



DredgerControl M - Manual



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Functional description

- Vizualisation
- Parameterisation
- Vacuum, speed and jet controllers



General description

Symbols next to the texts

- This item is informative...



- It should be noted that...



- Action must be taken here...



Safety instruction

General

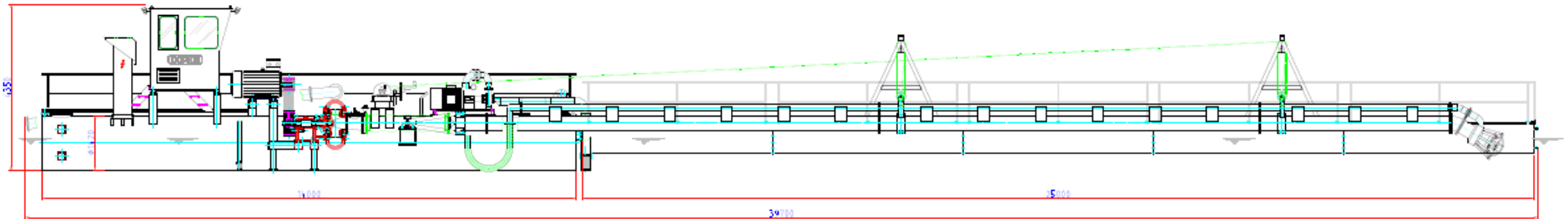
The described devices must be operated according to this manual. The standard EN 50110-1:2013 (operation of electrical installations) must be observed. The national working safety rules must also be observed.



Warning!

- Work on electrical components danger to life due to electric shock! In-sufficient knowledge and experience may cause injury or death.
- All work on electrical equipment must be performed by comprehensively trained and licensed electricians with sufficient professional experience.
- Electricians must observe the 5 safety rules:
 1. Disconnect completely
 2. Secure against re-connection
 3. Verify that the installation is dead
 4. Carry out earthing and short-circuiting
 5. Provide protection against adjacent live parts

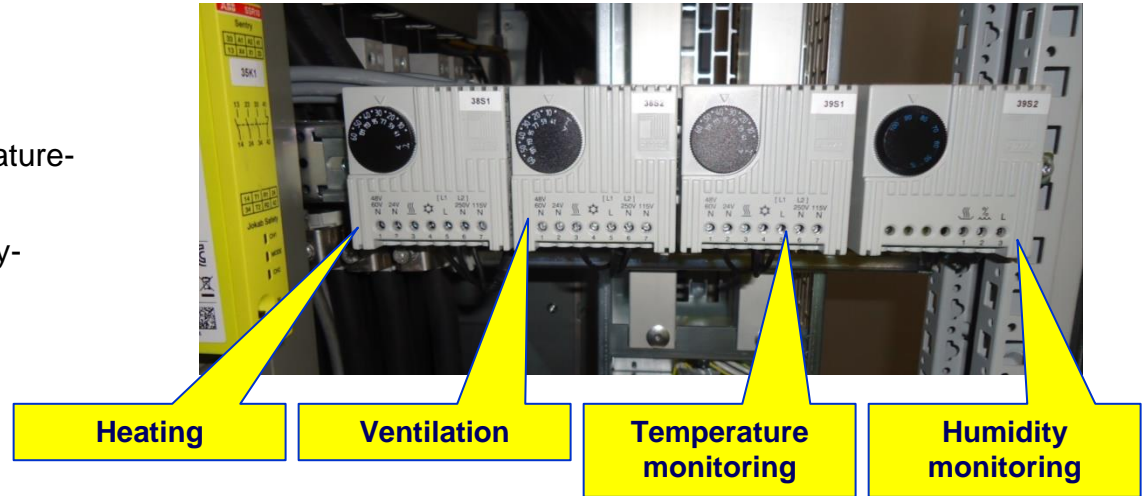
Suction dredger model S III E



- Control cabinet behind the cabin
- Overwater sand pump with variable frequency drive (VFD)
- Overwater jet pump with variable frequency drive (VFD)
- Overwater gland-water pump
- Manned operation

Condition of electrical equipment of the suction dredger

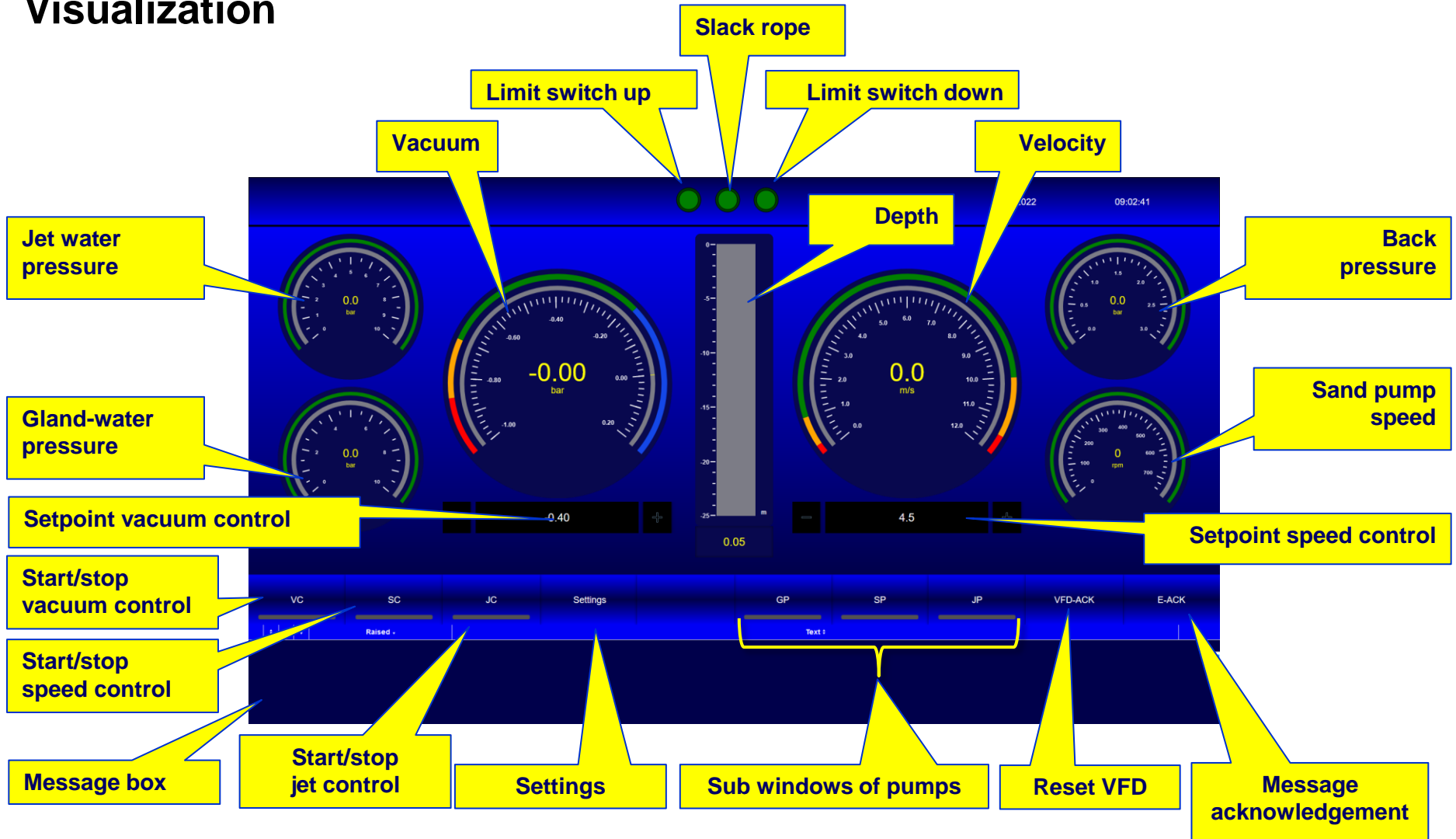
- The control cabinets are heated.
- The control cabinets are ventilated.
- The control cabinets are additionally temperature-monitored (limit value 35°)
- The control cabinets are additionally humidity-monitored (limit value 85°)



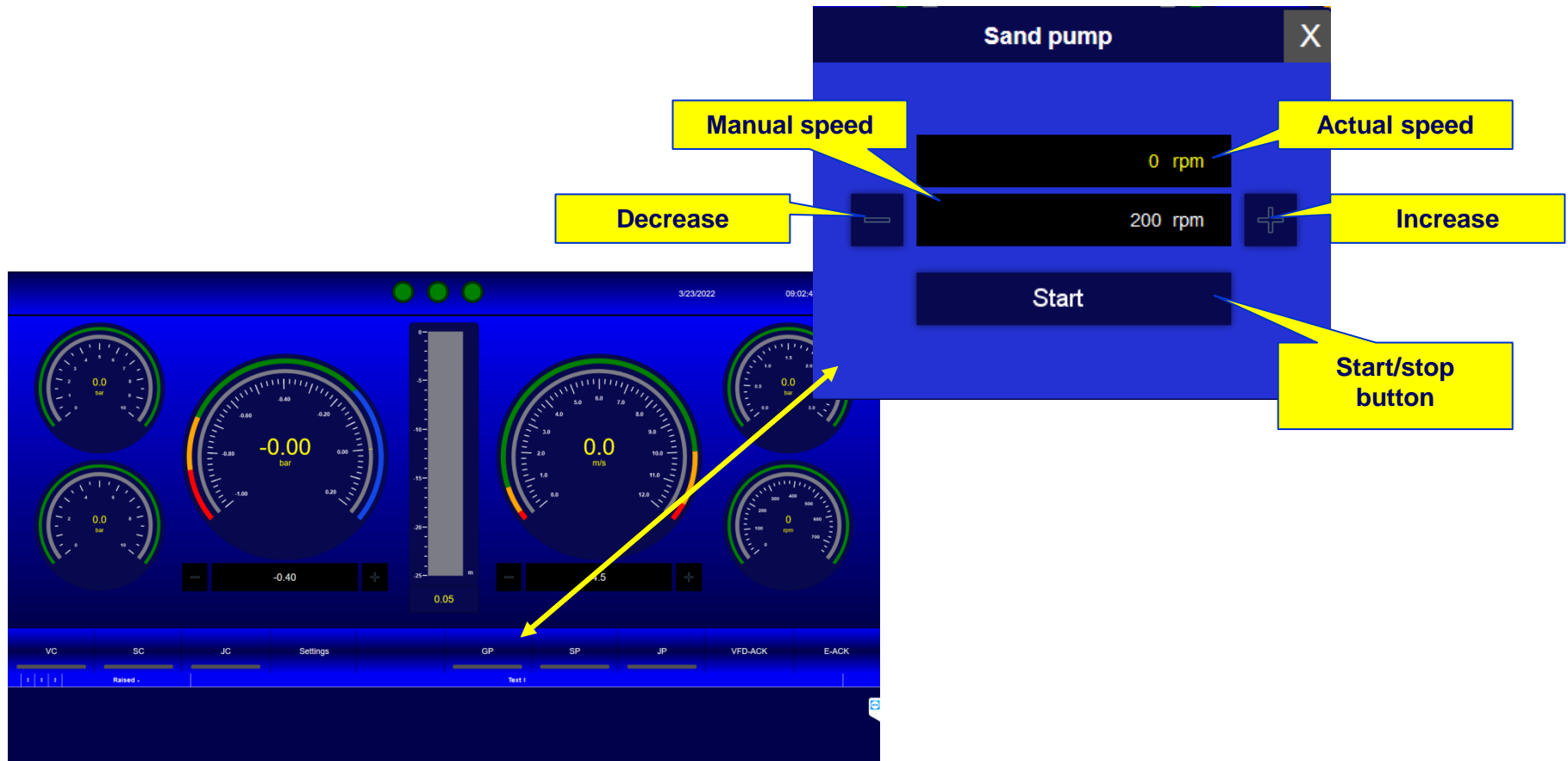
If the humidity in the cabinets is above 85%, the cabinets must be heated and ventilated. The aggregates must NOT be switched on.



Visualization



Sub windows of pumps



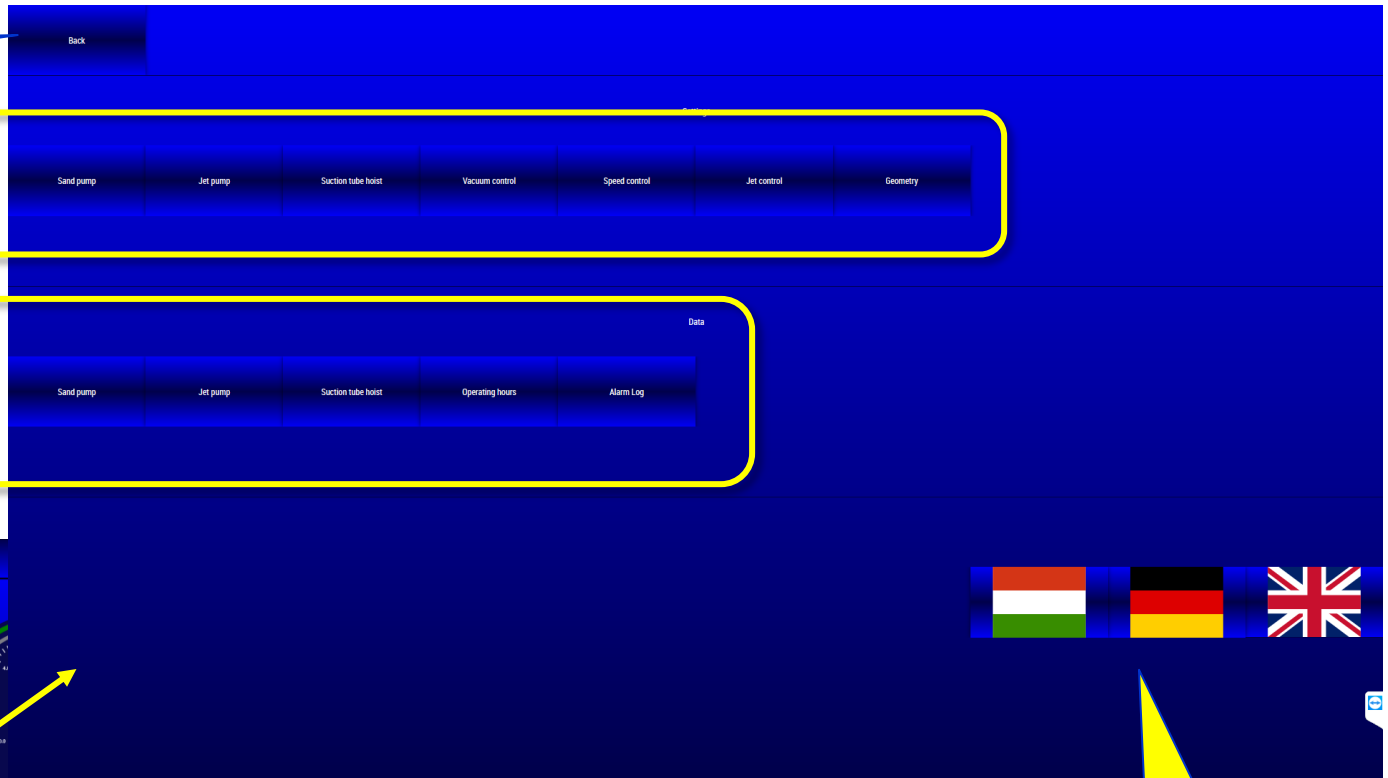
If the pump cannot be switched on, it has a **fault** or is **interlocked**.

Settings – Overview

Exit

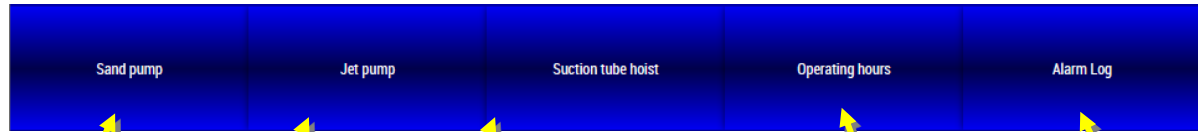
Settings

Data



Selection of the language

Data



Alarm logbook

Sand pump data		X
Speed	0 rpm	
Current	0.0 A	
Voltage	0 V	
Power	0.0 kW	
Torque	0.0 %	

Jet pump data		X
Speed	0 rpm	
Current	0.0 A	
Voltage	0 V	
Power	0.0 kW	
Torque	0.0 %	

Suction tube hoist data		X
Speed	0 rpm	
Current	0.0 A	
Voltage	0 V	
Power	0.0 kW	
Torque	0.0 %	

Operating hours		X
Vacuum threshold material	-0.30 bar	
Operating hours material total	2 h	
Operating hours material day	0.0 h	
Operating hours sand pump total	2 h	
Operating hours sand pump day	0.0 h	
Operating hours jet pump total	3 h	
Operating hours jet pump day	0.0 h	

Vacuum threshold
If this value is passed, the material time is counted.



Data of the variation frequency drives (VFD)

Operating hours

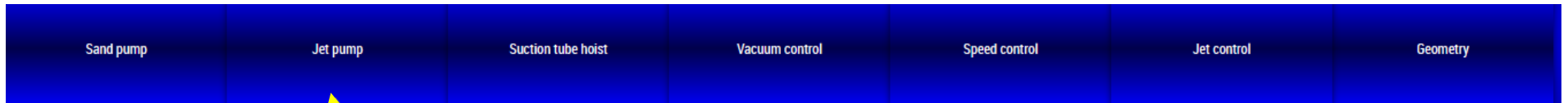
Settings – sand pump



Sand pump parameter		X
Start speed	200 rpm	
Speed min	75 rpm	
Speed max	745 rpm	

- Manual speed with controller switched off
- Minimum drive speed
- Maximum drive speed

Settings – jet pump



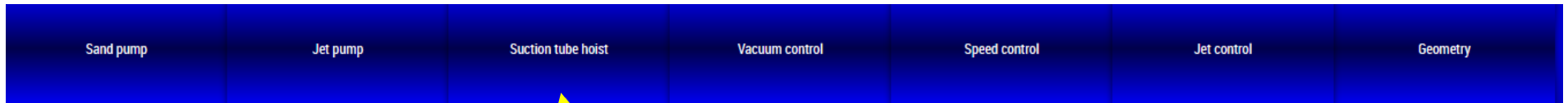
Jet pump parameter		X
Start speed	200 rpm	
Speed min	75 rpm	
Speed max	2975 rpm	

Manual speed with controller switched off

Minimum drive speed

Maximum drive speed

Settings – suction tube hoist



Suction tube hoist parameter	
Joystick speed	600 rpm
Speed min	100 rpm
Speed max	1445 rpm

Joystick speed with controller switched off

Minimum drive speed

Maximum drive speed

Vacuum control

The vacuum regulation has the task of regulating the material intake of the pump. The closer the suction head comes to the material, the higher the vacuum on the suction side rises. The control has the task of keeping this value as constant as possible, even if the material inflow at the suction head changes quickly.

The actual control is done by raising and lowering the suction tube. This is done via the suction tube hoist.



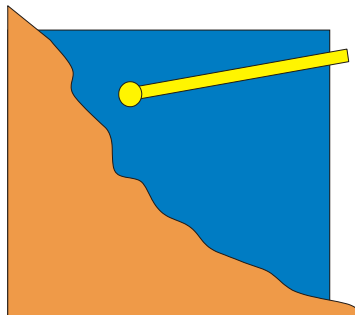
- The suction dredger is manned.
- The vacuum controller supports the operator in the production process.



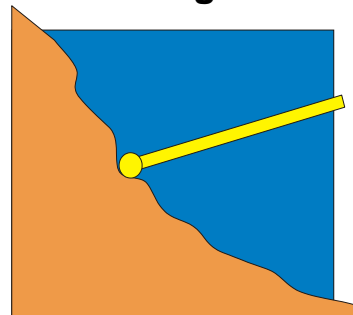
- In the event of a fault, the control is switched off and the operator has to set the suction dredger into a safe condition.



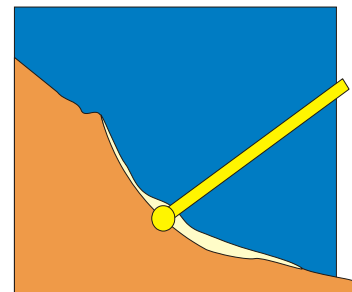
Vacuum water



Vacuum target value



Collapse detection



Vacuum control - parameters

Setpoint

The control tries to reach the **vacuum target value (setpoint)**. The suction tube is lowered and raised. With the **dead band**, an area is defined around the setpoint where the control does nothing.

Vacuum setpoint	0.00 bar
Dead band	0.00 bar

Collapse

In the event of a collapse, the vacuum value increases abruptly. If the **collapse detection vacuum** value is reached, the suction tube is lifted. If the vacuum value reaches the **collapse hysteresis value**, the suction tube hoist stops and the sand pump flushes the pipeline for a defined time (**sand pump purge time**).

Vacuum collapse detection	0.00 bar
Vacuum collapse hysteresis	0.00 bar
Sand pump purge time	0 s

Controller parameters

The **minimum** and **maximum** hoist **speed** can be set, as well as the **gain**. After changing the gain, keep a close eye on the speed controller. The optimization of the controller behavior through the gain is limited.

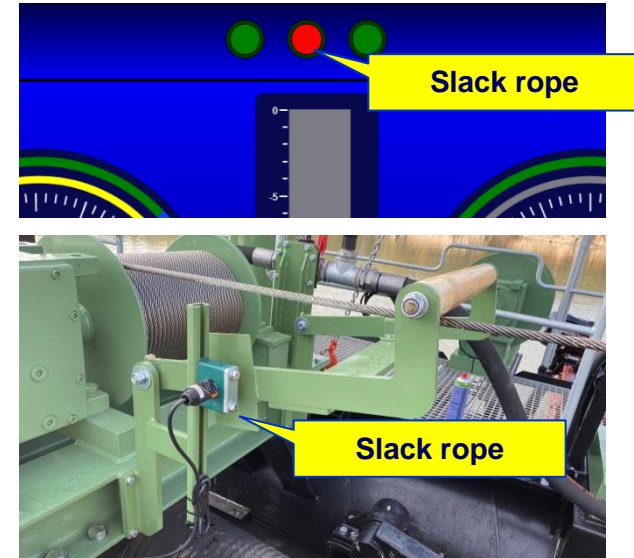
Controller output speed min	0 rpm
Controller output speed max	0 rpm
Gain	0

Vacuum control - slack rope sensor

Slack rope sensor

If the material cannot be loosened in the production process (e.g. very hard layer or too low jet pressure), the target vacuum value (setpoint) cannot be reached and the suction tube head lies on the bottom of the lake.

In this case, the slack rope sensor is triggered and the suction tube rope is not reeled off any further.

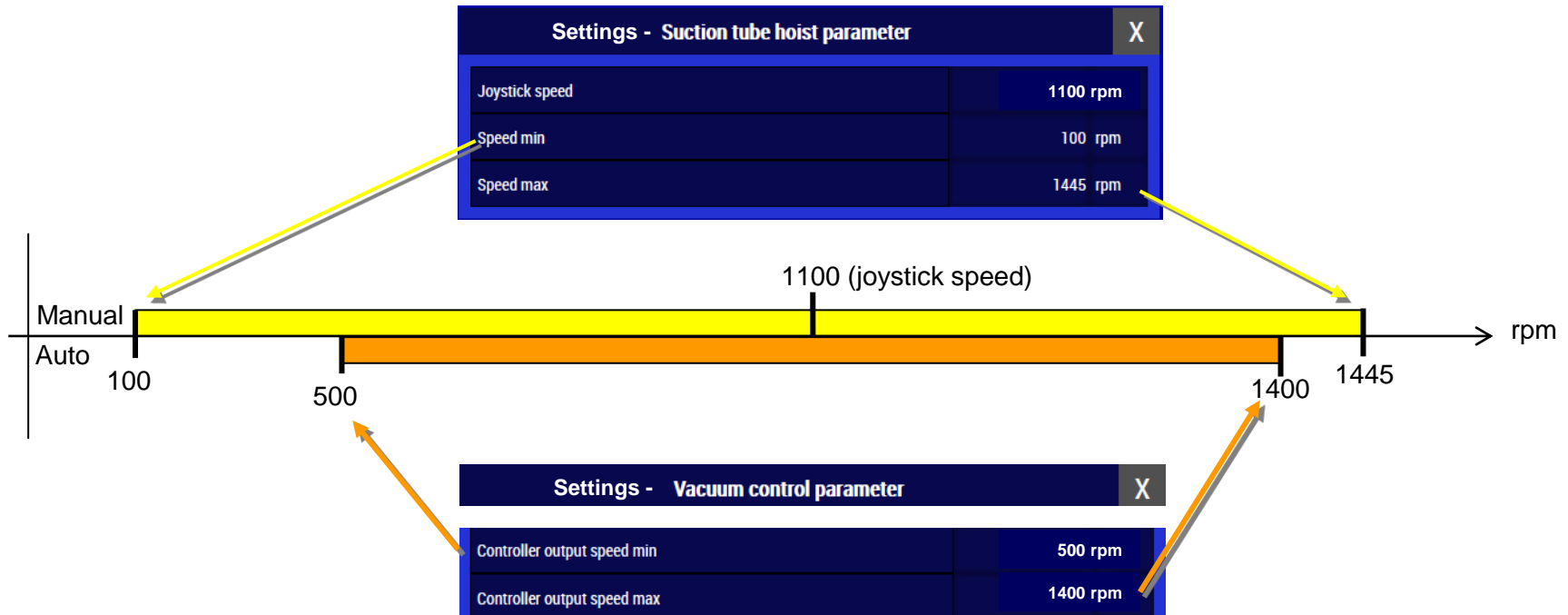


This signal may need to be delayed if the suction dredger is rocking.



Vacuum control parameter		X
Slack rope delay time		0 s

Vacuum control – parameters and limit values for suction tube hoist



The outer limit values of the controller must be within the limits for the aggregate. The values may lie on top of each other.



Speed control

For speed control, the velocity behind the sand pump is measured with a special sensor. The speed of the pump changes between the minimum and maximum value during regulation.



- The suction dredger is manned.
- The speed controller supports the operator in the production process.



- In the event of a fault, the control is switched off and the operator has to set the suction dredger into a safe condition.



By increasing or decreasing the pump speed, an aim is made to reach the **target flow velocity (setpoint)** behind the pump.

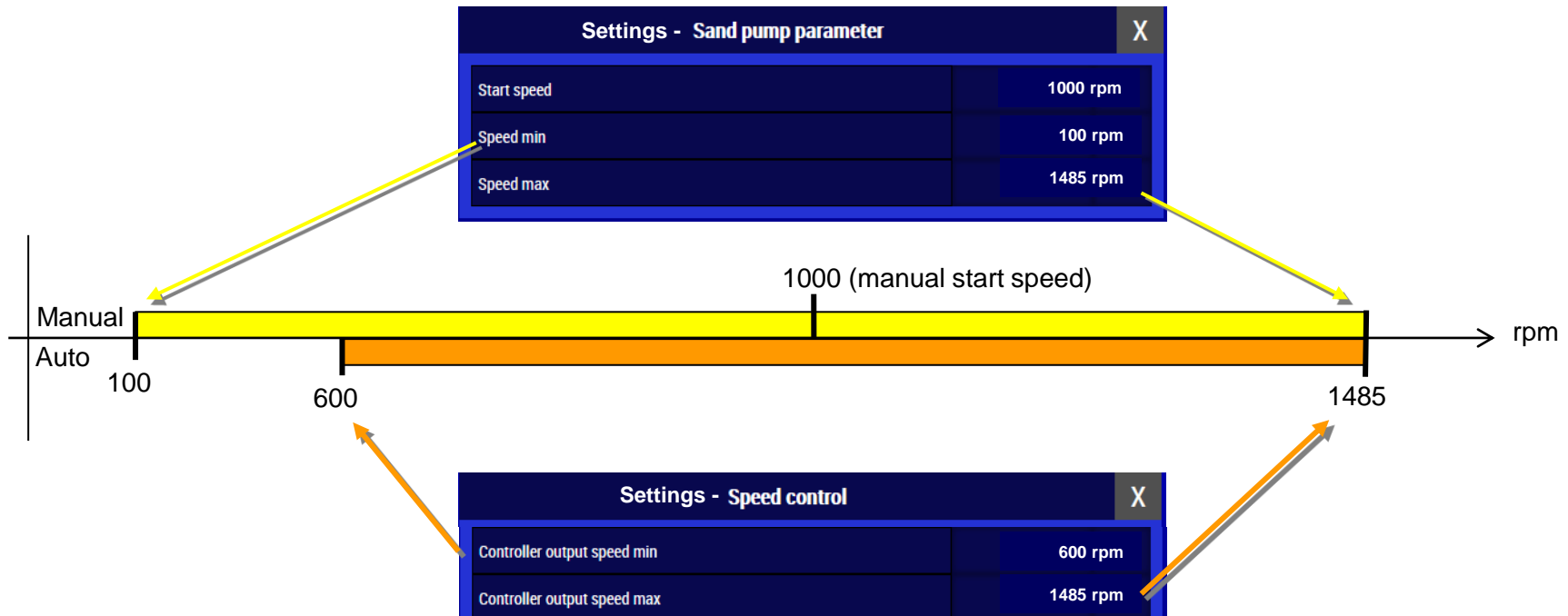
Flow speed setpoint	4.5 m/s
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Controller parameters

The **minimum** and **maximum** pump **speed** can be set, as well as the **gain** and **Tn**. After changing the gain or Tn, keep a close eye on the speed controller. The optimization of the controller behavior through the gain is limited.

Controller output speed min	400 rpm
Controller output speed max	745 rpm
Gain	50
Parameter Tn	10 s

Speed control – parameters and limit values for sand pump



The outer limit values of the controller must be within the limits for the aggregate.
The values may lie on top of each other.



Jet control

If the vacuum setpoint is reached during the dredging process, the speed of the jet pump can be reduced. If the extraction process comes to a standstill, the speed of the jet pump is increased again.



- The suction dredger is manned.
- The jet pump controller supports the operator in the production process.



- In the event of a fault, the control is switched off and the operator has to set the suction dredger into a safe condition.



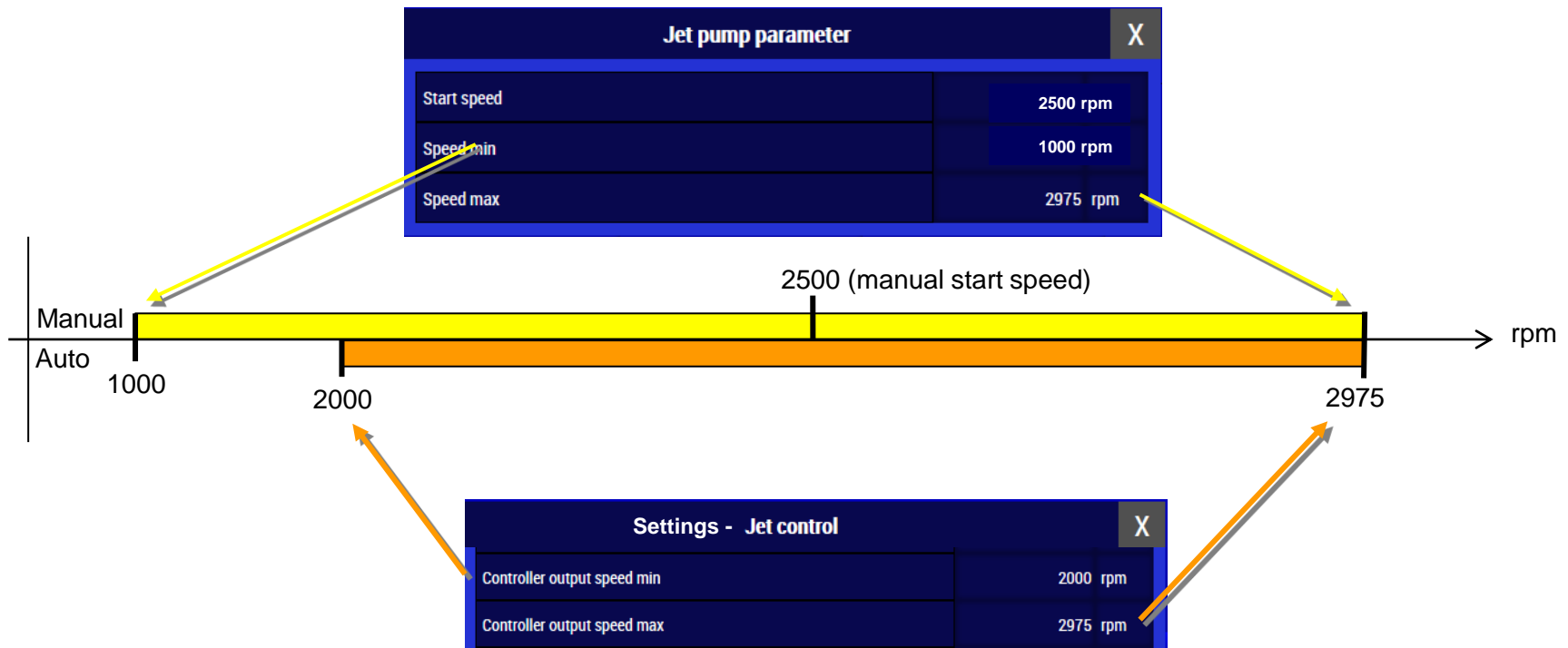
By increasing or decreasing the jet pump speed, an aim is made to reach the **target vacuum (setpoint)** with as low energy as possible.

Controller parameters

The **minimum** and **maximum** jet pump **speed** can be set, as well as the **time tau** and the **vacuum tolerance**. After changing the time tau and the vacuum tolerance, keep a close eye on the jet pump controller.

Jet control		X
Time constant tau	100.0 s	
Controller output speed min	2000 rpm	
Controller output speed max	2975 rpm	
Vacuum tolerance	0.01 bar	

Jet control – parameters and limit values for jet pump

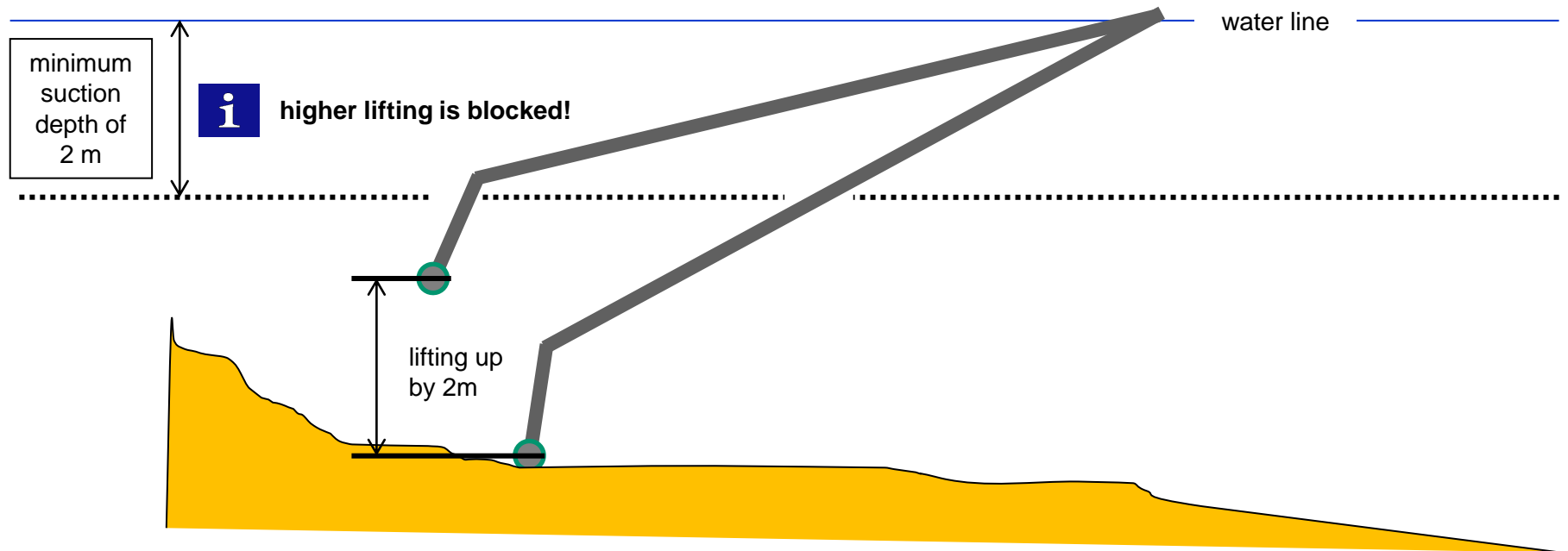


The outer limit values of the controller must be within the limits for the aggregate.
The values may lie on top of each other.



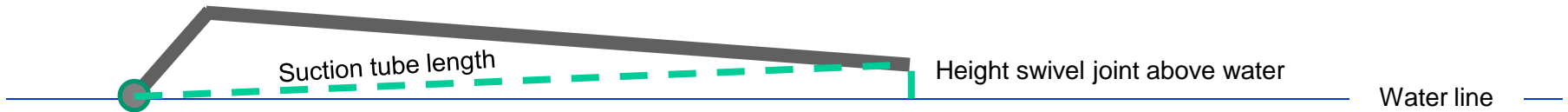
Fault signal of the shore installation

The control system reacts to a fault input signal (e.g. fault in the shore installation) by switching off the controllers, lifting up the suction tube by 2 meters and starts sucking water. The minimum suction depth of 2 meters is not dropped below. A message is generated.



Geometry

Changes to the suction tube affect the depth information in the visualization and must be subsequently maintained. The **suction tube length** is the imaginary line between the **swivel joint** and the suction tube head. The **maximum angle** (normally 60°) and the **maximum depths** can also be parameterized.



Geometry		X
Suction tube length	18.8 m	}
Height swivel joint	0.37 m	
Max. angle tube	60.0 °	
Max. depth	16.1 m	}
Suction tube angle	25.39 °	
0m-Calibration	Save	

Parameters

Actual suction tube angle (not editable)

For a 0m-calibration, lift the suction tube on the waterline and press the "Save" button.

Suction tube - hardware protection

The **maximum angle** (normally 60°) can be parameterized.

Two limit switches provide additional protection.

When the suction tube is moved to one of the limit switches, it is interlocked.

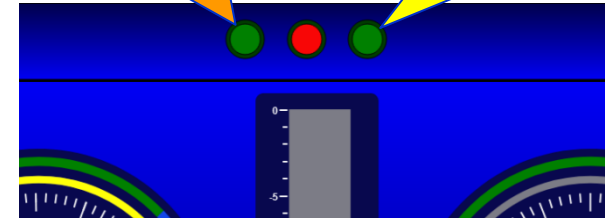


To unlock the suction tube, the bypass button must be pressed at the same time as the joystick.



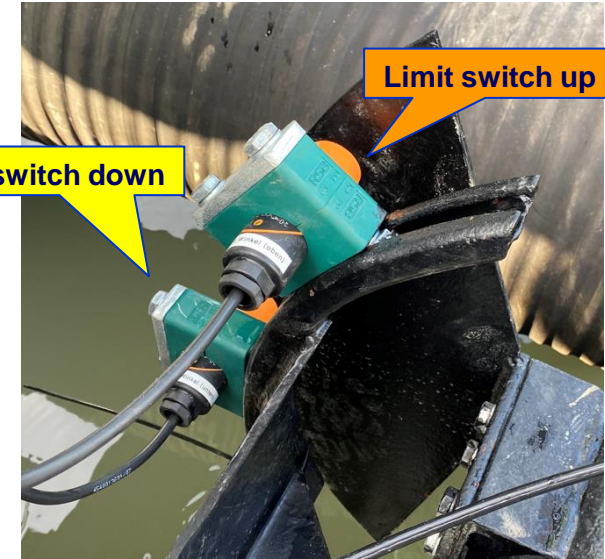
Limit switch up

Limit switch down



Limit switch up

Limit switch down



Attention: While pressing the button the limit switches are bypassed and both directions of movement are enabled. The operator must ensure that the suction tube is moved in the right direction.