ACS 800

Supplement
Centrifuge Control Application Program

Centrifuge Control Application Program

Supplement

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Introduction to this manual

Overview

This chapter gives some general information about the manual, and describes the contents in brief.

What this supplement contains

This supplement describes the differences between the Centrifuge Control Application and the Standard Application program for ACS 800 Drives.

In this supplement the term Decanter refers to the two-motor driven two-shaft centrifuge (see Figure 2). The term Centrifuge stands for the simpler, one-motor centrifuge.

The contents of the supplement is the following:

Introduction to this manual gives some general information about the manual, and describes the contents in brief.

Operation of the Centrifuge Control Application program describes the basics of the Centrifuge Control Application.

Start-up & control connections instructs in start-up and represents the default control connections of the Centrifuge Control Application.

Parameters describes the application specific functions and parameters.

Decanter examples shows three different illustrative Decanter configurations. These practical examples give information how parameters should be set correctly depending on the mechanics.

Compatibility

The supplement is compatible with the ACS 800 Centrifuge Control Application program version 7.xx or later.

Safety

The complete safety instructions are given in a Hardware or Safety Manual delivered with the drive. Read the safety instructions before attempting any work on the unit. Read the software function specific warnings and notes before changing the default settings of the function. For each function, the warnings and notes are given in the subsection describing the related user-adjustable parameters.

Intended audience

The reader of this manual is expected to have:

- knowledge of standard electrical wiring practices, electronic components, and electrical schematic symbols
- knowledge of ABB product names and terminology
- no experience or training in installing, operating, or servicing the ACS 800.

Related documents

This supplement is to be used together with:

- *Firmware Manual for ACS800 Standard Application Program* 7.x (code: 64527592 [english]), in which the program part identical to the Standard Application program is described

Operation of the Centrifuge Control Application program

Overview

This chapter describes:

- the operation sequence of the Centrifuge drive, and instructs how to start, stop, reset and halt the sequence
- the Decanter specific software functions and the operation of the application.

Choosing the mode of operation

The mode of operation must be chosen between Centrifuge and Decanter. For a Centrifuge use, follow the *Checklist for a Centrifuge start-up* in chapter *Start-up & control connections*. For a Decanter use, see the examples and parameters in chapter *Decanter examples*.

Centrifuge operation principle

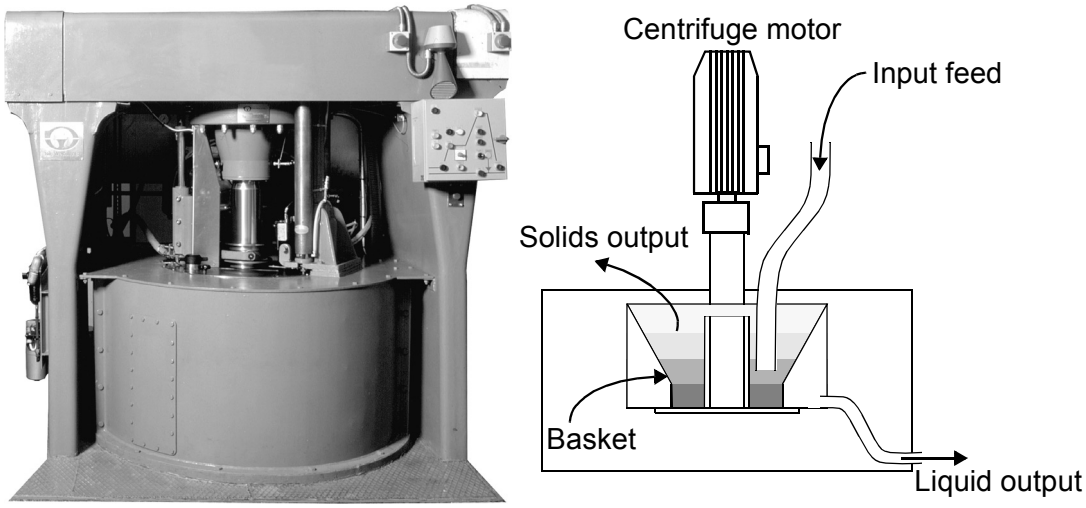
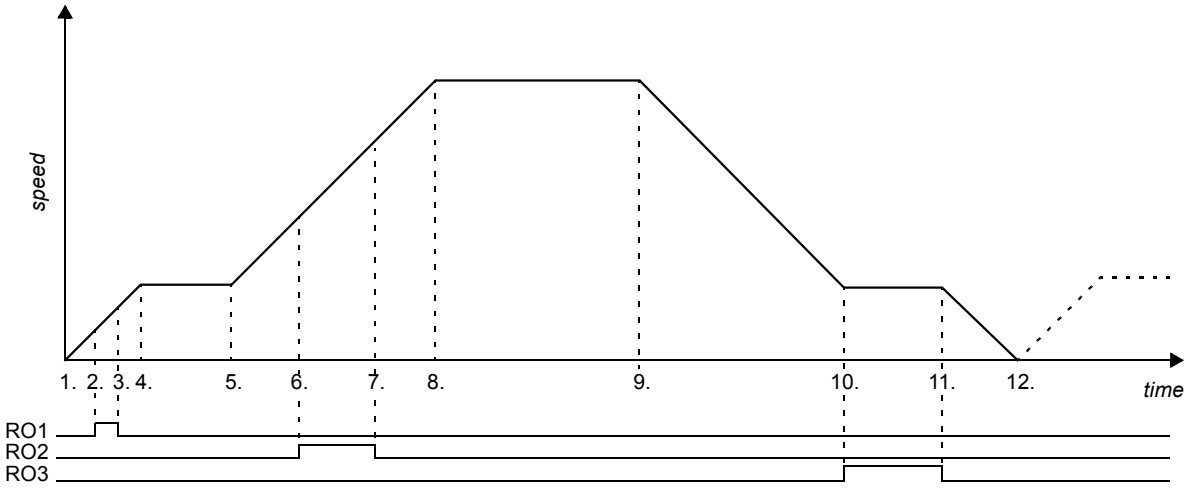


Figure 1. An example of a Centrifuge

The centrifuge operates on the principle of centrifugal force. The centrifuge accelerates to a predetermined filling speed and the feed input is initiated. As centrifugal force drives the feed through filter media and perforated basket wall, a cake builds up on the filter media. The liquids are removed through an outlet. The retained solids are accelerated to spinning speed, after which the centrifuge decelerates to unloading speed and a discharger removes the product from the basket. An alternative unloading method allows top removal of product in a filter bag.

Basic Centrifuge operation sequence

The figure and table below illustrate the operation sequence of a Centrifuge.



	Stage	What happens	Parameter settings
1.	The external system gives the drive a start command through DI1.	Drive shifts to acceleration*.	49.01 ACC T TO FILL SPEED
2.	Drive reaches the pre-washing speed.	Pre-washing counter starts. RO1 energises switching the pre-washing on. (/ giving the external system an indication to switch on the pre-washing.)	49.03 PREWASHING SPEED
3.	The counter reaches the set pre-washing time.	RO1 de-energises switching the pre-washing off. (/ giving the external system an indication to switch off the pre-washing.)	49.04 PREWASHING TIME
4.	Drive reaches the filling speed.	Drive shifts to a constant speed. The external system starts filling the Centrifuge.	49.02 FILLING SPEED
5.	External system stops the Centrifuge filling and gives the drive an indication through DI2.	Drive accelerates*.	49.05 ACCT TO SPIN SPEED
6.	Drive reaches the washing speed.	Washing counter starts. RO2 switches the washing on. (/ gives the external system an indication to switch on the washing.)	49.06 WASHING SPEED
7.	The counter reaches the set washing time.	RO2 switches the washing off. (/ gives the external system an indication to switch off the washing.)	49.07 WASHING TIME
8.	Drive reaches the spinning speed.	Drive shifts to constant speed. The spinning time counter starts.	49.08 SPIN SPEED
9.	The counter reaches the set spinning time.	Drive shifts to deceleration*.	49.09 SPINNING TIME 49.10 DEC T UNLOADING
10.	Drive reaches the unloading speed.	Drive shifts to constant speed. Relay output RO3 energises switching the unloading on. Unload counter starts.	49.11 UNLOADING SPEED

	Stage	What happens	Parameter settings
11.	The counter reaches the set unload time.	Relay output RO3 de-energises switching the unloading off. Drive stops as defined in parameter 21.03 STOP FUNCTION.	49.12 DISCHARGE TIME 21.03 STOP FUNCTION
12.	The Centrifuge comes to standstill.	See step 1.	…

* Acceleration and deceleration ramp shape is defined by parameter 22.06 ACC/DEC RAMP SHPE.

How to start and stop the Centrifuge

The Stop command stops the Centrifuge at any phase of the sequence. The Start command starts the sequence, or continues the sequence after the Stop.

Note: To start the centrifuge after a Fault or power switch-off, a rising edge of the start signal must be received.

From the control panel

- Start: Press the Start key of the panel.
- Stop: Press the Stop key of the panel.

Note: Panel control is possible only when the drive is in local control mode. The "L" on the first row of the panel indicates local control. Press LOC/REM key to shift between local control and external control.

Through the I/O

- Start/Stop: Control the digital input defined as the source for the command. See Parameter 10.01 SP STRT/STP/DIR.

Note: I/O control is possible only when the drive is in external control mode. The "L" on the first row of the panel indicates local control. Press LOC/REM key to shift between local control and external control.

How to reset the Centrifuge sequence

The sequence reset starts the sequence from beginning, and clears all actual signals in group 6.

From the control panel

- Stop the drive.
- Set Parameter 48.01 PATTERN RESET SEL to RESET NOW, and then back to NOT SELECTED.

Through the I/O

- Stop the drive.
- Set the digital input defined as the source for the reset. See Parameter 48.01 PATTERN RESET SEL.

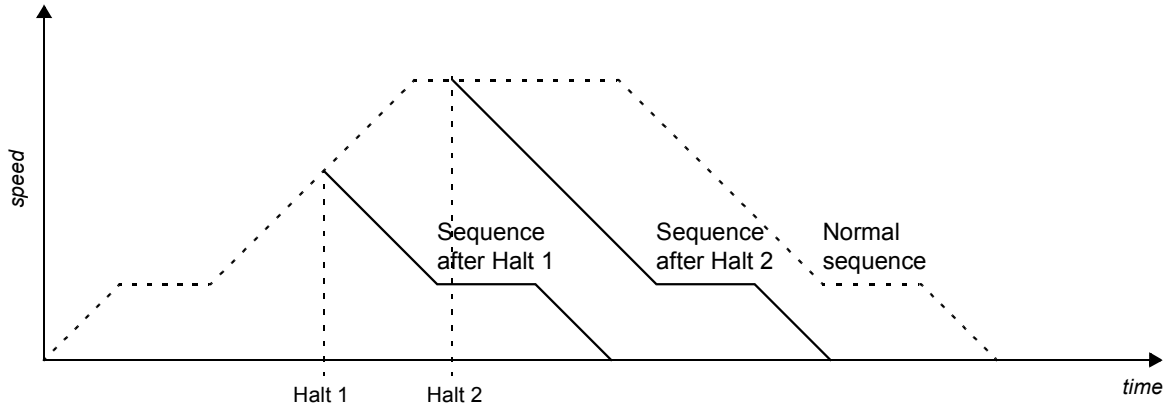
Note: Check that the selected DI is not used for other purposes.

How to halt the Centrifuge

After receiving the Halt, the drive shifts immediately to deceleration, and runs the Centrifuge to standstill along the remaining sequence.

The figure below shows two cases on how the sequence continues after the Halt:

- Halt 1 = Drive receives Halt during acceleration phase
- Halt 2 = Drive receives Halt during spinning phase



Through the I/O

- Set the digital input defined as the source for the Halt. See Parameter 48.02 MANUAL HALT SEL.

The Decanter operation principle

The Decanter control is designed to fulfil the common requirements for two-shaft decanters, where the machinery consists of a bowl and a scroll (screw conveyor).

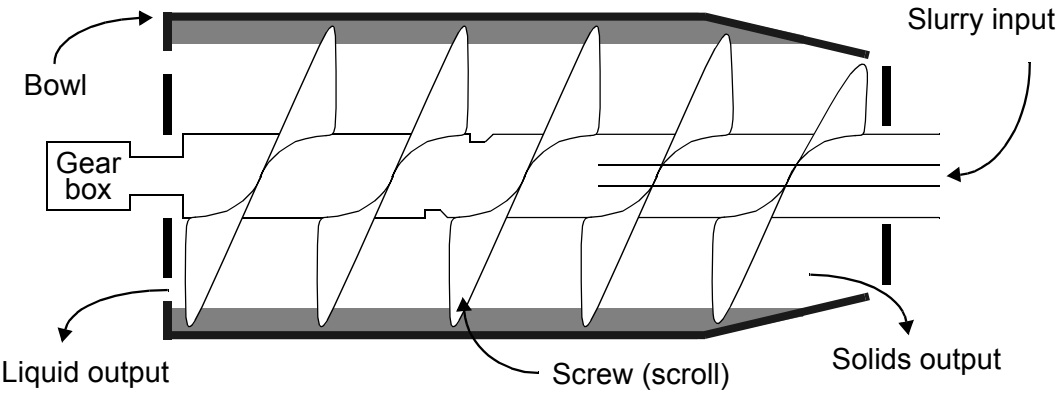


Figure 2. An example of a two-shaft Decanter

A two-shaft Decanter operates on the principle of sedimentation. The slurry (input product) is fed through a fixed central pipe into the distributor located in the scroll,

thereafter the product is accelerated through the spiral gravity separator to the bowl. This means that solid particles heavier than the liquid will settle out. Centrifugal force speeds up the separation process.

The bowl speed is the master speed of separation. The speed difference (delta speed) between the bowl and the scroll influences directly the removal of the solid particles. The delta speed plays a major part in a Decanter.

The master speed (bowl actual speed) is sent from the bowl drive via DDCS (Distributed Drive Communication System) link to the scroll drive. The scroll drive does the necessary scalings based on the given gearbox and belt gear parameters.

The process load compensation function (Torque Window Control) supervises the actual torque of the scroll drive. When necessary the function corrects the delta speed reference. The delta speed reference is subtracted from (or added to) the master speed and used as the speed reference of the follower (scroll).

The main Decanter features

- Accurate speed and torque control without pulse encoder feedback
- Direct communication from the bowl to the scroll drives (DDCS optical link)
- Automatic scaling of process speed based on given gearbox and belt ratio values
- Speed difference control of scroll drive
- Process load compensation to optimise the production
- Jogging function
- Speed difference supervision
- Overload supervision to protect mechanics
- Common DC bus configuration possibility
- Multifunctional reference and control selections through conventional I/Os or fieldbus

Decanter control modes

There are three basic control modes. Local Control, Speed Reference Control and Decanter Control.

Local Control is selected with LOC/REM key on the panel. L is visible on the first row of the panel display.

In Local Control mode there is only standard speed reference available. The motor runs directly with given speed reference and Decanter Control is not active.

Speed Reference Control is active if Local Control and Decanter Control are not active. Speed Reference selection and Start/Stop commands are defined in group 10. Speed Reference Control functions the same way as EXT1 in the Standard Application program. Typically the bowl is in the Speed Reference mode.

Decanter Control is activated if Local Control is not active and the signal selected by parameter 11.01 DECANTER SELECT is on. Typically the scroll is in the Decanter Control mode.

The following scroll drive functions can be activated only when the Decanter Control is on:

- Differential speed function
- Torque window function
- Jogging function

Decanter Control parameters are defined in group 11.

Process load compensation of Decanter

The Torque Window Control of scroll drive enables an efficient way to compensate the process load variations of a Decanter. This means that it is possible to influence the quality of the end product automatically through a differential speed correction.

The operation principle of the load compensation is based on the window control of actual torque. The control will be activated when the actual torque of the scroll drive exceeds the given reference.

Differential speed correction can be adjusted by means of separate integrator, gain and scaling factors of the Torque Window Control, see Figure *3* Decanter Control reference chain of scroll drive and chapter *Parameters*.

A control block diagram for scroll drive of Decanter

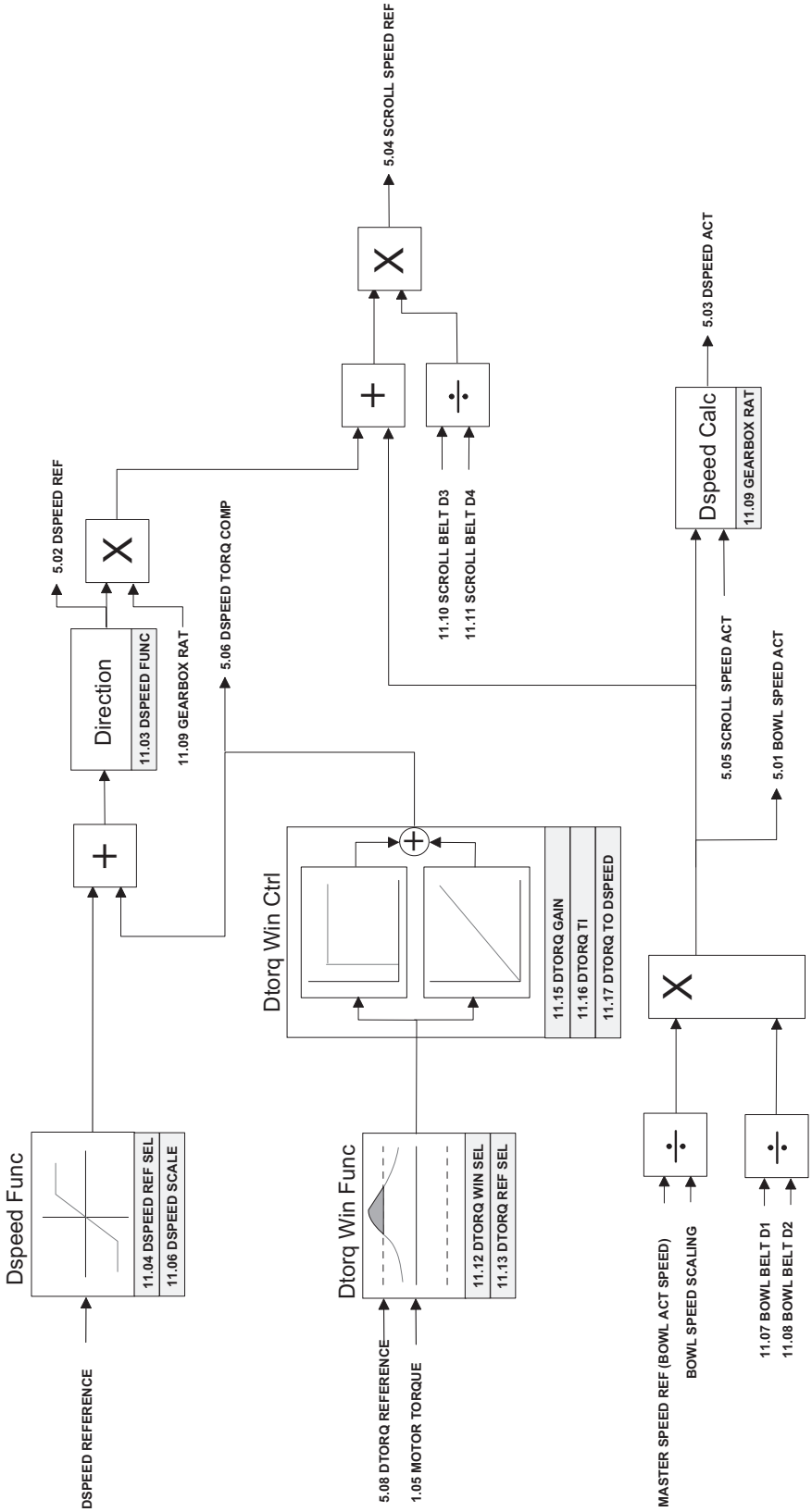


Figure 3. Decanter Control reference chain of scroll drive

Start-up & control connections

Overview

This chapter:

- instructs how to start-up a Centrifuge
- represents the default control connections of a Centrifuge
- represents the default control connections of a Decanter.

Note: For Decanter start-up examples see chapter *Decanter examples*.

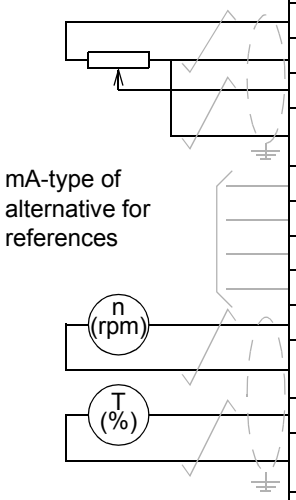
Checklist for a Centrifuge start-up

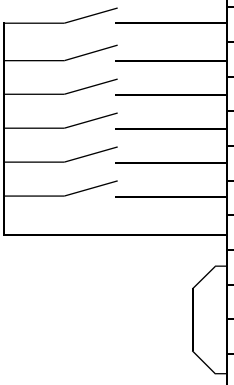
The basic start-up procedure of the ACS 800 is explained in the Firmware Manual. An additional checklist for the Centrifuge start-up is given below:

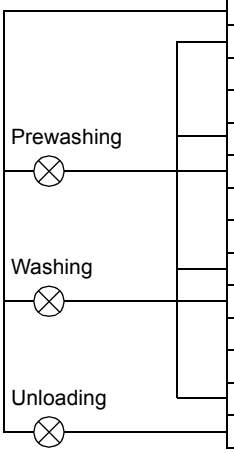
Step	Action
1.	Connect the digital and analogue I/Os according to the wiring diagram shown on sub-section *Centrifuge I/O control connections*.
2.	Perform the basic start-up of a drive, see the Standard Application Program Firmware Manual.
3.	Activate the Centrifuge Application by setting Parameter 10.03 SP REF SELECT to CENTRIF REF. The default relay outputs (Par 06.04 Bits 1, 4 and 7, see *Centrifuge I/O control connections* Terminal blocks X25 to X27) and the default actual values (Stage, elapsed time and remaining time) on the control panel can be activated by setting Parameter 10.06 SET DEFAULT ACT to CENTRIFUGE.
4.	Set the speed limits 20.01 MINIMUM SPEED = 0 rpm and 20.02 MAXIMUM SPEED = max. running speed of the motor.
5.	Set the acceleration and deceleration ramps 49.01 ACC T TO FILL SPEED and 49.10 DEC T UNLOAD SPD and tune the other parameters controlling the Centrifuge sequence in Group 49.
6.	The drive is now ready to run. Perform a test run with the motors still de-coupled from the driven machinery. You can start the drive locally by following the instructions in chapter *Operation of the Centrifuge Control Application program*, sub-section *How to start and stop the Centrifuge*.

Centrifuge I/O control connections

The diagram below shows the default control connections of the Centrifuge on the RMIO board.



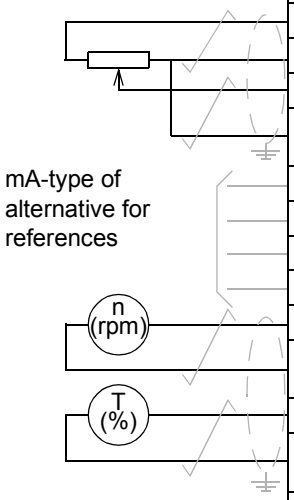




Terminal block X20		
1	VREF	Reference voltage -10 VDC 1 kohm ≤ R_L ≤ 10 kohm
2	GND	
Terminal block X21		
1	VREF	Reference voltage +10 VDC max, 10 mA
2	GND	
3	AI1+	Analogue input 1 Default: Not in use 0...10 V
4	AI1-	
5	AI2+	Analogue input 2 0(4)...20 mA
6	AI2-	
7	AI3+	Analogue input 3 0(4)...20 mA
8	AI3-	
9	AO1+	Analogue output 1 Default: Absolute value of actual speed 0...20 mA
10	AO1-	
11	AO2+	Analogue output 2 Default: Absolute value of actual torque 0...20 mA
12	AO2-	
Terminal block X22		
1	DI1	Start/Stop
2	DI2	Accelerate to spinning
3	DI3	Not used
4	DI4	Manual halt
5	DI5	Not used
6	DI6	Reset pattern
7	+24VDC	+24 VDC max. 100 mA
8	+24VDC	
9	DGND1	Digital ground
10	DGND2	Digital ground
11	DI IL	Start interlock (0 = stop)
Terminal block X23		
1	+24VDC	Auxiliary voltage output +24VDC, 250 mA
2	GND	
Terminal block X25		
1	RO11	Relay output 1
2	RO12	
3	RO13	Prewashing
Terminal block X26		
1	RO21	Relay output 2
2	RO22	
3	RO23	Washing
Terminal block X27		
1	RO31	Relay output 3
2	RO32	
3	RO33	Unloading

Decanter I/O control connections

The following connection diagram shows the default I/O connections on the RMIO board for the bowl and the scroll in a Decanter.



Terminal block X20		
1	VREF	Reference voltage -10 VDC 1 kohm ≤ R_L ≤ 10 kohm
2	GND	
Terminal block X21		
1	VREF	Reference voltage +10 VDC max, 10 mA
2	GND	
3	AI1+	Analogue input 1 Speed reference (bowl)/ Not in use (scroll) *) 0...10 V
4	AI1-	
5	AI2+	Analogue input 2 0(4)...20 mA
6	AI2-	
7	AI3+	Analogue input 3 0(4)...20 mA
8	AI3-	
9	AO1+	Analogue output 1 Actual motor speed (Actual delta speed) 0...20 mA <-> 0... Motor nominal speed
10	AO1-	
11	AO2+	Analogue output 2 Actual motor torque 0...20 mA <-> 0... Motor nominal torque
12	AO2-	
Terminal block X22		
1	DI1	Start/Stop
2	DI2	
3	DI3	
4	DI4	
5	DI5	
6	DI6	
7	+24VDC	+24 VDC max. 100 mA
8	+24VDC	
9	DGND1	Digital ground
10	DGND2	Digital ground
11	DI IL	Start interlock (0 = stop)
Terminal block X23		
1	+24VDC	Auxiliary voltage output +24VDC, 250 mA
2	GND	
Terminal block X25		
1	RO11	Relay output 1
2	RO12	
3	RO13	Ready (no fault)
Terminal block X26		
1	RO21	Relay output 2
2	RO22	
3	RO23	Running
Terminal block X27		
1	RO31	Relay output 3
2	RO32	
3	RO33	Fault (-1)

*) The scroll drive calculates its speed reference from the delta speed reference and the bowl actual speed. By default the delta speed is given by a parameter 11.05, and the bowl actual speed is received via the serial link from the bowl drive.

Optical link for Decanter

To realise the internal drives communication (DDCS) there must be an optical link connection between the bowl drive and the scroll drive. Channel 2 of both drives must be connected together with a pair of fibre optic cable (2 m to 10 m). Please note that channels CH0/CH1/CH2/CH3 are located on the optional RDCO-0x board.

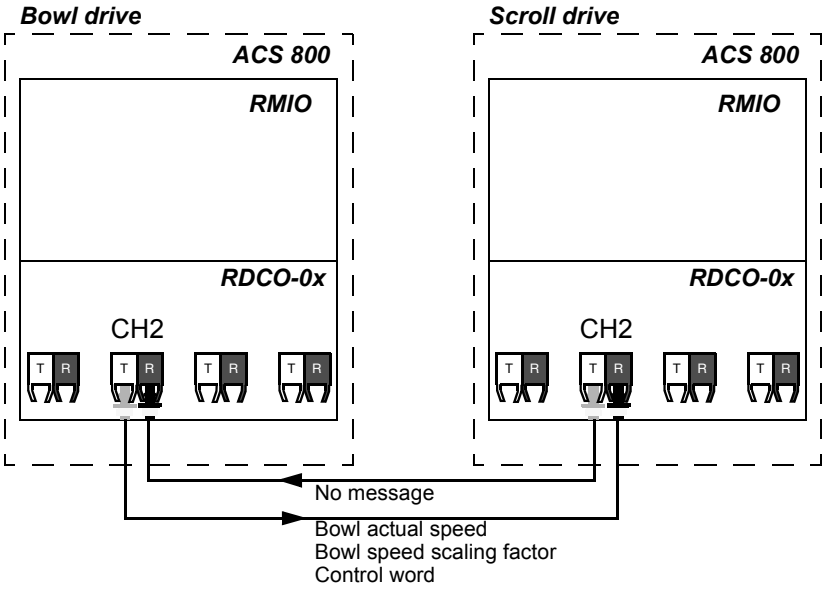


Figure 4. Optical link connection (T = Transmitter, R = Receiver)

Decanter fieldbus control

Fieldbus References:

	Speed Reference Control	Decanter Control
Ref 1	Speed reference	Delta speed reference
Ref 2	Not used	Torque window limit

Fieldbus Control Word:

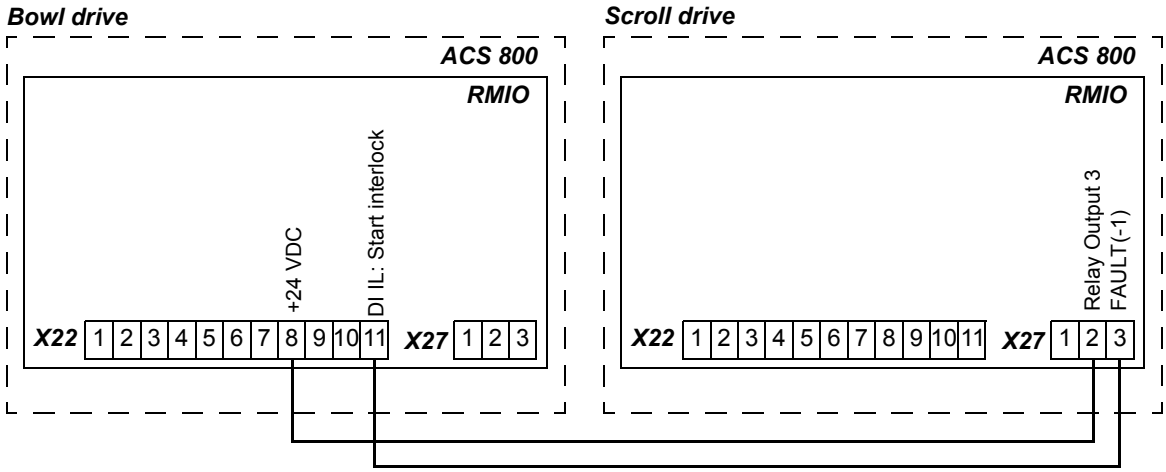
	Speed Reference Control	Decanter Control
Bit 0	Start (OFF 1)	Start (OFF 1)
Bit 1	Ready (OFF 2)	Ready (OFF 2)
Bit 2	Ready (OFF 3)	Ready (OFF 3)
Bit 3	Start, if bits 0...2 are ON	Start, if bits 0...2 are ON
Bit 4	Ramp in zero	Ramp in zero
Bit 5	Ramp out zero	Ramp out zero
Bit 6	Ramp hold	Ramp hold
Bit 7	Fault reset	Fault reset
Bit 8	Not used	Not used
Bit 9	Not used	Not used
Bit 10	Fieldbus remote command	Fieldbus remote command
Bit 11	Not used	Torque Window Enable
Bit 12	Not used	Decanter Control Enable
Bit 13	Not used	Clean-up Enable
Bit 14	Not used	Jogging Enable
Bit 15	Not used	Not used

Decanter scroll fault supervision

CAUTION! The scroll drive does not send any feedback data to the bowl drive via the serial DDCS link. Therefore it is highly recommended to separately wire the fault information of the scroll to the bowl, or to an overriding control system.

Decanter connection example

The connection below will stop both the bowl drive and the scroll drive upon a scroll fault.



Parameters

Overview

This chapter explains the function of, and valid selections for, each parameter compared differing from Standard Application program.

Terms and abbreviations

Term	Definition
FbEq	Fieldbus equivalent shows how the value on control panel is converted to an integer value when communicated over a serial communication link (fieldbus interface).
Def	Default value
Type	Data type
B	Data type boolean
I	Data type integer
R	Data type real

Parameter differences

The following table summarises the parameter differences between the Standard Application program and the Centrifuge Control Application program.

Parameter / Parameter group	In Standard Application	In Centrifuge Control Application
Group 5	not existing	DECANTER ACT VAL see below in this manual
Group 6	not existing	CENTRIFUGE ACT see below in this manual
Group 10	START/STOP/DIR see Firmware manual	SPEEDREF CONTROL see below in this manual
Group 11	REFERENCE SELECT see Firmware manual	DECANTER CONTROL see below in this manual
12.17 CONST DSPEED SEL	not existing	(1) NOT SEL
		(2) DI1(DSPEED1)
		(3) DI2(DSPEED2)
		(4) DI3(DSPEED3)
		(5) DI4(DSPEED1)
		(6) DI5(DSPEED2)
		(7) DI6(DSPEED3)
		(8) DI1,2; (9) DI3,4
		(10) DI5,6; (11) DI7,8
		(12) DI9,10; (13) DI11,12
12.18 CONST DSPEED 1	not existing	0.0 - 1500.0 rpm

Parameter / Parameter group	In Standard Application	In Centrifuge Control Application
12.19 CONST DSPEED 2	not existing	0.0 - 1500.0 rpm
12.20 CONST DSPEED 3	not existing	0.0 - 1500.0 rpm
15.01 ANALOGUE OUTPUT1	(10) APPL OUTPUT	(10) DSPEED ACT
	(12) CONTROL DEV	(12) DSPEED TCOMP
	(13) ACTUAL 1	(13) SCROLL SPEED
	(14) ACTUAL 2	(14) BOWL SPEED
15.06 ANALOGUE OUTPUT2	(10) APPL OUTPUT	(10) DSPEED ACT
	(12) CONTROL DEV	(12) DSPEED TCOMP
	(13) ACTUAL 1	(13) SCROLL SPEED
	(14) ACTUAL 2	(14) BOWL SPEED
16.01 RUN ENABLE	(15) PARAM 16.08	(15) START INTRLCK
Group 17	not existing	JOGGING FUNCTION see below in this manual
21.09 START INTRL FUNC	(1) OFF2 STOP; (2) OFF3 STOP	not existing
Group 24	TORQUE CTRL see Firmware manual	not existing
Group 40	PID CONTROL see Firmware manual	not existing
Group 48	not existing	CENTRIFUGE CTRL see below in this manual
Group 49	not existing	CENTRIF PATTERN see below in this manual
Group 60	MASTER/FOLLOWER see Firmware manual	not existing
98.09 DI/O EXT1 DI FUNC	(2) REPL DI1,2; (4) REPL DI1,2,3	not existing [1)]
98.10 DI/O EXT2 DI FUNC	(2) REPL DI3,4; (4) REPL DI4,5,6	not existing [2)]
98.11 DI/O EXT3 DI FUNC	(2) REPL DI5,6	not existing [3)]
99.02 APPLICATION MACRO	(2) HAND/AUTO	not existing
	(3) PID CTRL	not existing
	(4) T CTRL	not existing
	(5) SEQ CTRL	not existing
	(6) USER 1 LOAD	(2) USER 1 LOAD
	(7) USER 1 SAVE	(3) USER 1 SAVE
	(8) USER 2 LOAD	(4) USER 2 LOAD
	(9) USER 2 SAVE	(5) USER 2 SAVE

[1)] Note DI1 and DI2 of module 1 are DI7 and DI8 in the application program
[2)] Note DI1 and DI2 of module 2 are DI9 and DI10 in the application program
[3)] Note DI1 and DI2 of module 3 are DI11 and DI12 in the application program

Default parameter value differences

The table below shows the default parameter values different from the Standard Application Program default values.

Parameter	Standard Application	Centrifuge Control Application
10.01 EXT1 STRT/STP/DIR 10.01 SP STRT/STP/DIR	(3) DI1,2	(2) DI1
12.01 CONST SPEED SEL	(10) DI5,6	(1) NOT SEL
15.06 ANALOGUE OUTPUT2	(5) CURRENT	(6) TORQUE
16.01 RUN ENABLE	(1) YES	(15) START INTRLCK
22.01 ACC/DEC SEL	(6) DI4	(1) ACC / DEC 1
99.02 APPLICATION MACRO	(1) FACTORY	(1) DECANTER

Group 5 Decanter actual values

Index	Name/Selection	Description	(FbEq)/Def/Type
05	DECANTER ACT VAL	Decanter actual values	
05.01	BOWL SPEED ACT	Bowl actual speed that has been sent to scroll	R
	-18000 ... 18000 rpm	Value range	(-180000 ... 180000)
05.02	DSPEED REF	Differential (delta) speed reference	R
	-1500 ... 1500 rpm	Value range	(-15000 ... 15000)
05.03	DSPEED ACT	Differential (delta) speed actual	R
	-1500 ... 1500 rpm	Value range	(-15000 ... 15000)
05.04	SCROLL SPEED REF	Scroll speed reference	R
	-18000 ... 18000 rpm	Value range	(-180000 ... 180000)
05.05	SCROLL SPEED ACT	Scroll speed actual	R
	-18000 ... 18000 rpm	Value range	(-180000 ... 180000)
05.06	DSPEED TORQ COMP	Torque window correction function to speed reference	R
	-1500 ... 1500 rpm	Value range	(-150000 ... 150000)
05.07	DECANTER STATUSW.	Decanter status word. Bit presentation of scroll status information.	I
	Bit 0	1 = Speed over limit of parameter 32.02	
	Bit 1	1 = Torque over limit of parameter 32.08	
	Bit 2	1 = Torque over limit of parameter 32.10	
	Bit 3	1 = Delta speed reference in limit (see par. 11.06)	
	Bit 4	1 = Jogging function is active.	
	Bit 5	1 = Clean-up function and DC Undervoltage controller are active.	
	Bit 6	1 = DDCS communication from bowl (CH2) to scroll (CH2) is broken.	
	Bit 7	1 = 90% of final speed reference reached	
05.08	DTORQ REF	Window Control torque limit reference	R

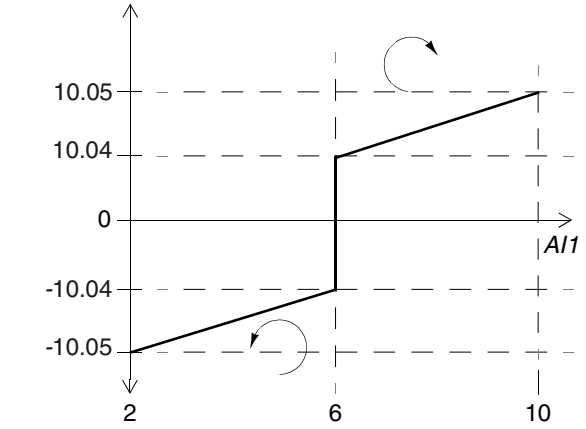
Index	Name/Selection	Description	(FbEq)/Def/Type
	0 ... 100 %	Value of the source defined in parameter 11.13	(0 ... 1000)

Group 6 Centrifuge actual values

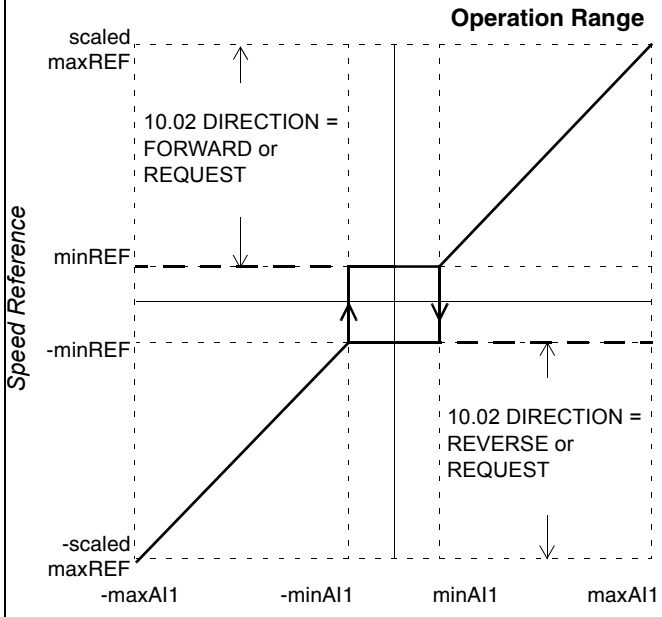
Index	Name/Selection	Description	(FbEq)/Def/Type
06	CENTRIFUGE ACT	Measured and calculated values	I
06.01	STAGE	Actual stage of the centrifuge sequence	
	STOPPED	Drive is not running.	(1)
	ACC FILLING	Drive is accelerating to the filling speed.	(2)
	PREWASHING	The selection is activated by a digital output specified in group 14 DIGITAL OUTPUTS.	(3)
	FILLING	Drive is at speed 49.02 FILLING SPEED	(4)
	ACC SPINNING	Drive is accelerating to spinning speed	(5)
	WASHING	Drive has exceeded speed 49.06 WASH SPEED and washing is started by the means of digital output specified in group 14 DIGITAL OUTPUTS.	(6)
	SPINNING	Drive is at maximum speed 49.08 SPIN SPEED.	(7)
	DEC UNLOADING	Drive is decelerating to speed 49.11 UNLOADING SPEED.	(8)
	DISCHARGING	Drive is at speed 49.11 and the centrifuge is discharged by the means of digital output specified in group 14 DIGITAL OUTPUTS.	(9)
06.02	ELAPSED TIME	Completed sequence time since the start command	R
	0 ... 30110 s	Value range	(0 ... 30110)
06.03	REMAINING TIME	Calculated value based on machine parameters, section times and speed values set for Speed Time Pattern 3	R
	0 ... 30110 s	Value range	(0 ... 30110)
06.04	CENTRIFUGE SW	Status bit signals of the centrifuge, 100 ms update intervals	
	Bit 0 ACC FILLING SPEED	1 = Accelerating to filling speed 49.02	
	Bit 1 PREWASHING	1 = Sequence is at pre-washing stage.	
	Bit 2 FILLING	1 = Sequence is at filling stage.	
	Bit 3 ACC TO SPIN SPEED	1 = Accelerating to spinning speed 49.08	
	Bit 4 WASHING	1 = Sequence is at washing stage i.e. speed > 49.06.	
	Bit 5 SPINNING	1 = Sequence is at spinning stage.	
	Bit 6 DEC UNLOADING	1 = Decelerating to unloading speed 49.11	
	Bit 7 UNLOADING	1 = Sequence is at unloading speed.	
	Bit 8 MAN HALT ON	1 = Manual halt is active.	
	Bits 9 ... 15	Not in use	

Group 10 Speed reference control

<table>
<tr><th>Index</th><th>Name/Selection</th><th>Description</th><th>(FbEq)/Def/Type</th></tr>
<tr><td>10</td><td>SPEEDREF CONTROL</td><td></td><td></td></tr>
<tr><td>10.01</td><td>SP STRT/STP/DIR</td><td>Selects the Speed Reference Control Start/Stop and Direction.</td><td>I</td></tr>
<tr><td></td><td>NOT SEL</td><td>No start, stop and direction command source</td><td>(1)</td></tr>
<tr><td></td><td>DI1</td><td>Start and stop through digital input DI1. 0 = stop; 1 = start. Direction is fixed according to parameter 10.02 SP DIRECTION.
  WARNING! After a fault reset, the drive will start if the start signal is on.</td><td>(2) Def</td></tr>
<tr><td></td><td>DI1,2</td><td>Start and stop through digital input DI1. 0 = stop, 1 = start. Direction through digital input DI2. 0 = forward, 1 = reverse. To control direction, parameter 10.02 SP DIRECTION must be REQUEST.
  WARNING! After a fault reset, the drive will start if the start signal is on.</td><td>(3)</td></tr>
<tr><td></td><td>DI1P,2P</td><td>Pulse start through digital input DI1. 0 -> 1: Start. Pulse stop through digital input DI2. 1 -> 0: Stop. Direction of rotation is fixed according to parameter 10.02 SP DIRECTION.</td><td>(4)</td></tr>
<tr><td></td><td>DI1P,2P,3</td><td>Pulse start through digital input DI1. 0 -> 1: Start. Pulse stop through digital input DI2. 1 -> 0: Stop. Direction through digital input DI3. 0 = forward, 1 = reverse. To control direction, parameter 10.02 SP DIRECTION must be REQUEST.</td><td>(5)</td></tr>
<tr><td></td><td>DI1P,2P,3P</td><td>Pulse start forward through digital input DI1. 0 -> 1: Start forward. Pulse start reverse through digital input DI2. 0 -> 1: Start reverse. Pulse stop through digital input DI3. 1 -> ”0”: stop. To control the direction, parameter 10.02 SP DIRECTION must be REQUEST.</td><td>(6)</td></tr>
<tr><td></td><td>DI6</td><td>See selection DI1.</td><td>(7)</td></tr>
<tr><td></td><td>DI6,5</td><td>See selection DI1,2. DI6: Start/stop, DI5: direction.</td><td>(8)</td></tr>
<tr><td></td><td>KEYPAD</td><td>Control panel. To control the direction, parameter 10.02 SP DIRECTION must be REQUEST.</td><td>(9)</td></tr>
<tr><td></td><td>COMM.CW</td><td>Fieldbus Control Word.</td><td>(10)</td></tr>
<tr><td></td><td>DI7</td><td>See selection DI1.</td><td>(11)</td></tr>
<tr><td></td><td>DI7,8</td><td>See selection DI1,2.</td><td>(12)</td></tr>
<tr><td></td><td>DI7P,8P</td><td>See selection DI1P,2P.</td><td>(13)</td></tr>
<tr><td></td><td>DI7P,8P,9</td><td>See selection DI1P,2P,3.</td><td>(14)</td></tr>
<tr><td></td><td>DI7P,8P,9P</td><td>See selection DI1P,2P,3P.</td><td>(15)</td></tr>
<tr><td></td><td>RESERVED</td><td>Reserved for later use</td><td>(16)</td></tr>
<tr><td></td><td>DI1F, DI2R</td><td>Start, stop and direction commands through digital inputs DI1 and DI2.
<table><tr><th>DI1</th><th>DI2</th><th>Operation</th></tr><tr><td>0</td><td>0</td><td>Stop</td></tr><tr><td>1</td><td>0</td><td>Start forward</td></tr><tr><td>0</td><td>1</td><td>Start reverse</td></tr><tr><td>1</td><td>1</td><td>Stop</td></tr></table>
Note: Parameter 10.03 DIRECTION must be REQUEST.</td><td>(17)</td></tr>
</table>

Index	Name/Selection	Description	(FbEq)/Def/Type
10.02	SP DIRECTION	Selects the speed reference direction.	I
	FORWARD	Fixed to forward	(1) Def
	REVERSE	Fixed to reverse	(2)
	REQUEST	Direction of rotation control allowed	(3)
10.03	SP REF SELECT	Selects the speed reference.	I
	KEYPAD	Control panel. The first line on the display shows the reference value.	(1)
	AI1	Analogue input AI1. **Note:** If the signal is bipolar (±10 VDC), use the selection AI1 BIPOLAR. (The selection AI1 ignores the negative signal range.)	(2) Def
	AI2	Analogue input AI2.	(3)
	AI3	Analogue input AI3.	(4)
	AI1/JOYST	Unipolar analogue input AI1 as joystick. The minimum input signal runs the motor at the maximum reference in the reverse direction, the maximum input at the maximum reference in the forward direction. **Note:** Parameter 10.02 must have the value REQUEST. **WARNING!** Minimum reference for joystick must be higher than 0.5 V. Set parameter 13.01 to 2 V or to a value higher than 0.5 V and analogue signal loss detection parameter 30.01 to FAULT. The drive will stop in case the control signal is lost. *Speed Reference (REF1)*  Par. 13.01 = 2 V, Par 13.02 = 10 V **Note:** If the signal is bipolar (±10 VDC), use the selection AI1 BIPOLAR. The selection AI1/JOYST ignores the negative signal range.	(5)
	AI2/JOYST	See AI1/JOYST.	(6)
	AI1+AI3	Summation of analogue input AI1 and AI3	(7)
	AI2+AI3	Summation of analogue input AI2 and AI3	(8)
	AI1-AI3	Subtraction of analogue input AI1 and AI3	(9)
	AI2-AI3	Subtraction of analogue input AI2 and AI3	(10)
	AI1*AI3	Multiplication of analogue input AI1 and AI3	(11)
	AI2*AI3	Multiplication of analogue input AI2 and AI3	(12)
	MIN(AI1,AI3)	Minimum of analogue input AI1 and AI3	(13)

Index	Name/Selection	Description	(FbEq)/Def/Type
	MIN(AI2,AI3)	Minimum of analogue input AI2 and AI3	(14)
	MAX(AI1,AI3)	Maximum of analogue input AI1 and AI3	(15)
	MAX(AI2,AI3)	Maximum of analogue input AI2 and AI3	(16)
	DI3U,4D(R)	Digital input 3: Reference increase. Digital input DI4: Reference decrease. Stop command or power switch off resets the reference to zero. Parameter 22.04 defines the rate of the reference change.	(17)
	DI3U,4D	Digital input 3: Reference increase. Digital input DI4: Reference decrease. The program stores the active speed reference (not reset by a stop command or power switch-off). Parameter 22.04 defines the rate of the reference change.	(18)
	DI5U,6D	See DI3U,4D(R).	(19)
	COMM. REF	Fieldbus reference REF1	(20)
	COM.REF1+AI1	Summation of fieldbus reference REF1 and analogue input AI1	(21)
	COM.REF1×AI1	Multiplication of fieldbus reference REF1 and analogue input AI1	(22)
	FAST COMM	As with the selection COMM. REF, except the following differences: - shorter communication cycle time when transferring the reference to the core motor control program (6 ms -> 2 ms) - the direction cannot be controlled through interface defined by parameter 10.01 or with the control panel. - parameter group 25 CRITICAL SPEEDS is not effective **Note:** If parameter 99.04 is SCALAR, the selection is not effective. Instead, the operation is according to COMM. REF.	(23)
	COM.REF1+AI5	See selection COM.REF1+AI1 (AI5 used instead of AI1).	(24)
	COM.REF1×AI5	See selection COM.REF1*AI1 (AI5 used instead of AI1).	(25)
	AI5	Analogue input AI5	(26)
	AI6	Analogue input AI6	(27)
	AI5/JOYST	See AI1/JOYST.	(28)
	AI6/JOYST	See AI1/JOYST.	(29)
	AI5+AI6	Summation of analogue input AI5 and AI6	(30)
	AI5-AI6	Subtraction of analogue input AI5 and AI6	(31)
	AI5*AI6	Multiplication of analogue input AI5 and AI6	(32)
	MIN(AI5,AI6)	Lower of analogue input AI5 and AI6	(33)
	MAX(AI5,AI6)	Higher of analogue input AI5 and AI6	(34)
	DI11U,12D(R)	See DI3U,4D(R).	(35)
	DI11U,12D	See DI3U,4D.	(36)

<table>
<tr><th>Index</th><th>Name/Selection</th><th>Description</th><th>(FbEq)/Def/Type</th></tr>
<tr><td></td><td>AI1 BIPOLAR</td><td>Bipolar analogue input AI1 (-10 … 10 V). The figure below illustrates the use of the input as the speed reference.
 

minAI1 = 13.01 MINIMUM AI1
maxAI1 = 13.02 MAXIMUM Ai1
scaled maxREF = 13.03 SCALE AI1 x 10.05 SP REF MAXIMUM
minREF = 10.04 SP REF MINIMUM</td><td>(37)</td></tr>
<tr><td></td><td>CENTRIF REF</td><td>Activates centrifuge control.</td><td>(38)</td></tr>
<tr><td>10.04</td><td>SP REF MINIMUM</td><td>Sets the minimum speed reference in rpm.</td><td>0 Def/R</td></tr>
<tr><td></td><td>0 ... 18000 rpm</td><td>Setting range</td><td>(0 ... 18000)</td></tr>
<tr><td>10.05</td><td>SP REF MAXIMUM</td><td>Sets the maximum speed reference in rpm.</td><td>1500 Def/R</td></tr>
<tr><td></td><td>0 ... 18000 rpm</td><td>Setting range</td><td>(0 ... 18000)</td></tr>
<tr><td>10.06</td><td>SET DEFAULT ACT</td><td>Selects Centrifuge or Decanter specific RMIO relays and actual values to be shown on the control panel.</td><td>I</td></tr>
<tr><td></td><td>DEFAULT</td><td>Default actual values.</td><td>(1) Def</td></tr>
<tr><td></td><td>DECANTER</td><td>Sets the RMIO relays for Decanter use and selects the actual values to show on the control panel.
<table>
<tr><td>Actual values</td><td>05.01 BOWL SPEED ACT</td></tr>
<tr><td></td><td>05.02 DSPEED REF</td></tr>
<tr><td></td><td>05.03 DSPEED ACT</td></tr>
<tr><td>Relay outputs</td><td>Relay output 1, Ready</td></tr>
<tr><td></td><td>Relay output 2, Running</td></tr>
<tr><td></td><td>Relay output 3, Fault (-1)</td></tr>
</table></td><td>(2)</td></tr>
</table>

Index	Name/Selection	Description	(FbEq)/Def/Type
	CENTRIFUGE	Sets the RMIO relays for Centrifuge use and selects the actual values to show on the control panel. Actual values: 06.01 STAGE 06.02 ELAPSED TIME 06.03 REMAINING TIME Relay outputs: Relay output 1, Prewashing Relay output 2, Washing Relay output 3, Unloading	(3)

Group 11 Decanter control

Index	Name/Selection	Description	(FbEq)/Def/Type
11	DECANTER CONTROL		
11.01	DECANTER SELECT	Defines the signal that activates Decanter control in the scroll drive.	I
	NOT SEL	Not selected	(1) Def
	YES	Decanter control active	(2)
	DI1	Digital input 1. 0 = Decanter control is inactive. 1 = Decanter control is active.	(3)
	DI2	See DI1.	(4)
	DI3	See DI1.	(5)
	DI4	See DI1.	(6)
	DI5	See DI1.	(7)
	DI6	See DI1.	(8)
	COMM.CW	Fieldbus Control Word, bit 12. 0 = Decanter control is inactive. 1 = Decanter control is active.	(9)
	DI7	See DI1.	(10)
	DI8	See DI1.	(11)
	DI9	See DI1.	(12)
	DI10	See DI1.	(13)
	DI11	See DI1.	(14)
	DI12	See DI1.	(15)
11.02	DSPEED START/STOP	Selects the Decanter Control Start/Stop.	I
	NOT SEL	Not selected	(1)
	DI1	Digital input 1. 0 = Stop Decanter. 1 = Start Decanter.	(2) Def
	DI2	See DI1.	(3)
	DI3	See DI1.	(4)
	DI4	See DI1.	(5)
	DI5	See DI1.	(6)
	DI6	See DI1.	(7)
	KEYPAD	Start and stop with the control panel	(8)
	COMM.CW	Fieldbus Control Word, bit 3. 0 = Stop Decanter. 1 = Start Decanter.	(9)
	BOWL DRIVE	Setting in scroll: The scroll reads the Start/Stop from the control word received from the bowl.	(10)
	DI7	See DI1.	(11)
	DI8	See DI1.	(12)
	DI9	See DI1.	(13)

Index	Name/Selection	Description	(FbEq)/Def/Type
	DI10	See DI1.	(14)
	DI11	See DI1.	(15)
	DI12	See DI1.	(16)
11.03	DSPEED FUNCTION	Selects the differential speed direction (effective only in the scroll drive)	I
	FORW. DRIVE	(scroll speed > bowl speed)	(1)
	BACK DRIVE	(scroll speed < bowl speed)	(2) Def
11.04	DSPEED REF SELECT	Selects the differential speed reference (delta speed) of Decanter Control.	I
	AI1	Analogue input AI1. **Note:** The Analogue input selections ignore the negative signal range.	(1)
	AI2	Analogue input AI2.	(2)
	AI3	Analogue input AI3.	(3)
	AI5	Analogue input AI5.	(4)
	AI6	Analogue input AI6.	(5)
	COMM.REF1	Fieldbus Reference Ref1.	(6)
	KEYPAD	The differential speed reference is set from the control panel.	(7)
	PAR. 11.05	Value of parameter 11.05	(8) Def
	DI3U,4D(R)	Digital input 3: Reference increase. Digital input DI4: Reference decrease. Stop command or power switch off resets the reference to zero. Parameter 22.04 defines the rate of the reference change.	(9)
	DI3U,4D	Digital input 3: Reference increase. Digital input DI4: Reference decrease. The program stores the active speed reference (not reset by a stop command or power switch-off). Parameter 22.04 defines the rate of the reference change.	(10)
	DI5U,6D	See DI3U,4D.	(11)
	DI11U,12D(R)	See DI3U,4D(R).	(12)
	DI11U,12D	See DI3U,4D.	(13)
11.05	DSPEED REF PAR	Defines delta speed if parameter 11.04 = PAR. 11.05	0 Def/R
	0 ... 1500 rpm	Setting range	(0 ... 15000)
11.06	DSPEED REF SCALE	Maximum Delta speed in rpm, a scaling and limiting function	0 Def/R
	0 ... 1500 rpm	Setting range	(0 ... 15000)
11.07	BOWL BELT D1	Mechanical drive factor of bowl motor belt roller D1	1 Def/R
	-1000 ... 1000	Setting range	(-1000 ... 1000)
11.08	BOWL BELT D2	Mechanical drive factor of bowl belt roller D2	1 Def/R
	-1000 ... 1000	Setting range	(-1000 ... 1000)
11.09	GEARBOX RATIO	Gearbox ratio of decanter	0 Def/R
	-1000 ... 1000	Setting range	(-1000 ... 1000)
11.10	SCROLL BELT D3	Mechanical drive factor of scroll belt roller D3	1 Def/R
	-1000 ... 1000	Setting range	(-1000 ... 1000)
11.11	SCROLL BELT D4	Mechanical drive factor of scroll motor belt roller D4	1 Def/R
	-1000 ... 1000	Setting range	(-1000 ... 1000)
11.12	DTORQ WIN SELECT	Activates the Torque Window Control, load compensation function.	I
	NOT SEL	Not selected	(1) Def

Index	Name/Selection	Description	(FbEq)/Def/Type
	YES	Torque Window Control activated	(2)
	DI1	Digital input 1. 0 = Torque Window Control is inactive. 1 = Torque Window Control is active.	(3)
	DI2	See DI1.	(4)
	DI3	See DI1.	(5)
	DI4	See DI1.	(6)
	DI5	See DI1.	(7)
	DI6	See DI1.	(8)
	COMM.CW	Fieldbus Control Word bit 11. 0 = Torque Window Control is inactive. 1 = Torque Window Control is active.	(9)
	DI7	See DI1.	(10)
	DI8	See DI1.	(11)
	DI9	See DI1.	(12)
	DI10	See DI1.	(13)
	DI11	See DI1.	(14)
	DI12	See DI1.	(15)
11.13	DTORQ REF SELECT	Defines the limit source for the Torque Window Control.	I
	AI1	Analogue input 1	(1)
	AI2	Analogue input 2	(2)
	AI3	Analogue input 3	(3)
	AI5	Analogue input 5	(4)
	AI6	Analogue input 6	(5)
	COMM.REF2	Fieldbus Reference Ref2	(6)
	PAR. 11.14	Value of parameter 11.14	(7) Def
11.14	DTORQ REF PAR	Defines the limit for the Torque Window Control.	0 Def/R
	0 ... 300 %	Setting range	(0 ... 3000)
11.15	DTORQ GAIN	Defines the Torque Window Control proportional gain.	0 Def/R
	0 ... 100	Setting range	(0 ... 100)
11.16	DTORQ TI	Defines the Torque Window Control integration time.	1 Def/R
	0.01 ... 300 s	Setting range	(1 ... 30000)
11.17	DTORQ TO DSPEED	Defines the Torque Window Control output to delta speed reference scaling.	0 Def/R
	0 ... 1500 rpm	Setting range	(1 ... 1500)
11.18	DECANTER MODE SEL	Selects the decanter mode and activation of internal DDCS-communication.	I
	NOT SEL	Not selected	(1) Def
	BOWL	The drive operates as a bowl drive. If parameter 11.19 SCROLL REF SEL is set to DDCS, the drive is a master in the optical ring connected to CH2.	(2)
	SCROLL	The drive operates as a scroll drive. If parameter 11.19 SCROLL REF SEL is set to DDCS, the drive is a slave in the optical ring connected to CH2.	(3)
11.19	SCROLL REF SEL	Selects the input of actual bowl motor speed in scroll drive. The speed will be used in scroll drive as Decanter Control's master speed reference.	I
	DDCS	The actual bowl motor speed will be read from the DDCS link, CH2.	(1) Def

Index	Name/Selection	Description	(FbEq)/Def/Type
	AI1	The actual bowl motor speed will be read from the analogue input, AI1. See also parameter 11.20 BOWL MOTOR RPM.	(2)
	AI2	The actual bowl motor speed will be read from the analogue input, AI2. See also parameter 11.20 BOWL MOTOR RPM.	(3)
11.20	BOWL MOTOR RPM	Scaling of external actual bowl motor speed. Maximum AI1 or AI2 value in rpm.	1500 Def/R
	- 18000 ... 18000 rpm	Setting range	(-18000 ... 18000)
11.21	CLEAN-UP SELECT	Selects the Clean-up function activation. The function delays the Stop command with 200 ms. The scroll drive remains running if the DC Undervoltage controller of the bowl drive is active even if the Start command would not be active any more.	I
	NOT SEL	Not selected	(1) Def
	YES	Clean-up function is active	(2)
	DI1	Digital input 1. 0 = Clean-up function is inactive. 1 = Clean-up function is active.	(3)
	DI2	See DI1.	(4)
	DI3	See DI1.	(5)
	DI4	See DI1.	(6)
	DI5	See DI1.	(7)
	DI6	See DI1.	(8)
	COMM.CW	Fieldbus Control Word, bit 13. 0 = Clean-up function is inactive. 1 = Clean-up function is active.	(9)
	DI7	See DI1.	(10)
	DI8	See DI1.	(11)
	DI9	See DI1.	(12)
	DI10	See DI1.	(13)
	DI11	See DI1.	(14)
	DI12	See DI1.	(15)

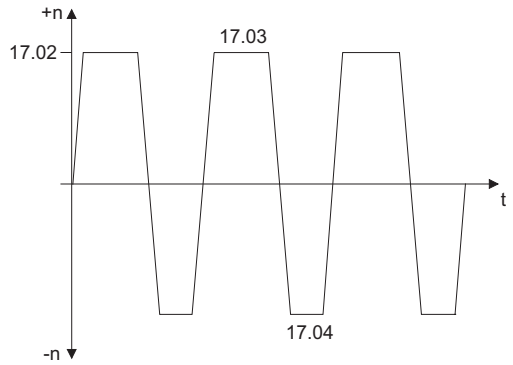
Group 12 Constant speeds

Index	Name/Selection	Description	(FbEq)/Def/Type
12	CONSTANT SPEEDS	Constant speed selection and values. An active constant speed overrides the drive speed reference.	
12.17	CONST DSPEED SEL	Activates the constant delta speed or selects the activation signal.	I
	NOT SEL	No constant delta speed in use.	(1) Def
	DI1(DSPEED1)	Delta speed defined by parameter 12.18 is activated through digital input DI1. 1 = active, 0 = inactive.	(2)
	DI2(DSPEED2)	Delta speed defined by parameter 12.19 is activated through digital input DI2. 1 = active, 0 = inactive.	(3)
	DI3(DSPEED3)	Delta speed defined by parameter 12.20 is activated through digital input DI3. 1 = active, 0 = inactive.	(4)
	DI4(DSPEED1)	Delta speed defined by parameter 12.18 is activated through digital input DI4. 1 = active, 0 = inactive.	(5)

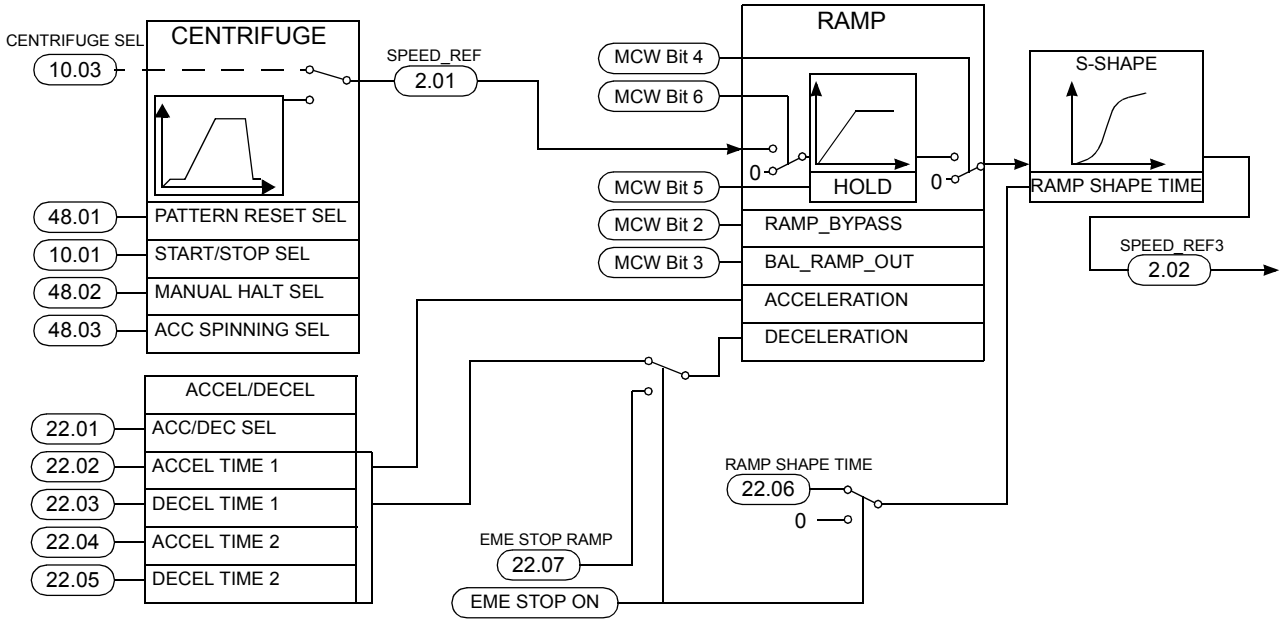
<table>
<tr><th>Index</th><th>Name/Selection</th><th>Description</th><th>(FbEq)/Def/Type</th></tr>
<tr><td></td><td>DI5(DSPEED2)</td><td>Delta speed defined by parameter 12.19 is activated through digital input DI5. 1 = active, 0 = inactive.</td><td>(6)</td></tr>
<tr><td></td><td>DI6(DSPEED3)</td><td>Delta speed defined by parameter 12.20 is activated through digital input DI6. 1 = active, 0 = inactive.</td><td>(7)</td></tr>
<tr><td></td><td>DI1,2</td><td>Constant speed selection through digital input DI1 and DI2.
<table><tr><th>DI1</th><th>DI2</th><th>Constant speed in use</th></tr><tr><td>0</td><td>0</td><td>No constant speed</td></tr><tr><td>1</td><td>0</td><td>Speed defined by parameter 12.18</td></tr><tr><td>0</td><td>1</td><td>Speed defined by parameter 12.19</td></tr><tr><td>1</td><td>1</td><td>Speed defined by parameter 12.20</td></tr></table></td><td>(8)</td></tr>
<tr><td></td><td>DI3,4</td><td>See selection DI1,2.</td><td>(9)</td></tr>
<tr><td></td><td>DI5,6</td><td>See selection DI1,2.</td><td>(10)</td></tr>
<tr><td></td><td>DI7,8</td><td>See selection DI1,2.</td><td>(11)</td></tr>
<tr><td></td><td>DI9,10</td><td>See selection DI1,2.</td><td>(12)</td></tr>
<tr><td></td><td>DI11,12</td><td>See selection DI1,2.</td><td>(13)</td></tr>
<tr><td>12.18</td><td>CONST DSPEED 1</td><td>Defines speed 1. An absolute value. Does not include the direction information.</td><td>0 Def/R</td></tr>
<tr><td></td><td>0 ... 1500 rpm</td><td>Setting range</td><td>(0 ... 15000)</td></tr>
<tr><td>12.19</td><td>CONST DSPEED 2</td><td>Defines speed 2. An absolute value. Does not include the direction information.</td><td>0 Def/R</td></tr>
<tr><td></td><td>0 ... 1500 rpm</td><td>Setting range</td><td>(0 ... 15000)</td></tr>
<tr><td>12.20</td><td>CONST DSPEED 3</td><td>Defines speed 3. An absolute value. Does not include the direction information.</td><td>0 Def/R</td></tr>
<tr><td></td><td>0 ... 1500 rpm</td><td>Setting range</td><td>(0 ... 15000)</td></tr>
</table>

Group 17 Jogging function

Index	Name/Selection	Description	(FbEq)/Def/Type
17	JOGGING FUNCTION		
17.01	JOGGING SELECT	Selects the jogging function. Jogging can be activated only if Decanter Control is on and the scroll drive is not yet running. If jogging function is selected when the scroll drive is running, the function is activated only after the scroll drive has been stopped and started again. The drive starts to follow the jogging reference when the jogging function is active and the start command has been given.	I
	NOT SEL	Not selected.	(1) Def
	DI1	Digital input 1. 0 = Jogging function is inactive. 1 = Jogging function is active.	(2)
	DI2	See DI1.	(3)
	DI3	See DI1.	(4)
	DI4	See DI1.	(5)
	DI5	See DI1.	(6)
	DI6	See DI1.	(7)
	COMM.CW	Fieldbus Control Word, bit 14. 0 = Jogging function is inactive. 1 = Jogging function is active.	(8)
	DI7	See DI1.	(9)
	DI8	See DI1.	(10)

Index	Name/Selection	Description	(FbEq)/Def/Type
	DI9	See DI1.	(11)
	DI10	See DI1.	(12)
	DI11	See DI1.	(13)
	DI12	See DI1.	(14)
17.02	JOGGING REF	Speed reference for the jogging function. The purpose of this function is to remove any stuck material from the centrifuge. Jogging overrides the delta speed reference and can be activated with Par 17.01 JOGGING SELECT.  	300 Def/R
	0 ... 3000 rpm	Setting range	(0 ... 3000)
17.03	JOGGTIME FORWARD	Time period to jog forwards	1 Def/R
	0.1 ... 300 s	Setting range	(1 ... 30000)
17.04	JOGGTIME BACKWARD	Time period to jog backwards	1 Def/R
	0.1 ... 300 s	Setting range	(1 ... 30000)
17.05	JOGGING RAMP	Ramping time for jogging	1 Def/R
	0.1 ... 300 s	Setting range	(1 ... 30000)

Group 48 Centrifuge functions

Index	Name/Selection	Description	(FbEq)/Def/Type
48	CENTRIFUGE CTRL	Centrifuge functions	
See sub-section *Basic Centrifuge operation sequence* in chapter *Operation of the Centrifuge Control Application program* for an illustration on the centrifuge sequence. 			
48.01	PATTERN RESET SEL	Resets the centrifuge sequence. ***Note:*** The drive must be stopped before the reset is possible.	I
	NOT SEL	Not selected	(1)
	RESET NOW	Reset. ***Note:*** Change back to NOT SELECTED.	(2)
	DI1	Reset through DI1. Ensure DI is not in other use.	(3)
	...	...	...
	DI6	Reset through DI6. Ensure DI is not in other use.	(8) Def
	...	...	...
	DI12	Reset through DI12. Ensure DI is not in other use.	(14)
48.02	MANUAL HALT SEL	Shifts the Centrifuge Application to the deceleration mode.	I
	NOT SEL	Not selected	(1)
	D1	Halt through DI1. Ensure DI is not in other use.	(2)
	...	...	...
	D4	Halt through DI4. Ensure DI is not in other use.	(5) Def
	...	...	...
	D12	Halt through DI12. Ensure DI is not in other use.	(13)
48.03	ACC SPINNING SEL	Source for the acceleration start command	I
	D1	Acceleration command through DI1. Ensure DI is not in other use.	(1)
	D2	Acceleration command through DI2. Ensure DI is not in other use.	(2) Def
	...	...	...
	D12	Acceleration command through DI12. Ensure DI is not in other use.	(12)

Group 49 Centrifuge pattern

49	CENTRIF PATTERN	Defines the pre-set values for centrifuge sequence.	
49.01	ACC T TO FILL SPD	Acceleration time from zero to filling speed. Centrifuge status word 6.01 bit 0 active.	100 Def/R
	1 ... 3000 s	Setting range	(1 ... 30000)
49.02	FILLING SPEED	Filling speed. Centrifuge status word 6.01 bit 2 active.	50 Def/R
	0 ... 1800 rpm	Setting range	0 ... 1800
49.03	PREWASHING SPEED	Pre-washing speed	30 Def/R
	0 ... 18000 rpm	Setting range	(0 ... 180000)
49.04	PREWASHING TIME	Pre-washing time. Centrifuge status word 6.01 bit 1 active.	10 Def/R
	0 ... 3000 s	Setting range	(0 ... 3000)
49.05	ACC T TO SPIN SPD	Acceleration time from filling speed to spinning speed. Centrifuge status word 6.01 bit 3 active.	400 Def/R
	0 ... 3000 s	Setting range	(0 ... 30000)
49.06	WASHING SPEED	Washing speed	600 Def/R
	0 ... 18000 rpm	Setting range	(0 ... 18000)
49.07	WASHING TIME	Washing time. Centrifuge status word 6.01 bit 4 active.	100 Def/R
	0 ... 3000 s	Setting range	(0 ... 30000)
49.08	SPINNING SPEED	Spinning speed	1000 Def/R
	0 ... 18000 rpm	Setting range	(0 ... 180000)
49.09	SPINNING TIME	Spinning time. Centrifuge status word 6.01 bit 5 active.	300 Def/R
	0 ... 3000 s	Setting range	(0 ... 30000)
49.10	DEC T UNLOAD SPD	Deceleration time from spinning speed to unloading speed. Centrifuge status word 6.01 bit 6 active.	200 Def/R
	0 ... 3000 s	Setting range	(0 ... 30000)
49.11	UNLOADING SPEED	Unloading speed	300 Def/R
	0 ... 1800 rpm	Setting range	(0 ... 180000)
49.12	DISCHARGE TIME	Centrifuge unloading time. Centrifuge status word 6.01 bit 7 active.	10 Def/R
	0 ... 3000 s	Setting range	(0 ... 3000)

Decanter examples

Back drive, variant A

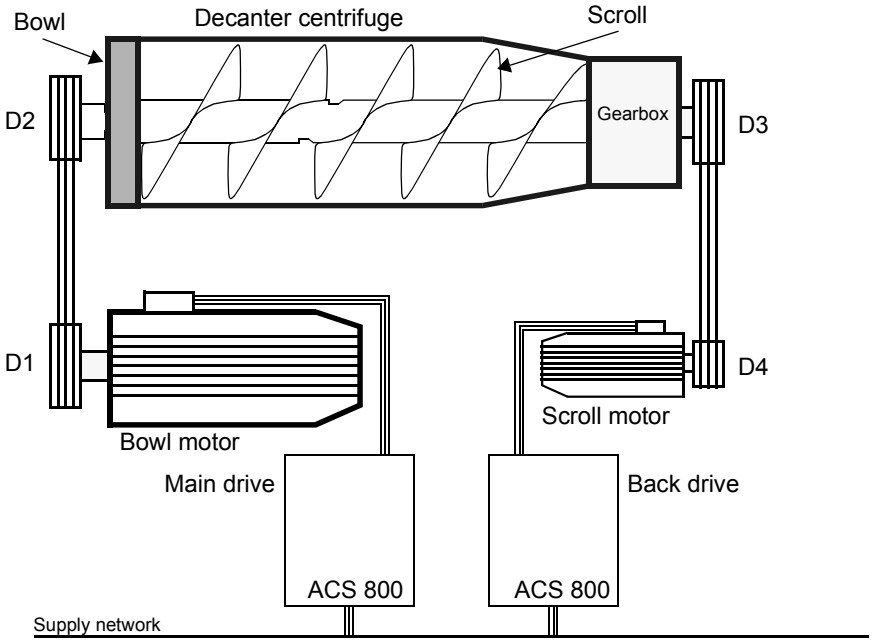


Figure 5. An example of mechanical and electrical configuration of a Back drive decanter centrifuge

If the positive rotation direction (forwards) of the bowl motor is considered as the correct process speed direction, the direction of the scroll motor rotation must be reversed (opposite direction). This can be taken into consideration in parameterisation of the Decanter Control parameters in group 11.

Warning! Because bowl and scroll motors are mounted opposite, one of the belt roller diameter values D3 or D4 must be given negative.

Scroll parameter settings:	11.03 = BACK DRIVE
	11.07 = "value of D1"
	11.08 = "value of D2"
	11.09 = "Gearbox ratio"
	11.10 = -1 x "value of D3"
	11.11 = "value of D4"
	11.18 = SCROLL
Bowl parameter settings:	11.07 = "value of D1"
	11.08 = "value of D2"
	11.18 = BOWL

Back drive, variant B

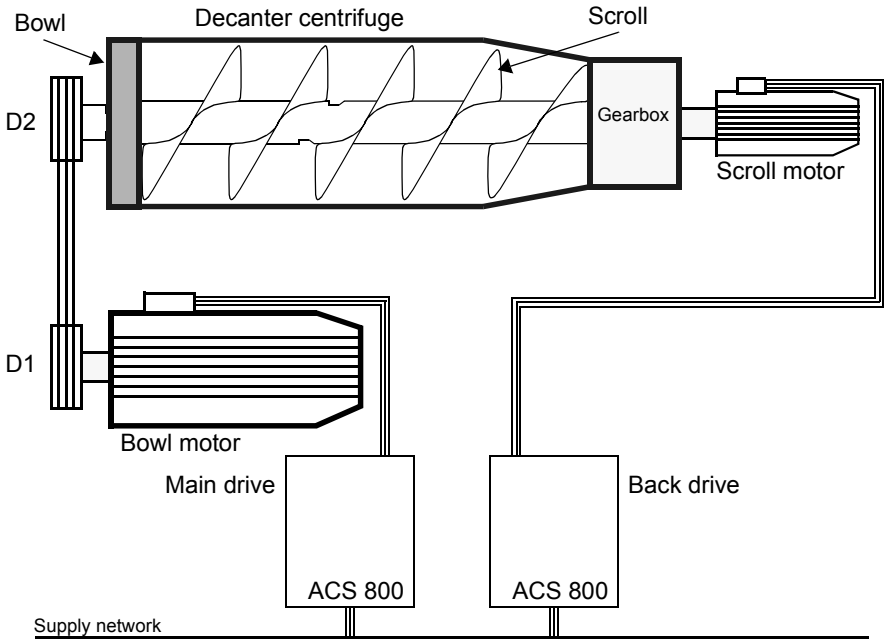


Figure 6. An example of mechanical and electrical configuration of a Back drive decanter centrifuge

If the positive rotation direction (forwards) of the bowl motor is considered as the correct process speed direction, the direction of the scroll motor rotation must be forwards as well. This can be taken into consideration in parameterisation of the Decanter Control parameters in group 11.

Since the scroll motor is directly coupled to the gearbox, parameters corresponding D3 and D4 (belt roller diameter) must be = 1.

Scroll parameter settings:	11.03 = BACK DRIVE
	11.07 = "value of D1"
	11.08 = "value of D2"
	11.09 = "Gearbox ratio"
	11.10 = "value of D3" = 1
	11.11 = "value of D4" = 1
	11.18 = SCROLL
Bowl parameter settings:	11.07 = "value of D1"
	11.08 = "value of D2"
	11.18 = BOWL

Forward drive

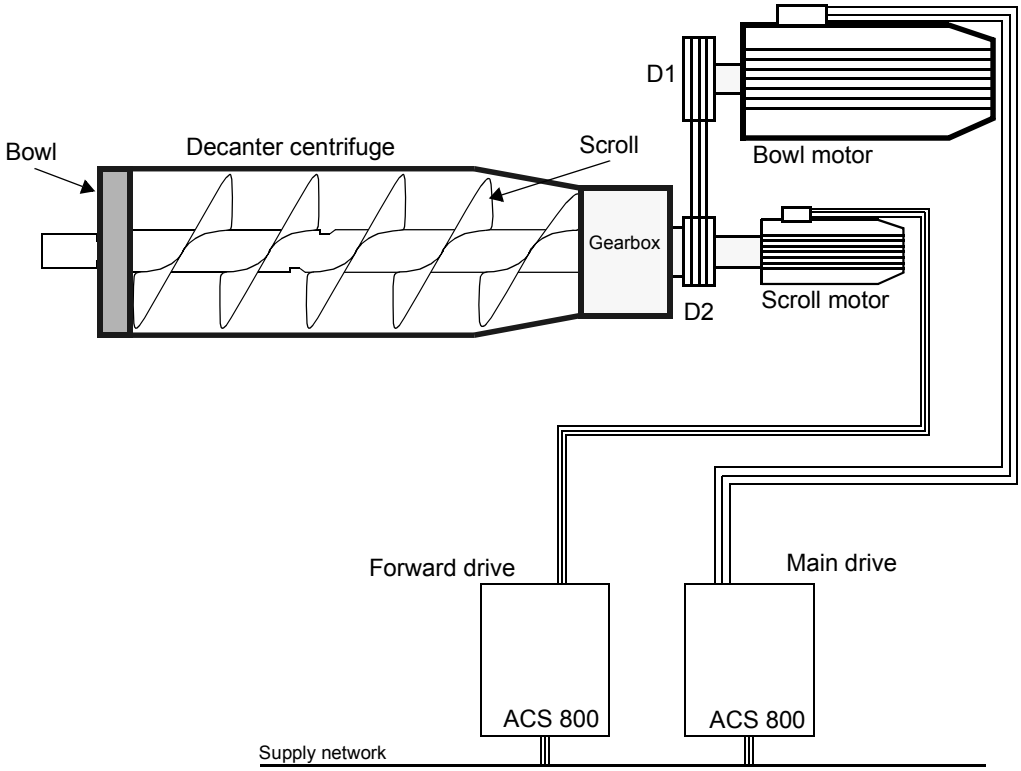


Figure 7. An example of mechanical and electrical configuration of a typical Forward drive decanter centrifuge

If the positive rotation direction (forwards) of the bowl motor is considered as the correct process speed direction, the direction of the scroll motor rotation must be forwards as well. This can be taken into consideration in parameterisation of the Decanter Control parameters in group 11.

Since the scroll motor is directly coupled to the gearbox, the values of the parameters corresponding D3 and D4 (belt roller diameter) must be 1.

Scroll parameter settings:
11.03 = FORW. DRIVE
11.07 = "value of D1"
11.08 = "value of D2"
11.09 = "Gearbox ratio"
11.10 = "value of D3" = 1
11.11 = "value of D4" = 1
11.18 = SCROLL

Bowl parameter settings:
11.07 = "value of D1"
11.08 = "value of D2"
11.18 = BOWL

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ABB Oy
AC Drives
P.O. Box 184
FIN-00381 HELSINKI
FINLAND
Telephone +358 10 22 11
Telefax +358 10 22 22681
Internet http://www.abb.com

ABB Inc.
Drives and Power Electronics
16250 West Glendale Drive
New Berlin, WI 53151
USA
Telephone 262 785-3200
800 243-4384
Telefax 262 780-5135