To connect: Loosen the outer screws and open the lid!



Instruction manual: Type: MARE IP66

Execution : pressure S-No.:

System controller for pumps with frequency inverter

Software Version 1.13 (36.10) Stand 02.12.2022

| Execution: | 1 | pressure control |
|------------|----|------------------------|
| | | level control |
| | | temperature controller |
| | | volume controller |
| | 2 | chain mode |
| | 3 | multi mode |
| | 4 | HD pump controller |
| | 5 | limit controller |
| | 6 | limit switch |
| | 7 | vacuum controller |
| | 8 | motor mode |
| | 9 | |
| | 10 | inverter mode |

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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. Technical design 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 parameterised 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

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 convection, the frequency converter regulator must be installed at least 15 cm away from side walls or other equipment during installation.

The permissible temperature range of $+5 \circ C$ to $+30 \circ C$ must not be fallen below or exceeded.

Do not install the frequency converter controller near heat radiating equipment.

Depending on the design of the controller, a wall housing of different sizes is built.

The housing has 4 holes for wall mounting.

Mounting dimensions: See manufacturer data sheet

Environmental conditions:



| Ambient temperature: | |
|----------------------|--|
| Humidity: | |
| Altitude: | |
| Vibration: | |
| Type of protection: | |
| Technical data: | |

+ 5 ° C - + 30 ° C 0- 95% non-condensing 1000m, 1% reduction / 100m maximum 0.5g see type plate 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.



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 rated motor current is set in the menu.

Cable connection



The cable to the motor, the sensor cable and the cables for the external contacts must be provided with shielded cable (minimum 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!

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 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 menu.

Alarm relay output pump controller

Depending on the versions, different numbers of relays are available. These relay outputs are changeover, floating 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 an additional relay. Functions see menu.

Analog inputs (transducer)

There are two sensor inputs available. The signal is once 4-20mA and once 0-10VDC. Sensors with 24VDC supply are used. For long sensor lines or when transferring signals from external systems, the signal must be separated via a potential converter. 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. panel Description

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



After the initialization is finished, the operation display appears:

| Display manual mode (H | Display "Motor poti" | |
|---------------------------------------|--------------------------------|-------------------------------------------------|
| 35,0 Hz HAND 1,05bar 005,9A | 00,0 Hz STOP 1,50bar 005,9A | A: 35,0 Hz S: 35,0 Hz HAND 1,05bar 005,9A |

| Display in automatic mode (AUTO) Display "Motor poti" | | | | | | |
|-------------------------------------------------------|---------------------------------|--------------------------------------------|----------------------------------------------------|--|--|--|
| 01,50 bar STOP : 00Hz 000,0A | 01,50 bar AUTO : 42Hz 007,9A | 01,50 bar STANDBY AUTO : 42Hz 007,9A | A: 01,36 bar S: 01,50 bar AUTO : 42Hz 007,0A | | | |

Display with analogue monitor

A: 01,50 bar W: 44.0 % AUTO : 42Hz 007,0A

Dynamic setpoint active

A: 11,75 bar W: 01,25 bar SW: 10.50 AUTO : 42Hz 007,0A Operate system with manual or automatic mode



Setting values in manual mode or automatic mode with "Motor potentiometer".

A : actual "pressure", S : set point "pressure"

Attention ! "Motor poti" is possible only with single units!

manual / auto mode with "Motor poti"



Set manual frequency with "Motor poti"



6. Mode "Pump controller" (1)

The system is preset to "controller" (1).

Change operating mode via MODE". (see basic menu)

At power-up, the controller initializes.



Now Press "Down arrow" key until parameters appear

| Menu 1x set point | | 4x set point | | _ | | |
|-----------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------|------------------|--------|
| ControllerSetting | S | ControllerSetting | S | | | |
| set point | : 8,00 | set point | : 8,00 | | | |
| start difference | : 0,51 | set point 2 | : 8,40 | | | |
| testing phase | : 50 | set point 3 | : 8,80 | | | |
| stop frequency | : 35,0 | set point 4 | : 9,20 | | | |
| overrun time | : 05,0 | start difference | : 0,51 | | | |
| starting delay | : 05,0 | testing phase | : 50 | | | |
| a value tolerance | :01,0 | stop frequency | : 35,0 | | | |
| minimum frequency | : 20,0 | overrun time | : 05,0 | | | |
| maximum frequency | : 50,0 | starting delay | : 05,0 | | | |
| hand frequency | : 40,0 | a value tolerance | :01,0 | | | |
| setpoints 1/4 | :0 | minimum frequency | : 20,0 | | | |
| control monitor | :0 | maximum frequency | : 50,0 | | | |
| deviation | : 50 | hand frequency | : 40,0 | | | |
| guard time | : 180 | setpoints 1/4 | : 0 | | | |
| number of starts | :0 | control monitor | :0 | | | |
| maximum runtime | :0 | deviation | : 50 | | | |
| external on / off | :0 | guard time | : 180 | | | |
| external delay on | : 3 | number of starts | :0 | | | |
| external alarm | : 1 | maximum runtime | :0 | | | |
| autostart | .0 | external on / off | :0 | | | |
| autoreset | .0 | external delay on | : 3 | | | |
| rotating | .0 | external alarm | : 1 | | | |
| accelerate | .0 | autostart | .0 | | | |
| decelerate | · 02,0 | autoreset | .0 | | | |
| P-controller | · 0 30 | rotating | .0 | | | |
| I-controller | · 00 3 | accelerate | .02.0 | | | |
| rated current | · 09 0 | decelerate | · 02,0 | | | |
| analog Guardian limit | · 95 % | P_controller | · 0 30 | | | |
| analog Guardian on | · 10 % | I-controller | · 00 3 | | | |
| analog Guardian off | · 10 /0 | rated current | · 09 0 | | | |
| analog Guardian on | . 20 70 | analog Guardian limit | · 95 % | | | |
| | | analog Guardian on | · 10 % | | | |
| | | analog Guardian off | · 40 /0 | AA | | |
| | | allalog Guardiali oli | . 20 % | | | |
| 00 | | | 00 | | | |
| example | SET | | $\mathbf{O}\mathbf{V}$ | | (if necessary) | I |
| Controllon Domente | | Controllor Decomptor | Contro | llar Daramatar | Controller Parat | meter |
| ControllerParamete | er | controllerParameter | Contro | her-Parameter | Controllerr arai | · 1 00 |
| $\frac{\text{set point}}{2}$: 4, | $\frac{00}{50}$ | $\begin{array}{c} \text{point} \\ \vdots \\ \text{for any otherwise} \\ \vdots \\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$ | set poin | 1 : 4, <u>00</u> | Start difference | .4,00 |
| Start difference : 0, | 50 Su | art difference : 0,50 | Start di | Terence : 0,50 | Start difference | . 0,50 |
| 00 | SET | | | | | |
| | ٦Ľ | | | | | |
| ControllerParamete | 60 set | ontrollerParameter | | | | |

Start difference

: 0,50

: 0,50

Start difference

Select parameter Change / save values

25°

Exit menu

Controller Settings

Enter the set point, at which the system should operate. set point :04,00bar - 0,01bar - xx,xx bar Enter the starting difference, with which the system will work. - 0,01bar - xx,xx bar Start difference :00,50bar Enter the verification phase for zero amounts shutdown a. Recommendation: 50%. See also "zero flow cutoff" testing phase -1% - 200% = 0.1 - 2.00bar absolute ·90% Enter the global stop frequency for zero amounts shutdown. - 1Hz - 200Hz stop frequency :35Hz Enter the overrun time of the follow-up time for zero amounts shutdown. overrun time :5s -1s - 99sEnter the time of Starting delay for the restart after "Standby" starting delay - 1s - 99s :5s Enter the control tolerance for the PID - a regulation. a value tolerance :1% - 1% - 10% Enter the minimum frequency of the pump. This feature gives you the option to enter the minimum frequency of the pump for operation. This possibility of adjusting the pump speed can be limited. - 1Hz - 200Hz minimum frequency :25Hz Enter the maximum frequency of the pump. This feature gives you the option to enter the maximum frequency of the pump for operation. This possibility of adjusting the pump speed can be limited. :50Ĥz maximum frequency - 1Hz - 650Hz Enter the hand frequency in Hz, at which the respective motor is to be made manually. - 1Hz - 650Hz hand frequency :35Hz Enter the number of set points the system should work with. (Only available in menu 1) set points 1/4 -0 = 1 set point, 1 = 4 set points (dig. input 3+4) ·0 Enter the water deficiency function. 1 = All Off, 2 = sensor monitoring a, 3 = electronic dry run protection, 4 = pressure monitoring in%, 5 = electronic dry run protection + pressure monitoring in% control monitor function :1 - 1-6 low pressure is off, sensor monitoring is off, dry-running monitoring is Off 1 = 2 = low pressure is off, sensor monitoring / dry running (<0.1 bar) (10s) 3 =low pressure on electronic dry run protection (<0.5 bar) (20s) 4 =low pressure on pressure is low in%. (1-100%) (40s) 5 = low pressure on electronic dry run protection (<0.5 bar) + pressure is low in%. (1-100%) 6 = low pressure on electronic dry run protection (<0.5 bar) + pressure is low in%. (1-100%) inactive in Manuel mode Enter the deviation in% for the pressure is low. This value monitors the actual pressure on deviation. - 0-100% **Control monitor** ·50% Enter the guard time delay until the pressure drop is switched off. - 0- 999s guard time :180s Enter the number of starts. The controller can restart, x times in 60 min. number of starts -1-99 = Ein, 0 = Aus:0 Enter the number of starts. The controller can restart, x times in 60 min. maximum runtime :0 -1-999 = Ein, 0 = AusSpecify the function for the digital input 1. Attention ! Automatic restart. external on / off -1 = closer / 0 = opener:0 Enter the time of the switch-on delay for the digital input "External On / Off". external delay on :3s - 1s - 99s Specify the function for the digital input 2. Attention ! Restart only after reset. -1 = closer / 0 = openerexternal alarm :0 Specify the function for the startup to "power on". autostart -1 = on / 0 = off:0 Select the Reset to function. At fault is automatically tried calling 3 times in 20 minutes, again. Autoreset can only be selected together with Autostart! -1 = on / 0 = offauto-reset :0 Enter the direction of rotation of the pump (in). Power phase does not matter! -0 = right / 1 = leftrotating :0 Enter the Acceleration time of the pump (s). Recommendation: 1-3 seconds. - 0.01s - 99.9s / only manual operation accelerate :03.0s Enter the deceleration time of the pump (s). Recommendation: 2-10 seconds. decelerate :05.0s - 0,01s - 99,9s / only manual operation Enter the P gain of the pressure control. - 0,01 - 10,0 :0.30 **P-controller** Enter the integration time of the pressure control. **I-controller** :0.3s - 0,1s - 99,9s Enter the motor rated current of the pump (s). Data: See nameplate. rated current :xxx,0A - 0,01A - 199,9A Enter the values in% for analog Guardian. This value monitors the second analog input for deviation. Attention ! No "motor poti" function possible! - 0-100% **Analog Guardian limit** :95 % Warning ! Analog Guardian on :40 % - 0-100% Pump on Analog Guardian off :20 % - 0- 50% Pump off

7. Basic Menu



Press "Stop" button.

Select parameter

Change / save values

Exit menu

Press and hold "MODE" button until the basic menu appears

| Basicsettings | | Basicsettings | | Basicsettings | | Basicsettings | |
|--------------------|----------|---------------------|------------|---------------------|------------|---------------------|--------|
| language | :1 | language | : <u>1</u> | language | : <u>2</u> | language | : 2 |
| operating mode | :1 | operating mode | :1 | operating mode | :1 | operating mode | :1 |
| unit | : 0 | unit | : 0 | unit | : 0 | unit | : 0 |
| range | : 1600 | range | : 1600 | range | : 1600 | range | : 1600 |
| offset | : 0 | offset | : 0 | offset | : 0 | offset | : 0 |
| sensor V/mA | :1 | sensor V/mA | :1 | sensor V/mA | :1 | sensor V/mA | :1 |
| control type | :1 | control type | :1 | control type | :1 | control type | :1 |
| standby type | : 0 | standby type | : 0 | standby type | : 0 | standby type | : 0 |
| PTC | :1 | PTC | :1 | PTC | :1 | PTC | :1 |
| inverter guard | :1 | inverter guard | :1 | inverter guard | :1 | inverter guard | :1 |
| keypad | : 0 | keypad | : 0 | keypad | : 0 | keypad | : 0 |
| light | : 99 | light | : 99 | light | : 99 | light | : 99 |
| lock on/ off | : 0 | lock on/ off | : 0 | lock on/ off | : 0 | lock on/ off | : 0 |
| analog Guardian | : 0 | analog Guardian | : 0 | analog Guardian | : 0 | analog Guardian | : 0 |
| characteristics | : 2 | characteristics | : 2 | characteristics | : 2 | characteristics | : 2 |
| rated frequency | : 50,0 | rated frequency | : 50,0 | rated frequency | : 50,0 | rated frequency | : 50,0 |
| carrier frequency | : 5000 | carrier frequency | : 5000 | carrier frequency | : 5000 | carrier frequency | : 5000 |
| sine filter | :1 | sine filter | :1 | sine filter | :1 | sine filter | : 1 |
| Test threshold (Hz |) : 10,0 | Test threshold (Hz) |) : 10,0 | Test threshold (Hz) |) : 10,0 | Test threshold (Hz) | : 10,0 |

| Basic menu settings: | | |
|----------------------|-------|-------------------------------------------------------------------------------------|
| Language | :1 | -1 = D (German), $2 = E$ (English) |
| Operating mode | :1 | - 1 = Pump controller, 2 = chain 3 = Multi, 4 = inverter, 5= limit, 6= limit switch |
| Unit | :0 | -0 = bar, $1 = mbar$, $2 = cm$, $3 = m$, $4 = °C$, $5 = m/s$, $6 = %$ |
| Range | :1600 | -0-9999, (1600 = 16bar) |
| Offset | : 0 | -0-9999, (1000 = 10bar) |
| Sensor V/ mA | :1 | - $1 = V$, $2 = mA$. Switching between 0-10V and 4-20mA. |
| Control type | :1 | - 1 = positive, 0 = negative. PID control function on. (e.g. filling or emptying) |
| Standby type | :0 | -0 = stop (standby), $1 = basic speed$ (factory setting 35Hz) |
| PTC | :1 | - $1 = off / 2 = on$. PTC thermistor function for motor monitoring |

If necessary, select the inverter protection function. The frequency converter then no longer has any protective functions. **inverter guard** : 1 -0 = off / 1 = onEnter the keypad function for safe operation.

| Enter the keypad functio | n for safe oper | ration. | |
|-----------------------------|----------------------------|-----------------------------------------------------------------------|-----|
| If the set value is greater | than 0, the dr | ive is stopped when the keypad is disconnected (safe operation). | |
| Keypad | :0 | - 0 - 30s | |
| Enter the time for the dis | play backligh | t. $0 = off; 100 = permanent light$ | |
| Light | :99 | - 0 - 100 | |
| Function for locking para | ameters. <mark>"Cod</mark> | e 174". Disable "1" the setpoint is still active. Lock "2" everything | is |
| Lock / Unlock | : 0 | -0 = OFF / 1 = a single / 2 = an all | |
| Analog Guardian | :0 | - 0 - 5 analog guard on. Monitors the second analog input | ıt. |

0 = Analog Guardian is Off

1 = Analogue Guardian is On for "Water Shortage" - automatic restart!

2 = Analogue Guardian is On for "dry run" - no automatic restart! (Reset)

3 = Analogue Guardian is On for "Water Shortage" - automatic restart! + Fill mode

4 = Analogue Guardian is On for "dry run" - no automatic restart! (Reset) + Fill mode

5 = Dynamic set point (pre-pressure + set point = (control value) Target

Set the characteristic for the motor. When "6" is selected, the motor data must be entered. Detailed description on page 19 "Setting the engine characteristic" Characteristics :2 -2 = V/Hz- Asynchronous motor, 6 = PM- Synchronous motor Enter the rated frequency in Hz from the motor nameplate. - 1Hz - 650Hz rated frequency :50Hz The parameter must be switched on when operating with a sine filter. :5000Hz - 2000Hz - 9999Hz carrier frequency Enter the clock frequency of the pump(s). Low clock frequencies cause higher engine noise.. sine filter -0 = on, 1 = off: 1 Enter the frequency in Hz for the test threshold of the test phase. This frequency is added to the stop frequency. The test phase is switched off above this frequency. e.g.: stop frequency = 35Hz + 5Hz = 40Hz > off.

locked.



Enter the difference value for the master-slave operation. difference value :00,80bar - 0,01bar - xx,xx bar

Enter the switching time for the master-slave exchange with chain operation. **changing time** :1500min - 1min - 999min

| Unit 1 terminals: | Chain connection between Unit 1 + 2 | Unit 2 terminals: |
|-----------------------------------|-----------------------------------------|-----------------------------------|
| DI3 Setpoint 1/2 or Chan (Unit 1) | >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> | DO1 Chain >>>>> DI3 (Unit 2) |
| DO1 Chain <<<< 6 (Unit 1) | ~~~~~~ | DI3 Setpoint 1/2 or Chan (Unit 2) |
| GND (Unit 1) | ~~~~~ >>>>> | GND (Unit 2) |



Set point:125,00bar- 0,01bar - xx,xx barEnter the starting difference, with which the system will work.Start difference:20,00bar- 0,01bar - xx,xx bar

Enter the verification phase for zero amounts shutdown a. Recommendation: 50%. See also "zero flow cutoff" **testing phase** :5% - 1% - 200% = 0,1- 2,00bar absolute

 $\begin{array}{c} \mbox{Enter the global stop frequency for zero amounts shutdown.} \\ \mbox{stop frequency} & :30\mbox{Hz} & -1\mbox{Hz} - 200\mbox{Hz} \\ \end{array}$

Enter the hand frequency in Hz, at which the respective motor is to be made manually. hand frequency :40 Hz - 1 Hz - 650 Hz



Limit controller Set parameters

Enter the time limit for the delay of the shutdown at "null set" a. **limit time** :00:10 - 00:00 - 99:59 min

Enter the bridging time for bridging the lower pressure monitor. Bridge time :10:00 - 00:00 - 99:59 min

Enter the expiration time (egg timer) to a plant shutdown.Expiration time:00:00- 00:00 - 99:59 Std.

| 11. Mode "Limit sw | vitch" (6) | | | Select par | ameter | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------|------------------------------------------------------|---------------------------------------------|---------------------------------|
| The system is set to "limit switch" (6). | | | | | save values | |
| Change operating mode via "MODE". (see basic menu) | | | | | 1 | |
| At power-up, the contr Initialization display | oller initializes Main | display | Dis | splay Status - E | Error memory | |
| MA V1.xx (xx.x) SN. (Init FU-SW. 1.xx | T ▲▼ 35, 00001 STOP | 0Hz og 8,00 UG 2,00 • 00Hz 000,0A | | Starts: RH: 000 : 00 E011, 45Hz, 10,5 ERR 2 | 15 25°) : 43 A, 00,15bar | 00 |
| Now Press "Down arro Limit switch - Para <u>Upper limit</u> : U-test value : Lower limit : L-test value : minimum frequency : maximum frequency : hand frequency : Fix frequency : Control monitor : deviation : guard time : external alarm : rotating : accelerate : decelerate : timit time : Expiration time : | bw" key until meter 12,50 0,00 3,20 0,00 25,0 50,0 40,0 45,0 1 50 180 0 1 0 02,0 03,0 09,0 00:30 10:00 00:00 | parameters apj | bear | | | |
| Displays in automatic inactive | mode Bridge time | active Fil | l active | Limit time acti | ve | |
| 35,0Hz og 8,00 UG 2,00 STOP 00Hz 000,0A | 35,0Hz og 8,0 UG 2,0 Bridge time 60 m AUTO 42Hz 007,9 | 35,0H 35,0H fill 9 min AUTO 42 | Z OG 8,00 UG 2,00 Hz 000,0A | 35,0Hz og UG limit time 20s AUTO 42Hz 0 | 8,00 2,00 00,0A | |
| example OO | SET | | 00 | | (if neces | sary) |
| Limit switch - Paramet Upper limit : 4, U-test value : 0, | er <u>00</u> 50 Limit switch <u>Upper limit</u> U-test value | n - Parameter : 4,0 <u>0</u> : 0,50 | Limit switch Upper limit U-test value | h - Parameter : 4,00 e : 0,50 | Limit switch Upper limit U-test value | - Parameter : 4,00 : 0,50 |
| 00 | SET | | | | | |
| Limit switch - Paramet Upper limit : 4, U-test value : 0, | er Limit switcl Upper limit 50 <u>U-test value</u> | n - Parameter : 4,60 : 0,50 | | | | |

Set the limit switch parameters

| Enter the upper limit value at which the Upper limit | ne system is to swite :12,50bar | h off. - 0,01bar - xx.xx bar |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enter the upper test value with which U-test value | the upper limit value :00,00bar | e is to be calculated. - 0,00bar - xx.xx bar |
| Enter the lower limit value at which th Lower limit | ne system is to swite :03,20bar | h off. - 0,01bar - xx.xx bar |
| Enter the lower test value with which L-test value | the lower limit value :00,00bar | e is to be calculated. - 0,01bar - xx.xx bar |
| Enter the minimum frequency of the p operation. This possibility of adjusting minimum frequency Enter the maximum frequency of the p operation. This possibility of adjusting maximum frequency Enter the hand frequency in Hz, at wh hand frequency | pump. This feature g g the pump speed ca :25Hz pump. This feature g g the pump speed ca :50Hz ich the respective m :35Hz | ives you the option to enter the minimum frequency of the pump for n be limited. - 1Hz - 200Hz gives you the option to enter the maximum frequency of the pump for n be limited. - 1Hz - 650Hz lotor is to be made manually. - 1Hz - 650Hz |
| Enter the fixed frequency value in Hz Fix frequency | at which the respect :45Hz | tive motor is to be driven - 1Hz - 650Hz |
| Enter the water deficiency function. 1 4 = pressure monitoring in%, 5 = elec Control monitor 1 = Control monitor is off, sen 2 = Control monitor is off, sen 3 = Control monitor on electro 4 = Control monitor on pressu 5 = Control monitor on electro 6 = Control monitor on electro | = all off, 2 = sensor tronic dry run protect :1 sor monitoring is o sor monitoring / dr onic dry run protect tre is low in%. (1- 1 onic dry run protect onic dry run protect | <pre>monitoring a, 3 = electronic dry run protection, etion + pressure monitoring in% - 1 - 6 ff, dry-running monitoring is Off ry running (<0.1 bar) (10s) tion (<0.5 bar) (20s) 00%) (40s) tion (<0.5 bar) + pressure low in%. (1- 100%) tion (<0.5 bar) + pressure low in%. (1- 100%) inactive in Manuel mode</pre> |
| Enter the deviation in% for the pressu deviation | re is low. This value :50% | monitors the actual pressure on deviation.0-100% |
| Enter the guard time delay until the pr guard time | essure drop is swite :180s | hed off. - 0- 999s |
| Specify the function for the digital inperiod external on / off | out 1. Attention ! A :0 | utomatic restart. - 1 = closer / 0 = opener |
| Specify the function for the digital inpective external alarm | out 2. Attention ! Re: :0 | estart only after reset. - 1 = closer / 0 = opener |
| Enter the direction of rotation of the p rotating | ump (in). Power pha | ase does not matter! - 0 = right / 1= left |
| Enter the Acceleration time of the pur accelerate | np (s). Recommenda :03,0s | ation: 1-3 seconds. - 0,01s - 99,9s / only manual operation |
| Enter the deceleration time of the pun decelerate | np (s). Recommenda :05,0s | tion: 2-10 seconds. - 0,01s - 99,9s / only manual operation |
| Enter the motor rated current of the parated current | ump (s). Data: See n :xxx,0A | ameplate. - 0,01A - 199,9A |
| Enter the time limit for the delay of th limit time | e shutdown at "null :00:10 | set" a. - 00:00 - 99:59 min |
| Enter the bridging time for bridging th Bridge time | ne lower pressure mo :10:00 | onitor. - 00:00 - 99:59 min |
| Enter the expiration time (egg timer) t Expiration time | to a plant shutdown. :00:00 | - 00:00 - 99:59 Std. |

12. mode "Vacuum" (7)

The system is set to "vacuum regulator" (7).

Change operating mode via MODE". (see basic menu)



Change / save values

SET SET MODE

Exit menu



Now Press "Down arrow" key until parameters appear

Menu 1x set point

| 4x set point |
|--------------|
| VacuumPat |

| VacuumParameter | | VacuumParameter | |
|-------------------|--------|-------------------|--------|
| Setpoint | : 500 | Setpoint 1 | : 500 |
| Hold frequency | : 35,0 | Setpoint 2 | : 475 |
| a value tolerance | : 01,0 | Setpoint 3 | : 450 |
| minimum frequency | : 20,0 | Setpoint 4 | : 425 |
| maximum frequency | : 50,0 | Hold frequency | : 35,0 |
| hand frequency | : 40,0 | a value tolerance | : 01,0 |
| setpoints 1/4 | : 0 | minimum frequency | : 20,0 |
| control monitor | : 0 | maximum frequency | : 50,0 |
| deviation | : 50 | hand frequency | : 40,0 |
| guard time | : 180 | setpoints 1/4 | : 0 |
| number of starts | : 0 | control monitor | : 0 |
| maximum runtime | : 0 | deviation | : 50 |
| external on / off | : 0 | guard time | : 180 |
| external delay on | : 3 | number of starts | : 0 |
| external alarm | : 1 | maximum runtime | : 0 |
| autostart | : 0 | external on / off | : 0 |
| autoreset | : 0 | external delay on | : 3 |
| rotating | : 0 | external alarm | :1 |
| accelerate | : 01,0 | autostart | : 0 |
| decelerate | : 01,0 | autoreset | : 0 |
| P-controller | : 0,40 | rotating | : 0 |
| I-controller | : 00,1 | accelerate | : 01,0 |
| rated current | : 09,0 | decelerate | : 01,0 |
| | | P-controller | : 0,40 |
| | | I-controller | : 00,1 |
| | | rated current | : 09,0 |
| | | | |



Set vacuum controller parameters

| set point | :500mbar | - 010mbar - xxx mbar |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enter the global holding frequence Hold frequency | ey for the minimum spo :35Hz | eed. - 1Hz - 200Hz |
| Enter the control tolerance for the a value tolerance | e PID - a regulation. :1% | - 1% - 10% |
| Enter the minimum frequency of operation. This possibility of adju minimum frequency | the pump. This feature sting the pump speed :25Hz | e gives you the option to enter the minimum frequency of the pump for can be limited. - 1Hz - 200Hz |
| Enter the maximum frequency of operation. This possibility of adju maximum frequency | the pump. This feature the pump speed :50Hz | e gives you the option to enter the maximum frequency of the pump for can be limited. - 1Hz - 650Hz |
| Enter the hand frequency in Hz, a hand frequency | t which the respective :35Hz | motor is to be made manually. - 1Hz - 650Hz |
| Enter the number of set points the set points 1/4 :0 | e system should work v - $0 = 1$ | with. (Only available in menu 1) set point, $1 = 4$ set points (dig. input 3+4) |
| Enter the water deficiency functio 4 = pressure monitoring in%, 5 = control monitor function 1 = low pressure is off, sen 2 = low pressure is off, sen 3 = low pressure on electron 4 = low pressure on pressure 5 = low pressure on electron 6 = low pressure on electron | on. 1 = All Off, 2 = sen electronic dry run prov :1 sor monitoring is off sor monitoring / dry onic dry run protectio ire is low in%. (1- 10) onic dry run protectio onic dry run protectio | hsor monitoring a, 3 = electronic dry run protection, tection + pressure monitoring in% - 1 - 6 C, dry-running monitoring is Off running (<0.1 bar) (10s) on (<0.5 bar) (20s) 0%) (40s) on (<0.5 bar) + pressure is low in%. (1- 100%) on (<0.5 bar) + pressure is low in%. (1- 100%) inactive in Manuel mode |
| Enter the deviation in% for the pr Control monitor | essure is low. This val :50% | ue monitors the actual pressure on deviation. - 0- 100% |
| Enter the guard time delay until the | he pressure drop is swi | itched off. |
| guard time | :180s | - 0- 999s |
| guard time Enter the number of starts. The conumber of starts | :180s ontroller can restart, x :0 | - 0- 999s times in 60 min . - 1- 99 = Ein, 0 = Aus |
| guard time Enter the number of starts. The conumber of starts Enter the number of starts. The comaximum runtime | :180s ontroller can restart, x :0 ontroller can restart, x :0 | - 0- 999s times in 60 min . - 1- 99 = Ein, 0 = Aus times in 60 min . - 1- 999 = Ein, 0 = Aus |
| guard time Enter the number of starts. The conumber of starts Enter the number of starts. The comaximum runtime Specify the function for the digitatexternal on / off | :180s ontroller can restart, x :0 ontroller can restart, x :0 al input 1. Attention ! :0 | - 0- 999s times in 60 min. - 1- 99 = Ein, 0 = Aus times in 60 min. - 1- 999 = Ein, 0 = Aus Automatic restart. - 1 = closer / 0 = opener |
| guard time Enter the number of starts. The conumber of starts Enter the number of starts. The comaximum runtime Specify the function for the digitatexternal on / off Specify the function for the digitatexternal alarm | :180s ontroller can restart, x :0 ontroller can restart, x :0 al input 1. Attention ! :0 al input 2. Attention ! :0 | - 0- 999s times in 60 min. - 1- 99 = Ein, 0 = Aus times in 60 min. - 1- 999 = Ein, 0 = Aus Automatic restart. - 1 = closer / 0 = opener Restart only after reset. - 1 = closer / 0 = opener |
| guard time Enter the number of starts. The conumber of starts Enter the number of starts. The comaximum runtime Specify the function for the digitatexternal on / off Specify the function for the digitatexternal alarm Specify the function for the starturation autostart | :180s ontroller can restart, x :0 ontroller can restart, x :0 al input 1. Attention ! :0 al input 2. Attention ! :0 up to "power on". :0 | - 0- 999s times in 60 min. - 1- 99 = Ein, 0 = Aus times in 60 min. - 1- 999 = Ein, 0 = Aus Automatic restart. - 1 = closer / 0 = opener Restart only after reset. - 1 = closer / 0 = opener - 1 = on / 0 = off |
| guard time Enter the number of starts. The conumber of starts Enter the number of starts. The comaximum runtime Specify the function for the digitatexternal on / off Specify the function for the digitatexternal alarm Specify the function for the startuautostart Select the Reset to function. At fate auto-reset can only be selected to auto-reset | :180s ontroller can restart, x :0 ontroller can restart, x :0 al input 1. Attention ! :0 al input 2. Attention ! :0 up to "power on". :0 uult is automatically tri gether with Autostart! :0 | - 0- 999s times in 60 min. - 1- 99 = Ein, 0 = Aus times in 60 min. - 1- 999 = Ein, 0 = Aus Automatic restart. - 1 = closer / 0 = opener Restart only after reset. - 1 = closer / 0 = opener - 1 = on / 0 = off ted calling 3 times in 20 minutes, again. - 1 = on / 0 = off |
| guard time Enter the number of starts. The conumber of starts Enter the number of starts. The comaximum runtime Specify the function for the digitatexternal on / off Specify the function for the digitatexternal alarm Specify the function for the startuautostart Select the Reset to function. At fate auto-reset can only be selected to auto-reset Enter the direction of rotation of the startuautostart | :180s ontroller can restart, x : :0 ontroller can restart, x : :0 al input 1. Attention ! :0 al input 2. Attention ! :0 :0 :0 :0 :0 :0 :0 :0 :0 :0 | - 0- 999s times in 60 min. - 1- 99 = Ein, 0 = Aus times in 60 min. - 1- 999 = Ein, 0 = Aus Automatic restart. - 1 = closer / 0 = opener Restart only after reset. - 1 = closer / 0 = opener - 1 = closer / 0 = off ted calling 3 times in 20 minutes, again. - 1 = on / 0 = off bhase does not matter! - 0 = right / 1 = left |
| guard time Enter the number of starts. The conumber of starts Enter the number of starts. The commaximum runtime Specify the function for the digitatexternal on / off Specify the function for the digitatexternal alarm Specify the function for the digitatexternal alarm Specify the function for the startuate autostart Select the Reset to function. At fate auto-reset can only be selected to auto-reset Enter the direction of rotation of the rotating Enter the Acceleration time of the accelerate Enter the deceleration time of the decelerate Enter the P gain of the pressure con P-controller Enter the integration time of the pressure constrained to the pressure constrained | :180s ontroller can restart, x : :0 ontroller can restart, x : :0 al input 1. Attention ! :0 al input 2. Attention ! :0 :0 :0 :0 :0 :0 :0 :0 :0 :0 | - $0 - 999s$ times in 60 min. - $1 - 99 = Ein, 0 = Aus$ times in 60 min. - $1 - 999 = Ein, 0 = Aus$ Automatic restart. - $1 = closer / 0 = opener$ Restart only after reset. - $1 = closer / 0 = opener$ - $1 = on / 0 = off$ ted calling 3 times in 20 minutes, again. - $1 = on / 0 = off$ bhase does not matter! - $0 = right / 1 = left$ bhase does not matter! - $0 = right / 1 = left$ hdation: 1-3 seconds. - $0,01s - 99,9s / only manual operation dation: 2-10 seconds 0,01s - 99,9s / only manual operation- 0,01s - 99,9s / only manual operation$ |

Vacuum Boost Function

The boost function is designed for faster start-up to full vacuum. In plastic processing on extenders, the work process is supported.

Boost function on / off switching

The system must be active in automatic mode.

Press the **FUN** "FUN" key for 2 sec. The controller now works at maximum power.

Boost active !

A: -150 mbar S: -155 mbar Boost AUTO : 50Hz 009,0A



"FUN" key for 2 sec. The controller is now working in control mode.

Boost inactive !

A: -150 mbar S: -155 mbar AUTO : 38Hz 007,0A



"" "Stop" button also turns off the boost function.

13. Construction of a vacuum control 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!

| 1 flow direction | 5 back flow preventer |
|------------------|-----------------------|
| 2 regulator | 6 vacuum sensor |
| 3 Motor | |
| 4 pump | |

Examples:





DC

| example | SET | 00 | (if necessary) |
|----------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| MotorParameterFix-frequency 1: 20,0Fix-frequency 2: 30,0 | MotorParameterFix-frequency 1: 20,0Fix-frequency 2: 30,0 | MotorParameterFix-frequency 1: 20,0Fix-frequency 2: 30,0 | MotorParameterFix-frequency 1: 20,0Fix-frequency 2: 30,0 |
| 00 | SET | | |
| MotorParameterFix-frequency 1: 25,0Fix-frequency 2: 30,0 | MotorParameter Fix-frequency 1 : 25,0 Fix-frequency 2 : 30,0 | | |

Set motor parameters

| Enter the start command for the contro start command | l motor. :0 | -0 = keypad start, $1 =$ external start, |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------|
| Enter the set point specification for the set point selection | control motor :0 | - 0 =direct frequency 1=analog 10V, 2=analog mA, 4=Fix-frequency1-4 |
| Enter the minimum set point in%. With Minimum setpoint | this setting the eng :20% | gine speed will be limited. - 0-50% |
| Enter the maximum set point in%. With Maximum set point | h this setting the en :100% | gine speed will be limited. - 50-100% |
| Enter the reference values for the respective Fix-frequency 1-4 | ective fixed frequen :35Hz | cy in Hz at which the respective motor should work - 1Hz - 200Hz |
| Enter the desired value for the direct fr direct frequency | equency in Hz, at w :35Hz | which the respective motor is to operate. - 1Hz - 200Hz |
| Enter the minimum frequency. With th minimum frequency | is setting the engine :25Hz | e speed will be limited. - 0Hz - 200Hz |
| Enter the maximum frequency. With th maximum frequency | is setting the engine :50Hz | e speed will be limited - 1Hz - 650Hz |
| Enter the number of starts. The control number of starts | ler may restart x tin :0 | nes in 60 minutes. - 1- 99 = Ein, 0 = Aus |
| Specify the function for the digital inpuesternal on / off | ut 1. Attention ! Au :0 | - 1 = closer / 0 = opener |
| Enter the time of the switch-on delay for external delay on | or the digital input | "External On / Off". - 1s - 99s |
| Specify the function for the digital inpuesternal alarm | ut 2. Attention ! Re :0 | start only after reset. - 1 = closer / 0 = opener |
| Specify the function for the startup to ' autostart | 'power on". :0 | -1 = on / 0 = off |
| Select the Reset to function. At fault is Auto reset can only be selected togethe auto-reset | automatically tried er with Autostart! :0 | calling 3 times in 20 minutes , again. - $1 = \text{on} / 0 = \text{off}$ |
| Select the test run function. The engine Test run | e will then start brie :0 | fly every 1-99 hours. - 1 - 99h, 0 = off |
| Enter the direction of rotation of th rotating | e pump (in). Pow :0 | er phase does not matter! - 0 = right / 1= left |
| Enter the Acceleration time of the j accelerate | pump (s). Recomi :03,0s | nendation: 1-3 seconds. - 0,01s - 99,9s / only manual operation |
| Enter the deceleration time of the p decelerate | oump (s). Recomm :05,0s | nendation: 2-10 seconds. - 0,01s - 99,9s / only manual operation |
| Enter the motor rated current of the rated current | e pump (s). Data: :xxx,x A | See nameplate. - 0,01A - 199,9A |

15. Error messages





In the event of a fault, the control switches off and the pump (s) runs free. Error messages are acknowledged by pressing the STOP / RESET key for a longer time. The red LED lights up. The alarm relay switches.

Display examples:

| Error messages can be reset by pressing the "Stop" button. | | | | | |
|------------------------------------------------------------|------------------------------|------------------------------|--|--|--|
| 00,59 bar | 00,59 bar | 00,59 bar | | | |
| ER 004 STOP : 00Hz 000,0A | ER 101 STOP : 00Hz 000,0A | ER 103 STOP : 00Hz 000,0A | | | |

Inverter MA-FU

| 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 has been triggered. Digital input DI2 |
| 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 (AErr) 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 keynad (CE1) F930. Check setting on the FI operator part! |
| error Er067 | Motor overload (OC2) Motor protection tripping Reduce nump power Adjust motor protection! |
| error Er072 | Motor overload (OC2) Motor protection tripping. Reduce pump power Adjust motor protection |
| | . Motor overledd (002) Motor protection arpping. Reddoe puinp power, ragast motor protection. |
| Error messages pump | controller |
| error Fr102 | · Sensor 1 open. The sensor connection is open. Check cable connection! |
| error Fr103 | · Error sensor 1. The sensor value is out of tolerance. Sensor defect? |
| error Er104 | : Sansor 2 open. The sensor connection is open. Check cable connection! |
| error Er105 | Error songer 2. The senser value is out of telement. Songer defeat? |
| error Er106 | : Error sensor 2. The sensor value is out of toterancesensor defect? |
| error Er107 | . Ince |
| error Er109 | Error memory protocological protocological and the second of the second of the second |
| critici El 108 | Error of external drought protection has triggered. Check setting or water intert |
| error Er110 | Error dry nun avternally. The avternal dry nun protection has tripped. Check setting of water Infel! |
| | Error autobing. The existence of a grant and a strange of the second strange of the seco |
| entor Erily | Error switching. The switching frequency was exceeded; Ulock operation. Uneck check valves! |
| error Er120 | Error runtime. The maximum runtime has been exceeded; Leakage. Uneck check valves! |
| error Er122 | : Keypad too warm> 60 °. Call service! |



16. Expert mode

switch-off frequency

The switch-off frequency is the lowest operating frequency in the pressure control. If the switch-off frequency achieved waiting the pressure regulator the switch-off before the particular pump into "standby" position. The switch-off frequency should be adjusted so that just no longer promotes the respective pump. The delay time should be set so that does not get the pump in this operating point to vibrate.

This feature supports the zero flow cutoff.

zero flow shut-off

The zero flow shut-off ensures safe shutdown output "0".

The zero flow cutoff requires when setting some experience and detailed knowledge of the operation of the controller. If the system with the factory setting of zero flow cutoff does not operate satisfactorily, please contact your dealer or the manufacturer.

The **test phase**: 1 - 99% **50%** Recommendation: 50%. manipulates the desired pressure while the pump is operating to constantly check whether it delivers. The larger the test phase, the safer switches on the pump when pumping "0".

Expert knowledge is required for setting the system with test phase and cut-off frequency!

END of Menu

17. Construction scheme of a multi-pump system

| Slave Number | :1 | (MASTER Address: 101) | Slave Number | :2 | (MASTER Address: 102) |
|--------------|----|-----------------------|--------------|----|-----------------------|
| Slave Number | :3 | (MASTER Address: 103) | Slave Number | :4 | (MASTER Address: 104) |
| Slave Number | :5 | (MASTER Address: 105) | Slave Number | :6 | (MASTER Address: 106) |
| Slave Number | :7 | (MASTER Address: 107) | Slave Number | :8 | (MASTER Address: 108) |



| 2 MASTER | 6 Pressure Transc |
|----------|-------------------|
| 3 Motor | 7 Pressure vessel |

4 Pump 8.x controller

18. Operating mode "Multi" (3)



Setting multi mode parameters

emergency setpoint : 5,00

:1

: 40,0

emergency mode

distress frequency

Enter the slave address for the multi-operation. Attention! Only use each address once **Slave Number** ·1 -1-4

Enter the function for emergency operation. 1 = off, 2 = emergency frequency area code, 3 = emergency frequency with automatic start, 4 = emergency control with own sensor preselection, 5 = emergency control with own sensor with autostart. emergency mode ·1 - 1 - 5

Enter the distress frequency of the pump. This function gives you the possibility the pump with distress frequency to operate if the main controller. - 1Hz - 200Hz distress frequency :40Hz

Enter the emergency setpoint with which the system should work. This function gives you the option of operating the pump as a single controller in the event of a failure of the main controller. emergency setpoint :05,00bar - 0,01bar - xx,xx bar

Set multi parameters using the example of the slave address.



Status display in multi-operation mode Example Triple system in multi-mode with MASTER



Change / save values



· 2

3

19. Operating mode "frequency" (10)



Press "Stop" button.

Press and hold "MODE" button until the basic menu appears Now Set Mode 10.

| Basicsettings | Basicsettings | Basicsettings | Basicsettings |
|------------------------------|------------------------------|-------------------------------|-------------------------------|
| Language: 2Operating mode: 2 | Language: 2Operating mode: 2 | Language: 2Operating mode: 10 | Language: 2Operating mode: 10 |

In the operating mode "Frequency converter" you have full access to all original frequency inverter parameters. Now all parameters are directly adjustable. After power off / on, the frequency converter operation is invoked unchanged. If you change the works council, all required parameters of the new operating mode are set.



"FUN" button for 2 sec. And hold to exit the base.

Status displays in FU operation Example Stop mode or Run mode

| Inverter | Inverter | |
|----------|----------|-----|
| 00,0 Hz | 35,0 Hz | |
| 000,0 A | 007,2 A | |
| STOP | RUN | FUN |

inverter Parameter



Setting parameters in operating frequency



Setting the frequency parameter

Enter the value of parameter F 114. F114 = ramp (Example) F114 :10.0 - 0.01- 99.0 All other parameters can be found in the original operating instructions of the frequency inverter!

Select parameter

Change / save values

Exit menu

20. Adjust motor characteristic

Set PM synchronous motor

If the characteristic is set to "6", the motor data are opened in the menu. These must be entered exactly. After the input has been completed, the "calibration" must be carried out.

| 4 | Ņ | 7 |
|---------------------|---------|--------|
| Basi | csettin | gs |
| Characteristics : 6 | | |
| Motor power : 5,5 | | : 5,5 |
| Motor voltage : 400 | | : 400 |
| Motor current | | : 10,5 |
| Motor speed : 30 | | : 3000 |

Motor frequency

calibrating

Warning ! This input is important for optimal operation to ensure from the motor!

Caution !

This input is important to avoid motor damage!

Set the characteristic for the motor. When "6" is selected, the motor data must be entered. **Characteristics** :6 -2 = V/Hz- Asynchronous motor, 6 = PM- Synchronous motor

Enter the motor power. Data: See type plate. **Motor power** :xxx,x kW - 0,01s - 199,9kW

Enter the motor voltage. Data: See type plate. **Motor voltage** :xxxV - 1V - 500V

:100

:0

Enter the motor current. Data: See type plate. **Motor current** :xxx,x A - 0,01A - 199,9A

Enter the motor speed. Data: See type plate. **Motor speed** :3000n - 100n - 9999n

Enter the rated motor frequency. Data: See type plate. **Motor frequency** :xxxHz - 1Hz - 200Hz

Set "Measure" to "2" and then press the SET "Set" button.

The "calibration" is now carried out. This process takes some time. After successful calibration, the "calibrating" parameter is reset to "0". **calibrating** :0 -0 = calibrating off, 2 = calibrating on

END of Menu

21. Erase fault memory / starts / enter code

Enter code

Code eingeben !

(CODE 0174)

The code entry should be made once for the basic settings or for the menu. If "Lock" is set, a lock is shown on the display. The code must be entered for the basic setting or for the menu.

Read / clear fault memory

Display error memory

| Starts: RH: | 15 000 : 00 : 43 | 33° |
|----------------|----------------------------|------|
| E011 , 45 | Hz, 10,5A, 00,1 · ERR 2 | 5bar |

| SET) | "Set | "button | for 60 | sec. | Hold | to clear | the | memory | y. |
|------|------|---------|--------|------|------|----------|-----|--------|----|
| | | | | | | | | | |

| Starts: | 15 | 33° | | |
|---------|-----------|-----|--|--|
| RH: | 000:00:43 | | | |
| ERR 1 | | | | |
| ERR 2 - | - | | | |

22. Status of the LED displays on the display

| ALM | = | Alarm (fault) | permanent light |
|------|---|--------------------------|-----------------|
| ALM | = | Alarm (Guardian) | flash light |
| LOC | = | Control mode (local) | permanent light |
| REM | = | Multi mode (remote) | flash light |
| FWD | = | Clockwise (forward) | permanent light |
| REV | = | Anti-clockwise (reverse) | permanent light |
| FWD | = | forward (Standby) | flash light |
| REV | = | reverse (Standby) | flash light |
| STOP | = | Stop | permanent light |
| STOP | = | Standby / External off | flash light |

23. Wiring diagram pump controller



| Alarm relay TA - TB - TC: changeover contact: | Switches over at "Power on". In the event of a fault or "mains off", the relay. The contact is potential free. Load: 230V 1A maximum. |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| External on / off CM - DI1: | enable control via external potential-free contact. The input can be set as normally open or normally closed in the menu. |
| External alarm CM - DI2: | shutdown of the control via external potential-free contact. The input can be set as normally open or normally closed in the menu. |
| Set points CM - DI3: Switching CM and DI4: | Switching over the set points via external potential-free contact. The inputs can be set in the menu. |
| PTC monitor CM - DI5: | shutdown of the control via external thermistor (PTC). The input can be set in the menu. |
| External reset CM - DI6: | Reset the control via external potential-free contact. The input is active in the event of a fault. |
| Transducer 4-20mA: | connection to P24 and AI2. Scaling, offset and selection takes place in the basic menu. Factory setting: input active / 0-16bar. |
| Transducer 0-10V: | connection to P24, GND and AI1. Scaling, offset and selection takes place in the basic menu. Factory setting: input inactive / 0-16bar. |

Connection pressure transducer Danfoss MBS 3050:

Connect the sensor cable with M12x1 plug, 4-pin to the:

Cable brown (1) and black (4) connect. = + supply 24VDC = signal input 4-20mA (MARE - P24) (MARE - AI2)



24VDC 4-20mA Brown (1) Blue (3) Connection thread G1/4"

Connection pressure transducer Danfoss DST P140:

Connect the sensor cable with M12x1 plug, 4-pin to the:

Cablebrown (1)= + supply 24VDC(MARE - P24)andblue (3)= signal input 4-20mA(MARE - AI2)connect.

24. customer settings :

Date: _____