MAR
V.3
1-3 pumps
Pressure

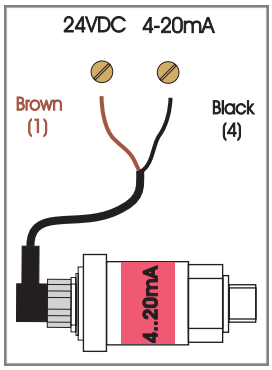
MAR 1-3 pumps: 1-phase mains connection 230V - motor 3x 230V - 0,40kW-2,2kW

MAR 1-3 pumps: 3-phase mains connection 400V - motor 3x 400V - 0,75kW-15,0kW

The standard pressure transducer (Danfoss) MBS:

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

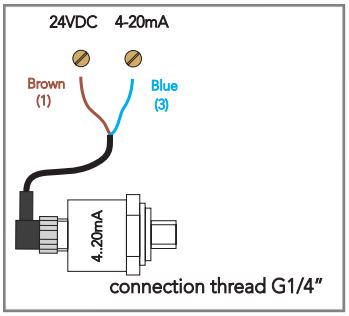
Brown (1)	+	= + supply 24VDC	(70) , (72)
Black (4)	-	= Signal Input 4-20mA	(71) , (73)



Connecter standard OEM pressure transducer (Danfoss) DST:

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

Brown (1)	+	= + supply 24VDC	(70) , (72)
Blue (3)	-	= - Signal Input 4-20mA	(71) , (73)



Instruction manual — Execution: pressure

Type: MAR V.3 — S-No.: _____

System controller for 1- 3 pumps

Software version 1.02 (xxx) Stand 01.05.2025

Execution:	pressure control
	pressure switch
	limit control
	limit switch
	level control
	level switch
	temperature controller
	temperature switch
	volume regulator
	fluid flow regulator
	vacuum regulator
	inverter Mode
Option:	RS485 Modbus / GSM
Inverter:	E810 0,75-15,0kW

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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 setpoint. 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 a Modbus data transfer

Wenn Sie die Modus Schnittstelle installiert haben, können Sie den Pumpenregler überwachen oder
If you have installed the Modus interface, you can monitor the pump controller or query data in the registers. Depending on the technical design, different data is 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 controller.

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:

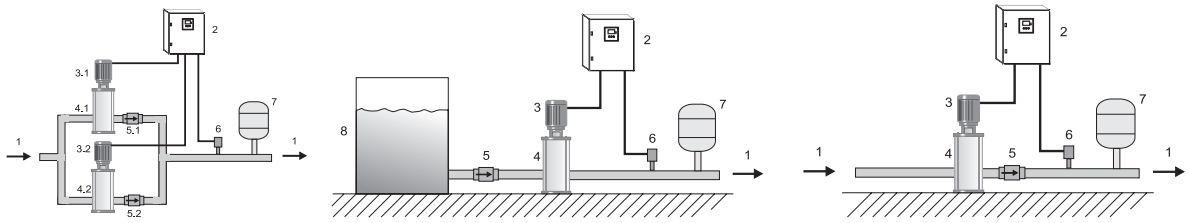
Ambient temperature:	+ 5 ° C - + 35 ° C
Humidity:	0- 95% non-condensing
Altitude:	1000m, 1% reduction / 100m
Vibration:	maximum 0.5g
Type of protection:	see type plate
Technical data:	see type plate

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

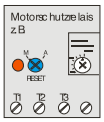
Booster systems (DEA)

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

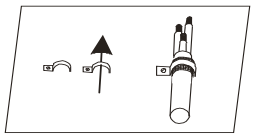


The pump controller has a monitoring function for the motor current. The motor rated current when frequency converter operation is set in the menu. For designs with soft starter or contactor, the rated motor current is set on the motor protection relay or on the soft starter. See the respective operating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

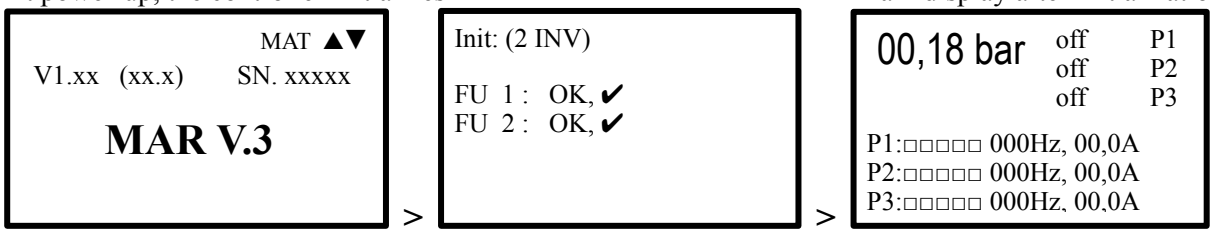
motor connection

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

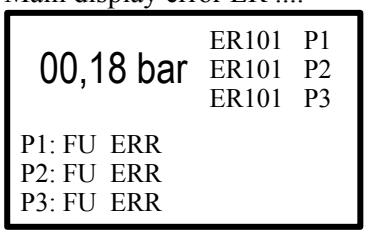
At power-up, the controller initializes



Main display after initialization

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

Main display error ER ....

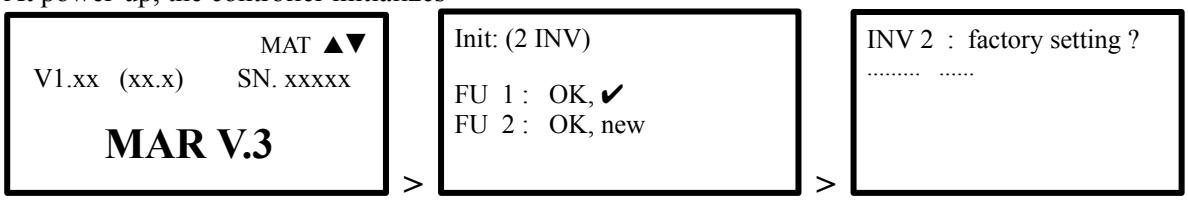


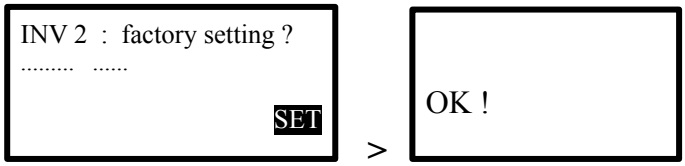
The system is now set to "AW" = active change.
If the system setting is to be changed, this must be done in the base menu.

5.1 Switching on the system after changing the frequency inverter

Example: Double system with new INV 2

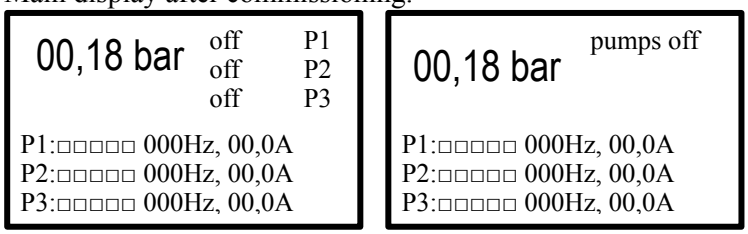
At power-up, the controller initializes





Attention! The factory setting is set automatically.

Main display after commissioning.



6. panel Description

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

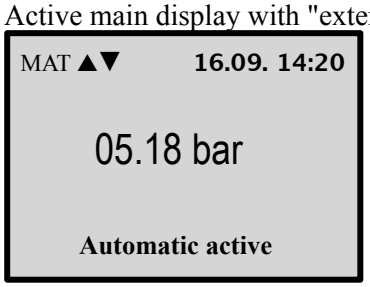
The backlight can be switched off with a delay.

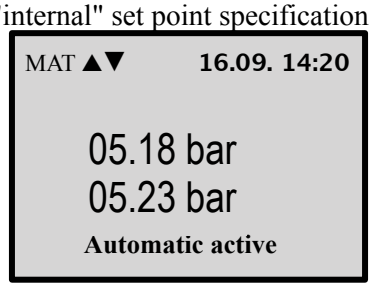
The **arrow keys**
Select the functions (scrolling),
Enter / change data.

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

Display with different symbols and values

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



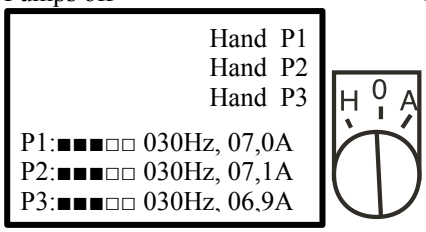


Symbols show on the rest side whether GSM or Modbus is used.

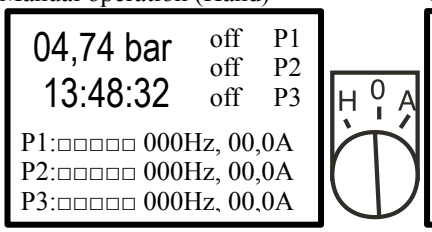
operating displays

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

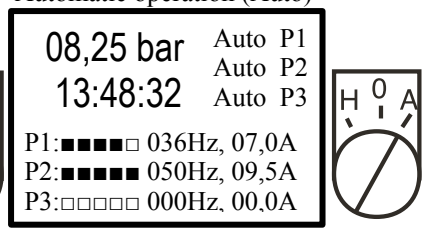
Pumps off



Manual operation (Hand)



Automatic operation (Auto)

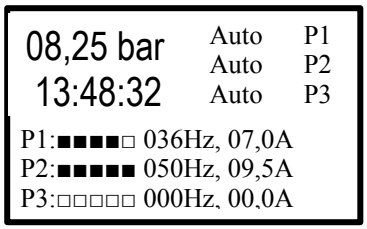


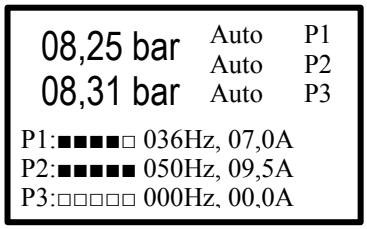
Select operating displays

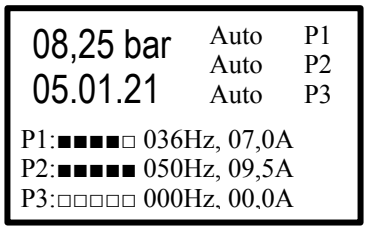
With the ▲ arrow key, the next screen is displayed.
Pressing the same arrow key the next screen is displayed.
Use the ▼ arrow key, the previous screen is displayed.
If the display is "hours of operation" is displayed and the ▲ arrow key is pressed, so you get to the error memory.
From the fault memory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

active messages

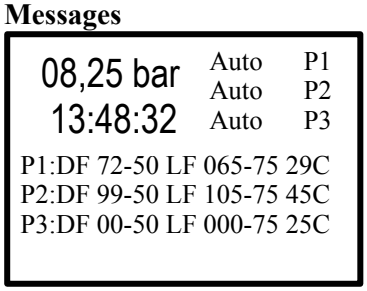
Operating Status: time, pressure, frequency, current P1-xx ... , equipment temperature

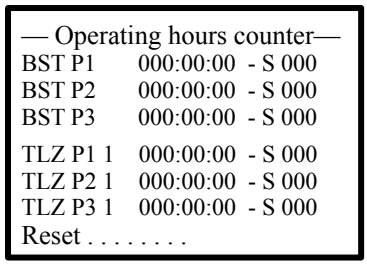


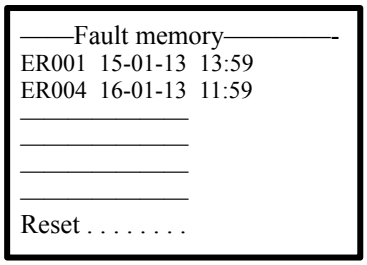




Messages



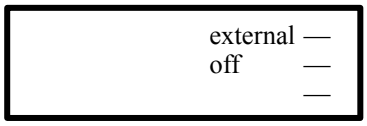




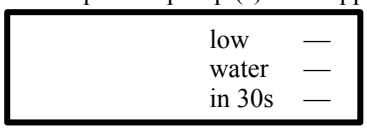
Memory status: Hour meter BST: P1-Px Memory status: day run - counter TLZ: P1-Px
Fault memory: 1 - x with date stamp for the last 1-16 error. For each error, the pressure and pump status are stored on an extra page. Switch over by pressing the SET button for 10 seconds

Information displays

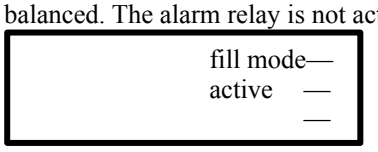
External off
The MA controller is connected via an external input. If the connection is open, the message "External off" appears. The respective pump (s) are stopped. The alarm relay is not activated



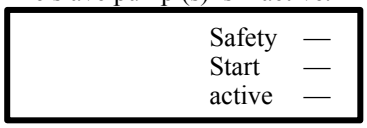
External low water
The MA controller is connected via an external input. If the connection is open, the message "low water" will appear. The respective pump (s) are stopped. The alarm relay switches.



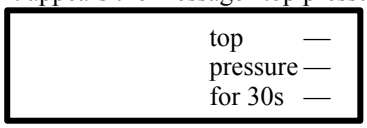
Fill mode in active
If the "under-pressure" to be active, the MA-regulator is operated in fill mode until the pressure for the first time is balanced. The alarm relay is not activated.



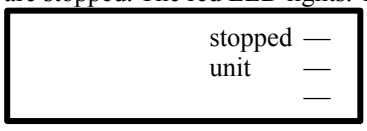
Safety start active
If the function "Safe Start" to be selected, the MAR controller is operated in fill mode. The master pump is active. The slave pump (s) is inactive. The alarm relay is not activated.



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 alarm relay is not activated.



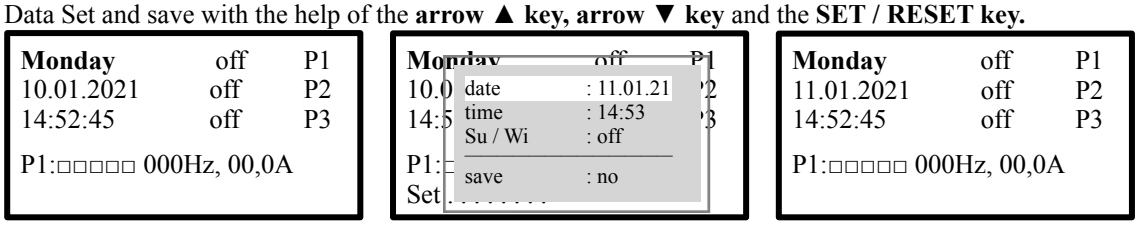
Stopped unit
The MA-controller is connected via an external emergency stop. It appears the message "Stopped unit". The pump (s) are stopped. The red LED lights. The alarm relay switches. "Restart" via GSM or reset - function.



7. Clock, GSM, Modbus, SD-Card set

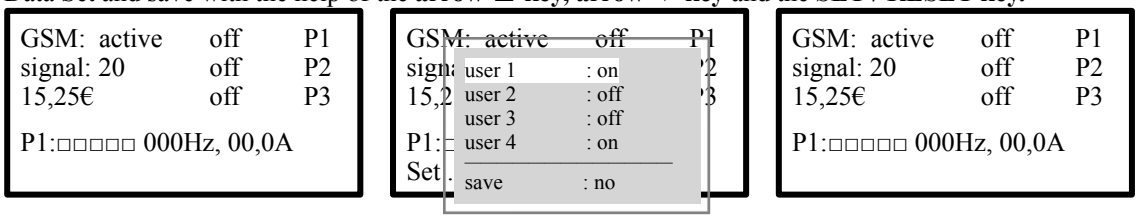
Set time / date:

Press the **SET / RESET button** on the respective side.
Data Set and save with the help of the **arrow ▲ key, arrow ▼ key** and the **SET / RESET key.**



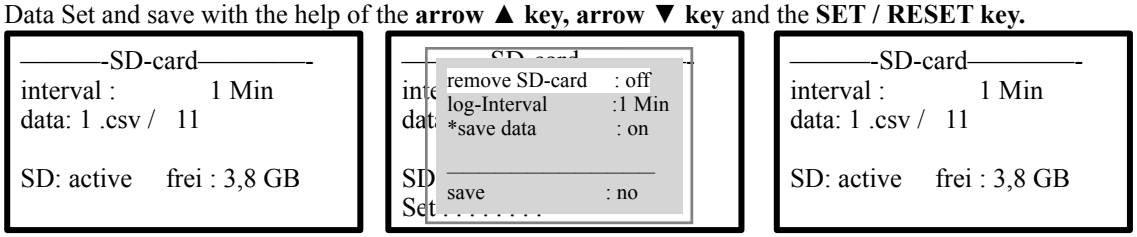
Set GSM users:

Press the **SET / RESET button** on the respective side.
Data Set and save with the help of the **arrow ▲ key, arrow ▼ key** and the **SET / RESET key.**



Set SD card:

Press the **SET / RESET button** on the respective side.
Data Set and save with the help of the **arrow ▲ key, arrow ▼ key** and the **SET / RESET key.**



SD card messages:

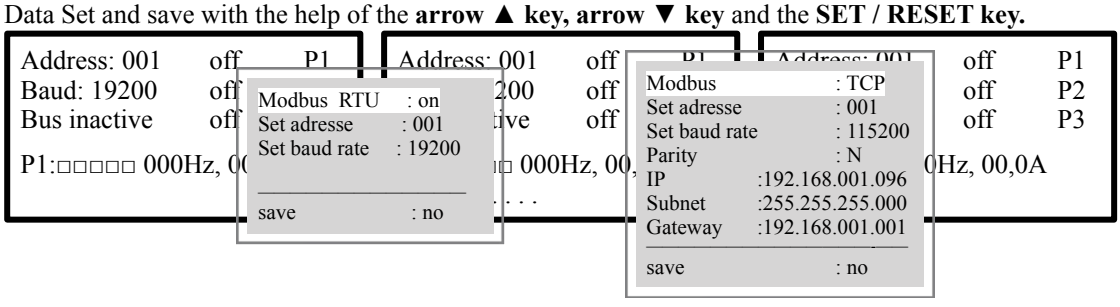
Data rate: 1 min: min / 10 min / 1 hour / 10 sec.

Specification:	1/15 0 (display example)
	1 / = Current file to be written to
	15 = number of data written in the current file
	0 = number of incorrect data
SD: Err.card	(display example)
message: SD:	none: no SD card inserted
message: SD:	active: data is being written
message: SD:	active + full: data will be overwritten
message: SD:	inactive: data are 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 evaluation in Numbers (MAC) or Excel (Microsoft)

Set Modbus Adresse RTU / TCP :

Press the **SET / RESET button** on the respective side.
Data Set and save with the help of the **arrow ▲ key, arrow ▼ key** and the **SET / RESET key.**



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

8. Menu operating

Set and save values
(Example set points)

setpoints
times
messages
transducer
safety
controller
pump/motor
communication
system setting
cabinet setting
*Quick setting

password : xxx
(enter the password)

setpoint : 03,00bar
start difference : 00,50bar
overrun time : 5s
save : no

setpoint : 03,90bar
Start difference : 00,50bar
overrun time : 5s
save : no

setpoint : 03,90bar
start difference : 00,50bar
overrun time : 5s
save : no

setpoint : 03,90bar
start difference : 00,50bar
overrun time : 5s
save : no

setpoint : 03,90bar
start difference : 00,50bar
overrun time : 5s
save : no

setpoint : 03,90bar
start difference : 00,50bar
overrun time : 5s
save : no

setpoint : 03,90bar
start difference : 00,50bar
overrun time : 5s
save : no

setpoint : 03,90bar
start difference : 00,50bar
overrun time : 5s
save : yes
(save parameters)

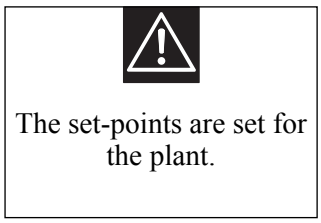
By pressing the  button for 5 seconds, the menu can be interrupted.

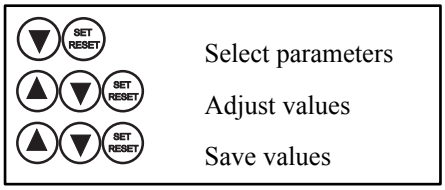
Password code: xxx 
Parameter: xx.xx bar 
save: Yes / No 

setpoints	Code: 174
times	Code: 174
messages	Code: 174
transducer	Code: 174
safety	Code: 174
controller	Code: 174
pump/motor	Code: 174
communication	Code: 815
system setting	Code: 815
cabinet setting	Code: xxx
*Quick setting	Code: 012

9. adjust set-points

setpoint 1	:	☑
setpoint 1	:	2.10 bar
start difference 1	:	1.00 bar
setpoint 2	:	☐
setpoint 2	:	3.00 bar
start difference 2	:	1.50 bar
differential value	:	0.50 bar
overrun time	:	5 s
top value difference	:	1.00 bar
save	:	yes





Explanation of parameters:

Activate Setpoint 1/2. Enter the setpoint with which the system should operate.
Setpoint 1/2 :03,00bar - 0,01bar - 999,99bar

Enter the start difference at which the system starts again after “standby”.
Start difference 1/2 :00,50bar - 0,01bar - 999,99bar

Enter the difference value at which the next pump should be switched on.
Differential value :00,20bar - 0,01bar - 999,99bar / inaktiv by single unit

Enter the run-on time until the system should stop.
Overrun time :5s - 0s - 999s

The peak value regulates the pump down to limit the pressure increase.
The difference value 100% = 1 bar, which is calculated on the setpoint.
Top value difference :01,00bar - 0,01bar - 999,99bar

analog setpoint	:	ext. bar
start difference	:	1.00 bar
differential value	:	0.50 bar
overrun time	:	5 s
top value difference	:	1.00 bar
save	:	yes

Activate Analogue Value. Set the setpoint with which the system should work.
Analog setpoint :03,00bar - 0%-100% / (Sensor value), No potentiometer operation possible!

Enter the start difference at which the system starts again after “standby”.
Start difference :00,50bar - 0,01bar - 999,99bar

Enter the difference value at which the next pump should be switched on.
Differential value :00,20bar - 0,01bar - 999,99bar / inaktiv by single unit

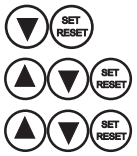
Enter the run-on time until the system should stop.
Overrun time :5s - 0s - 999s

The peak value regulates the pump down to limit the pressure increase.
The difference value 100% = 1 bar, which is calculated on the setpoint.
Top value difference :01,00bar - 0,01bar - 999,99bar

10. adjust times

reduction	:	1%
reduction on	:	20:00 h
reduction off	:	04:00 h
test run (1-999s)	:	20 s
weekdays testing	:	_ _ _ _ _ _ _
test time	:	10:15 h
test interval	:	0 days
flushing (1-999s)	:	Off
weekdays flushing	:	_ _ _ _ _ _ _
flushing time	:	10:15 h
flushing interval	:	0 days
overflow + lack pressure	:	□
timer clock 1	:	□
weekdays	:	SMTWTFS
time 1 on	:	10:00 h
time 1 off	:	16:00 h
timer clock 2	:	□
weekdays	:	SMTWTFS
time 2 on	:	18:00 h
time 2 off	:	19:00 h
save	:	yes

The times are set for the plant.



Select parameters

Adjust values

Save values

External outputs: SLS - flushing active (together without button / auto flushing)

Explanation of parameters:

If necessary, select the pressure reduction for the pump for a limited time.
This function gives you the option of reducing the pump's energy consumption.

Reduction (value)	:off	- 1 - 100 % / off
Reduction on	:xx:xx h	- 00:00 - 23:59 h
Reduction off	:xx:xx h	- 00:00 - 23:59 h

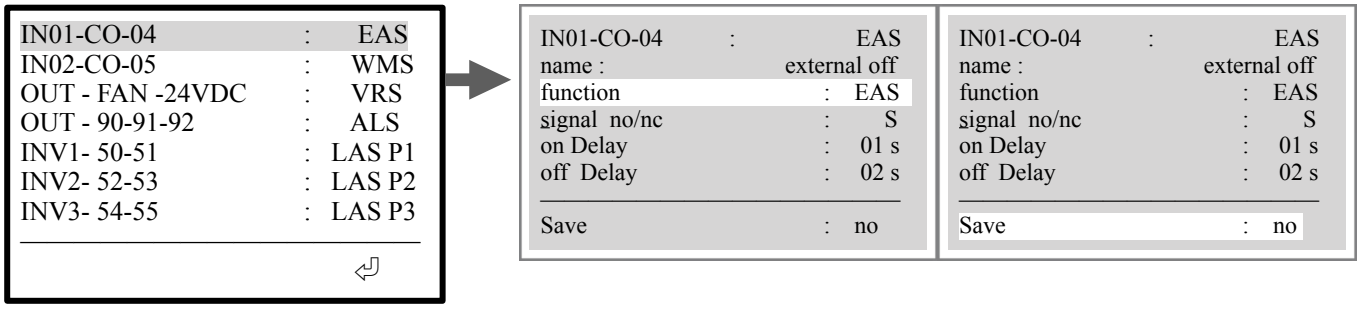
Select the test run (e.g. fire extinguishing) for the pump. This function gives you the option of running the pump at manual frequency once every 24 hours. This function can prevent the pump from seizing up.

Test run	:off	- 1 - 999s / Off (with manual frequency (SMS) (Dig. Input))
Weekdays testing	: _ _ _ _ _ _ _	- S M T W T F S, adjustable,
Test time	:10:15 h	- 00:00 - 23:59 h
Test time	:20s	- 1 - 999s with manual frequency (SMS) (Dig. Input)
Test interval	:0 days	- 0 - 30 days (0 days = off)

Select the test run (e.g. fire extinguishing) for the pump. This function gives you the option of running the pump at manual frequency once every 24 hours. This function can prevent the pump from seizing up.

F**lushing**	:off	- 1 - 999s / Off (with manual frequency (SMS) (Dig. Input))
Weekdays flushing	: _ _ _ _ _ _ _	- S M T W T F S adjustable,
Flushing time	:10:15 h	- 00:00 - 23:59 h
Flushing time	:20s	- 1 - 999s with manual frequency (SMS) (Dig. Input)
Flushing interval	:0 days	- 0 - 30 days (0 days = off)
overflow + lack of pressure	**:** □	- on / off - useful when rinsing containers
Time clock 1/2	**:** □	- on / off - Works with weekday and Time 1 / Time 2
Weekdays 1/2	: S _ _ _ _ F _	- S M T W T F S, adjustable, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. Using the arrow▲ key, arrow▼ key adjustable.
Time 1/2 On	: 10:00 h	- 00:00h -23:59h , adjustable
Time 1/2 Off	: 16:00 h	- 00:00h -23:59h , adjustable

11. setting messages for the digital inputs and outputs



Explanation of parameters:

Digital inputs 1- x: (04, 05)

The digital inputs can be set to function as normally closed or normally open contacts.

external inputs	:xxx	- no function
external inputs	:SO	- setpoint 1/2 (two set-points)
external inputs	:WM	- Water shortage report
external inputs	:TR	- Dry run notification
external inputs	:SM	- Current defect report
external inputs	:HW	- Flood report
external inputs	:EA	- External on/off
external inputs	:RS	- Reset
external inputs	:NA	- Emergency stop, switch off without restart, no SMS reset possible
external inputs	:ES	- External alarm
external inputs	:TE	- Start test run (button)
external inputs	:FG	- Frequency limit 1/2 (two frequency limits)
external inputs	:MSG	- Global Motor protection alarm
external inputs	:MSP	- Motor protection alarm (adjustable per pump)
external inputs	:SI	- Error fuse failure
external inputs	:AK	- Battery operation
external inputs	:EAP	- external on/off pump (adjustable per pump)
external inputs	:WMP	- low water message pump (adjustable per pump)
external inputs	:IN	- switching the control direction

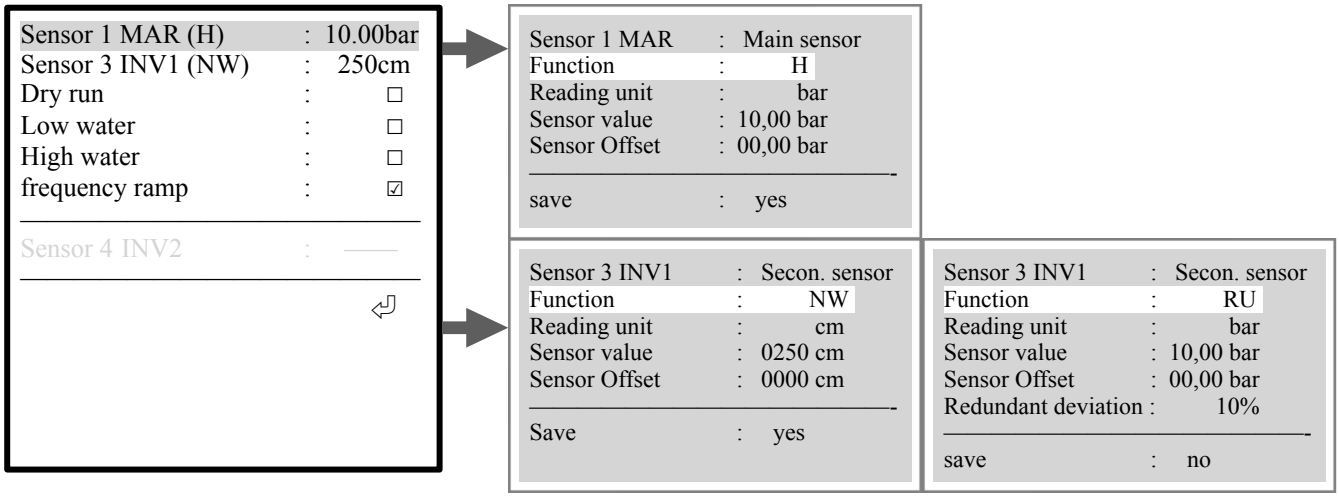
Digital outputs 1- 2: (90 / 91) + (VRS)

Frequency inverter relay: (INVx) (50 / 51, 52 / 53, 54 / 55)

The digital outputs and the frequency inverter relay can be set to function as normally closed or normally open contacts.

external outputs	: xxx	- No function (free setting directly at the inverter)
external outputs	:AL	- Global alarm
external outputs	:AF	- Global alarm (memory)
external outputs	:WA	- Global warning
external outputs	:WM	- low water
external outputs	:DM	- low pressure
external outputs	:TR	- dry run
external outputs	:SE	- transducer error
external outputs	:BE	- Operating signal global
external outputs	:DW	- low pressure warning
external outputs	:DI	- low pressure warning always (even when “Pump Off”)
external outputs	:OD	- Maximum value (upper value) active (main transducer)
external outputs	:BR	- Ready Signal global
external outputs	:HZ	- Heating (cabinet)
external outputs	:VR	- fan - additional cooling
external outputs	:HW	- High water
external outputs	:FA	- Alarm pump (adjustable per pump)
external outputs	:LA	- Running signal pump (adjustable per pump)
external outputs	:SL	- Flushing active
external outputs	:PA	- Pumps off
external outputs	:ON	- Maximum value (upper value) active (side transducer)
external outputs	:HU	- Alarm horn; switch off with reset possible
external outputs	:SM	- Lack of flow
external outputs	:AK	- Battery operation (+SMS)

12. transducers - Set values for main sensors and secondary sensors



S1= transducer 1: (86, 87), S3= transducer from INV1: (84, 85)

——	=	off	Sensor has no function
H	=	Main sensor	Main transducer
RD	=	Redundant	sensor works on comparison sensor 2-1 (Redundant)
RU	=	Redundant + auto	sensor works on comparison sensor 2-1 (Redundant with switching)
DW	=	Pressure guard	Sensor works as a pressure monitor
NW	=	Level guard	Sensor works as a level monitor
TW	=	Temperature guard	Sensor works as a temperature monitor
SW	=	Flow guard	Sensor works as a flow monitor

Explanation of parameters:

Enter the sensor input for the main sensor. The main sensor can be any existing sensor.

Function Main sensor	:H	- H (Main transducer)
Reading unit	:bar	- bar / cm / C° / % / l/m / m
Sensor value	:16,00 bar	- 0 - xxxx
Sensor Offset	:00,00	- 0 - xxxx

Enter the sensor input for the side sensor. Secondary sensor can be any existing sensor.

Function Secondary sensor	:NW	- NW (Niveauwächter) /DW /SW /TW / RD / RU
Reading unit	:cm	- bar / cm / C° / % / l/m / m
Sensor value	:500 cm	- 0 - xxxx
Sensor Offset	:00,00	- 0 - xxxx

Set the analogue function. If the threshold reached is pressed, the "Report" is switched off.

Low water (example)	:On	- off / on
Switch off manual	:On	- off / on
Switch off Auto	:On	- off / on
Threshold on	:550 cm / bar	- 0 - xxx cm / bar
Threshold off	:450 cm / bar	- 0 - xxx cm / bar

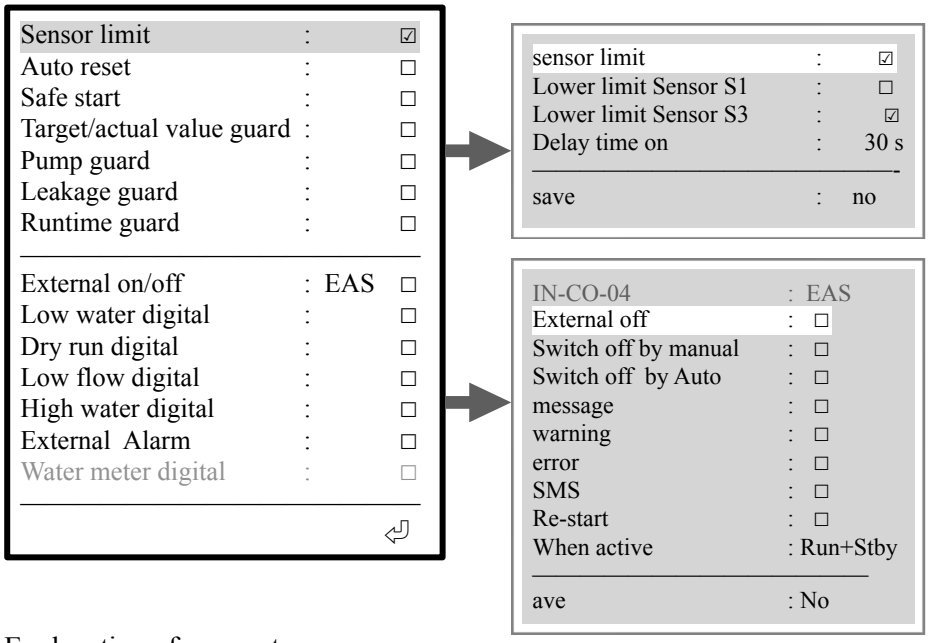
Set the analogue function. If the threshold reached is pressed, the "Report" is switched off.

High water (example)	:On	- off / on
Switch off manual	:On	- off / on
Switch off Auto	:On	- off / on
Threshold on	:750 cm / bar	- 0 - xxx cm / bar
Threshold off	:650 cm / bar	- 0 - xxx cm / bar

Set the frequency ramp function.Select the sensor for the function.
Automatic restart is preset! This frequency is reduced. (only with inverter operation)

Frequency ramp	:Off	- off / on
Transducer	:On	- NS (S2-S3)
Threshold on	:200 cm	- 0 - xxx cm
Threshold off	:150 cm	- 0 - xxx cm
Frequency ramp	:100.00 Hz	- Min - Max Hz
When active	:Run+StBy	- Run

13. Set and save safety functions for the main sensor / digital inputs



Explanation of parameters:

Enter the sensor boundary at which you want the system to turn off. Limit "Off" is no longer monitored < or > 20mA.

Sensor limit	:on	- off / on
Lower limit S1 / S2	:on	- off / on
Upper limit S1 / S2	:on	- off / on
Delay	:30 s	- 1 s - 99 s

Select the reset function. In case of malfunction, we restarted x times within 20 minutes.

Auto reset	:off	- off / on
Number of resets / 20 min	:04	- 1 - 99
Delay	:30 s	- 1 s - 99 s

When the safe start is switched on, the pipeline is slowly filled after the mains voltage is switched on or returned. In the safe start, only one pump with fixed speed works for the set time.

Safe start	:on	- off / on / Always
Time	:09 Min	- 1 Min - 99 Min
Safe frequency	:40 Hz	- 0 -xxx Hz

Enter the % value of the target monitoring for the main sensor where the system should shut down in case of lack of pressure. The % value refers to the target value. In addition, the electronic dry run can be selected. In case of steps below, it is switched off to "dry run". The dry run is also active in manual operation. No automatic restart!

Target/actual value guard	:on	- off / on
Threshold in	:50 %	- 1 % -100 %
Delay on	:180 s	- 1 s - 9999 s
message	:no	- No / Yes
warning	:no	- No / Yes
error	:yes	- No / Yes
SMS	:no	- No / Yes
When active	:Run	- Run / Run+Standby
Dry run	:on	- off / on
Threshold in	:05 %	- 1 % - 50%
Delay on	:30 s	- 1 s - 99 s**.**
When active	:Run	- Run / Run+Standby

The pump guard ensures that the pump is safely switched off at too low a speed.
The function is important to protect engines. Always turn on the pump guard for underwater pumps.

Pump guard	:off	- off / on
Guardian Time	:99s	- 9s - 99s
Guardian frequency	:30Hz	- 20Hz - 200Hz

The leakage monitor ensures the safe switch-off of the pumps with a high switching frequency during operation. Important to protect, for example, underwater pumps from overheating. The switching frequency refers to one hour (60 min).

Leakage guard	:off	- off / on
Number of starts / 60 min	:05	- 1 - 99

The maximum runtime monitoring ensures the safe shutdown of the pumps at long
Operation. Important to protect e.g. underwater pumps from overheating.

Runtime guard	:off	- off / on
Guardian Time	:300 Min	- 10 Min - 999 Min

Set the digital external on / off. If the digital input is activated, it is switched off to "external off".
Assignment of the digital inputs is done menu.

External On/Off	:EAS	- Off / On (EAS / EAO)
Switch off manual	:on	- Off / On
Switch off auto	:on	- Off / On High water
message	:no	- No / Yes
warning	:no	- No / Yes
error	:no	- No / Yes
SMS	:no	- No / Yes
Re-start	:yes	- No / Yes
When active	:Run+StBy	- Run / Run+Standby / Always

Adjust the digital water shortage protection. If the digital input "WM" is activated, it is switched off to "lack of water". Automatic restart is preset! Assignment of the digital inputs is done menu.

Low water	:on	- Off / On (WMS / WMO)
Re-start	:yes	- No / Yes
.....		
When active	:Run+StBy	- Run / Run+Standby / Always

Set the digital dry running protection. If the digital input "TR" is pressed, it is switched off to "dry running".
There is no automatic restart! Assignment of the digital inputs is done menu.

Dry run	:on	- Off / On (TRS / TRO)
Re-start	:yes	- No / Yes
.....		
When active	:Run+StBy	- Run / Run+Standby / Always

Adjust the digital flow shortage. If the digital input "SM" is activated, it is switched off to "lack of current".
There is no automatic restart preset! Assignment of the digital inputs is done menu.

Low flow	:off	- Off / On (SMR / SMO)
Re-start	:yes	- No / Yes
.....		
When active	:Run	- Run / Run+Standby / Always

Set up digital flood protection. If the digital input "HW" is activated, a warning of "flood" is given. Preset is warning without switching off! Assignment of the digital inputs is done menu "Reports"

High water	:on	- Off / On (HWS / HWO)Externe
Re-start	:yes	- No / Yes
.....		
When active	:Always	- Run / Run+Standby / Always

Set the digital input to External Disruption. If the digital input "ES" is pressed, it is switched off to "External interference".
Preset is warning without switching off! Assignment is made menu "Reports".

External alarm	:off	- Off / On (ESS / ESO)
Re-start	:yes	- No / Yes
.....		
When active	:Always	- Run / Run+Standby / Always

14. adjust the controller

PID P gain	:	0,50
PID I time	:	0,50 s
Value of tolerance	:	1.0 %
Control ramp +	:	01 s
Control ramp -	:	01 s
Target value adjustment	:	100 %
switch-on delay	:	02s
switch-off delay	:	02 s
switchover time	:	05 s
pump changeover time	:	300min
standby	:	☑
top value	:	10 %
top value time	:	20 s
switch-off frequency	:	035 Hz
load factor	:	050 %
speed factor	:	050 %
test phase	:	050 %

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 :0,20 - 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 setpoint tolerance for the zero quantity shutdown.
Value of actual tolerance :1% - 1% - 99%

Enter the time for the control ramp Plus. The controller becomes faster or slower when adjusting the ramp-up.
Control ramp plus :1s - 1s - 09s

Enter the time for the control ramp minus. The control becomes faster or slower when regulating down.
Control ramp minus :1s - 1s - 09s

Enter the set value adjustment at which the target pressure should be adjusted to the pipeline.
Smaller 100% = Target Pressure Reduction; Larger 100% = Target Pressure Increase.
Target value adjustment :100% - 20% - 200% / 100% = No customization

Enter the switch-on delay time for the next pump.
switch-on delay :3s - 1s - 99s

Enter the time delay for the zero quantities shutdown.
switch-off delay :3s - 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 :on - on / off

The top value regulates the pump down to limit the pressure increase.
top value :15% - 0% - 50% (0%=aus)
top value time :20s - 0% - 99s

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

Enter the load factor for the individual frequency inverter for zero-volume shutdown.
load factor (global) :50% - 1% - 100% from the frequency inverter

Enter the speed factor for the individual frequency inverter for zero-volume shutdown.
speed factor (global) :50% - 1% - 100% from the frequency inverter

Enter the test phase for the zero quantity shutdown. Recommendation: 20%. See also "Zero quantity shutdown"
Test phase (global) :50% - 1% - 100% = 0,1- 1,00bar absolutely

15. adjust pump/motor

read inverter	:	P1
rotating direction	:	R
acceleration time	:	01,0s
deceleration time	:	02,0s
rated current	:	008,0A
rated voltage	:	400V
rated frequency	:	050Hz
min frequency	:	020Hz
max frequency	:	050Hz
hand frequency	:	035Hz
Fix frequency	:	042Hz
load factor (local)	:	050%
speed factor (local)	:	050%
motor characteristic	:	Constant
Boost	:	04%
carrier frequency	:	5000Hz
PTC / thermistor	:	☐
Sinus filter	:	☐
phase monitor	:	☐

Explanation of parameters:

Select whether you want to read the data from the respective frequency inverter.
read inverter :P1 - P1 - Px

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

Enter the deceleration time of the pump (s). Recommendation: 2-10 seconds.
deceleration time :05,0s - 0,01s - 99,9s

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

Enter the engine voltage of the pump(s). Data: See engine nameplate.
rated voltage :400V - 200V - 480V

Enter the rated frequency of the pump(s). Data: See type plate. from the engine.
rated frequency :50Hz - 1Hz - 200Hz

Enter the minimum frequency (limit - smallest operating frequency) of the pump(s).
min frequency :25Hz - 1Hz - 200Hz

Enter the maximum frequency (limit - maximum operating frequency) of the pump.
max frequency :50Hz - 1Hz - 200Hz

Enter the manual setpoint in Hz at which the respective motor should operate in manual operation.
hand frequency :35Hz - 1Hz - 200Hz

Enter the fix frequency in Hz at which the respective motor should operate in fixed operation.
Fix frequency :50Hz - 1Hz - 200Hz

Enter the load factor for the individual frequency inverter for zero-volume shutdown.
load factor (local) :50% - 1% - 100% from the frequency inverter

Enter the speed factor for the individual frequency inverter for zero-volume shutdown.
speed factor (local) :50% - 1% - 100% from the frequency inverter

Choose the engine characteristic for the engine. Attention !
motor characteristic :Constant - Constant / Square

Enter the boost value of the pump(s). This function improves the start to start the pump.
Boost :04% - 00% - 20%

Enter the clock frequency for the engine(s). Low clock frequencies cause higher engine noises.
This function is required to match the clock frequency to the application for different cable lengths.
carrier frequency :5000Hz - 2000Hz - 9999Hz

Select the PTC function for the respective motor. (DI2 - CO)
PTC / thermistor :off - off / on

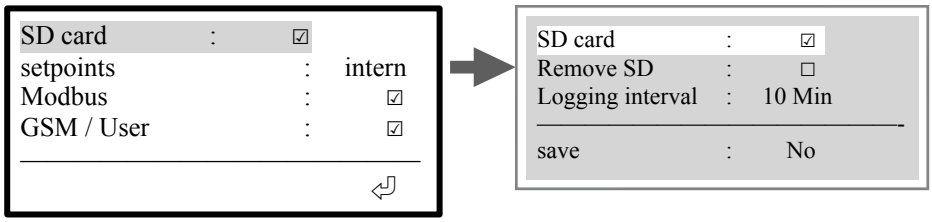
Set the sinus filter function if it is installed between the controller and the pump.
Sinus filter :off - off / on

Sine filter or motor throttle are connected into the (motor) line between the converter output and the motor. Especially with long motor lines, sinus filters are used to reduce parasitic line capacities. If the LC filter is dimensioned appropriately (sine filter only), the pulse-wide modulated (PWM) output voltage of the frequency converter is converted into a sine voltage.

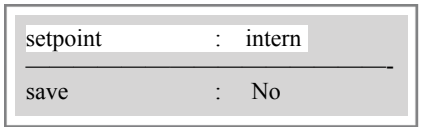
Each sinus filter has a frequency range. This working area must be observed so that the sinus filter does not burn. The sinus filter function must therefore be switched on in the engine menu if a sine filter is installed. This prevents the frequency converter from reducing its clock frequency at higher temperatures.
With many manufacturers of underwater motors, sinus filters are often prescribed. Sine filters produce noise, so that permanent work in the environment is not possible.

Select the phase failure detection output. The phase failure detection protects the motor against cable interruption.
phase monitor :off - off / on

16. adjust communication



Explanation of parameters:

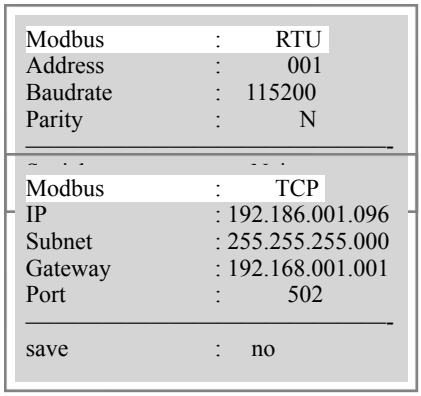


The SD card is automatically activated when you insert it.

SD Karte (aktiv)	:on	- off / on
Remove SD card	:off	- off / on
Logging interval	:10 Min	- 1s -1h.

Select the target value for the control.

Setpoint	:intern	- Intern , Modbus, 4-20mA , INV 10V



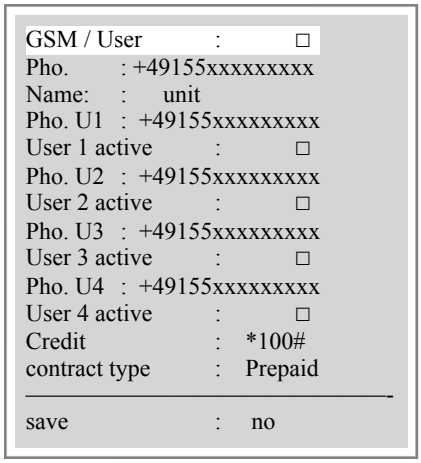
When data is read out, the Modbus address is set here.
The Modbus registers can be found in the attachment Modbus.

Modbus RTU	:RTU	- RTU
Address	:001	- 1 -255.
Baudrate	:115200	- x-115200
Parity	:N	- N / O / E

When data is read out, the Modbus address is set here.
The Modbus registers can be found in the attachment Modbus.

Modbus TCP/IP	:TCP	- TCP
IP	:192.168.001.096	- xxx.xxx.xxx.xxx
Subnet	:255.255.255.000	- xxx.xxx.xxx.xxx
Gateway	:192.168.001.001	- xxx.xxx.xxx.xxx
Port	:502	- 502

GSM / User



Communication / Address Book
Dial the GSM. The SMS command list can be found in the GSM attachment.
For a new phone card, enter the PIN and decant the PIN.
With this function, you can monitor the attachment via SMS.

GSM / User	:off	- off/ on

Enter the attachments - name and the attachments - telephone number
By overwriting. With this name, the system reports via SMS.

Name (unit)	:Irrigation (z.B.)
Phone number (unit)	: +49150123456789 (E.g.)

Turn the user x "On" or "Off" and enter the phone number
Of user 1- 4. If this user is "On", he is connected to the system.

User 1 (1-4)	:off	- off / on
Phone number (user)	: +49155123456789 (E.g.)	

If necessary, change the free credit - query - phone number.

Credit:	:*100#
contract type	:Prepaid / contract

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.

17. System setting

number INV	: 3
number FIX	: 0
INV 1	: AW
……..	
INV 3	: AW
Operating mode	: DR
Switching logic	: ☑
PID-controller	: ☑
Parallel Mode	: 0
Control direction	: +
save	: no

number INV	: 2
number FIX	: 1
INV 1	: AW
……..	
FIX 3	: AW
Operating mode	: DR
Switching logic	: ☑
PID-controller	: ☑
Parallel Mode	: 0
Control direction	: +
save	: no

Enter the number of set pressure values with which the system should work.
Number of target values :1/2/3
- 1= one target value, 2= two target values, 3= target values 1xJockey +2x AW

Explanation of parameters:

Enter the number of frequency converters (INV) pumps.
Number FU :1 - 1 - 3

Enter the number of fixed pumps (FIX) pumps.
Number FIX :1 - 1 - 3

Meaning of the abbreviation:

JO	**= Jockey pump in the system**	**First pump in the system in fixed position with switch-off, Handover without returning to the first system pump. Selectable only once. (INV only)**
JR	**= Jockey pump in the system**	**First pump in the system in fixed position with switch-off, Handover and return to the first system pump. Selectable only once. (INV only)**
SP	**= Suction pump in the system**	**First pump in the system in fixed position only together with a Or several system pumps. Duration limitation possible. Only selectable once. (contactor, soft starter, INV fix speed)**
AW	**= Work pump in the system**	**Active pump in the system with change function System pump (contactor, soft starter, INV)**
PW	**= Work pump in the system**	**Passive pump in the system for changing pump with power limitation of the system**
AF	**= Work pump in the system**	**Active pump in the system with fixed position System pump (contactor, soft starter, INV)**
RF	**= Reserve Pump in the system**	**Reserve pump in the system in return for replacement / fixed pump.**
BO	**= Booster Pump in the system**	**Last pump with system in fixed position with connection and Shutdown. Only selectable once. (contactor, soft starter, INV)**

Operating mode **:DR - DR ....**

DR	**=**	**Pressure controller**	**The system works as a pressure controller / pressure switch (bar)**
TE	**=**	**Heating / Cooling**	**The system works as a temperature controller / temperature switch (°C)**
NI	**=**	**Fill / Empty Level**	**The system works as a level controller / level switch (cm)**
VR	**=**	**Vacuum controller**	**The system works as a vacuum controller (mbar)**
ME	**=**	**Quantity / Flow controller**	**The system works as a quantity regulator (l/min) (%)**
FU	**=**	**Frequency converter**	**The system operates as a motor controller with fixed or adjustable speed with external release (Hz) (rpm)**

Turn off the switching logic if necessary. There is no more pump change / switch-on / shutdown!
Switching logic :on - on / off

If necessary, de-enter the PID controller. There is no more pump control! The operation is like a pressure switch.
PID - Controller :on - on / off

Enter the function for the parallel mode. (2 pumps are regulated like a pump)
Parallel Modus :off - on / off

Shift the control direction if necessary. This changes, for example, "Fill" to "Empty" operation.
Control direction :Plus - plus / minus

18. cabinet setting

Fan Mode	: 2
Fan delay time	: 30s
Overtemperature	: 65°C
Temp. Warning	: 55°C
Fan on	: 35°C
Fan off	: 30°C
Frost warning	: 03°C
Heating on	: 05°C
Heating off	: 10°C
Language	: DE
Rest picture	: 0s
Dimming the display	: 180s
Display brightness	: 32
Display S/W	: 1
Type size	: 1
frame	: □
Display display kW	: □
Measured value curve	: □
Sensor calibrate	: □
USP- delay	: 30s
I/O Internal	: 0
factory reset	: 0
Operating hours reset	: 0
Counter reset	: 0
Internal	: 0

Explanation of parameters:

Adjustable fan mode, mode 0 = fan off, mode 1 = fan depending on
Temperature, mode 2 = fan after running signal, mode 3 = fan permanently on.
Fan Mode : 1 - 0/1/2/3

Adjust the fan after-time for mode 2.
Fan delay time : 30s - 0-999s

The control cabinet temperature is monitored to the set temperature.
Overtemperature : 65°C - 55°C - 70°C (99°C=off)
Temperature Warning : 55°C - 45°C - 60°C

The control cabinet fan is switched on and off at the set temperature.
Turned off. This function is dependent on the frequency converter line.
Fan On : 35°C - 25°C - 40°C
Fan Off : 30°C - 20°C - 35°C

The control cabinet temperature is monitored to the set temperature.
Frost warning : 3°C - 0°C - 8°C (9°C = off)

The control cabinet heater is switched on and off at the set temperature.
This function is dependent before installation.
Heating On : 5°C - 0°C - 15°C
Heating Off : 15°C - 6°C - 20°C

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

Enter the time for the display lighting. At setting 0s, the light is permanently switched on.
Ruhebild (Display) : 0s - 0 -999s

Geben Sie die Zeit für die Display Beleuchtung verringert wird. Bei Einstellung 0s ist das Dimmen dauerhaft ausgeschaltet.
Dimming the display : 180s - 0 -999s

This function gives you the possibility to adjust the brightness of the display.
Display brightness : 32 - 0 - 100

This function gives you the possibility to customize the display of the display text from light to dark.
Display B/W (Light / Dark) : 1 - 1/2

This function gives you the possibility to adjust the font size of the display text.
Type size : 1 - 1/2

The frame in the display is displayed to be able to stick the display film better (active until network "Off").
Frame :Off - off / on

The display shows the engine power in "A" (amps) or "kW" (kilowatts), depending on the setting.
Display display in kW : Off - off / on

The display shows the measured value curve if necessary.
Measured value curve : Off - off / on

The sensor value of the main sensor (S1/S2) and secondary sensors (S3) can be compared here.
Cal. S1 4mA : 0 Cal. S1 20mA : 0
Cal. S3 4mA : 0 Cal. S3 20mA : 0
Calibrate sensor :Off - off / on

Enter the time for the under voltage delay. Here the error „under voltage" is suppressed.
Under voltage delay :30s - 0 -999s

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

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

Enter the code to delete the entire operating hours. (Code: ask the manufacturer)
Operating hours reset :0 - 0 „Code“

Enter the code to delete the meter (water meter). (Code: ask the manufacturer)
Counter reset :0 - 0 „Code“

The internal settings are only accessible to the manufacturer (MAT).
internal :0 - 0 „Code“

END of Menu

19. Internal settings

The "Internal Settings" are only from the Manufacturer can be changed!

(Code)

Maximum sensors	:	3
Control ramp	:	01s
OC1 F727 Ein/Aus	:	☐
temp. cal.	:	☐
RTC cal. s/24h	:	☐
Cal. S1 mA	:	☐
Cal. S2 mA	:	☐
Switch-off function	:	☐
Help Texts	:	☐
Adjust colour	:	☐
Möller Switch	:	☐
MB Setpoint +-	:	☐
HS Hysterese	:	☐
NS Hysterese	:	☐
Poti Hysterese	:	☐
MS-Reset Delay	:	☐
Custom I/O	:	☐
Mon.Expert Settings	:	☐
Code On / Off	:	☐
OC1 F727 On / Off	:	☐

20. Daily operating hours delete memory

Press the **SET/RESET button** on the corresponding page for a long time!

——— runtime counter ———	
OPH P1	001:17:08 - S 004
…….	
DOH P1	000:55:05 - S 001
Reset	

——— runtime counter ———	
OPH P1	001:17:08 - S 004
…….	
DOH P1	000:00:00 - S 000
Reset	

21. pump change

If the pumps are set to "AW" or "PW" in the "Basic" menu, an automatic pump change takes place
To ensure uniform operation of the pumps. This pump change is set in the "Controller" menu. The factory setting is 300 operating minutes changeover time. If a pump is stopped or fails due to a defect, a pump change is carried out. See the change time to "0", will be changed after each standby. For service purposes, the pump can be changed by switching off the respective master pump. The stop passes the master status to the next pump. Now the new master's degree can be done in the same way.

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

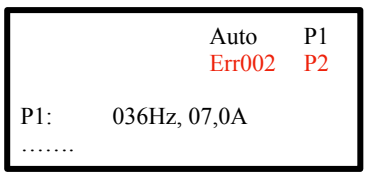
The second option is to switch the pumps to standby at the "0" level, by setting the load factor and the speed factor for the pump at the set operating point. This function is only possible with frequency inverter operation. On the expert page, the current values for the last pump are visible and the 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.

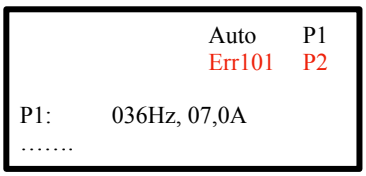
The logic of mathematical logic is to say:
Actual pressure = set pressure + speed value <+ speed factor load value <= load factor standby.

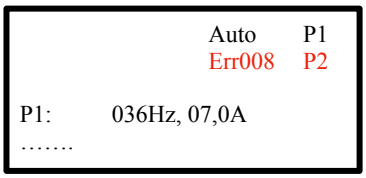
The load factor and the speed factor can be switched between global and local in the menu. If the factors are local, the two values for each pump can be individually set in the motor menu. This is helpful if the pumps in the system are different sizes.

23. Error list

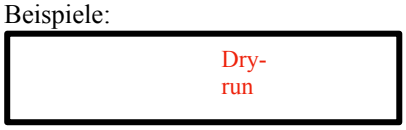
On the event of a malfunction, the control will switch off and the pump(s) run free. Error messages are acknowledged by an external reset input or errors are acknowledged by pressing the SET/REST button for a long time. Optionally, it can also be reset via SMS during GMS operation.







Beispiele:



Example: pressure error, shift play, U-pump, dry running, lack of water, motor protection
Diese Fehler sind softwaremäßige Abschaltungen. Da es häufige Fehler sind, werden diese in Klartext im Wechsel mit dem Fehlercode angezeigt. Die jeweilige Pumpe(n) sind gestoppt. Die rote LED leuchtet. Das Alarmrelais schaltet.

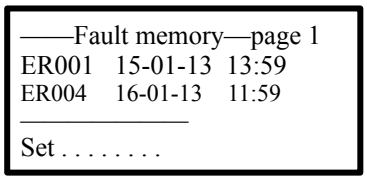
MS	= external motor protection tripped. (Operation with softstarter or contactor)
dry run	= shutdown without restart. See the "Security" menu.
dow water	= shutdown with restart. See the "Security" menu.
dow pressure	= shutdown without restart. See the "Security" menu.
temperature warning	= control cabinet 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"

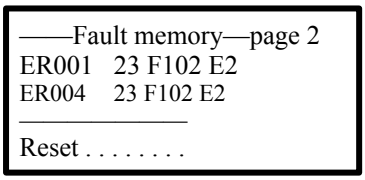
Example: Error sensor
The pump regulator is connected to the sensor via a cable. If the connection is interrupted, the error message "Sensor open" appears. If the connection is interrupted, the error message "Sensor defective" will appear.
The respective pump(s) are stopped. The red LED lights up. The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

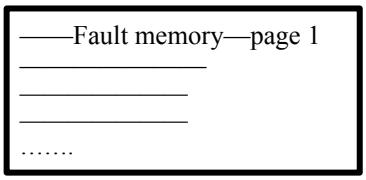
Sensor open	= Sensor is not connected or on interference. If necessary, press Reset.
Sensor defective	= sensor values are outside the signal values.
Sensor deviation	= Sensor values are too far apart for redundancy. See menu "Sensor"

Delete error memory

Press the SET/RESET button on the corresponding page for a long time!







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

Error messages Pump regulator MAR

The pump regulator MAR indicates all errors! The MAR controller also displays the errors of the frequency converter.

Reset only on the MAR display with set/reset acknowledge / reset!

The errors "Er001" to "Er199" are error messages. The alarm relay is switching.

Error Er100	: Error Modbus; Modbus connection restricted. Check connection?
Error Er101	: Error Modbus; Address incorrect; ModBus connection defective. Check connection or address?
Error Er102	: Sensor 1 or 2 or both sensors open. < 4mA, > 20mA, check cable connection or sensor!
Error Er103	: Sensor 3- Sensor 10 open. < 4mA, (Inverter 1-6(8)) Check cable connection or sensor!
Error Er104	: Check error sensor deviation between S1+S2 set tolerance (%). Sensor defective?
Error Er105	: free
Error Er106	: free
Error Er107	: Error internal lack of pressure protection has triggered. Check setting or water supply!
Error Er108	: Error dry running electronic. The dry running protection has triggered.. Check water supply!
Error Er109	: Error the external water shortage protection has triggered. Check setting or water supply!
Error Er110	: External dry run error. The external dry running protection has been triggered. Check water supply!
Error Er111	: Error flood warning via digital input.
Error Er112	: Fault lack of flow. The current has fallen below. Check the system / flow limit!
Error Er113	: Error emergency stop (SMS). System was set to emergency stop by SMS. Reset only at the system!
Error Er114	: External error was triggered. Monitoring function for an external system.
Error Er115	: Converter works without release (software). Dig. Inverter input defective, or not parameterized.
Error Er116	: Release converter missing (software). Dig. Inverter input missing, defective, or not parameterized.
*Error Er117	: Modem error. An error occurred with the modem connection. Call service!
Error Er118	: Error low flow limit reached before limit reset (time expiration)!
Error Er119	: Error switching frequency was exceeded; clock operation. Check check check check valves!
Error Er120	: Error maximum running time reached; leakage. Runtime setting, or check check check valves!
Error Er121	: Error U pump guard has triggered. Check water consumption / check check valves!
Error Er122	: Overheating control cabinet (warning/shutdown). Check fan. Adjust/improve cooling.
Error Er123	: Side sensor temperature warning triggered. Message can be used for frost monitoring.
Error Er124	: Error cold conductor release (software). The PTC has triggered. Check engine power / cooling!
*Error Er125	: Error PT100 trigger (software). The PT100 has triggered. Check engine power / cooling!
Error Er126	: Fault motor protection. External motor protection triggering. Adjust engine protection!
Error Er127	: Error fuse failed. External backup failure. Check main fuse!
Error Er128	: Error test run. The test run has not been completed without errors. Check the system!
Error Er129	: Battery operation. The battery operation is active. Check power supply!
Error Er130	: Error low water analogue
Error Er131	: Error dry running analogue
Error Er132	: Error flood analogue
Error Er133	: free
Error Er134	: free
Error Er135	: Chain fault (n.c.)
Error Er136-179	: free
Error Er190-Er199	: SW-ERR (Call customer service!)

Error messages pump controller with frequency inverter

When operating the controller without a frequency converter, these errors do not exist!

Error Er002/5/8/16/67	: Overload motor engine protection triggering. Decrease pump power. Adjust engine protection!
Error Er003	: Over-voltage Intermediate Circuit (O.E.) Mains over-voltage; check check check valves. Call service!
Error Er004	: Phase error mains input (P.F1) phase failure. Check fuses. Check the mains voltage.
Error Er006	: Under-voltage (L.U.) Mains voltage error. Check fuses, check mains voltage.
Error Er007	: Over-temperature Converter (O.H.) Converter too hot. Reduce carrier frequency. Cooling defective?
Error Er011	: External error ESP. Enter the wrong password on the frequency converter
Error Er013	: Error engine parameter ERR2. Set the inverter to factory settings! Call service!
Error Er015	: Error current measurement ERR4. Frequency converter defective. Exchange FU. Call service!
Error Er017	: Phase error engine (PF0) engine phase interrupted. Check engine cable, check engine.
Error Er018	: Wire break analogue signal (AErr) converter set to factory settings! Call service!
Error Er019	: Under-load frequency converter (EP3). Engine load in operation too low. Check engine performance?
Error Er020/21	: Under-load frequency converter (EP). Engine load in operation too low. Check engine performance?
Error Er022	: Sleep mode nP. Set the inverter to factory settings! Call service!
Error Er023	: Converter parameters wrong (ERR5) Set converter to factory settings! Call service!

24. Attachment SMS Commands

If the emergency stop is triggered, no SMS reset is possible!
The reset is only possible directly at the control!

SMS commands 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

If the emergency stop is triggered, no SMS reset is possible!
The reset is only possible directly at the control!

25. MAR Modbus Register (Excerpt) (RS485)

Extract from the Modbus Register List.

Example Modbus TCP/IP query with Siemens LOGO 8.3 / LOGO 8.4.

Register MAR	Register LOGO Setting	Content MAR	Number format or coding
400	401	Alive-Counter Watchdog	Seconds Counter 0 - 999 - 0
401	402	Setpoint	500 = 5,00bar
402	403	Starting value	100 = 1,00bar
403	404	Main sensor S1	478 = 4,78bar
404	405	Hauptsensor S2	478 = 4,78bar
405	406	Fault code	0 = no disturbance

Complete Modbus Register list available on request from the manufacturer.

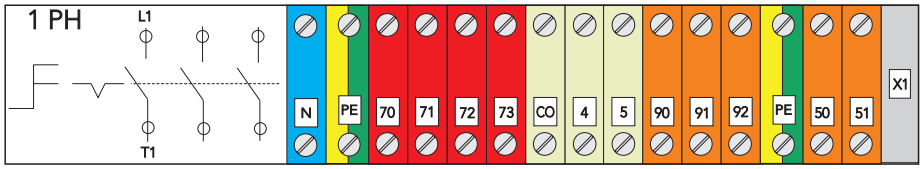
26. Terminal strip MAR

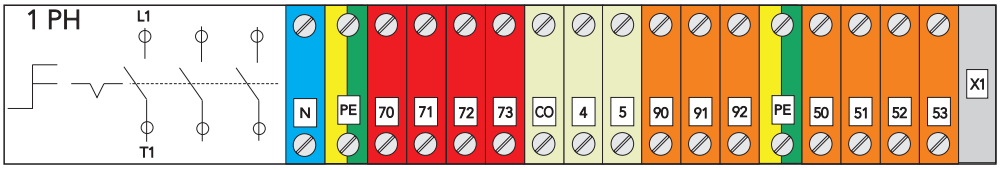
The base terminal strip differs only in the number of relay outputs.
Each frequency converter we have a relay output which can be set in the I/O menu.
Special versions with additional functions can be found in the respective circuit diagram.

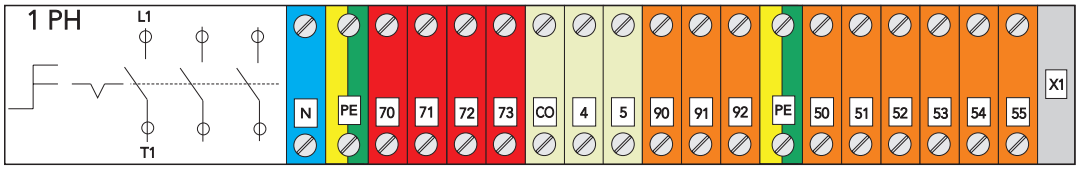
Standard is:

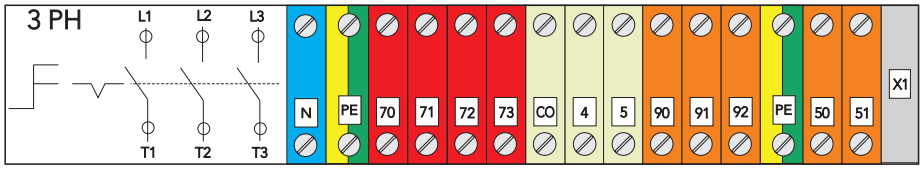
Power supply:	L1(T1), L2(T2), L3(T3), N, PE, oder L1(T1), N, PE
Dig. Inputs:	CO, 4, 5,
Transducer Inputs:	70, 71, 72, 73, (74, 75)
MAR Relay Output:	PE, 90, 91,92, (24VDC, 5A, 230VAC, 5A)
Frequency inverter output:	PE, 50, 51, ... (55), (24VDC, 5A, 230VAC, 5A)

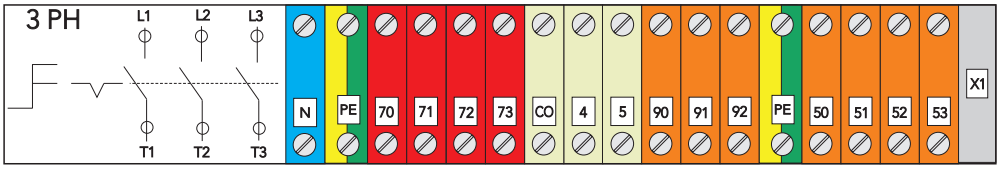
Terminal strip X1

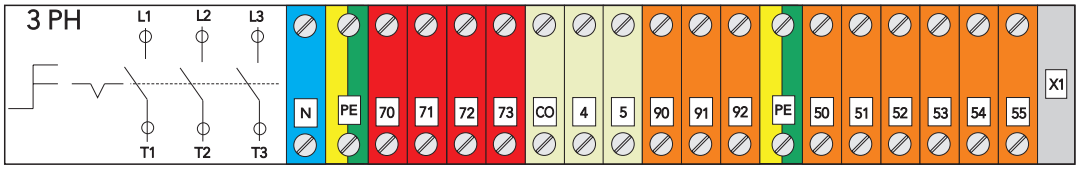




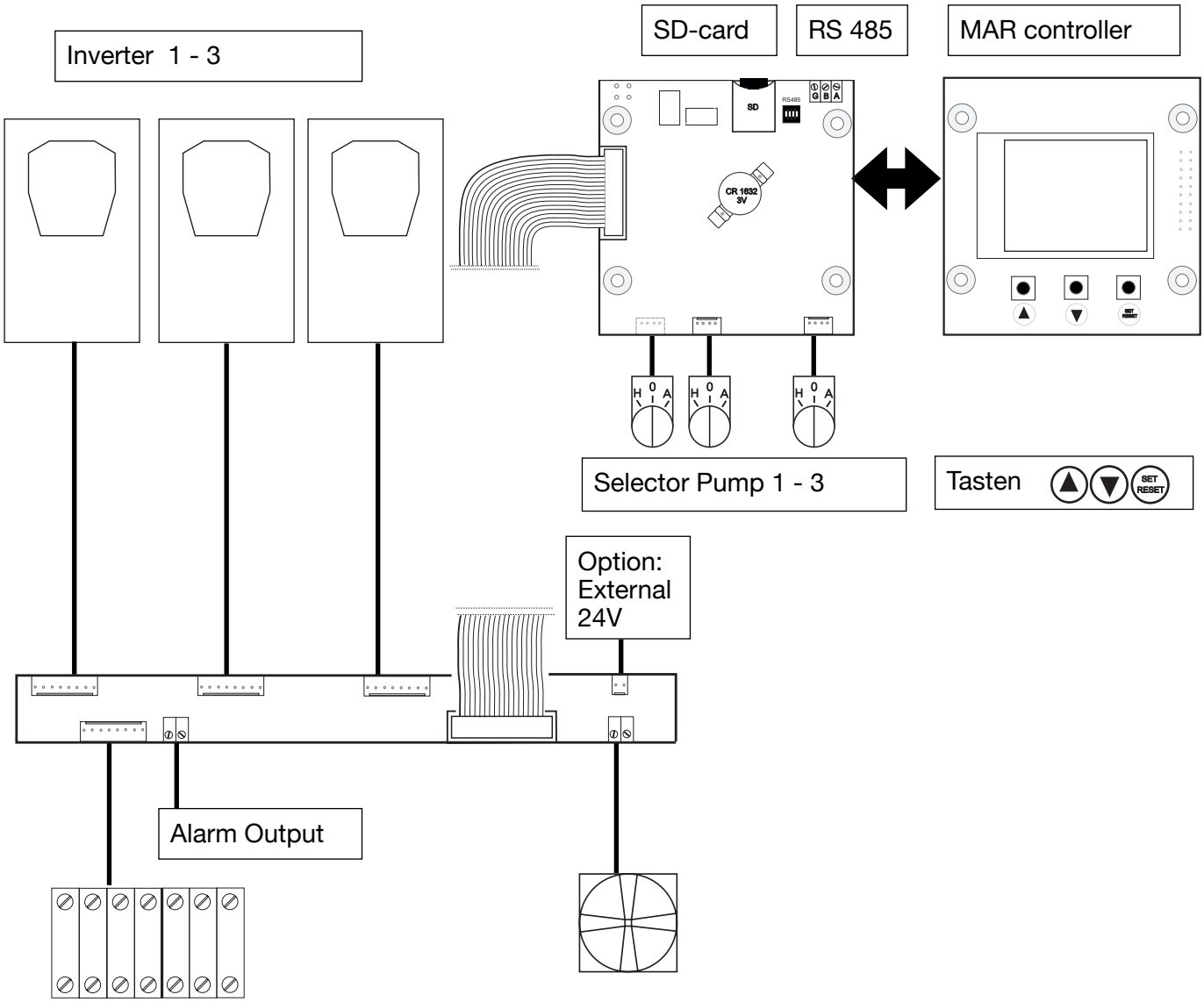


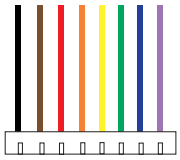






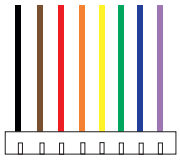
27. Technical structure of the MAR control



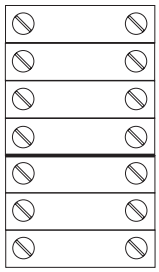


Connect inverter

GND	- black
A	- brown
B	- red
P24	- orange
CM	- yellow
DI4	- green
AI1	- blue
AO1	- purple



Connect terminals



Sensor 1+	- purple
Sensor 1-	- blue
Sensor 2+	- green
Sensor 2-	- yellow
CO	- orange
IN4	- red
IN5	- brown
Out 90/91	- black

Connect selector

Hand 1-3 com	- red
Hand 1-3 IN	- brown
Auto 1-3 IN	- red
Auto 1-3 com	- black