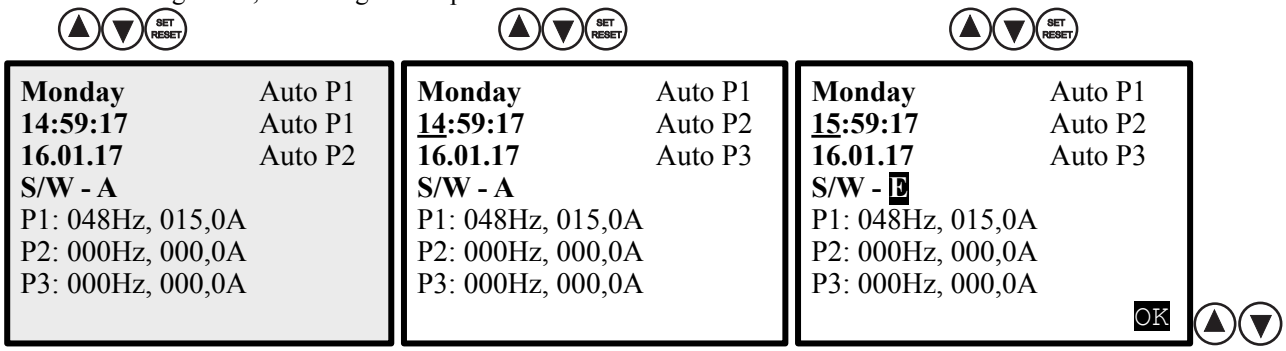
Stopped plant
The MA-controller is connected via an external emergency stop. It appears the message "Stopped plant". The pump (s) are stopped. The red LED lights. The alarm relay switches. "Restart" via GSM or reset - function.



7. Clock, GSM, Modbus, counter setting

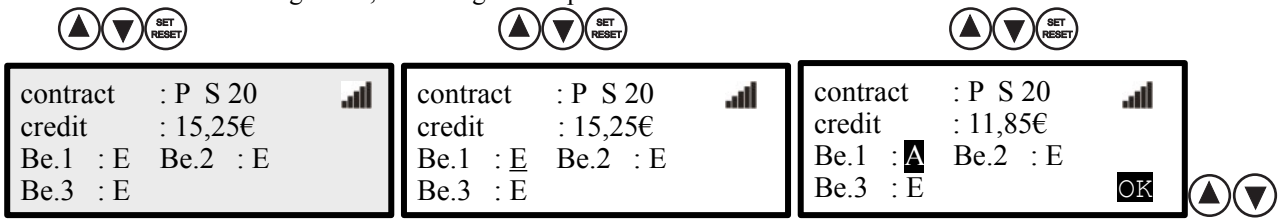
Set time / date:

Press **SET / RESET button** for 5 seconds at the operating display time / date.
If the cursor is flashing, the time and date using the
Arrow ▲ button, arrow ▼ button and the **SET / RESET button** can be set.
After confirming "OK", the change is adopted.



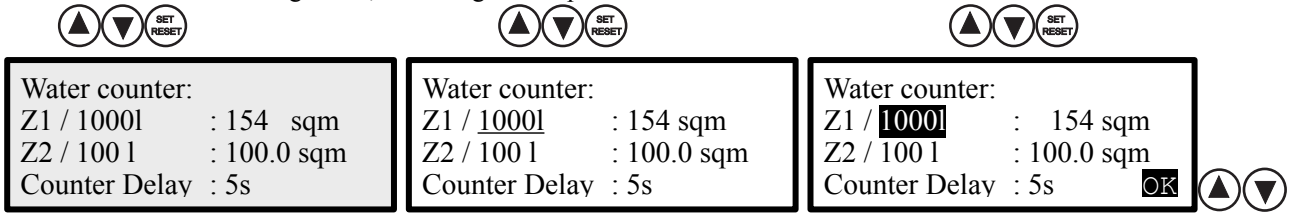
Set GSM users:

You can use the "Communication" menu, activate a GSM modem
and set in the phonebook, the system and the user and provide input or output.
On this page you can change the Contract, see the signal strength (0-30), to interrogate their accounts and each user (Be.x) "A" or turn "off". When the credit card contract is always at € 99.99.
If the cursor is flashing, the value using the **arrow ▲ button, arrow ▼ button** and the **SET / RESET button** can be set. After confirming "OK", the change is adopted.



Set External Counter / Counter Delay:

You can configure via the menu "Messages" inputs as counter
To put the meter on, press **SET / RESET button** for 5 seconds when displaying water meter.
If the cursor is flashing, the value using the **arrow ▲ button, arrow ▼ button** and the **SET / RESET button** can be set. After confirming "OK", the change is adopted.

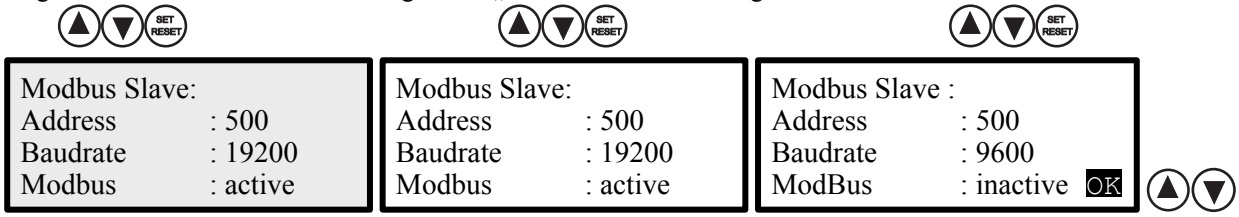


Reset the counter:

To reset the counters to **"0"** , the following procedure:
Go to the page "water meter" and hold the **SET / RESET button** for about 10sec. pressed!

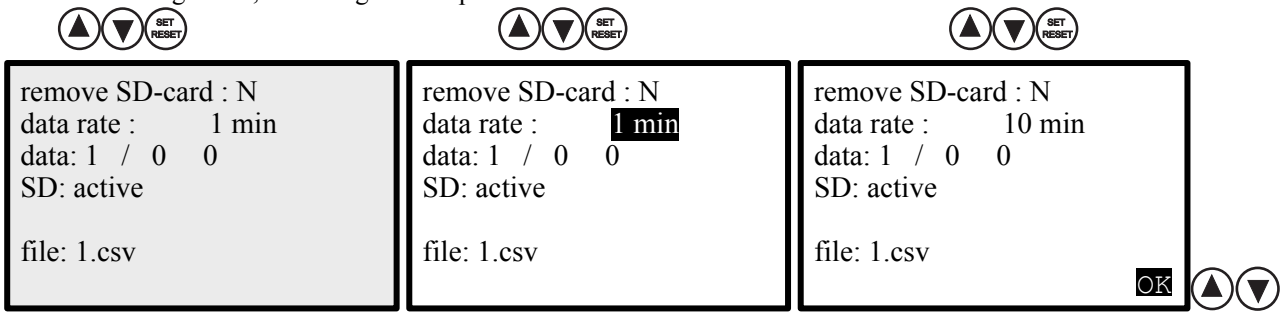
Set Modbus Slave:

Sie können über das Menü „ Kommunikation“ ein Modbus aktivieren.
Um die Modbus Datenrate einzustellen, drücken Sie **SET/RESET-Taste** für 5 Sekunden bei der Anzeige Modbus.
Wenn der Cursor blinkt kann der Wert mit Hilfe der **Pfeil▲-Taste**, **Pfeil▼-Taste** und der **SET/RESET-Taste** eingestellt werden. Nach dem Bestätigen von „OK“ wird die Änderung übernommen..

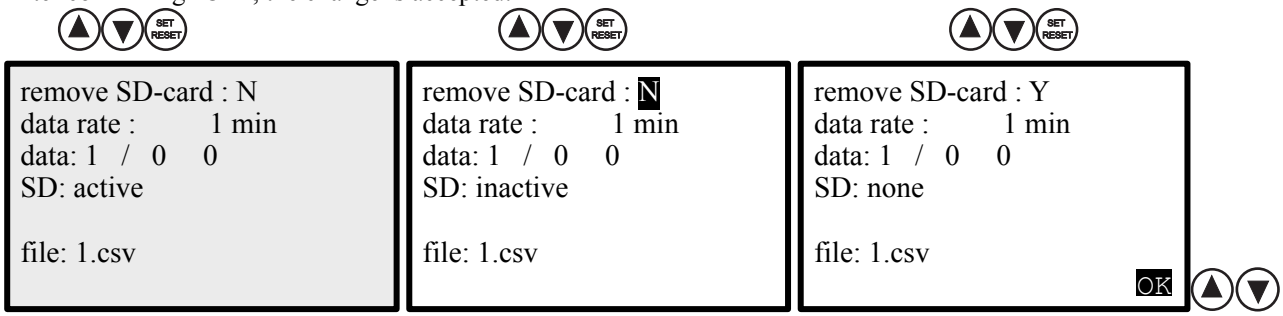


Between the displays operation can be changed with the arrow keys ▲ and ▼.

Set SD card:
To remove the SD card, press **SET / RESET button** for 5 seconds when displaying SD card.
Switch to the second line with the **arrow ▼ key**.
When the cursor is blinking, the value can be set using the
Arrow ▲ button, arrow ▼ button and **SET / RESET button** are set.
After confirming "OK", the change is accepted.



Remove SD card:
To remove the SD card, press **SET / RESET button** for 5 seconds when displaying SD card.
When the cursor is blinking, the value can be set using the
Arrow ▲ button, arrow ▼ button and **SET / RESET button** are set.
After confirming "OK", the change is accepted.



SD card messages:

data rate:	1 min : min / 10 min / 1 hr / 10 sec.	
Specifications:	1 / 15 0 (Display example)	
	1/ = Current file being written to	
	15 = Number of written data in the current file	
	0 = number of erroneous data	
SD:	Err. map (Display example)	
Message :	SD :none	: no SD card inserted
Message :	SD: active	: data is written
Message :	SD: Active + full	: data is overwritten
Message :	SD: inactive	: data is not written
Message :	SD: Err. card	: SD card defective
Message :	SD: format	: no DS card inserted

file: 1.csv file name and file format for analysis in Numbers (MAC) or Excel (Microsoft)

Between the displays operation can be changed with the arrow keys ▲ and ▼.

8. Menu operating

Set values

Example set points

setpoints
times
base setting
pump/motor
transducer
controller
safety
messages
communication
intern

Only in zero position

By pressing the SET RESET - button for 5 seconds, the menu can be interrupted.

Password Code: xxx

Parameter: xx.xx bar

save: Yes / No

setpoints
(Select a menu)

setpoints xxx
(Enter the password)

top value 05,90bar
.
(select the parameter)

top value 05,85bar
.
(set the value)

setpoint: 04,00bar
.
(select new parameters)

save: Y
.
(save all parameters)

setpoints	Code: 174
times	Code: 174
base setting	Code: 815
pump/Motor	Code: 815
transducer	Code: 815
controller	Code: 815
safety	Code: 815
messages	Code: 815
communication	Code: 815
Intern	Code: xxx

Operation of the menus is the same for everyone.
When saving the values, the system queries whether the values for P1, P2, ...
or stored for all pumps.

9. Adjust set-points

Password Code: xxx
Parameter: xxx.xx
save: Yes / No

set-points

top value	: 05,00bar
setpoint	: 04,00bar
Start difference	: 00,50bar
overrun time	: 5s

top value	: 05,00bar
setpoint	: 04,00bar
Start difference.	: 00,50bar
difference value	: 00,10bar
overrun time	: 5s

top value	: 05,00bar
setpoint	: 04,00bar
Start difference	: 00,50bar
difference value	: 00,10bar
overrun time	: 5s

top value	: 05,00bar
setpoint 1	: 04,00bar
Start difference 1	: 00,50bar
setpoint 2	: 04,00bar
Start difference 2	: 00,50bar
difference value	: 00,10bar
overrun time	: 5s

The set-points are set for the plant.

Adjust pressure regulator set points

Pressure regulator 1 set point

top value	: 05,00bar
setpoint	: 04,00bar
Start difference	: 00,50bar
difference value	: 00,10bar
overrun time	: 5s

Pressure regulator 2 set point 2

top value	: 05,00bar
setpoint 1	: 04,00bar
Start difference 1	: 00,50bar
setpoint 2	: 04,00bar
Start difference 2	: 00,50bar
difference value	: 00,10bar
overrun time	: 5s

Pressure regulator analog set point

top value	: 05,00bar
analog value	: 04,00bar
Start difference	: 00,50bar
difference value	: 00,10bar
overrun time	: 5s

Pressure switch 1 set point

top value	: 05,00bar
stop value	: 04,00bar
Start difference.	: 00,50bar
difference value	: 00,10bar
overrun time	: 5s

Pressure switch 2 set point 2

top value	: 05,00bar
stop value 1	: 04,00bar
Start difference 1	: 00,50bar
stop value 2	: 04,00bar
Start difference 2	: 00,50bar
difference value	: 00,10bar
overrun time	: 5s

Pressure switch analog set point

top value	: 05,00bar
analog value	: 04,00bar
Start difference	: 00,50bar
difference value	: 00,10bar
overrun time	: 5s

Explanation of parameters:

Enter the top value value at which the system will be governed immediately.
top value :05,00bar - 0,01bar - 99,99bar (1-4)

Enter the set point or stop value with which the system should work.
Attention ! With analog value specification nothing can be set here! Here, the current set point is only displayed!
set point/ Stop value :02,00bar - 0,01bar - 99,99bar

Enter the start difference value at which the system will start again after the "Standby"
Start difference :00,50bar - 0,01bar - 99,99bar

Enter the differential value at which the next pump will be switched on.
differential value :00,10bar - 0,01bar - 99,99bar

Enter the delay time until the pump to stop.
overrun time :5s - 0s - 999s

10. adjust times

Password Code: xxx
Parameter: xxx.xx
save: Yes / No

times

reduction	: 000%
reduction time on	: 20:00h
reduction time off	: 23:00h
test time	: 10:00h
duration	: 0s
Test interval	: 0 days
timer Function	: A
expiration time	: 10 Min
weekdays	: S_ _ _ _ F _
time 1 on	: 10:00h
time 1 off	: 14:00h

The times are set for the plant.

Explanation of parameters:

If necessary, select the pressure reduction for the pump on time.
This function gives you the possibility to reduce the energy consumption of the pump.

reduction	:0	- 0 - 100 % / 0=off
reduction time on	:xx:xx h	- 00:00 - 23:59 h
reduction time off	:xx:xx h	- 00:00 - 23:59 h

Select the test run (e.g., fire extinguishing) for the pump. This feature gives you the option of running the pump once a day at hand frequency in 24 hours. This function can prevent the pump from seizing.

test time	:10:00h	- 00:00 - 23:59 h
duration	:00s	- 0 - 999s with manual frequency
T.Interval	:0 days	- 0 - 30 days (0 days = Off)

If necessary, select the timer function T or N. This function gives you the opportunity to operate the system for a short time or with an after-run.

Timer function	: A	- (A) Off, timer without function
	: T	- the expiration time is active when the system is started..
	: N	- the expiry time is active as soon as the system is started and goes into "standby" mode (follow-up time).

With an additional button "Set timer", which is activated via a digital input "TIS", the set time can be counted up. Example: Expiry time T = 10min. Press the button briefly: new time: 20min. By holding down the key for a longer time, the timer value is reset to the basic setting, e.g. 10min. set back.
The set time is only ever active once.
Thereafter, the expiry time set in the menu is always active again.

expiration time : 10 Min

If necessary, select the timer function E. This function allows you to control the system in time with day of the week and two times

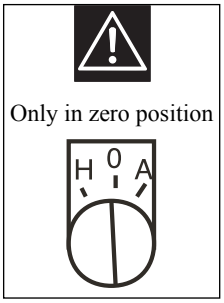
timer Function	: E	- (E) On, facility works with weekday, time 1 + time 2
weekdays	: S _ _ _ _ F _	- S M T W T F S, adjustable, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. with the **arrow▲-button**, **arrow▼-Taste** adjustable.
time 1 on	: 10:00h	- 00:00h -23:59h , adjustable
time 1 off	: 14:00h	- 00:00h -23:59h , adjustable

11. Base Setting

Password Code: xxx
Parameter: xxx.xx
save: Yes / No

Base Setting

number INV	:	3
number FIX	:	0
INV 1	:	AW
INV 2	:	AW
INV 3	:	AW
INV 4	:	AW
setpoints	:	1
operating mode	:	DR



3x FIX

number INV	:	0
number FIX	:	3
FIX 1	:	AW
FIX 2	:	AW
FIX 3	:	AW
FIX 4	:	AW
setpoints	:	1
operating mode	:	DR

3xINV+1xFIX

number INV	:	3
number FIX	:	1
INV 1	:	AW
INV 2	:	AW
INV 3	:	AW
FIX 1	:	AF
setpoints	:	1
operating mode	:	DR

4xINV JO+AW+AW+BO

number INV	:	4
number FIX	:	0
INV 1	:	JO
INV 2	:	AW
INV 3	:	AW
INV 4	:	BO
setpoints	:	1
operating mode	:	DR

4x FIX AW+AW+BO

number INV	:	0
number FIX	:	4
FIX 1	:	AW
FIX 2	:	AW
FIX 3	:	AW
FIX 4	:	BO
setpoints	:	1
operating mode	:	DR

3xINV+1xFIX AW+AW+BO

number INV	:	2
number FIX	:	1
INV 1	:	AW
INV 2	:	AW
INV 3	:	AW
FIX 1	:	BO
setpoints	:	1
operating mode	:	DR

1xINV+3xFIX JO+AW+AW+AW + setp.3

number INV	:	1
number FIX	:	2
INV 1	:	JO
FIX 1	:	AW
FIX 2	:	AW
FIX 3	:	AW
setpoints	:	3
operating mode	:	DR

Explanation of parameters:

Enter the number of frequency converter (INV) pumps.
number INV :1 - 1 - 4

Enter the number of direct (contactor / softstarter) (FIX) pumps.
number FIX :0 - 0 - 4

Enter the function of the respective frequency converter pump.
INV x (1-3) :AW - AW .....

Enter the function of the respective direct (contactor / softstarter) pump.
FIX x :AW - AW .....

Meaning of the abbreviation:

JO **= Jockey pump in the system** **first pump in the system in fixed position with shutdown, transfer without return to the first system pump. Only selectable once. (only INV)**

JR **= Jockey pump in the system** **first pump in the system in fixed position with shutdown, transfer and return to the first system pump Only selectable once. (only INV)**

***SP** **= Suction pump in the system** **first pump in the system in fixed position only together with one or more system pumps. Running time limitation possible. Only selectable once. (Contactor, soft starter)**

AW **= Work pump in the system** **active pump in the system with interchangeable system pump (contactor, soft starter, INV)**

PW **= Work pump in the system** **passive pump in the system for the change pump with power limitation of the plant**

AF **= Work pump in the system** **active pump in the system with fixed position System pump (contactor, soft starter, INV)**

RF **= Work pump in the system** **Reserve pump in the system as a revere for change / fix pump.**

BO **= Booster pump in the system** **last pump with system in fixed position with switching on and off. Only selectable once. (Contactor, soft starter, INV)**

Enter the number of the set-points, at which the system is to operate.
Number of set-points :1/2/3/5 - 1 = one set point, 2 = two set points, 3 = 1x jockey + 2x AW

Depending on the version, not all operating modes can be set.

Select the operating mode of the system.
operating mode :DR - DR ....

DR	**=**	**Pressure**	**The system works as a pressure regulator / pressure switch (bar)**
DF	**=**	**Pressure + fire mode**	**The system works as a pressure regulator / pressure switch (bar) with the special function fire extinguishing (only MARH)**
DG	**=**	**Pressure + Limit**	**The system works as a pressure regulator / pressure switch with restart interlock (bar)**
DD	**=**	**differential pressure**	**The system works as a differential pressure controller with two sensors (bar)**
TH	**=**	**Heating**	**The system works as a temperature controller / temperature switch (°C)**
TK	**=**	**Cooling**	**The system works as a temperature controller / temperature switch (°C)**
TP	**=**	**Difference temperature +**	**The system works as a differential temperature controller with two sensors (°C)**
TM	**=**	**Difference temperature -**	**The system works as a differential temperature controller with two sensors (°C)**
NF	**=**	**Level filling**	**The system works as a level controller / level switch (cm)**
NL	**=**	**Level empty**	**The system works as a level controller / level switch (cm)**
VR	**=**	**Vacuum**	**The system works as a vacuum regulator (mbar)**
VD	**=**	**Difference vacuum**	**The system works as differential vacuum regulator (mbar)**
ME	**=**	**Volume**	**The system works as a flow regulator (l/min)**
ST	**=**	**Flow**	**The system works as a flow controller (%)**
GW	**=**	**Limit control**	**The system operates as a limit value Control with / without adjustable speed with restart interlock (Hz) (rpm)**
FU	**=**	**frequency inverter**	**The system works as a motor controller with fixed or adjustable speed with external release (Hz) (rpm)**

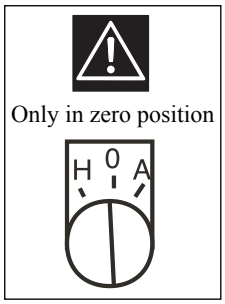
If required, switch on the limit value function for irrigation systems.
If the limit value function is active, the system switches off and must be restarted with the external command.

12. Set electric pump / electric motor

Password Code: xxx
Parameter: xxx.xx
save: Yes / No

Pump/Motor/ inverter

Read INV	:	P1
rotating direction	:	R
acceleration time	:	03,0s
deceleration time	:	03,0s
Rated current	:	008,0A
rated voltage	:	400V
rated frequency	:	050Hz
min frequency	:	020Hz
max frequency	:	050Hz
hand frequency	:	035Hz
fix frequency	:	050Hz
switch-off frequency	:	035Hz
load factor	:	050%
speed factor	:	050%
Characteristic	:	K
Boost	:	04%
carrier frequency	:	5000Hz
vario - carrier frequency	:	A
Motor protection	:	A
sine filter	:	A
phase guard output	:	A
Fire Mode	:	0



Explanation of parameters:

Select whether you want to read the data from the respective frequency inverter.
read INV :P1 - P1 / P2 / P3 / P4

Enter the rotation direction of the pump (s). AC phase angle does not matter!
rotating direction :R / L - Right / Left

Enter the Acceleration time of the pump (s). Recommendation: 1-3 seconds.
acceleration time :03,0s - 0,01s - 99,9s / only manual operation

Enter the deceleration time of the pump (s). Recommendation: 2-10 seconds.
deceleration time :03,0s - 0,01s - 99,9s / only manual operation

Enter the motor rated current of the pump (s). Data: See nameplate.
rated current :xxx,0A - 0,01A - 199,9A

Enter the motor voltage to the pump (s). The setting they found on the nameplate of the motor.
rated voltage :400V - 200V - 480V

Enter the rated frequency of the pump (s). Data: See nameplate. With this function, the nominal frequency of the pump is set.
rated frequency :50Hz - 1Hz - 200Hz

Enter the minimum frequency of the pump (s). This feature gives you the option of the minimum frequency of the pump for operation entered. This way of setting the pump power can be limited.
min frequency :25Hz - 1Hz - 200Hz

Enter the maximum frequency of the pump. This feature gives you the option to enter the maximum frequency of the pump for operation. This way of setting the pump power can be limited.
max frequency :50Hz - 1Hz - 200Hz

Enter the hand frequency in Hz, a hand, in which the respective engine in manual mode is to move up and down..
hand frequency :35Hz - 1Hz - 200Hz

Enter the fixed frequency for the respective pump with the limit switch is to operate. This rate can be expressed by SMS - command (option) for the current operation to change. If a SMS - start command sent without a value, the system works with the fixed frequency.
fix frequency :50Hz - 1Hz - 200Hz

Enter the switch-off frequency for the respective zero-flow shut-off pump.
switch-off frequency (local) :35Hz - 1Hz - 200Hz

Enter the load factor for the null sets shutdown. Recommendation: 50%. See also "zero flow cutoff"
load factor (local) :50% - 1% - 100% from Inverter

Enter the speed factor for the null sets shutdown. Recommendation: 50%. See also "zero flow cutoff"
speed factor (local) :50% - 1% - 100% from Inverter

Select the motor characteristic (Constant / quadratic / specific) of the pump. With this function, the power consumption of the pump can be changed. Recommendation: Square for centrifugal pumps; constant for submersible pumps; specifically at frequency inverter problems.
motor characteristic :K - Constant / quadratic / specific

Enter the value of the boost pump (s). This function is needed to better run the pump for heavy start-up.
Boost :04% - 00% - 20%

Enter the carrier frequency of the pump (s). Low carrier frequencies result in higher engine noise. This function is used to tune the carrier frequency to use with different cable lengths between pump and drive.
carrier frequency :5000Hz - 2000Hz - 9999Hz

Select the Vario - carrier frequency of the pressure control. The Vario - carrier frequency cause changes in engine noise to the soundscape for people to improve.
vario - carrier frequency :A - (A) off / (E) on

Select the motor protection function.
motor protection :A / K - off / PTC / (PT100)

Set the Sinus Filter function if it is installed between the controller and the pump.
sine filter :A /E - (A) off// (E) on

Sine filters are switched in the (motor) line between inverter output and motor. Especially with long motor cables, sine-wave filters are used to reduce parasitic conduction capacitances. If the LC filter is dimensioned appropriately, the pulse width modulated (PWM) output voltage of the frequency converter is converted into a sinusoidal voltage.

Each sine-wave filter has a frequency working range. This work area must be kept, so that the sine filter does not burn. The sinusoidal filter function must therefore be switched on in the motor menu if a sine-wave filter is installed. This prevents the frequency converter from lowering its clock speed at higher temperatures.

Many manufacturers of submersible motors require sinus filters. Sinusoidal filters generate noise, so that a permanent work in the environment is not possible.

Motor reactors are generally switched to the (motor) line between the inverter output and the motor. They are intended to reduce the noise emissions of the motor cables and to limit the voltage peaks caused by the inverter clock frequency. In addition to improved EMC, it is important to protect the engine and also to achieve a reliable operating behaviour. Motor chokes generate noises, so that a permanent work in the environment is not possible.

Each motor reactor has a frequency workspace. This work area must be maintained so that the motor choke does not burn. The sine filter function must therefore be activated in the motor menu if a motor choke is installed. This prevents the frequency converter from lowering its clock speed at higher temperatures.

Select the phase failure detection output of the pressure control. The phase failure detection protects the motor against cable interruption.
phase guard output :A - (A) off// (E) on

Choose the Fire mode if necessary. In Fire Modus 1, one or all pumps are regulated to pressure (a later option). In Fire Modus 2, one or all pumps is controlled to maximum speed. Fire operation is activated via a separate entrance to terminal X2 -14-15. All monitoring function is switched off in Fire Operation. “Fire Px” appears in the MARB display.
Fire Mode :0 - 0 / 1 / 2

13. Adjustment of transducer

Password Code: xxx
Parameter: xxx.xx
save: Yes / No

Transducer

Main sensor	: S1
Sensor range	: 10,00bar
Main sensor offset	: 00,00bar
secondary sensor	: S2
secondary sensor Function	: A

The set points change after sensor range change !

S1= Sensor 1,
S2= Sensor 2,

Main sensor function: This function is determined by the basic setting of the system.

secondary sensor Function:

A =	Off	Sensor has no function
RD =	Redundant	Sensor works on comparison sensor 2-1 (Redundant)
RU =	Redundant + Auto	Sensor works on comparison Sensor 2-1 (Redundant with changeover)
DD =	pressure difference	Sensor works in difference with the main sensor
TD =	temperature difference	Sensor works in difference with the main sensor
SO =	set point input	Sensor works as set point input (%)
DW =	Pressure monitor	Sensor works as pressure Guardian
NW =	level monitor	Sensor works as level Guardian
SW =	flow monitor	Sensor works as flow Guardian
TS =	Temperature warning	Sensor operates as SMS temperature warning

Main sensor pressure 16 bar

Main sensor	: S1
Sensor range	: 16,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: A

Main sensor z.B: S1 pressure 10 bar

Main sensor	: S1
Sensor range	: 10,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: A

Main sensor z.B.: S3 pressure 16 bar Offset 1 bar

Main sensor	: S2
Sensor range	: 02,50bar
Main sensor offset	: 01,00bar
secondary sensor	: S1
secondary sensor Function	: A

Main sensor z.B: S3 pressure 10 bar

Main sensor	: S2
Sensor range	: 10,00bar
Main sensor offset	: 0
secondary sensor	: S1
secondary sensor Function	: A

Explanation of parameters:

Enter the sensor input for the main sensor. Main sensor can be any existing sensor.
Main sensor : S1 - S1 - S2 **(function of the main sensor: basic setting)**

Set the sensor measuring range. Data: See nameplate sensor.
Sensor range :16,00 - 0,00 - 99,99

Enter the offset from the sensor.
Main sensor Offset :00,00 - 0,00 - 99,99

Enter the sensor input and the function for the secondary sensor. Secondary sensor can be any other existing sensor.
secondary sensor :A - S2 - S1

Enter the function for the secondary sensor.
secondary sensor Funktion :A - Sensor has no function !

Main sensor + 2. sensor Redundant

Main sensor	: S1
Sensor range	: 16,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: RD
Redundant deviation	: 10%

Main sensor + 2. sensor Redundant switch over

Main sensor	: S1
Sensor range	: 16,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: RU
Redundant deviation	: 10%

Explanation of parameters:

The Redundant function compares two sensors for deviation.

Enter the sensor input for the main sensor. Main sensor can be any existing sensor.
Main sensor : S1 - S1 - S2 **(function of the main sensor: basic setting)**

Set the sensor measuring range. Data: See nameplate sensor.
Sensor range :16,00 - 0,00 - 99,99

Enter the offset from the sensor.
Main sensor Offset :00,00 - 0,00 - 99,99

Enter the sensor input and the function for the secondary sensor. Secondary sensor can be any other existing sensor.
secondary sensor :S2 - S2 - S1

Enter the function for the secondary sensor.
If the function is set to **"RD"**, there is a message "Sensor deviation". A shutdown of the system does not take place.
If the function is set to **"RU"**, the secondary sensor is automatically switched over when the main sensor is defective.
secondary sensor Function :RD - RD sensor works on comparison sensor 2-1 (redundant)
secondary sensor Function :RU - RD sensor works on comparison sensor 2-1 (redundant switch over)

The secondary sensor must be identical to the main sensor from the sensor value. Data: See nameplate sensor.

Enter the permissible deviation in %.
Redundant deviation :10% - 0% - 100%

Main sensor+ 2. sensor differential pressure

Main sensor	: S1
Sensor range	: 06,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: DD
Sensor range	: 06,00bar
secondary sensor offset	: 0

Main sensor+2. sensor differential temperature

Main sensor	: S1
Sensor range	: 60,00°C
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: TD
Sensor range	: 60,00°C
secondary sensor offset	: 0

Explanation of parameters:

The difference function forms a control value from the values of the two sensors..

Enter the sensor input for the main sensor. Main sensor can be any existing sensor.
Main sensor : S1 - S1 - S2 **(function of the main sensor: basic setting)**

Set the sensor measuring range. Data: See nameplate sensor.
Sensor range :16,00 - 0,00 - 99,99

Enter the offset from the sensor.
Main sensor Offset :00,00 - 0,00 - 99,99

Enter the sensor input and the function for the secondary sensor. Secondary sensor can be any other existing sensor.
secondary sensor :S2 - S2 - S1

Enter the function for the secondary sensor.
Is the function summer / winter at a dig. Input active, sensor 1 + 2 is changed over by switching over. This can be switched between "heating" and "cooling".
secondary sensor Function :DD - DD sensor works on comparison sensor 2-1 (differential pressure)

Set the sensor measuring range for the secondary sensor Data: See nameplate sensor.
Sensor range :16,00 - 0,00 - 99,99

Enter the offset from the sensor. Both sensors 1 + 2 must have the same scaling.
secondary sensor offset :00,00 - 0,00 - 100

Main sensor+secondary sensor set point function

Main sensor	: S1
Sensor range	: 10,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: SO
Minimal setpoint	: 20%
Maximal setpoint	: 80%

Main sensor	: S2
Sensor range	: 10,00bar
Main sensor offset	: 0
secondary sensor	: S1
secondary sensor Function	: SO
Minimal setpoint	: 20%
Maximal setpoint	: 80%

Explanation of parameters:

The set point function uses the secondary sensors as the set point source.

Enter the sensor input for the main sensor. Main sensor can be any existing sensor.
Main sensor : S1 - S1 - S2 **(function of the main sensor: basic setting)**

Set the sensor measuring range. Data: See nameplate sensor.
Sensor range :16,00 - 0,00 - 99,99

Enter the offset from the sensor.
Main sensor Offset :00,00 - 0,00 - 99,99

Enter the sensor input and the function for the secondary sensor. Secondary sensor can be any other existing sensor.
secondary sensor :S2 - S2 - S1

Enter the function for the secondary sensor.
secondary sensor Function :SO - SO sensor works as analog setpoint input 4-20mA.
Minimal setpoint :20% - 0 - 100%
Maximal setpoint :80% - 0 - 100%

Main sensor + Secondary sensor pressure guard

Main sensor	: S1
Sensor range	: 16,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: DW
Sensor range	: 10,00bar
secondary sensor offset	: 0
Min-value off	: 00,50bar
Min-value on	: 01,00bar
Min-value Ramp on	: 01,50bar
Ramp frequency	: 050Hz
Max-value Ramp off	: 02,00bar
Max-value off	: 03,00bar

Main sensor + Secondary sensor level guard

Main sensor	: S1
Sensor range	: 16,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: NW
Sensor range	: 10,00m
secondary sensor offset	: 0
Min-value off	: 00,50m
Min-value on	: 01,00m
Min-value Ramp on	: 01,50m
Ramp frequency	: 050Hz
Max-value Ramp off	: 02,00m
Max-value off	: 03,00m

Main sensor + Secondary sensor level guard + terrain

Main sensor	: S1
Sensor range	: 16,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: NW
Sensor range	: 10,00m
secondary sensor offset	: 25,00m
Min-value off	: -19,50m
Min-value on	: -17,00m
Min-value Ramp on	: -13,50m
Ramp frequency.	: 050Hz
Max-value Ramp off	: -10,00m
Max-value off	: -08,00m

Explanation of parameters:

If the guardian function is active for the secondary sensor, enter the corresponding values.

Enter the sensor input for the main sensor. Main sensor can be any existing sensor.
Main sensor : S1 - S1 - S2 **(function of the main sensor: basic setting)**

Set the sensor measuring range. Data: See nameplate sensor.
Sensor range :16,00 - 0,00 - 99,99

Enter the offset from the sensor.
Main sensor Offset :00,00 - 0,00 - 99,99

Enter the sensor input and the function for the secondary sensor. Secondary sensor can be any other existing sensor.
secondary sensor :S2 - S2 - S1

Enter the function for the secondary sensor.
With the watchdog function, the speed is reduced to the ramp frequency if required. At min-value-off, the system is stopped. At min-value-on, the system will release. (Float switch function). At the max value off, a warning is signal led and a relay is switched. The system does not switch off.
secondary sensor Function :NW - NW sensor works as level guardian
secondary sensor Function :DW - NW sensor works as pressure guardian

Set the sensor measuring range for the secondary sensor Data: See nameplate sensor.
Sensor range :10,00 - 0,00 - 100m

Enter the offset from the sensor. Both sensors 1 + 2 must have the same scaling
secondary sensor offset :00,00 - 0,00 - 100m

Enter the Min value of the guardian function at which the system should stop. (Float switch function)
Min- value off :0,50 - 0,00 - 100m

Enter the maximum value of the guardian function at which the system should restart. (Float switch function)
Min-value on :1,00 - 0,00 - 100m

Enter the minimum value Ramp of the guardian function, at which the lowest frequency is driven.
Min-value ramp :1,50 - 0,00 - 100m

Enter the ramp frequency of the guardian function. This frequency is reduced. (only with INV operation)
Ramp frequency :50Hz - xxHz - xxxHz

Enter the maximum value Ramp of the guardian function, at which the maximum frequency is driven.
Max-value Ramp off :2,00 - 0,00 - 100m

Enter the maximum value of the guardian function at which the system should stop. (Flood function)
Max-value off :3,00 - 0,00 - 100°C

Main sensor + Secondary sensor flow guard

Main sensor	: S1
Sensor range	: 16,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: SW
Sensor range	: 100%
secondary sensor offset	: 0
minimum flow	: 10%

Explanation of parameters:

If the guardian function is active for the secondary sensor, enter the corresponding values.

Enter the sensor input for the main sensor. Main sensor can be any existing sensor.
Main sensor : S1 - S1 - S2 **(function of the main sensor: basic setting)**

Set the sensor measuring range. Data: See nameplate sensor.
Sensor range :16,00 - 0,00 - 99,99

Enter the offset from the sensor.
Main sensor Offset :00,00 - 0,00 - 99,99

Enter the sensor input and the function for the secondary sensor. Secondary sensor can be any other existing sensor.
secondary sensor :S2 - S2 - S1

Enter the function for the secondary sensor.
In the watchdog function, the system is monitored for flow. If there is no flow, the system is stopped, a fault is reported and a relay is switched. The system does not automatically switch back on. (Note auto reset function).
secondary sensor Function :SW - NW sensor works as flow guardian

Set the sensor measuring range for the secondary sensor Data: See nameplate sensor.
Sensor range :16,00 - 0,00 - 100%

Enter the offset from the sensor. Both sensors 1 + 2 must have the same scaling
secondary sensor offset :00,00 - 0,00 - 100%

Enter the value for the minimum flow of the system in%.
minimum flow :10% - 0% - 100%

Secondary sensor SMS Warning „frost“

Main sensor	: S1
Sensor range	: 16,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: TS
Sensor range	: 60,00°C
secondary sensor offset	: 20,00°C
Warning on	: 02,00°C
Warning off	: 05,00°C

Secondary sensor SMS Warning „Heat“

Main sensor	: S1
Sensor range	: 16,00bar
Main sensor offset	: 0
secondary sensor	: S2
secondary sensor Function	: TS
Sensor range	: 60,00°C
secondary sensor offset	: 20,00°C
Warning on	: 32,00°C
Warning off	: 25,00°C

Explanation of parameters:

If the SMS alert feature is active for the slave sensor, enter the appropriate values.

Enter the sensor input for the main sensor. Main sensor can be any existing sensor.
Main sensor : S1 - S1 - S2 **(function of the main sensor: basic setting)**

Set the sensor measuring range. Data: See nameplate sensor.
Sensor range :16,00 - 0,00 - 99,99

Enter the offset from the sensor.
Main sensor Offset :00,00 - 0,00 - 99,99

Enter the sensor input and the function for the secondary sensor. Secondary sensor can be any other existing sensor.
secondary sensor :S2 - S2 - S1

Enter the function for the secondary sensor.
In the case of the SMS warning function, an SMS message is sent when the warning light is on and a relay is switched.
At the max warning on, an SMS warning is sent and a relay is switched. The system never switched off.
secondary sensor Function :TS - TS sensor works as temperature SMS Warning

Set the sensor measuring range for the secondary sensor Data: See nameplate sensor.
Sensor range :60,00 - 0,00 - 100°C

Enter the offset from the sensor. Both sensors 1 + 2 must have the same scaling
secondary sensor offset :00,00 - 0,00 - 100°C

Enter the value of the warning at which an SMS Min message is sent. (frost)
Warning on :02,00 - 0,00 - 100°C

Enter the value of the warning at which the min warning is reset.
Warning off :05,00 - 0,00 - 100°C

Enter the value of the warning at which the max warning is reset.
Warning off :32,00 - 0,00 - 100°C (heat warning)

Enter the value of the alert at which an SMS Max message is sent.
Warning on :25,00 - 0,00 - 100°C

14. adjust controller

Password Code: xxx
Parameter: xxx.xx
save: Yes / No

controller

PID P gain	:	0,50
PID-I time	:	0,50s
control ramp	:	1,0s
Actual value tolerance	:	01%
set point adjustment	:	100%
testing phase	:	050%
switch-off delay	:	02s
switch-on delay	:	01s
switchover time	:	5s
pump changeover time	:	300Min
Standby	:	E
top value	:	15%
top value time	:	20s
switch-off frequency	:	G
load factor	:	050%
speed factor	:	050%
switch-off frequency	:	035Hz

The rule values are set for the plant

Explanation of parameters:

Enter the PID P gain of pressure control. Ensures the rapid adjustment of the pump to the desired value.
PID P gain :0,50 - 0,01 - 9,99
Enter the integration time of the PID controller. Ensures the rapid adjustment of the pump to the desired value.
PID-I time :0,50s - 0,1s - 9,99s

Enter the control ramp of pressure control. The regulation changes the ramp adjustment of the pump.
control ramp :1,0s - 0,1s - 99,99s

Enter the set point tolerance for zero amounts shutdown.
Actual value tolerance :01% - 0% - 10%

Enter the set-point adjustment, in which the target pressure should be adjusted to the pipe.
Small 100% = target pressure drop; Larger 100% = target pressure increase.
set point adjustment :100% - 20% - 200% / 100% = no adjustment

Enter the Testing phase for the null sets a shutdown. Recommendation: 20%. See also "zero flow cutoff"
testing phase :20% - 1% - 99% = 0,1- 0,99bar absolute

Enter the time delay for the zero quantities shutdown.
switch-off delay :2s - 1s - 99s

Enter the time delay for the zero quantities shutdown.
switch-on delay :1s - 1s - 99s

Enter the changeover time for the gentle pump change a
switchover time :5s - 1s - 19s
Enter the operating time until the pump change.
pump changeover time :300Min - 1Min - 999Min

Enter the standby function. (Stop when the controller is balancing or basic speed)
Standby :E - E(on) / A(off)
The electronic protection monitoring for dry running. Special function in target guardian.
top value :25% - 0% - 50% (0% = off)
top value time :20s - 1% - 99%

Set the cutoff frequency to global (same for all pumps) or to local (for all pumps individually)
switch-off frequency :G - (G) global / (L) local

Enter the load factor for the null sets shutdown. Recommendation: 50%. See also "zero flow cutoff"
load factor (global) :50 - 1% - 99% from Inverter

Enter the speed factor for the null sets shutdown. Recommendation: 50%. See also "zero flow cutoff"
speed factor (global) :50 - 1% - 99% from Inverter

Enter the cutoff frequency for the zero quantities shutdown.
switch-off frequency (global) :35Hz - 1Hz - 200Hz

15. Setting the safety

Password Code: xxx
Parameter: xxx.xx
save: Yes / No

Safety only with the main transducer

Sensor limit	: 95%
Limit Delay	: 30s
Auto Reset	: A
Safe Start	: 0Min
Safe frequency	: 35Hz
dry run	: A
dry delay	: 010s
low water	: A
water delay off	: 010s
water delay on	: 003s
flow shortage	: A
flow delay	: 180s
maximum detector	: O
maximum delay	: 180s
pressure monitor	: K
pressure monitor	: 50%
pressure delay	: 180s
submersible pump guard	: A
Guard frequency	: 30Hz
Guard time	: 30s
leakage control	: 0
Runtime control	: 0Min

Maximum detector main sensor

A =	**off**	**No function**
O =	**regulate**	**only for automatic / top value function**

Pressure monitor main sensor

A =	**off**	**No function**
E =	**on**	**only active in automatic mode**
I =	**always**	**active with automatic and manual**
K =	**Complete**	**with automatic and manual active plus electronic dry run (<0.5bar in 30s)**

Explanation of parameters:

Enter the sensor limit value for the MA controller as well as the delay time at which the system is to switch off.
Sensor limit value monitoring is always active.

Sensor limit :95% - 1% - 99% 100% = upper value> 20mA is no longer monitored.
Limit Delay :30s - 1s - 99s

Select the reset function for the MA-regulator. This feature gives you the option at fault automatically to let **3 times in 20 minutes**, start up again. **Note: The system restarts automatically!**

Auto Reset :A - A(off) / E(on) / 3x in 20 Min

If necessary, select the security start for the MA-regulator. If the Safe Start is selected, the pipe is after turning on the power or after a power failure, slowly and gently to fill. The Safe Start mode, only one pump operates at fixed speed for the time set. The next pump (s) is (are) stopped.
This function should be set by an expert, or after consultation with the manufacturer.

Safe Start :0 - 0 - 99 Min 0 Min = off
Safe frequency :35 - 0 -200Hz

If necessary, select the dry run protection, in which the system will shut down when running dry.
If the pressure / level below or the corresponding digital input is operated, shut down due to "dry run".
If "Always" is selected, the dry run is also active in manual mode. No automatic restart after dry run!

dry run :A - A(off) / E(on)
dry delay :10s - 1s - 999s

If necessary, select the low water protection, in which the system will shut down if the water shortage.
If the pressure / level below or the corresponding digital input is operated, shut down due to "low water". If "Always" is selected, the water shortage is also active in manual mode. Automatic restart after water shortage.

low water	:A	- A(off) / E(on)
low delay off	:10s	- 1s - 999s
low delay on	:10s	- 1s - 999s

If necessary, select the flow shortage - protection, in which the plant is shut down for lack of flow.
If the flow falls below or operated the corresponding digital input is switched off due to "lack of fluid". If "Always" is selected, the flow shortage is also active in manual operation. No automatic restart after flow shortage!

flow shortage	A	- A(off) / E(on)
flow delay	:180s	- 1s - 999s

If necessary, select the maximum detector function. The maximum detector is only active in "Auto" mode!

maximum detector	: O	- A / S / W / O
maximum delay	: 180s	- 1s - 999s

A = off; the maximum detector is out of order No Text
O = top value; when the upper value is reached, the system is immediately de-regulated. Text "top value"

Enter the% value of the pressure monitoring, in which the system will shut down if the pressure deficiency. The% value refers to the set pressure value. Example: 50% of 4.0 bar. The under-pressure is from <2.0 bar active and switches to 3 minutes delay the pump.
If "0%" is set, the under-pressure monitoring is disabled.
In addition, the electronic protection against dry running, in which the system will shut down if the dry run, are elected to do so.
If the pressure of at least 0.5 bar is not reached after 30 seconds, it will shut down due to "dry run".
The dry run is also active in manual mode. No automatic restart after a under-pressure / dry run !

pressure monitor	:K	- A(off) / E(On) / I(always) / K(Complete)

pressure monitor	:50%	- 0% - 100% 0% = off
pressure delay	:180s	- 1s - 999s delay

A =	**off**	**low- pressure has no function**
E =	**on**	**low- pressure is active in automatic**
I =	**always**	**low- pressure is active in automatic and manual**
K =	**Complete**	**low- pressure is in automatic and manual active plus electronic dry run (<0.5 bar in 30s)**

The submersible pump guard ensures the safe shutdown of the pump at low speed. The function is important to protect submersible motors. Turn the U-pump guard with a submersible pump operation.

submersible pump guard	:A	- A (off)/ E (On)
Guard frequency	:25Hz	- 25Hz - 200Hz
Guard time	:99s	- 9s - 99s

The leakage control ensures the safe shutdown of the pump at to higher switching frequency. The function is important for example, To protect submersible pumps from overheating. The switching frequency refers to one hour..

leakage control	:0	- 0-99 per hour

Ensures the safe shutdown of the pump if running too long time. The function is important for example, To protect the pump against leakage.
Select the type of the runtime control.

Runtime control	:0	- 0-999 Min / 0=off

16. adjust messages

Password Code: xxx

Parameter: xxx.xx

save: Yes / No

messages

IN01-CO-04	:	EAS
IN02-CO-05	:	WMS
IN03-CO-06	:	TRS
IN04-CO-07	:	RSS
OUT1- 90-91	:	ALS
OUT2- 92-93	:	BES
OUT3- 94-95	:	WMS
OUT4- 98-N	:	VRS
INV1- 01-02	:	FAS
INV2- 11-12	:	FAS
INV3- 21-22	:	FAS
INV4- 31-32	:	FAS

Explanation of parameters:

Digital inputs 1- 4: (4, 5, 6, 7)

The digital inputs are adjustable.

external inputs	:xxx	- no function
external inputs	:SOS /SOO	- set point 1+2
external inputs	:Z1S /Z2S	- counter 1/ counter 2
external inputs	:WMS /WMO	- low water
external inputs	:TRS /TRO	- dry run
external inputs	:EAS /EAO	- External on / off
external inputs	:RSS /RSO	- Reset
external inputs	:ESS /ESO	- Extern Störung (also SMS)
external inputs	:FXS /FXO	- Extern Fix frequency Global
external inputs	:HRS /HRO	- Hunter Relay (irrigation)
external inputs	:SIS /SIO	- Main fuse failed
external inputs	:MSS /MSO	- external motor protection (not INV)
external inputs	:SMS /SMO	- low shortage
external inputs	:AKS /AKO	- Battery operation (closer)
external inputs	:SUS / SUO	- Switching main sensor / secondary sensor by Different or Redundant operation
external inputs	:TIS	- Timer set (limit Function)
external inputs	:STS	- Start Pulse Funktion (limit Function)
external inputs	:SRS	- Start/Stop/Reset (limit Function)
external inputs	:SDS	- Start/Stop switch Funktion (limit Function)
external inputs	:SPS	- Start/Stop Pulse Funktion limit Function)
external inputs	:HWS	- High level warning (secondary sensor function)
external inputs	:THS	- Thermostat for Bypass (fire mode)
external inputs	:HNS	- Hand refilling, output NSS
external inputs	:ANS	- Auto refilling, output NSS
external inputs	:NSS	- digital request auto refill output NSS
***external inputs**	:HPS	- Hand pumping out, output APS
***external inputs**	:APS	- Auto pumping out, output APS
external inputs	:NAO	- Emergency stop, shutdown without restart, no SMS reset possible.
external inputs	:P1EPS / EPO	- Extern on/off pump 1(intern)
external inputs	:P1WPS / WPO	- Extern Wassermangel pump 1 (intern)
external inputs	:P2EPS / EPO	- Extern on/off pump 1(intern)
external inputs	:P2WPS / WPO	- Extern Wassermangel pump 1 (intern)
external inputs	:P3EPS / EPO	- Extern on/off pump 1(intern)
external inputs	:P3WPS / WPO	- Extern Wassermangel pump 1 (intern)
external inputs	:P4EPS / EPO	- Extern on/off pump 1(intern)
external inputs	:P4WPS / WPO	- Extern Wassermangel pump 1 (intern)

Digital outputs 1- 4: (90 / 91, 92 / 93, 94 / 95, 98 / N)

The digital outputs are adjustable.

external outputs	:xxx	- no function
external outputs	:ALO / ALS	- Global Alarm
external outputs	:WMS / WMO	- Wassermangel
external outputs	:TRS / TRO	- dry run
external outputs	:DWS / DWO	- low water Warning (only Auto)
external outputs	:DMS / DMO	- low water
external outputs	:DIS / DIO	- low water Warning (Hand + Auto)
external outputs	:SMS / SMO	- flow shortage
external outputs	:BES / BEO	- operating signal global
external outputs	:ODS / ODO	- maximum value (top value) active
external outputs	:ONS / ONO	- maximum value (top value) Warning
external outputs	:PAS / PAO	- Pumps off
external outputs	:BRS / BRO	- Ready signal global
external outputs	:SES / SEO	- Sensorfehler
external outputs	:HUS / HUO	- Alarm horn; Switch off with reset possible
external outputs	:AKS / AKO	- Battery operation (SMS)
*** external outputs**	:BWS / BWO	- Ready signal global + „Wait“
external outputs	:NSS	- refilling (secondary sensor) / (together HRS / ARS)
external outputs	:APS	- pumping out (secondary sensor) / (together HRS / ARS)
external outputs	:BVS	- Bypass valve (temperature switch)
external outputs	:TWS	- Temperature warning secondary sensor
external outputs	:UBS	- Maximum warning secondary sensor
external outputs	:HWS	- High level warning secondary sensor
external outputs	:TFS	- Timer (T) finished or expired successfully
*** external outputs**	:AFO /AFO	- fire mode Alarm, no Auto Reset
*** external outputs**	:FAO / FAS	- frequency inverter Alarm

CAUTION ! Change the following settings only after consultation!

external outputs	:HZS	- Heating (cabinet)
external outputs	:VRS	- fan (cabinet) (> 5,4kW INV changeable)
external outputs	:P1LAS / ALO	- Run signal pump 1 (internal)
external outputs	:P1ALS / ALO	- Alarm pump 1 (internal)
external outputs	:P2LAS / ALO	- Run signal pump 1 (internal)
external outputs	:P2ALS / ALO	- Alarm pump 1 (internal)
external outputs	:P3LAS / ALO	- Run signal pump 1 (internal)
external outputs	:P31ALS / ALO	- Alarm pump 1 (internal)
external outputs	:P4LAS / ALO	- Run signal pump 1 (internal)
external outputs	:P4ALS / ALO	- Alarm pump 1 (internal)

Inverter Relays: (INVx) (1 / 2, 11 / 12, 21 / 22)

The alarm relay frequency converter (INV) 1 to frequency converter X is adjustable. (not always executed on terminal)

Relay INVx	: xxx	- no function (free setting directly at the INV drive)
Relay INVx	:ALS / ALO	- Global Alarm
Relay INVx	:FAS / FAO	- Local Alarm
Relay INVx	:WMS /WMO	- low water
Relay INVx	:TRS /TRO	- dry run
Relay INVx	:DMS /DMO	- low pressure
Relay INVx	**:**SMS / SMO	- flow shortage
Relay INVx	:BES / BEO	- operating signal global
Relay INVx	:LAS / LAO	- Run signal per pump
Relay INVx	:ODS / ODO	- maximum value (top value) active

17. adjust communication

Password Code: xxx
Parameter: xxx.xx
save: Yes / No

Communication

setpoint	: I
GSM / users	: A
SD card	: A
ModBus	: A

setpoint	: P
Minimum setpoint	: 20%
Maximum setpoint	: 80%
GSM / users	: A
SD-card	: A
ModBus	: A

Explanation of parameters:

Select the set point specification for the controller.
This function gives you the option of setting the set point "I" via keyboard or "P" via a 0-10V signal.
If the auxiliary sensor is active, the set point specification can be used with the "SO" function on the 4-20mA secondary transducer.
This function is possible with controllers with / without frequency converter.
If the secondary sensor is not active, the analog signal "P" from the frequency converter 1 is used with 0-10V.
This function is only possible with controllers with frequency inverters.
set point :I - I-internal or secondary transducer / P-potentiometer 0-10V

Enter the limits for the min / max set point range. Within these limits, the potentiometer set point is adjustable.
Attention ! These limits only apply to potentiometer operation!
Minimal setpoint :20% - 0 - 99%
Maximal setpoint :80% - 0 - 99%

Select the GSM function.
This function gives you the possibility to use the GSM function. SMS commands see xx.x.
GSM / users :A - (A) off / (E) on

Select the SD card function.
This function gives you the possibility to collect data. Settings are made on the SD page.
SD card :A - (A) off / (E) on

Select the ModBus slave function.
This function gives you the possibility to use the ModBus function. Data is output. Remote adjustment via Modbus is not possible for security reasons. Settings are made on the Modbus page. Data register see appendix.
ModBus :A - (A) off / (E) on

For a new phone card, enter the PIN.

plant name :
irrigation

plant number :
+44155xxxxxxxxx

user 1 : on
+44150xxxxxxxxx
user 2 : off
+44160xxxxxxxxx
user 3 : off
+44170xxxxxxxxx
user 4 : off
+44177xxxxxxxxx

---
credit :
*100#

card Contract :
Prepaid

Set the phone book on the SIM - card:
Enter the plants - the names and the facilities - telephone number by one overwrite.With this name, the system reports via SMS.
plant name :irrigation (z.B.)
plant number : +44155123456789 (e.g.)

Switch the user x "On" or "Off" and
Enter the phone number of the user.
If this user is "on" he is entitled to operate the system.
user x : (A) off / (E) on :+44150123456789 (e.g.)

Change it if necessary free balance inquiry - phone number.
credit: :*100# (Germany)

Select the SIM - card Contract.
With this, the SIM card - a management.
SIM - card :Prepaid / contract

18. Setting the Phone Book

To set the system name or phone number, press **SET / RESET button** on the ad.Use the **arrow key▲ button, arrow key▼ button** and the **SET / RESET button** to change the letters or numbers. After confirming "OK", the change is accepted and the cursor jumps to the next field. To complete the name or phone number you provide a "!" And press "OK".
Now they can use the **arrow key ▼ button** to the next user or go to the end..
All values are only active when they are stored in the "Communication" menu.

Select these characters and numbers in circles: AB....YZ...ab...yz..._0123456789...+*#...<..!..AB...YZ...

Special function: < = delete **Special function: ! = finish**

Enter phone number Example:

Station number: Number 1 is selected and confirmed with "OK".
+441

Station number: Number 5 is selected and confirmed with "OK".
+4415

Station number: Delete "<" is selected and the number "5" is deleted.
+4415<

Station number: Number 6 is selected and confirmed with "OK".
+4416
...
Station number: End "!" Selected to complete the entry
+441621234578! and confirm with "OK".

Station number: Entry ended.
+441621234578

Name and other users can be set as well.

Example User Off - On - Switch:

user x : off „OK“
user x : off „OK“
user x : on „▲“ or „▼“
user x : on „OK“

Error Messages GSM "Error Modem"

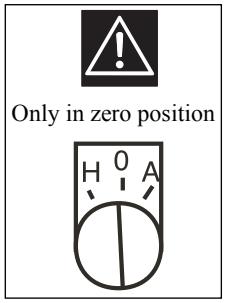
0	=	SIM telephone book incomplete. Causes: 1. All "Users" are set to "Off", 2. No valid "User" telephone number is entered
1	=	SIM lock: Enter PIN
2	=	Communication between EDS and modem interfered, received murks. Cause: Interference source or cable damaged?
3	=	s.o.
4	=	Problem with SIM card: No SIM inserted?
5.6	=	Signal strength interrogation (every 10 sec.) Interfered. Cause: Interference source or cable damaged?
7	=	No response to signal strength query (every 10 sec.): Modem disconnected or off?
11	=	SMS transmission failed (after 10 attempts). Causes: 1. Prepaid credit blank, 2nd card blocked at provider, 3. Invalid phone number on SIM
12	=	Timeout when reading or writing the SIM. One reason: too old and slow SIM or SIM removed?
13	=	Cable problem (when starting) detected: cable damaged?
14	=	Error acknowledgment from modem, cause depends on context
15	=	Communication between EDS and modem interfered, received musks. Cause: source of interference or cable damaged?
16	=	Modem in wrong mode. Possible cause: Modem was short-circuit-free. Solution: Re-enable GSM in the menu
20	=	"ERROR" from the modem when attempting to clean the SIM of SMS. Cause: SIM removed?

19. adjust Internal

Password Code: xxx
Parameter: xxx.xx
save: Yes / No

Internal

Overheating On	: 65°C
Temperature warning On	: 55°C
Ventilator On	: 35°C
Ventilator Off	: 30°C
Frost warning On	: 03°C
Heating On	: 05°C
Heating Off	: 10°C
frame	: 0
Language	: EN
Dynamic Threshold	: 000%
electronic protection	: 5%
electronic delay	: 30s
Version	: 2
operating hours reset	: 0
Factory reset	: 0
IO Internal	: 0
under-voltage delay	: 30s
Light	: 180s
*Display contrast	: 41%
Save settings	: A
Debug	: 0
* exp.-vessel	: Y



Explanation of parameters:

If the values for the control cabinet temperature monitoring. This function protects the cabinet from overheating.
overheating On :65°C - 55°C - 70°C (99°C=Off)
Temperature warning On :55°C - 20°C - 60°C

The cabinet fan is at the set temperature and off. This function depends on prior to the frequency line.
Ventilator On :35°C - 25°C - 35°C
Ventilator Off :30°C - 20°C - 30°C

If the values for the control cabinet frost monitoring. This function protects the cabinet against frost or condensation.
Frost warning On :3°C - 0°C - 8°C (9°C = Off)

The cabinet heater is at the set temperature and off. This function depends on prior to installation.
Heating On : 5°C - 1°C - 15°C
Heating Off :10°C - 6°C - 20°C

To the frame on the display appears around the display foil stick better (active until power "Off").
frame :0 - 0 (off) / 1 (on)

Set the menu language.
Language : DE / EN / ES - German / English / Spanish

The dynamic threshold is active when the pressure switch operation. Special mode without conservator.
Dynamic Threshold :0% - 0 - 100%

The electronic protection monitoring for dry running. Special function in target guardian.
electronic protection :5% - 0 - 50%
electronic delay :30s - 0 - 99s

Enter the polarity of the DS board.
Version :2 - 1 / 2

Enter to clear the total hours of the code. (Code: Ask the manufacturer)
operating hours reset :0 - 0 „Code“

Enter the code to perform a factory reset. (Code: ask the manufacturer)
Factory reset :0 - 0 „Code“

Enter the code to set the internal I / O menu. (Code: ask the manufacturer)
I/O Internal :0 - 0 „Code“

Enter the time for the under-voltage delay is to the frequency set to failure.
under-voltage delay :30s - 0 -999s

Enter the time for the display backlight. In setting 0s the light is switched on permanently.
Light (Display) :180s - 0 -999s

This function gives you the possibility to adjust the contrast of the display.
Display contrast :41% - 0 - 99%

The custom settings are saved or loaded.
Save / load settings :A - L(load) / S(save) / A (off)

The MB-debug-S status indicates internal error. There is no setting.
Debug :0 - internal use only

Select whether the system works with or without expansion vessel.
Expansion vessel :Y - no / yes

END of Menu

20. Error messages pump regulator

In the event of a fault, the control switches off and the pump (s) runs free. Error messages are acknowledged by an external external reset input or errors are acknowledged by pressing and holding the SET / RESET key. As an option, GMS operation can be reset via SMS.

examples:

Dry- Run	Error Modem	no Network ....
Hand P1 Er051P2	Dry Run	open Sensor ....
Error Modbus	low Water	Sensor deviate ....

Error communication to external devices

The pump controller is connected via a serial connection via Modbus to an external device or the GSM modem.

If the connection is interrupted or disturbed, the pump (s) will not be stopped.
The respective error message appears in the display. The red LED lights up. The alarm relay switches.

Error modem = no connection to GSM modem

Error connection

The pump controller is connected to the frequency converter via a serial Modbus connection.
If the connection is interrupted or disturbed, the respective frequency inverter is stopped.
The display shows the error message "Er101". The red LED lights up. The alarm relay switches.

Error Modbus = no connection to the frequency converter (ER101)

Error transducer

The pump regulator is connected to the sensor via a cable. If the connection is interrupted, the error message "Sensor open" appears. If the connection is disturbed, the error message "Sensor defective" appears.
The respective pump (s) are stopped. The red LED lights up. The alarm relay switches.

Sensor open = Sensor is not connected or faulty. If necessary, press "Reset".
Sensor defective = sensor values are outside the signal values.
Sensor deviation = sensor values are too far apart at Redundant. See menu "Sensor"

Error pressure, switching, U-pump, dry running, lack of water, motor protection

These errors are software shutdowns. Since these are common mistakes, they are displayed in plain text alternating with the error code. The respective pump (s) are stopped. The red LED lights up. The alarm relay switches.

MS = external motor protection tripped. (Operation with softstarter or contactor)
Dry run = shutdown without restart. See the "Security" menu.
Low water = shutdown with restart. See the "Security" menu.
Low pressure = shutdown without restart. See the "Security" menu.
Temperature warning = control cabinet becomes too hot. Improve cooling.
Overheating = the control cabinet becomes too hot. Improve cooling.
PTC = thermistor triggered. Engine too hot.
External alarm = shutdown via an external input. See menu "Messages"

Error messages pump controller with frequency inverter

The error "Er001" to "Er199" are error messages. The red LED lights. The alarm relay switches.

error Er002 : Motor overload (O.C.) Motor protection tripping. Reduce pump power. Adjust motor protection!
error Er003 : Over voltage DC link (O.E.) Mains over voltage; Check check valves. Call service!
error Er004 : Phase error mains input (P.F1) phase failure. Check fuses. Check mains voltage.
error Er005 : Overload converter (O.L1) Inverter Check power; Check pump performance. Set parameters!
error Er006 : Under voltage (L.U.) Mains voltage error. Check fuses, check mains voltage.
error Er007 : Over temperature converter (O.H.) Inverter too hot. Reduce carrier frequency. Cooling defective?
error Er008 : Overload inverter (O.L2) Inverter Check power; Check pump performance. Set parameters!
error Er009 : Under-load inverter (Err)? Engine load too low during operation. Check engine performance?
error Er011 : External error ESP. Enter wrong password on the frequency converter
error Er012 : wrong password Frequency converter (ERR1) Frequency converter defective. Call service!
error Er013 : Error motor parameter ERR2. Set inverter to factory setting! Call service!
error Er014 : Over current at standstill ERR3. Motor load at standstill too high. Pump is blocked! Call service!
error Er015 : Error current measurement ERR4. Frequency converter defective. Exchange the FU. Call service!
error Er016 : Motor overload (OC1) Motor protection tripping. Reduce pump power. Adjust motor protection!
error Er017 : Phase error motor (PF0) Motor phase interrupted. Check motor cable, check engine.
error Er018 : Wire break analog signal (A Err) Set inverter to factory setting! Call service!
error Er019 : Under load inverter (EP3). Engine load too low during operation. Check engine performance?
error Er020 : Under load inverter (EP). Engine load too low during operation. Check engine performance?
error Er021 : Under load inverter (EP2). Engine load too low during operation. Check engine performance?
error Er022 : Sleep mode nP. Set inverter to factory setting! Call service!
error Er023 : Inverter parameter incorrect (ERR5) Set inverter to factory setting! Call service!
error Er026 : Check ground fault in cable or motor or FU (GP) wiring, drive and drive! Call service!
error Er032 : Inverter parameter incorrect (PCE) Set inverter to factory setting! Call service!
error Er035 : Fault PTC thermistor tripping (O.H1). The PTC thermistor has tripped. Improve cooling.
error Er044 : Inverter parameter incorrect (ERR5) Set inverter to factory setting! Call service!
error Er045 : Communication error frequency converter (CE). Modbus address wrong; Check ModBus?
error Er046 : Master - Slave connection faulty (FL). F930 not set correctly. Check keypad setting!
error Er047 : EEPROM error in frequency converter (EEEP) Reset inverter! Call service!
error Er049 : Watchdog error (Em6) Check inverter settings! Call service!
error Er050 : Torque control error (?) Check inverter settings!
error Er053 : Communication error Check keypad (CE1) F930. Check setting on the FI operator part!
error Er067 : Motor overload (OC2) Motor protection tripping. Reduce pump power. Adjust motor protection!

Error messages pump controller

error Er101 : Communication error with the frequency ; Modbus connection defective. Check connection or address
error Er102 : Sensor 1 open. The sensor connection is open. Check cable connection!
error Er103 : Error sensor 1. The sensor value is out of tolerance. .Sensor defect?
error Er104 : Sensor 2 open. The sensor connection is open. Check cable connection!
error Er105 : Error sensor 2. The sensor value is out of tolerance. .Sensor defect?
error Er106 : Error sensor Check deviation between S1 + S2 set tolerance (%). Sensor defect?
error Er107 : Error internal pressure deficiency protection has triggered. Check setting or water inlet!
error Er108 : Error dry running electronically. Dry running protection has triggered .. Check water supply!
error Er109 : Error of external drought protection has triggered. Check setting or water inlet!
error Er110 : Error dry run externally. The external dry run protection has tripped. Check water supply!
error Er111 : Error the set limit pressure has been exceeded. Check system. Set limit pressure!
error Er112 : Error emergency stop (SMS). The plant was set to emergency stop by SMS. Reset only on the system!
error Er113 : Error the set lower limit has fallen below. Check system. Set limit!
error Er114 : External an external error was triggered. Monitoring function for an external system.
error Er115 : Error over temperature control (inverter). The controller gets too hot. Cooling defective?
error Er116 : Enable inverter is missing. Dig. Inverter input missing, defective, or not parameterized.
error Er117 : Error modem. An error has occurred during the modem connection. Call service!
error Er118 : Error lack of flow. The flow has fallen below. Check system / flow limit!
error Er119 : Error switching. The switching frequency was exceeded; Clock operation. Check check valves!
error Er120 : Error reaches maximum runtime; Leakage. Run time adjustment, or check check valves.
error Er121 : Error U-pump monitor has tripped. Check water consumption / check valves.
error Er122 : Overheat Cabinet (Warning / Shutdown) .Ventilator Check. Adjust / improve cooling.
error Er123 : Temperature warning Sensor 2 has triggered. The message can be used for frost monitoring.
error Er124 : Fault PTC tripping (software). PTC has tripped. Check engine performance / cooling.
error Er125 : Error PT100 tripping (software). The PT100 has triggered. Check engine performance / cooling.
error Er126 : Error external motor protection. External motor protection tripping. Adjust motor protection!
error Er127 : Failed main fuse failed. External fuse failure. Check main fuse!
error Er128 : Error test run. The test run has not ended without error. Check system!
error Er129 : Battery operation. Battery mode is active. Check power supply!
error Er130 : Chain error (special MARH version)
error Er131 : High level warning when the level is exceeded when the level monitor is functioning.
error Er132 : Enable converter permanently. Dig. Inverter input is on, bridged, or not parameterized.
.
error Er133-179 : free
.
error Er190-Er199 : SW-ERR (Call customer service!)

21. Clear memory, change pumps

Reset the daily hours of operation

To the daily operating hours (TLZ) to "0" to reset the following procedure:
Go to the page "operating hours" and hold the SET / RESET button for about 60sec. pressed!

Messages in the display:

```
OPH Pump  1   1:17:08
DOH Pump  1   1:17:08
...
```

It appears this message after deleting the display:

```
OPH Pump  1   1:17:08
DOH Pump  1   0:00:00
...
```

If unsuccessful, repeat the process.

Reset the fault memory

To reset the fault memory, proceed as follows:
Go to the page "error memory" and hold the SET / RESET button for about 30sec. pressed!

Messages in the display:

```
ER01 18-01-13 13:59
ER04 19-01-13 11:59
...
```

It appears this message after deleting the display:

```
 -- ERR1 --
 -- ERR2 --
...
```

If unsuccessful, repeat the process.

pump change

If the pumps are set to "AW" or "PW" in the "Basic" menu, the pump is automatically changed
to ensure a smooth operation of the pumps. This pump change is set in the "Controller" menu. The factory setting is 300 operating minutes change time. If a pump is stopped or fails due to a defect, a pump change is performed. If the change time is set to "0", it is changed after each standby.
For service purposes, the pump can be changed by switching off the respective master pump. The stop transfers the master status to the next pump. Now you can proceed in the same way with the new master.

Pumps that are set as jockey, suction pump or boost do not change.

The Jockey pump is the first pump in the system in fixed position with shutdown and transfer to the first system pump. Only possible once. (INV)

The suction pump is the first pump in the system in fixed position only together with one or more system pumps. Running time limitation possible. Only possible once. (Contactor, soft starter)

The booster pump is the last pump with a fixed position system with connection and disconnection. Only possible once. (Contactor, soft starter, INV)

Functions see menu "Basic".

The pump alternation is interrupted by the following criteria:

-The manual mode can be enabled with pump
-The programming process is not completed at a controller
-A pump is at fault.

22. zero flow shut-off

The Zero flow cutoff ensures the safe switching off of the pumps at delivery volume "0" into standby.
There are two ways to switch the pumps into standby mode in the MAR regulator.

1. testing phase (T) 50% - 1% - 100% = 0,1- 1,00bar absolute

The testing phase increases the set point in the function sawtooth whenever a pump is running. The time interval is permanently set in the program. 3 minutes sawtooth, 3 minutes break. By raising the set point, we will put the pump into standby mode at the end of the testing phase with delivery "0". The switch-off frequency is the smallest possible frequency of the pump. The switch-off delay is always active. Only at the last pump does the standby take place after the switch-off delay and the run-on time.

switch-off frequency :35Hz - 1Hz - 200Hz
switch-off delay :2s - 1s - 99s
switch-off frequency :G - global / local

The larger the test phase, the safer the pump will switch to standby mode when pumping "0".
This function is called a "lifeline".

2. load factor (LF) :50% - 1% - 200% from the frequency inverter
speed factor (DF) :50% - 1% - 100% from the frequency inverter

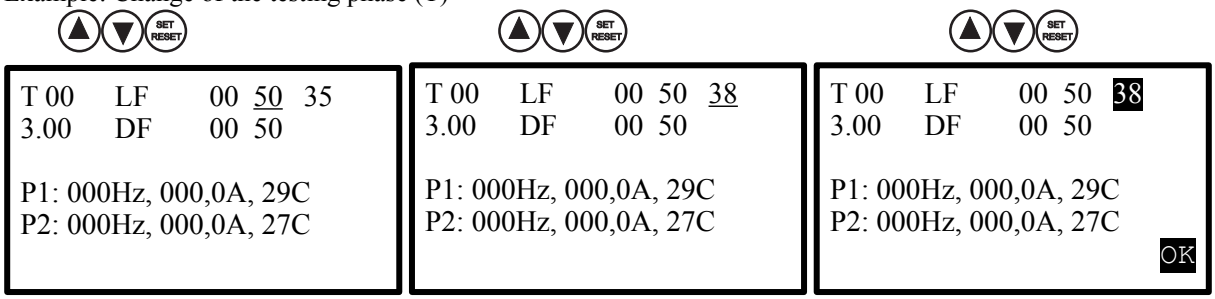
The second option is to switch the pumps to standby at the "0" level, by setting the load factor and the speed factor for the pump at the set operating point. This function is only possible with frequency inverter operation. On the expert page, the current values for the last pump are visible and the values are set directly. As soon as the pump falls below both values, the last pump with switch-off delay and the switch-off delay is switched to standby. The cut-off frequency is irrelevant.

The logic of mathematical logic is to say:
Actual pressure = set pressure + speed value <+ speed factor load value <= load factor standby.

The load factor and the speed factor can be switched between global and local in the menu. If the factors are local, the two values for each pump can be individually set in the motor menu. This is helpful if the pumps in the system are different sizes.

expert site:

Example: Change of the testing phase (T)



After confirming "OK", the change is accepted.

It is possible to combine both zero sets of shutdowns. In 90% of the cases, a setting of the test phase, the cut-off frequency and the switch-off delay will suffice.

Standby :E - (E) on / (A) off
If standby is switched off, the last pump continues to rotate at the cutoff frequency. This feature is used in systems that must maintain a minimum flow.

overrun time :5s - 0s - 999s
The overrun time from the set point is always active at the last pump and adds to the switch-off delay at the last pump. This time is needed because in systems with fixed pumps otherwise no follow-up time would be adjustable.

23. Modbus register MARH

Reg.-No.	content	Cabinet number format and coding
0	Software-Version	
1	cabinet temperature	in °C
2	Status Flags	2^0 = deviation between redundant transducers 2^1 = low water (analog) 2^3 = low water (external) 2^6 = fill mode active 2^8 = temperature warning about two sensor 2^10 = top value - limitation active 2^11 = Target rate reduction active 2^12 = stopped plant (DG, GW) (only when limit function) 2^14 = Cabinet frost warning 2^15 = Cabinet overheating warning
3	Error Flags	2^0 = Main transducer open 2^1 = Main Transducer defective 2^2 = beside transducer open 2^3 = beside Transducer defective 2^4 = Error number of starts (leakage) 2^5 = dry run 2^6 = Target - deviation (low pressure) 2^7 = U-Pumpenwächter 2^8 = Max. Laufzeit 2^9 = Shutdown sensor sizes 2^10 = Emergency Stop 2^11 = shutdown 2^12 = flow shortage 2^15 = Software - Störung
4	Impulse counter 1	e.g..: 115 = Litre or 1,15 = m$\mathfrak{Z}$ or 11,5 = m$\mathfrak{Z}$ or 115,0 = m$\mathfrak{Z}$
5	Impulse counter 2	e.g..: 115 = Litre or 1,15 = m$\mathfrak{Z}$ or 11,5 = m$\mathfrak{Z}$ or 115,0 = m$\mathfrak{Z}$
10	Main transducer	e.g.: 478 = 4.78 bar oder 478 cm oder 4.78 °C
11	Besides transducer	e.g.: 478 = 4.78 bar oder 478 cm oder 4.78 °C
12	digital inputs	2^0=I.1.1, 2^1=I.1.2, 2^2=I.2.1, 2^3=I.2.2, ..., 2^6=I.4.1, 2^7=I.4.2
13	digital Outputs	2^0=O.1.1, 2^1=O.1.2, 2^2=O2.1, 2^3=O.2.2,..., 2^6=O.4.1, 2^7=O.4.2
14	Pump-states and manual switch	2^0 =P1 Hand, 2^1 = P1 Auto, 2^2 =P1 active, 2^3 =P1 Error 2^4 =P2 Hand, 2^5 = P2 Auto, 2^6 =P2 active, 2^7 =P2 Error 2^8 =P3 Hand, 2^9 = P3 Auto, 2^10=P3 active, 2^11=P3 Error 2^12=P4 Hand, 2^13= P4 Auto, 2^14=P4 active, 2^15=P4 Error
15	Pump-states and manual switch	2^0 =P5 Hand, 2^1 = P5 Auto, 2^2 =P5 active, 2^3 =P5 Error 2^4 =P6 Hand, 2^5 = P6 Auto, 2^6 =P6 active, 2^7 =P6 Error ...
50	Operating mode	0=DR, 1=DF, 2=DG, 4=GW, 5=NF, 6=NL, 7=TH, 8=TK, 9=ST, 10=FU
51	Operating size 1	Top pressure (DR) or TO-pressure (GW) or ...
52	Operating size 2	Target pressure / stop pressure (DR) or TT-pressure (GW) or ...
53	Operating size 3	Start printing (DR) or UG-pressure (GW) or ...
54	Operating size 4	Differential pressure (DR) or LT-pressure (GW) or ...
55	Setpoint adjustment	At full load: 100 = 100%, 70 = 70%, 130 = 130%
56	overrun time	in seconds
57	limit delay time	in seconds
58	bridging time	in minute
110	P1: operation hours	in full hours

Reg.-No.	content	Cabinet number format and coding
111	P1: Hand-switch and pump status	1 = Hand, 2 = Auto, 4 = active, 8 = failure Ex .: 6 = Active in Auto mode, 9 = fault in hand mode
112	P1: Drive Status	0 = off, 1 = forward, 2 = reverse, 4-47 = fault (s. ER04-ER47 error messages)
113	P1: inverter frequency	In 0.01 Hz, d.h. 3000 = 30.00 Hz
114	P1: inverter current	In 0.01 A, d.h. 450 = 4.5 A
120	P2: operation hours	in full hours
121	P2: Hand-switch and pump status	1 = Hand, 2 = Auto, 4 = active, 8 = failure Ex .: 6 = Active in Auto mode, 9 = fault in hand mode
122	P2: Drive Status	0 = off, 1 = forward, 2 = reverse, 4-47 = fault (s. ER04-ER47 error messages)
123	P2: inverter frequency	In 0.01 Hz, d.h. 3000 = 30.00 Hz
124	P2: inverter current	In 0.01 A, d.h. 450 = 4.5 A
130	P3 operation hours	in full hours
131	P3: Hand-switch and pump status	1 = Hand, 2 = Auto, 4 = active, 8 = failure Ex .: 6 = Active in Auto mode, 9 = fault in hand mode
132	P3: Drive Status	0 = off, 1 = forward, 2 = reverse, 4-47 = fault (s. ER04-ER47 error messages)
133	P3: inverter frequency	In 0.01 Hz, d.h. 3000 = 30.00 Hz
134	P3: inverter current	In 0.01 A, d.h. 450 = 4.5 A
140	P4 operation hours	in full hours
141	P4: Hand-switch and pump status	1 = Hand, 2 = Auto, 4 = active, 8 = failure Ex .: 6 = Active in Auto mode, 9 = fault in hand mode
142	P4: Drive Status	1 = Hand, 2 = Auto, 4 = active, 8 = failure Ex .: 6 = Active in Auto mode, 9 = fault in hand mode
143	P4: inverter frequency	In 0.01 Hz, d.h. 3000 = 30.00 Hz
144	P4: inverter current	In 0.01 A, d.h. 450 = 4.5 A
150	P5: operation hours	in full hours
151	P5: Hand-switch and pump status	1 = Hand, 2 = Auto, 4 = active, 8 = failure Ex .: 6 = Active in Auto mode, 9 = fault in hand mode
152	P5: Drive Status	0 = off, 1 = forward, 2 = reverse, 4-47 = fault (s. ER04-ER47 error messages)
153	P5: inverter frequency	In 0.01 Hz, d.h. 3000 = 30.00 Hz
154	P5: inverter current	In 0.01 A, d.h. 450 = 4.5 A
160	P6: operation hours	in full hours
161	P6: Hand-switch and pump status	1 = Hand, 2 = Auto, 4 = active, 8 = failure Ex .: 6 = Active in Auto mode, 9 = fault in hand mode
162	P6: Drive Status	0 = off, 1 = forward, 2 = reverse, 4-47 = fault (s. ER04-ER47 error messages)
163	P6: inverter frequency	In 0.01 Hz, d.h. 3000 = 30.00 Hz
164	P6: inverter current	In 0.01 A, d.h. 450 = 4.5 A

Modbus RTU interface (slave)

characteristics

- Baud rate: 9600, 19200, 38400
- Modbus-Address: 1-250
- Parity and stop bits:
  a) „N“ = no parity: „8N2“ (2 Stop bits)
  b) „U“ = Odd parity: „8O1“ (1 Stop bit)
  c) „G“ = Even parity „8E1“ (1 Stop bit)

Timing

- Response Time: Normal 50-200 ms (significantly longer during menu operation)
- There is a maximum answered one call per second

Modbus commands

- Currently only **03 = "Read Holding Registers"**
- Number of simultaneously readable register = 6
- Example query: "01 03 00 32 00 06 64 07" (hex)
  (Device address 1, command 03, from register No. 50, read 6 pieces, CRC: 64 07)
- Sample answer: "01 03 0C 00 00 01 F4 00 C8 00 B4 00 14 00 64 4C 48" (hex)
- holding register 50 is 0 = operating mode „DR“
- holding register 51 is 500 = top pressure 5.0 bar
- holding register 52 is 200 = target pressure 2.0 bar
- holding register 53 is 180 = start pressure1.8 bar
- holding register 54 is 20 = differential pressure = 0.2 bar
- holding register 55 is 100 = Set point adjustment: 100

24. SMS commands

SMS commands the control mode "pressure, level, temperature“:

commands	Send SMS → ✆::
Status query	STATUS
system reset	RESET
Check values	WERTE
delete values	WRESET
Log on the system	ONLINE
Log off the system	OFFLINE
system emergency stop	NOTSTOPP
Start test run	TEST

When an emergency stop is triggered, no SMS reset is possible!
The reset is only possible directly on the controller!

SMS commands the MARH - control mode "Pressure control + limit":

commands	Send SMS → ✆::
system start	START
Start system with setpoint 1	START S1
Start system with setpoint 2	START S2
Start system for 40 minutes	START T40
Start system for 40 minutes with setpoint 1	START S1 T40
Start system for 40 minutes with setpoint 2	START S2 T40
stop system	STOPP
system reset and start	RESTART
Status query	STATUS
system reset	RESET
Check values	WERTE
delete values	WRESET
Log on the system	ONLINE
Log off the system	OFFLINE
Start test run	TEST

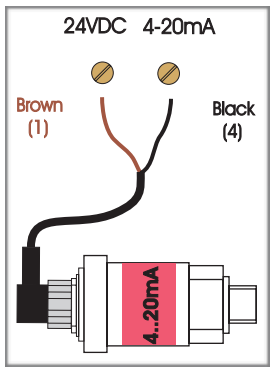
SMS commands the MARH - control mode "+ Adjustable frequency limit":

commands	Send SMS → ✆::
system start	START
system starting with 45Hz	START F45
Start system for 40 minutes	START T40
system starting with 45Hz for 40 minutes	START F45 T40
stop system	STOPP
system reset and start	RESTART
Status query	STATUS
system reset	RESET
Check values	WERTE
delete values	WRESET
Log off the system	ONLINE
Log off the system	OFFLINE
Start test run	TEST

SMS commands the MARH - control mode "Soft starter + limit":

commands	Send SMS → ✆::
system start	START
Start system for 40 minutes	START T40
stop system	STOPP
system reset and start	RESTART
Status query	STATUS
system reset	RESET
Check values	WERTE
delete values	WRESET
Log on the system	ONLINE
Log off the system	OFFLINE
Start test run	TEST

25. The standard pressure transducer (Danfoss) MBS:



Transducer 4-20mA with M12x1 connector, 4-pin connection:

Brown (1) 24V	=	+ supply 24VDC	(86) (88)
Black (4)	=	Signal Input 4-20mA	(87) (89)

26. customer settings

Date: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____