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<div>6. 유지관리 메뉴얼</div>		

OPERATION MANUAL

DIGITAL GOVERNOR

Project: DAE CHEONG - VISUALIZATION EXCHANGE
PROJECT

Type of machine: Francis Turbine

Customer: K-Water

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	Created by			Checked/Released by		
Project number: K330.154042			Document number: DCC15-GOV-9873			

Original language: English

5 Operation

5.1 Safety instructions



CAUTION

Changing the turbine controller parameters influence its behaviour and can cause instabilities.

5.2 Basic Display Structure

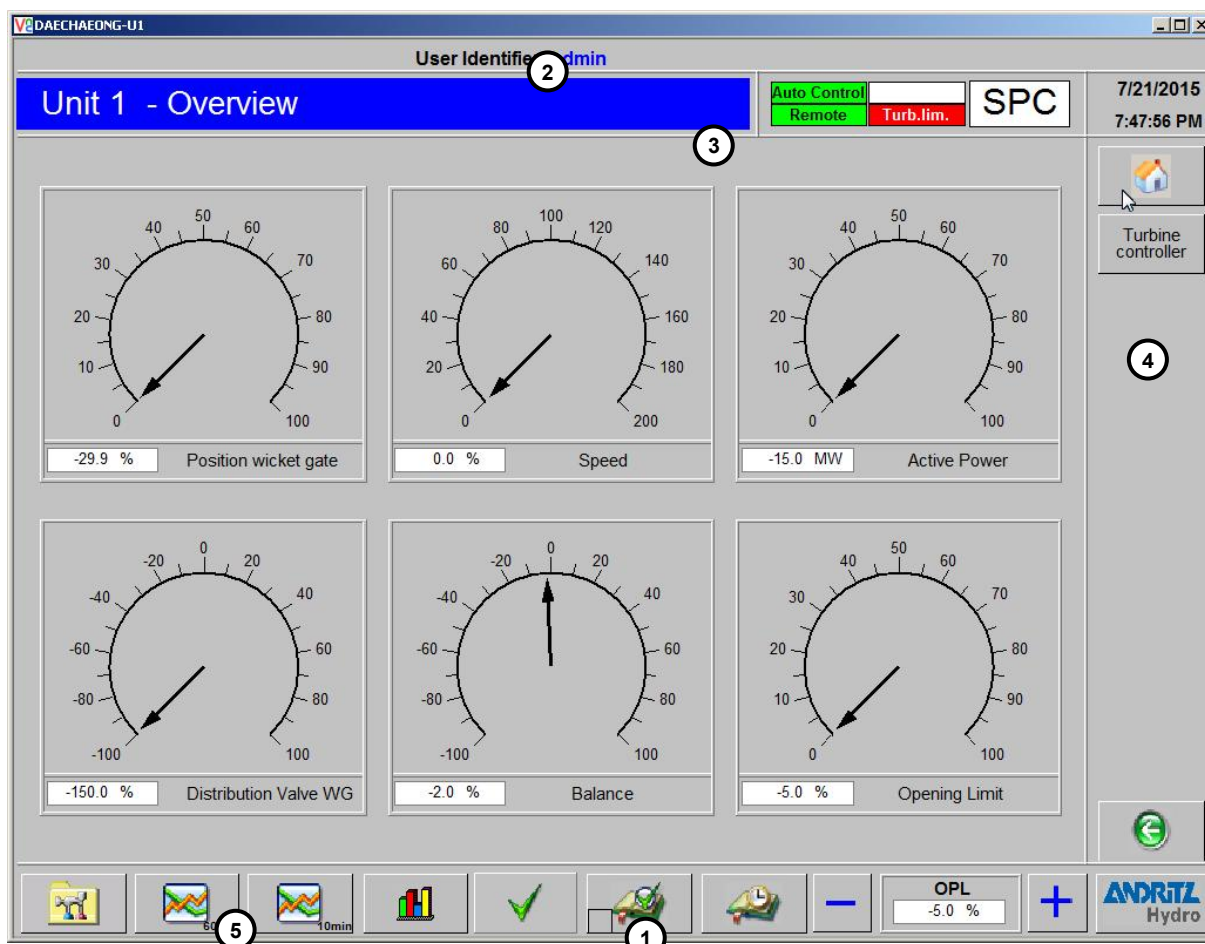


Fig. 1 Basic Structure – 15" Touch Panel

The basic structure of the 15"-Touch-Panel for the turbine is split into altogether five sections:

Alarm- and Status button (1)

The button for opening the alarm list shows if an alarm appears. If an alarm comes up the button will get coloured in red blinking. After pushing this button the alarm list gets opened, and the user gets displayed all alarms. If all alarms are quitted, but they still exist, the button changes to a continuous red colour. If the alarms are gone but not quitted, the button changes to green blinking.

The status window first becomes visible again when all alarms or warnings have been acknowledged by the user in the Alarm Signal List.

Header (2)

Here, besides the current display title, the data and time of the system is also displayed.

At the left side of time and date some additional items will be displayed:

- automatic or manual operation
- local or remote operation
- island detection [internal or external]
- turbine in limited state
- current active controller (POC- Power Controller, OPC- Opening Controller, SPC – Speed Controller)

Main window (3)

Here the respective operating- and monitoring windows are superimposed.

Navigation menu (4)

The display navigation is carried out using the buttons of this menu. There is a navigation menu for each display, which shows all pictures that can be called from this display.

The Touch-Panel program contains five display levels, of which one, the lowest level in the hierarchy, can only be reached via the supplementary menu.

Some navigation menus are structured in three pages in order to accommodate the large number of detailed displays.

Main menu buttons



- main overview display



- Picture Back



- next page

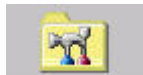


- previous page

Supplementary menu (5)

The additional images can be opened using the buttons of this menu. This supplementary menu is available in this form in all displays, with the exception of the supplementary displays themselves.

Supplementary menu buttons



- System control



- Trend diagram



- quit isolated network operation, reset after quick shutdown



- Alarm Signal List



- Chronologic Event List



and



changes to the opening limiter at any time



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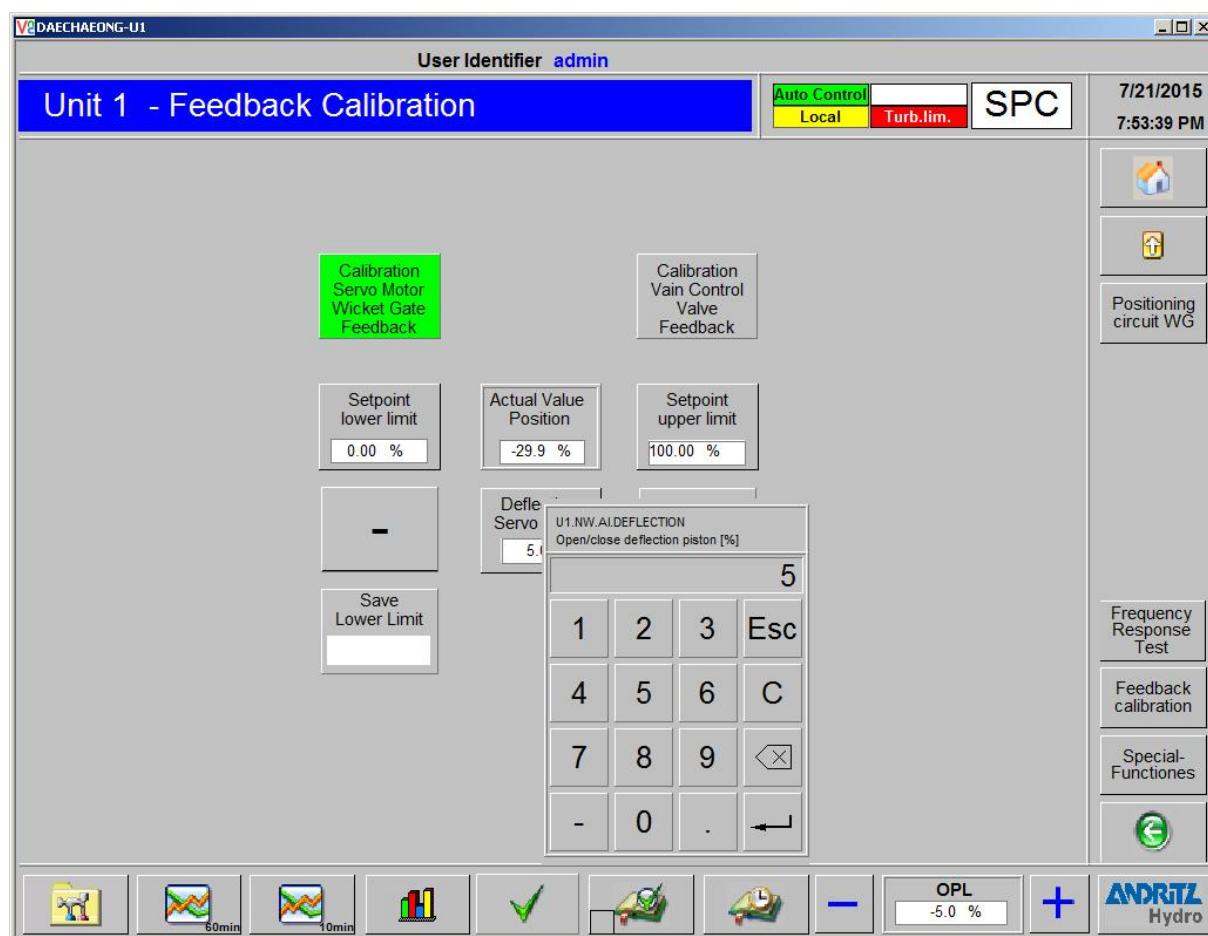


Fig. 3 Display - Setpoint Input

The input of the desired setpoint value is carried out using the virtual keypad on the Touch-Panel. After confirming the input by pressing the ↵-key the value is immediately accepted. The input can be corrected at any time by pressing the ←-key or terminated by pressing the ESC-key.

5.3 Display - Overview

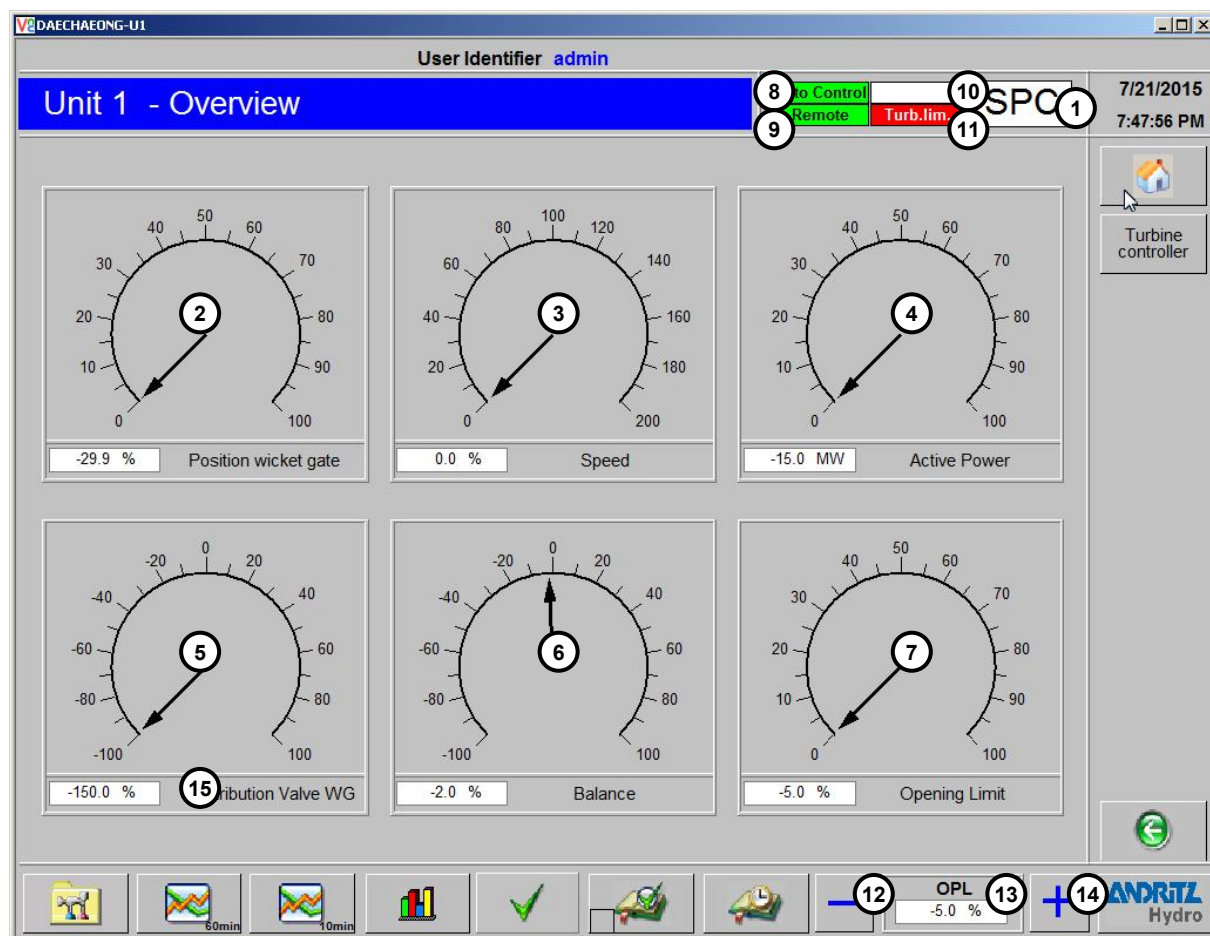


Fig. 4 Display – Overview

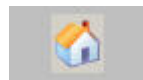
By default, this main overview display contains the most important machine data and -information.

The main window itself contains display and operating elements. This overview is activated automatically after the start of the SAT250-Runtime. One can reach this display from any other display by pressing the



-button in the navigation menu. Since with this display it has to

do with the highest display level, both the



-button as well as the



-button are deactivated and are therefore displayed grey.

From this display, using the navigation menu one reaches the controller overview display described in the following.

In the active state, the unit information (8 to 10) appears on a green background. The analogue values (2 to 7) contained in this display can be



found again in the trend diagram (), that one reaches by means of the supplementary menu.

Optionally, this main window can have a plant-specific representation or drawing superimposed on it.

Displayed variables:

No.	Variable	Description
1	Ux.NW.DO.SPC_ON_INT Ux.NW.DO.OPC_ON_INT Ux.NW.DO.POC_ON_INT Ux.NW.DO.LEC_ON_INT	Speed controller active Opening controller active Power controller active Level controller active
2	Ux.NW.AO.WG_INT	Wicket gate position [%]
3	Ux.NW.AO.n_ACTIVE	Speed [%]
4	Ux.NW.AO.P_INT	Active power [MW]
5	Ux.NW.AO.DV_INT	Distribution valve position [%]
6	Ux.NW.AO.BALANCE	Control signal to pilot valve [%] / Balance [%]
7	Ux.NW.AO.OPL	Opening limit [%]
8	Ux.NW.DO.MAN_MODE	Manual mode (Manual Positioning selected)
9	Ux.NW.DO.LOCAL	Local operation (Local Switch on MANUAL)
10	Ux.NW.DO.ISNET	Isolated network
11	Ux.NW.DO.TU_LIMITED	Turbine limited
12	Ux.NW.DI.OPL-	Opening limit lower
13	Ux.NW.AO.OPL	Opening limit [%]
14	Ux.NW.DI.OPL+	Opening limit higher

Tab. 1 Variables - Display Overview

5.4 Display - Controller Overview

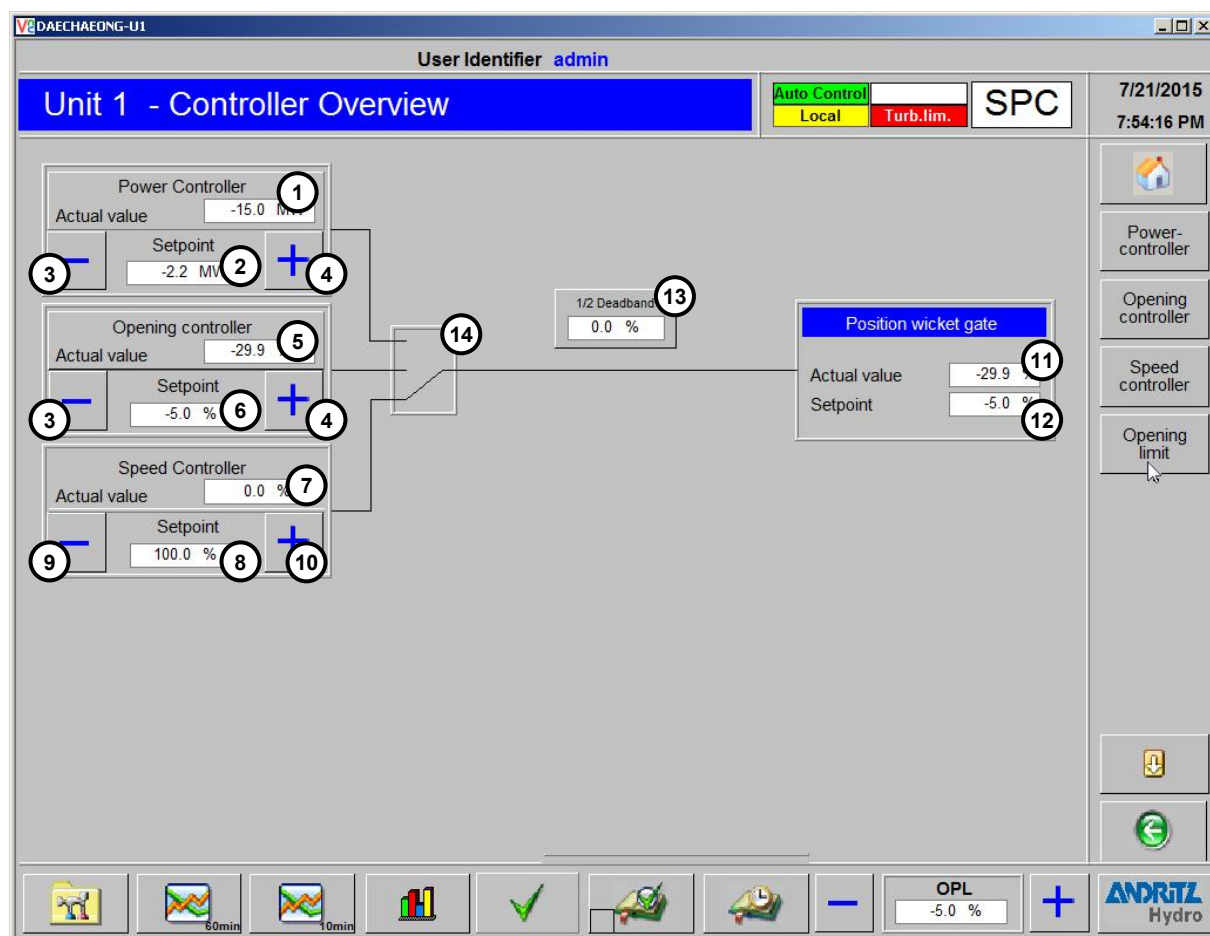
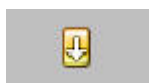


Fig. 5 Display - Controller Overview

This controller overview display combines the most important values of the machine and the associated controllers in one display. In this main window the controller operating mode can be switched over. This takes place by pressing the corresponding controller buttons (1 or 5). Only the speed controller cannot be explicitly switched on, since it is automatically activated depending on the operating mode (Noload, Island operation) of the machine. The associated controller setpoints can be raised or lowered by pressing the (+)- and (-)-buttons (3 and 4 or 9 and 10) respectively. The setpoints are traveled in the desired direction as long as the corresponding button is pressed. The associated setting gradients can be adapted to the corresponding detailed controller displays. In addition, the most important machine data are displayed on this display. The actual operation mode will be displayed in the head line, as well it's indicated within the position of the switch (14).

From this display, one can call up all detailed controller displays as well as the feedback sensors calibration and the special functions display via the

navigation menu. The selection buttons for the last two displays mentioned are located on the second page of the menu.



- Next page

Displayed variables:

No.	Variable	Description
1	Ux.NW.DI.POC_ON Ux.NW.AO.P_INT	Power controller on Active power [MW]
2	Ux.NW.AO.PSP	Internal power setpoint [MW]
3	Ux.NW.DI.PSP/OSP-	Power-/Opening setpoint lower
4	Ux.NW.DI.PSP/OSP+	Power-/Opening setpoint higher
5	Ux.NW.DI.OPC_ON Ux.NW.AO.WG_INT	Opening controller on Wicket gate position [%]
6	Ux.NW.AO.OSP	Internal opening setpoint [%]
7	Ux.NW.AO.n_ACTIVE	Speed [%]
8	Ux.NW.AO.SSP	Speed setpoint [%]
9	Ux.NW.DI.SSP-	Speed setpoint lower
10	Ux.NW.DI.SSP+	Speed setpoint higher
11	Ux.NW.AO.WG_INT	Wicket gate position [%]
12	Ux.NW.AO.WG-SP	Wicket gate setpoint [%]
13	Ux.NW.AO.DEAD_BND	Half Deadband for Load Operation [%]
14	Ux.NW.DO.SPC_ON_INT Ux.NW.DO.OPC_ON_INT Ux.NW.DO.POC_ON_INT	Speed controller active Opening controller active Power controller active

Tab. 2 Variables - Display Controller Overview

5.5 Display - Power Controller

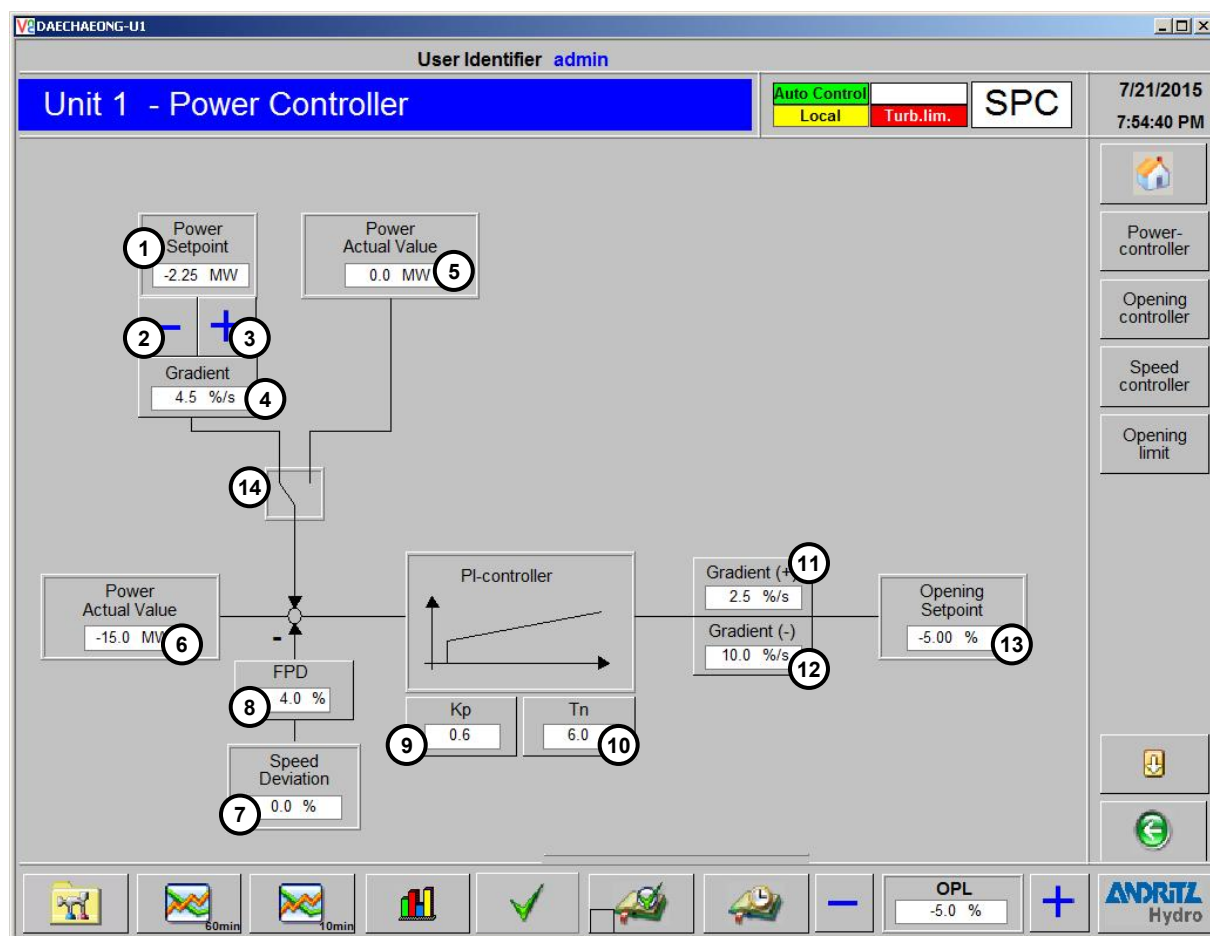


Fig. 6 Display - Power Controller

This detailed controller display represents the block diagram of the power controller. Besides the power setpoint (1 to 3), here important parameters for this controller can also be modified. Included here are the gradient for the adjustment of the power setpoint with the (+)- and (-)-buttons (4), the frequency-/power droop (8) as well as the controller parameters KP and TN (9 and 10), as well as the output gradient. The output gradient can be set for raising (11) and falling (12) values separately. The actual power setpoint (internal or external) is indicated with the switch (14)

Displayed variables:

No.	Variable	Description
1	Ux.NW.AO.PSP	Internal power setpoint [MW]
2	Ux.NW.DI.PSP/OSP-	Power setpoint lower
3	Ux.NW.DI.PSP/OSP+	Power setpoint higher
4	Ux.NW.AO.TIM_PSP	Gradient power setpoint (+/-) [%/s] – from digital inputs or buttons
5	Ux.NW.AO.PSP_INT	External power setpoint [MW] – from MODBUS
6	Ux.NW.AO.P_INT	Active power [MW]
7	Ux.NW.AO.E-F	Speed deviation [%]
8	Ux.NW.AO.FPD	Frequency-/Power droop [%]
9	Ux.NW.AO.KP_POC	Proportional gain power controller [-]
10	Ux.NW.AO.TN_POC	Integral action time power controller [s]
11	Ux.NW.AO.GRH_WG_SP	Gradient output powercontroller raising [%/s]
12	Ux.NW.AO.GRL_WG_SP	Gradient output powercontroller falling [%/s]
13	Ux.NW.AO.POC_WG-SP	Output power controller [%]
14	Ux.NW.DO.LOCAL	Operation from local control panel

Tab. 3 Variables - Display Power Controller

5.6 Display - Opening Controller

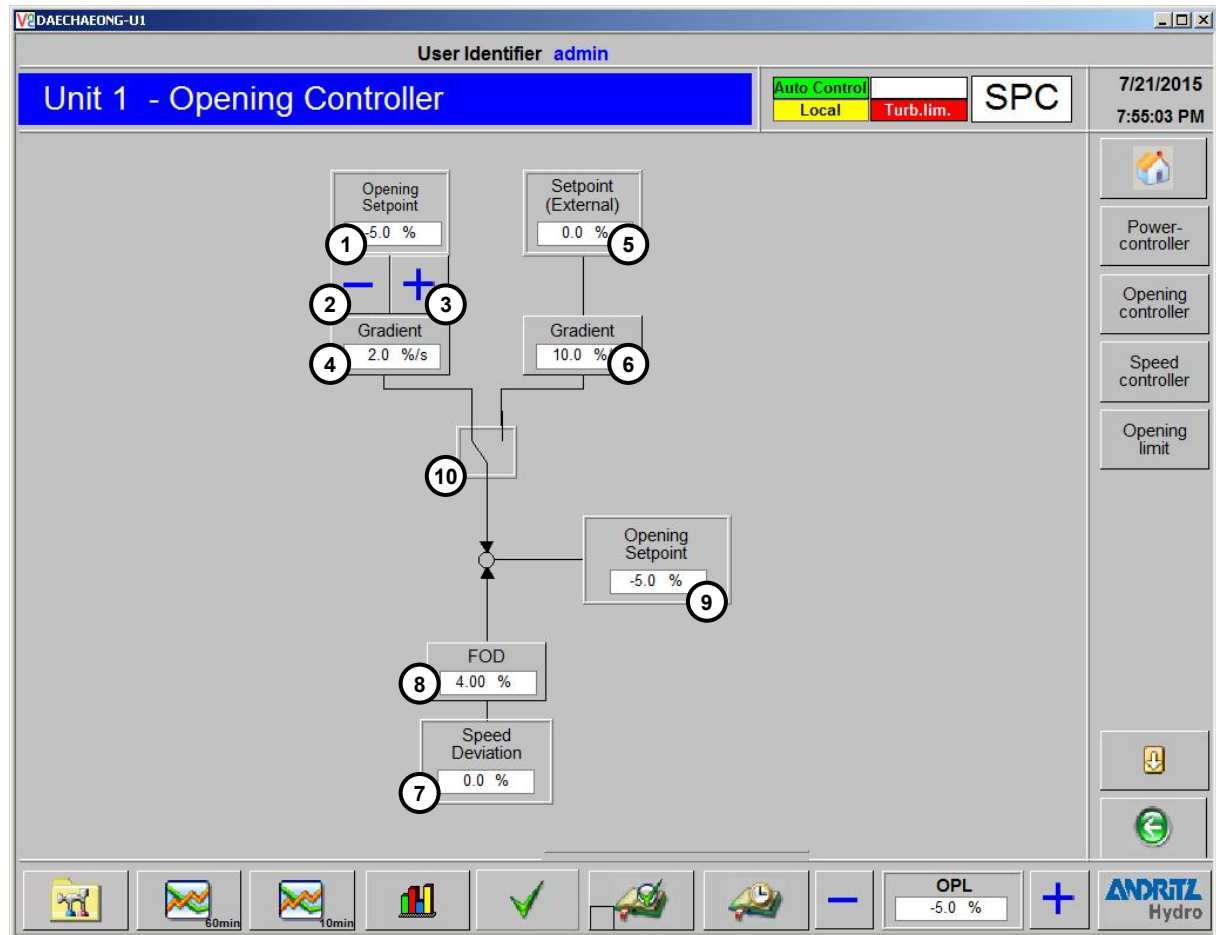


Fig. 7 Display - Opening Controller

This detailed controller display represents the block diagram of the opening controller. Besides the opening setpoint (1 to 3), important parameters for this controller such as the gradient for the adjustment of the opening setpoint with the (+)- and (-)-buttons (4), the gradient for the external opening setpoint (6) as well as the frequency-/power drop (8) can also be modified. The actual used opening setpoint (internal or external) will be displayed within the position of switch (10).

Displayed variables:

No.	Variable	Description
1	Ux.NW.AO.OSP	Internal opening setpoint [%]
2	Ux.NW.DI.PSP/OSP-	Opening setpoint lower
3	Ux.NW.DI.PSP/OSP+	Opening setpoint higher
4	Ux.NW.AO.TIM_OSP	Gradient opening setpoint (+/-) [%/s] – from digital inputs or buttons
5	Ux.NW.AO.OSP_INT	External opening setpoint [%] – not used
6	Ux.NW.AO.GRD_OSP	Gradient external opening setpoint [%/s] – not used
7	Ux.NW.AO.E-F	Speed deviation [%]
8	Ux.NW.AO.FOD	Frequency-/Opening droop [%]
9	Ux.NW.AO.OPC_WG-SP	Output opening controller [%]
10	Ux.NW.DO.LOCAL	Operation from local control panel

Tab. 4 Variables - Display Opening Controller

5.7 Display - Speed Controller

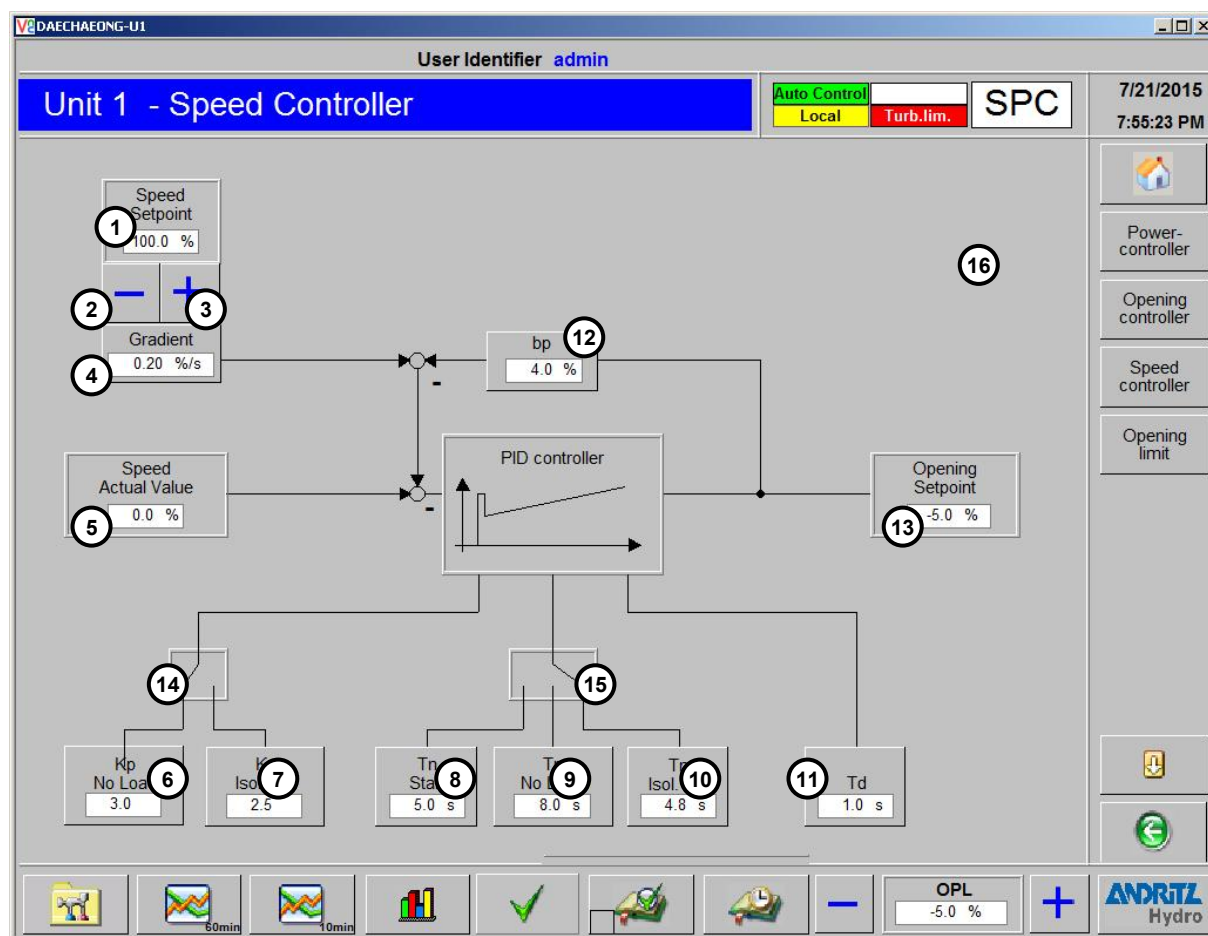


Fig. 8 Display - Speed Controller

This detailed controller display represents the block diagram of the speed controller. In contrast to the other controllers, here various setpoints (in dependance of operating mode) can be defined or modified depending on the respective operating mode (6 to 10). The controller parameter TD (11) is independent of the respective operating state. In addition, here the gradient for the adjustment of the speed setpoint with the (+)- and (-) buttons (4) as well as the permanent speed droop (12) can also be modified. The actual used controller parameter are indicated with the switches (14 and 15). For testing you can add an offset value (16) to the speed setpoint (SSP).



CAUTION

Changing the turbine controller parameters influence its behaviour and can cause instabilities.

Displayed variables:

No.	Variable	Description
1	Ux.NW.AO.SSP	Speed setpoint [%]
2	Ux.NW.DI.SSP-	Speed setpoint lower
3	Ux.NW.DI.SSP+	Speed setpoint higher
4	Ux.NW.AO.SSP_TIM	Gradient speed setpoint (+/-) [%/s]
5	Ux.NW.AO.n_ACTIVE	Speed [%]
6	Ux.NW.AO.KP_NOLOAD	Proportional gain speed controller noload [-]
7	Ux.NW.AO.KP_ISNET	Proportional gain speed controller isolated network [-]
8	Ux.NW.AO.TN_START	Integral action time speed controller start [s]
9	Ux.NW.AO.TN_NOLOAD	Integral action time speed controller noload [s]
10	Ux.NW.AO.TN_ISNET	Integral action time speed controller isolated network [s]
11	Ux.NW.AO.TD_SPC	Derivative action time speed controller [s]
12	Ux.NW.AO.bp_SPC	Permanent droop speed controller [%]
13	Ux.NW.AO.SPC_WG-SP	Output speed controller [%]
14	Ux.NW.DO.ISNET	Isolated network (int. or ext.)
15	Ux.NW.DO.ISNET Ux.NW.DO.TN_ST_ACTIVE	Isolated network (int. or ext.) TN start is active
16	Ux.NW.AO.SSP_OFFSET	Speed Setpoint offset value for step response test only [%]

Tab. 5 Variables - Display Speed Controller

5.8 Display - Opening Limit

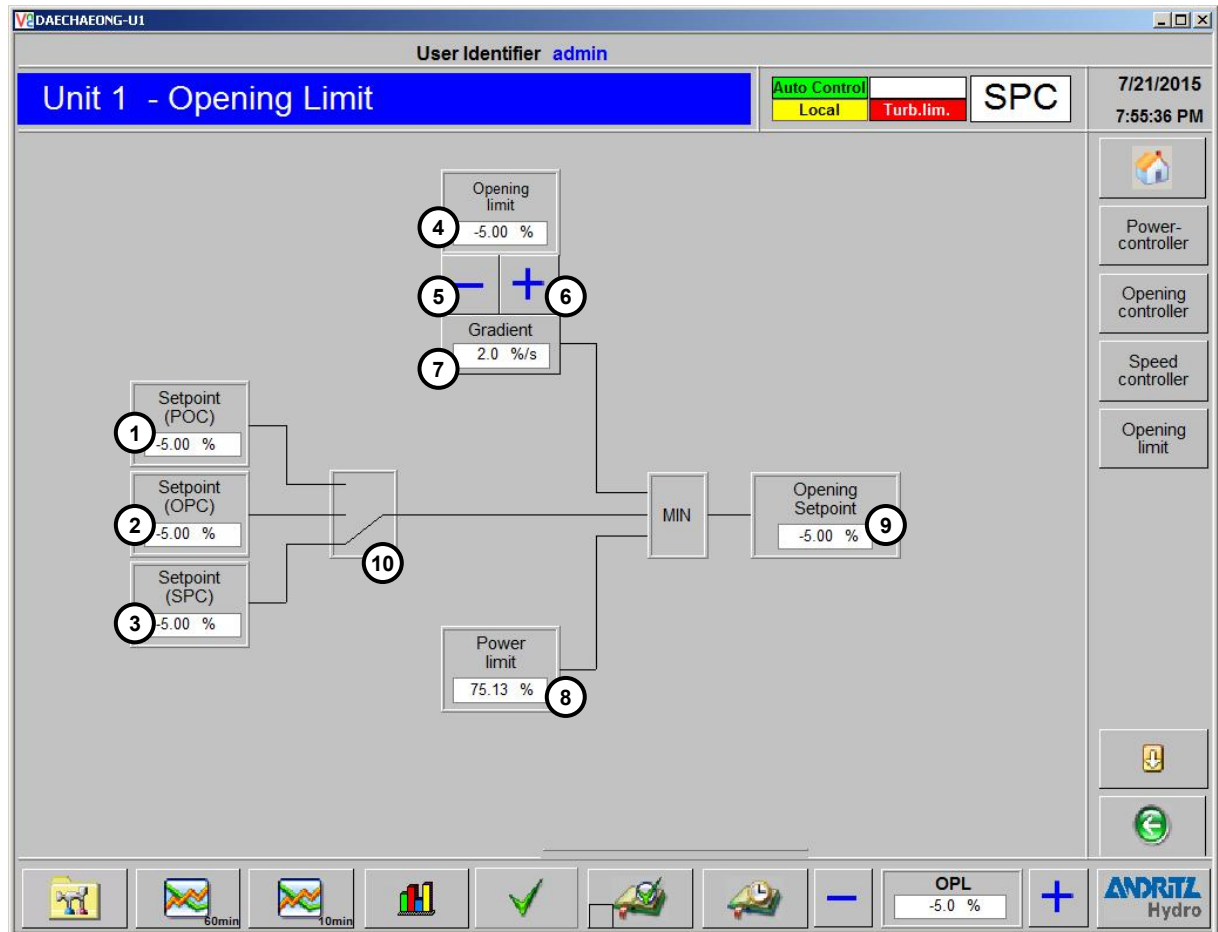


Fig. 9 Display - Opening Limit

This detailed controller display represents the block diagram of the opening limit. Besides the actual limitation (4 to 6), here the associated gradient for the adjustment of the limitation value (7) can also be changed. In addition, the issued maximum opening limit (9) corresponds with the setpoint of the positioning circuit described in the following positioning circuit. The actual used controller setpoint is indicated with the switch (10).

Displayed variables:

No.	Variable	Description
1	Ux.NW.AO.POC_WG-SP	Output power controller [%]
2	Ux.NW.AO.OPC_WG-SP	Output opening controller [%]
3	Ux.NW.AO.SPC_WG-SP	Output speed controller [%]
4	Ux.NW.AO.OPL	Opening limitation [%]
5	Ux.NW.DI.OPL-	Opening setpoint lower
6	Ux.NW.DI.OPL+	Opening setpoint higher
7	Ux.NW.AO.TIM_OPL	Gradient opening limitation (+/-) [%/s]
8	Ux.NW.AO.Y_LI_GOV	Power limitation generator [%]
9	Ux.NW.AO.WG-SP	Opening setpoint [%]
10	Ux.NW.DO.SPC_ON_INT Ux.NW.DO.OPC_ON_INT Ux.NW.DO.POC_ON_INT	Speed controller active Opening controller active Power controller active

Tab. 6 Variables - Display Opening Limit

5.9 Display - Positioning Circuit Wicket Gate

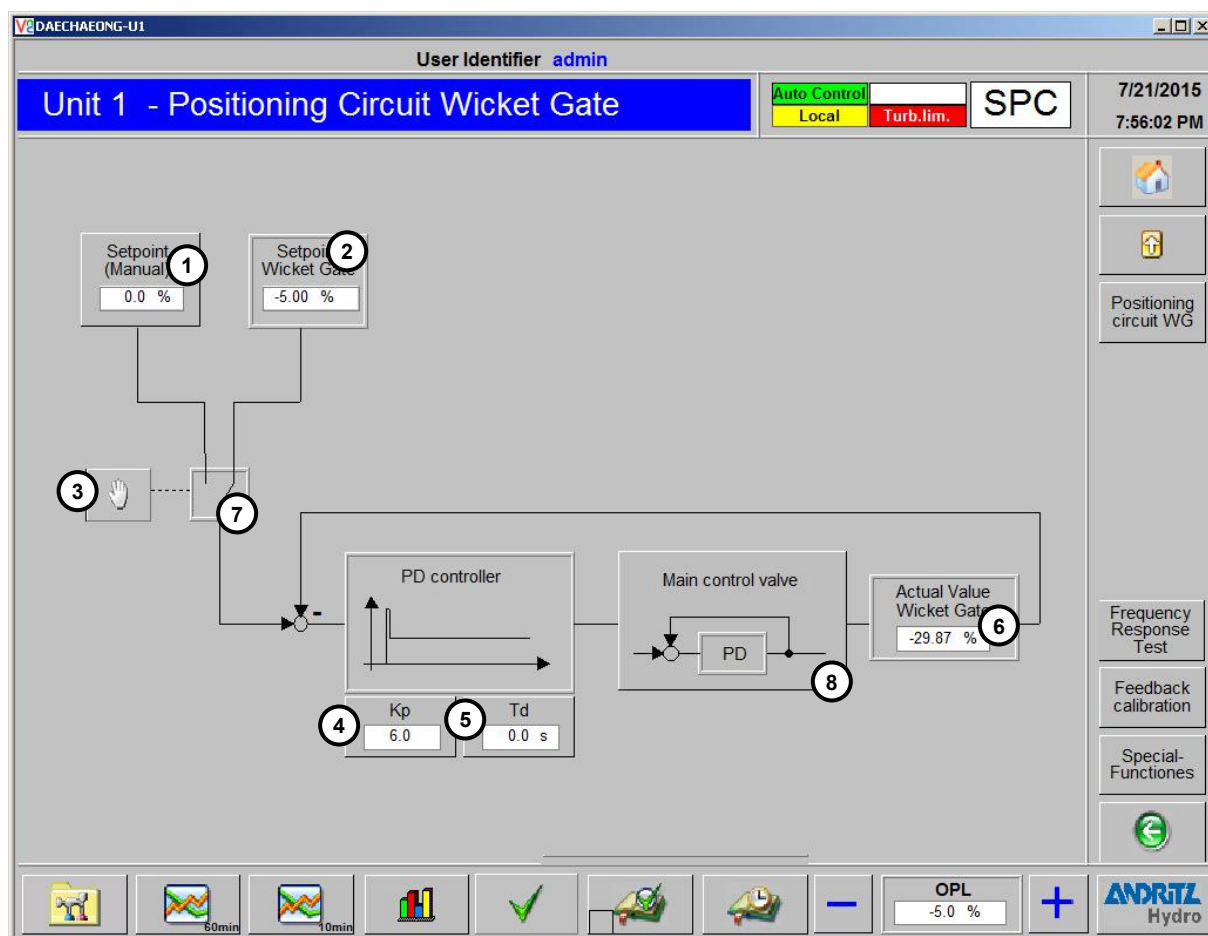


Fig. 10 Display - Positioning Circuit Wicket Gate



DANGER

Hydraulic servomotor operation.

Non-adherence can lead to death or serious injuries and to extensive material damages.

In this display the block diagram of the positioning circuit for the wicket gate is represented. For simplification, in this display the positioning circuit of the main control valve has only been intimated. By pressing the button „Main Control Valve“(8), one reaches the corresponding detailed display. In this display, besides the setting of the controller parameters KP and TD (4 and 5) one can also switch to a manual setpoint for the positioning (3). This manual setpoint can be defined individually (1). the actual operating mode (hand or automatic) will be displayd in the head line as well in the indication of the switch (7).

Manual Positioning can be only selected when the local selector switch on the cubicle is set to “MANUAL” and there is no “QSD” from 86-1 or 86-2. Oil pressure must be available for operation !

For Step Response select corresponding switch in the “Special Function” menu.

Displayed variables:

Nr.	Variable	Description
1	Ux.NW.AO.MAN_SP_WG	Manual setpoint wicket gate [%]
2	Ux.NW.AO.WG-SP	Wicket gate setpoint [%]
3	Ux.NW.DI.MAN_WG_SM	Manual setpoint on
4	Ux.NW.AO.KP_WG_SM	Proportional gain positioning controller servomotor [-]
5	Ux.NW.AO.TD_WG_SM	Differential action time positioning controller servomotor [s]
6	Ux.NW.AO.WG_INT	Wicket gate position [%]
7	Ux.NW.DO.MAN_WG	Manual operation WG

Tab. 7 Variables - Display Positioning Circuit Wicket Gate

5.10 Display - Main Control Valve Wicket Gate

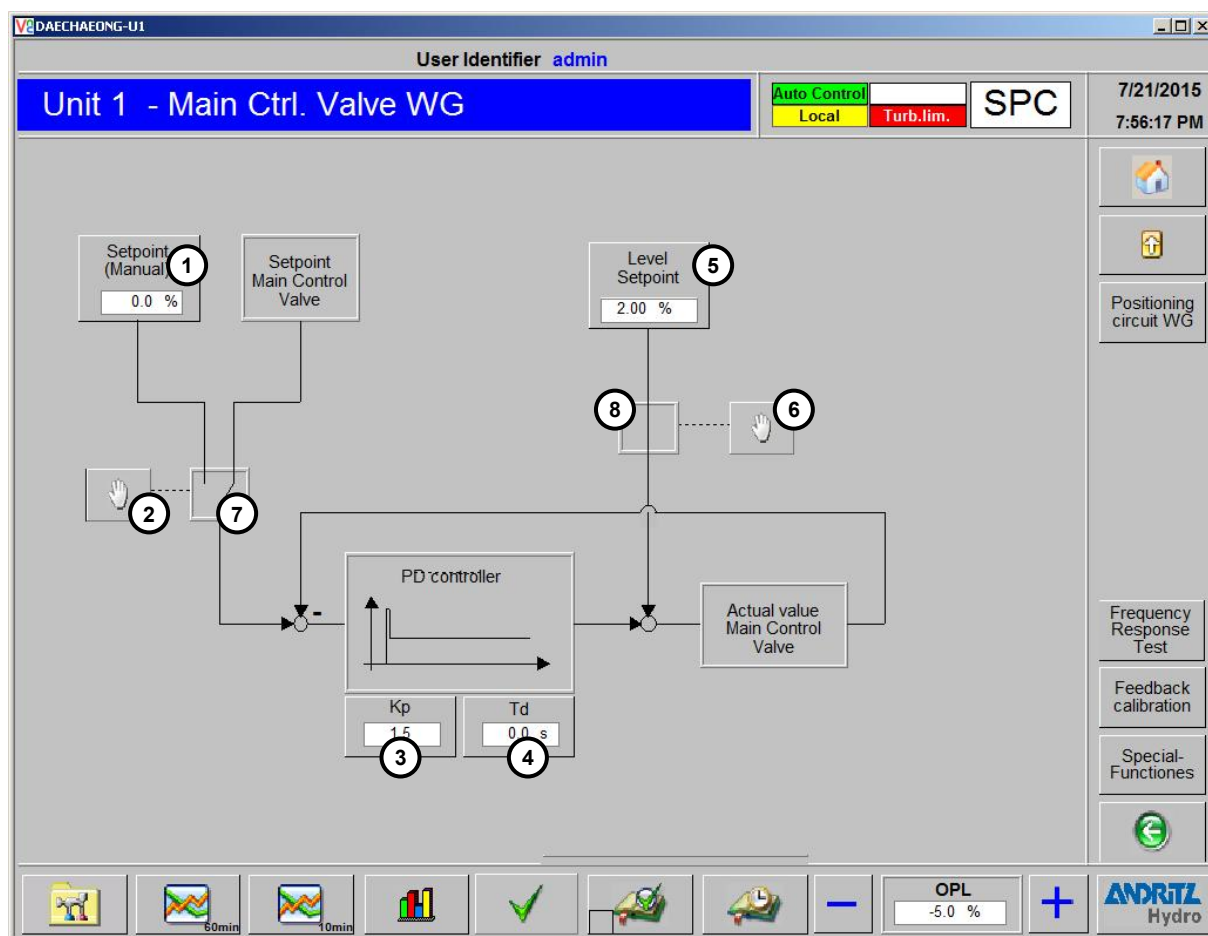


Fig. 11 Display – Main Control Valve Wicket Gate



DANGER

Hydraulic servomotor operation.

Non-adherence can lead to death or serious injuries and to extensive material damages.

In this display the detailed block diagram of the positioning circuit of the main control valve is represented. Here too, besides the setting of the controller parameters KP and TD (3 and 4) one can also switch to a manual setpoint for the positioning (2). This manual setpoint can also be defined individually here (1). In addition, for the output of this positioning circuit an oscillator signal can also be activated (6). The amplitude of this signal can also be predefined individually (5). The actual operation modes will be displayed with the switches (7 and 8)

Manual Positioning can be only selected when the local selector switch on the cubicle is set to “MANUAL” and there is no “QSD” from 86-1 or 86-2. Oil pressure must be available for operation !

For Step Response select corresponding switch in the “Special Function” menu.

Displayed variables:

Nr.	Variable	Description
1	Ux.NW.AO.MAN_SP_DV	Manual setpoint main control valve wicket gate [%]
2	Ux.NW.DI.MAN_WG_DV	Manual setpoint on
3	Ux.NW.AO.KP_WG_DV	Proportional gain positioning controller main control valve [-]
4	Ux.NW.AO.TD_WG_DV	Differential action time positioning controller main control valve [s]
5	Ux.NW.AO.DIT_WG_X	Amplitude dither signal [%]
6	Ux.NW.DI.DITHER_ON	Dither on – permanently on !
7	Ux.NW.DO.MAN_DV_WG	Manual operation DV WG
8	Ux.NW.DO.DITHER_ACTIVE	Dither MCV is on

Tab. 8 Variables - Display Main Control Valve Wicket Gate

5.11 Display – Frequency Response Test

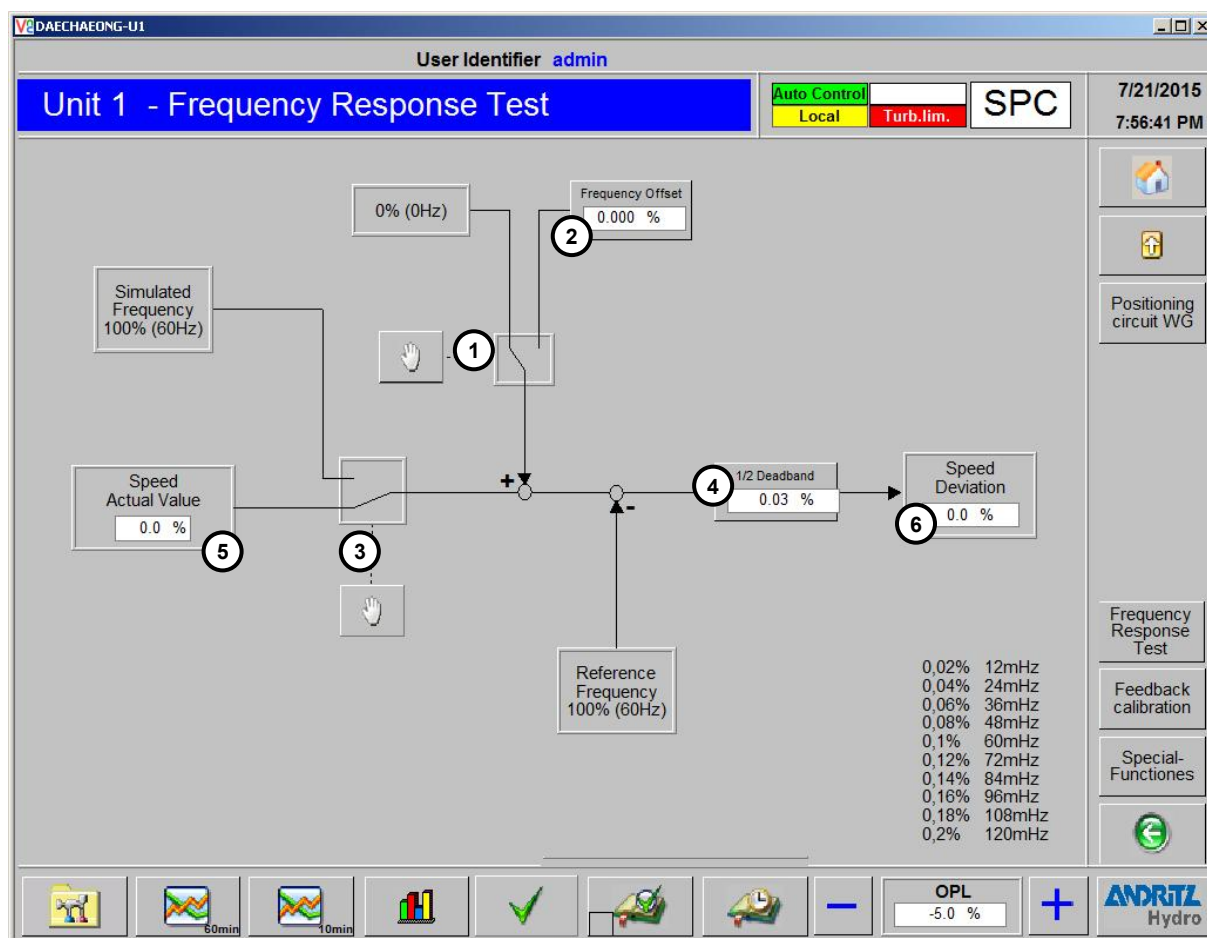


Fig. 12 Display – Frequency Response Test

In this display network grid frequency disturbances can be simulated. By injecting a specified frequency offset, the response of frequency-/power droop (POC) and frequency-/opening droop(OPC) can be verified.

First, the manual offset needs to be activated (1). Next, the required frequency offset is adjusted (2). This offset is added to the actual grid frequency or to a simulated constant grid frequency (3). Depending on frequency deadband setting (4) a speed deviation is calculated which is fed to droop of POC resp. OPC.

Nr.	Variable	Description
1	Ux.NW.DI.SIM_OFFSET Ux.NW.DO.SIM_OFFSET	Activate simulated frequency offset Simulated frequency offset is active
2	Ux.NW.AI.FREQ_OFFSET Ux.NW.AO.FREQ_OFFSET	Frequency offset

Nr.	Variable	Description
3	Ux.NW.DI.SIM_FREQ Ux.NW.DO.SIM_FREQ	Activate simulated frequency Simulated frequency is active
4	Ux.NW.AI.DEAD_BND Ux.NW.AO.DEAD_BND	Dead band [%]
5	Ux.NW.AO.n_ACTIVE	Speed [%]
6	Ux.NW.AO.E-F	Speed deviation [%]

Tab. 9 Variables - Display Frequency Response Test

5.12 Display – Feedback Calibration

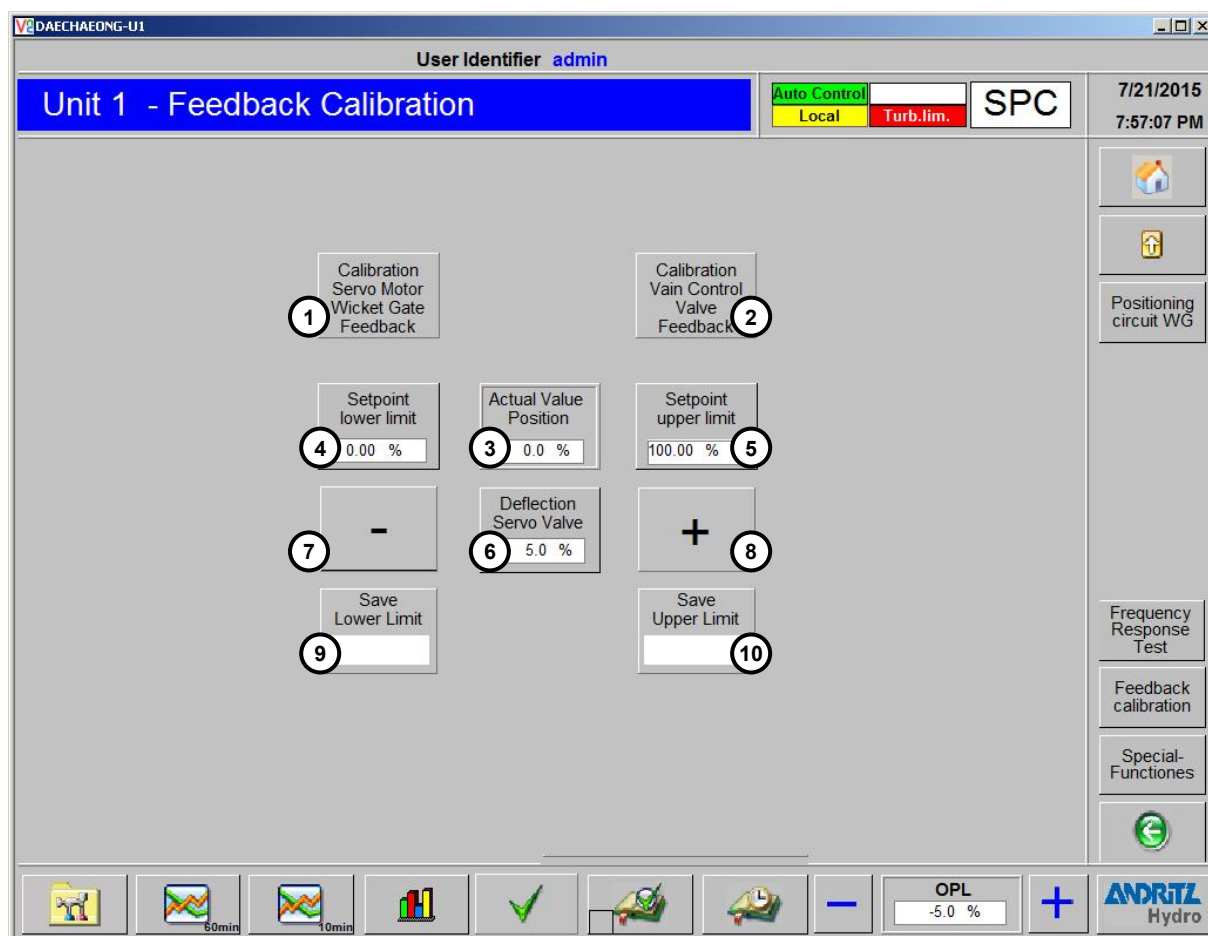


Fig. 13 Display – Feedback Calibration



DANGER

Hydraulic servomotor operation.

Non-adherence can lead to death or serious injuries and to extensive material damages.

This display, just like the special functions display, is only intended for commissioning personnel. With this, one can calibrate the feedback sensors of the servomotor and the main control valve. For this, select the feedback sensor by activating the corresponding switch (1 or 2). Then set the desired lower- and upper limit (4 and 5). With the help of the disengager (6) the opening- or closing speed can be influenced. Now one can travel the servomotor or the main control valve to the desired end position with the (+)- and (-)-buttons (7 and 8). As soon as the servomotor or the main control valve has reached the desired end position, by

pressing the corresponding save button (9 or 10) one can calibrate the actual value of the position (3) to the setpoint value. The successful storage is confirmed by a corresponding notice (see 10).

The selector switches (1 and 2) are counter-blocked, i.e. only one switch can be switched on at one time. The same is valid for the (+)- and (-)- buttons (7 and 8). Apart from this, these are automatically reset when the selector button is switched over. All buttons are automatically reseted on leaving the display. Displayed variables:

Nr.	Variable	Description
1	Ux.NW.DI.FBC_ADJ_SM_WG	Feedback sensor calibration servomotor on
2	Ux.NW.DI.FBC_ADJ_DV_WG	Feedback sensor calibration main control valve on
3	Ux.NW.AO.POS	Current position [%]
4	Ux.NW.AI.FBC_VAL_L	Reference value minimum [%]
5	Ux.NW.AI.FBC_VAL_H	Reference value maximum [%]
6	Ux.NW.AO.DEFLECTION	Opening-/Closing deflection servo valve [%]
7	Ux.NW.DI.FBC_MINUS_SV	Close Servomotor/Main control valve
8	Ux.NW.DI.FBC_PLUS_SV	Open Servomotor/Main control valve
9	Ux.NW.DI.FBC_MIN_KEY Ux.NW.DO.LOW_OK	Calibration minimum position Calibration minimum position achieved
10	Ux.NW.DI.FBC_MAX_KEY Ux.NW.DO.HIGH_OK	Calibration maximum position Calibration maximum position achieved

Tab. 10 Variables - Display Feedback Calibration

5.13 Display – Special Functions

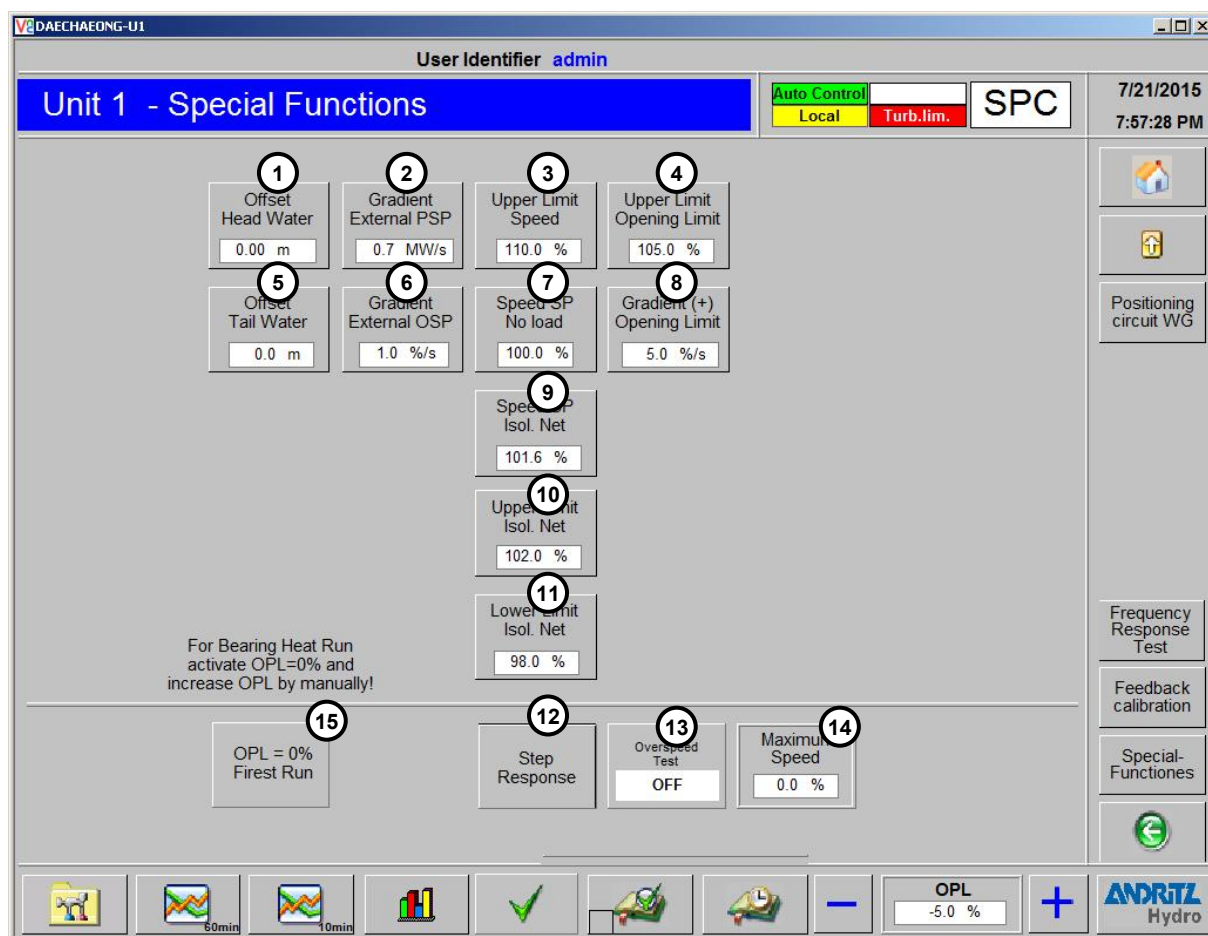


Fig. 14 Display - Special Functions



DANGER

Overspeed test.

Non-adherence can lead to death or serious injuries and to extensive material damages.

This display, just like the previous one, is only intended for commissioning personnel. With this, besides the offset for the head water level (1), and the head measurement (5), the gradients for the external setpoints (2 and 6), the carrying on parameters for the speed controller (3,7,9,10 and 11), as well as the parameters for opening limit (4 and 8). Besides that the step-response for the wicket gate (12) and the overspeedtest (13) can be switched on.

For the first run / bearing heat run the button “OPL=0% - First Run” (15) can be activated. Start is performed as usual automatically. After the start

command was sent the oil pressure will be built up and the main valve (distribution valve) will travel to middle position (0%). Governor control signal / balance will be about 0% for the first moment.

The Opening Limit will increase from -5,0% to 0,0% and not up to Start Up Opening Limit. After some seconds the OPL can be increased manually to increase the opening step by step up to the desired opening or speed level. After the unit is running on nominal speed the speed controller takes over control and the OPL can be increased to the normal Start Opening Limit and the button “OPL=0% - First Run” (15) can be deactivated.

Displayed variables:

No.	Variable	Description
1	Ux.NW.AO.0-PT_HHW	Height correction value head water level [m]
2	Ux.NW.AO.GR_PSP	Gradient external power setpoint [MW/s]
3	Ux.NW.AO.SSP_LIH	Maximum value speed setpoint [%]
4	Ux.NW.AO.LIH_OPL	Upper limit opening limit [%]
5	Ux.NW.AO.0-PT_H_NET	Height correction value pressure measurement head [m]
6	Ux.NW.AO.GRD_OSP	Gradient external opening setpoint [%/s]
7	Ux.NW.AO.SSP_START	Speed-setpoint Noload [%]
8	Ux.NW.AO.GRH_OPL	Raising gradient opening limit [%/s]
9	Ux.NW.AO.SSP_ISNET	Speed-setpoint Island operation [%]
10	Ux.NW.AO.LIH_ISNET	Upper limit value isolated network detection [%]
11	Ux.NW.AO.LIL_ISNET	Lower limit value isolated network detection [%]
12	Ux.NW.DI.STEP_RES	Step response
13	Ux.NW.DI.n_MAX_EXT Ux.NW.DO.n_MAX_TEST_EN	Overspeed test on Overspeed test activated
14	Ux.NW.AO.nMAX_t-1	Maximum speed during active period [%]
15	Ux.NW.DI.OPL_FR Ux.NW.DO.OPL_FR	OPL=0% / First Run mode on OPL=0% / First Run mode activated

Tab. 11 Variables - Display Special Functions

5.14 Display - System Control

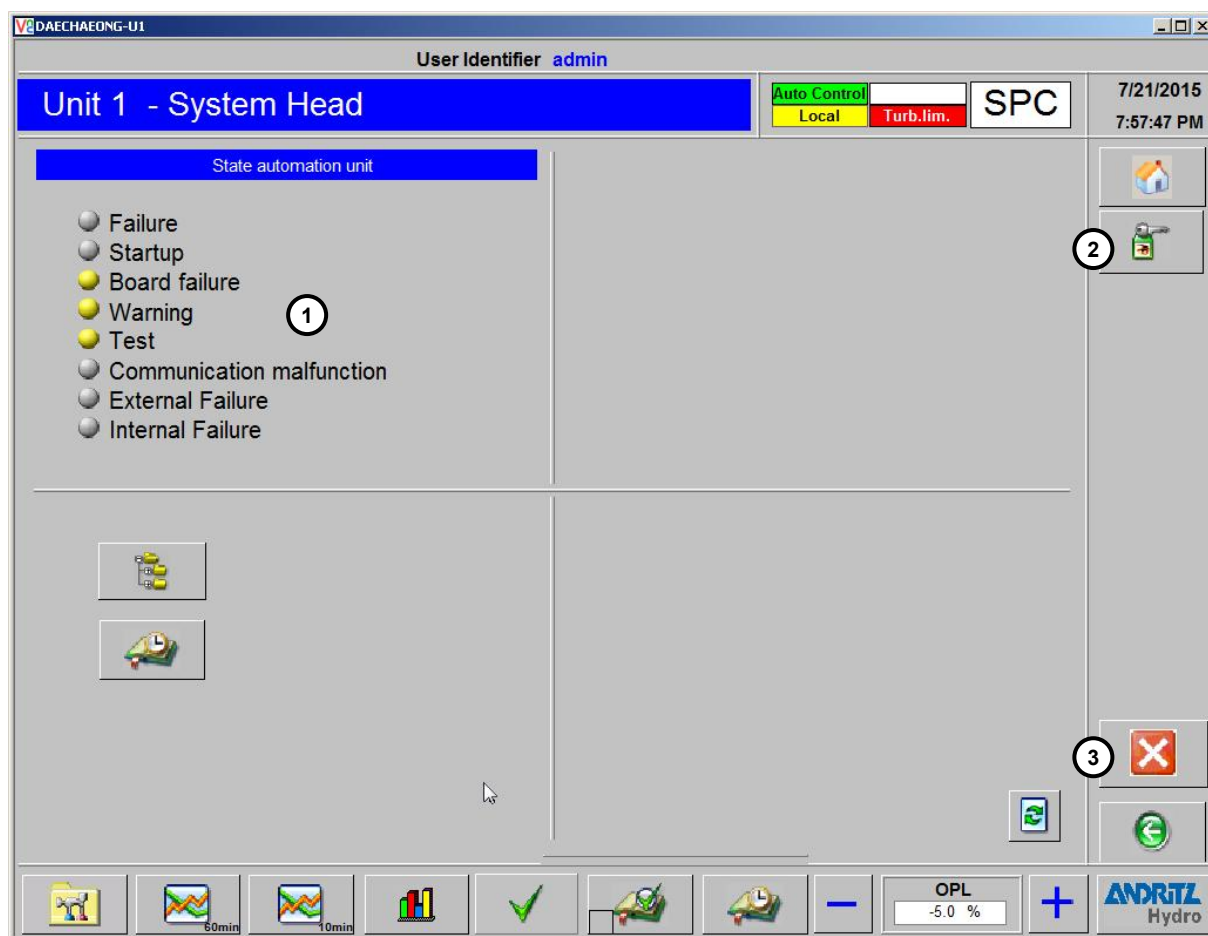



Fig. 15 Display - System Control

This picture has a unique main menu with additional functions.

With the  button one can log-on to the system. This is carried out by means of the following dialog:

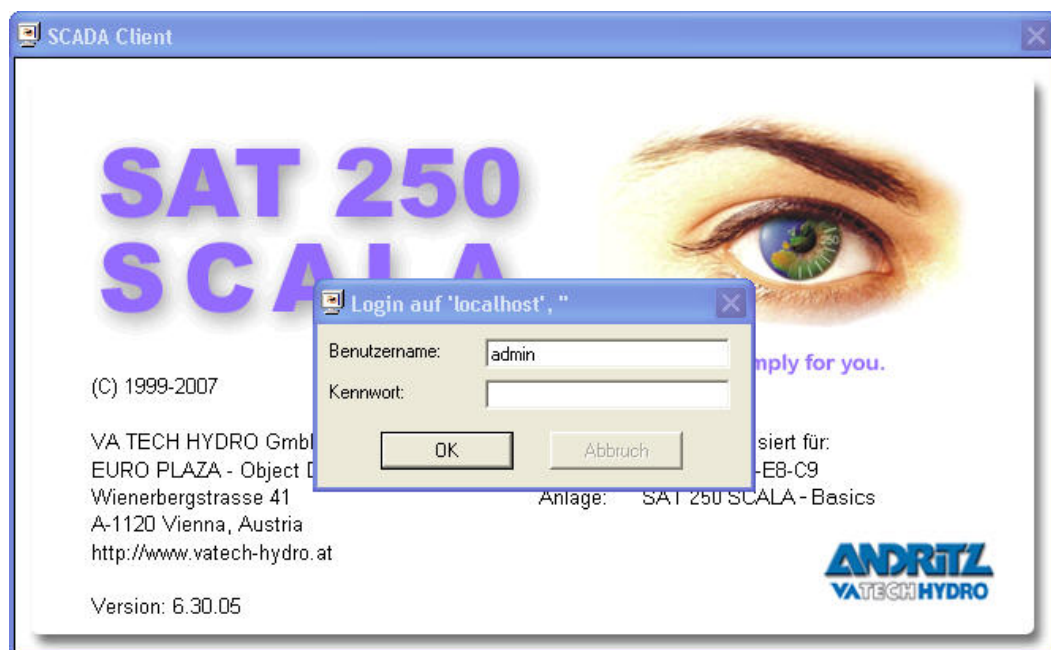


Fig. 16 Display – Login

The input of the data is carried out using the virtual keypad on the touch panel. After entering the user name and the associated password, correspondingly protected function calls or operator inputs can also be carried out.



- Logon / Logoff



- terminate visualization (SAT250 runtime) program only with user "admin"



- one picture back.

Additionally also some important system states are indicate in this picture.

No.	Description
1	General Information about the automation unit
2	Login – Button
3	Exit - Button

Tab. 12 Information - System Control

5.15 Display - Trend Diagram (10min, 1h)

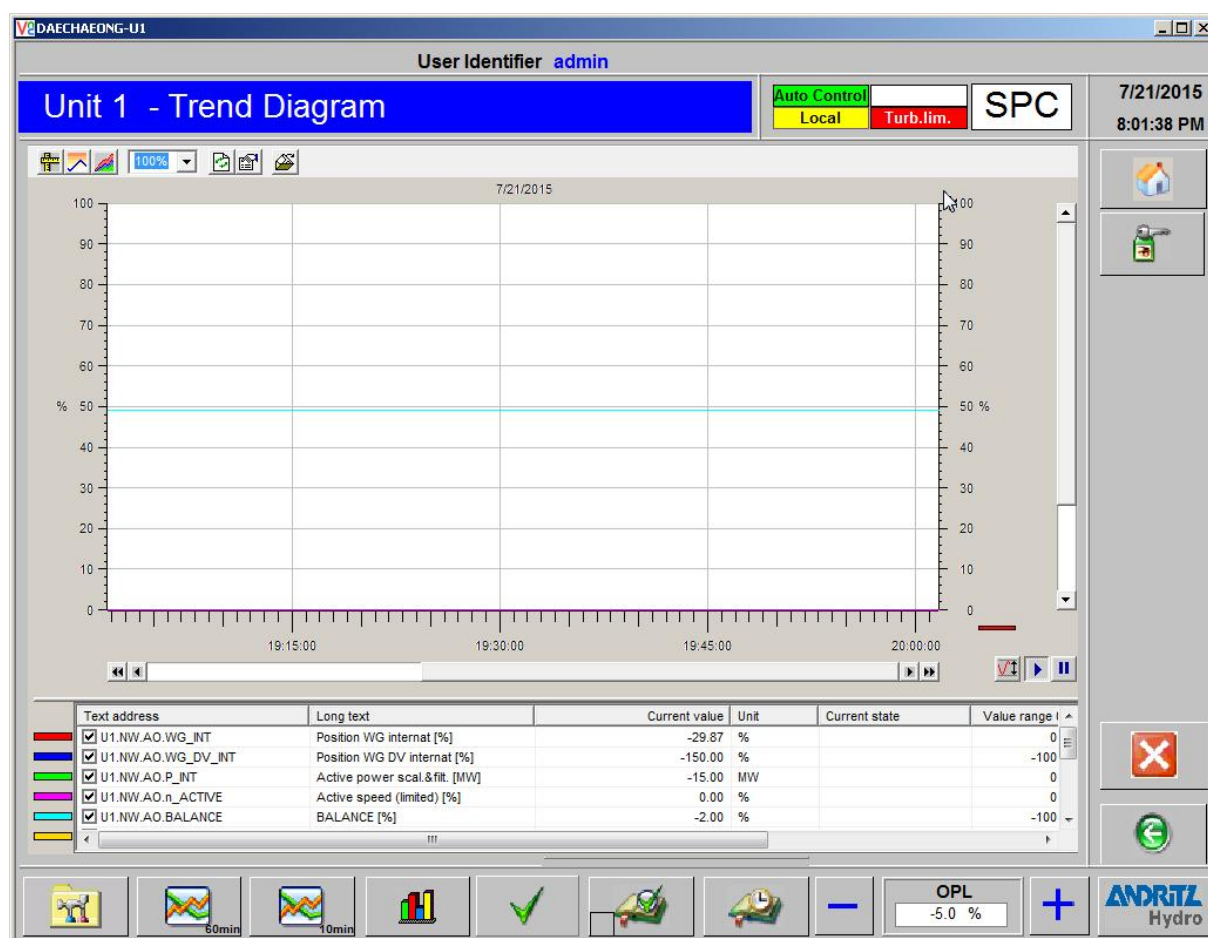



Fig. 17 Display - Trend Diagram

This display shows the chronological trends of the most important analogue values of the machine. These are the same analogue values that are also shown on the main overview display and the measured value display. The legend for the curves with the measurement ranges and the curves colours is located above the diagram. In addition to the familiar buttons, the supplementary menu contains a Close-button. With this -button the trend diagram is closed and the previous page of the touch panel will be shown again.

Displayed variables:

No.	Variable	Description
1	F.NW.AO.WG_INT	Wicket gate position [%]
2	F.NW.AO.WG_DV_INT	Position WG DV
3	F.NW.AO.P_INT	Active Power [MW]
4	F.NW.AO.n_ACTIVE	Active Speed [%]
5	F.NW.AO.BALANCE	Control signal [%]

Tab. 13 Variables - Display Trend Diagram

5.16 Display – Measured Values

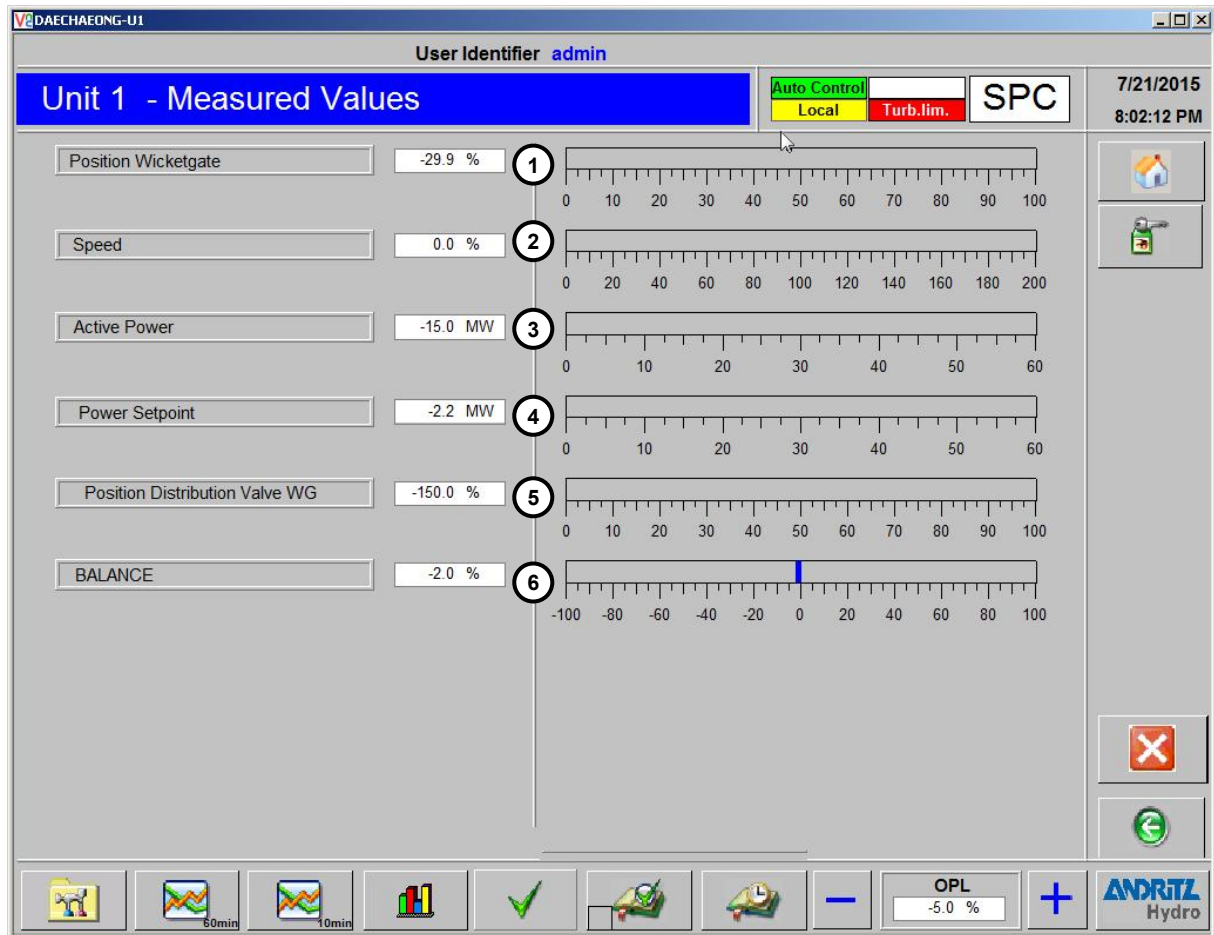


Fig. 18 Display – Measured Values

The most important analog values of the machine are also represented on this display. The representation as bar diagram serves for improved clarity. Here too it has to do with the same analog values that are also shown on the main overview display and the trend diagram. In addition to the familiar buttons, the supplementary menu contains a Close-button. With this -button the measured values display is closed and that display opened from where one called the measured values display.

Displayed variables:

No.	Variable	Description
1	U1.NW.AO.WG_INT	Wicket gate position [%]
2	U1.NW.AO.n_ACTIVE	Speed [%]
3	U1.NW.AO.P_INT	Active power [MW]
4	U1.NW.AO.PSP	Power setpoint [MW]
5	U1.NW.AO.DV_INT	Distribution valve position [%]
6	U1.NW.AO.BALANCE	Control Signal / Balance [%]

Tab. 14 Variables - Display Measured Values

5.17 Display - Alarm Signal List

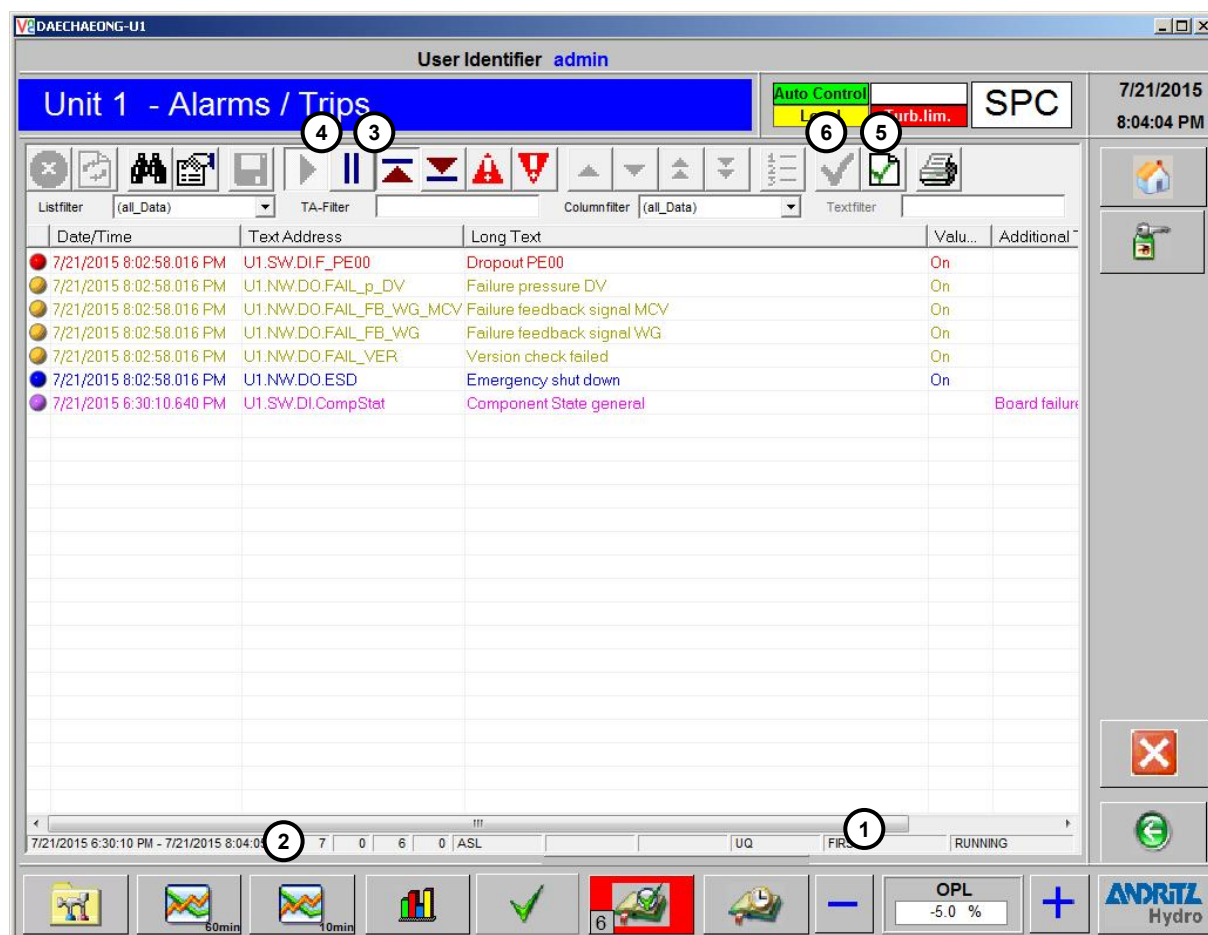




Fig. 19 Display - Alarm Information List

The display Alarm Signal List contains a list window with active or inactive and not acknowledged alarms (red), warnings (yellow) and trips (light blue). Those entries are listed in the corresponding colour, with the associated identifier, the long text, the state, the time of occurrence, the time of acknowledgement and the time of going. The navigation within the list is carried out by means of the horizontal (1) and the, only visible if required, vertical slider. Under the list window there is a display of the number of alarms (2). In addition, one can acknowledge all alarms from the displayed page in the list (5) or acknowledge just single alarms (6). The list refreshing can be interrupted and continued with (3) and (4)

Besides the familiar -button the supplementary menu contains a -button, which can be used to close the Alarm Signal List and return to the previous display.

5.18 Display - Chronologic Event List

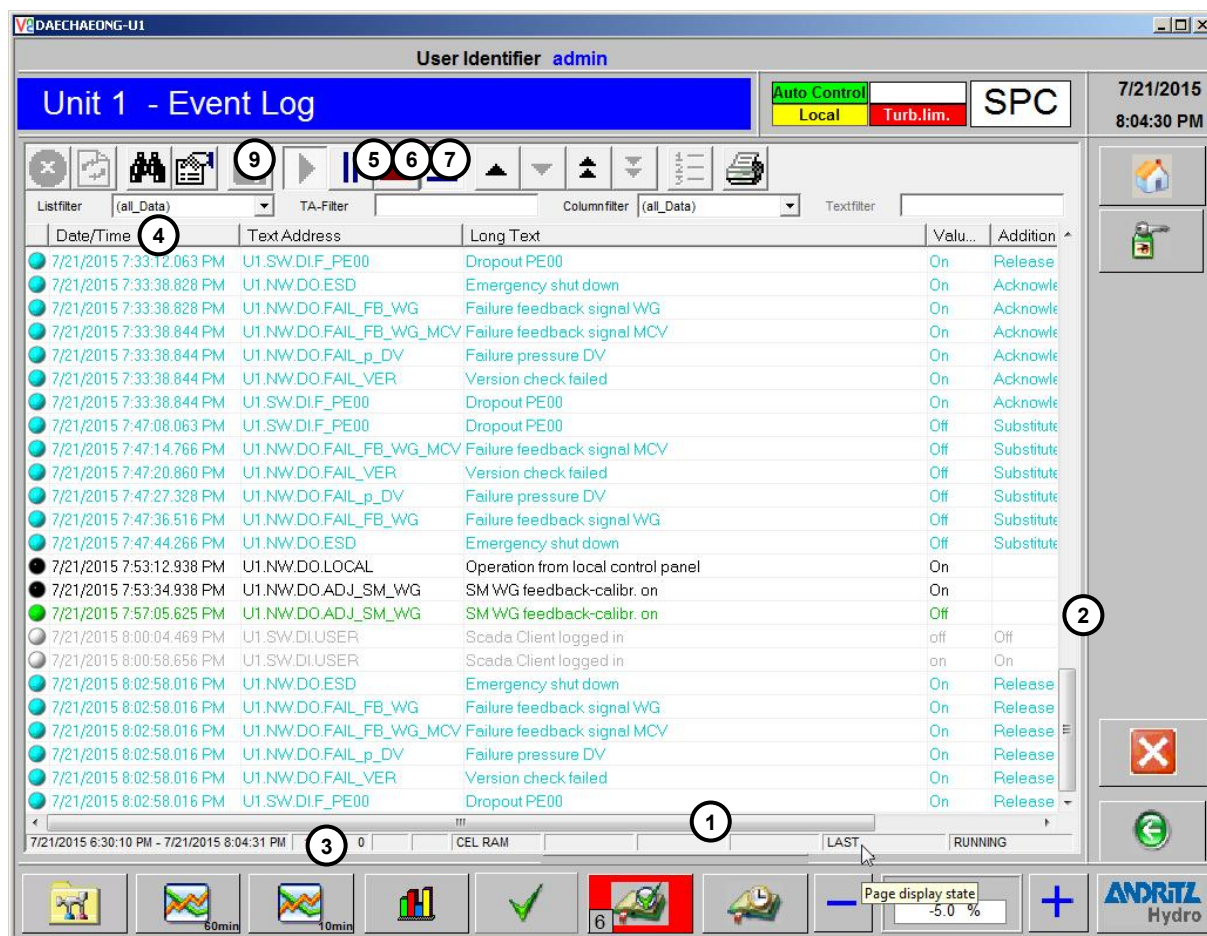




Fig. 20 Display - Chronologic Event List

The Chronologic Event-List is a list which records all alarms (red), warnings (yellow) and trips (light blue), all binary information (green) as well as setpoint value changes and other operator inputs (dark blue). Same as in the Alarm Signal List the entries in this list are displayed with the corresponding colour together with the associated identifier, the long text, the state and the time of the occurrence. The navigation within the list is carried out by means of the horizontal (1) and the, only visible if required, vertical slider (2) or the navigation buttons (5 to 8) arranged in the upper part of the list window. On the lower part of the list window there is a display of the number of list entries (3). In addition one can sort all entries in the list according to the time of their occurrence (4) as well as interrupt the recording of the events (9).

In the main menu there are buttons for the selection of predefined filter functions. Thereby one has the choice between the display of all events in the list (10), the events occurring in the last hour (11) and the events occurring within the last 24 hours (12). It's further possible to make a

classification accordingly to alarms (13), warnings (14), trips (15) and information (16).

Besides the familiar -button the supplementary menu contains a -button, with which the Chronologic Event List can be closed and that display activated from where one called up the Chronological Event List.

5.19 List of Errors and Description of Causes

Error	Name of Error	Meaning of Error Alarm	Possible Cause	Remedy
Ux.NW.DO.F_n1_START	Failure speed pick up 1 start	No speedsignal after starting	Speed sensor 1 defect (no open circuit !!)	Replace donator
Ux.NW.DO.F_n2_START	Failure speed pick up 2 start	No speedsignal after starting	Speed sensor 1 defect (no open circuit !!)	Replace donator
Ux.NW.DO.FAIL_FB_WG	Failure feedback signal WG	Signal feedback, Wicketgate < -5% or > 105%, signal changes faster than max. possible speed	Feedback donator wrong setted, signaldrift, Signaldrift, signal hissing	Check fitting of donator, check scalingm check wiring
Ux.NW.DO.FAIL_FB_WG_MCV	Failure feedback signal MCV	Signal feedback, Wicketgate < -105% oder > 105%, signal changes faster than max. possible speed	Feedback donator wrong setted, signaldrift, Signaldrift, signal hissing	Check fitting of donator, check scalingm check wiring
Ux.NW.DO.FAIL_FB_WG_MCV	Failure feedback signal MCV	Exceeding of deflection of setpoint and actual value of main control valve wicket gate	Breckdown of input modle AI- 6300 or output module AO- 6380, open ciruit detection, failure servovalve, breakdown of feedback donator maincontrol valve	Check wiring, change module, feedback donator changing, check hydraulics
Ux.NW.DO.FAIL_n1	Failure speed pick up 1	Failure speed donator 1	Open circuit, donator breakdown, failure of input- module TE-6420	Check wiring, change donator, change module
Ux.NW.DO.FAIL_n2	Failure speed pick up 2	Failure speed donator 2	Open circuit, donator breakdown, failure of input- module TE-6420	Check wiring, change donator, change module
Ux.NW.DO.FAIL_OSP	Failure ext. opening setpoint	Failure external opening setpoint	Open ciruit, failure of input module AI-6300	Check wiring, change module

Error	Name of Error	Meaning of Error Alarm	Possible Cause	Remedy
Ux.NW.DO.FAIL_P	Failure active power	Failure active power signal	Open circuit, failure of input module AI-6300	Check wiring, change module
Ux.NW.DO.FAIL_POS	Failure positioning circuit	Exceeding of deflection of setpoint and actual value of wicket gate → Quick shut down	Breakdown of input module AI-6300 oder output module AO-6380, Open circuit, failure servovalve, breakdown Feedback donator main control valve or servovalve, jammed impurity	Check wiring, change module Feedback donator change, check hydraulics, removal of jammed impurity
Ux.NW.DO.FAIL_PSP	Failure ext. power setpoint	Failure of external power-setpoint	Open circuit, failure of input module AI-6300	Check wiring, change module
Ux.NW.DO.FAIL_VER	Version check failed	Current touchpanel version does not fit to Caex-plus application	Wrong touchpanel standard used	Change to right panel software
Ux.NW.DO.FAIL_WG	Failure peripheral devices WG	Failure of perhipherial devices wicket gate → Quick shut down	Open circuit feedback donators servovalve or main control valve, failure of input-module AI-6300,failure of input module AO-6380	Check wiring, change module
Ux.NW.DO.n>n_ESD_1	Overspeed limit 1	Speed of maschine exceeds longer the Maschinendrehzahl hat längere Zeit treshold 1 → delayed quick shut down	Failure of controlling device	Check controlling device
Ux.NW.DO.n>n_ESD_2	Overspeed limit 2	Speed of maschine exceeds longer the Maschinendrehzahl hat längere Zeit treshold 2 → immediately quick shut down	Failure of controlling device	Check controlling device

5.20 Alarm Signal List “Trips”

Information	Description	Meaning of message	action
Ux.NW.DO.ESD	Emergency shut down	Failure Electrical controller	shutdown
Ux.NW.DO.FAIL_I	Fail primary signals	Critical state of turbine	Quick shut down
Ux.NW.DO.OVERSPEED	Trip because of overspeed	Forbidden overspeed exceeded	shutdown

5.21 Alarm Signal List “Alarms”

Message	Description	Meaning of message	action
Ux.NW.DO.FAIL_POS	Failure positioning circuit	Exceeding of allowed deviation of setpoint and actual value for wicket gate	Emergency shut down
Ux.NW.DO.FAIL_WG	Failure peripheral devices WG	Failure of peripheral devices wicket gate	Emergency shut down
Ux.NW.DO.n>n_ESD_1	Overspeed limit 1	Exceeding of limit overspeed 1	Emergency shut down delayed
Ux.NW.DO.n>n_ESD_2	Overspeed limit 2	Exceeding of limit overspeed 2	Emergency shut down
Ux.SW.DI.F_DV_POS	Dropout distribution valve position	Open circuit positioning donato main control valve	Emergency shut down
Ux.SW.DI.F_PE00	Dropout PE00	Breakdown peripheral element PE00	Emergency shut down
Ux.SW.DI.F_PE00_TM0	Dropout modul PE00 TM0	Breakdown output module AO-6380	Emergency shut down
Ux.SW.DI.F_PE00_TM2	Dropout modul PE00 TM2	Breakdown input module AI-6300	Emergency shut down
Ux.SW.DI.F_PE00_TM3	Dropout modul PE00 TM3	Breakdown input module TE-6420	Quick shut down
Ux.SW.DI.F_PE00_TM4	Dropout modul PE00 TM4	Breakdown output module DO-6200	Emergency shut down
Ux.SW.DI.F_PE00_TM5	Dropout modul PE00 TM5	Breakdown input module DI-6101	Emergency shut down
Ux.SW.DI.F_PE00_TM6	Dropout modul PE00 TM6	Breakdown input module DI-6101	Emergency shut down
Ux.SW.DI.F_WG_POS	Dropout wicket gate position	Open circuit positioning servo valve	Emergency shut down

5.22 Alarm Signal List „Warnings“

Message	Description	Meaning of message	action
Ux.NW.DO.F_n1_START	Failure speed pick up 1 start	Failure of speed donator 1	Warning
Ux.NW.DO.F_n2_START	Failure speed pick up 2 start	Failure of speed donator 2	Warning
Ux.NW.DO.FAIL_FB_WG	Failure feedback signal WG	Failure feedback wicket gate	Warning
Ux.NW.DO.FAIL_FB_WG_MCV	Failure feedback signal MCV	Failure feedback main control valve	Warning
Ux.NW.DO.FAIL_n1	Failure speed pick up 1	Failure speed pick up 1	Warning
Ux.NW.DO.FAIL_n2	Failure speed pick up 2	Failure speed pick up 2	Warning
Ux.NW.DO.FAIL_OSP	Failure ext. opening setpoint	Failure ext. opening setpoint	Warning
Ux.NW.DO.FAIL_P	Failure active power	Failure active power	Warning
Ux.NW.DO.FAIL_POS_MCV	Failure positioning circuit MCV	Exceeding of allowed deviation of setpoint and actual value for main control valve wicket gate	Warning
Ux.NW.DO.FAIL_PSP	Failure ext. power setpoint	Failure external power setpoint	Warning
Ux.NW.DO.FAIL_VER	Version check failed	Version check failed- Panel	Warning
Ux.NW.DO.QSD	Quick Shut Down external	Trip of 86-1 or 86-2 protection	Warning
Ux.SW.DI.F_PE00_TM1	Dropout modul AO	Breakdown outputmodule AO-6380	Warning
Ux.SW.DI.F_PSP	Dropout power setpoint	Dropout power setpoint	Warning

5.23 Alarm Signal List „Information“

Message	Description	Meaning of message	action
Ux.NW.DO.ISNET	Unit runs in isolated network	Island operation	Information
Ux.NW.DO.LOCAL	Operation from local control panel	Operation from local control panel	Information
Ux.NW.DO.MAN_MODE	Manual operating	Manual operating	Information
Ux.NW.DO.OPC_ON_INT	Opening controller active	Opening controller active	Information
Ux.NW.DO.POC_ON_INT	Power controller active	Power controller active	Information
Ux.NW.DO.SPC_ON_INT	Speed controller active	Speed controller active	Information
Ux.NW.DO.STEP_RES	Enable step response WG	Stepp response of setpointchange with manual operation active	Information
Ux.TP.O.TU_LIMITED	Turbine limited	Turbine limited	Information