Start-Up Guide
ACS550 Equipped with ITT Flygt Application Program

Flygt

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896544_03

ACS550 Equipped with
ITT Flygt Application Program

Start-Up Guide

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About this guide

What this chapter contains

This chapter describes the guide in short.

Use of this guide

Start up the ITT Flygt version of ACS550 drives according to the instructions given in this guide. The guide contains an installation and commissioning overview, Table *1*, with references to other manuals and chapters in this guide.

Target reader

The guide is intended for people who plan the installation, install, commission, use and service the drive. Read the guide before working on the drive. The reader is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

Safety

Only qualified specialists are allowed to install, commission and maintain the drive.

WARNING! Follow the safety instructions given in *ACS550-01/U1 User's Manual* [3AFE64804588 (English)] when installing, operating and servicing the drive. If ignored, physical injury or death may follow, or damage may occur to the drive or the pump motor. Read the safety instructions before working on the drive.

Contents

The chapters of this guide are briefly described below.

About this guide describes the guide.

Description of the ITT Flygt version of ACS550 describes the ITT Flygt version of the ACS550 drive.

Start-up describes the start-up procedure of the drive.

Controlling the pump cleaning sequence describes the different principles of controlling the pump cleaning sequence.

ITT Flygt version of ACS550 parameters is a list of standard ACS550-01/U1 parameters which are modified for the ITT Flygt version of ACS550 added with special ITT Flygt parameter group 46 PUMP CLEAN SEQ.

Other related manuals

ACS550-01/U1 User's Manual [3AFE64804588 (English)]

The manual contains Quick Start Guide, complete installation instructions, control panel use, complete parameter descriptions, maintenance instructions and technical data for the standard ACS550-01/U1 drive.

Where necessary, the *ACS550-01/U1 User's Manual* [3AFE64804588 (English)] can be consulted parallel to this Start-Up Guide. However, the modifications done to the ITT Flygt version of ACS550 compared to the standard ACS550-01/U1, as presented in *Appendix 2 – ITT Flygt version of ACS550 parameters*, must be noticed to avoid confusion.

Installation and commissioning overview

Table *1* shows an overview of the tasks in installing and commissioning the drive.

Table 1. Overview of the tasks in installing and commissioning.

Step	Task	Reference
1	Identify the frame size of your drive: R2, R3, R4, R5 or R6.	Chapter Technical data in ACS550-01/U1 User's Manual [3AFE64804588 (English)].
2	Plan the installation: Check the ambient conditions, ratings, required cooling air flow, input power connection, compatibility of the motor, motor connection, and other technical data. Select the cables.	Quick Start Guide and chapters Installation and Technical Data in ACS550-01/U1 User's Manual [3AFE64804588 (English)]. Option manual (if optional equipment is included).
3	Install the drive: - mechanical installation - input and output power wiring - control wiring between the pump controller and the drive.	Quick Start Guide and chapters Installation and Technical Data in ACS550-01/U1 User's Manual [3AFE64804588 (English)]. *Drive input/output (from/to pump controller)*, page *11*.
4	Commission the drive.	*Start-up*, page *12*. ACS550-01/U1 User's Manual [3AFE64804588 (English)].

Abbreviations

PCS – Pump Cleaning Sequence

Description of the ITT Flygt version of ACS550

What this chapter contains

This chapter describes the ITT Flygt version of ACS550 in short.

Basics

The ITT Flygt version of ACS550 is customized from the standard ACS550-01/U1 drive to suit the speed regulated wastewater pumping application.

The ITT Flygt version of ACS550 is designed to be operated by one external pump controller. In a typical speed regulated wastewater pumping application, several drives are controlled by one external pump controller and each pump is driven by its own drive unit as illustrated in Figure *1*.

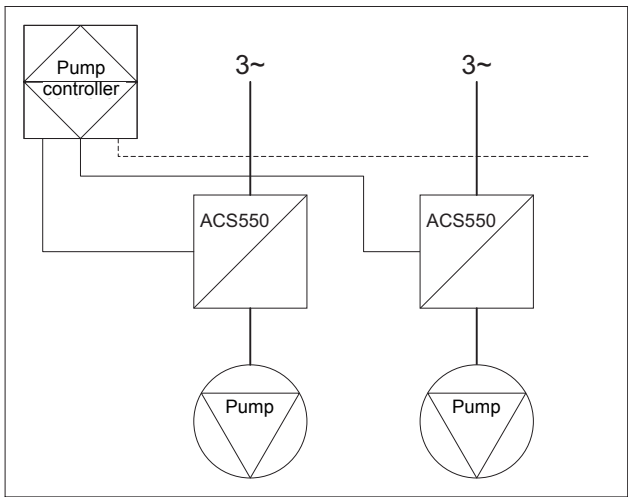


Figure 1. ITT Flygt version of ACS550 in speed regulated wastewater pumping application.

Function

The drive contains one application macro: ITT Flygt. The main function of the macro is to automatically detect and remove clogging substances from the pump impeller. The drive can detect clogging that occurs during operation by monitoring the pump motor torque. The actual value is compared to a reference value that has been set to the drive. If, due to clogging, the actual value exceeds the reference value for a certain time period, the pump cleaning sequence can be executed.

The pump cleaning sequence can also be executed at run time intervals, set to the drive, counting from zero at every pump start. Execution of the pump cleaning sequence at run time intervals can be used as a preventive measure and a complement to the automatic detection and removal of clogging in applications that are prone to clogging.

User interface

By default, only parameter groups 46 PUMP CLEAN SEQ and 99 START-UP DATA are shown and accessible. The reason is to minimize the number of parameters that confront the user. All parameters in the drive – shown and hidden – have default values that are especially fit for speed regulated wastewater pumping. If necessary, all parameter groups can be shown and accessible by a selection in the submenu SHOW/HIDE.

The ITT Flygt version of ACS550 is equipped with a special control panel. The main menu of the control panel features submenu SHOW/HIDE, which is used to make all parameter groups accessible/inaccessible, except groups 46 PUMP CLEAN SEQ and 99 START-UP DATA who are always shown. The control panel does not provide assistants as does the standard ACS550-01/U1 Assistant Control Panel.

Application macro: ITT Flygt

The application macro ITT Flygt is configured for wastewater pumping applications and contains the pump cleaning sequence. When the ITT Flygt macro is selected (parameter 9902 APPLIC MACRO), all drive parameters – shown and hidden – are reset to default values.

Pump cleaning sequence (PCS)

The pump cleaning sequence (PCS) is defined by parameter group 46 PUMP CLEAN SEQ. When the PCS is executed, it operates as illustrated in Figure *2*, where one PCS cycle is shown together with the parameters forming it. Refer to section *Important parameter settings* on page *19* to study all the parameters involved with the PCS, as well as particularly important normal operation parameters.

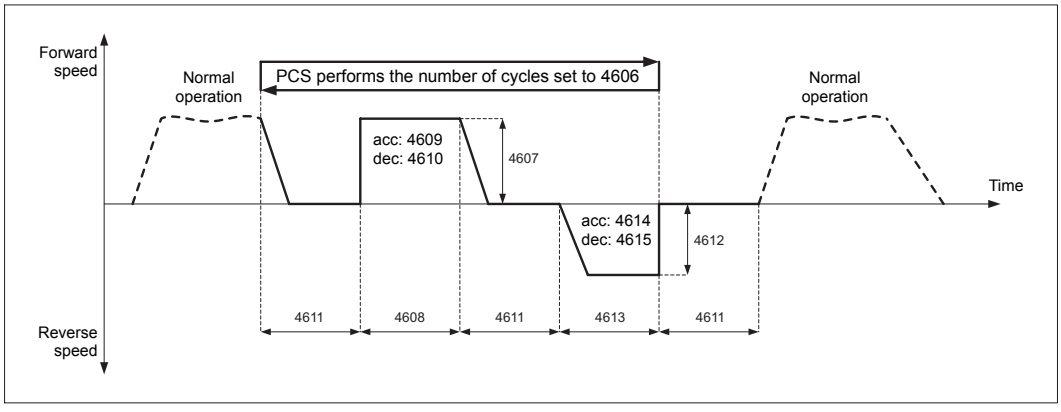


Figure 2. Continuous line: Pump cleaning sequence (PCS), Dashed line: Normal operation.

The PCS is controlled in a way that is referred to as “request” and “execute”. The control is defined by the combination of the settings of parameters 4601 EXE P CLEAN SEQ and 4602 REQ P CLEAN SEQ. Refer to Table *3* for description of the parameters. For detailed descriptions of the control principles of the PCS, refer to *Appendix 1 – Controlling the PCS*.

The PCS can be executed:

- by the pump controller at detection of clogging by the drive

and/or

- by the pump controller at regular run time intervals set to the drive

and/or

- by the pump controller at any time, depending on what parameters are analyzed by the pump controller and what logic is programmed to the pump controller

or

- by the drive itself at detection of clogging and/or at regular run time intervals set to the drive.

Drive input/output (from/to pump controller)

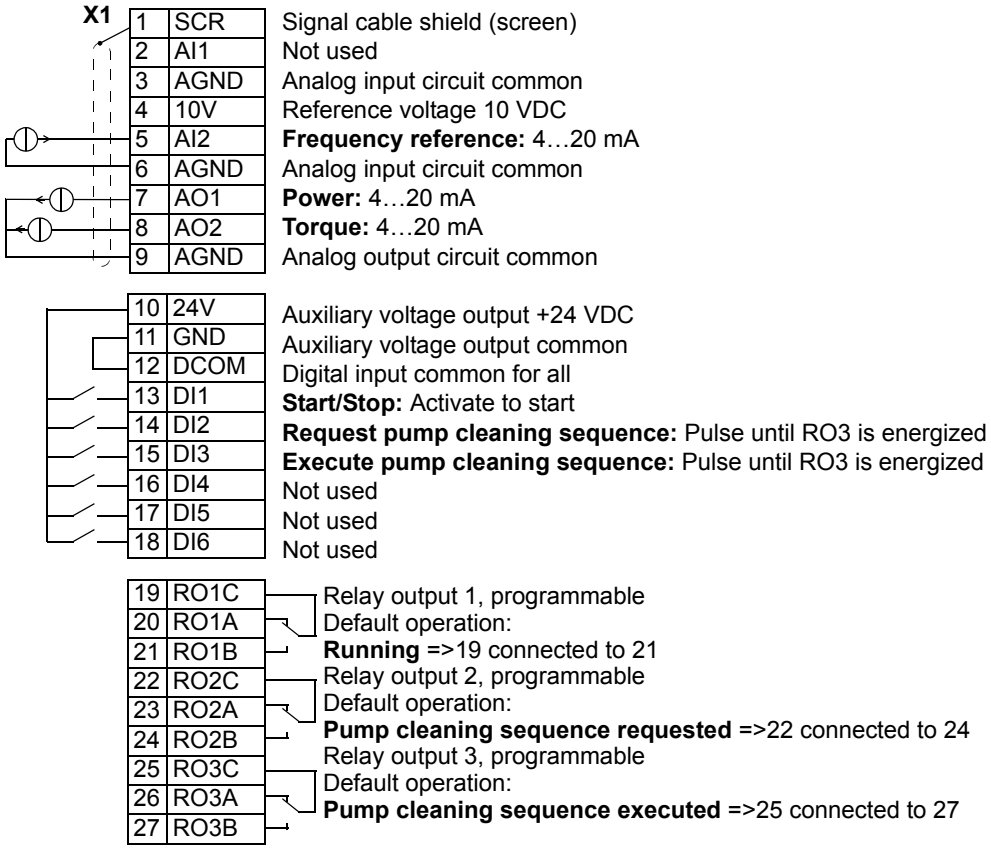


Figure 3. Drive input/output (from/to pump controller).

Start-up

What this chapter contains

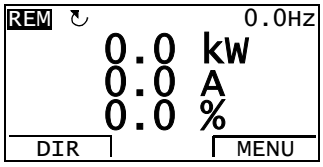
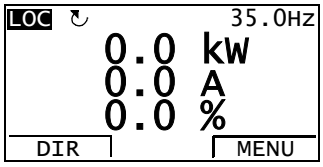
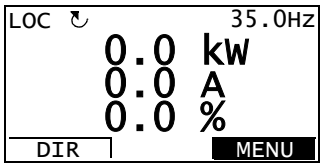
This chapter describes the start-up procedure of the drive.

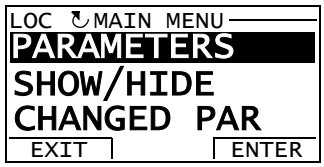
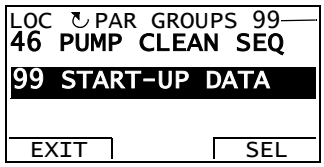
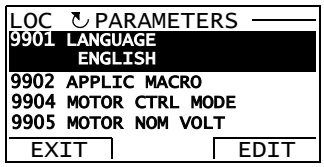
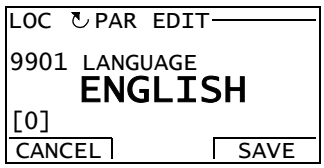
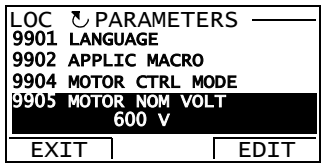
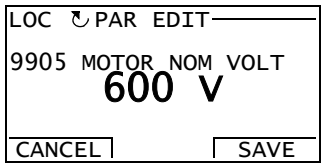
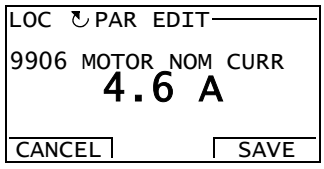
Start-up procedure

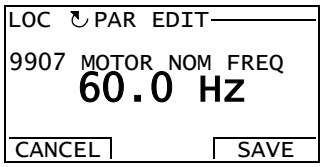
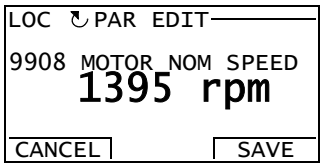
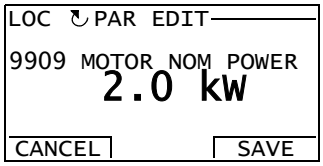
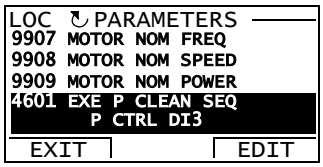
By default, only parameter groups 46 PUMP CLEAN SEQ and 99 START-UP DATA are shown and accessible. All parameters in the drive – shown and hidden – have default values that are especially fit for speed regulated wastewater pumping. It is strongly recommended that section *Important parameter settings* on page *19* is studied before commissioning the drive.

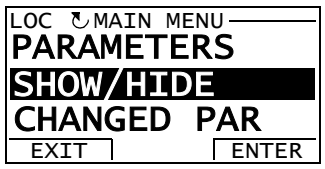
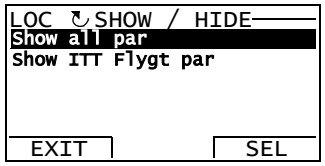
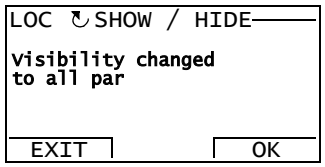
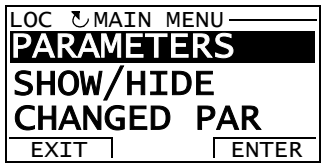
To commission the drive step-by-step, refer to Table *2*.

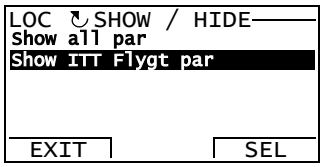
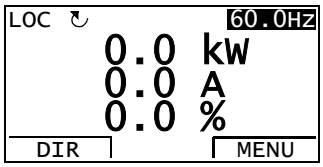
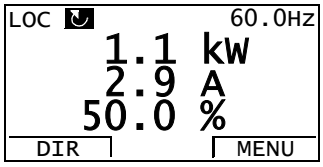
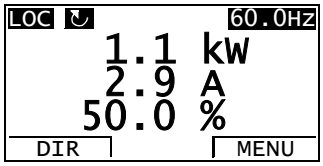
Table 2. Step-by-step commissioning of the drive.

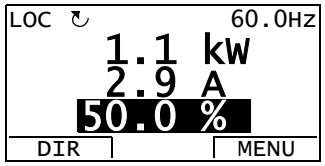
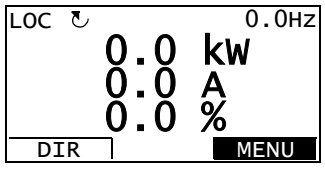
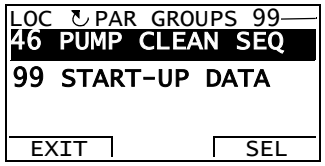
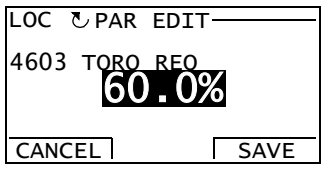
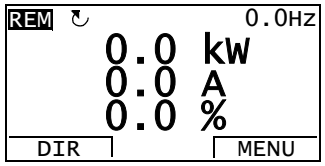
Step	Action	Control panel display
0	Apply power to the drive. The ITT Flygt logo will shortly appear before the output mode is displayed in the control panel.	
1	At the very first power up, the drive will be in remote control as indicated by “REM” in the upper left corner of the control panel display. The display shows the status information: REFERENCE FREQUENCY (Hz), POWER (kW), CURRENT (A) and TORQUE (% of nominal torque). a) Switch to local control by pressing (LOC/REM). Local control is indicated by “LOC” in the upper left corner of the control panel display. b) Enter the main menu by pressing MENU. Note concerning heavy inflow conditions: In case pumping must be done before the commissioning of the drive can be completed, do steps 13 and 14 a) and b) before steps from 2 to 12!	  

Step	Action	Control panel display
2	a) Scroll to submenu PARAMETERS by pressing ▲ or ▼, then press ENTER.	
	b) Scroll with ▲/▼ to parameter group 99 START-UP DATA, then press SEL.	
3	**Start-up data: Always to be set!** a) Scroll with ▲/▼ to parameter 9901 LANGUAGE and press EDIT.	
	b) Scroll with ▲/▼ to the language to be set, then press SAVE.	
4	**Start-up data: Always to be set!** a) Check the pump data sheet and find the nominal voltage. Scroll with ▲/▼ to parameter 9905 MOTOR NOM VOLT and press EDIT.	
	b) Set the nominal voltage by pressing ▲/▼, then press SAVE.	
5	**Start-up data: Always to be set!** a) Check the pump data sheet and find the rated current. b) Scroll to parameter 9906 MOTOR NOM CURR, set the rated current, then save.	

Step	Action	Control panel display
6	**Start-up data: Always to be set!** a) Check the pump data sheet and find the nominal frequency. b) Scroll to parameter 9907 MOTOR NOM FREQ, set the nominal frequency, then save.	
7	**Start-up data: Always to be set!** a) Check the pump data sheet and find the nominal speed. b) Scroll to parameter 9908 MOTOR NOM SPEED, set the nominal speed, then save.	
8	**Start-up data: Always to be set!** a) Check the pump data sheet and find the rated power. b) Scroll to parameter 9909 MOTOR NOM POWER, set the rated power, then save.	
9	**Parameter 4601: Set depending on the pump cleaning sequence (PCS) control principle!** For description of the parameter, see page *19*. If another selection than default is to be set: a) Scroll with ▲/▼ to parameter 4601. b) Press EDIT, select by pressing ▲/▼, then press SAVE.	
10	**Parameter 4602: Set depending on the PCS control principle!** For the parameter description, see page *20*. If another selection than default is to be set: Scroll to the parameter, set it and save the selection.	
11	**Parameters 4604–4615: Normally not to be set!** The parameters are described on pages *20* to *22*. If any default value is not suitable to the actual application, scroll to the parameter, set it and save the value.	

Step	Action	Control panel display
12	**Hidden parameters: Normally not to be set!** For complete parameter description, refer to *Appendix 2 – ITT Flygt version of ACS550 parameters* and *ACS550-01/U1 User's Manual* [3AFE64804588 (English)]. If any default value is not suitable to the actual application, proceed to step 12 a) to change the value. Otherwise, proceed to step 13.	
	a) Press EXIT repeatedly until the control panel display reaches the output mode. Enter the main menu by pressing MENU. Scroll to and enter submenu SHOW/HIDE by pressing ENTER.	 
	b) Select "Show all par" by pressing SEL. Confirm the change by pressing OK.	 
	c) Press EXIT to reach the main menu. Scroll to and enter submenu PARAMETERS.	
	d) Scroll to the parameter, set and save the non-default selection/value. If all parameter groups, except 46 PUMP CLEAN SEQ and 99 START-UP DATA, are to be hidden/inaccessible again: proceed to step 12 e). Otherwise, proceed to step 13.	

Step	Action	Control panel display
	e) Press EXIT repeatedly until the control panel display reaches the output mode. Enter the main menu. Scroll to and enter submenu SHOW/ HIDE. Select “Show ITT Flygt par” and confirm the change (OK).	
13	**Check the direction of rotation.** a) Press EXIT repeatedly until the control panel display reaches the output mode. Set the maximum frequency reference to the drive by pressing ▲ until the maximum frequency reference indicated in the upper right corner of the control panel display is reached.	
	b) Start the pump by pressing ▽. Check that the rotating arrow that indicates the direction of rotation in the upper left part of the control panel display is rotating clockwise. If the arrow is rotating counter-clockwise: press DIR to change to the clockwise direction.	
	c) Check the flow (or head) delivered by the pump to make sure that the pump is running in the forward direction. If the pump is running in the forward direction: proceed to step 14. If the pump is running in the reverse direction, proceed to step 13 d). d) Stop the drive by pressing ◇. Power off the drive and switch two phases on the output of the drive. Apply power to the drive and repeat commissioning from step 13 a).	
	Torque test!	
14	**ATTENTION!** When parameter 4602 REQ P CLEAN SEQ is set to 1 or 3, it is strongly recommended that parameter 4603 TORQ REQ is set to a non default value that suits the actual application. In order to do so a torque test is done as follows: a) Make sure that the drive is: - in local control - started - indicating clockwise direction of rotation - set to the maximum frequency reference.	

Step	Action	Control panel display
	b) Make sure that the pump is: - running in the forward direction - pumping at a relevant physical level in the sump according to the pumping strategy to be used in the actual application - delivering a stable flow. c) Read the motor torque level percentage value on the third row of the control panel display (e.g. 50%). d) Multiply the value by 1.2 (e.g. 50% × 1.2 = 60%). The factor 1.2 corresponds to a torque contribution that can be expected when clogging occurs. e) Stop the drive by pressing (◈). Proceed to step 15 to set the result of step 14 d) to parameter 4603 TORQ REQ.	
15	**Set the torque reference value.** a) Enter the main menu. Scroll to and enter submenu PARAMETERS. b) Scroll to and select parameter group 46 PUMP CLEAN SEQ. c) Scroll to parameter 4603. Set and save the resulting value from step 14 d) (e.g. 60%).	  
16	Press (EXIT) repeatedly until the control panel display reaches the output mode, showing the status information. Switch to remote control by pressing (LOC/REM). The control panel display shall indicate “REM” in the upper left corner. The drive is now commissioned and ready to be controlled by the pump controller.	

Basic operating rules for the PCS

Basic operating rules for controlling the PCS are described below. For detailed descriptions of the control principles of the PCS, refer to *Appendix 1 – Controlling the PCS*.

Start command in remote control

The drive must be in remote control, given a start command (DI1 = 1) and run (indicated by energized relay output RO1) to accept a request and execution of the PCS. In local control, the PCS cannot be requested/executed at all, whereas in remote control the PCS can be requested/executed provided there is a preceding start command. Consequently, If a request of the PCS is not answered by executing the PCS before a stop command (DI1 = 0) (indicated by de-energized relay output RO1) is given, the request of the PCS is cancelled.

Interrupting the PCS

When the PCS is executed, it will interrupt before completion if the drive is given a stop command. This means, that the pump is actually stopped. However, the pump can be restarted to normal operation immediately by a new start command.

Blocked PCS

Request and execution of the PCS are blocked for 3 seconds after every given start command and after every completed PCS. This way normal dynamic motor load during acceleration is not able to request or execute the PCS.

Important parameter settings

Table *3* lists the parameters whose settings are particularly important in order to achieve reliable speed regulated wastewater pumping. Parameters marked with * are described in ACS550-01/U1 User's Manual [3AFE64804588 (English)]. Parameters numbered from 4601 to 4615 are dedicated to the ITT Flygt version of ACS550.

Note: All default values are related to ITT Flygt pumps exclusively.

Table 3. Particularly important parameter settings to achieve reliable speed regulated wastewater pumping.

Code	Name	Description
2007*	MINIMUM FREQ	**ATTENTION!** No lower value than 35.0 Hz shall be set, since the risk of clogging increases with reduced speed. **Default:** 35.0 Hz.
2008*	MAXIMUM FREQ	**ATTENTION!** No higher value than nominal frequency shall be set, otherwise the pump motor may overheat. **Default:** Nominal frequency.
2202*	ACCELER TIME 1	If the actual application demands a longer normal operation (non PCS) acceleration time due to fluid, mechanical or electrical factors, set the parameter to meet the demand. **ATTENTION!** No lower value than 2.0 s shall be set, since stress on the impeller and shaft increases with reduced acceleration time. **Default:** 2.0 s.
2203*	DECELER TIME 1	If the actual application demands a longer normal operation (non PCS) deceleration time due to fluid, mechanical or electrical factors, set the parameter to meet the demand. **Note:** The default value is valid for lift pump stations, i.e. systems with limited discharge line length. As a rule of thumb, all discharge systems longer than 400 m should be analyzed from a water hammer point of view (in such an analysis of transients, a number of system parameters have to be considered) – in these cases, please consult ITT Flygt for assistance with setting the parameter to a correct value. **ATTENTION!** No lower value than 4.0 s shall be set, since stress on the impeller and shaft increases with reduced deceleration time. **Default:** 4.0 s.
4601	EXE P CLEAN SEQ	Defines how the PCS is executed. Upon execution, the drive relay output RO3 energizes. RO3 remains energized during the PCS. **Range:** 0, 1, 2. **0 = NOT SEL** The PCS is not executed. **1 = P CTRL DI3** The PCS is executed by the pump controller setting the drive digital input DI3 from 0 to 1. **2 = ACS550** The PCS is executed by the drive itself. **Default:** 1.

Code	Name	Description
4602	REQ P CLEAN SEQ	Defines what triggers a request of the PCS. Upon request, the drive relay output RO2 energizes. RO2 remains energized until the execution of the PCS starts and during the PCS. **Range:** 0, 1, 2, 3, 4. **0 = NOT SEL** The PCS is not requested. **1 = TORQ** The request of the PCS is triggered when the actual motor torque (parameter 0105 TORQUE) exceeds the reference value set to parameter 4603 TORQ REQ for a time that exceeds the value set to parameter 4604 TON TORQ. The fulfilment of the condition is monitored and analyzed by the drive. **2 = RUN TIME** The request of the PCS is triggered when the actual run time (parameter 0114 RUN TIME), since the last start command or since the last completed PCS, exceeds the reference value set to parameter 4605 RUN TIME REQ. The fulfilment of the condition is monitored and analyzed by the drive. **3 = TORQ OR RUN TIME** The request of the PCS is triggered when either the motor torque or run time condition is fulfilled as described above under selection 1 = TORQ or 2 = RUN TIME. **4 = P CTRL DI2** The request of the PCS is triggered by the pump controller setting digital input DI2 of the drive from 0 to 1. There are two reasons for using this selection: - Only the parameters analyzed by the pump controller and the logic programmed to the pump controller are used to control the PCS – thus the drive's capability to analyze torque and/or run time is not utilized. - Testing/demonstrating the PCS and the logic of the relay output and digital input signals involved with the PCS by simulating that the request of the PCS is coming from the drive (as if the torque and/or run time condition was really fulfilled as monitored and analyzed by the drive). **Default:** 1.
4603	TORQ REQ	The parameter is used with parameter 4602 REQ P CLEAN SEQ selections 1 and 3. It defines the motor torque reference value in percent of nominal motor torque. The actual motor torque (parameter 0105 TORQUE) must exceed the reference value (due to clogging) before request of the PCS can be triggered. **ATTENTION!** It is strongly recommended that this parameter is set to a non-default value that suits the actual application as described in Table *2*, Step 14 and 15. **Range:** 0.0...200.0%. **Resolution:** 0.1%. **Default:** 120%.
4604	TON TORQ	The parameter is used with parameter 4602 REQ P CLEAN SEQ selections 1 and 3. It defines the time for which the actual motor torque (parameter 0105 TORQUE) must exceed the motor torque reference value (parameter 4603 TORQ REQ) before request of the PCS can be triggered. Parameter 4604 TON TORQ ensures that the PCS does not become oversensitive and react to normal dynamic motor load during acceleration at every pump start or to minor disturbances during normal operation. **Range:** 0...100 s. **Resolution:** 1 s. **Default:** 5 s.

Code	Name	Description
4605	RUN TIME REQ	The parameter is used with parameter 4602 REQ P CLEAN SEQ selections 2 and 3. It defines the run time reference value that the actual run time (parameter 0114 RUN TIME) must exceed, since the last start command or completed PCS, before request of the PCS can be triggered. Parameter 0114 RUN TIME is reset to 0 at every stop command and after every completed PCS. Set the value to parameter 4605 RUN TIME REQ based on knowledge and perception of the proneness to clogging in the actual application: the higher the proneness to clogging, the lower the value. **Range:** 1…100 h. **Resolution:** 1 h. **Default:** 2 h.
4606	NUM OF CYCLES	Defines the number of cycles that the PCS performs at each execution. Set a high enough value to render the PCS a fair chance to fully clean the impeller in one execution only. If the PCS fails to fully clean the impeller at the first execution, the PCS will be requested anew provided that the condition for the request is fulfilled. **Range:** 1...10. **Resolution:** 1. **Default:** 2.
4607	FWD RUN FREQ	Defines the forward running frequency in the PCS in percent of the maximum motor frequency (parameter 2008 MAXIMUM FREQ). **Range:** 0.0%...100.0%. **Resolution:** 0.1%. **Default:** 100.0%.
4608	FWD RUN TIME	Defines the forward running time in the PCS. **Range:** 0.0...100.0 s. **Resolution:** 0.1 s. **Default:** 7 s.
4609	FWD RUN ACC	Defines the forward acceleration time in the PCS. If the actual application demands a longer PCS forward acceleration time due to fluid, mechanical or electrical factors, set the parameter to meet the demand. **Range:** 0.0...100.0 s. **Resolution:** 0.1 s. **Default:** 0.3 s.
4610	FWD RUN DEC	Defines the forward deceleration time in the PCS. If the actual application demands a longer PCS forward deceleration time due to fluid, mechanical or electrical factors, set the parameter to meet the demand. **Note:** The default value is valid for lift pump stations, i.e. systems with limited discharge line length. As a rule of thumb, all discharge systems longer than 400 m should be analyzed from a water hammer point of view (in such an analysis of transients, a number of system parameters have to be considered) – in these cases, please consult ITT Flygt for assistance with setting the parameter to a correct value**.** **ATTENTION!** No lower value than 2.0 s shall be set, since stress on the impeller and shaft increases with reduced deceleration time. **Range:** 0.0...100.0 s. **Resolution:** 0.1 s. **Default:** 2.0 s.

Code	Name	Description
4611	ZERO SPEED PAUSE	Defines the zero speed pause time in the PCS. **Note:** The default value is valid for lift pump stations, i.e. systems with limited discharge line length. As a rule of thumb, all discharge systems longer than 400 m should be analyzed from a water hammer point of view (in such an analysis of transients, a number of system parameters have to be considered) – in these cases, please consult ITT Flygt for assistance with setting the parameter to a correct value**.** **Range:** 0.0...100.0 s. **Resolution:** 0.1 s. **Default:** 7.0 s.
4612	REV RUN FREQ	Defines the reverse running frequency in the PCS in percent of the maximum motor frequency (parameter 2008 MAXIMUM FREQ). **ATTENTION!** No higher value than 80% shall be set, since stress on the impeller and shaft increases with increased frequency. **Range:** 0.0%...100.0%. **Resolution:** 0.1%. **Default:** 80.0%.
4613	REV RUN TIME	Defines the reverse running time in the PCS. **Range:** 0.0...100.0 s. **Resolution:** 0.1 s. **Default:** 7.0 s.
4614	REV RUN ACC	Defines the reverse acceleration time in the PCS. If the actual application demands a longer PCS reverse acceleration time due to fluid, mechanical or electrical factors, set the parameter to meet the demand. **ATTENTION!** No lower value than 2.0 s shall be set, since stress on the impeller and shaft increases with reduced acceleration time. **Range:** 0.0...100.0 s. **Resolution:** 0.1 s. **Default:** 2.0 s.
4615	REV RUN DEC	Defines the reverse deceleration time in the PCS. If the actual application demands a longer PCS reverse deceleration time due to fluid, mechanical or electrical factors, set the parameter to meet the demand. **Range:** 0.0...100.0 s. **Resolution:** 0.1 s. **Default:** 0.3 s.

Appendix 1 – Controlling the PCS

What this appendix contains

This appendix describes the control principles of the pump cleaning sequence (PCS) regarding communication between the pump controller and the ITT Flygt version of ACS550.

Overview

The PCS can be controlled according to 3 (0 to 2) different principles.

Disable the PCS – Control principle 0

In order to completely disable the PCS, parameters 4601 EXE P CLEAN SEQ and 4602 REQ P CLEAN SEQ must both be set to 0 = NOT SEL.

Pump controller executing the PCS – Control principle 1

When parameter 4601 EXE P CLEAN SEQ is set to 1 and parameter 4602 REQ P CLEAN SEQ to 1, 2 or 3, the drive requests the pump controller to execute the PCS when the torque and/or run time condition is fulfilled as monitored and analyzed by the drive. The drive requests the PCS by energizing relay output RO2. When the pump controller receives the energized RO2 signal from the drive, the pump controller takes the decision when to execute the PCS (depending on what logic is programmed to the pump controller). When the pump controller decides to execute the PCS, the pump controller sets digital input DI3 of the drive from 0 to 1. When DI3 is set from 0 to 1, the PCS is executed and the drive energizes also relay output RO3. The very moment that the pump controller receives the energized RO3 signal from the drive, the pump controller must reset DI3 from 1 to 0. During the PCS both RO2 and RO3 remain energized. When the last cycle of the PCS ends both RO2 and RO3 deenergize and normal operation continues.

Control principle 1a, including the order of events, is illustrated in Figure *4*.

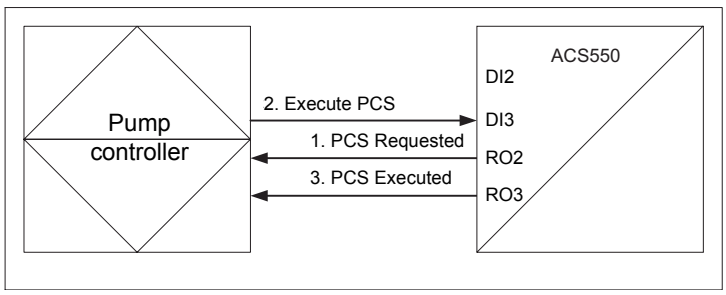


Figure 4. Control principle 1a. PCS = Pump cleaning sequence, DI = Digital input, RO = Relay output.

When parameter 4601 EXE P CLEAN SEQ is set to 1 and parameter 4602 REQ P CLEAN SEQ to 1, 2, 3 or 4, it is also possible for the pump controller to execute the PCS at any time without any preceding request from the drive. Again, the pump controller executes the PCS by setting digital input DI3 of the drive from 0 to 1. When the PCS is executed, both relay outputs RO2 and RO3 energize. The very moment that the pump controller receives the energized RO3 signal from the drive, the pump controller must reset DI3 from 1 to 0. During the PCS both RO2 and RO3 remain energized. When the last cycle of the PCS ends both RO2 and RO3 deenergize and normal operation continues.

The setting of parameter 4601 EXE P CLEAN SEQ to 1 and parameter 4602 REQ P CLEAN SEQ to 4 is applied when only the parameters analyzed by the pump controller and the pump controller logic are to control the PCS – thus the drive's capability to analyze torque and/or run time is not utilized.

Control principle 1b, including the order of events, is illustrated in Figure *5*.

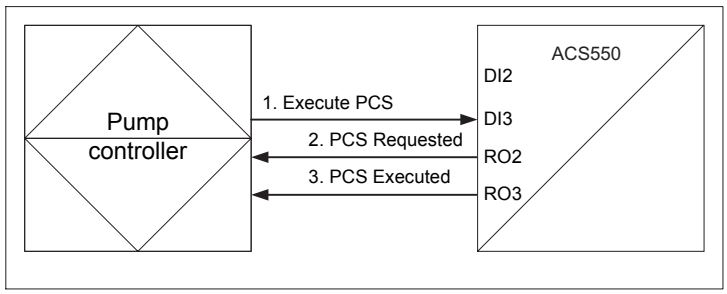


Figure 5. Control principle 1b. PCS = Pump cleaning sequence, DI = Digital input, RO = Relay output.

ACS550 executing the PCS – Control principle 2

When parameter 4601 EXE P CLEAN SEQ is set to 1 and parameter 4602 REQ P CLEAN SEQ to 1, 2 or 3, the drive requests itself to directly execute the PCS when the torque and/or run time condition is fulfilled as monitored and analyzed by the drive. The very moment that the PCS is executed, both relay outputs RO2 and RO3 of the drive energize. During the PCS both RO2 and RO3 remain energized. When the last cycle of the PCS ends both RO2 and RO3 deenergize and normal operation continues.

Control principle 2 is applied when only the drive's capability to monitor and analyze torque and/or run time is to control the PCS – thus the parameters analyzed by the pump controller and the logic programmed to the pump controller are not utilized.

Control principle 2, including the order of events, is illustrated in Figure *6*.

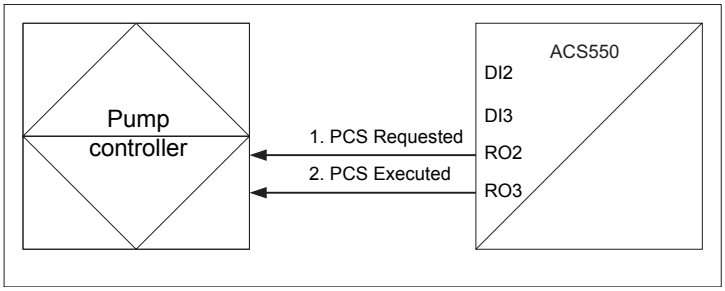


Figure 6. Control principle 2. PCS = Pump cleaning sequence, DI = Digital input, RO = Relay output.

Testing/demonstrating the PCS

When parameter 4601 EXE P CLEAN SEQ is set to 1 or 2 and parameter 4602 REQ P CLEAN SEQ to 4, the pump controller can set digital input DI2 of the drive from 0 to 1 to simulate that the request of the PCS is coming from the drive (as if the torque and/or run time condition was really fulfilled as monitored and analyzed by the drive). When DI2 is set from 0 to 1, the drive energizes relay output RO2. Depending on whether parameter 4601 EXE P CLEAN SEQ is set to 1 or 2, the PCS can then be executed according to Control principle 1a or 2 respectively. When parameter 4601 EXE P CLEAN SEQ is set to 1 and parameter 4602 REQ P CLEAN SEQ to 4, the PCS can also be executed without any preceding simulated request by DI2 according to Control principle 1b.

Appendix 2 – ITT Flygt version of ACS550 parameters

What this appendix contains

This appendix contains Table *4*, which presents the parameters that are modified in the ITT Flygt version of ACS550 compared to the standard ACS550-01/U1. The right-hand side column describes the modification.

For a complete standard ACS550-01/U1 parameter list with descriptions of the parameters, refer to *ACS550-01/U1 User's Manual* [3AFE64804588 (English)].

Table 4. ITT Flygt version of ACS550 parameters.

Code	Name	Range	Res.	Default	Modifications in ITT Flygt version of ACS550
Group 99: START-UP DATA					
9902	APPLIC MACRO	20 = ITT Flygt	1	1	ADDED: APPLIC MACRO: ITT Flygt. REMOVED: ALL STANDARD ACS550 APPLIC MACROS. CHANGED: DEFAULT VALUE.
9904	MOTOR CONTROL MODE	3 = SCALAR	1	3	REMOVED: 1 = VECTOR: SPEED, 2 = VECTOR: TORQUE.
9910	MOTOR ID RUN	0 = OFF, 1 = ON	1	0	REMOVED.
Group 01: Operating Data					
0114	RUN TIME (R)	0…9999 h	1 h	0 h	CHANGED: RESET TO 0 AT EVERY STOP COMMAND AND EVERY COMPLETED CLEANING SEQUENCE.
0126	PID 1 OUTPUT	-1000…1000%	0.1%	-	REMOVED.
0127	PID 2 OUTPUT	-100…100%	0.1%	-	REMOVED.
0128	PID 1 SETPNT	Unit and scale defined by par. 4006/4106 and 4007/4107	-	-	REMOVED.
0129	PID 2 SETPNT	Unit and scale defined by par. 4206 and 4207			REMOVED.
0130	PID 1 FBK	Unit and scale defined by par. 4006/4106 and 4007/4107	-	-	REMOVED.
0131	PID 2 FBK	Unit and scale defined by par. 4206 and 4207	-	-	REMOVED.
0132	PID 1 DEVIATION	Unit and scale defined by par. 4006/4106 and 4007/4107	-	-	REMOVED.
0133	PID 2 DEVIATION	Unit and scale defined by par. 4206 and 4207	-	-	REMOVED.
Group 10: Start/Stop/Dir					
1001	EXT 1 COMMANDS	0…14	1	1	CHANGED: DEFAULT VALUE.
1003	DIRECTION	1…3	1	3	CHANGED: DIRECTION CANNOT BE REQUESTED IN REMOTE CONTROL MODE. AUTOMATIC REVERSE DIRECTION IN THE PUMP CLEANING SEQUENCE.

Code	Name	Range	Res.	Default	Modifications in ITT Flygt version of ACS550
Group 11: Reference Select					
1102	EXT1/EXT2 SEL	-6…12	1	0	REMOVED: 9 = TIMER FUNCTION 1, 10…12 = TIMER FUNCTION 2…4.
1103	REF1 SELECT	0…17	1	2	CHANGED: DEFAULT VALUE.
1106	REF2 SELECT	0…19	1	2	REMOVED: 9 = TIMER FUNCTION 1, 10…12 = TIMER FUNCTION 2…4, 19 = PID1OUT.
Group 12: Constant Speeds					
1201	CONST SPEED SEL	-14…19	1	9	REMOVED: 15…18 = TIMER FUNCTION 1…4, 19 = TIMER 1 & 2.
1209	TIMED MODE SEL	1…2	1	2	REMOVED.
Group 13: Analogue Inputs					
1304	MINIMUM AI2	0...100%	0.1%	20%	CHANGED: DEFAULT VALUE.
Group 14: Relay Outputs					
1401	RELAY OUTPUT 1	0…45	1	2	ADDED: 46 = PCS REQ 47 = PCS EXE REMOVED: 30 = PID SLEEP, 31 = PFC, 32 = AUTOCHANGE. CHANGED: DEFAULT VALUE.
1402	RELAY OUTPUT 2	0…45	1	46	ADDED: 46 = PCS REQ 47 = PCS EXE REMOVED: 30 = PID SLEEP, 31 = PFC, 32 = AUTOCHANGE. CHANGED: DEFAULT VALUE.
1403	RELAY OUTPUT 3	0…45	1	47	ADDED: 46 = PCS REQ 47 = PCS EXE REMOVED: 30 = PID SLEEP, 31 = PFC, 32 = AUTOCHANGE. CHANGED: DEFAULT VALUE.
Group 15: Analogue Outputs					
1501	AO1 CONTENT SEL	99...199	1	106	CHANGED: DEFAULT VALUE.
1502	AO1 CONTENT MIN	-	-	0 kW	CHANGED: DEFAULT VALUE.
1504	MINIMUM AO1	0.0...20.0	0.1 mA	4 mA	CHANGED: DEFAULT VALUE.
1507	AO2 CONTENT SEL	99…199	1	105	CHANGED: DEFAULT VALUE.
1510	MINIMUM AO2	0.0…20.0	0.1mA	4 mA	CHANGED: DEFAULT VALUE.

Code	Name	Range	Res.	Default	Modifications in ITT Flygt version of ACS550
Group 20: Limits					
2007	MINIMUM FREQ	-500...500 Hz	0.1 Hz	35 Hz	CHANGED: DEFAULT VALUE.
Group 21: Start/Stop					
2101	START FUNCTION	1…5	1	2	CHANGED: DEFAULT VALUE.
2102	STOP FUNCTION	1 = COAST, 2 = RAMP	1	2	CHANGED: DEFAULT VALUE.
2103	DC MAGN TIME	0…10 s	0.01 s	1 s	CHANGED: DEFAULT VALUE.
Group 22: Accel/Decel					
2201	ACC/DEC 1/2 SEL	0…7, -1...-6	1	5	REMOVED.
2202	ACCELER TIME 1	0.0…1800 s	0.1 s	2 s	CHANGED: DEFAULT VALUE.
2203	DECELER TIME 1	0.0...1800 s	0.1 s	4 s	CHANGED: DEFAULT VALUE.
2205	ACCELER TIME 2	0.0…1800 s	0.1 s	60 s	REMOVED.
2206	DECELER TIME 2	0.0…1800 s	0.1 s	60 s	REMOVED.
Group 29: Maintenance Trig					REMOVED.
Group 30: Fault Functions					
3005	MOT THERM PROT	0 = NOT SEL, 1 = FAULT, 2 = WARNING	1	0 (NOT SEL)	CHANGED: DEFAULT VALUE. **UL** The drive is suitable for use on a circuit capable of delivering not more than 65 kA rms symmetrical amperes at the drive nominal voltage (600 V maximum for 690 V units). The drive provides overload protection in accordance with the National Electrical Code (US). The ITT Flygt version of ACS550 default setting is off and must be activated at start-up. See User's Manual [3AFE64804588 (English)] for the standard ACS550-01/U1 default setting. The drives are to be used in a heated indoor controlled environment, see chapter Technical Data, section Ambient Conditions, User's Manual [3AFE64804588 (English)], for specific limits. Brake chopper – ABB has brake choppers that, when applied with appropriately sized brake resistors, will allow the drive to dissipate regenerative energy (normally associated with quickly decelerating a motor). Proper application of the brake chopper is defined in chapter Technical Data, section Brake Components, User's Manual [3AFE64804588 (English)]. This can be applied to a single drive or multiple drives with DC bus connected to allow a sharing of regenerative energy.
Group 33: Information					
3301	FW VERSION	0000...FFFF hex	1	Firm-ware version	
3302	LP VERSION	0000...FFFF hex	1	0	ADDED: ITT Flygt LOADING PACKAGE. REMOVED: STANDARD ACS550 LOADING PACKAGE.
Group 34: Panel Display/Process Variables					
3401	SIGNAL 1 PARAM	100...199	1	106	CHANGED: DEFAULT VALUE.
Group 36: Timer Functions					REMOVED.
Group 40: Process PID Set 1					REMOVED.
Group 41: Process PID Set 2					REMOVED.
Group 42: Ext/Trim PID					REMOVED.

Code	Name	Range	Res.	Default	Modifications in ITT Flygt version of ACS550
Group 46: PUMP CLEAN SEQ					ADDED
4601	EXE P CLEAN SEQ	0 = NOT SEL, 1 = P CTRL DI3, 2 = ACS550	1	1	ADDED.
4602	REQ P CLEAN SEQ	0 = NOT SEL, 1 = TORQ, 2 = RUN TIME, 3 = TORQ OR RUN TIME, 4 = P CTRL DI2	1	1	ADDED.
4603	TORQ REQ	0.0…200.0%	0.1%	120.0%	ADDED.
4604	TON TORQ	0…100 s	1 s	5 s	ADDED.
4605	RUN TIME REQ	0...100 h	1 h	2 h	ADDED.
4606	NUM OF CYCLES	0…10	1	2	ADDED.
4607	FWD RUN FREQ	0.0…100.0%	0.1%	100.0%	ADDED.
4608	FWD RUN TIME	0.0…100.0 s	0.1 s	7.0 s	ADDED.
4609	FWD RUN ACC	0.0…100.0 s	0.1 s	0.3 s	ADDED.
4610	FWD RUN DEC	0.0…100.0 s	0.1 s	2.0 s	ADDED.
4611	ZERO SPEED PAUSE	0.0…100.0 s	0.1 s	7.0 s	ADDED.
4612	REV RUN FREQ	0.0…100.0%	0.1%	80.0%	ADDED.
4613	REV RUN TIME	0.0…100.0 s	0.1 s	7.0 s	ADDED.
4614	REV RUN ACC	0.0…100.0 s	0.1 s	2.0 s	ADDED.
4615	REV RUN DEC	0.0…100.0 s	0.1 s	0.3 s	ADDED.
Group 81: PFC Control					REMOVED.

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