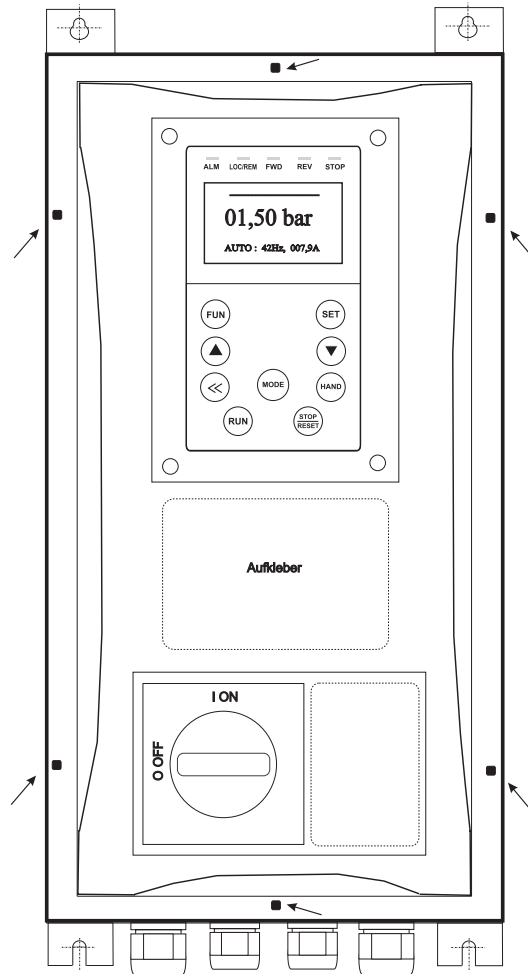


To connect:

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

Advantages of pump control

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

Design of the pump regulation

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

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 ° C to + 30 ° 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:

+ 5 ° C - + 30 ° 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

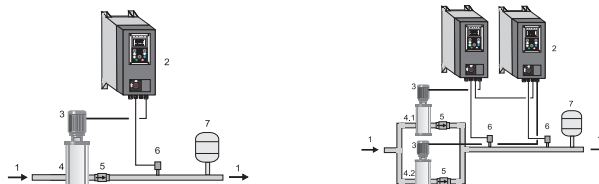
Construction of a pump system



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.

Examples:

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



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.

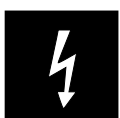
Alarm relay output pump controller

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.

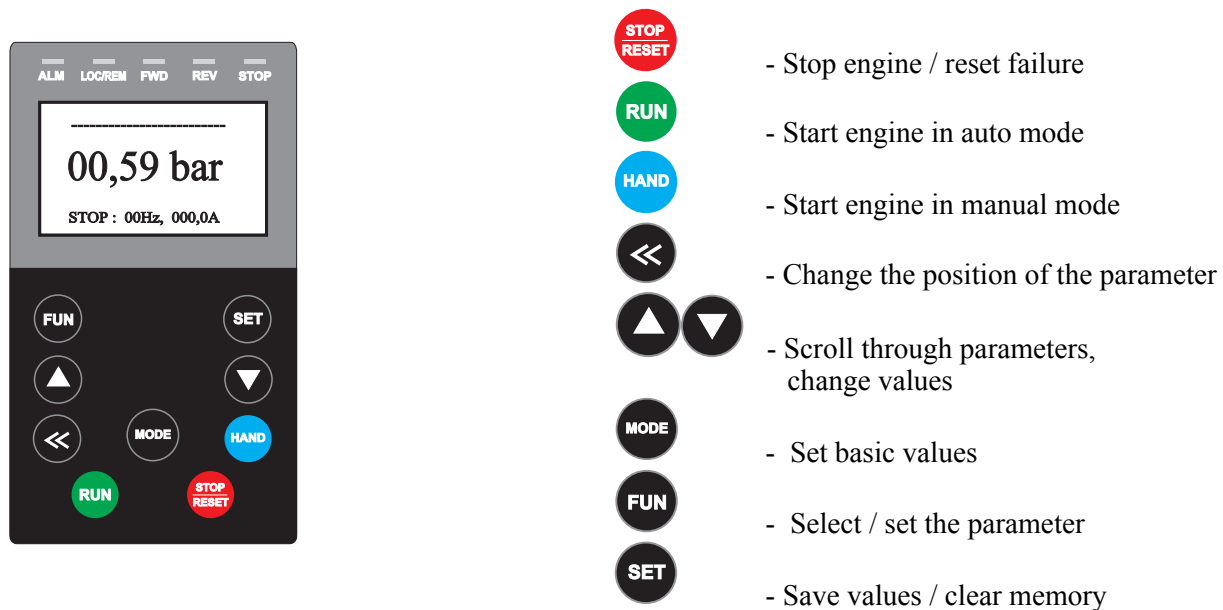
For controls with soft starter or contactor, the direction of rotation must be adjusted by reconnecting.

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 (HAND)

<p>-----</p> <p>35,0 Hz</p> <p>HAND 1,05bar 005,9A</p>	<p>-----</p> <p>00,0 Hz</p> <p>STOP 1,50bar 005,9A</p>	<p>-----</p> <p>A: 35,0 Hz S: 35,0 Hz</p> <p>HAND 1,05bar 005,9A</p>
---	---	--

Display „Motor poti“

Display in automatic mode (AUTO)

<p>-----</p> <p>01,50 bar</p> <p>STOP : 00Hz 000,0A</p>	<p>-----</p> <p>01,50 bar</p> <p>AUTO : 42Hz 007,9A</p>	<p>-----</p> <p>01,50 bar</p> <p>STANDBY AUTO : 42Hz 007,9A</p>	<p>-----</p> <p>A: 01,36 bar S: 01,50 bar</p> <p>AUTO : 42Hz 007,0A</p>
--	--	--	---

Display „Motor poti“

Display with analogue monitor

<p>-----</p> <p>A: 01,50 bar W: 44.0 %</p> <p>AUTO : 42Hz 007,0A</p>
--

Dynamic setpoint active

<p>A: 11,75 bar W: 01,25 bar</p> <p>SW: 10.50 AUTO : 42Hz 007,0A</p>
--

Operate system with manual or automatic mode

Select automatic operation

RUN Auto mode „Run“ ----- 01,50 bar AUTO : 42Hz 007,9A	STOP RESET Auto mode „Stop“ ----- 00,59 bar STOP : 00Hz 000,0A	HAND Manual mode „Hand“ ----- 35,0 Hz HAND 1,50bar 005,9A
--	--	---

Select manual mode

HAND Manual mode „Hand“ ----- 35,0 Hz HAND 1,50bar 005,9A	STOP RESET Manual mode „Stop“ ----- 00,0 Hz HAND 0,58bar 000,0A	RUN Auto mode „Run“ ----- 01,50 bar AUTO : 42Hz 007,9A
---	---	--

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 set point with "Motor poti" in automatic mode

SET "Motor poti" select ----- A: 00,50 bar S: 01,50 bar AUTO : 42Hz 007,9A	▲ ▼ Setting values ----- A: 00,50 bar S: 01,55 bar STOP : 00Hz 000,0A	SET store values ----- A: 01,50 bar S: 01,55 bar HAND 1,50bar 005,9A
---	--	--

Set manual frequency with "Motor poti"

SET "Motor poti" select ----- A: 00,0 Hz S: 33,0 Hz HAND 1,50bar 005,9A	▲ ▼ Setting values ----- A: 00,0 Hz S: 36,0 Hz HAND 0,58bar 000,0A	SET store values ----- A: 36,0 Hz S: 36,0 Hz AUTO : 42Hz 007,9A
--	---	---

6. Mode "Pump controller" (1)

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

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

Select parameter



Change / save values



Exit menu



At power-up, the controller initializes.

Initialization display

```

MAT ▲▼
V1.xx (xx.x) SN. 00001
Init ...
FU-SW. 1.xx
    
```

Main display

```

-----
A: 00,22 bar
S: 01,50 bar
STOP : 00Hz 000,0A
    
```

Display Status - Error memory

```

Starts:      15    25°
RH:         000 : 00 : 43
E011, 45Hz, 10,5A, 00,15bar
-- ERR 2 --
    
```

Now Press "Down arrow"  key until parameters appear

Menu 1x set point

```

-----Controller--Settings-----
set point           : 8,00
start difference    : 0,51
testing phase       : 50
stop frequency      : 35,0
overrun time        : 05,0
starting delay      : 05,0
a value tolerance   : 01,0
minimum frequency   : 20,0
maximum frequency   : 50,0
hand frequency      : 40,0
setpoints 1/4       : 0
control monitor     : 0
deviation           : 50
guard time          : 180
number of starts    : 0
maximum runtime     : 0
external on / off    : 0
external delay on    : 3
external alarm       : 1
autostart           : 0
autoreset           : 0
test run            : 0
rotating            : 0
accelerate           : 02,0
decelerate          : 03,0
P-controller        : 0,30
I-controller        : 00,3
rated current        : 09,0
analog Guardian limit : 90 %
analog Guardian on   : 40 %
analog Guardian off  : 20 %
    
```

4x set point

```

-----Controller--Settings-----
set point           : 8,00
set point 2         : 8,40
set point 3         : 8,80
set point 4         : 9,20
start difference    : 0,51
testing phase       : 50
stop frequency      : 35,0
overrun time        : 05,0
starting delay      : 05,0
a value tolerance   : 01,0
minimum frequency   : 20,0
maximum frequency   : 50,0
hand frequency      : 40,0
setpoints 1/4       : 0
control monitor     : 0
deviation           : 50
guard time          : 180
number of starts    : 0
maximum runtime     : 0
external on / off    : 0
external delay on    : 3
external alarm       : 1
autostart           : 0
autoreset           : 0
test run            : 0
rotating            : 0
accelerate           : 02,0
decelerate          : 03,0
P-controller        : 0,30
I-controller        : 00,3
rated current        : 09,0
analog Guardian limit : 90 %
analog Guardian on   : 40 %
analog Guardian off  : 20 %
    
```

example



(if necessary)

```

--Controller--Parameter---
set point           : 4,00
Start difference     : 0,50
    
```

```

--Controller--Parameter---
set point           : 4,00
Start difference     : 0,50
    
```

```

--Controller--Parameter---
set point           : 4,00
Start difference     : 0,50
    
```

```

--Controller--Parameter---
set point           : 4,00
Start difference     : 0,50
    
```



```

--Controller--Parameter---
set point           : 4,60
Start difference     : 0,50
    
```

```

--Controller--Parameter---
set point           : 4,60
Start difference     : 0,50
    
```

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.

Start difference :00,50bar - 0,01bar - xx,xx bar

Enter the verification phase for zero amounts shutdown a. Recommendation: 50%. See also "zero flow cutoff"

testing phase :90% - 1% - 200% = 0,1- 2,00bar absolute

Enter the global stop frequency for zero amounts shutdown.

stop frequency :35Hz - 1Hz - 200Hz

Enter the overrun time of the follow-up time for zero amounts shutdown.

overrun time :5s - 1s - 99s

Enter the time of Starting delay for the restart after "Standby"

starting delay :5s - 1s - 99s

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.

minimum frequency :25Hz - 1Hz - 200Hz

Enter the maximum frequency of the pump. This feature gives you the option to enter the maximum frequency of the pump for operation. This possibility of adjusting the pump speed can be limited.

maximum frequency :50Hz - 1Hz - 650Hz

Enter the hand frequency in Hz, at which the respective motor is to be made manually.

hand frequency :35Hz - 1Hz - 650Hz

Enter the number of set points the system should work with. (Only available in menu 1)

setpoint 1/4 :0 - 0 = 1 setpoint, 1 = 4 set points (dig. input 3+4)

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

1 = low pressure is off, sensor monitoring is off, dry-running monitoring is Off

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.

Control monitor :50% - 0- 100%

Enter the guard time delay until the pressure drop is switched off.

guard time :180s - 0- 999s

Enter the number of starts. The controller can restart, x times in 60 min.

number of starts :0 - 1- 99 = Ein, 0 = Aus

Enter the number of starts. The controller can restart, x times in 60 min.

maximum runtime :0 - 1- 999 = Ein, 0 = Aus

Specify the function for the digital input 1. Attention ! Automatic restart.

external on / off :0 - 1 = closer / 0 = opener

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.

external alarm :0 - 1 = closer / 0 = opener

Specify the function for the startup to "power on".

autostart :0 - 1 = on / 0 = off

Select the Reset to function. At fault is automatically tried calling 3 times in 20 minutes, again.

Auto reset can only be selected together with Autostart!

auto-reset :0 - 1 = on / 0 = off

Enter the direction of rotation of the pump (in). Power phase does not matter!

rotating :0 - 0 = right / 1 = left

Enter the Acceleration time of the pump (s). Recommendation: 1-3 seconds.

accelerate :03,0s - 0,01s - 99,9s / only manual operation

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.

P-controller :0,30 - 0,01 - 10,0

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!

Analog Guardian limit :90 % - 0- 100% Warning !

Analog Guardian on :40 % - 0- 100% Pump on

Analog Guardian off :20 % - 0- 50% Pump off

7. Basic Menu



Press "Stop" button.



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

Select parameter



Change / save values

Exit menu

-----Basic--settings-----	-----Basic--settings-----	-----Basic--settings-----	-----Basic--settings-----
language : 1	language : 1	language : 2	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 = on

Enter the keypad function for safe operation.

If the set value is greater than 0, the drive is stopped when the keypad is disconnected (safe operation).

Keypad :0 - 0 - 30s

Enter the time for the display backlight. 0 = off; 100 = permanent light

Light :99 - 0 - 100

Function for locking parameters. „Code 174“. Disable "1" the setpoint is still active. Lock "2" everything is locked.

Lock / Unlock :0 - 0 = OFF / 1 = a single / 2 = an all

Analog Guardian :0 - 0 - 5 analog guard on. Monitors the second analog input.



- 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.

rated frequency :50Hz - 1Hz - 650Hz

The parameter must be switched on when operating with a sine filter.

carrier frequency :5000Hz - 2000Hz - 9999Hz

Enter the clock frequency of the pump(s). Low clock frequencies cause higher engine noise..

sine filter : 1 - 0 = on , 1 = off

Enter the frequency in Hz for the test threshold of the test phase. This frequency is added to the stop frequency.

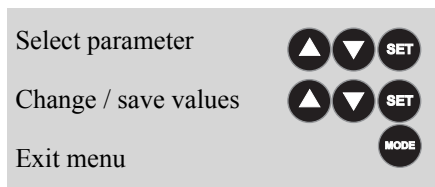
The test phase is switched off above this frequency. e.g. : stop frequency = 35Hz + 5Hz = 40Hz> off.

Test threshold (Hz) :10Hz - 1Hz - 25Hz

8. Mode "chain" (2)

The system is set to "chain" (2).

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

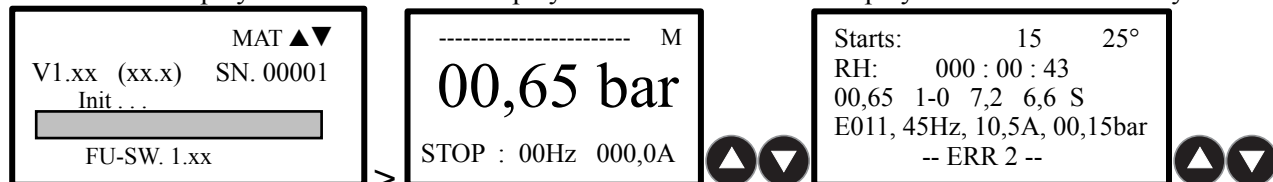


At power-up, the controller initializes.

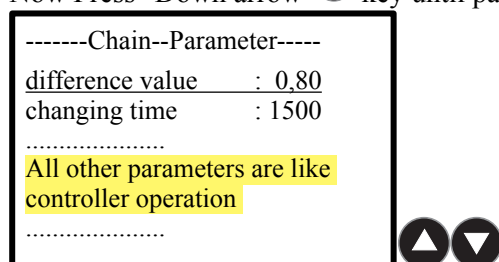
Initialization display

Main display

Display Status - Error memory



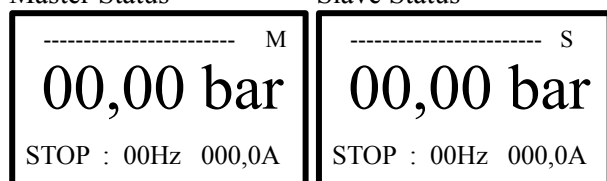
Now Press "Down arrow" key until parameters appear



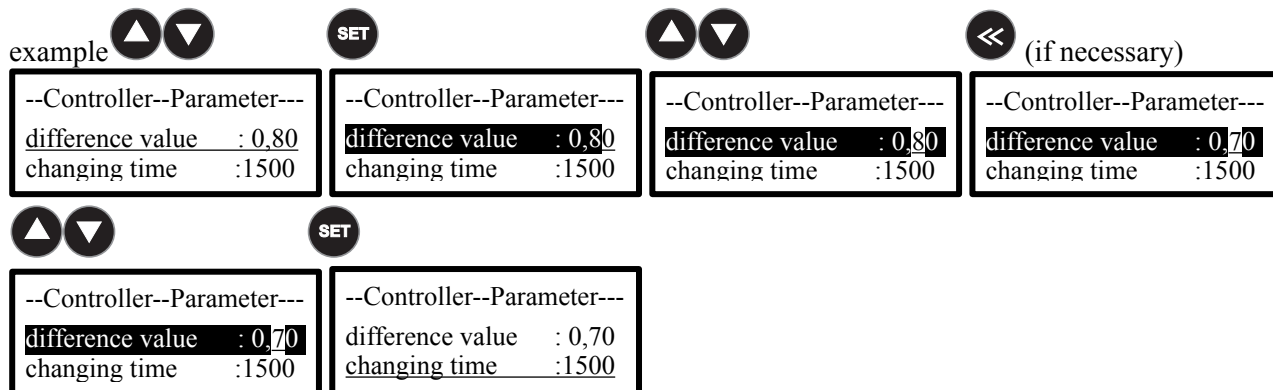
Displays in automatic mode

Master Status

Slave Status



example



Setting parameters chains

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)

9. mode "HD controller" (high pressure) (4)

The system is set to "HD controller" (4).

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

Select parameter



Change / save values

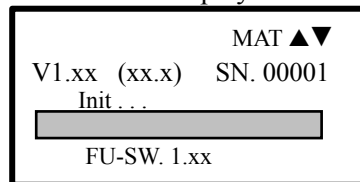


Exit menu

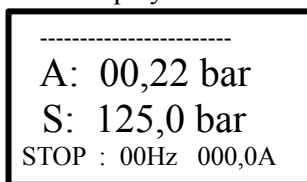


At power-up, the controller initializes.

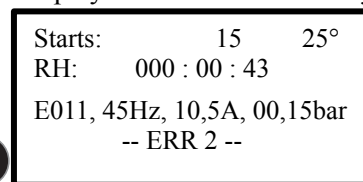
Initialization display



Main display

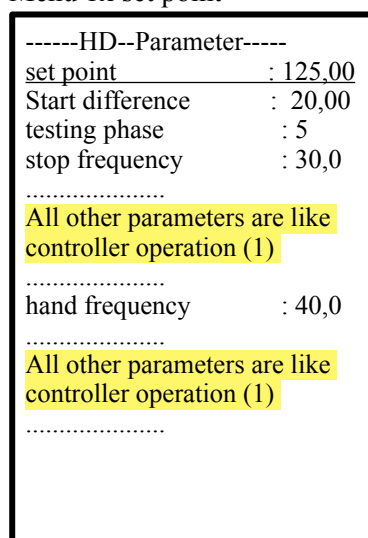


Display Status - Error memory

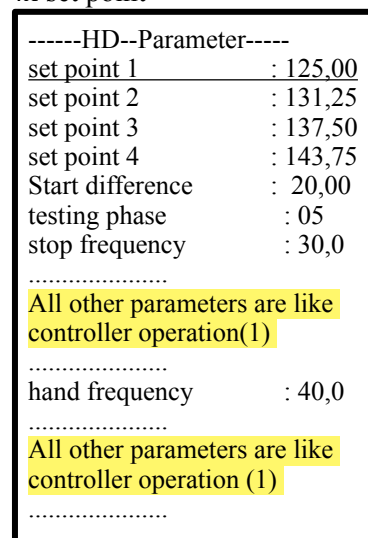


Now Press "Down arrow"  key until parameters appear

Menu 1x set point



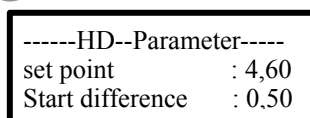
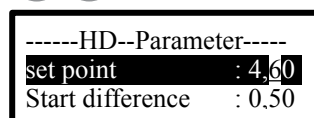
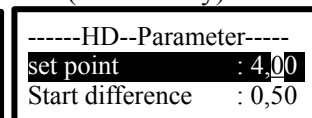
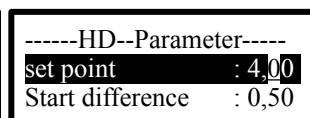
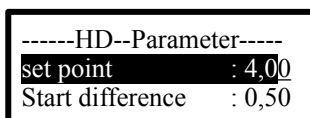
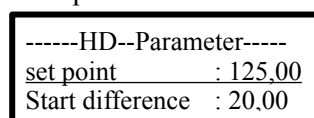
4x set point



example



(if necessary)



HD-Controller Settings

Enter the set point, at which the system should operate.

set point :125,00bar - 0,01bar - xx,xx bar

Enter 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

Enter the global stop frequency for zero amounts shutdown.

stop frequency :30Hz - 1Hz - 200Hz

Enter the hand frequency in Hz, at which the respective motor is to be made manually.

hand frequency :40Hz - 1Hz - 650Hz

10. Mode „limit controller“ (5)

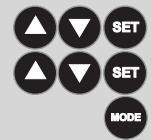
The system is set to "Limit controller" (5).

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

Select parameter

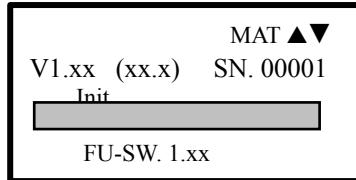
Change / save values

Exit menu

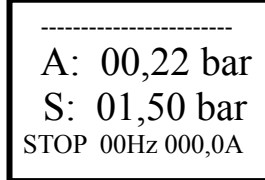


At power-up, the controller initializes.

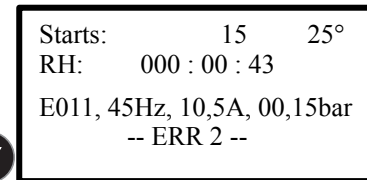
Initialization display



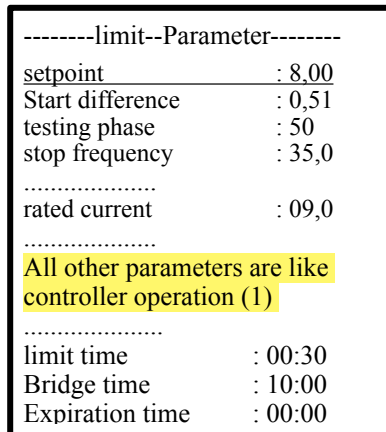
Main display



Display Status - Error memory



Now Press "Down arrow"  key until parameters appear



Displays in automatic mode

inactive



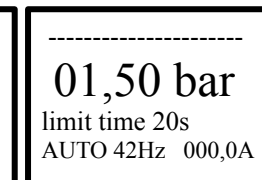
Bridge time



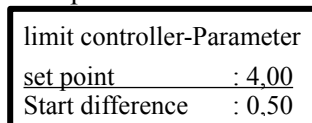
active Fill active



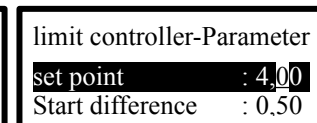
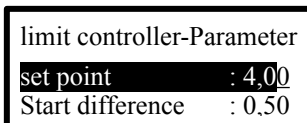
Limit time active



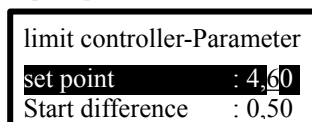
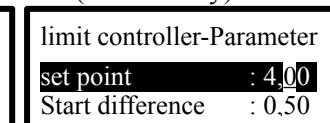
example



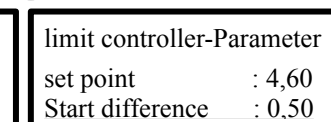
SET



(if necessary)



SET



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 switch“ (6)

The system is set to "limit switch" (6).

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

Select parameter



Change / save values



Exit menu

MODE

At power-up, the controller initializes..

Initialization display

MAT ▲▼

V1.xx (xx.x) SN. 00001

Init ...

FU-SW. 1.xx

Main display

35,0Hz OG 8,00

UG 2,00

STOP 00Hz 000,0A

Display Status - Error memory

Starts: 15 25°

RH: 000 : 00 : 43

E011, 45Hz, 10,5A, 00,15bar

-- ERR 2 --

Now Press "Down arrow" **▼** key until parameters appear

---- Limit switch - Parameter ----

Upper limit : 12,50

U-test value : 0,00

Lower limit : 3,20

L-test value : 0,00

minimum frequency : 25,0

maximum frequency : 50,0

hand frequency : 40,0

Fix frequency : 45,0

Control monitor : 1

deviation : 50

guard time : 180

external on / off : 0

external alarm : 1

rotating : 0

accelerate : 02,0

decelerate : 03,0

rated current : 09,0

limit time : 00:30

Bridge time : 10:00

Expiration time : 00:00

Displays in automatic mode

inactive

35,0Hz OG 8,00

UG 2,00

STOP 00Hz 000,0A

Bridge time

35,0Hz OG 8,00

UG 2,00

Bridge time 60 min

AUTO 42Hz 007,9A

active Fill active

35,0Hz OG 8,00

UG 2,00

fill 9 min

AUTO 42Hz 000,0A

Limit time active

35,0Hz OG 8,00

UG 2,00

limit time 20s

AUTO 42Hz 000,0A

example



(if necessary)

Limit switch - Parameter

Upper limit : 4,00

U-test value : 0,50

Limit switch - Parameter

Upper limit : 4,00

U-test value : 0,50

Limit switch - Parameter

Upper limit : 4,00

U-test value : 0,50

Limit switch - Parameter

Upper limit : 4,00

U-test value : 0,50



Limit switch - Parameter

Upper limit : 4,60

U-test value : 0,50

Limit switch - Parameter

Upper limit : 4,60

U-test value : 0,50

Set the limit switch parameters

Enter the upper limit value at which the system is to switch off.

Upper limit :12,50bar - 0,01bar - xx.xx bar

Enter the upper test value with which the upper limit value is to be calculated.

U-test value :00,00bar - 0,00bar - xx.xx bar

Enter the lower limit value at which the system is to switch off.

Lower limit :03,20bar - 0,01bar - xx.xx bar

Enter the lower test value with which the lower limit value is to be calculated.

L-test value :00,00bar - 0,01bar - xx.xx bar

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.

minimum frequency :25Hz - 1Hz - 200Hz

Enter the maximum frequency of the pump. This feature gives you the option to enter the maximum frequency of the pump for operation. This possibility of adjusting the pump speed can be limited.

maximum frequency :50Hz - 1Hz - 650Hz

Enter the hand frequency in Hz, at which the respective motor is to be made manually.

hand frequency :35Hz - 1Hz - 650Hz

Enter the fixed frequency value in Hz at which the respective motor is to be driven..

Fix frequency :45Hz - 1Hz - 650Hz

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 :1 - 1 - 6

1 = Control monitor is off, sensor monitoring is off, dry-running monitoring is Off

2 = Control monitor is off, sensor monitoring / dry running (<0.1 bar) (10s)

3 = Control monitor on electronic dry run protection (<0.5 bar) (20s)

4 = Control monitor on pressure is low in%. (1- 100%) (40s)

5 = Control monitor on electronic dry run protection (<0.5 bar) + pressure low in%. (1- 100%)

6 = Control monitor on electronic dry run protection (<0.5 bar) + pressure 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.

deviation :50% - 0- 100%

Enter the guard time delay until the pressure drop is switched off.

guard time :180s - 0- 999s

Specify the function for the digital input 1. Attention ! Automatic restart.

external on / off :0 - 1 = closer / 0 = opener

Specify the function for the digital input 2. Attention ! Restart only after reset.

external alarm :0 - 1 = closer / 0 = opener

Enter the direction of rotation of the pump (in). Power phase does not matter!

rotating :0 - 0 = right / 1= left

Enter the Acceleration time of the pump (s). Recommendation: 1-3 seconds.

accelerate :03,0s - 0,01s - 99,9s / only manual operation

Enter the deceleration time of the pump (s). Recommendation: 2-10 seconds.

decelerate :05,0s - 0,01s - 99,9s / only manual operation

Enter the motor rated current of the pump (s). Data: See nameplate.

rated current :xxx,0A - 0,01A - 199,9A

Enter the 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.

12. mode "Vacuum" (7)

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

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

Select parameter



Change / save values



Exit menu



At power-up, the controller initializes.

Initialization display

```

MAT ▲▼
V1.xx (xx.x) SN. 00001
Init . . .
FU-SW. 1.xx
    
```

Main display

```

-----
A: -150 mbar
S: -155 mbar
STOP : 00Hz 000,0A
    
```

Display Status - Error memory

```

Starts:      15    25°
RH:         000 : 00 : 43
E011, 45Hz, 10,5A, 00,15bar
-- ERR 2 --
    
```

Now Press "Down arrow"  key until parameters appear

Menu 1x set point

```

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

4x set point

```

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

example



(if necessary)

```

---controller-Settings---
set point          : 400
Hold frequency     : 35,0
    
```

```

---controller-Settings---
set point          : 400
Hold frequency     : 35,0
    
```

```

---controller-Settings---
set point          : 400
Hold frequency     : 35,0
    
```

```

---controller-Settings---
set point          : 400
Hold frequency     : 35,0
    
```



```

---controller-Settings---
set point          : 460
Hold frequency     : 35,0
    
```

```

---controller-Settings---
set point          : 460
Hold frequency     : 35,0
    
```

Set vacuum controller parameters

Enter the set point, at which the system should operate.

set point :500mbar - 010mbar - xxx mbar

Enter the global holding frequency for the minimum speed.

Hold frequency :35Hz - 1Hz - 200Hz

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.

minimum frequency :25Hz - 1Hz - 200Hz

Enter the maximum frequency of the pump. This feature gives you the option to enter the maximum frequency of the pump for operation. This possibility of adjusting the pump speed can be limited.

maximum frequency :50Hz - 1Hz - 650Hz

Enter the hand frequency in Hz, at which the respective motor is to be made manually.

hand frequency :35Hz - 1Hz - 650Hz

Enter the number of set points the system should work with. (Only available in menu 1)

set points 1/4 :0 - 0 = 1 set point, 1 = 4 set points (dig. input 3+4)

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

1 = low pressure is off, sensor monitoring is off, dry-running monitoring is Off

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.

Control monitor :50% - 0- 100%

Enter the guard time delay until the pressure drop is switched off.

guard time :180s - 0- 999s

Enter the number of starts. The controller can restart, x times in 60 min.

number of starts :0 - 1- 99 = Ein, 0 = Aus

Enter the number of starts. The controller can restart, x times in 60 min.

maximum runtime :0 - 1- 999 = Ein, 0 = Aus

Specify the function for the digital input 1. Attention ! Automatic restart.

external on / off :0 - 1 = closer / 0 = opener

Specify the function for the digital input 2. Attention ! Restart only after reset.

external alarm :0 - 1 = closer / 0 = opener

Specify the function for the startup to "power on".

autostart :0 - 1 = on / 0 = off

Select the Reset to function. At fault is automatically tried calling 3 times in 20 minutes, again.

Auto reset can only be selected together with Autostart!

auto-reset :0 - 1 = on / 0 = off

Enter the direction of rotation of the pump (in). Power phase does not matter!

rotating :0 - 0 = right / 1 = left

Enter the Acceleration time of the pump (s). Recommendation: 1-3 seconds.

accelerate :03,0s - 0,01s - 99,9s / only manual operation

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.

P-controller :0,01 - 0,01 - 10,0

Enter the integration time of the pressure control.

I-controller :0,4s - 0,1s - 99,9s

Enter the motor rated current of the pump (s). Data: See nameplate.


rated current :xxx,0A - 0,01A - 199,9A

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" key for 2 sec. The controller now works at maximum power.

Boost active !

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

Press the  "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

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

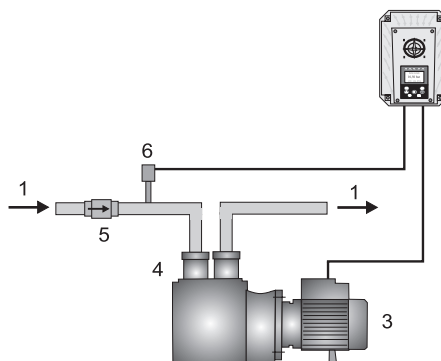
13. Construction of a vacuum control system



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:



14. Operating mode "Motor" (8)

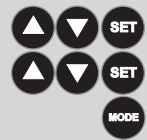
The system is set to "Motor" (8).

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

Select parameter

Change / save values

Exit menu



At power-up, the controller initializes.

Initialization display

MAT ▲▼

V1.xx (xx.x) SN. 00001

Init . . .

FU-SW. 1.xx

Main display

00,0 Hz

00,0 A

STOP Direkt

Display Status - Error memory

Starts: 15 25°

RH: 000 : 00 : 43

E011, 45Hz, 10,5A, 00,15bar

-- ERR 2 --

Example operation with fixed frequency

<p style="text-align: center;">-----</p> <p style="text-align: center;">00,0 Hz</p> <p style="text-align: center;">00,0 A</p> <p style="text-align: center;">STOP Fix 1</p>	<p style="text-align: center;">-----</p> <p style="text-align: center;">35,0 Hz</p> <p style="text-align: center;">07,2 A</p> <p style="text-align: center;">RUN Fix 1</p>	<p style="text-align: center;">-----</p> <p style="text-align: center;">00,0 Hz</p> <p style="text-align: center;">00,0 A</p> <p style="text-align: center;">Ext. Aus READY Fix 1</p>	<p style="text-align: center;">-----</p> <p style="text-align: center;">00,0 Hz</p> <p style="text-align: center;">00,0 A</p> <p style="text-align: center;">ER 011 Ext. Alarm STOP Fix 1</p>
---	--	---	---

Example operation with analog setpoint

<p style="text-align: center;">-----</p> <p style="text-align: center;">00,0 Hz</p> <p style="text-align: center;">00,0 A</p> <p style="text-align: center;">STOP Analog 1</p>	<p style="text-align: center;">-----</p> <p style="text-align: center;">35,0 Hz</p> <p style="text-align: center;">07,2 A</p> <p style="text-align: center;">RUN Analog 1</p>	<p style="text-align: center;">-----</p> <p style="text-align: center;">00,0 Hz</p> <p style="text-align: center;">00,0 A</p> <p style="text-align: center;">Ext. Aus READY Analog 1</p>	<p style="text-align: center;">-----</p> <p style="text-align: center;">00,0 Hz</p> <p style="text-align: center;">00,0 A</p> <p style="text-align: center;">ER 011 Ext. Alarm STOP Analog 1</p>
--	---	--	--

Example operation with direct frequency

<p style="text-align: center;">-----</p> <p style="text-align: center;">00,0 Hz</p> <p style="text-align: center;">00,0 A</p> <p style="text-align: center;">STOP direct</p>	<p style="text-align: center;">-----</p> <p style="text-align: center;">35,0 Hz</p> <p style="text-align: center;">07,2 A</p> <p style="text-align: center;">RUN direct</p>	<p style="text-align: center;">-----</p> <p style="text-align: center;">00,0 Hz</p> <p style="text-align: center;">00,0 A</p> <p style="text-align: center;">Ext. Aus READY direct</p>	<p style="text-align: center;">-----</p> <p style="text-align: center;">00,0 Hz</p> <p style="text-align: center;">00,0 A</p> <p style="text-align: center;">ER 011 Ext. Alarm STOP direct</p>
--	---	--	--

Now Press "Down arrow"  key until parameters appear.

direct frequency

----Motor--Parameter----

start command : 1

setpoint selection : 0

direct frequency : 40,0

min- frequency : 25,0

max- frequency : 50,0

number of starts : 0

external on / off : 1

external delay on : 3

external alarm : 1

autostart : 0

auto reset : 0

test run : 0

rotating : 0

accelerate : 02,0

decelerate : 03,0

rated current : 09,0

set point I1 (0-10V)

----Motor--Parameter----

start command : 0

set point selection : 1

Min- set point : 20

Max- setpoint : 100

min- frequency : 25,0

max- frequency : 50,0

number of starts : 0

external on / off : 1

external delay on : 3

external alarm : 1

autostart : 0

auto reset : 0

test run : 0

rotating : 0

accelerate : 02,0

decelerate : 03,0

rated current : 09,0

set point I2 (4-20mA)

----Motor--Parameter----

start command : 0

set point selection : 2

Min- set point : 20

Max- setpoint : 100

min- frequency : 25,0

max- frequency : 50,0

number of starts : 0

external on / off : 1

external delay on : 3

external alarm : 1

autostart : 0

auto reset : 0

test run : 0

rotating : 0

accelerate : 02,0

decelerate : 03,0

rated current : 09,0

fixed frequency 1-4

----Motor--Parameter----

start command : 0

set point selection : 4

Fix-frequency 1 : 25,0

Fix-frequency 2 : 30,0

Fix-frequency 3 : 38,0

Fix-frequency 4 : 50,0

min- frequency : 25,0

max- frequency : 50,0

number of starts : 0

external on / off : 1

external delay on : 3

external alarm : 1

autostart : 0

auto reset : 0

test run : 0

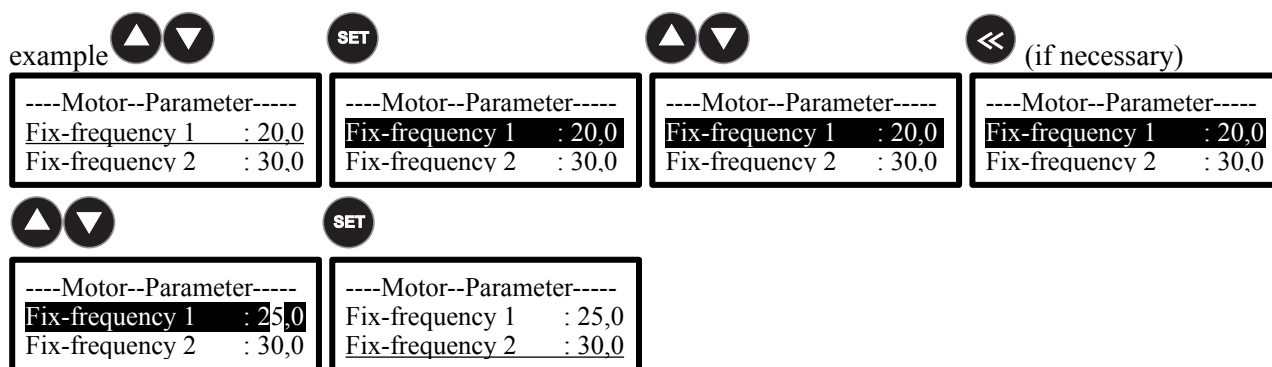
rotating : 0

accelerate : 02,0

decelerate : 03,0

rated current : 09,0





Set motor parameters

Enter the start command for the control motor.

start command :0 - 0 = keypad start, 1 = external start,

Enter the set point specification for the control motor

setpoint selection :0 - 0 =direct frequency 1=analog 10V, 2=analog mA, 4=Fix-frequency1-4

Enter the minimum set point in%. With this setting the engine speed will be limited.

Minimum setpoint :20% - 0-50%

Enter the maximum set point in%. With this setting the engine speed will be limited.

Maximum setpoint :100% - 50-100%

Enter the reference values for the respective fixed frequency in Hz at which the respective motor should work

Fix-frequency 1-4 :35Hz - 1Hz - 200Hz

Enter the desired value for the direct frequency in Hz, at which the respective motor is to operate.

direct frequency :35Hz - 1Hz - 200Hz

Enter the minimum frequency. With this setting the engine speed will be limited.

minimum frequency :25Hz - 0Hz - 200Hz

Enter the maximum frequency. With this setting the engine speed will be limited

maximum frequency :50Hz - 1Hz - 650Hz

Enter the number of starts. The controller may restart x times in 60 minutes.

number of starts :0 - 1- 99 = Ein, 0 = Aus

Specify the function for the digital input 1. Attention ! Automatic restart.

external on / off :0 - 1 = closer / 0 = opener

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.

external alarm :0 - 1 = closer / 0 = opener

Specify the function for the startup to "power on".

autostart :0 - 1 = on / 0 = off

Select the Reset to function. At fault is automatically tried calling **3 times in 20 minutes**, again.

Auto reset can only be selected together with Autostart!

auto-reset :0 - 1 = on / 0 = off

Select the test run function. The engine will then start briefly every 1-99 hours.

Test run :0 - 1 - 99h, 0 = off

Enter the direction of rotation of the pump (in). Power phase does not matter!

rotating :0 - 0 = right / 1 = left

Enter the Acceleration time of the pump (s). Recommendation: 1-3 seconds.

accelerate :03,0s - 0,01s - 99,9s / only manual operation

Enter the deceleration time of the pump (s). Recommendation: 2-10 seconds.

decelerate :05,0s - 0,01s - 99,9s / only manual operation

Enter the motor rated current of the pump (s). Data: See nameplate.

rated current :xxx,x A - 0,01A - 199,9A

15. Error messages

ALM LOC/REM FWD REV STOP



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 ER 004 STOP : 00Hz 000,0A	----- 00,59 bar ER 101 STOP : 00Hz 000,0A	----- 00,59 bar 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 (EEEE) Reset inverter! Call service!
error Er049	: Watchdog error (Em6) Check inverter settings! Call service!
error Er050	: Torque control error (?) Check inverter settings!
error Er053	: Communication error Check keypad (CE1) F930. Check setting on the FI operator part!
error Er067	: Motor overload (OC2) Motor protection tripping. Reduce pump power. Adjust motor protection!
error Er072	: Motor overload (OC2) Motor protection tripping. Reduce pump power. Adjust motor protection!

Error messages pump controller

error Er102	: Sensor 1 open. The sensor connection is open. Check cable connection!
error Er103	: Error sensor 1. The sensor value is out of tolerance. .Sensor defect?
error Er104	: Sensor 2 open. The sensor connection is open. Check cable connection!
error Er105	: Error sensor 2. The sensor value is out of tolerance. .Sensor defect?
error Er106	: free
error Er107	: Error internal pressure deficiency protection has triggered. Check setting or water inlet!
error Er108	: Error dry running electronically. Dry running protection has triggered .. Check water supply!
error Er109	: Error of external drought protection has triggered. Check setting or water inlet!
error Er110	: Error dry run externally. The external dry run protection has tripped. Check water supply!
error Er119	: Error switching. The switching frequency was exceeded; Clock operation. Check check valves!
error Er120	: Error runtime. The maximum runtime has been exceeded; Leakage. Check check valves!
error Er122	: Keypad too warm> 60 °. Call service!
error Er130	: Chain error The chain error was triggered. Check wiring / setting of chain operation!
error Er190	: Software error. 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 is achieved, the pressure regulator switches the pump into "standby" position. The switch-off frequency should be adjusted so that it no longer promotes the respective pump. The delay time should be set so that it 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".

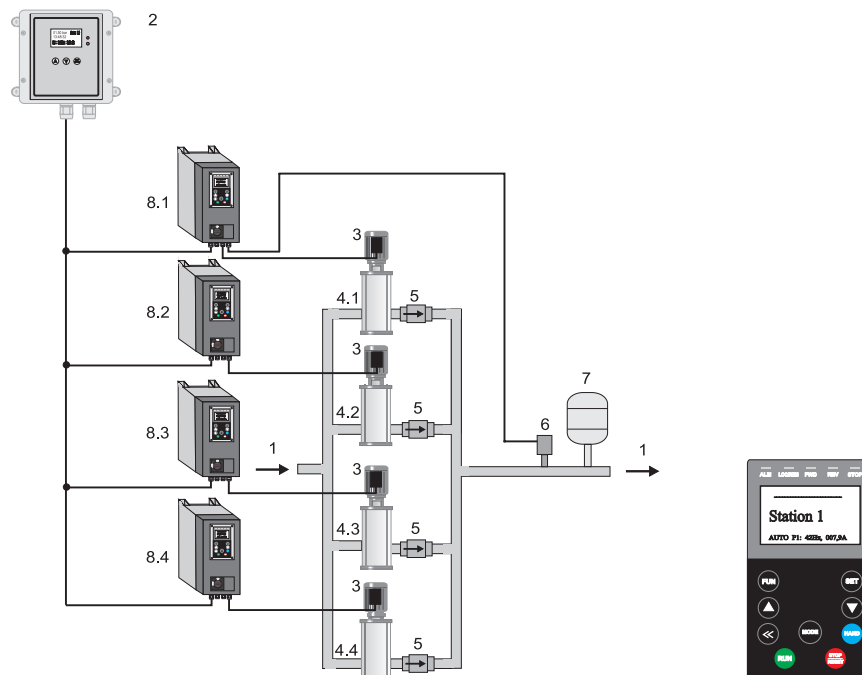


Expert knowledge is required for setting the system with test phase and cut-off frequency!

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)



1 Flow direction	5 Non-return valve
2 MASTER	6 Pressure Transducer
3 Motor	7 Pressure vessel
4 Pump	8.x controller

18. Operating mode "Multi" (3)



Press "Stop" button.



Press and hold "MODE" button until the basic menu appears
Now Set Mode 3.

Select parameter



Change / save values



Exit menu



```
-----Basic--settings-----
Language           : 2
Operating mode     : 2
```

```
-----Basic--settings-----
Language           : 2
Operating mode     : 2
```

```
-----Basic--settings-----
Language           : 2
Operating mode     : 3
```

```
-----Basic--settings-----
Language           : 2
Operating mode     : 3
```

In the operating mode "Multi" the MASTER takes over the pump control.
To do this, all controllers are connected to the MASTER via Modbus. The slave address must be set on the controller. He must not give any gaps between the slave addresses. There must not be a double assignment of the slave addresses.

Set slave address (1-4)

```
-----Basic--settings-----
Language           : 0
Operating mode     : 3
Slave              : 0
```

>>

Slave 1

wait for Master
Cancel with stop

```
-----Multi-mode--Parameter---
Slave              : 1
emergency mode     : 1
distress frequency : 40,0
emergency setpoint : 5,00
```



Setting multi mode parameters

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.

distress frequency : 40Hz - 1Hz - 200Hz

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.



(if necessary)

```
-Multi-mode--Settings-
emergency mode : 1
distress frequency : 40,0
```

```
-Multi-mode--Settings-
emergency mode : 1
distress frequency : 40,0
```

```
-Multi-mode--Settings-
emergency mode : 2
distress frequency : 40,0
```

```
-Multi-mode--Settings-
emergency mode : 2
distress frequency : 40,0
```

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

```
Starts: 15
RH: 000 : 00 : 43
---- ERR1 ----
```



```
-----
Station Init
P1: 00Hz 000,0A
```

```
-----
Station 1
AUTO P1: 50Hz 009,9A
```

```
-----
Station off
P2: 00Hz 000,0A
```

19. Operating mode "frequency" (10)



Press "Stop" button.



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

Select parameter



Change / save values



Exit menu



```
-----Basic--settings-----
Language       : 2
Operating mode : 2
```

```
-----Basic--settings-----
Language       : 2
Operating mode : 2
```

```
-----Basic--settings-----
Language       : 2
Operating mode : 10
```

```
-----Basic--settings-----
Language       : 2
Operating 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-----
00,0 Hz
000,0 A
STOP
```

```
-----Inverter-----
35,0 Hz
007,2 A
RUN
```



inverter Parameter

```
-----Inverter-----
F114 : 10,0
```



Setting parameters in operating frequency



(if necessary)



```
-----Inverter-----
F114 : 10,0
```

```
-----Inverter-----
F114 : 10,0
```

```
-----Inverter-----
F114 : 10,0
```

```
-----Inverter-----
F114 : 12,0
```



(if necessary)



```
-----Inverter-----
F114 : 12,0
```

```
-----Inverter-----
F115 : 10,0
```

```
-----Inverter-----
F115 : 10,0
```

```
-----Inverter-----
F125 : 30,0
```



(if necessary)



(if necessary)



```
-----Inverter-----
F125 : 30,0
```

```
-----Inverter-----
F200 : 4
```

```
-----Inverter-----
F200 : 4
```

```
-----Inverter-----
F201 : 4
```



(if necessary)



```
-----Inverter-----
F201 : 4
```

```
-----Inverter-----
F201 : 3
```

```
-----Inverter-----
F201 : 3
```

```
-----Inverter-----
F202 : 4
```

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!

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.



Warning !

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

-----Basic--settings-----	
Characteristics	: 6
Motor power	: 5,5
Motor voltage	: 400
Motor current	: 10,5
Motor speed	: 3000
Motor frequency	: 100
calibrating	: 0

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

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" button.

The "calibration" is now carried out. This process takes some time.

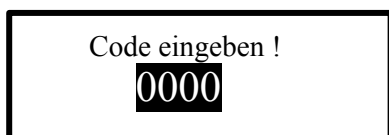
After successful calibration, the "calibrating" parameter is reset to "0".

calibrating :0 - 0 = calibrating off, 2 = calibrating on

END of Menu

21. Erase fault memory / starts / enter code

Enter code



(CODE 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



"Set "button for 60 sec. Hold to clear the memory.

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

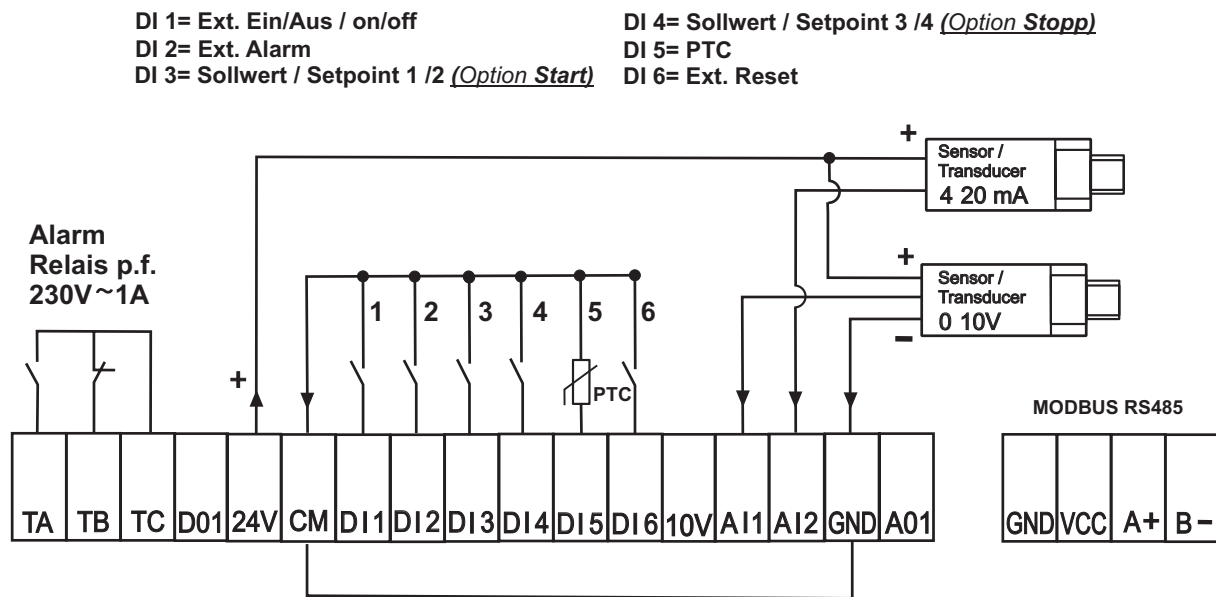
Starts:	15	33°
RH:	000 : 00 : 43	
-- ERR 1 --		
-- ERR 2 --		

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

0,75-15kW



Alarm relay TA - TB - TC: Switches over at "Power on". In the event of a fault or "mains off", the changeover contact: 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 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.

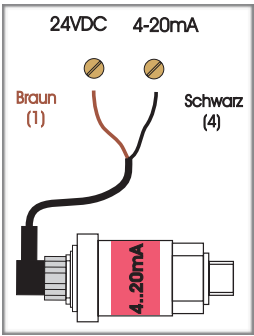
Transducer 0-10V: connection to P24, GND and AI1. Scaling, offset and selection takes place in the basic menu. Factory setting: input inactive / 0-16bar.

Connection pressure transducer Danfoss MBS 3050:

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

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

connect.

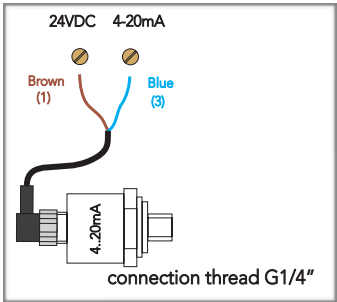


Connection pressure transducer Danfoss DST P140:

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

Cable	brown (1)	= + supply 24VDC	(MARE - P24)
and	blue (3)	= signal input 4-20mA	(MARE - AI2)

connect.



24. customer settings :

Date: _____
