

# Operating Instructions

## **HYDROVAR<sup>®</sup>** *Smart*



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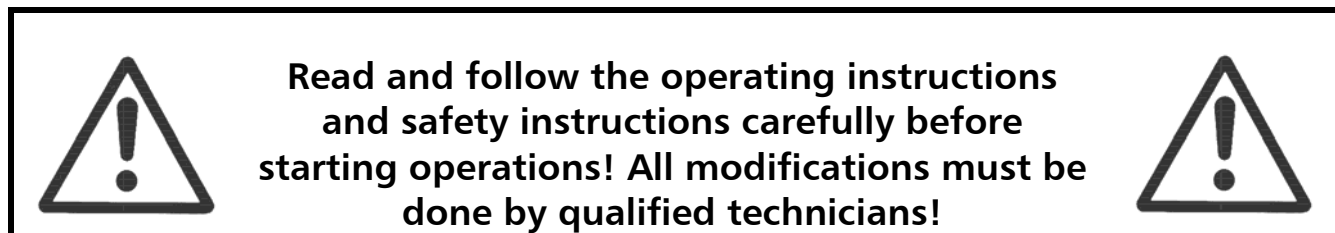
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Follow the Pump Operating and Maintenance Instructions  
We reserve the right to alter specifications

## 1 Important safety instructions



In addition to the instructions contained in these operating instructions please pay attention to universal safety and accident prevention regulations.



Warns that disregarding of the regulations may cause electric shock.



Warns that disregarding of the regulations may cause personal injury or damage to property.

The HYDROVAR-*Smart* control unit must be disconnected from the power supply before any work can be carried out in the electrical or mechanical part of the system.

Installation, maintenance and repair work may only be carried out by trained, skilled and qualified personnel.

Unauthorised modifications or changes to the system make all guarantees null and void.

When in operation, the motor can be stopped by remote control, whereby the inverter and the motor remain under voltage. For safety reasons, the unit has to be disconnected from the power supply when carrying out work on the machinery as locking out the equipment by switching off the release mechanism or set value cannot prevent accidental starting of the motor.



The HYDROVAR-*Smart* works with a low voltage supply of 24VAC/DC. Nevertheless it is not allowed to touch any parts of the unit, when power supply is on. Because of the possibility to connect external voltages to the relays, at some places of the HYDROVAR-*Smart*, there can be dangerous voltages!

### Touching these components seriously endangers life !

Before removing the HYDROVAR-*SMART* the system must be disconnected from the power supply. After switching off the power supply wait **at least 5 minutes** before starting work on or in the HYDROVAR-*SMART* drive head (the capacitors in the intermediate circuit of the inverter have to be discharged by the installed discharge resistors first).

Please refer also to the instruction manual of the connected frequency converter and read it carefully!



Furthermore, care must be taken not to short circuit the neighbouring components when connecting the external control wires and that open cable ends which are not in use are isolated.

The HYDROVAR-*SMART* control unit contains electronic safety devices which switch off the frequency drive in the event of faults, whereby the motor has zero current but remains energised and comes to a halt. The motor can also be halted by mechanical blocking. If it is switched off electronically the motor is disconnected from the mains voltage through the electronics of the frequency converter but is not potential-free in the circuit.

In addition voltage fluctuations, especially power failures can cause the system to switch off itself.

**Repair of faults can cause the motor to start up again!**

The system is only allowed to be put into operation when it has been earthened. In addition, efficient grounding of all pipes must be ensured.

The operating instructions must be read, understood and followed by the operating personnel. We point out that we accept no liability for damage and operating disorders which are the result of non-compliance with the operating instructions.

## 2 Technical Data

HYDROVAR Smart	Supply Voltage		Output Signal	Weight
Type	Voltage	Max. Current	to the Inverter	kg
Wall mounting unit	24 VAC/DC	130 mA	0 – 10 VDC	1,70
Panel mounting unit	24 VAC/DC	130 mA	0 – 10 VDC	0,5

The HYDROVAR-*Smart* is tested according to the following standards:

EN 61000-6-3

EN 61000-6-4

EN 61010-1

Ambient temperature: +5° C ... +40°C

Storage temperature: -25° C ... +55° C (+70°C during max. 24 hours.)

Humidity: RH max. 50% at 40°C, Unlimited

RH max. 90% at 20°C, max. 30 days per year

75% average per year (Class F, DIN 40 040)

**Condensation is not permitted!**

Air pollution:

The air may contain dry dust as found in workshops where there is no excessive quantity of dust due to machines.

Excessive amounts of dust, acids, corrosive gases, salts etc. are not permitted

Class of protection :

Wall mounting unit ..... IP 55

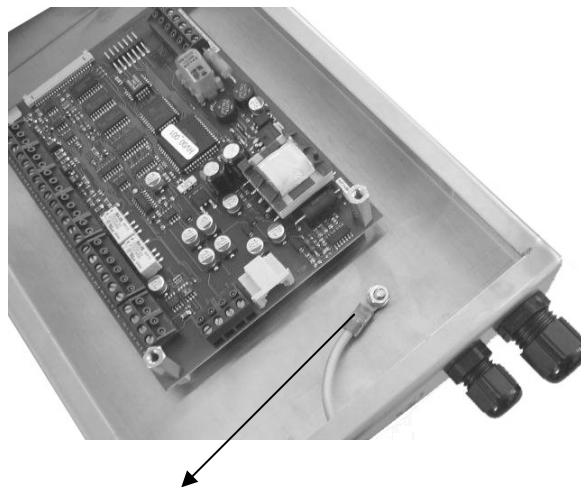
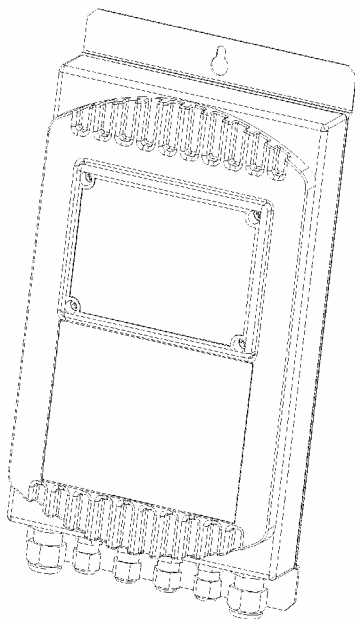
Panel mounting unit ... IP 00

### 3 Included components and mounting instructions

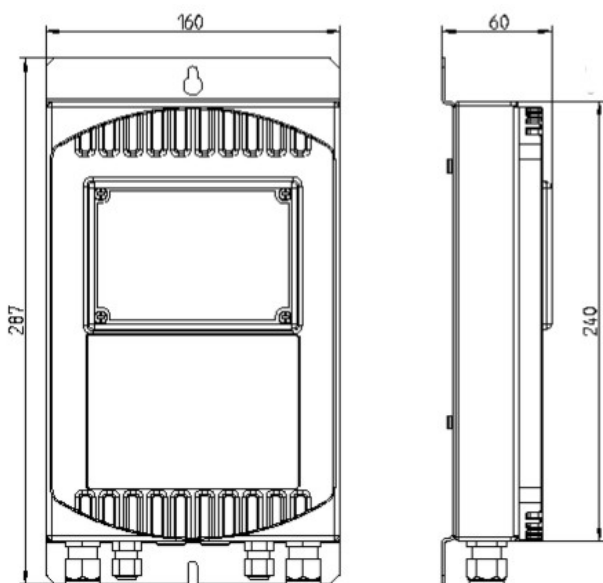
#### 3.1 Wall mounting unit

##### 3.1.1 Layout and Ground connection

The back cover can be opened by removing the 4 screws on the back side of the Hydrovar-*Smart*. For the arrangement of the control terminals, please refer to chapter 4. The grounding has to be done according to the following pictures.



Ground connection



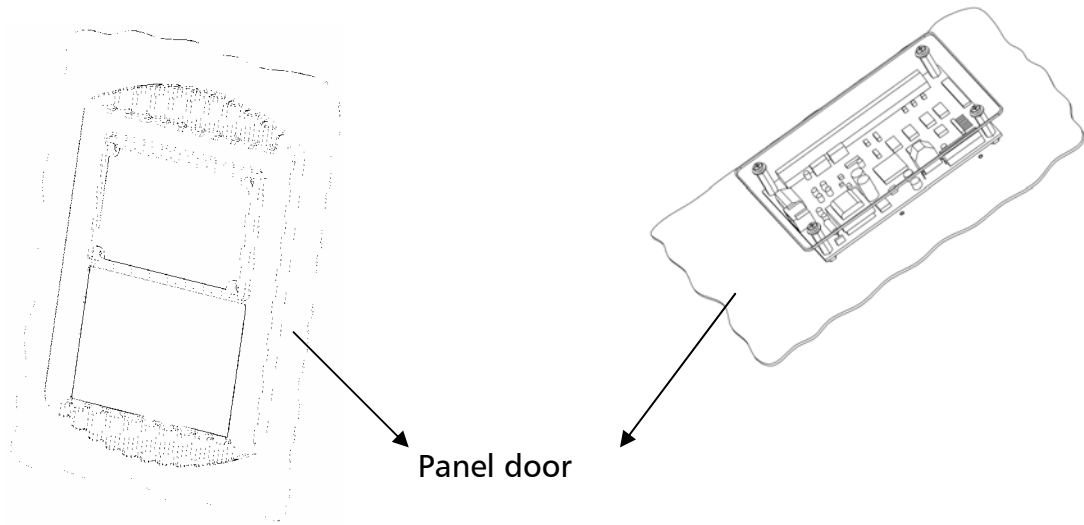
All dimensions in mm

pcs.	Cable gland type	Max.Cable Ø
2	M16x1,5	10mm
2	M12x1,5	7,5mm
2	Rubber plug for M12	7,5mm



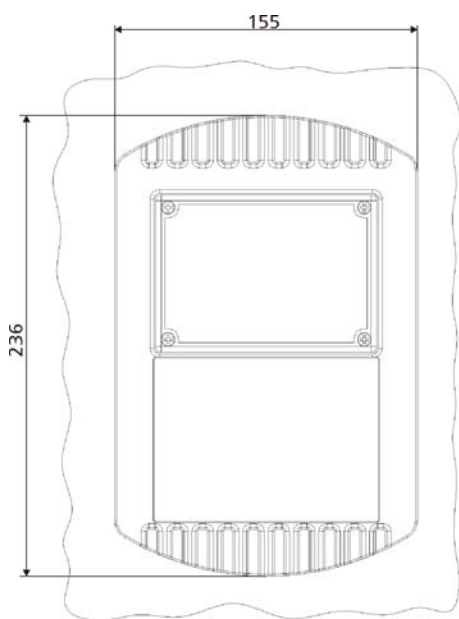
### 3.2 Panel mounting unit

#### 3.2.1 Layout and Ground connection

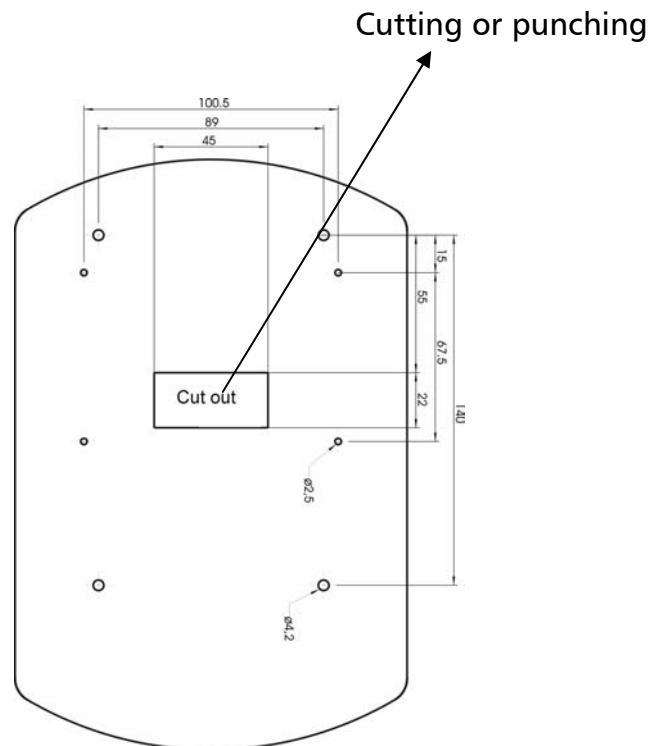


The proper ground connection has to be realised over the panel door. No additional grounding required!

#### Dimensions:



All dimensions in mm

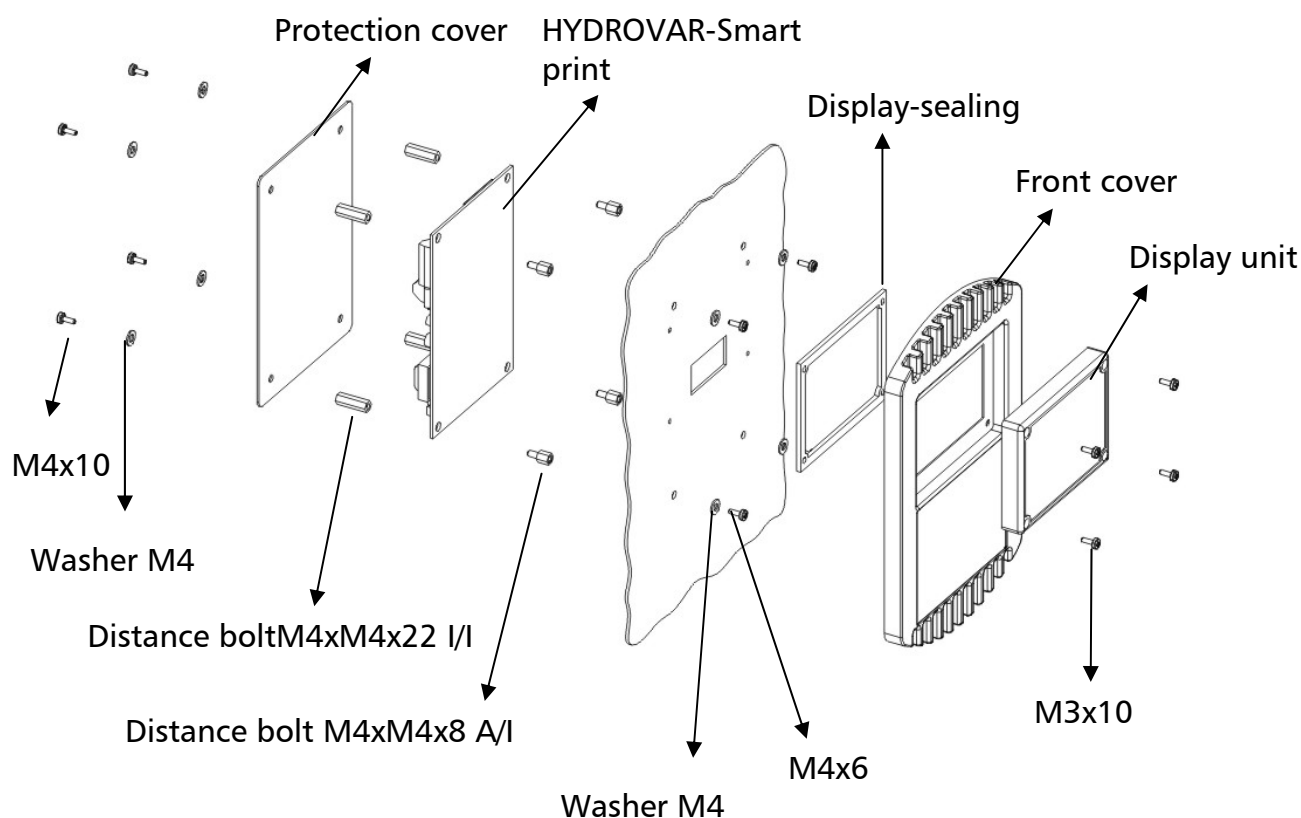


You can find the drilling plan in the real dimensions 1:1 on an enclosed sheet.

### 3.2.2 Included Component

- 1 x HYDROVAR-*Smart* print
- 1 x Display unit
- 1 x Display-sealing
- 1 x Front cover
- 1 x Protection cover
- 1 x Label (SCH 60.25)
- 1 x Label (SCH 60.35)
- 4 x Distance bolt M4xM4x22 I/I
- 4 x Distance bolt M4xM4x8 A/I
- 4 x Screw M3x10
- 4 x Screw M4x10
- 4 x Screw M4x6
- 8 x Washer M4

### 3.3 Explosion drawing



The self-adhesive label SCH 60.25 (with the cut-out for the display) has to be fixed in this way, that the yellow areas are placed on top of the push buttons.

The self-adhesive label SCH 60.35 has to be fixed below the display unit.  
A photo of the right place for these labels is shown on the first page of this instruction manual!

**3.4 Pressure transducer****PA-22S (4-20mA)**

The sensor of this transmitter is a piezoresistive silicon pressure sensor, mounted on a tape (TAP) freely floating in an oil chamber. The pressure is transferred to the sensor by a separate steel diaphragm in the oil chamber.

**Specification**

Range (FS):	10 bar	16 bar	25 bar	40 bar
Max. pressure – P <sub>max</sub> :	20 bar	30 bar	50 bar	80 bar

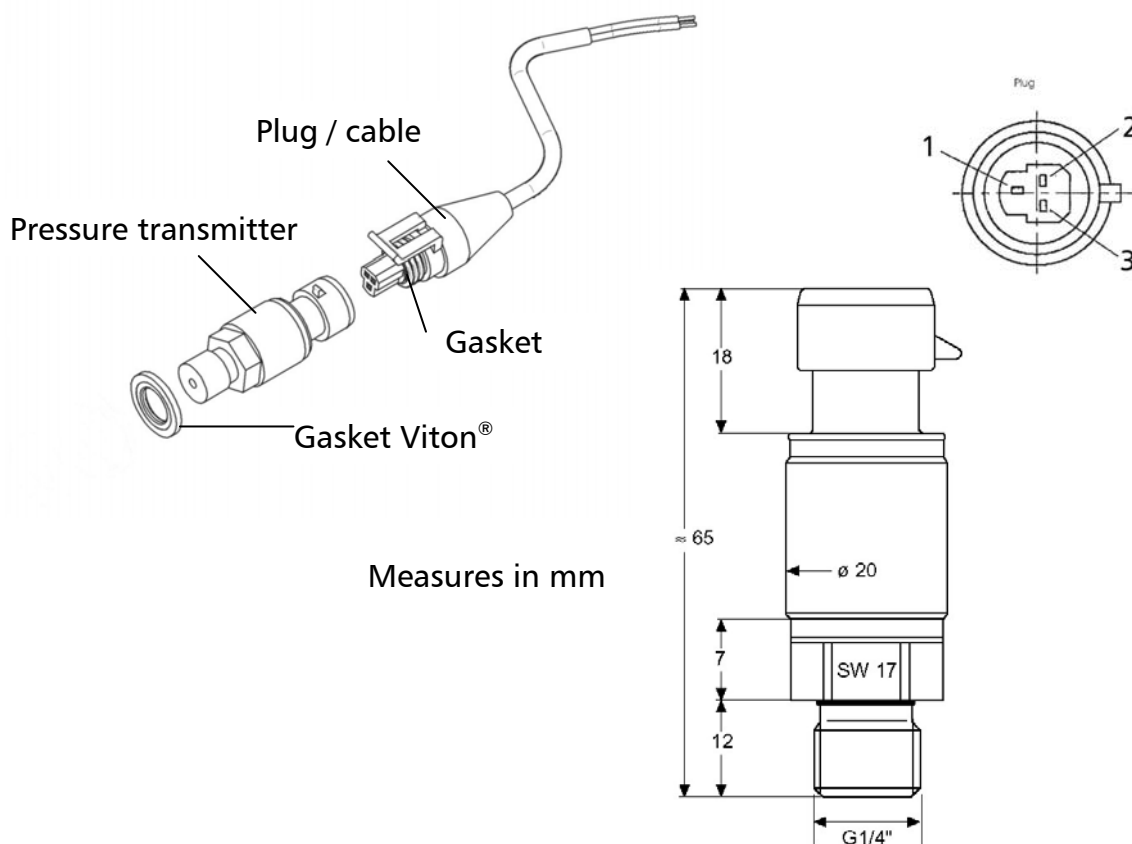
Class of protection: IP 67  
 Output signal: 4...20 mA; 2-wire  
 Supply: 8 – 28 VDC  
 Operating temperature: -10...80°C compensated (max. -40...135 °C)  
 Storage temperature: -40...135°C  
 Cable length: 2 m (screen)

**Material:**

Body: 1.4435  
 Diaphragm: 1.4435  
 Thread: G 1/4"

**Electrical connection:**

White = Analogue output signal (+ Out) (1)  
 (2) not used  
 Brown = Supply voltage (+ VCC) (3)



**Note:** To guarantee the protection class IP67, the rubber gasket has to be mounted between the pressure transducer and the plug!

**3.5 Pressure transducer****PD-39S**

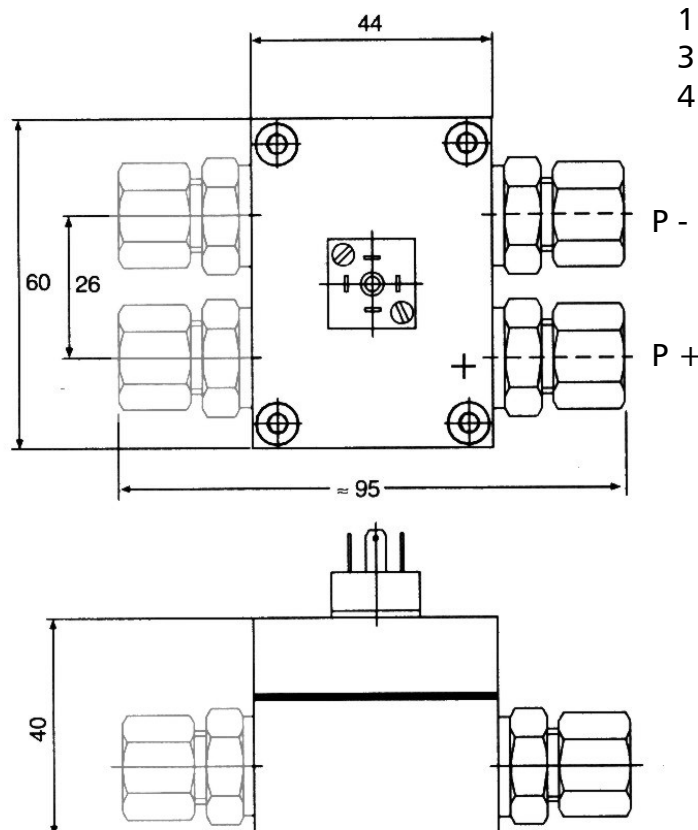
The sensors of this differential pressure transmitter are two piezoresistive silicon pressure sensors, mounted on a tape (TAP), freely floating in an oil chamber. The pressure is transferred to the sensor by a separating steel diaphragm in the oil chamber.

**Specifications**

Measuring range	0,4 bar	2bar	4bar	10bar	Differential
(FS):					(other ranges upon request)
Over-pressure / Pmax:	16 bar	16 bar	16 bar	16 bar	Single-sided
Class of protection :	IP 65				

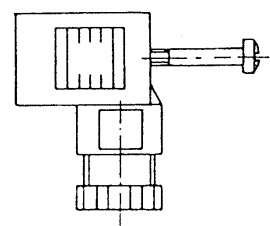
Output-Signal:	4...20mA; 2-wire
Supply:	8...28VDC
Load resistance:	max. 50 $\Omega$ at supply voltage = 10VDC
Linearity::	typ. $\pm 0.20$ % FS; max. $\pm 0.5$ % FS
Stability:	typ. $\pm 0.1$ % FS; max. $\pm 0.2$ % FS
Operating temperature:	-20...+80°C
Storage Temperature:	-40...+120°C
Cable length:	2 m

**Material:** Body and diaphragm: 1.4435 stainless steel (316L)  
Screw joint and cover: Steel electroplated for Ermetopipe d=8mm



1: WH: OUT/GND 4...20mA  
3: BN: +VCC 8...28VDC  
4: Screen

Plug: mPm 193  
incl. 2 m cable



**cable:**  
Out (white)  
+ Vcc (brown)  
Screen

All dimensions in mm

## 4 Control Terminals and Display unit

All externally used cables must to be shielded. Do not connect the ground of the electronic components to other potentials (all electronic ground and GND of the RS 485-interface are connected together internally).

For external on/off switches, (terminals X1/4 – X1/5) contacts, which are suitable for switching low voltages <10 VDC, are necessary.

**If unshielded control cables are used, signal interference may occur and interfere with the function of the controller.**

<b>Terminals:</b>	X1/	1	GND	
		2	Actual value input 4...20mA, 50 Ohm internal load resistance	
		3	Power supply for external transducer; 15VDC, max. 100mA	
		4	GND	
		5	5 VDC for external on/off (release); Ri= 10kOhm, (gold plated contact necessary!)	
		6	GND	
		7	5 VDC for external low water protection; Ri= 10kOhm, (e.g. incoming pressure switch or water level switch)	
		8	Thermal switch or PTC (in motor terminal box)	
		9	Thermal switch or PTC	
		10	GND	
		11	Analogue output 2; 0...10 VDC (see chapter 7.25)	
		12	Current signal input 4...20mA	
		13	Voltage signal input 0...10V or 2...10V	
		14	Digital input for activating of 2 <sup>nd</sup> required value	

<b>Terminal:</b> (for dry Contacts)	X2/	1	Fault signal relay	NC	max. 250VAC	1A free of inductivity
		2	Fault signal relay	CC	max. 250VAC	1A free of inductivity
		3	Fault signal relay	NO	max. 250VAC	1A free of inductivity
		4	Pump operation signal relay	NC	max. 250VAC	1A free of inductivity
		5	Pump operation signal relay	CC	max. 250VAC	1A free of inductivity
		6	Pump operation signal relay	NO	max. 250VAC	1A free of inductivity

**!! Fault relay (X2/2 - X2/3) is closed, when there is no error!!**

**Terminal:** X3 Display

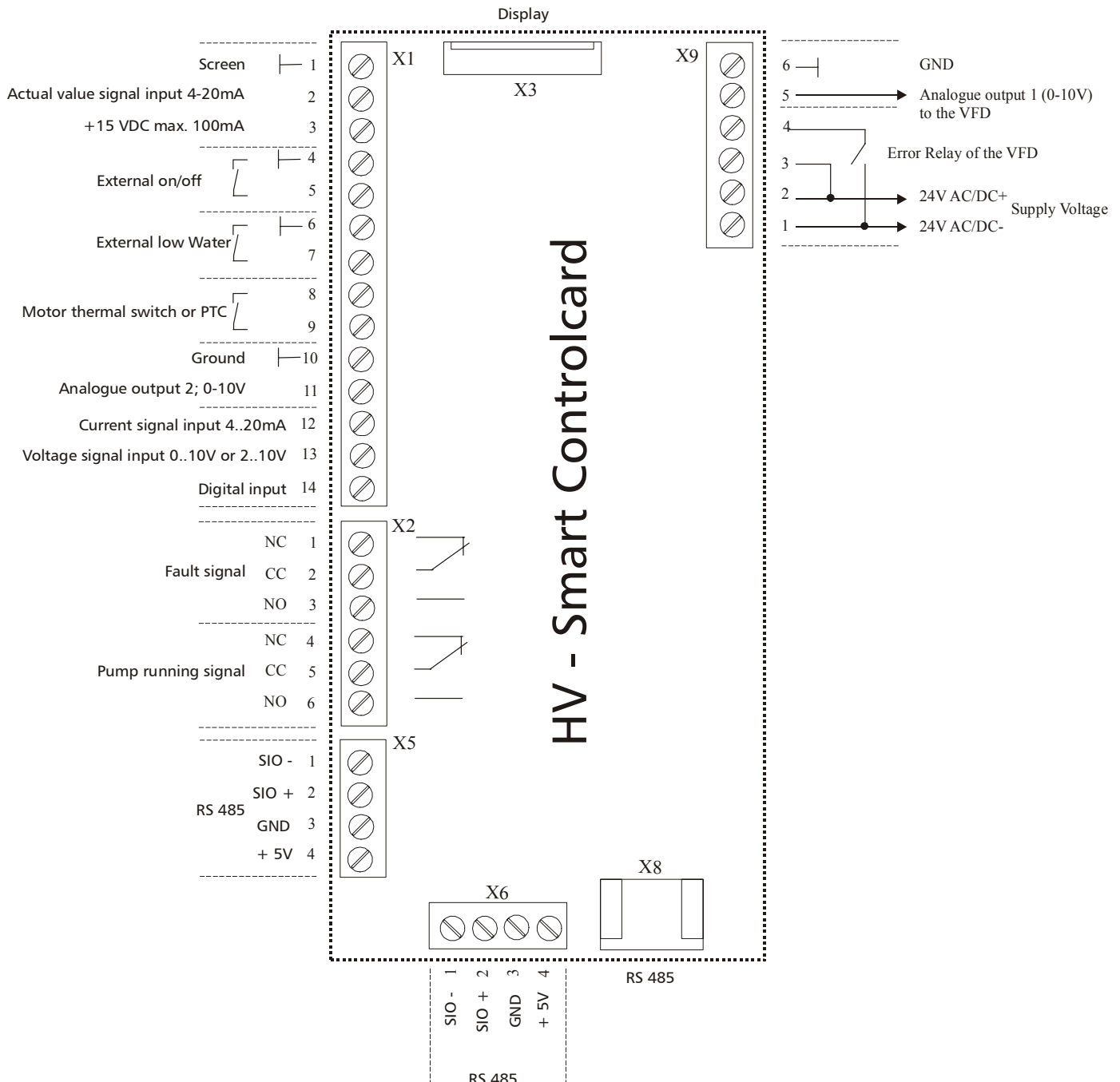
<b>Terminal:</b>	X5-6/	1	RS 485	SIO -	LOW
		2	RS 485	SIO +	HIGH
		3	RS 485	GND	
		4	RS 485	+ 5 VDC	max. 20mA out

For supply of external interface converter

**Terminal:** X8 RS 485

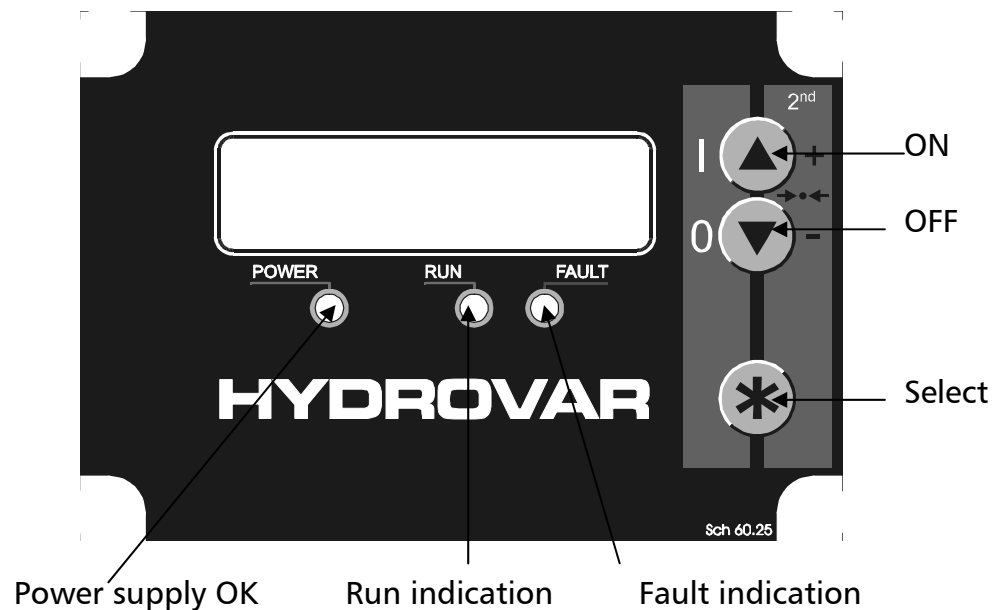
<b>Terminal:</b>	X9/1	24 VAC or DC	Supply Voltage
	2	24 VAC or GND	Supply Voltage
	3	Error relay of the connected VFD	
	4	Error relay of the connected VFD	
	5	Analogue output for the speed signal of the VFD (0-10V DC)	
	6	GND	

#### 4.1 Terminals of the HYDROVAR-Smart



When connecting more variable speed drives (max. 4 pumps) via the interface RS 485, the terminals X5/1/2/3 or X6/1/2/3 of each Hydrovar-Smart have to be connected together by using a shielded cable and have to be programmed accordingly.

## 4.2 Display unit



## 5 Language Selection

The information on the display can be called up in German, English, Italian, French, Spanish, Portuguese or Dutch.

To select the required language proceed as follows:

Briefly press \* and ↑ simultaneously (in 1<sup>st</sup> display);

⇒ the actual language will now appear in the second line and the desired language can be selected with the buttons ↑ or ↓. After the language has been selected, press \* briefly and the 1<sup>st</sup> display of the main menu will appear again.

If only the language is changed it is not necessary to SAVE.

## 6 Parameters of the main menu

After connection of the Hydrovar-*Smart* unit to the power supply the following displays become visible.

SW-Ver:	HV00-001	The current software version with the date of programming is displayed for about 3s.
Date:	xxxx	

The following two displays are depending on the selected mode:

### a) Active MODE = Controller:

1. 

ITT INDUSTRIES XX.X BAR
----------------------------

 This window is mentioned several times in the Operating Instructions as 1<sup>st</sup> display at Mode Controller

Continue by pressing the \*-button

2. 

REQUIRED VALUE 1 X.XX BAR
------------------------------

 Set the desired set pressure with either ↑ or ↓ and then briefly press the \*-button.

If several pumps are connected via the RS-485 interface, one pump must be ready for operation when the set pressure is changed, otherwise the set value will not be accepted by the follow-up pumps. Afterwards the new required pressure has to be saved in all pumps.

**If you want to change to Required Value 2 you have to close the external contact, connected to X1/10-X1/14.**

After closing this contact, the display changes from Required value 1 to

- 2.1 

REQUIRED VALUE 2 ADC-X XX.X BAR
------------------------------------

 In this window, there is shown the condition of the second Required value.  
**ADC-X:** This parameter shows the source of the external or internal value.  
**XX.X Bar:** shows the actual value of the Required Value 2.

Continue by pressing the \*-button (to point 3)



**b) Active MODE = Actuator:**

1. 

ITT INDUSTRIES Frequency XX.X Hz
-------------------------------------

 This window is mentioned several times in the Operating Instructions as 1<sup>st</sup> display at the Mode Actuator.

Continue by pressing the \*-button

2. 

REQUIRED VALUE 1 X.XX BAR
------------------------------

 Not active in the actuator mode, because the internal controller is not active.

Continue by pressing the \*-button (to point 3)

**c) Active MODE = Synch. Controller or Multicontroller:**

1. 

ADR (X)    P X XX.X Bar
----------------------------

 This window is mentioned several times in the Operating Instructions as 1<sup>st</sup> display in the Synch. Controller or Multicontroller mode.

Continue by pressing the \*-button

2. 

REQUIRED VALUE 1 X.XX BAR
------------------------------

 Set the desired set pressure with either  $\uparrow$  or  $\downarrow$  and then briefly press the \*-button.

If several pumps are connected via the RS-485 interface, one pump must be ready for operation when the set pressure is changed, otherwise the set value will not be accepted by the follow-up pumps. Afterwards the new required pressure has to be saved in all pumps.

**If you want to change to Required Value 2 you have to close the external contact, connected to X1/10-X1/14.**

After closing this contact, the display changes from Required value 1 to

- 2.1 

REQUIRED VALUE 2 ADC-X    XX.X BAR
---------------------------------------

 In this window, there is shown the condition of the second Required value.

**ADC-X:** This parameter shows the source of the external or internal value.

**XX.X Bar:** shows the actual value of the Required Value 2.

Continue by pressing the \*-button (to point 3)

**d) Active MODE = Manual control:**

1. 

ITT INDUSTRIES  
Frequency XX.X Hz

 This window is mentioned several times in the Operating Instructions as 1<sup>st</sup> display at the Mode Manual control.

Continue by pressing the \* -button

2. 

MANUAL LOCAL  
X.X Hz X.XX BAR

 Set the desired output frequency with either ↑ or ↓ and then briefly press the \* -button.  
If several pumps are connected via the RS-485 interface, you have to set this parameter on each pump!

Press the \* button on the Hydrovar-Smart to change to

**!! The following displays of the main menu are valid for all selected Modes !!**

3. 

AUTO - START  
ON

 Select (ON) with the ↑ button or (OFF) with ↓ .

*AUTO-START* ON starts the pump automatically after a failure of the power supply.

If *AUTO-START* is OFF, the Hydrovar-Smart has to be restarted by pressing the buttons ↓ (OFF) and then ↑ (ON) after a power supply failure.

If the AUTO-START is OFF, the unit will not start again in cases of a power supply failure or disconnection. After restarting the following message is shown:

- 3.1 

NO AUTOSTART  
disable inverter

To restart the unit, press at first the ↓ and then the ↑ button for the start.

Press \* and the display changes to

**Note:** All errors are only readable in English language

4. 

ERROR 1  
.....

 Here, there is shown the last error

Press the \* button to change to

5. 

ERROR 2  
.....

 Shows the error before the last error

Press the \* button to change to

6. ERROR 3  
..... Shows the error before error 2

Press the \* button to change to

7. ERROR 4  
..... Shows the error before error 3

Press the \* button to change to

8. ERROR 5  
..... Shows the error before error 4

Press the \* button to change to

9. TOTAL RUN TIME  
0000:00 Runtime of the motor.  
This time can be reset together with the  
Operating hours.

Press the \* button to change to

**Note: All changes have to be saved, that they will not be lost in case of shut off of the power supply !!**

10. SAVE ???  
↑ + ↓ Simultaneously press buttons ↑ and ↓ until...:

11. SAVE ???  
SAVED appears on the display. After five seconds the display jumps back to the 1<sup>st</sup> display.

These parameters can also be set during operation; To do so, briefly press the button \* and repeat steps 1 – 10.

**Note: Often shown displays:**

12. INVERTER LOCKED  
enable inverter This message appears when the connection of terminal X1/4-X1/5 is open (external release contact).

To start the Hydrovar-Smart, connect these terminals by closing the external release contact or by using a short-circuit connection!

## 7 Settings in the Secondary Menu



**Important!** Before entering the secondary menu, these instructions have to be read carefully to prevent incorrect settings which could cause malfunction.

### Secondary Menu:

INVERTER STOP  
ON -> START

Stop motor by pressing ↓ (OFF)

PASSWORD  
0000

Press \* for 3 seconds to change to

PASSWORD  
0066

Set 'Password 0066' by pressing ↑

**Note: The password must be entered at each entry!**

J O G – MODE  
0.0Hz X.XX Bar

Confirm by pressing \* and the first window of the sub menu is shown

In the following paragraphs all possible settings are listed (in the display, there is shown the European default setting).

### 7.1 JOG-MODE

#### Display and Manual Operation Mode

J O G – MODE  
0.0Hz X.XX Bar

Actual outgoing frequency and actual analogue input are shown. By pressing ↑ or ↓ in this menu, the

internal controller of the Hydrovar-*Smart* will be shut off and the inverter changes to manual mode. With the buttons ↑ and ↓ you can set any constant speed.

Setting of 0,0 Hz stops the inverter. If the JOG-MODE is left at a frequency higher than 0,0 Hz the inverter will continue its normal automatic operation.

**Press \* on the Hydrovar-*Smart* to change to**

### 7.2 Window - %

WINDOW  
5%

This value indicates the max. variation of the outgoing pressure.

Possible setting: between 0% - 100% of required value.

**Press \* on the Hydrovar-*Smart* to change to**

### 7.3 Ramp Hysteresis

RAMP HYSTERESIS 80%
------------------------

Level, where the fast ramps are changing to the slow ramps

Possible setting: between 0%..100% of the window

Press \* on the Hydrovar-*Smart* to change to

### 7.4 Ramp 1: Fast running up time:

Time setting at Ramp 1, 2, 3, or 4 will influence the control of the pump and **MUST NOT BE CHANGED** at normal operation. Possible setting of each ramp 0,05 - 1000 sec.

Please take care, that the ramp times of the connected VFD are every time faster than the settings of the ramps 1-4 of the HYDROVAR-*Smart*!

The fast ramp times 1 and 2 are determined by the power of the connected drive. (Standard settings = 4-15s, depending on the power)

RAMP 1 4.0 Sec
-------------------

Excessively **fast running** up time may overload the inverter in the starting moment.

Excessively **slow running** up time may cause a break down of the outgoing pressure during operation.

Press \* on the Hydrovar-*Smart* to change to

### 7.5 Ramp 2: Fast running down time:

RAMP 2 4.0 Sec
-------------------

Excessively **fast running** down time tends to cause oscillation or hunting or can cause an error

(OVERVOLTAGE) during ramp down of the pump.

Excessively **slow running** down time tends to generate over pressure.

Press \* on the Hydrovar-*Smart* to change to

### 7.6 Ramp 3: Slow running up time:

The following ramps 3 and 4 determine the speed of the internal Hydrovar-*Smart* controller and depend on the system, which should be controlled.

RAMP 3 70 Sec
------------------

A **too slow running** up time can cause a break of the outgoing pressure during variation of the demand.

A **too fast running** up time may lead to oscillation and/or overload of the inverter.

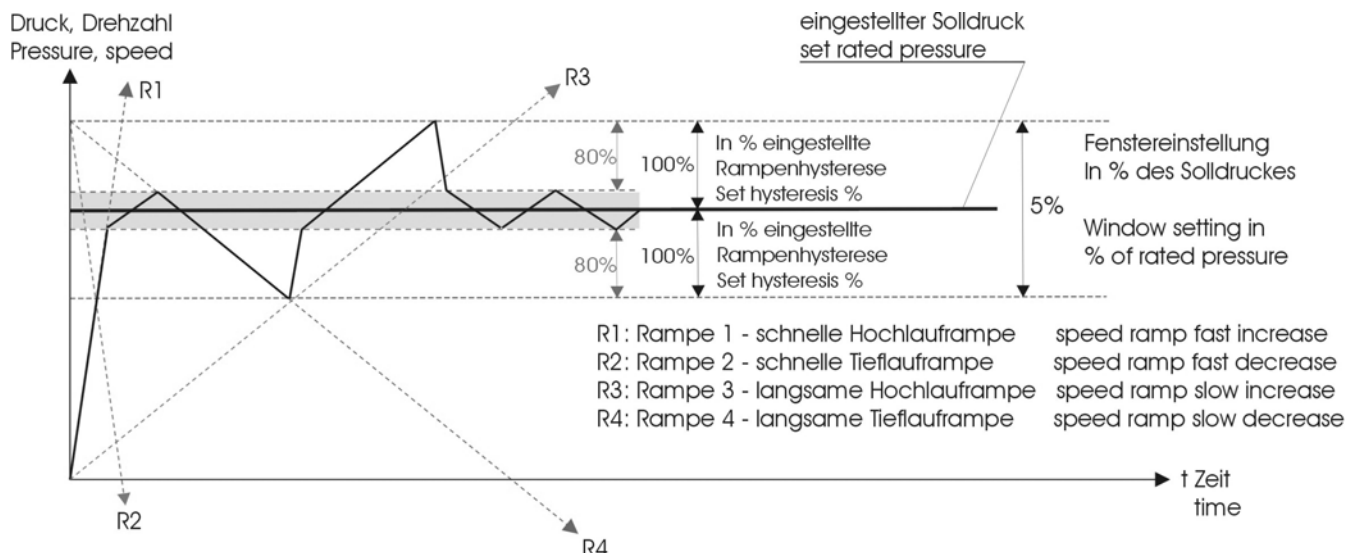
Press \* on the Hydrovar-*Smart* to change to

**7.7 Ramp 4: Slow running down time:**

**RAMP 4**  
70 Sec

A **too fast** setting leads to oscillation  
A **too slow** setting delays the switching off too much

Diagram: Ramp – Window



Press \* on the Hydrovar-*Smart* to change to

**7.8 Maximum Frequency**

**MAX. FREQUENCY**  
50.0 Hz

Possible setting between 40 and 70 Hz.

The Hydrovar-*Smart* gives an analogue output signal of 0-10VDC as a speed signal, which is connected to the frequency drive, where 0V corresponds to 0Hz and 10VDC corresponds to the maximum frequency.

It is important that this values correspond with the values of the inverter.

**Note: The setting of the Maximum frequency in the HYDROVAR-Smart has to be the same than in the connected VFD!**

Press \* on the Hydrovar-*Smart* to change to

**7.9 Minimum Frequency**

**MIN. FREQUENCY**  
0.0 Hz

Here you can set the minimum frequency between 0,0 and the Maximum frequency.

**Attention!:** If there is set  $f > f_{min}$  in the parameter CONFIG. FMIN the pump will not stop in the normal mode. It will keep running with the set minimum frequency.

**!! Possibility of overheating of the pump !!**

Press \* on the Hydrovar-*Smart* to change to

### 7.10 Operation at the minimum frequency

CONFIG FMIN $f \Rightarrow f_{min}$
--

If you have selected „f->0“ the frequency will go down to the selected minimum frequency.

Then the inverter will keep running for the selected stop-delay time and after this time the Hydrovar-*Smart* will stop automatically.

If the selection is „f-> $f_{min}$ “ you can not run the pump below the set minimum frequency. In the controller, actuator and multi controller mode the pump will never run below the set minimum frequency (the pump will only stop with an external on/off-(terminals X1/4 and X1/5) or in case of a failure.

**Press \*** on the Hydrovar-*Smart* to change to

### 7.11 Delay time for shut off at minimum frequency

STOP-DELAY FMIN 5 s
------------------------

After running the pump for this selected time at minimum frequency, the pump will stop, if parameter

CONFIG. FMIN is set to  $f \Rightarrow 0$   
Adjustable between 0 and 100s.

NOTICE!

Problems with shut off of the pump at 0 demand (too small or no pressure tank) can be solved by using these settings!

Additional function: selectable delay time to start a full speed pump in case of "Simple Multicontroller" mode.

**Press \*** on the Hydrovar-*Smart* to change to

### 7.12 Sensor – Adjust

SENSOR_ADJUST? Out of range
--------------------------------

**Zero point adjustment of the transmitter**

Depressurise the system and press buttons  $\uparrow + \downarrow$

simultaneously. After a successive adjustment, "adjusted" appears on the display.

If "out of range" is shown on the display, no adjustment is possible

**Press \*** on the Hydrovar-*Smart* to change to

### 7.13 Sensor - Curve

SENSOR-CURVE Linear
------------------------

Function of the input signal (4...20mA) of the Hydrovar to the actual measured value.

**Application:**

linear: Pressure control, differential pressure control, level, temperature and flow control (inductive or mechanical).

quadratic: Flow control by using an orifice plate together with a differential pressure transmitter.

Press \* on the Hydrovar-*Smart* to change to

### 7.14 Setting of the sensor range

SENSOR RANGE  
20mA = 10.0Bar

Setting of the maximum value of the measuring transmitter, which corresponds to

20mAe.g. 10.0 bar = 20mA of the pressure transmitter

Adjustable ranges: Bar: 0.2...100 bar; psi 2.9...1450psi;

m<sup>3</sup>/h: 4...2400m<sup>3</sup>/h; g/min: 9...10560g/min

mH<sub>2</sub>O: max 1019,5mH<sub>2</sub>O; ft: max 3345ft

0...100 %; or without unit: max 1000;

Press \* on the Hydrovar-*Smart* to change to

### 7.15 Operation Mode

MODE:  
Controller

Select your required Mode by using the ↑ and ↓ buttons

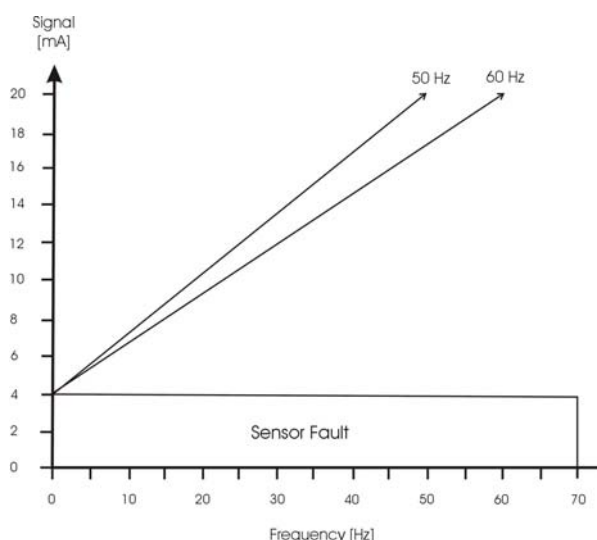
If only one HYDROVAR-*Smart* pump is in operation set the **Controller**. If more than one pump work together via the RS485 interface (follow-up pump control), the **Multicontroller** must be set with the buttons ↑ or ↓.

#### Synch. Controller:

The **Synchronous Controller** mode is working in the same way like the Multicontroller. The only difference is, that all pumps in a multipump system are running at the same frequency.

#### Actuator:

The **Actuator** application is only used if you have another external controller. Then the internal controller is shut off, and the output frequency is proportional to the input signal (X1/2)  $\Rightarrow$  4-20 mA = 0 -  $f_{max}$ . The outgoing signal changes with the programmed ramps 1 and 2. The functions of low water, thermal protection and external ON/OFF are still working.





If **MANUAL CONTROL** is selected, the parameter *REQUIRED VALUE* will change to **MANUAL CONTROL** in the main menu, where the actual frequency and the actual value is displayed (according to the *JOG-MODE* in the submenu).

Now the frequency can be changed with the **↑** and **↓** buttons, and the speed of the pump will change with the fasten ramps. After selecting the right frequency, it can be saved with the standard *SAVE*.

After a supply failure, the pump will then run with this selected frequency (depending on the parameter *AUTO-START*).

The frequency can be changed between the set minimum and maximum frequency.

In the 1<sup>st</sup> display, there is shown the actual frequency.

**NOTE:** CONFIG. FMIN will not work in this mode.

**Attention** Driving the pump in a not allowed speed range can damage the motor or the inverter!

Press **\*** on the Hydrovar-*Smart* to change to

### 7.16 Control Response

REGULATION MODE  
Normal

**Normal:** Speed is increased with falling actual value signals. (e.g.: Control at constant output pressure).

**Inverse:** Speed is reduced with falling actual value signal, (e.g.: Control at constant suction pressure or at constant level).

Press **\*** on the Hydrovar-*Smart* to change to

### 7.17 Start Value

START VALUE  
disabled

This parameter gives you the start value after pump stop in percentage of the required value (adjustable between disabled and sensor range).

Example:

*required value:* 5,0 bar

*start value:* 2,5 bar

If the pump system have reached the required pressure from 5.0 Bar and there is no more consumption, the Hydrovar-*Smart* shuts off the pump. When the consumption increases and the pressure goes down the pump will normally start. If you have selected the **START VALUE** at 2,5 bar the pump will start again at this selected pressure.

Press **\*** on the Hydrovar-*Smart* to change to

**7.18 2<sup>nd</sup> Required Value**

**CONFIG. REQ. VAL.2**  
**OFF**

With this parameter CONFIG. REQ. VAL.2 you can select a independent 2<sup>nd</sup> required value.

The change between 1<sup>st</sup> and the 2<sup>nd</sup> required value can be done over the digital input, terminal X1/14 on the control card. If this input is connected to Ground, 2<sup>nd</sup> required value active.

Possible settings:

**OFF:** actual value 2 is not active (no change after closing the input X1/14)

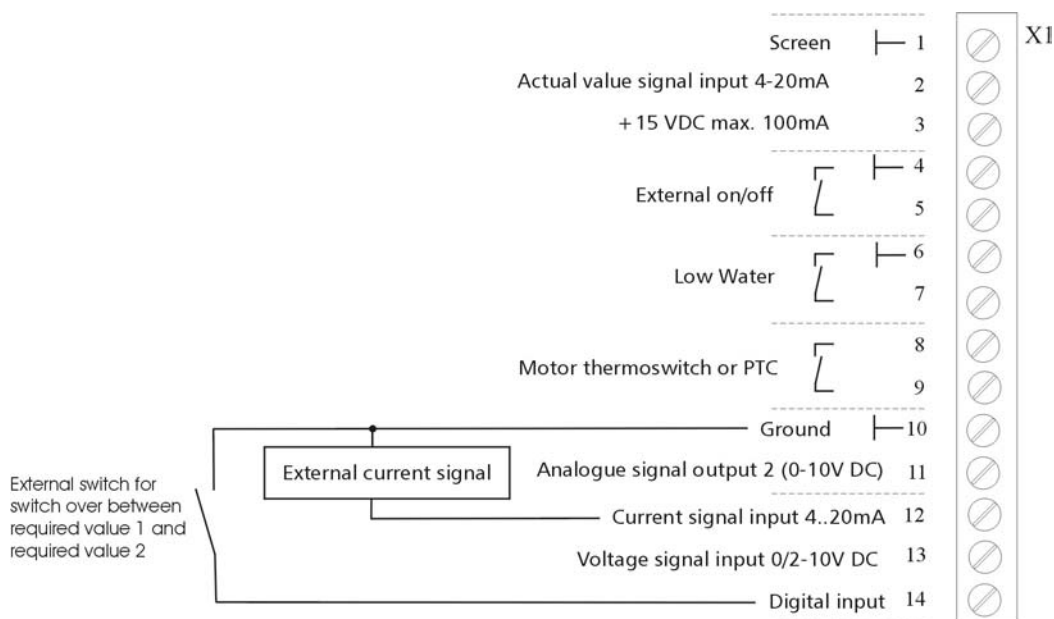
**INT:** internal required value 2, function and setting according to existing required value.

**EXT ADC-I:** the required value 2 is made from the value of the current signal (4-20mA) at the terminals X1/12, X1/10. 20mA is equal to the programmed **SENSOR RANGE**. If the incoming current signal is below 4mA, there will be shown an error message on the display, but no failure is indicated (*failure relay is not closed*). In this case the required value 2 will be 0.

**EXT ADC-U 0-10V:** the required value 2 is made from the value of the voltage signal of 0-10VDC at the terminals X1/13, X1/10 (Ground)

**EXT ADC-U 2-10V:** the required value 2 is made from the value of the voltage signal of 2-10VDC at the terminals X1/13, X1/10 (Ground)

Example for connection of an external 4-20mA signal for the 2<sup>nd</sup> required value:



### Setting the required value2:

The active required value is shown in the actual display of the parameter required value. When the 2<sup>nd</sup> required value is active (digital input, terminal X1/14, closed), in the first line, there is shown Required value 2. The second line will show the source of the 2<sup>nd</sup> value, which is selected in the parameter **CONFIG. REQ VAL:2** (INT, EXT-ADC-I or EXT-ADC-U) and also the actual value of this input.

**INT:** you can select your value with the **↑** and **↓** buttons

**EXT:** only display of the value of the 2<sup>nd</sup> analogue input signal.

In case of saving, every time both required values are saved.

Press **\*** on the Hydrovar-*Smart* to change to

## 7.19 Configuration of 1<sup>st</sup> relay

RELAY CONFIG. Simple Multicontr.
-------------------------------------

Selection possible with buttons **↑** and **↓**.

**Run Motor** ⇒ motor run indication (over the relay)

**Simple Multicontr.** ⇒ allows to start/stop a constant speed pump

Enable Seq.Ctl. – this will be the start frequency of the slave pump

Synchron. Limit – this will be the stop value of the slave pump

Stop Delay fmin. – this will be the delay time before starting the slave pump.

e.g. if the speed controlled pump reaches the start level, the relay will be switched on, and will be switched off, when the output frequency falls below the stop level.

Press **\*** on the Hydrovar-*Smart* to change to

## 7.20 Submenu Offset

S U B M E N U Offset
-------------------------

Press **\*** for about 3 seconds to enter the submenu and the display changes to

### 7.20.1 Source of the Offset input

OFFSET INPUT Off
---------------------

The second additional input can be used as required value 2 and also for an Offset of the 1<sup>st</sup> required value.

(Example:)

**OFF** : Offset deactivated

**EXT ADC-I** : Offset will be calculated according to the current input (4-20mA) at the terminals X1/12 (X1/10=Ground).

<b>Note:</b> If the incoming current signal is below 4mA, there will be an error message on the display, but no failure is shown ( <i>failure relay is not closed</i> ). In this case the <b>OFFSET INPUT</b> works like external signal=0.
---

**EXT ADC-U 0-10V:** Offset will be calculated according to the voltage input of 0-10VDC at terminals X1/13 (X1/10=Ground)

**EXT ADC-U 2-10V:** Offset will be calculated according to the voltage input of 2-10VDC at terminals X1/13 (X1/10=Ground)

Press **\*** on the Hydrovar-*Smart* to change to

**7.20.2 1<sup>st</sup> Offset level**

LEVEL 1  
XX.X %

The level 1 is the start level of the 1<sup>st</sup> Offset.  
(adjustable between 0 and 100% of the additional  
analogue input).

Press \* on the Hydrovar-*Smart* to change to

**7.20.3 2<sup>nd</sup> Offset level**

LEVEL 2  
XX.X %

The level 2 is the start level of the 2<sup>nd</sup> Offset.  
(adjustable between 0 and 100% of the additional  
analogue input).

Press \* on the Hydrovar-*Smart* to change to

**7.20.4 INTENSITY 1**

INTENSITY 1  
+XX.X %

This is the intensity of the 1<sup>st</sup> Offset of the required  
value at the zero point of the second analogue input  
Settings: -200% up to +200% of the sensor range.

Press \* on the Hydrovar-*Smart* to change to

**7.20.5 INTENSITY 2**

INTENSITY 2  
+XX.X %

This is the intensity of the 2<sup>nd</sup> Offset of the required  
value at the maximum point of the second analogue  
input.  
Settings: -200% up to +200% of the sensor range.

To leave the submenu press the \* longer than 3 sec. to change to

S U B M E N U  
Offset

**7.20.6 Example for the Offset:**

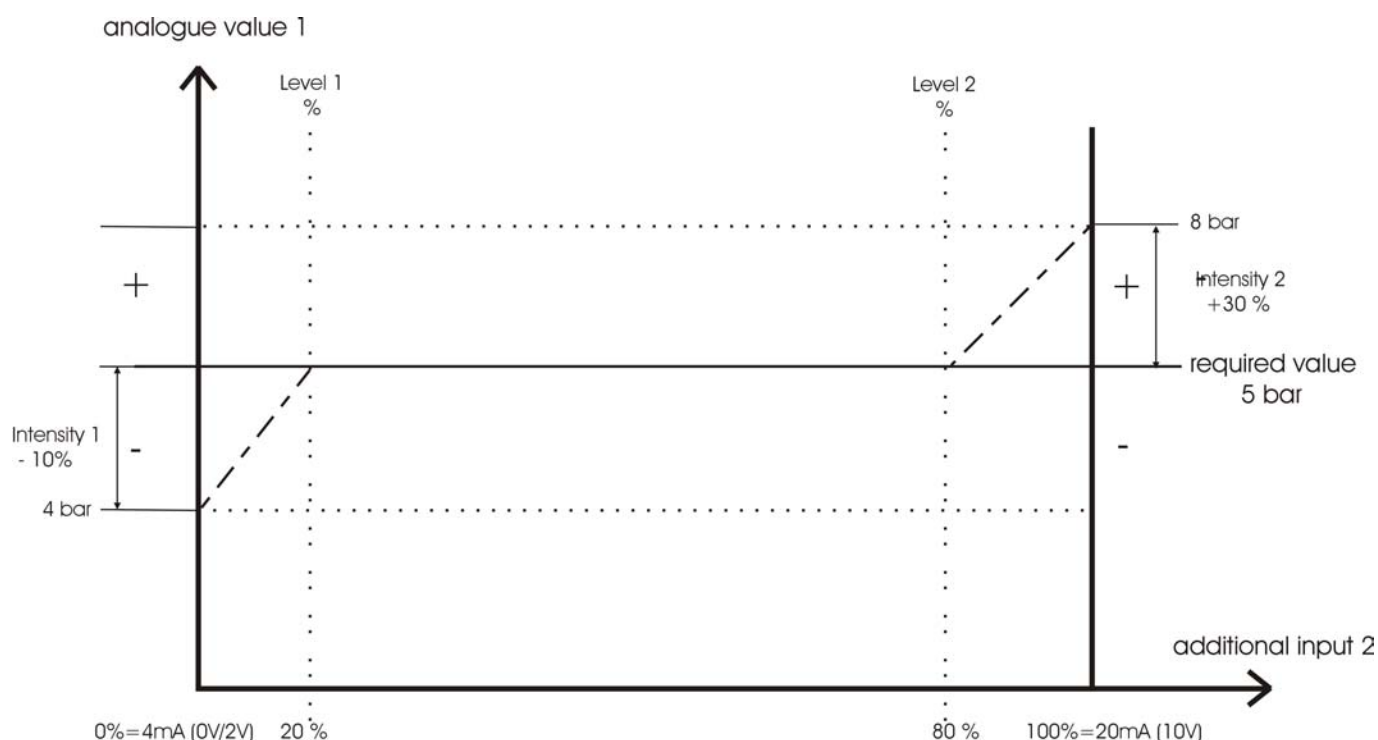
*Sensor range:* 20mA  $\triangleq$  10 bar  
*Required value:* 5 bar

Level 1: 20% of the 2<sup>nd</sup> additional input

Level 2: 80% of the 2<sup>nd</sup> additional input

Intensity 1: -10%  $\triangleq$  -1 bar (refer to the required value)

Intensity 2: +30%  $\triangleq$  +3 bar (refer to the required value)



The *Level 1* have to be entered on the axis of the "additional input" in percent of this *Second Additional* input (=20%). Also proceed with the second level (80%).

*Intensity 1* and *2* are depending on the *Sensor range* of the actual value signal. The offset of *Intensity 1* is valid till *Level 1*. After reaching *Level 1* the *Required Value* has no offset. Therefore you have to enter the *Intensity 1* at the 0%-axis to fine the right offset value. The *Required Value* is valid till you reach the *Level 2*. After reaching *Level 2*, the new value, is influenced by the offset of *Intensity 2*. To get the right offset after *Level 2*, you have to enter the *Intensity 2* at the 100%-axis of the additional input.

Press \* on the Hydrovar-*Smart* to change to

## 7.21 Submenu Sequence control

S U B M E N U Seq. Control
-------------------------------

### Programming of the Multipump Operation:

Up to four pumps can be connected using the integrated RS-485 interface, by connecting the terminals /1, /2 and /3 of the terminal blocks X5 or X6 of each pump together). However, the following additional programming must be carried out in the submenu:

Press \* for about 3 seconds to enter the submenu and the display changes to

#### 7.21.1 Lift Value

ACTU. VALUE INC. 0.35 Bar
------------------------------

Adjustable between 0.0 to the pre-selected  
*Sensor range*

#### Operation of the start of the slave pump:

- 1) Pump 1 reaches ENABLE SEQ. CONTROL (maximum speed)
- 2) Pressure falls and reaches the start-value of the 2<sup>nd</sup> pump  
(= REQUIRED VALUE – ACTU. VALUE DEC.)
- 3) Pump 2 is switched on automatically
- 4) The required value is calculated new, after the start of the 2<sup>nd</sup> pump in the following way!

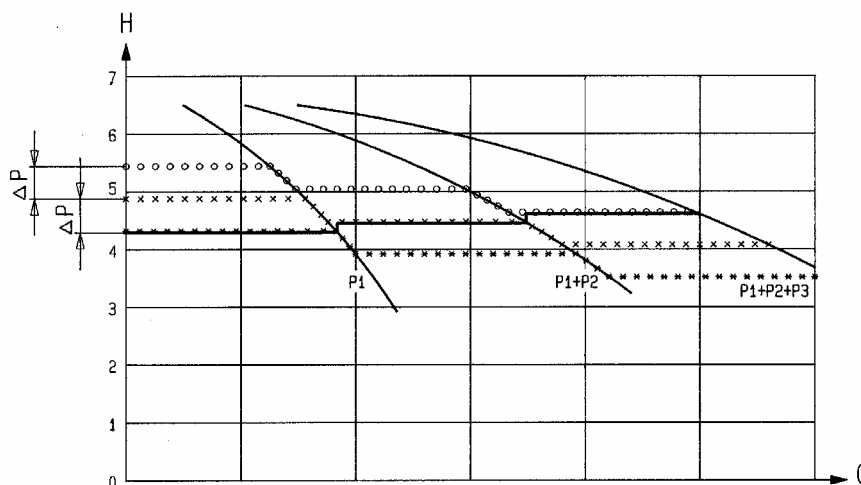
*New required value* = REQUIRED VALUE – ACTU. VALUE DEC. + ACU. VALUE INC.

#### Generally:

k ... Number of active pumps (k > 1)

$$p = p_{\text{set}} + (k-1) \cdot [\text{lift value} - \text{fall value}]$$

- Lift value = Fall value  $\Rightarrow$  **Pressure constant** when pumps switch on
- Lift value > Fall value  $\Rightarrow$  **Pressure rises** when lag-pump switches on
- Lift value < Fall value  $\Rightarrow$  **Pressure falls** when lag-pump switches on



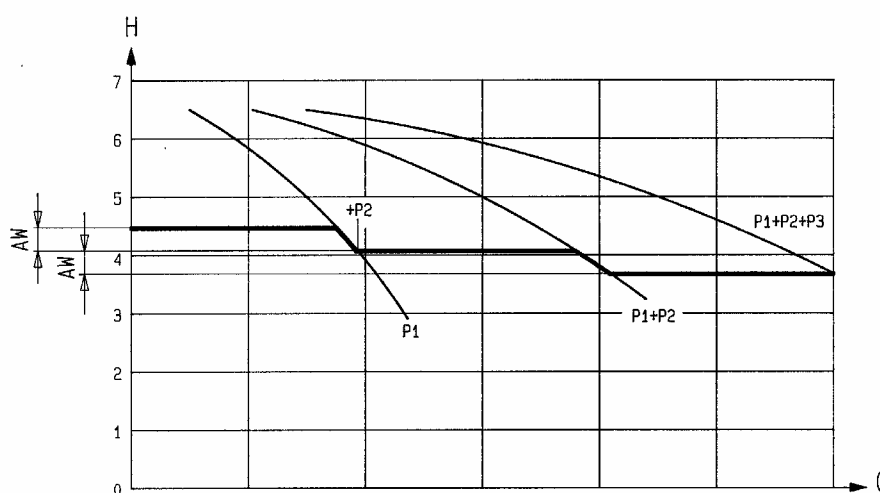
Press \* on the Hydrovar-*Smart* to change to

### 7.21.2 Fall Value

For calculation of the set pressure after start of pumps 2 to 4

ACTU. VALUE DEC.  
0.15 BAR

Adjustable from 0,0 to pre-selected *Sensor range* determines the start-value of the 2<sup>nd</sup> pump and the other following pumps.  
(*Start-Value* = REQUIRED VALUE – ACT. VALUE DEC.)



Press \* on the Hydrovar-*Smart* to change to

### 7.21.3 Release frequency of the following controller

ENABLE SEQ. CTL.  
48.0 Hz

Release of the follow-up pump only when the start-value is reached and the lead

Pump has reached the programmed frequency (Adjustable from 0.0 Hz to 70 Hz)

If you do not want to start a following pump this value has to be set higher than the maximum frequency.

This parameter is also used to start a constant speed pump (when Simple Multicontr. is set). When this frequency level is reached, the potential free contact of the relay X2/5 – X2/6 will be closed.

Press \* on the Hydrovar-*Smart* to change to

#### 7.21.4 Switch Interval

SWITCH INTERVAL 12 hours
-----------------------------

For changing the master pump and follow-up pump in order to achieve even operating hours of the pumps

Adjustable between 1 hour and 100 hours. If it is set higher than 100 hours, the automatic changeover is deactivated).

Manual change of master pump in the 1<sup>st</sup> display with the ↑-button.

Press \* on the Hydrovar-*Smart* to change to

#### 7.21.5 Source of required value

SOURCE REQ. VALUE OFF
--------------------------

for selecting the pump address of the source of the required value.

Five settings are possible:

OFF, ADR1, ADR2, ADR3 and ADR4. If an additional input (INT or EXT-ADC-I or EXT-ADC-U) is active, you must select the address where this input is connected.

When Multicontroller or Synch. Controller is active, the actual active value is shown in brackets in the middle of the display. If the sign “#” is shown in the second line of the display, the pump will work with a required value from another pump in the multipump system. On the pump, which is the source of the required value, there is no “#” shown.

Press \* on the Hydrovar-*Smart* to change to

#### 7.21.6 Synchronous Control

If the synchronous control is active the activated pumps try to control the set pressure together (all pumps run at the same frequency). The 2<sup>nd</sup> pump starts, when the 1<sup>st</sup> pump reaches the release frequency (ENABLE SEQ. CONTR.) The pumps will now maintain constant pressure by running synchronously. The follow-up pump will stop, when both pumps together run below the set SYNCHRON. LIMIT. This creates the hysteresis effect.

S U B M E N U Synch. Control
---------------------------------

Press \* for about 3 seconds to enter the submenu and the display changes to

##### 7.21.6.1 Synchronous Limit

SYNCHRON. LIMIT 0,0 Hz
---------------------------

Frequency threshold adjustable between 0,0 Hz and the set maximum frequency.

Switch off threshold of the first follow-up pump. The switch off thresholds of the other pumps are each higher by the SYNCHRON-WINDOW.



This parameter is also used for the stop value for the external constant speed pump at activated Simple Multicontroller in the parameter configuration relay.

Press \* on the Hydrovar-*Smart* to change to

### 7.21.6.2 Synchronous Window

SYNCHRON-WINDOW 2.0 Hz
---------------------------

Frequency offset  
Adjustable between 0...10 Hz

Threshold lift for switching off the 3<sup>rd</sup> and 4<sup>th</sup> follow-up pump.

#### Setting the Synchronous Limit:

1. Set the desired set value and close the outgoing valves for no flow.
2. Start the first pump in JOG Mode (1st Window in the submenu), increase the frequency, till you reach the required value. Read the frequency ( =  $f_0$  )
3. Set the synchronous threshold ( $f_0 + 2-3$  Hz)
4. Set the synchronous offset to 1-2 Hz  
(depending on the pump curve and operating point).

To leave the submenu press the \* longer than 3 sec. to change to

S U B M E N U Synch. Control
---------------------------------

Press \* on the Hydrovar-*Smart* to change to

### 7.21.7 Pump status indication

PUMP – SEQUENCY Adr1 disabled
----------------------------------

Shows the status of the individual drives  
- for follow-up pump switching

- settings from address 1 to 4, (address 5 is reserved for external control devices)
- Information concerning the actual sequential status of each pump.

The following diagnosis parameters can be also be read in this display window:

hold Px	Pump is stopped (control released)
run Px	Pump is running (control released)
stop Px	Pump is stopped, because $f <$ start frequency of the previous pump
Disabled	Hydrovar- <i>Smart</i> not ready to start (no release)
Error	Hydrovar- <i>Smart</i> error
Fault	Polling failure (RS-485) (interface connection wrong or not connected)
Detected	Polling successful (RS-485)
AdrX *	"*" -> Address of the pump that is being read

Press \* on the Hydrovar-*Smart* to change to

**7.21.8 Error Signals for Data Bus Interruptions**

BUSARBIT-DIAG. 0
---------------------

Counts the number of fault synchronising attempts over the RS-485 interface.

Is there an indication >100, the RS485 interface connection has to be checked!

To leave the submenu press the \* longer than 3 sec. to change to

S U B M E N U Seq. Control
-------------------------------

Press \* on the Hydrovar-*Smart* to change to

**7.22 Submenu - RS 485 Interface**

S U B M E N U RS 485-Interface
-----------------------------------

Press \* for about 3 seconds to enter the submenu and the display changes to

**7.22.1 Pump Address**

PUMP-ADDRESS OFF
---------------------

If only one pump is used, the setting remains OFF. If several pumps are connected via the RS-485 interface (max. 4) each pump must be allocated its own address number.

<b>Each address may only be used once!</b>
--

Press \* on the Hydrovar-*Smart* to change to

**7.22.2 ADC Reference**

ADC REFERENCE Local
------------------------

Reference for the local ADC (Analogue/Digital-Converter) or SIO (RS485 interface).

LOCAL: Actual value from transmitter (Terminal X1/ 1-2)

REMOTE: Actual value via RS-485 (Terminal X5 or X6 / 1-2-3)

To leave the submenu press the \* longer than 3 sec. to change to

S U B M E N U RS 485-Interface
-----------------------------------

Press \* on the Hydrovar-*Smart* to change to

**7.23 Compensation Frequency**

Control according to a system curve (increase of the set pressure, depending upon the flow rate or speed).

FREQU. – LIFTING  
30.0 Hz

Adjustable between 6 Hz and the set MAXIMUM FREQUENCY, this setting states at which frequency the set pressure should be increased. That is the speed, where the pump works at the set pressure and at a flow rate=0 (can be read in the JOG MODE).

Press \* on the Hydrovar-*Smart* to change to

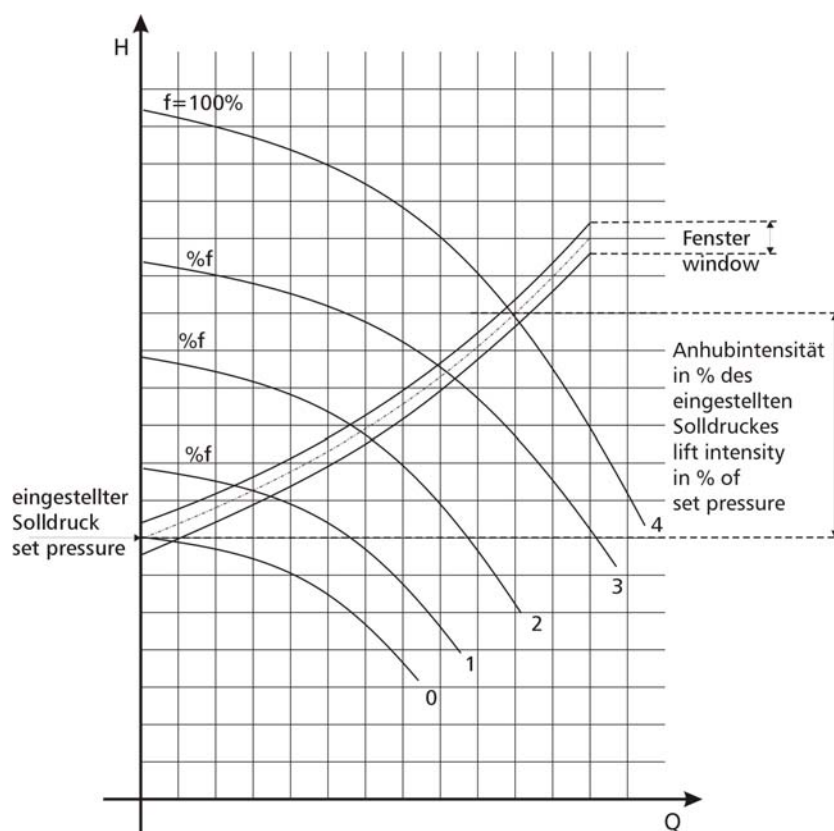
**7.24 Lift-Intensity**

LIFT – AMOUNT  
0.0 %

Adjustable from 0% to 99,9%; this value states how much the set value should be increased, when the pump is running at maximum speed (=maximum flow).

1. Setting of the required pressure (see: Inverter main menu)
2. Enter frequency for *demand* = 0 and *set pressure* = *Actual Value* (see: Jog Mode )  $\Rightarrow$  FREQU. LIFTING
3. Set desired lift at maximum speed, in % of *required pressure*.

Figure: **Lift-Intensity**



Press \* on the Hydrovar-*Smart* to change to

**7.25 Analogue output 1**

ANALOG OUT 1 Frequency
---------------------------

Determines the source of the output signal (0-10VDC on terminals X9/5 and X1/11)

Selection possible over the ↑ and ↓ buttons:

→ **Setting Frequency:** At terminal X9/5 there is the 0-10VDC output of the speed signal for the connected VFD; At terminal X1/11 the 0-10VDC output corresponds to the actual value input signal on X1/2.

→ **Setting Actual value:** The source for the 0-10VDC signals are vice versa.

Standard setting = Frequency!

Press \* on the Hydrovar-*Smart* to change to

**7.26 Unit**

DIMENSION UNIT Bar
-----------------------

Adjustable units: bar, psi, m<sup>3</sup>/h, g/min, ft, mH<sub>2</sub>O, % or without unit can be changed with ↑ or ↓.

Press \* on the Hydrovar-*Smart* to change to

**7.27 Automatic test run**

TEST RUN after 100 h.
--------------------------

Adjustable between 10...100 operating hours.

The timer for the automatic test run starts at every motor stop. After the motor is not running for the set time, the automatic test run starts:

The HYDROVAR-*Smart* starts the pump and ramps up with ramp time 1 up to the set TEST Frequency, runs at this frequency for 1 second and stops the pump, by ramping down with ramp time 2.

Because the timer is updated only hourly, there can be a tolerance of this automatic test run timer of about 1 hour!

The automatic test run can be deactivated by holding the ↑ button and press the ↓ button shortly together.

-> *deactivated is shown in the 2<sup>nd</sup> line.*

To reactivate the automatic test run, you have to press the ↓ button.

***The automatic test run is only active, when the HYDROVAR-Smart is not switched off over the external release signal (X1/4 and X1/5) or the OFF button on the display unit!***

But the internal timer is running also, when the HYDROVAR-SMART is stopped and the test run timer will start again internally, either the HYDROVAR-*Smart* has done the test run or not.

Press \* on the Hydrovar-*Smart* to change to

## 7.28 Submenu for manual test run

S U B M E N U TEST RUN man.
--------------------------------

Press \* for about 3 seconds to enter the submenu and the display changes to

### 7.28.1 Activate manual test run

TEST RUN man. ↑ + ↓
------------------------

By simultaneously pressing ↑ + ↓ a test run will be released.

The function and operation of the started manual test run is similar to the automatic test run

Press \* on the Hydrovar-*Smart* to change to

### 7.28.2 Test Frequency

TEST-FREQUENCY 30.0 Hz
---------------------------

Frequency for manual and automatic test run.  
Can be set from 6.0 Hz up to 70,0 Hz

Press \* on the Hydrovar-*Smart* to change to

To leave the submenu press the \* longer than 3 sec. to change to

S U B M E N U TEST RUN man.
--------------------------------

Press \* on the Hydrovar-*Smart* to change to

## 7.29 Submenu - Error

S U B M E N U ERRORS
-------------------------

Press \* for about 3 seconds to enter the submenu and the display changes to

### 7.29.1 Conveyor Limit

CONVEYOR-LIMIT disabled
----------------------------

Disabled or adjustable between 0.00...SENSOR RANGE. To disable the conveyor limit, press ↓ till

"disabled" or "0 bar" is shown on the display.

An adjusted value >0 has to be reached till the programmed "DELAY TIME".

Doesn't this value be reached; the failure "VAL. RANGE CONTR." will be indicated and the pump stops.

Press \* on the Hydrovar-*Smart* to change to

**7.29.2 Delay Time**

DELAY TIME 2 Sec
---------------------

Adjustable between 0...100 Sec.

Delayed switch-off of the Hydrovar-*Smart*

in case of low water, (terminals X1/6-X1/7 opened) and also for the conveyor limit.

Press \* on the Hydrovar-*Smart* to change to**7.29.3 Automatic Error reset**

ERROR – RESET OFF
----------------------

The parameter can be set OFF (no automatic reset)

or, if you want to have an automatic error reset for

5 times, a delay time of the automatic restart (0-250 sec.) has to be set.

e.g. *ERROR-RESET = 5 seconds*

The Inverter tries to reset the failure for 5 times, between each try to reset the failure and restart the HYDROVAR-*Smart* there is a delay of 5 seconds. After 5 not successful restarts, the Hydrovar-*Smart* will shut off and an error message is shown.

The last five error signals are always stored in the Error memory 1 to 5 (main menu)

Press \* on the Hydrovar-*Smart* to change to**7.29.4 Erase Error memory**

CLEAR ERRORS 0000
----------------------

The error memory can be deleted by entering a

password. If you want to know that, please contact your responsible distributor!

To leave the submenu press the \* longer than 3 sec. to change to

S U B M E N U ERRORS
-------------------------

Press \* on the Hydrovar-*Smart* to change to**7.30 Operating Hours**

OPERATING HOURS 0000 h.
----------------------------

operating time of the control unit (Hydrovar-*Smart* -supply is OK)

Reset by simultaneously pressing of ↑ + ↓ until TIMER – RESET appears.

Press \* on the Hydrovar-*Smart* to change to

**7.31 Display - Contrast**

DISP. CONTRAST 50 %
------------------------

Can be adjusted between 10...100%. For improved clarity of the display, depending on the installation position.

Press \* on the Hydrovar-*Smart* to change to

**7.32 Set Password**

SET PASSWORD 0066
----------------------

The pre-set password can be changed if necessary.

Press \* on the Hydrovar-*Smart* to change to

**7.33 Operating Lock**

LOCK FUNCTION OFF
----------------------

When [ON] is activated, it is not possible to make any changes in the main menu.

Only the ON/OFF (start and stop) buttons ↑ and ↓ are active.

In order to change the desired set value, the lock function must be switched off [OFF], then you can return into the main menu and the set pressure can be changed.

Press \* on the Hydrovar-*Smart* to change to

**7.34 Setting Default Values**

S U B M E N U DEFAULT VALUES
---------------------------------

Press \* for about 3 seconds to enter the submenu and the display changes to

**7.34.1 Default Values Europe**

DEFAULT EUROPE ↑ + ↓
-------------------------

Load the DEFAULT – PARAMETERS for Europe  
Press buttons ↑ + ↓ for approx. 5 seconds.

(e.g.: maximum frequency 50 Hz, display unit = bar, Analog out 1 = Frequency)

Press \* on the Hydrovar-*Smart* to change to

**7.34.2 Default Values USA**

DEFAULT USA ↑ + ↓
----------------------

Load the DEFAULT – PARAMETER for the USA  
Press buttons ↑ + ↓ for approx. 5 seconds

(e.g.: max. frequency 60 Hz, display unit = psi, Analog out 1 = Frequency)

<b>Attention</b> After reloading the default settings the display is flashing, to deactivate the flashing press the * until you reach the parameter "SAVE"
--

To leave the submenu press the \* longer than 3 sec. and change to

S U B M E N U  
DEFAULT VALUES

Press \* on the Hydrovar-*Smart* to change to

### 7.35 Saving

SAVE ???  
↑ + ↓

All values must be saved (stored in an EEPROM) after changing. If they are not saved, all changes will be

lost in case of a power failure!

*Saving:* Press ↑ + ↓ together, till the message "SAVED" is shown on the display.

After saving, the display automatically changes to the 1<sup>st</sup> display after a few seconds.



## 8 Error Signals

The active Error messages are every time shown in the selected language, but in the Error memory (main menu) the last 5 Error are stored only in English language!

### 8.1 Low Water – Lack of water

LACK OF WATER :  
E R R O R

Remedy:  
Check suction pressure or tank level!

If suction pressure or tank level is normal the unit restarts itself. If there is no suction pressure switch (e.g. circulating systems), bridge terminals X1/6 and X1/7.

### 8.2 Conveyor Control – Val. Range contr.

VAL.RANGE CONTR.  
E R R O R

The set minimum pressure threshold for monitoring pump delivery (delivery

threshold) was not achieved within the set delay time.

At error reset ON the system is only shut down after 5 attempts of starting. If the delivery threshold is set at <0, this function is deactivated.

After the cause has been remedied, the malfunction can be reset by cutting off the power supply or pressing all three buttons (↑, ↓ and \*) together for about 5 seconds.

### 8.3 Overheating – Motor

MOTOR OVERHEAT  
E R R O R

Possible causes: insufficient cooling  
Ambient temperature is too high, motor

overloaded. After the cause has been remedied, the malfunction can be reset by cutting off the power supply or pressing all three buttons (↑, ↓ and \*) together for about 5 seconds.

### 8.4 Inverter Error

INVERTER - ERROR  
INVERTER- ERROR

Possible cause: The inverter error relay indicates and failure (contact open), or there

is an installation error (terminals X9/3 and X9/4)

After the cause has been remedied, the malfunction can be reset by cutting off the power supply or pressing all three buttons (↑, ↓ and \*) together for about 5 seconds.

### 8.5 Pressure Sensor Error I < 4 mA – act. value sensor

ACT. VALUE SENSOR  
E R R O R

Possible cause: Defective pressure transmitter or broken cable (damaged cable)

Check the pressure transmitter!

After the cause has been remedied, the malfunction can be reset by cutting off the power supply or pressing all three buttons (↑, ↓ and \*) together for about 5 seconds.

An error indication is given over terminal X2/1, X2/2 and X2/3 (changeover contact). If no Error is active, the relay is switched on and terminals X2/2 and X2/3 are closed.

**Attention** If "AUTO - START ON" and "ERROR-RESET – ON" are programmed, the unit can start again automatically after a power failure.

### 8.6 Additional Error signals:

ERROR 1	:	EEPROM-ERROR (corresponding data block malfunction)
ERROR 2	:	Security error / Software protection error
ERROR 4	:	Display unit / Push buttons error (e.g.: jammed key)
ERROR 5	:	EPROM-error
ERROR 6	:	Program error: Watchdog error
ERROR 7	:	Program error: Processor pulse error
ERROR 8	:	Program error: invalid processor command

These ERROR signals can be reset by cutting off the power supply or pressing all three buttons (↑, ↓ and \*) together for about 5 seconds.

If the error signal should appear again, contact customer service and provide a detailed description of the error.

## 9 RS 485 - Interface

Standardised Bus-Interface for communication between the inverters (Hydrovar-*Smart* and/or Hydrovar Drive heads) and/or an overruling external control system.

The data protocol complies with ISO 1745 for RS 485 interfaces and contains the following configurations:

Transfer rate : 9600 Baud (1 Start bit, 8 Data, 1 Stop bit)

An interface inverter RS 232/RS 485 is necessary in case communication with a V24 interface of a PC or another external control system is wanted.

All parameters can be approached via the standard interface. The inline structure of the Hydrovar-*Smart* Drive head can be obtained upon request.

For further information see:

**serial data transmission – RS485  
HYDROVAR-*Smart* – Protocol 120**

## 10 Auxiliary Texts

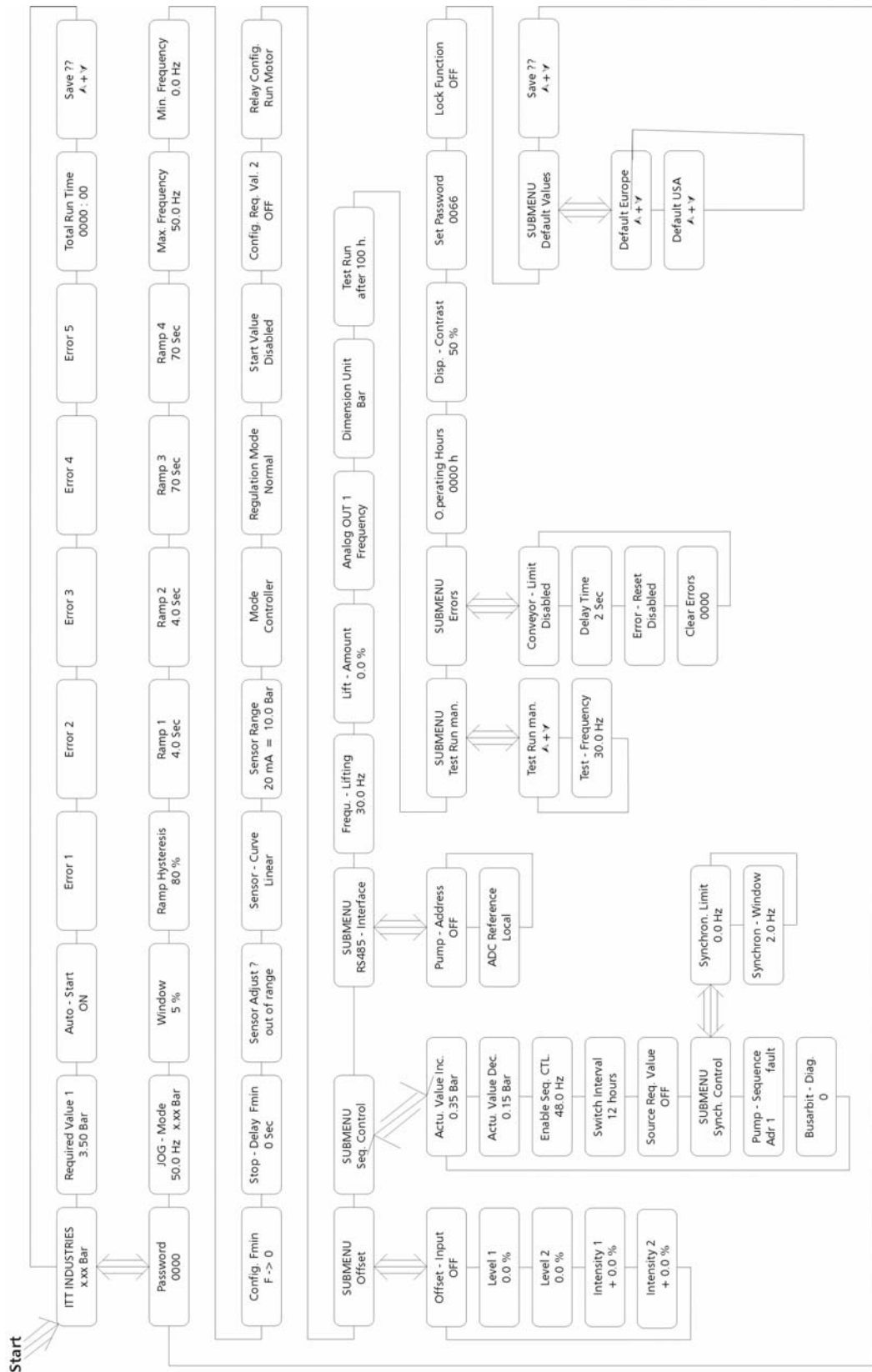
All auxiliary texts that are available in texts in the display window are listed here. To call them up press the buttons \* + ↑; each auxiliary text then appears as "running text" in the second line of the window.

## 11 Maintenance

The Hydrovar-*Smart* unit does not require special maintenance.

When replacing the control card in a plant with more than one pump **ensure**, that **the same or compatible software version** is used in all Hydrovar-*Smart* units.

For further information, please ask your responsible distributor!

**12 Diagram of all Software parameters**



## Manufacturer's Declaration

as defined in EC Machinery Directive 98/37/EEC,  
Appendix II B  
and the EMC Directive 89/336/EEC

We herewith declare that the frequency converter of type

### **HydrovarSmart**

is intended for assembly with other machines to a machine. It is forbidden to start using it until it has been established that the machine on this converter is to be installed or with which this converter is to be assembled complies with the provisions of EC Directives.

Relevant technical standards and specifications, especially

EN 61000-6-3  
EN 61000-6-4  
EN 61010-1

.....  
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Stockerau, 29.07.02

**Vogel Pumpen**



**ITT Industries**  
*Engineered for life*







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