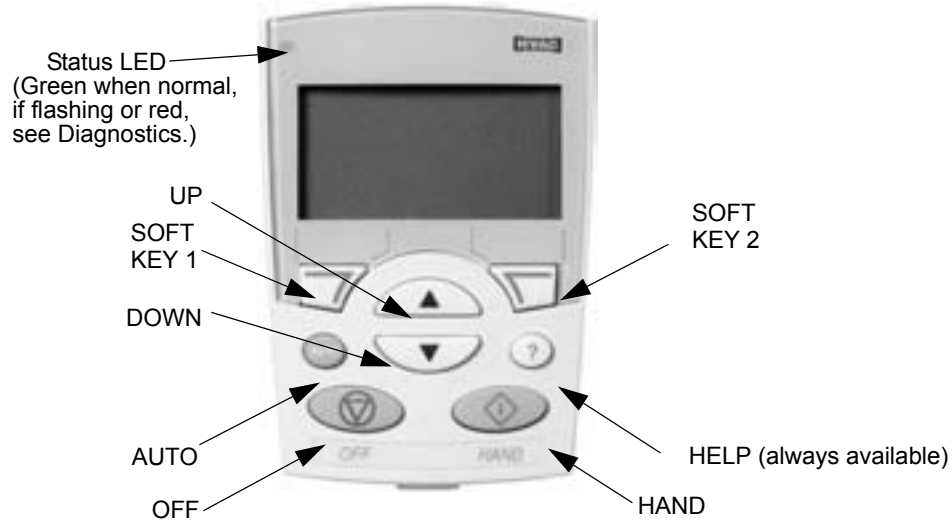


Start-Up

HVAC Control Panel Features

The AYK550 HVAC control panel (ACS-CP-B) features:



X0201

- Language selection for the display
- Drive connection that can be made or detached at any time
- Start-up assistant to facilitate drive commissioning
- Copy function for moving parameters to other AYK550 drives
- Backup function for saving parameter sets
- Context sensitive help
- Real-time clock

General Display Features

Soft Key Functions

The soft key functions are defined by text displayed just above each key.

Display Contrast

To adjust display contrast, simultaneously press  and  or , as appropriate.

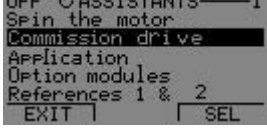
Start-Up

Start-Up can be performed in two ways:

- Using the Start-Up Assistant.
- Changing the parameters individually.

Start-Up by Using the Start-Up Assistant

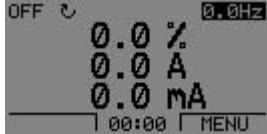
To start the Start-Up Assistant, follow these steps:

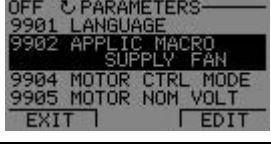
1	Select MENU to enter the main menu		
2	Select ASSISTANTS with the Up/Down buttons and select ENTER.		
3	Scroll to COMMISSION DRIVE with the Up/Down buttons.		
4	Change the values suggested by the assistant to your preferences and then press SAVE after every change.		

The Start-Up Assistant will guide you through the start-up.

Start-Up by Changing the Parameters Individually

To change the parameters, follow these steps:

1	Select MENU to enter the main menu.		
2	Select the Parameters mode with the UP/DOWN buttons and select ENTER to select the Parameters mode.		
3	Select the appropriate parameter group with the UP/DOWN buttons and select SEL		

4	Select the appropriate parameter in a group with the UP/DOWN buttons. Select EDIT to change the parameter value.		
5	Press the UP/DOWN buttons to change the parameter value.		
6	Select SAVE to store the modified value or select CANCEL to leave the set mode. Any modifications not saved are cancelled.		
7	Select EXIT to return to the listing of parameter groups, and again to return to the main menu.	 	

To complete the control connections by manually entering the parameters, see "Parameters Mode" in this section.

For detailed hardware description, see the "Technical Data" section.

Note! The current parameter value appears below the highlighted parameter.

Note! To view the default parameter value, press the UP/DOWN buttons simultaneously.

Note! The most typical and necessary parameters to change are parameter groups 99 Start-up data, 10 Start/Stop/Dir, 11 Reference Select, 20 Limits, 21 Start/Stop, 22 Accel/Decel, 26 Motor Control and 30 Fault Functions.

Note! To restore the default factory settings, select the application macro HVAC default.

Modes

The HVAC control panel has several different modes for configuring, operating and diagnosing the drive. The modes are:

- **Standard display mode** – Shows drive status information and operates the drive.
- **Parameters mode** – Edits parameter values individually.
- **Start-up assistant mode** – Guides the start-up and configuration.
- **Changed parameters mode** – Shows changed parameters.
- **Drive parameter backup mode** – Stores or uploads the parameters.
- **Clock set mode** – Sets the time and date for the drive.
- **I/O settings mode** – Checks and edits the I/O settings.

Standard Display Mode

Use the standard display mode to read information on the drive's status and to operate the drive. To reach the standard display mode, press EXIT until the LCD display shows status information as described below.

Status Information

Top. The top line of the LCD display shows the basic status information of the drive.

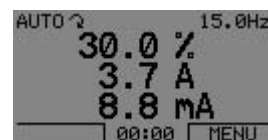
- HAND – Indicates that the drive control is local, that is, from the control panel.
- AUTO – Indicates that the drive control is remote, such as the basic I/O (X1) or fieldbus.
- ↻ – Indicates the drive and motor rotation status as follows:

Control panel display	Significance
Rotating arrow (clockwise or counterclockwise)	• Drive is running and at setpoint • Shaft direction is forward or reverse
Rotating arrow blinking	Drive is running but not at setpoint
Stationary arrow	Drive is stopped

- Upper right – shows the active reference.

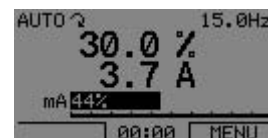
Middle. Using parameter group 34, the middle of the LCD display can be configured to display:

- One to three parameter values – The default display shows parameters 0103 (OUTPUT FREQ) in percentages, 0104 (CURRENT) in amperes and 0120 (AI1) in milliamperes.
- A bar meter rather than one of the parameter values.



Bottom. The bottom of the LCD display shows:

- Lower corners – show the functions currently assigned to the two soft keys.
- Lower middle – displays the current time (if configured to show the time).



Operating the Drive

AUTO/HAND – The very first time the drive is powered up, it is in the auto control (AUTO) mode, and is controlled from the Control terminal block X1.

To switch to hand control (HAND) and control the drive using the control panel, press and hold the  or  button.

- Pressing the HAND button switches the drive to hand control while keeping the drive running.
- Pressing the OFF button switches to hand control and stops the drive.

To switch back to auto control (AUTO), press and hold the  button.

Hand/Auto/Off – To start the drive press the HAND or AUTO buttons, to stop the drive press the OFF button.

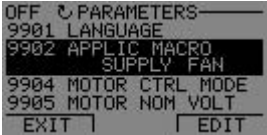
Reference – To modify the reference (only possible if the display in the upper right corner is in reverse video) press the UP or DOWN buttons (the reference changes immediately).

The reference can be modified in the local control mode, and can be parameterized (using Group 11 reference select) to also allow modification in the remote control mode.

Parameters Mode

To change the parameters, follow these steps:

1	Select MENU to enter the main menu.		
2	Select the Parameters mode with the UP/DOWN buttons, and select ENTER to select the Parameters mode.	  	
3	Select the appropriate parameter group with the UP/DOWN buttons and select SEL	  	
4	Select the appropriate parameter in a group with the UP/DOWN buttons. Select EDIT to change the parameter.	  	
5	Press the UP/DOWN buttons to change the parameter value.	 	

6	Select SAVE to store the modified value or select CANCEL to leave the set mode. Any modifications not saved are cancelled.		
7	Select EXIT to return to the listing of parameter groups, and again to return to the main menu.	 	

To complete the control connections by manually entering the parameters, see "Parameters Mode" in the this section.

For detailed hardware description, see the Appendix.

Note! The current parameter value appears below the highlighted parameter.

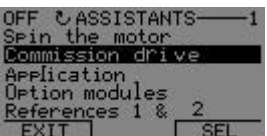
Note! To view the default parameter value, press the UP/DOWN buttons simultaneously.

Note! The most typical and necessary parameters to change are parameter groups 99 Start-up data, 10 Start/Stop/Dir, 11 Reference Select, 20 Limits, 21 Start/Stop, 22 Accel/Decel, 26 Motor Control and 30 Fault Functions.

Note! To restore the default factory settings, select the application macro HVAC default.

Start-Up Assistant Mode

To start the Start-Up Assistant, follow these steps:

1	Select MENU to enter the main menu		
2	Select ASSISTANTS with the Up/Down buttons and select ENTER.	 	
3	Scroll to COMMISSION DRIVE with the Up/Down buttons and select SEL.	 	

4	Change the values suggested by the assistant to your preferences and then press SAVE after every change.		
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The Start-Up Assistant will guide you through the start-up.

The Start-Up Assistant guides you through the basic programming of a new drive. (You should familiarize yourself with basic control panel operation and follow the steps outlined above.) At the first start, the drive automatically suggests entering the first task, Language Select. The assistant also checks the values entered to prevent entries that are out of range.

The Start-Up Assistant is divided into tasks. You may activate the tasks one after the other, as the Start-Up Assistant suggests, or independently.

Note! If you want to set the parameters independently, use the Parameters mode.

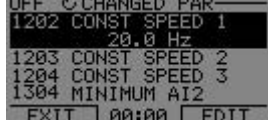
The order of tasks presented by the Start-up Assistant depends on your entries. The following task list is typical.

Task name	Description
Spin the motor	• Prompts for control panel display language selection. • Prompts for motor data. • Guides user through rotation check.
Commission drive	Prompts for motor data.
Application	Prompts for application macro selection.
References 1 & 2	• Prompts for the source of speed references 1 and 2. • Prompts for reference limits. • Prompts for frequency (or speed) limits.
Start/Stop Control	• Prompts for the source for start and stop commands. • Prompts for start and stop mode definition. • Prompts for acceleration and deceleration times.
Protections	• Prompts for current and torque limits. • Prompts for the use of Run enable and Start enable signals. • Prompts for the use of emergency stop. • Prompts for Fault function selection. • Prompts for Auto reset functions selection.
Constant Speeds	• Prompts for the use of constant speeds. • Prompts for constant speed values.
PID Control	• Prompts for PID settings. • Prompts for the source of process reference. • Prompts for reference limits. • Prompts for source, limits and units for the process actual value. • Defines the use of Sleep function.
Low Noise Setup	• Prompts for switching frequency. • Prompts for definition of Flux optimization. • Prompts for the use of Critical speeds.

Task name	Description
Panel Display	Prompts for display variable and unit settings.
Timed Functions	Prompts for the use of Timed functions.
Output	- Prompts for the signals indicated through the relay outputs. - Prompts for signals indicated through the analog outputs AO1 and AO2. Sets the minimum, maximum, scaling and inversion values.

Changed Parameters Mode

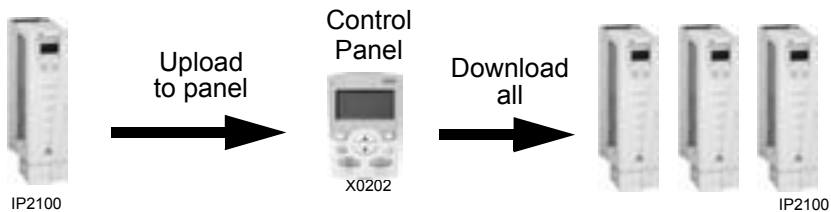
To view changed parameters, follow these steps:

1	Select MENU to enter the menu.		
2	Select CHANGED PAR with the UP/DOWN buttons and select ENTER.	 	
3	A list of changed parameters is displayed. Select EXIT to exit the parameters mode.		

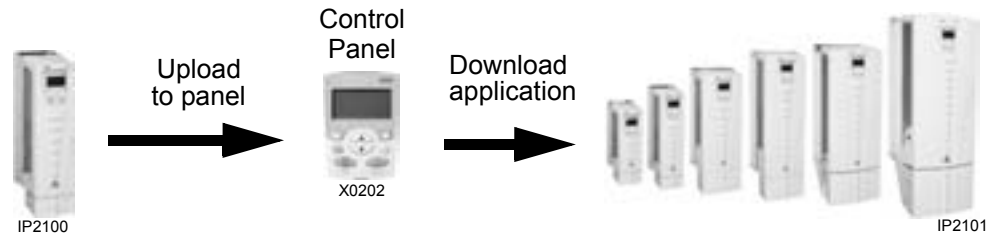
Drive Parameter Backup Mode

Use the parameter backup mode to export parameters from one drive to another. The parameters are uploaded from a drive to the control panel and downloaded from the control panel to another drive. Two options are available:

- Download all – copies all application and motor parameters to the drive. Useful where drives of the same size use the same application. Also useful to create a backup for recovery if drive parameters are corrupted or erased.



- Download application – copies only the application to the drive. Useful where drives of different sizes use the same application. Parameters 9905...9909, 1605, 1607, 5201, group 51 parameters and internal motor parameters are NOT copied.

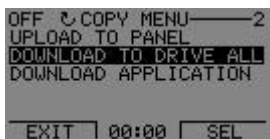
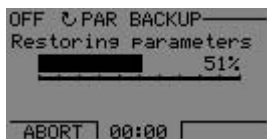


To upload parameters to control panel, follow these steps:

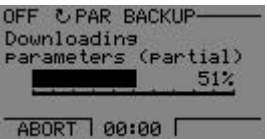
1	Select MENU to enter the main menu.		
2	Select PAR BACKUP with the UP/DOWN buttons and select ENTER.	 	
3	Scroll to Upload to Panel and select SEL.	 	
4	The text "Copying parameters" and a progress diagram is displayed. Select ABORT if you want to stop the process.		
5	The text "Parameter upload successful" is displayed and the control panel returns to the PAR BACKUP menu. Select EXIT to return to the main menu. Now you can disconnect the panel.		

To download all parameters to drive, follow these steps:

1	Select MENU to enter the menu.		
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2	Select PAR BACKUP with the UP/DOWN buttons.		
3	Scroll to Download to drive all and select SEL.		
4	The text “restoring parameters” is displayed. Select ABORT if you want to stop the process.		
5	After the download stops, the message “Parameter download successful” is displayed and the control panel goes back to PAR BACKUP menu. Select EXIT to return to the main menu.		 

To download application to drive, follow these steps:

1	Select MENU to enter the menu.		
2	Select PAR BACKUP with the UP/DOWN buttons.		
3	Scroll to DOWNLOAD APPLICATION and select SEL.		
4	The text “Downloading parameters (partial)” is displayed. Select ABORT if you want to stop the process.		

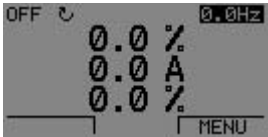
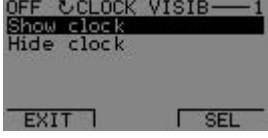
5	The text "Parameter download successful" is displayed and the control panel returns to PAR BACKUP menu. Select EXIT to return to the main menu.		 
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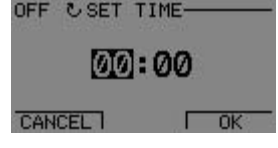
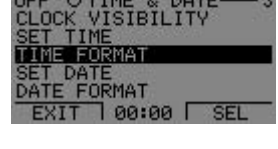
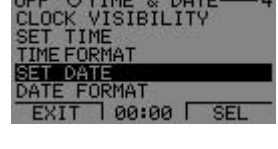
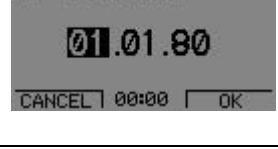
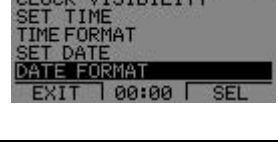
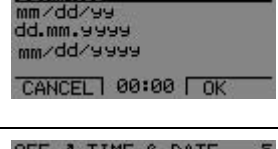
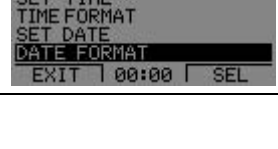
Note! If upload or download of parameters is aborted, the partial parameter set is not implemented.

Clock Set Mode

The clock set mode is used for setting the time and date for the internal clock of the AYK550. In order to use the timer functions of the AYK550, the internal clock has to be set first. Date is used to determine weekdays and is visible in Fault logs.

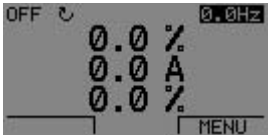
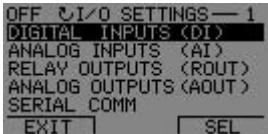
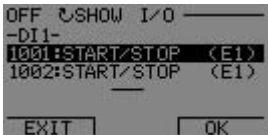
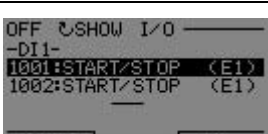
To set the clock, follow these steps:

1	Select MENU to enter the main menu.		
2	Scroll to Clock Set with the UP/DOWN buttons and select ENTER to enter the Clock Set mode.	  	
3	Scroll to Clock Visibility with the UP/DOWN buttons and select SEL to change the visibility of the clock.	  	
4	Scroll to Show Clock with the UP/DOWN buttons and select SEL to make the clock visible.	  	
5	Scroll to Set Time with the UP/DOWN buttons and select SEL.	  	

6	Change the hours and minutes with the UP/DOWN buttons and select OK to save the values. The active value is displayed in inverted color.	  	
7	Scroll to Time Format with the UP/DOWN buttons and select SEL.	  	
8	The different formats are displayed. Select a format with the UP/DOWN buttons and select SEL to confirm the selection.	  	
9	Scroll to Set Date with the UP/DOWN buttons and select SEL.	  	
10	Change the days, months and year with the UP/DOWN buttons and select OK to save the values. The active value is displayed in inverted color.	  	
11	Scroll to Date Format with the UP/DOWN buttons and select SEL.	  	
12	The Date formats are displayed. Select a date format with the UP/DOWN buttons and select OK to confirm the selection.	  	
13	Select EXIT twice to return to the main menu.		

I/O Settings Mode

To view and edit the I/O settings, follow these steps:

1	Select MENU to enter the main menu.		
2	Scroll to I/O Settings with the UP/DOWN buttons and select ENTER.		
3	Scroll to the I/O setting you want to view with the UP/DOWN buttons and select SEL.		
4	Select the setting you want to view with the UP/DOWN buttons and select OK.		
5	You can change the value with the UP/DOWN buttons and save it by selecting SAVE. If you do not want to change the setting, select CANCEL.		
6	Select EXIT to return to the main menu.		

Application Macros

Overview

Macros change a group of parameters to new, predefined values designed for specific applications. Use macros to minimize the need for manual editing of parameters. Selecting a macro sets all other parameters to their default values, except:

- Group 99: Start-up Data parameters
- The PARAMETER LOCK 1602
- The PARAM SAVE 1607
- Groups 50 52 serial communication parameters
- Group 29: Maintenance triggers

After selecting a macro, additional parameter changes can be made manually using the control panel.

Application macros are enabled by setting the value for parameter 9902 APPLIC MACRO. By default, HVAC default (value 1) is the enabled macro.

General Considerations

The following considerations apply for all macros:

- When using a direct speed reference in AUTO mode, connect the speed reference to analog input 1 (AI1), and provide the START command using digital input 1 (DI1). In HAND/OFF mode, the control panel provides the speed reference and START command.
- When using process PID, connect the feedback signal to analog input 2 (AI2). As a default, the control panel sets the Setpoint, but analog input 1 can be used as an alternate source. You can set up process PID using parameters (Group 40) or using the PID control assistant (recommended).

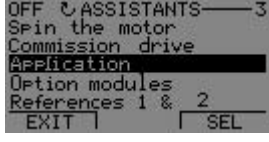
Application / Macro Listing

This section describes the following macros:

9902 Value	Macro		9902 Value	Macro
1	HVAC default		8	Internal timer
2	Supply fan		9	Internal timer with constant speeds
3	Return fan		10	Floating point
4	Cooling tower fan		11	Dual setpoint PID
5	Condenser		12	Dual setpoint PID with constant speeds
6	Booster pump		13	E-bypass
7	Pump alternation		14	Hand Control

Selecting an Application Macro

To select a macro, follow these steps:

1	Select MENU to enter the main menu.		
2	Select ASSISTANTS with the Up/Down buttons and select ENTER.		
3	Scroll to APPLICATION and select ENTER.		
4	Select a macro with the Up/Down buttons and select SAVE.		

Restoring Defaults

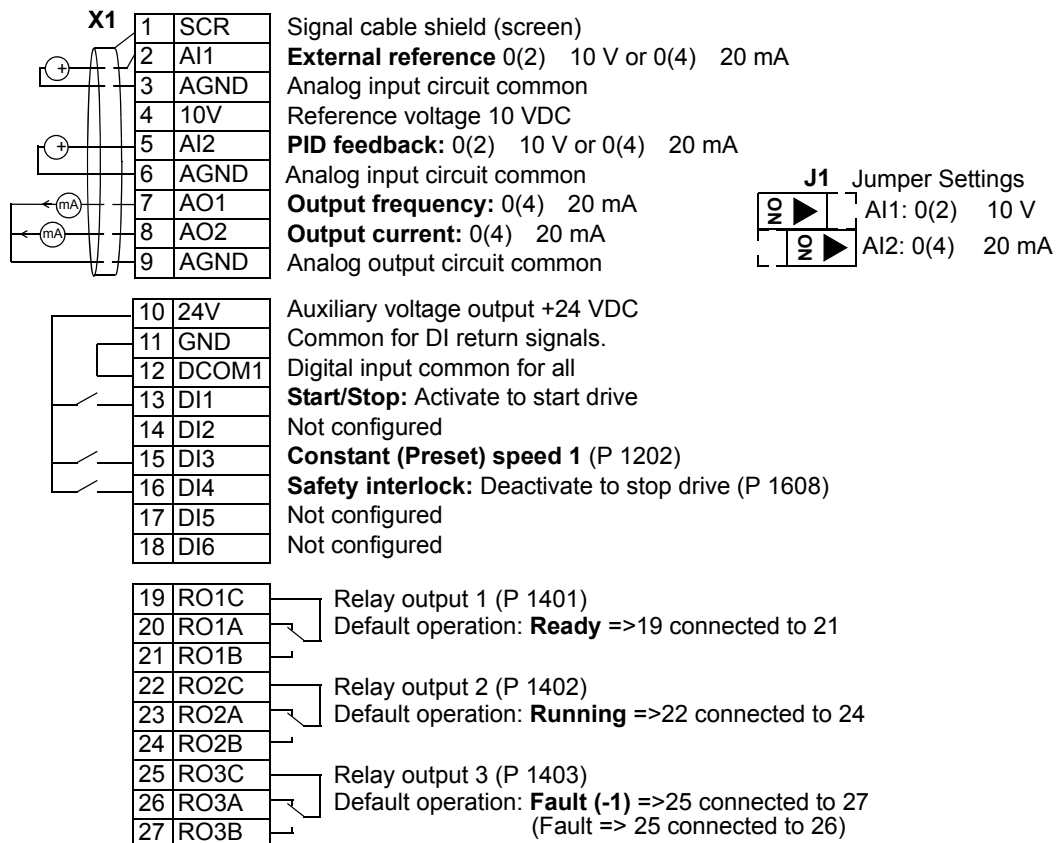
To restore the factory default settings, select the application macro HVAC Default.

Control Wiring

Each macro has specific requirements for control wiring. For general details about the AYK550 control wiring terminals, see "Control Terminal Descriptions" on page 235. Specific wiring requirements are included with each macro description.

HVAC Default

This macro provides the factory default parameter settings for the AYK550-UH. Factory defaults can be restored at any time by setting parameter 9902 to 1. The diagram below shows typical wiring using this macro. When using direct speed reference in AUTO mode or process PID, see "General Considerations" on page 30.

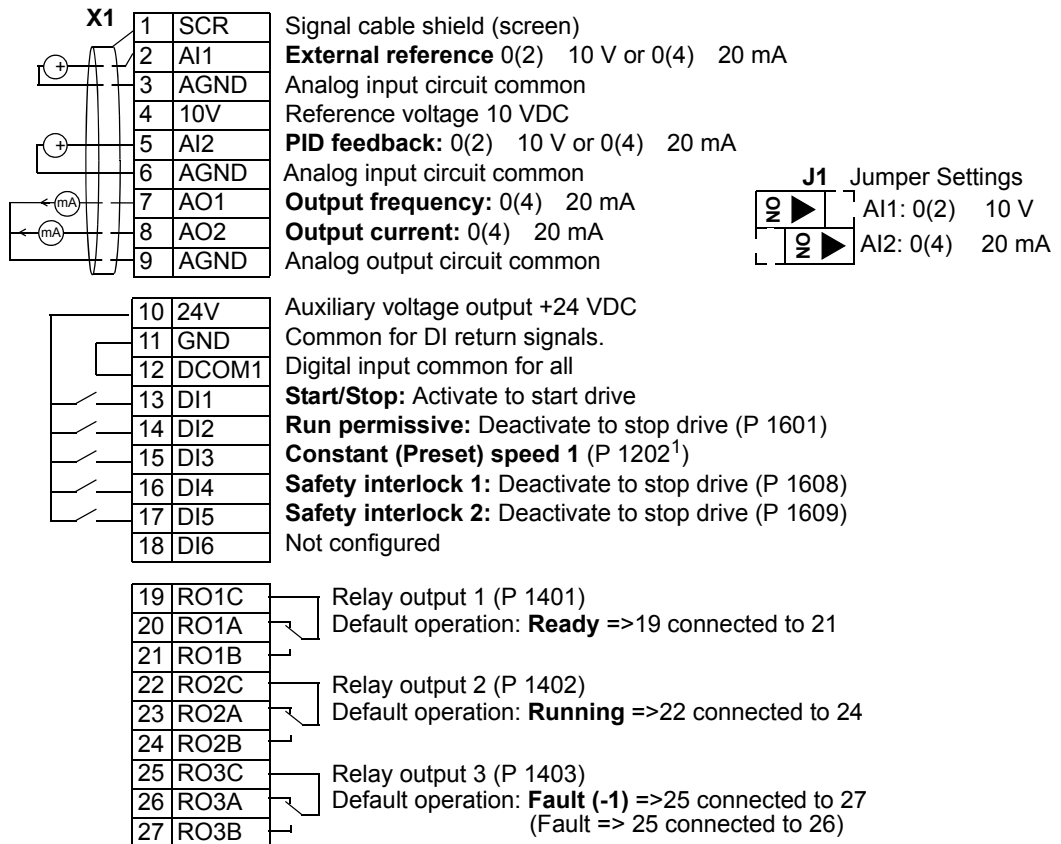


Parameters Changed Relative to HVAC Default			
Parameter	Value	Parameter	Value
None (Default macro)			

Note! YORK Drives are pre-configured using the "HVAC" default macro. Changing user macros may require changes to factory control wiring.

Supply Fan

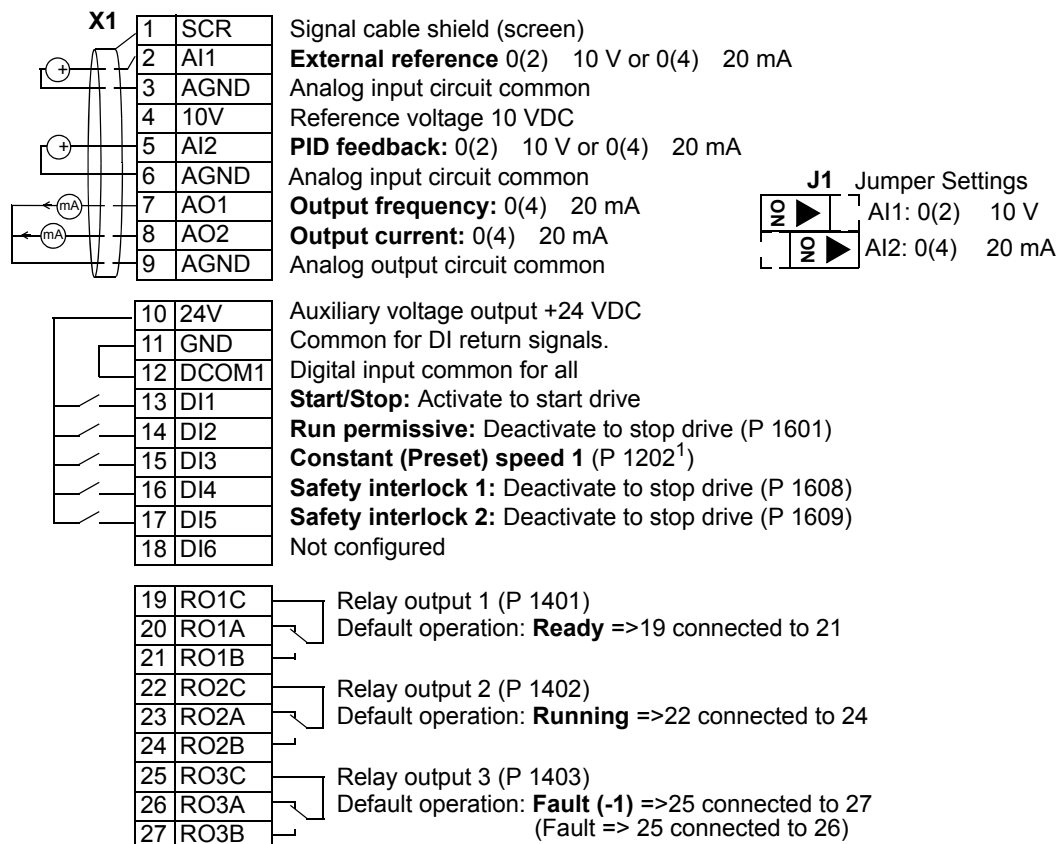
This macro configures for supply fan applications where the supply fan brings fresh air in according to signals received from a transducer. When using direct speed reference in AUTO mode or process PID, see "General Considerations" on page 30.



Parameters Changed Relative to HVAC Default				
Parameter		Value	Parameter	Value
9902	APPLIC MACRO	2 (SUPPLYFAN)	3207	SUPERV 3 PARAM
1401	RELAY OUTPUT 1	7 (STARTED)	4001	GAIN
1601	RUN ENABLE	2 (DI2)	4002	INTEGRATION TIME
1609	START ENABLE 2	5 (DI5)	4101	GAIN
2202	ACCELER TIME 1	15.0 s	4102	INTEGRATION TIME
2203	DECELER TIME 1	15.0 s		
			0103	(OUTPUT FREQ)

Return Fan

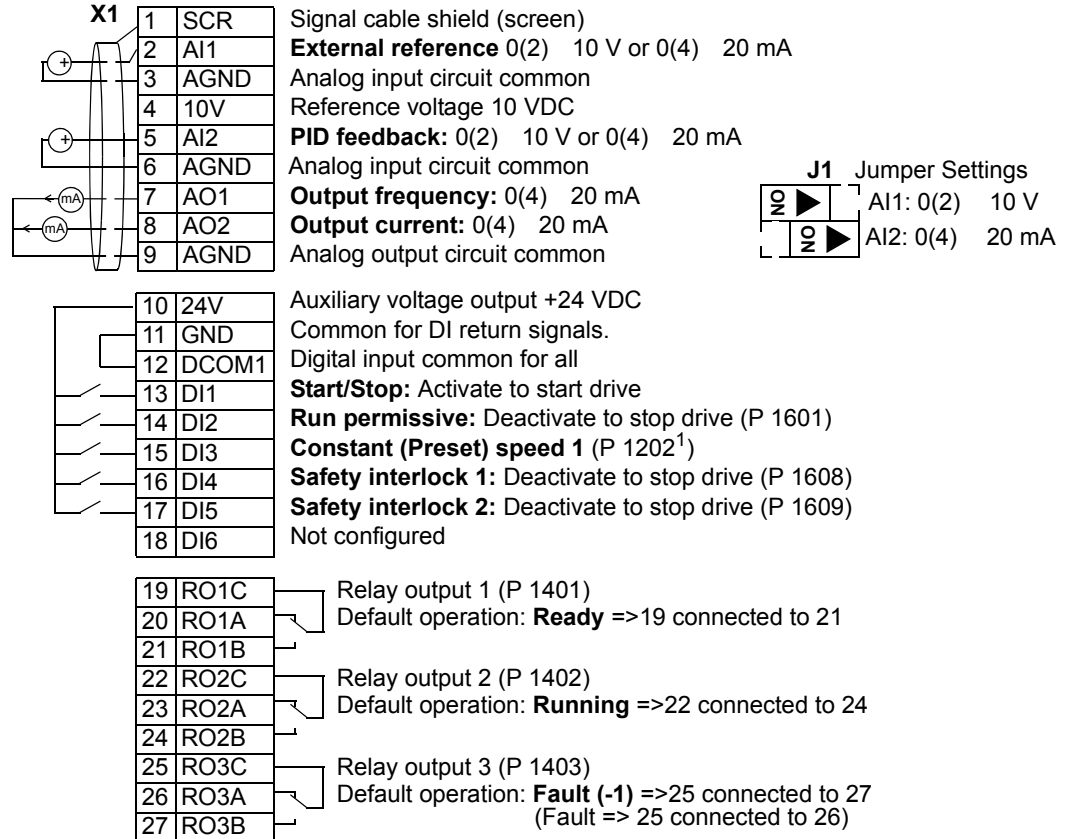
This macro configures for return fan applications where the return fan removes air according to signals received from a transducer. When using direct speed reference in AUTO mode or process PID, see "General Considerations" on page 30.



Parameters Changed Relative to HVAC Default				
Parameter		Value	Parameter	Value
9902	APPLIC MACRO	3 (RETURNFAN)	3207	SUPERV 3 PARAM
1401	RELAY OUTPUT 1	7 (STARTED)	4001	GAIN
1601	RUN ENABLE	2 (DI2)	4002	INTEGRATION TIME
1609	START ENABLE 2	5 (DI5)	4101	GAIN
2202	ACCELER TIME 1	15.0 s	4102	INTEGRATION TIME
2203	DECELER TIME 1	15.0 s		

Cooling Tower Fan

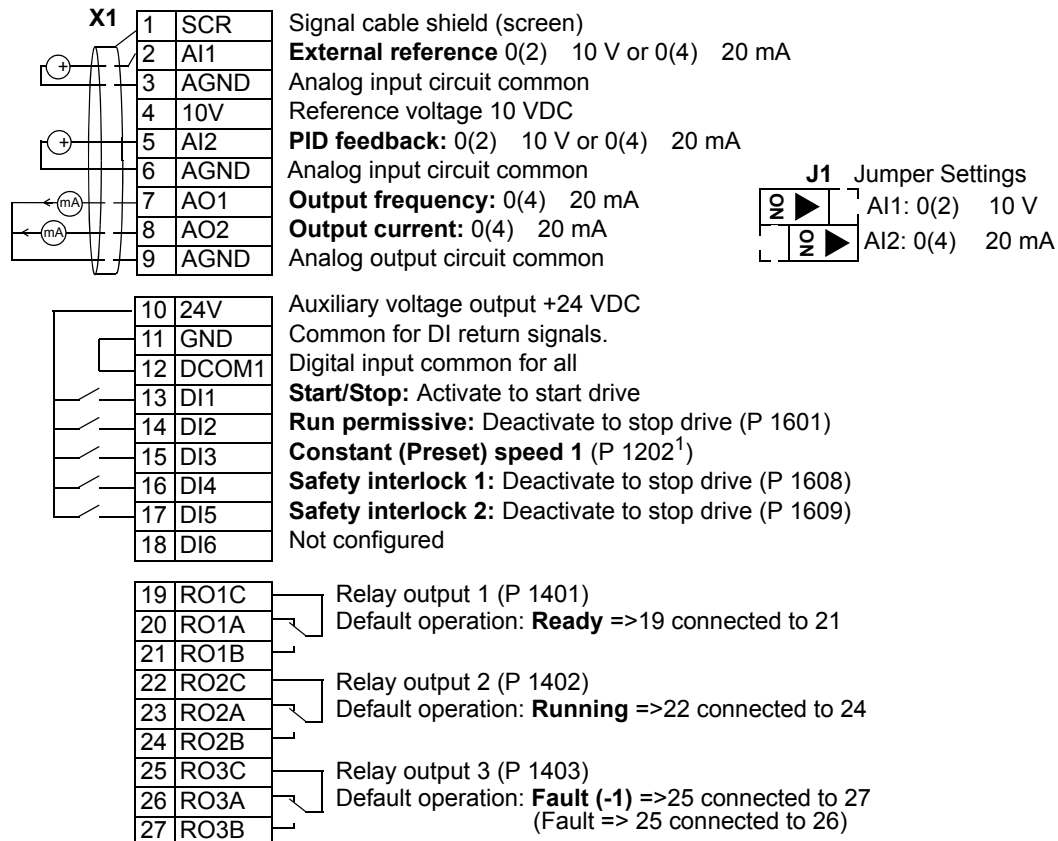
This macro configures for cooling tower fan applications where the fan speed is controlled according to the signals received from a transducer. When using direct speed reference in AUTO mode or process PID, see "General Considerations" on page 30.



Parameters Changed Relative to HVAC Default			
Parameter	Value	Parameter	Value
9902 APPLIC MACRO	4 (CLNGTWRFAN)	3207 SUPERV 3 PARAM	0103 (OUTPUT FREQ)
1401 RELAY OUTPUT 1	7 (STARTED)	4101 GAIN	1.0
1601 RUN ENABLE	2 (DI2)	4102 INTEGRATION TIME	60.0 s
1609 START ENABLE 2	5 (DI5)		

Condenser

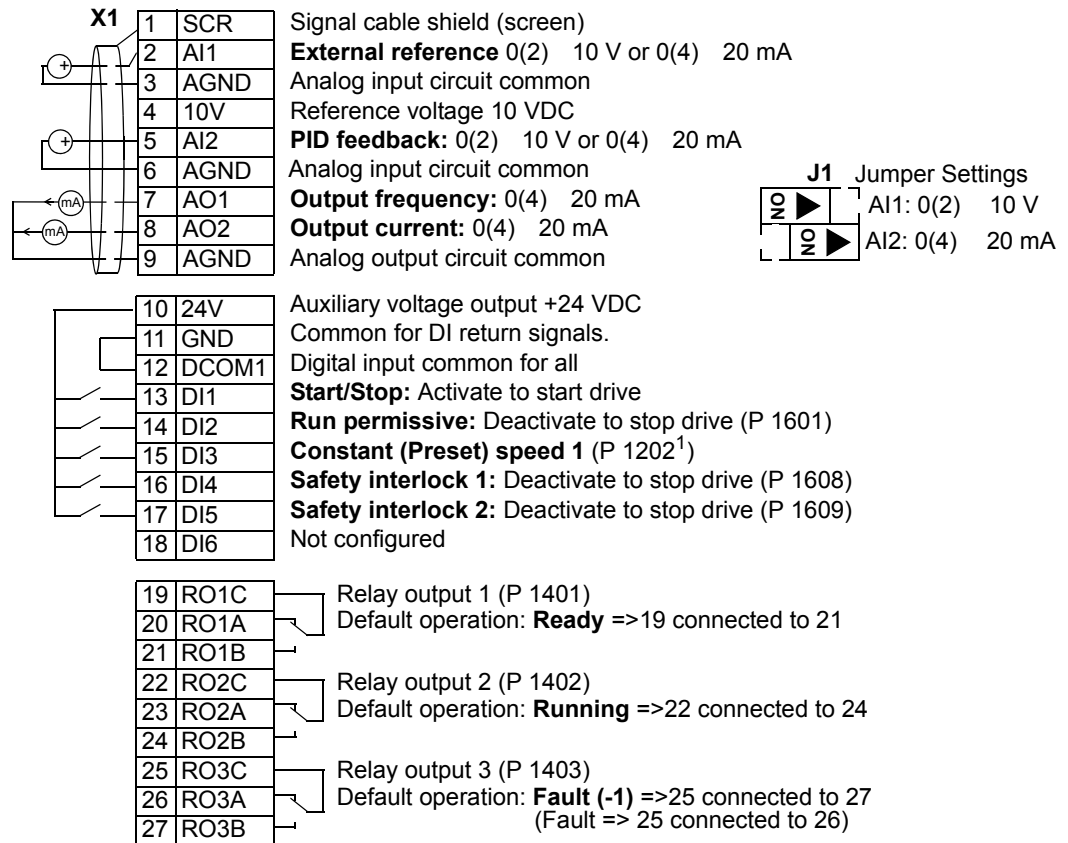
This macro configures for condenser and liquid cooler applications where fan speed is controlled according to signals received from a transducer. When using direct speed reference in AUTO mode or process PID, see "General Considerations" on page 30.



Parameters Changed Relative to HVAC Default						
Parameter		Value		Parameter	Value	
9902	APPLIC MACRO	5 (CONDENSER)		2203	DECELER TIME 1	10.0 s
1401	RELAY OUTPUT 1	7 (STARTED)		3207	SUPERV 3 PARAM	0103 (OUTPUT FREQ)
1601	RUN ENABLE	2 (DI2)		4005	ERROR VALUE INV	1 (YES)
1609	START ENABLE 2	5 (DI5)		4101	GAIN	1.0
2202	ACCELER TIME 1	10.0 s		4102	INTEGRATION TIME	60.0 s

Booster Pump

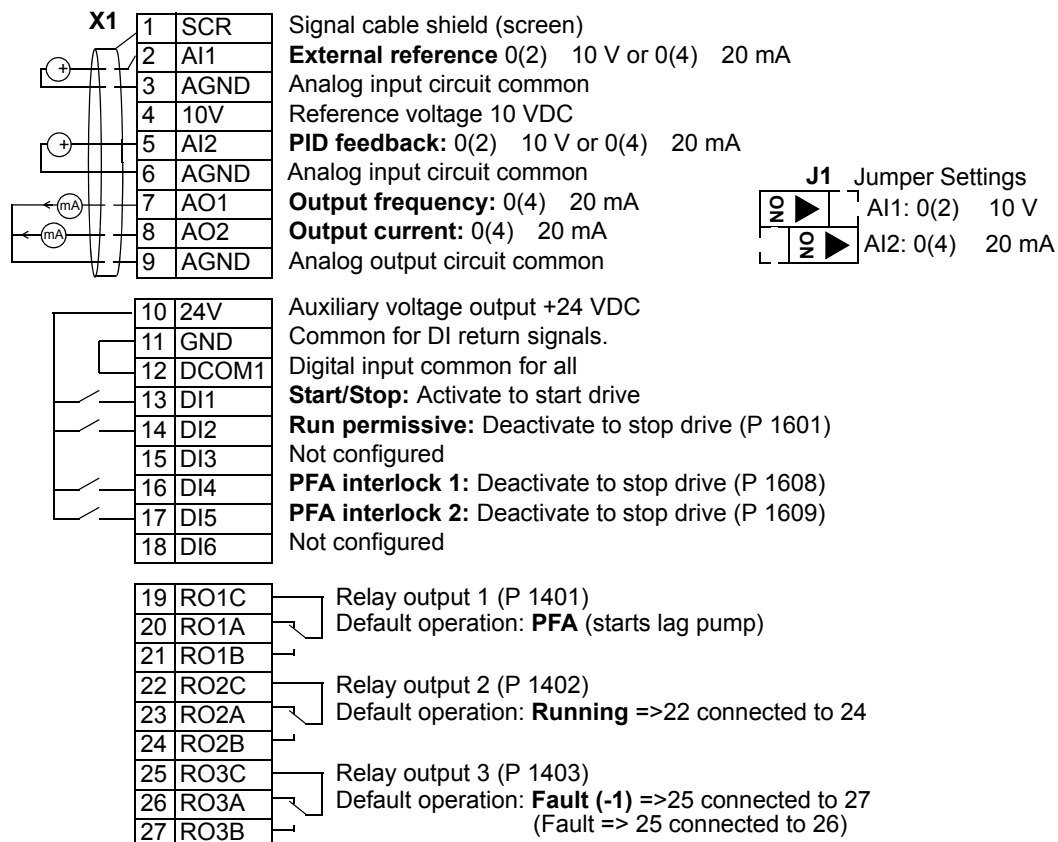
This macro configures for booster pump applications where the pump speed is controlled according to a signal received from a transducer. When using direct speed reference in AUTO mode or process PID, see "General Considerations" on page 30.



Parameters Changed Relative to HVAC Default				
Parameter	Value	Parameter	Value	
9902 APPLIC MACRO	6 (BOOSTERPUMP)	2203 DECELER TIME 1	5.0 s	
1401 RELAY OUTPUT 1	7 (STARTED)	3207 SUPERV 3 PARAM	0103 (OUTPUT FREQ)	
1601 RUN ENABLE	2 (DI2)	4001 GAIN	1.0	
1609 START ENABLE 2	5 (DI5)	4002 INTEGRATION TIME	60.0 s	
2202 ACCELER TIME 1	5.0 s			

Pump Alternation

This macro configures for pump alternation applications, usually used in booster stations. To adjust/maintain pressure in the network, the speed of the one pump changes according to a signal received from a pressure transducer. When the variable speed pump reaches a maximum speed limit, auxiliary pumps start as needed. When using process PID, see "General Considerations" on page 30. To use more than one (the default) Auxiliary pump, see parameter group 81.

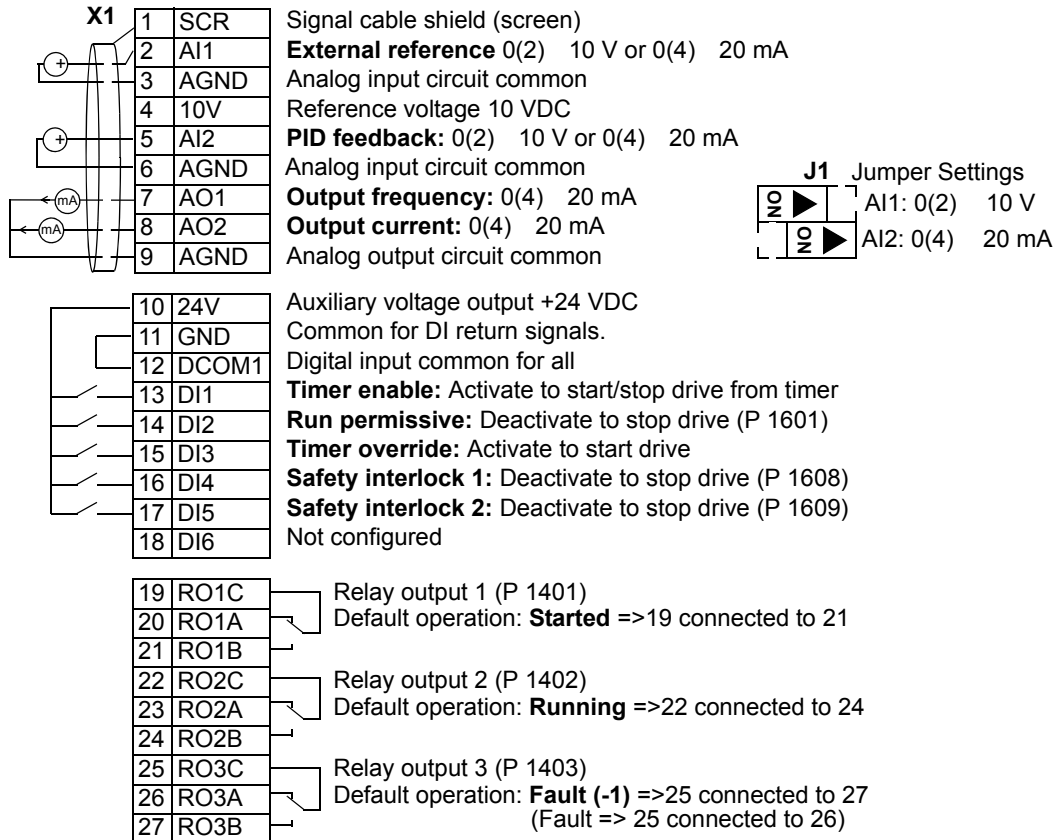


Parameters Changed Relative to HVAC Default						
Parameter		Value		Parameter	Value	
9902	APPLIC MACRO	7 (PUMPALTERN)		1609	START ENABLE 2	5 (DI5)
1105	REF1 MAX	62Hz/1860rpm		2208	EM DEC TIME	62HZ
1201	CONST SPEED SEL	0 (NOT SEL)		2202	ACCELER TIME 1	5.0 s
1401	RELAY OUTPUT 1	31 (PFA)		2203	DECELER TIME 1	5.0 s
1503	AO1 CONTENT MAX	62HZ		3207	SUPERV 3 PARAM	0103 (OUTPUT FREQ)
1508	AO2 CONTENT MIN	0.0%		4101	GAIN	1.0
1509	AO2 CONTENT MAX	100.0%		4102	INTEGRATION TIME	60.0 s
1601	RUN ENABLE	2 (DI2)		8123	PFA ENABLE	1 (ACTIVE)
1608	START ENABLE 1	0 (NOT SEL)				

Internal Timer

This macro configures for applications where a built-in timer starts and stops the motor. When the variable speed pump reaches a maximum speed limit, auxiliary pumps start as needed. When using direct speed reference in AUTO mode or process PID, see "General Considerations" on page 30.

Momentarily activating digital input 3 (DI3) provides a boost function which operates the motor. See group 36, Timer Functions, for more information on setting up timers.

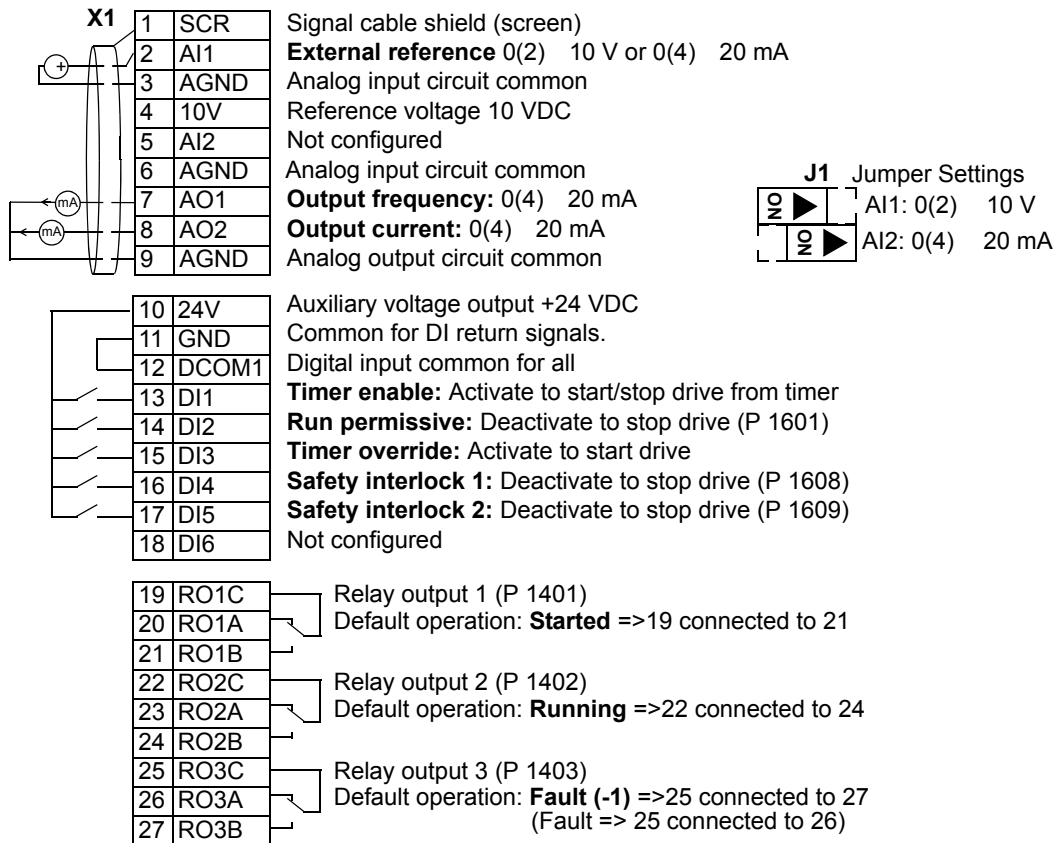


Parameters Changed Relative to HVAC Default						
Parameter		Value		Parameter		Value
9902	APPLIC MACRO	8 (INT TIMER)		1609	START ENABLE 2	5 (DI5)
1001	EXT1 COMMANDS	11 (TIMER1)		3207	SUPERV 3 PARAM	0103 (OUTPUT FREQ)
1002	EXT2 COMMANDS	11 (TIMER1)		3601	TIMERS ENABLE	1 (DI1)
1201	CONST SPEED SEL	0 (NOT SEL)		3622	BOOST SEL	3 (DI3)
1401	RELAY OUTPUT 1	7 (STARTED)		3626	TIMER 1 SRC	23 (B+P3+P2+P1)
1601	RUN ENABLE	2 (DI2)				

Internal Timer with Constant Speeds / PRV

This macro configures for applications such as a timed powered roof ventilator (PRV) which alternates between two constant speeds (constant speed 1 and 2) based on a built-in timer.

Momentarily activating digital input 3 (DI3) provides a boost function which operates the motor. See group 36, Timer Functions, for more information on setting up timers.

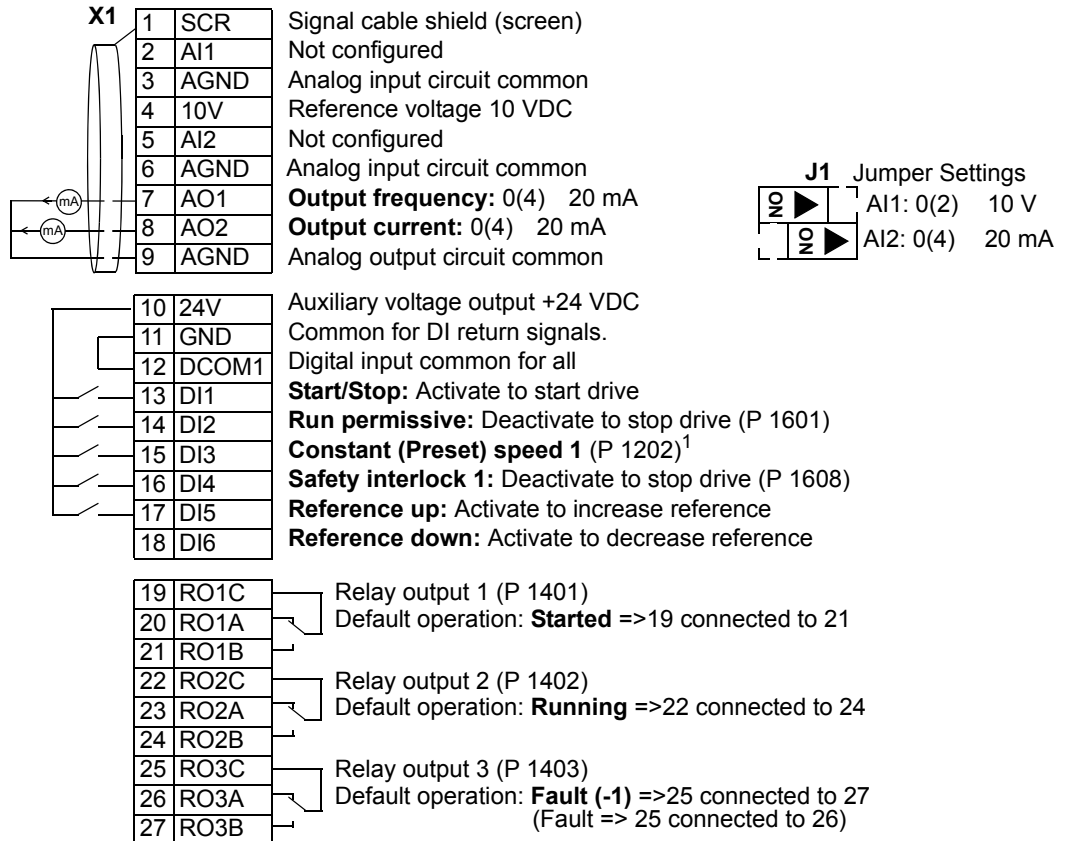


Parameters Changed Relative to HVAC Default					
Parameter		Value	Parameter		Value
9902	APPLIC MACRO	9 (INT TIMER CS)	3416	SIGNAL 3 MIN	-200.0%
1002	EXT2 COMMANDS	0 (NOT SEL)	3417	SIGNAL 3 MAX	200.0%
1103	REF1 SEL	0 (KEYPAD)	3419	OUTPUT 3 DSP UNIT	4 (%)
1106	REF3 SEL	2 (AI2)	3420	OUTPUT 3 MIN	-200.0%
1201	CONST SPEED SEL	15 (TIMER1)	3421	OUTPUT 3 MAX	200.0%
1301	MINIMUM AI1	0.0%	3622	BOOST SEL	3 (DI3)
1401	RELAY OUTPUT 1	7 (STARTED)	4001	GAIN	1.0
1601	RUN ENABLE	2 (DI2)	4002	INTEGRATION TIME	60.0 s
1609	START ENABLE 2	5 (DI5)	4101	GAIN	1.0
3207	SUPERV 3 PARAM	0103 (OUTPUT FREQ)	4102	INTEGRATION TIME	60.0 s
3415	SIGNAL 3 PARAM	0105 (TORQUE)	4110	SETPOINT SEL	1 (AI1)

Floating Point

This application macro is for applications where speed reference needs to be controlled through digital inputs (DI5 & DI6). By activating digital input 5, the speed reference increases, by activating digital input 6, the speed reference decreases. If both digital inputs are active or inactive, the reference does not change.

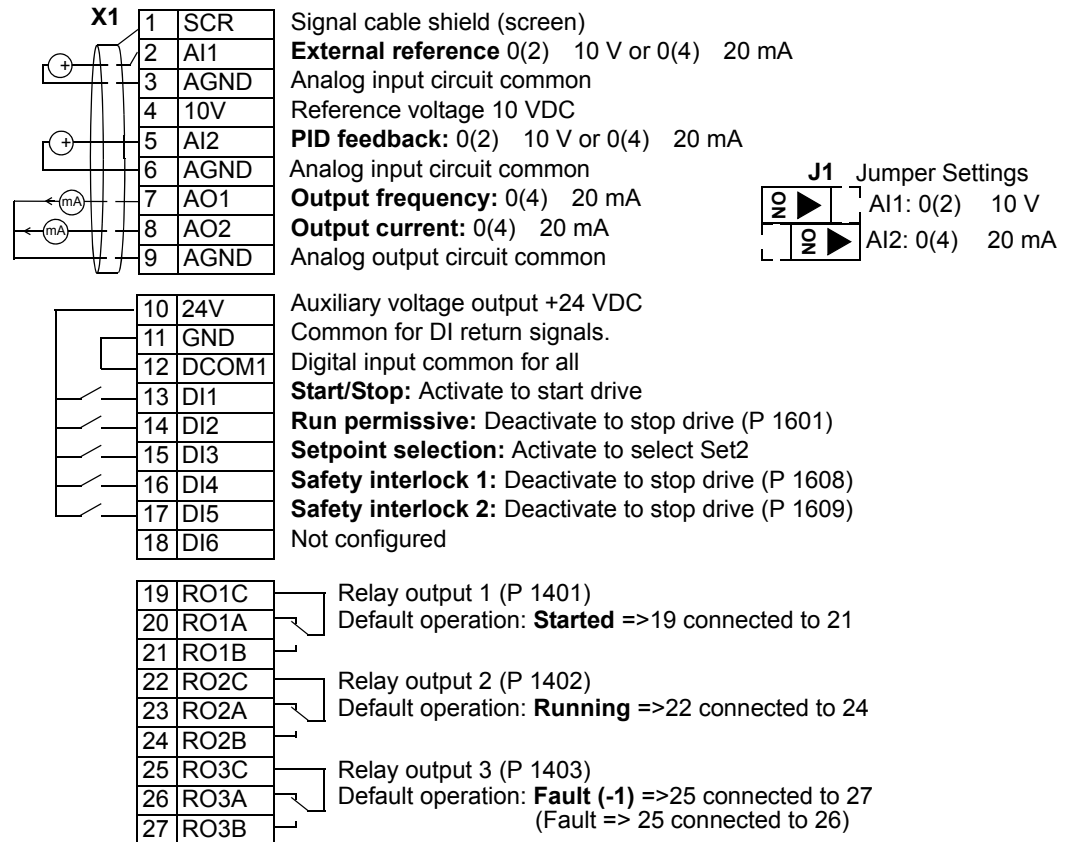
Note! When constant speed 1 is activated using digital input 3 (DI3), the reference speed is the value of parameter 1202. The value remains as the reference speed when digital input 3 is deactivated.



Parameters Changed Relative to HVAC Default					
Parameter		Value	Parameter		Value
9902	APPLIC MACRO	10 (FLOATINGPNT)	3416	SIGNAL 3 MIN	-200.0%
1103	REF1 SEL	7 (DI5U, 6D)	3417	SIGNAL 3 MAX	200.0%
1401	RELAY OUTPUT 1	7 (STARTED)	3419	OUTPUT 3 DSP UNIT	4 (%)
1601	RUN ENABLE	2 (DI2)	3420	OUTPUT 3 MIN	-200.0%
3207	SUPERV 3 PARAM	0103 (OUTPUT FREQ)	3421	OUTPUT 3 MAX	200.0%
3415	SIGNAL 3 PARAM	0105 (TORQUE)			

Dual Setpoint with PID

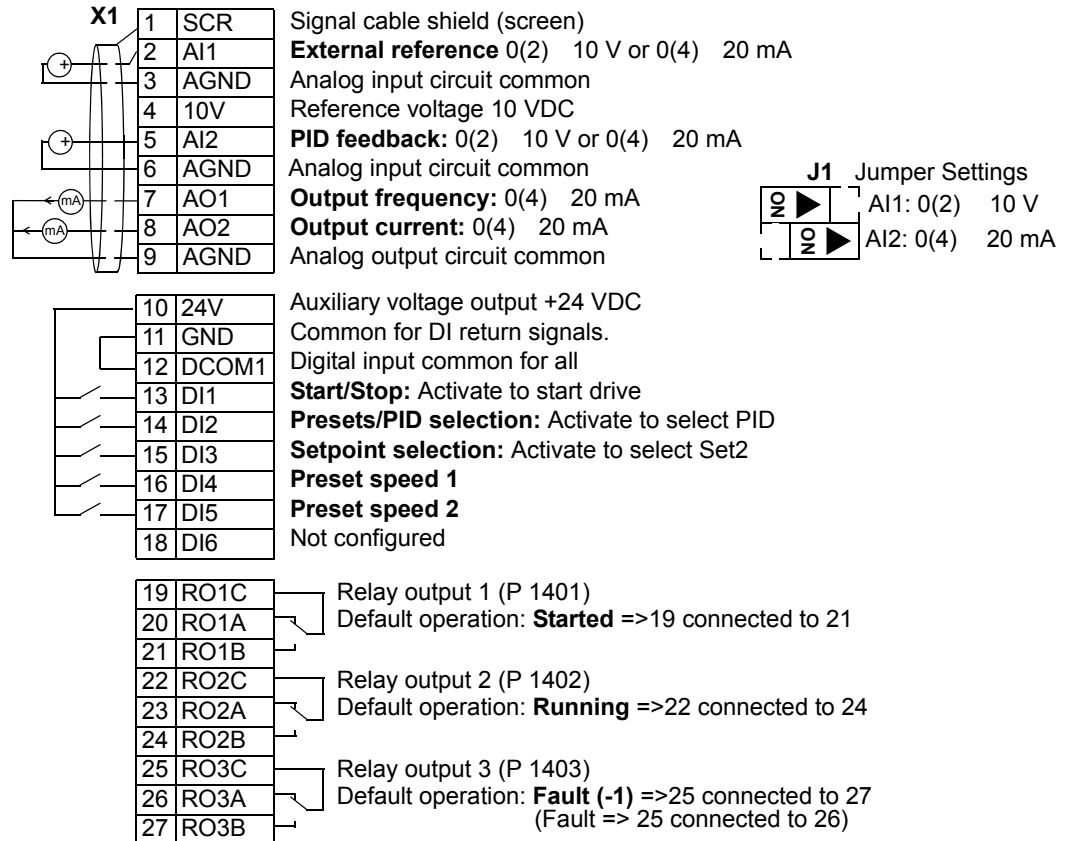
This macro configures for dual setpoint PID applications, where activating digital input 3 (DI3) changes the process PID controller's setpoint to another value. When using direct speed reference in AUTO mode or process PID, see "General Considerations" on page 30. Set process PID setpoints (internal to the drive) using parameters 4011 (SET1) and 4111 (SET2).



Parameters Changed Relative to HVAC Default						
Parameter		Value		Parameter	Value	
9902	APPLIC MACRO	11 (DUAL SETPNT)		4010	SETPOINT SEL	19 (INTERNAL)
1201	CONST SPEED SEL	0 (NOT SEL)		4011	INTERNAL SETPNT	50.0%
1401	RELAY OUTPUT 1	7 (STARTED)		4027	PID 1 PARAM SET	3 (DI3)
1601	RUN ENABLE	2 (DI2)		4110	SETPOINT SEL	19 (INTERNAL)
1609	START ENABLE 2	5 (DI5)		4111	INTERNAL SETPNT	100.0%
3207	SUPERV 3 PARAM	0103 (OUTPUT FREQ)				

Dual Setpoint with PID and Constant Speeds

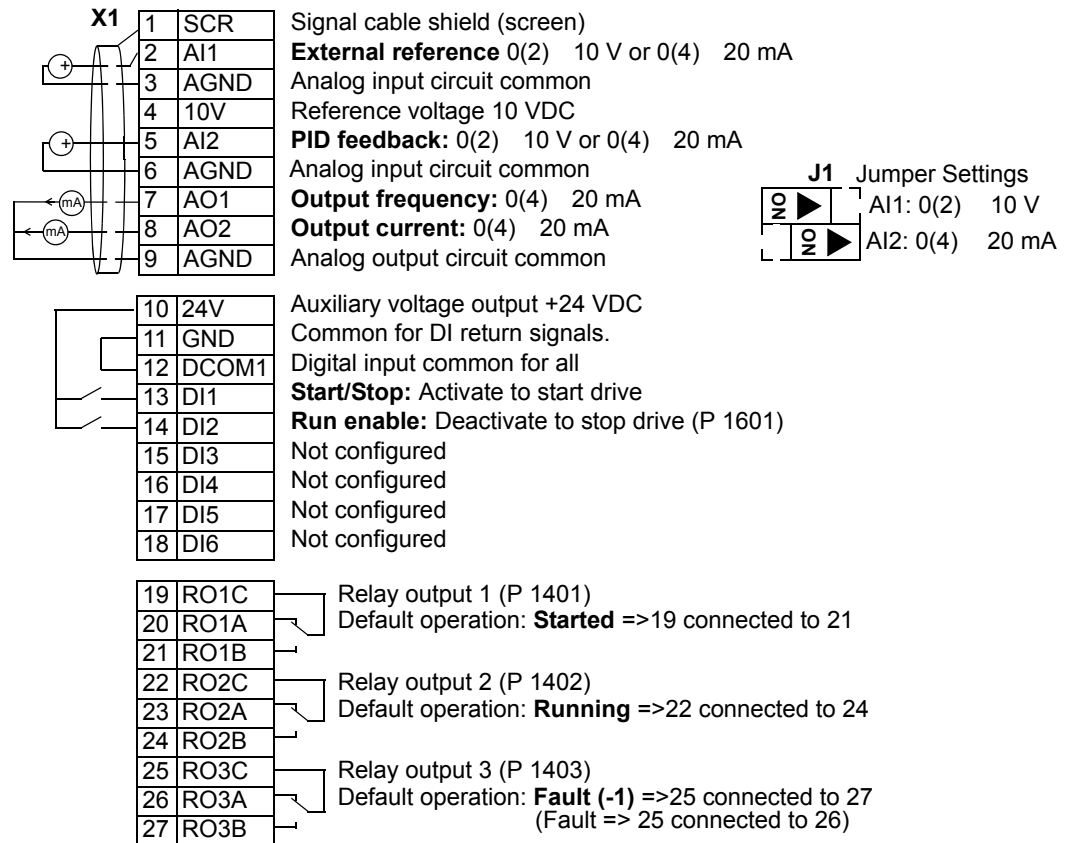
This macro configures for applications with 2 constant speeds, active PID and PID alternating between two setpoints using digital inputs. Set PID setpoints (internal to the drive) using parameters 4011 (SET1) and 4111 (SET2). The digital input DI3 selects the setpoints.



Parameters Changed Relative to HVAC Default				
Parameter	Value	Parameter	Value	
9902 APPLIC MACRO	12 (DUAL SPNTCS)	3207 SUPERV 3 PARAM	0103 (OUTPUT FREQ)	
1102 EXT1/EXT2 SEL	2 (DI2)	4001 GAIN	0.7	
1201 CONST SPEED SEL	11 (DI5, 6)	4002 INTEGRATION TIME	10.0 s	
1401 RELAY OUTPUT 1	7 (STARTED)	4010 SETPOINT SEL	19 (INTERNAL)	
1608 START ENABLE 1	0 (NOT SEL)	4011 INTERNAL SETPNT	50.0%	
2108 START INHIBIT	1 (ON)	4027 PID 1 PARAM SET	3 (DI3)	
2202 ACCELER TIME 1	10.0 s	4101 GAIN	0.7	
2203 DECELER TIME 1	10.0 s	4102 INTEGRATION TIME	10.0 s	
3105 AR OVERVOLTAGE	0 (DISABLE)	4110 SETPOINT SEL	19 (INTERNAL)	
3107 AR AI<MIN	0 (DISABLE)	4111 INTERNAL SETPNT	100.0%	

E-bypass

This macro configures for an Electronic Bypass device which can bypass the drive and connect the motor direct on-line. When using direct speed reference in AUTO mode or process PID, see "General Considerations" on page 30.

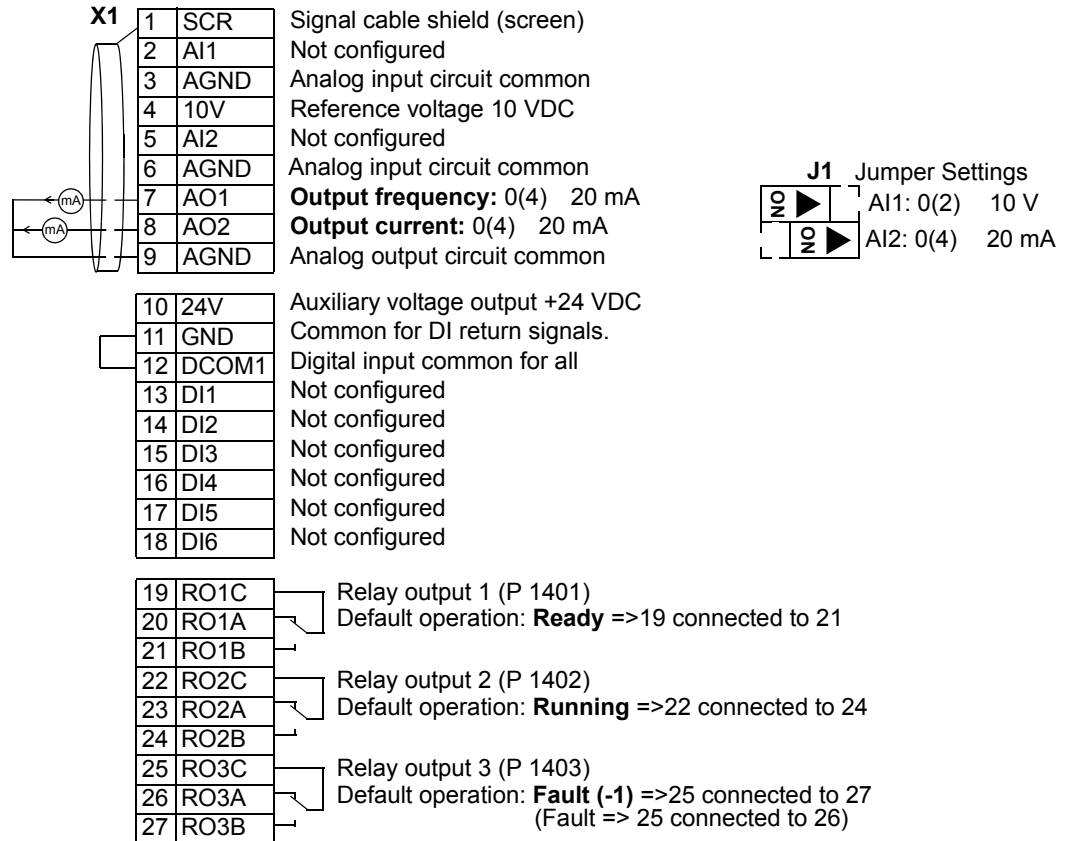


Parameters Changed Relative to HVAC Default			
Parameter	Value	Parameter	Value
9902 APPLIC MACRO	13 (E-BYPASS)	1608 START ENABLE 1	0 (NOT SEL)
1201 CONST SPEED SEL	0 (NOT SEL)	2108 START INHIBIT	1 (ON)
1401 RELAY OUTPUT 1	7 (STARTED)	3207 SUPERV 3 PARAM	0103 (OUTPUT FREQ)
1601 RUN ENABLE	2 (DI2)		

Note! Does not apply to YORK configured packages.

Hand Control

This macro configures for drive control using only the control panel with no automated control. Typically, this is a temporary configuration used prior to control wiring.



Parameters Changed Relative to HVAC Default					
Parameter		Value	Parameter		Value
9902	APPLIC MACRO	14 (HAND CONTROL)	3415	SIGNAL 3 PARAM	100 (NOT SEL)
1001	EXT1 COMMANDS	0 (NOT SEL)	3416	SIGNAL 3 MIN	(-)
1002	EXT2 COMMANDS	0 (NOT SEL)	3417	SIGNAL 3 MAX	(-)
1106	REF3 SEL	2 (AI2)	3418	OUTPUT 3 DSP FORM	(-)
1201	CONST SPEED SEL	0 (NOT SEL)	3419	OUTPUT 3 DSP UNIT	(-)
1301	MINIMUM AI1	0.0%	3420	OUTPUT 3 MIN	(-)
1304	MINIMUM AI2	0.0%	3421	OUTPUT 3 MAX	(-)
1401	RELAY OUTPUT 1	7 (STARTED)	4001	GAIN	1.0
1504	MINIMUM AO1	0.0mA	4002	INTEGRATION TIME	60.0 s
1510	MINIMUM AO2	0.0mA	4010	SETPOINT SEL	1 (AI1)
1601	RUN ENABLE	2 (DI2)	4101	GAIN	1.0
1608	START ENABLE 1	0 (NOT SEL)	4102	INTEGRATION TIME	60.0 s
2108	START INHIBIT	1 (ON)	4110	SETPOINT SEL	1 (AI1)
3207	SUPERV 3 PARAM	0103 (OUTPUT FREQ)	4210	SETPOINT SEL	1 (AI1)

YORK Defaults

GROUP 98 OPTIONS			GROUP 12 CONSTANT SPEEDS			GROUP 23 SPEED CONTROL					
9802	Comm Prot Sel	Not Sel	1201	Const Speed Sel	D3	2301	Prop Gain	3.00			
GROUP 99 START-UP DATA			1202	Const Speed 1	6.0 Hz	2302	Integration Time	2.50 s			
			1203	Const Speed 2	12.0 Hz	2303	Derivation Time	ms			
			1204	Const Speed 3	18.0 Hz	2304	Acc Compensation	0.00 s			
			1205	Const Speed 4	24.0 Hz	2305	Autotune Run	Off			
			1206	Const Speed 5	30.0 Hz	GROUP 24 TORQUE CONTROL					
			1207	Const Speed 6	48.0 Hz				2401	Torq Ramp Up	0.00 s
			1208	Const Speed 7	60.0 Hz				2402	Torq Ramp Down	0.00 s
			1209	Timed Mode Sel	CS1/CS2						
GROUP 01 OPERATING DATA			GROUP 13 ANALOG INPUTS			GROUP 25 CRITICAL SPEEDS					
			1301	Minimum AI1	20%	2501	Crit Speed Sel	Off			
			1302	Maximum AI1	100.0%	2502	Crit Speed 1 Lo	0.0 Hz			
			1303	Filter AI1	0.1 s	2503	Crit Speed 1 Hi	0.0 Hz			
			1304	Minimum AI2	20.0%	2504	Crit Speed 2 Lo	0.0 Hz			
			1305	Maximum AI2	100.0%	2505	Crit Speed 2 Hi	0.0 Hz			
			1306	Filter AI2	0.1 s	2506	Crit Speed 3 Lo	0.0 Hz			
						2507	Crit Speed 3 Hi	0.0 Hz			

YORK Defaults

GROUP 34 PANEL DISPLAY

3401	Signal1 Param	Output Freq
3402	Signal1 Min	0.0 Hz
3403	Signal1 Max	500.0 Hz
3404	Output1 Dsp Form	+0.0%
3405	Output1 Unit	%
3406	Output1 Min	0.0%
3407	Output1 Max	833.3%
3408	Signal2 Param	Current
3409	Signal2 Min	0.0 A
3410	Signal2 Max	1.1* A
3411	Output2 Dsp Form	+0.0
3412	Output2 Unit	A
3413	Output2 Min	0.0 A
3414	Output2 Max	1.1* A
3415	Signal3 Param	AI 1
3416	Signal3 Min	0.0%
3417	Signal3 Max	100.0%
3418	Output3 Dsp Form	+0.0
3419	Output3 Unit	mA
3420	Output3 Min	0.0 mA
3421	Output3 Max	20.0 mA

GROUP 35 MOTOR TEMP MEAS

3501	Sensor Type	None
3502	Input Selection	AI1
3503	Alarm Limit	0
3504	Fault Limit	0

GROUP 36 TIMED FUNCTIONS

3601	Timers Enable	Not Sel
3602	Start Time 1	12:00:00 AM
3603	Stop Time 1	12:00:00 AM
3604	Start Day 1	Monday
3605	Stop Day 1	Monday
3606	Start Time 2	12:00:00 AM
3607	Stop Time 2	12:00:00 AM
3608	Start Day 2	Monday
3609	Stop Day 2	Monday
3610	Start Time 3	12:00:00 AM
3611	Stop Time 3	12:00:00 AM
3612	Start Day 3	Monday
3613	Stop Day 3	Monday
3614	Start Time 4	12:00:00 AM
3615	Stop Time 4	12:00:00 AM
3616	Start Day 4	Monday
3617	Stop Day 4	Monday
3622	Boost Sel	Not Sel
3623	Boost Time	00:00:00
3626	Timer 1 Src	Not Sel
3627	Timer 2 Src	Not Sel
3628	Timer 3 Src	Not Sel
3629	Timer 3 Src	Not Sel

GROUP 40 PROCESS PID SET 1

4001	Gain	2.5
4002	Integration Time	3.0 s
4003	Derivation Time	0.0 s
4004	PID Derivation Filter	1.0 s
4005	Error Value Inv	No
4006	Units	%
4007	Unit Scale	1
4008	0% Value	0.0%
4009	100% Vluce	100.0%
4010	Set Point Sel	Keypad
4011	Internal Setpnt	40.0%
4012	Setpoint Min	0.0%
4013	Setpoint Max	100.0%
4014	Fbk Sel	Act1
4015	Fbk Multiplier	0.000
4016	Act1 Input	AI2
4017	Act2 Input	AI2
4018	Act1 Minimum	0%
4019	Act1 Maximum	100%
4020	Act2 Minimum	0%
4021	Act2 Maximum	100%
4022	Sleep Selection	Not Sel
4023	PID Sleep Level	0.0 Hz
4024	PID Sleep Delay	60.0 s
4025	Wake-Up Dev	0.0%
4026	Wake-Up Delay	0.50 s
4027	PID Param Set	Set 1

GROUP 41 PROCESS PID SET 2

4101	Gain	2.5
4102	Integration Time	3.0 s
4103	Derivation Time	0.0 s
4104	PID Deriv Filter	1.0 s
4105	Error Value Inv	No
4106	Units	%
4107	Unit Scale	0.0%
4108	% Value	0.0%
4109	100% Value	100.0%
4110	Set Point Set	Keypad
4111	Internal Setpnt	40.0%
4112	Setpoint Min	0.0%
4113	Setpoint Max	100.0%
4114	Fbk Sel	Act1
4115	Fbk Multiplier	0.000
4116	Act1 Input	AI2
4117	Act2 Input	0%
4118	Act1 Minimum	0%
4119	Act1 Maximum	100%
4120	Act2 Minimum	0%
4121	Act2 Maximum	100%
4122	Sleep Selection	Not Sel
4123	PID Sleep Level	0.0 Hz
4124	PID Sleep Delay	60.0 s
4125	Wake-Up Dev	0.0%
4126	Wake-Up Delay	0.50 s

GROUP 42 EXT/TRIM PID

4201	Gain	1.0
4202	Integration Time	60.0 s
4203	Derivation Time	0.0 s
4204	PID Deriv Time	1.0 s
4205	Error Value Inv	No
4206	Units	%
4207	Unit Scale	1
4208	9% Value	0.0%
4209	100% Value	100.0%
4210	Set Point Set	AI1
4211	Internal Setpnt	40.0%
4212	Setpoint Min	0.0%
4213	Setpoint Max	100.0%
4214	Fbk Sel	Act1
4215	Fbk Multiplier	0.000
4216	Act1 Input	AI2
4217	Act2 Input	AI2
4218	Act1 Minimum	0%
4219	Act1 Maximum	100%
4220	Act2 Minimum	0%
4221	Act2 Maximum	100%
4228	Activate	Not Sel
4229	Offset	0.0%
4230	Trim Mode	Not Sel
4231	Trim Scale	100.0%
4232	Correction Src	PID2ref

GROUP 51 EXT COMM MODULE

5101	FBA Type	Not Defined
5192	FBA Par 2...26	0
5127	FBA Par Refresh	Done
5128	FILE CPI FW Rev	0000 hex
5129	FILE Config ID	0000 hex
5130	FILE Config Rev	0000 hex
5131	FBA Status	Idle
5132	FBA CPIFW Rev	0000 hex
5133	FBA Appl FW Rev	0000 hex

GROUP 52 PANEL COMM

5201	Station ID	1
5202	Baud Rate	9.6 kb/s
5203	Parity	8N1
5204	OK Messages	0
5205	Parity Errors	0
5206	Frame Errors	0
5207	Buffer Overruns	0
5208	CRC Errors	0

GROUP 53 EFB PROTOCOL

5301	EFB Protocol ID	0000 hex
5302	EFB Station ID	1
5303	EFB Baud Rate	9.6 kb/s
5304	EFB Parity	8N1
5305	EFB Ctrl Profile	YORK Drives
5306	EFB OK Messages	0
5307	EFB CRC Errors	0
5308	EFB UART Errors	0
5309	EFB Status	Idle
5310	EFB Par 10-20	0

GROUP 81 PFC CONTROL

8103	Reference Step 1	0.0%
8104	Reference Step 2	0.0%
8105	Reference Step 3	0.0%
8109	Start Freq 1	60.0 Hz
8110	Start Freq 2	60.0 Hz
8111	Start Freq 3	60.0 Hz
8112	Low Freq 1	30.0 Hz
8113	Low Freq 2	30.0 Hz
8114	Low Freq 3	30.0 Hz
8115	Aux Mot Start D	5.0 s
8116	Aux Mot Stop D	3.0 s
8117	Nr Of Aux Mot	1
8118	Autochnng Interv	Not Sel
8119	Autochnng Level	50.0%
8120	Interlocks	DI4
8121	Reg Bypass Ctrl	No
8122	PFC Start Delay	0.50 s
8123	PFC Enable	Not Sel
8124	Acc in Aux Stop	Not Sel
8125	Dec in Aux Start	Not Sel
8126	Timed Autochnng	Not Sel
8127	Motors	2

Parameter Descriptions

Parameter data is specific to AYK550 firmware version 1.51.

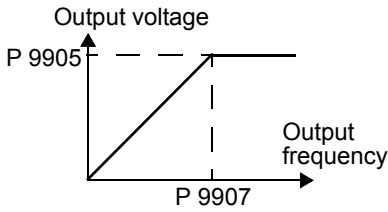
Group 99: Start-up Data

This group defines special Start-up data required to:

- Set up the drive.
- Enter motor information

Note! Parameters checked under the heading “S” can be modified only when the drive is stopped.

Group 99: Start-up Data					
Code	Description	Range	Resolution	Default	S
9901	LANGUAGE Selects the display language. 0 = ENGLISH 1 = ENGLISH (AM) 2 = DEUTSCH 3 = ITALIANO 4 = ESPAÑOL 5 = PORTUGUES 6 = NEDERLANDS 7 = FRANCAIS 8 = DANSK 9 = SUOMI 10 = SVENSKA	0...10	1	0	
9902	APPLIC MACRO Selects an application macro. Application macros automatically edit parameters to configure the AYK550 for a particular application. See "Application Macros" for application macro descriptions. 1 = HVAC DEFAULT 2 = SUPPLY FAN 3 = RETURN FAN 4 = COOLING TOWER FAN 5 = CONDENSER 6 = BOOSTER PUMP 7 = PUMP ALTERNATION 8 = INTERNAL TIMER 9 = INTERNAL TIMER WITH CONSTANT SPEEDS 10 = FLOATING POINT 11 = DUAL SETPOINT PID 12 = DUAL SETPOINT PID WITH CONSTANT SPEEDS 13 = E -BYPASS (Not used by YORK) 14 = HAND CONTROL	1...14	1	1	✓
9904	MOTOR CTRL MOD Selects the motor control mode. 1 = VECTOR: SPEED – sensorless vector control mode. (Not used in YORK HVAC applications) • Reference 1 is speed reference in rpm. • Reference 2 is speed reference in % (100% is absolute maximum speed, equal to the value of parameter 2002 MAXIMUM SPEED, or 2001 MINIMUM SPEED if the absolute value of the minimum speed is greater than the maximum speed). 3 = SCALAR: FREQ – scalar control mode. (Used for HVAC) • Reference 1 is frequency reference in Hz. • Reference 2 is frequency reference in % (100% is absolute maximum frequency, equal to the value of parameter 2008 MAXIMUM FREQUENCY, or 2007 MINIMUM FREQUENCY if the absolute value of the minimum speed is greater than the maximum speed).	1, 3	1	3	✓

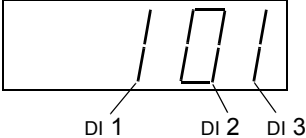
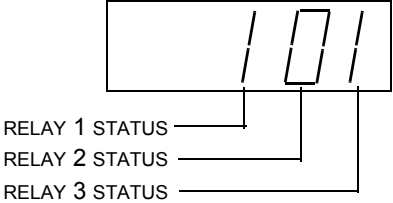
Group 99: Start-up Data					
Code	Description	Range	Resolution	Default	S
9905	MOTOR NOM VOLT Defines the nominal motor voltage. • Must equal the value on the motor rating plate. • Sets the maximum drive output voltage supplied to the motor. • The AYK550 cannot supply the motor with a voltage greater than the mains voltage.	230...690 V (US)	1 V	230 or 460 V (US)	✓
					
9906	MOTOR NOM CURR Defines the nominal motor current. Must equal the value on the motor rating plate. • Range allowed: $(0.2 \text{ } 2.0) \cdot I_N$ (where I_N is drive current).	$0.15 \cdot I_{2N} \dots 1.5 \cdot I_{2N}$	0.1 A	$1.5 \cdot I_{2N}$ Set for Motor Nameplate FLA	✓
9907	MOTOR NOM FREQ Defines the nominal motor frequency. • Range: 10 500 Hz (typically 50 or 60 Hz) • Sets the frequency at which output voltage equals the MOTOR NOM VOLT. • Field weakening point = Norm freq * Supply Volt / Mot Nom Volt	10.0...500 Hz	0.1 Hz	60 Hz (US)	✓
9908	MOTOR NOM SPEED Defines the nominal motor speed. • Must equal the value on the motor rating plate.	50...18000 rpm	1 rpm	Set for Motor Nameplate RPM	✓
9909	MOTOR NOM POWER Defines the nominal motor power. • Must equal the value on the motor rating plate.	$0.15 \dots 1.5 \cdot P_N$	0.1 Hp	Set for Motor Nameplate HP	✓
9910	MOTOR ID RUN 0, 1 This parameter controls a self-calibration process called the Motor Id Run. During this process, the drive operates the motor in order to identify it's characteristics, and then optimizes control by creating a motor model. This motor model is especially effective when: • Operation point is near zero speed. • Operation requires a torque range above the motor nominal torque, over a wide speed range, and without any measured speed feedback (i.e. without a pulse encoder). If no Motor Id Run is performed, the drive uses a less detailed motor model created when the drive is first run. This "First Start" model is updated automatically* after any motor parameter is changed. To update the model, the drive magnetizes the motor for 10 to 15 seconds at zero speed. *Creating the "First Start model does require that either 9904 = 1 (VECTOR: SPEED), or 9904 = 3 (SCALAR: FREQ) and 2101 = 3 (SCALAR FLYSTART) or 5 (FLYSTART + TORQ BOOST). Note: Motor models work with internal parameters and user-defined motor parameters. In creating a model the drive does not change any user-defined parameters. 0 = OFF – Disables the Motor Id Run creation process. (Does not disable the operation of a motor model.) 1 = ON – Enables a Motor Id Run at the next start command. After run completion, this value automatically changes to 0.	0, 1	1	0	✓
	To perform a Motor Id Run: 1. De-couple load from motor (or otherwise reduce load to near zero). 2. Verify that motor operation is safe: • The run automatically operates the motor in the forward direction – confirm that forward rotation is safe. • The run automatically operates the motor at 50 80% of nominal speed – confirm that operation at these speeds is safe. 3. Check following parameters (if changed from factory settings): • 2001 MINIMUM SPEED ≤ 0 • 2002 MAXIMUM SPEED $> 80\%$ of motor rated speed. • 2003 MAX CURRENT $\geq 130\%$ of I_{2N} value. • The maximum torque (parameters 2014, 2017 and/or 2018) $> 50\%$. 4. At the Control Panel, select: • Select Parameters • Select Group 99 • Select Parameter 9910				

Note! Motor ID run not required on HVAC.

Group 01: Operating Data

This group contains drive operating data, including actual signals. The drive sets the values for actual signals, based on measurements or calculations. You cannot set these values.

Group 01: Operating Data					
Code	Description	Range	Resolution	Default	S
0102	SPEED The calculated speed of the motor (rpm).	0...30000 rpm	1 rpm	-	
0103	OUTPUT FREQ The frequency (Hz) applied to the motor. (Also shown by default in OUTPUT display.)	0.0...500.0 Hz	0.1 Hz	-	
0104	CURRENT The motor current, as measured by the AYK550. (Also shown by default in OUTPUT display.)	0.0...1.5*I _{2N}	0.1 A	-	
0105	TORQUE Output torque. Calculated value of torque on motor shaft in % of motor nominal torque.	-200...200%	0.1%	-	
0106	POWER The measured motor power in kW.	-1.5...1.5*P _N	0.1 kW	-	
0107	DC BUS VOLTAGE The DC bus voltage in VDC, as measured by the AYK550.	0...2.5*V _{dN}	1 V	-	
0109	OUTPUT VOLTAGE The voltage applied to the motor.	0...2.0*V _{dN}	1 V	-	
0110	DRIVE TEMP The temperature of the drive heatsink in Centigrade.	0...150 °C	0.1 °C	-	
0111	EXTERNAL REF 1 External reference, REF1, in rpm or Hz – units determined by parameter 9904.	0...30000 rpm / 0...500 Hz	1 rpm / 0.1 Hz	-	
0112	EXTERNAL REF 2 External reference, REF2, in %.	0...100% (torque: 0...600%)	0.1%	-	
0113	CTRL LOCATION Active control location. Alternatives are: 0 = HAND 1 = EXT1 2 = EXT2	0...2	1	-	
0114	RUN TIME (R) The drive's accumulated running time in hours (h). • Can be reset by pressing UP and DOWN buttons simultaneously when in parameter set mode.	0...9999 h	1 h	0 h	
0115	KWH COUNTER (R) The drive's accumulated power consumption in kilowatt hours. • Can be reset by pressing UP and DOWN buttons simultaneously when in parameter set mode.	0...9999 kWh	1 kWh	-	
0116	APPL BLK OUTPUT Application block output signal. Value is from either: • PFA control, if PFA Control is active, or • Parameter 0112 EXTERNAL REF 2.	0...100% (torque: 0...600%)	0.1%	-	

Group 01: Operating Data					
Code	Description	Range	Resolution	Default	S
0118	DI1-3 STATUS Status of the three digital inputs. • Status is displayed as a binary number. • 1 indicates that the input is activated. • 0 indicates that the input is deactivated.	000...111 (0...7 decimal)	1	-	
					
0119	DI4-6 STATUS Status of the three digital inputs. • See parameter 0118 DI1-3 STATUS.	000...111 (0...7 decimal)	1	-	
0120	AI1 Relative value of analog input 1 in %.	0...100%	0.1%	-	
0121	AI2 The relative value of analog input 2 in %.	0...100%	0.1%	-	
0122	RO1-3 STATUS Status of the three relay outputs. • 1 indicates that the relay is energized. • 0 indicates that the relay is de-energized.	0...111 (0...7 decimal)	1	-	
					
0123	RO4-6 STATUS Status of the three relay outputs. See parameter 0122.	0...111 (0...7 decimal)	1	-	
0124	AO1 The analog output 1 value in milliamperes.	0...20 mA	0.1 mA	-	
0125	AO2 The analog output 2 value in milliamperes.	0...20 mA	0.1 mA	-	
0126	PID 1 OUTPPUT The PID Controller 1 output value in %.	-1000...1000%	0.1%	-	
0127	PID 2 OUTPUT The PID Controller 2 output value in %.	-100...100%	0.1%	-	
0128	PID 1 SETPNT The PID 1 controller setpoint signal. • Units and scale defined by PID parameters 4006/4106 & 4007/4107.	-	-	-	
0129	PID 2 SETPNT The PID 2 controller setpoint signal. • Units and scale defined by PID parameters 4206 & 4207.	-	-	-	
0130	PID 1 FBK The PID 1 controller feedback signal. • Units and scale defined by PID parameters 4006/4106 & 4007/4107.	-	-	-	

Group 01: Operating Data					
Code	Description	Range	Resolution	Default	S
0131	PID 2 FBK The PID 2 controller feedback signal. • Units and scale defined by PID parameters 4206 & 4207.	-	-	-	
0132	PID 1 DEVIATION The difference between the PID 1 controller reference value and actual value. • Units and scale defined by PID parameters 4006/4106 & 4007/4107.	-	-	-	
0133	PID 2 DEVIATION The difference between the PID 2 controller reference value and actual value. • Units and scale defined by PID parameters 4206 & 4207.	-	-	-	
0134	COMM RO WORD Free data location that can be written from serial link. • Used for relay output control. • See parameter 1401.	0...65535	1	0	
0135	COMM VALUE 1 Free data location that can be written from serial link.	-32768...+32767	1	0	
0136	COMM VALUE 2 Free data location that can be written from serial link.	-32768...+32767	1	0	
0137	PROCESS VAR 1 Process variable 1 • Defined by parameters in Group 34: Panel Display / Process Variables.	-	1		
0138	PROCESS VAR 2 Process variable 2 • Defined by parameters in Group 34: Panel Display / Process Variables.	-	1		
0139	PROCESS VAR 3 Process variable 3 • Defined by parameters in Group 34: Panel Display / Process Variables.	-	1		
0140	RUN TIME The drive's accumulated running time in thousands of hours (kh).	0...499.99 kh	0.01 kh	0 kh	
0141	MWH COUNTER The drive's accumulated power consumption in megawatt hours. Can not be reset.	0...9999 MWh	1 MWh	-	
0142	REVOLUTION CNTR The motor's accumulated revolutions in millions of revolutions.	0...9999	1	0	
0143	DRIVE ON TIME (HI) The drive's accumulated power on time in days.	0...65535 days	1 day	0	
0144	DRIVE ON TIME (LO) The drive's accumulated power on time in 2 second ticks (30 ticks = 60 seconds).	0...43200hh:mm:ss	2 s	0	
0145	MOTOR TEMP Motor temperature in degrees centigrade / PTC resistance in Ohms. • Applies only if motor temperature sensor is set up. See parameter 3501.	-10...200 °C/ 0...5000 Ohm / 0...1	1	0	
0150	CB TEMP The temperature of the drive control board in degrees C. Note! Some AYK550 drives have a control board that does not support this feature. These drives always show a fixed value of 25.0 degrees C.				

Group 03: Actual Signals

This group monitors fieldbus communications.

Group 03: Actual Signals

Code	Description	Range	Resolution	Default	S																																																			
0301	FB CMD WORD 1 Read-only copy of the Fieldbus Command Word 1. - The fieldbus command is the principal means for controlling the drive from a fieldbus controller. The command consists of two Command Words. Bit-coded instructions in the Command Words switch the drive between states. - To control the drive, using the Command Words, an external location (EXT1 or EXT2) must be active and set to COMM. (See parameters 1001 and 1002.) - The control panel displays the word in hex. For example, all zeros and a 1 in Bit 0 displays as 0001. All zeros and a 1 in Bit 15 displays as 8000 <table><tr><th>Bit #</th><th>0301, FB CMD WORD 1</th><th>0302, FB CMD WORD 2</th></tr><tr><td>0</td><td>STOP</td><td>FBLOCAL_CTL</td></tr><tr><td>1</td><td>START</td><td>FBLOCAL_REF</td></tr><tr><td>2</td><td>REVERSE</td><td>START_DISABLE1</td></tr><tr><td>3</td><td>LOCAL</td><td>START_DISABLE2</td></tr><tr><td>4</td><td>RESET</td><td>Reserved</td></tr><tr><td>5</td><td>EXT2</td><td>Reserved</td></tr><tr><td>6</td><td>RUN_DISABLE</td><td>Reserved</td></tr><tr><td>7</td><td>STPMODE_R</td><td>Reserved</td></tr><tr><td>8</td><td>STPMODE_EM</td><td>Reserved</td></tr><tr><td>9</td><td>STPMODE_C</td><td>Reserved</td></tr><tr><td>10</td><td>RAMP_2</td><td>Reserved</td></tr><tr><td>11</td><td>RAMP_OUT_0</td><td>REF_CONST</td></tr><tr><td>12</td><td>RAMP_HOLD</td><td>REF_AVE</td></tr><tr><td>13</td><td>RAMP_IN_0</td><td>LINK_ON</td></tr><tr><td>14</td><td>RREQ_LOCALLOC</td><td>REQ_STARTINH</td></tr><tr><td>15</td><td>TORQLIM2</td><td>OFF_INTERLOCK</td></tr></table>	Bit #	0301, FB CMD WORD 1	0302, FB CMD WORD 2	0	STOP	FBLOCAL_CTL	1	START	FBLOCAL_REF	2	REVERSE	START_DISABLE1	3	LOCAL	START_DISABLE2	4	RESET	Reserved	5	EXT2	Reserved	6	RUN_DISABLE	Reserved	7	STPMODE_R	Reserved	8	STPMODE_EM	Reserved	9	STPMODE_C	Reserved	10	RAMP_2	Reserved	11	RAMP_OUT_0	REF_CONST	12	RAMP_HOLD	REF_AVE	13	RAMP_IN_0	LINK_ON	14	RREQ_LOCALLOC	REQ_STARTINH	15	TORQLIM2	OFF_INTERLOCK	-	-	-	
Bit #	0301, FB CMD WORD 1	0302, FB CMD WORD 2																																																						
0	STOP	FBLOCAL_CTL																																																						
1	START	FBLOCAL_REF																																																						
2	REVERSE	START_DISABLE1																																																						
3	LOCAL	START_DISABLE2																																																						
4	RESET	Reserved																																																						
5	EXT2	Reserved																																																						
6	RUN_DISABLE	Reserved																																																						
7	STPMODE_R	Reserved																																																						
8	STPMODE_EM	Reserved																																																						
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14	RREQ_LOCALLOC	REQ_STARTINH																																																						
15	TORQLIM2	OFF_INTERLOCK																																																						
0302	FB CMD WORD 2 Read-only copy of the Fieldbus Command Word 2. See parameter 0301.	-	-	-																																																				

Group 03: Actual Signals

Code	Description	Range	Resolution	Default	S																																																			
0303	FB STS WORD 1 Read-only copy of the Status Word 1. The drive sends status information to the fieldbus controller. The status consists of two Status Words. <table> <tr> <th>Bit #</th> <th>0303, STS CMD WORD 1</th> <th>0304, FB STS WORD 2</th> </tr> <tr><td>0</td><td>READY</td><td>ALARM</td></tr> <tr><td>1</td><td>ENABLED</td><td>REQ_MAINT</td></tr> <tr><td>2</td><td>STARTED</td><td>DIRLOCK</td></tr> <tr><td>3</td><td>RUNNING</td><td>LOCALLOCK</td></tr> <tr><td>4</td><td>ZERO_SPEED</td><td>CTL_MODE</td></tr> <tr><td>5</td><td>ACCELERATE</td><td>Reserved</td></tr> <tr><td>6</td><td>DECELERATE</td><td>Reserved</td></tr> <tr><td>7</td><td>AT_SETPOINT</td><td>Reserved</td></tr> <tr><td>8</td><td>LIMIT</td><td>Reserved</td></tr> <tr><td>9</td><td>SUPERVISION</td><td>Reserved</td></tr> <tr><td>10</td><td>REV_REF</td><td>REQ_CTL</td></tr> <tr><td>11</td><td>REV_ACT</td><td>REQ_REF1</td></tr> <tr><td>12</td><td>PANEL_LOCAL</td><td>REQ_REF2</td></tr> <tr><td>13</td><td>FIELDDBUS_LOCAL</td><td>REQ_REF2EXT</td></tr> <tr><td>14</td><td>EXT2_ACT</td><td>ACK_STARTINH</td></tr> <tr><td>15</td><td>FAULT</td><td>ACK_OFF_ILCK</td></tr> </table>	Bit #	0303, STS CMD WORD 1	0304, FB STS WORD 2	0	READY	ALARM	1	ENABLED	REQ_MAINT	2	STARTED	DIRLOCK	3	RUNNING	LOCALLOCK	4	ZERO_SPEED	CTL_MODE	5	ACCELERATE	Reserved	6	DECELERATE	Reserved	7	AT_SETPOINT	Reserved	8	LIMIT	Reserved	9	SUPERVISION	Reserved	10	REV_REF	REQ_CTL	11	REV_ACT	REQ_REF1	12	PANEL_LOCAL	REQ_REF2	13	FIELDDBUS_LOCAL	REQ_REF2EXT	14	EXT2_ACT	ACK_STARTINH	15	FAULT	ACK_OFF_ILCK	-	1	- hex	
Bit #	0303, STS CMD WORD 1	0304, FB STS WORD 2																																																						
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11	REV_ACT	REQ_REF1																																																						
12	PANEL_LOCAL	REQ_REF2																																																						
13	FIELDDBUS_LOCAL	REQ_REF2EXT																																																						
14	EXT2_ACT	ACK_STARTINH																																																						
15	FAULT	ACK_OFF_ILCK																																																						
0304	FB STS WORD 2 Read-only copy of the Status Word 2. See parameter 0303.	-	1	- hex																																																				

Group 03: Actual Signals																																																																								
Code	Description	Range	Resolution	Default	S																																																																			
0305	FAULT WORD 1 Read-only copy of the Fault Word 1. - When a fault is active, the corresponding bit for the active fault is set in the Fault Words. - EAYK fault has a dedicated bit allocated within Fault Words. - See <i>"Fault Listing"</i> in section <i>"Diagnostics"</i> for a description of the faults. - The control panel displays the word in hex. For example, all zeros and a 1 in Bit 0 displays a 0001. All zeros and a 1 in Bit 15 displays as 8000.	-	1	0000 hex																																																																				
	<table><tr><th>Bit #</th><th>0305, FAULT WORD 1</th><th>0306, FAULT WORD 2</th><th>0307, FAULT WORD 3</th></tr><tr><td>0</td><td>OVERCURRENT</td><td>UNDERLOAD</td><td>EFB 1</td></tr><tr><td>1</td><td>DC OVERVOLT</td><td>THERM FAIL</td><td>EFB 2</td></tr><tr><td>2</td><td>DEV OVERTEMP</td><td>OPEX LINK</td><td>EFB 3</td></tr><tr><td>3</td><td>SHORT CIRC</td><td>OPEX PWR</td><td>Reserved</td></tr><tr><td>4</td><td>OVERLOAD</td><td>CURR MEAS</td><td>Reserved</td></tr><tr><td>5</td><td>DC UNDERVOLT</td><td>SUPPLY PHASE</td><td>Reserved</td></tr><tr><td>6</td><td>AI1 LOSS</td><td>Reserved</td><td>Reserved</td></tr><tr><td>7</td><td>AI2 LOSS</td><td>OVERSPEED</td><td>Reserved</td></tr><tr><td>8</td><td>MOT OVERTEMP</td><td>DC HIGH RUSH</td><td>Reserved</td></tr><tr><td>9</td><td>PANEL LOSS</td><td>DRIVE ID</td><td>Reserved</td></tr><tr><td>10</td><td>ID RUN FAIL</td><td>CONFIG FILE</td><td>Reserved</td></tr><tr><td>11</td><td>MOTOR STALL</td><td>SERIAL 1 ERR</td><td>System Error</td></tr><tr><td>12</td><td>Reserved</td><td>EFB CON FILE</td><td>System Error</td></tr><tr><td>13</td><td>EXT FLT 1</td><td>FORCE TRIP</td><td>System Error</td></tr><tr><td>14</td><td>EXT FLT 2</td><td>MOTOR PHASE</td><td>Hardware Error</td></tr><tr><td>15</td><td>EARTH FAULT</td><td>OUTPUT WIRING</td><td>Param. Setting Fault</td></tr></table>	Bit #	0305, FAULT WORD 1	0306, FAULT WORD 2	0307, FAULT WORD 3	0	OVERCURRENT	UNDERLOAD	EFB 1	1	DC OVERVOLT	THERM FAIL	EFB 2	2	DEV OVERTEMP	OPEX LINK	EFB 3	3	SHORT CIRC	OPEX PWR	Reserved	4	OVERLOAD	CURR MEAS	Reserved	5	DC UNDERVOLT	SUPPLY PHASE	Reserved	6	AI1 LOSS	Reserved	Reserved	7	AI2 LOSS	OVERSPEED	Reserved	8	MOT OVERTEMP	DC HIGH RUSH	Reserved	9	PANEL LOSS	DRIVE ID	Reserved	10	ID RUN FAIL	CONFIG FILE	Reserved	11	MOTOR STALL	SERIAL 1 ERR	System Error	12	Reserved	EFB CON FILE	System Error	13	EXT FLT 1	FORCE TRIP	System Error	14	EXT FLT 2	MOTOR PHASE	Hardware Error	15	EARTH FAULT	OUTPUT WIRING	Param. Setting Fault			
Bit #	0305, FAULT WORD 1	0306, FAULT WORD 2	0307, FAULT WORD 3																																																																					
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14	EXT FLT 2	MOTOR PHASE	Hardware Error																																																																					
15	EARTH FAULT	OUTPUT WIRING	Param. Setting Fault																																																																					
0306	FAULT WORD 2 Read-only copy of the Fault Word 2. See parameter 0305.	-	1	0000 hex																																																																				
0307	FAULT WORD 3 Read-only copy of the Fault Word 3. See parameter 0305.	-	1	0000 hex																																																																				

Group 03: Actual Signals

Code	Description	Range	Resolution	Default	S																																					
0308	ALARM WORD 1 Read-only copy of the ALARM WORD 1. - When a fault is active, the corresponding bit for the active fault is set in the Fault Words. - Each fault has a dedicated bit allocated within Fault Words. - Bits remain set until the whole alarm word is reset. (Reset by writing zero to the word). - The control panel displays the word in hex. For example, all zeros and a 1 in Bit 0 displays a 0001. All zeros and a 1 in Bit 15 displays as 8000. <table><tr><th>Bit #</th><th>0308, ALARM WORD 1</th><th>0309, ALARM WORD 2</th></tr><tr><td>0</td><td rowspan="3">Reserved</td><td>Reserved / OFFBUTTON 0*</td></tr><tr><td>1</td><td>PID SLEEP</td></tr><tr><td>2</td><td>ID RUN</td></tr><tr><td>3</td><td>DIR LOCK</td><td rowspan="12">Reserved</td></tr><tr><td>4</td><td>I/O COMM</td></tr><tr><td>5</td><td>AI1 LOSS</td></tr><tr><td>6</td><td>AI2 LOSS</td></tr><tr><td>7</td><td>PANEL LOSS</td></tr><tr><td>8</td><td>Reserved</td></tr><tr><td>9</td><td>MOT OVERTEMP</td></tr><tr><td>10</td><td>UNDERLOAD</td></tr><tr><td>11</td><td>MOTOR STALL</td></tr><tr><td>12</td><td>AUTORESET</td></tr><tr><td>13</td><td>AUTOCHANGE</td></tr><tr><td>14</td><td>PFA INTERLOCK</td></tr><tr><td>15</td><td>reserved BP LOSS</td></tr></table> * Applies only to HVAC drives.	Bit #	0308, ALARM WORD 1	0309, ALARM WORD 2	0	Reserved	Reserved / OFFBUTTON 0*	1	PID SLEEP	2	ID RUN	3	DIR LOCK	Reserved	4	I/O COMM	5	AI1 LOSS	6	AI2 LOSS	7	PANEL LOSS	8	Reserved	9	MOT OVERTEMP	10	UNDERLOAD	11	MOTOR STALL	12	AUTORESET	13	AUTOCHANGE	14	PFA INTERLOCK	15	reserved BP LOSS	-	1	0000 hex	
Bit #	0308, ALARM WORD 1	0309, ALARM WORD 2																																								
0	Reserved	Reserved / OFFBUTTON 0*																																								
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12	AUTORESET																																									
13	AUTOCHANGE																																									
14	PFA INTERLOCK																																									
15	reserved BP LOSS																																									
0309	ALARM WORD 2 Read-only copy of the ALARM WORD 3. See parameter 0308.	-	1	0000 hex																																						

Group 04: Fault History

This group stores a recent history of the faults reported by the drive.

Group 04: Fault History					
Code	Description	Range	Resolution	Default	S
0401	LAST FAULT 0 = Clear the fault history (on panel = NO RECORD). n = Fault code of the last recorded fault.	Fault code text	1	0	
0402	FAULT TIME 1 The day on which the last fault occurred. Either as: • A date – if real time clock is operating. • The number of days after power on – if real time clock is not used, or was not set.	Date dd.mm.yy / power-on days	1	0	
0403	FAULT TIME 2 The time at which the last fault occurred. Either as: • Real time, in format hh:mm:ss – if real time clock is operating. • The time since power on (less the whole days reported in 0402), in format hh:mm:ss – if real time clock is not used, or was not set.	Time hh:mm:ss	2 s	0	
0404	SPEED AT FLT The motor speed (rpm) at the time the last fault occurred.	-	1 rpm	0	
0405	FREQ AT FLT The frequency (Hz) at the time the last fault occurred.	-	0.1 Hz	0.0	
0406	VOLTAGE AT FLT The DC bus voltage (V) at the time the last fault occurred.	-	0.1 V	0.0	
0407	CURRENT AT FLT The motor current (A) at the time the last fault occurred.	-	0.1 A	0.0	
0408	TORQUE AT FLT The motor torque (%) at the time the last fault occurred.	-	0.1%	0.0	
0409	STATUS AT FLT The drive status (hex code word) at the time the last fault occurred.	-	1	0000 hex	
0410	DI1-3 AT FLT The status of digital inputs 1 3 at the time the last fault occurred.	000...111 (0...7 decimal)	1	000 bin	
0411	DI4-6 AT FLT The status of digital inputs 4 6 at the time the last fault occurred.	000...111 (0...7 decimal)	1	000 bin	
0412	PREVIOUS FAULT 1 Fault code of the second last fault. Read-only.	Fault code text	1	0	
0413	PREVIOUS FAULT 2 Fault code of the third last fault. Read-only.	Fault code text	1	0	

Group 10: Start/Stop/Dir

This group:

- Defines external sources (EXT1, and EXT2) for commands that enable start, stop and direction changes.
- Locks direction or enables direction control. To select between the two external locations use the next group, parameter 1102.

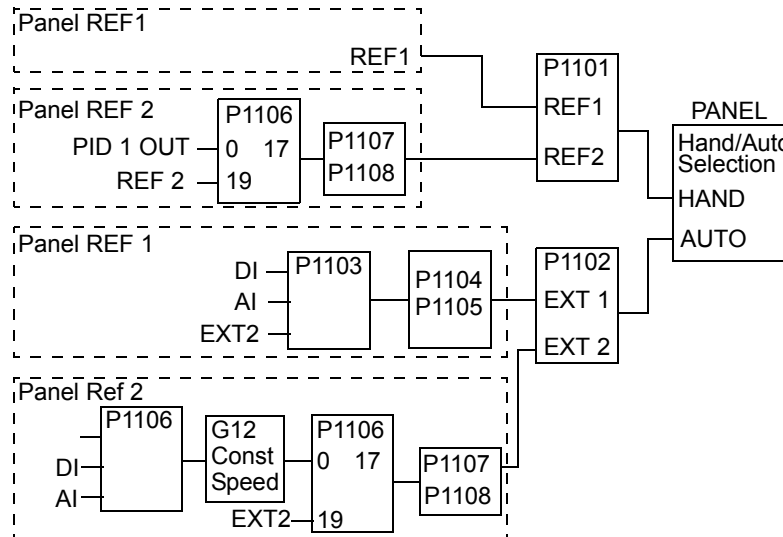
Group 10: AcStart/Stop?Dir					
Code	Description	Range	Resolution	Default	S
1001	EXT1 COMMANDS Defines external control location 1 (EXT1) – the configuration of start, stop and direction commands. 0 = NOT SEL – No external start, stop and direction command source. 1 = DI1 – Two-wire Start/Stop. • Start/Stop is through digital input DI1 (DI1 activated = Start; DI1 de-activated = Stop). • Parameter 1003 defines the direction. Selecting 1003 = 3 (request) is the same as 1003 = 1 (fwd). 2 = DI1, 2 – Two-wire Start/Stop, Direction. • Start/Stop is through digital input DI1 (DI1 activated = Start; DI1 de-activated = Stop). • Direction control (requires parameter 1003 = 3 (request)) is through digital input DI2 (DI2 activated = Reverse; de-activated = Forward). 3 = DI1P, 2P – Three-wire Start/Stop. • Start/Stop commands are through momentary push-buttons (the P stands for “pulse”). • Start is through a normally open push-button connected to digital input DI1. In order to start the drive, the digital input DI2 must be activated prior the pulse in DI1. • Connect multiple Start push-buttons in parallel. • Stop is through a normally closed push-button connected to digital input DI2. • Connect multiple Stop push-buttons in series. • Parameter 1003 defines the direction. Selecting 1003 = 3 (REQUEST) is the same as 1003 = 1 (FWD). 4 = DI1P, 2P, 3 – Three-wire Start/Stop, Direction. • Start/Stop commands are through momentary push-buttons, as described for DI1P, 2P. • Direction control (requires parameter 1003 = 3 (REQUEST)) is through digital input DI3 (DI3 activated = Reverse; de-activated = Forward).	0...14	1	1	✓
	5 = DI1P, 2P, 3P – Start Forward, Start Reverse, and Stop. • Start and Direction commands are given simultaneously with two separate momentary push-buttons (the P stands for “pulse”). • Start Forward command is through a normally open push-button connected to digital input DI1. In order to start the drive, the digital input DI3 must be activated during the pulse in DI1. • Start Reverse command is through a normally open push-button connected to digital input DI2. In order to start the drive, the digital input DI3 must be activated prior the pulse in DI2. • Connect multiple Start push-buttons in parallel. • Stop is through a normally closed push-button connected to digital input DI3. • Connect multiple Stop push-buttons in series. • Requires parameter 1003 = 3 (REQUEST). 6 = DI6 – Two-wire Start/Stop. • Start/Stop is through digital input DI6 (DI6 activated = Start; DI6 de-activated = Stop). • Parameter 1003 defines the direction. Selecting 1003 = 3 (REQUEST) is the same as 1003 = 1 (FWD). 7 = DI6, 5 – Two-wire Start/Stop/Direction. • Start/Stop is through digital input DI6 (DI6 activated = Start; DI6 de-activated = Stop). • Direction control (requires parameter 1003 = 3 (REQUEST)) is through digital input DI5 (DI5 activated = Reverse; de-activated = Forward). 8 = KEYPAD – Control Panel. • Start/Stop and Direction commands are through the control panel when EXT1 is active. • Direction control requires parameter 1003 = 3 (REQUEST). 9 = DI1F, 2R – Start/Stop/Direction commands through DI1 and DI2 combinations. • Start forward = DI1 activated and DI2 de-activated. • Start reverse = DI1 de-activated and DI2 activated. • Stop = both DI1 and DI2 activated, or both de-activated. • Requires parameter 1003 = 3 (REQUEST).				

Group 10: AcStart/Stop?Dir					
Code	Description	Range	Resolution	Default	S
	10 = COMM – Assigns the fieldbus Command Word as the source for the start/stop and direction commands. • Bits 0,1, 2 of Command Word 1 (parameter 0301) activates the start/stop and direction commands. • See Fieldbus user's manual for detailed instructions. 11 = TIMER 1. – Assigns Start/Stop control to Timer 1 (Timer activated = START; Timer de-activated = STOP). See Group 36, Timer Functions. 12 14 = TIMER 2 4 – Assigns Start/Stop control to Timer 2 4. See Timer Function 1 above.				
1002	EXT2 COMMANDS Defines external control location 2 (EXT2) – the configuration of start, stop and direction commands. • See parameter 1001 EXT1 COMMANDS above.	0...14	1	1	✓
1003	DIRECTION Defines the control of motor rotation direction. 1 = FORWARD – Rotation is fixed in the forward direction. 2 = REVERSE – Rotation is fixed in the reverse direction. 3 = REQUEST – Rotation direction can be changed on command.	1...3	1	1	✓

Group 11: Reference Select

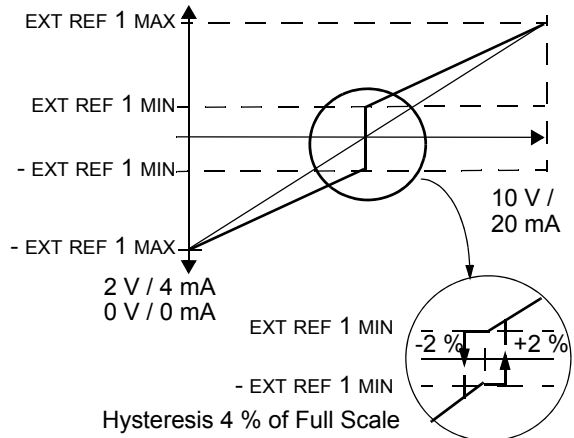
This group defines:

- How the drive selects between command sources.
- Characteristics and sources for REF1 and REF2.



Group 11: Reference Select					
Code	Description	Range	Resolution	Default	S
1101	KEYPAD REF SEL Selects the reference controlled in local control mode. 1 = REF1 (Hz/rpm) – Reference type depends on parameter 9904 MOTOR CTRL MODE. • Speed reference (rpm) if 9904 = 1 (VECTOR: SPEED). • Frequency reference (Hz) if 9904 = 3 (SCALAR; FREQ). 2 = REF2 (%)	1...2	1	1	
1102	EXT1/EXT2 SEL Defines the source for selecting between the two external control locations EXT1 or EXT2. Thus, defines the source for Start/Stop/Direction commands and reference signals. 0 = EXT1 – Selects external control location 1 (EXT1). • See parameter 1001 EXT1 COMMANDS for EXT1's Start/Stop/Dir definitions. • See parameter 1103 REF1 SELECT for EXT1's reference definitions. 1 = DI1 – Assigns control to EXT1 or EXT2 based on the state of DI1 (DI1 activated = EXT2; DI1 de-activated = EXT1). 2 6 = DI2 DI6 – Assigns control to EXT1 or EXT2 based on the state of the selected digital input. See DI1 above. 7 = EXT2 – Selects external control location 2 (EXT2). • See parameter 1002 EXT2 COMMANDS for EXT2's Start/Stop/Dir definitions. • See parameter 1106 REF2 SELECT for EXT2's reference definitions. 8 = COMM – Assigns control of the drive via external control location EXT1 or EXT2 based on the fieldbus control word. • Bit 5 of the Command Word 1 (parameter 0301) defines the active external control location (EXT1 or EXT2). • See Fieldbus user's manual for detailed instructions. 9 = TIMER 1 – Assigns control to EXT1 or EXT2 based on the state of the Timer (Timer activated = EXT2; Timer de-activated = EXT1). See Group 36, Timer Functions. 10 12 = TIMER 2 4 – Assigns control to EXT1 or EXT2 based on the state of the Timer. See Timer 1 above. -1 = DI1(INV) – Assigns control to EXT1 or EXT2 based on the state of DI1 (DI1 activated = EXT1; DI1 de-activated = EXT2). -2 -6 = DI2(INV) DI6(INV) – Assigns control to EXT1 or EXT2 based on the state of the selected digital input. See DI1(INV) above.	-6...12	1	0	✓

Group 11: Reference Select					
Code	Description	Range	Resolution	Default	S
1103	REF1 SELECT 0...17 1 1 ✓ Selects the signal source for external reference REF1. 0 = KEYPAD – Defines the control panel as the reference source. 1 = AI1 – Defines analog input 1 (AI1) as the reference source. 2 = AI2 – Defines analog input 2 (AI2) as the reference source. 3 = AI1/JOYST – Defines analog input 1 (AI1), configured for joystick operation, as the reference source. - The minimum input signal runs the drive at the maximum reference in the reverse direction. Define the minimum using parameter 1104. - The maximum input signal runs the drive at maximum reference in the forward direction. Define the maximum using parameter 1105. - Requires parameter 1003=3 (request). Warning! Because the low end of the reference range commands full reverse operation, do not use 0 V as the lower end of the reference range. Doing so means that if the control signal is lost (which is a 0 V input) the result is full reverse operation. Instead, use the following set-up so that loss of the analog input triggers a fault, stopping the drive: - Set parameter 1301 MINIMUM AI1 (1304 MINIMUM AI2) at 20% (2 V or 4 mA). - Set parameter 3021 AI1 FAULT LIMIT to a value 5% or higher. - Set parameter 3001 AI<MIN FUNCTION to 1 (FAULT). 4 = AI2/JOYST – Defines analog input 2 (AI2), configured for joystick operation, as the reference source. - See above (AI2/JOYST) description. 5 = DI3U,4D(R) – Defines digital inputs as the speed reference source (motor potentiometer control). - Digital input DI3 increases the speed (the U stands for “up”). - Digital input DI4 decreases the speed (the D stands for “down”). - A Stop command resets the reference to zero (the R stands for “reset”). - Parameter 2205 ACCELER TIME 2 controls the reference signal's rate of change. 6 = DI3U,4D – Same as above (DI3U,4D(R)), except: - A Stop command does not reset the reference to zero. The reference is stored. - When the drive restarts, the motor ramps up (at the selected acceleration rate) to the stored reference. 7 = DI5U,6D – Same as above (DI3U,4D), except that DI5 and DI6 are the digital inputs used. 8 = COMM – Defines the fieldbus as the reference source. 9 = COMM+AI1 – Defines a fieldbus and analog input 1 (AI1) combination as the reference source. See Analog Input Reference Correction below. 10 = COMM*AI1 – Defines a fieldbus and analog input 1 (AI1) combination as the reference source. See Analog Input Reference Correction below. 11 = DI3U, 4D(RNC) – Same as DI3U,4D(R) above, except that: - Changing the control source (EXT1 to EXT2, EXT2 to EXT1, LOC to REM) does not copy the reference. 12 = DI3U,4D(NC) – Same as DI3U,4D above, except that: - Changing the control source (EXT1 to EXT2, EXT2 to EXT1, LOC to REM) does not copy the reference. 13 = DI5U,6D(NC) – Same as DI3U,4D above, except that: - Changing the control source (EXT1 to EXT2, EXT2 to EXT1, LOC to REM) does not copy the reference. 14 = AI1+AI2 – Defines an analog input 1 (AI1) and analog input 2 (AI2) combination as the reference source. See Analog Input Reference Correction below. 15 = AI1*AI2 – Defines an analog input 1 (AI1) and analog input 2 (AI2) combination as the reference source. See Analog Input Reference Correction below. 16 = AI1-AI2 – Defines an analog input 1 (AI1) and analog input 2 (AI2) combination as the reference source. See Analog Input Reference Correction below. 17 = AI1/AI2 – Defines an analog input 1 (AI1) and analog input 2 (AI2) combination as the reference source. See Analog Input Reference Correction below.				



Group 11: Reference Select															
Code	Description	Range	Resolution	Default	S										
	Analog Input Reference Correction Parameter values 9, 10, and 14 17 use the formula in the following table.														
	<table><tr><th>Value Setting</th><th>AI reference is calculated as following:</th></tr><tr><td>C + B</td><td>C value + (B value - 50% of reference value)</td></tr><tr><td>C * B</td><td>C value * (B value / 50% of reference value)</td></tr><tr><td>C - B</td><td>(C value + 50% of reference value) - B value</td></tr><tr><td>C / B</td><td>(C value * 50% of reference value) / B value</td></tr></table>	Value Setting	AI reference is calculated as following:	C + B	C value + (B value - 50% of reference value)	C * B	C value * (B value / 50% of reference value)	C - B	(C value + 50% of reference value) - B value	C / B	(C value * 50% of reference value) / B value				
Value Setting	AI reference is calculated as following:														
C + B	C value + (B value - 50% of reference value)														
C * B	C value * (B value / 50% of reference value)														
C - B	(C value + 50% of reference value) - B value														
C / B	(C value * 50% of reference value) / B value														
	Where: • C = Main Reference value (= COMM for values 9, 10 and = AI1 for values 14 17). • B = Correcting reference (= AI1 for values 9, 10 and = AI2 for values 14 17).														
	Example: The figure shows the reference source curves for value settings 9, 10, and 14 17, where: • C = 25%. • P 4012 SETPOINT MIN = 0. • P 4013 SETPOINT MAX = 0. • B varies along the horizontal axis.														
1104	REF1 MIN	0.0...500.0 Hz 0...30000 rpm	0.1 Hz 1 rpm	0.0 Hz 0 rpm	YORK Default 15 Hz										
	Sets the minimum for external reference 1. • The minimum analog input signal (as a percent of the full signal in volts or amps) corresponds to REF1 MIN in Hz/rpm. • Parameter 1301 MINIMUM AI1 or 1304 MINIMUM AI2 sets the minimum analog input signal. • These parameters (reference and analog min. and max. settings) provide scale and offset adjustment for the reference.														
1105	REF1 MAX	0.0...500.0 Hz 0...30000 rpm	0.1 Hz 1 rpm	60.0 Hz (US) 1800 rpm (US)											
	Sets the maximum for external reference 1. • The maximum analog input signal (as a percent of full the signal in volts or amps) corresponds to REF1 MAX in Hz/rpm. • Parameter 1302 MAXIMUM AI1 or 1305 MAXIMUM AI2 sets the maximum analog input signal.														

Group 11: Reference Select					
Code	Description	Range	Resolution	Default	S
1106	REF2 SELECT Selects the signal source for external reference REF2. 0 17 – Same as for parameter 1103 REF1 SELECT. 19 = PID1OUT – The reference is taken from the PID1 output. See Groups 40 and 41.	0...19	1	19	✓
1107	REF2 MIN Sets the minimum for external reference 2. • The minimum analog input signal (in volts or amps) corresponds to REF2 MIN in %. • Parameter 1301 MINIMUM AI1 or 1304 MINIMUM AI2 sets the minimum analog input signal. • This parameter sets the minimum frequency reference. • The value is a percentage of the: – maximum frequency or speed – maximum process reference – nominal torque	0.0...100.0% (torque: 0...600%)	0.1%	0.0%	
1108	REF2 MAX Sets the maximum for external reference 2. • The maximum analog input signal (in volts or amps) corresponds to REF2 MAX in %. • Parameter 1302 MAXIMUM AI1 or 1305 MAXIMUM AI2 sets the maximum analog input signal. • This parameter sets the maximum frequency reference. • The value is a percentage of the: – maximum frequency or speed – maximum process reference – nominal torque	0.0...100.0% (torque: 0...600%)	0.1%	100.0%	

Group 12: Constant Speeds

This group defines a set of constant speeds. In general:

- You can program up to 7 constant speeds, ranging from 0 500 Hz or 0 30000 rpm.
- Values must be positive (No negative speed values for constant speeds).
- Constant speed selections are ignored if:
 - the torque control is active, or
 - the process PID reference is followed, or
 - the drive is in local control mode, or
 - PFA (Pump and Fan Alternation) is active

Note! Parameter 1208 CONST SPEED 7 acts also as a so-called fault speed which may be activated if the control signal is lost. Refer to parameter 3001 AI<MI FUNCTION and parameter 3002 PANEL COMM ERROR. For HVAC, do not set speeds over 60 Hz.

Group 12: Constant Speeds																				
Code	Description	Range	Resolution	Default	S															
1201	CONST SPEED SEL Defines the digital inputs used to select Constant Speeds. See general comments in the introduction. 0 = NOT SEL – Disables the constant speed function. 1 = DI1 – Selects Constant Speed 1 with digital input DI1. • Digital input activated = Constant Speed 1 activated. 2 6 = DI2 DI6 – Selects Constant Speed 1 with digital input DI2 DI6. See above. 7 = DI1,2 – Selects one of three Constant Speeds (1 3) using DI1 and DI2. • Uses two digital inputs, as defined below (0 = DI de-activated, 1 = DI activated): <table border="1"><thead><tr><th>DI1</th><th>DI2</th><th>Function</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>No constant speed</td></tr><tr><td>1</td><td>0</td><td>Constant speed 1 (1202)</td></tr><tr><td>0</td><td>1</td><td>Constant speed 2 (1203)</td></tr><tr><td>1</td><td>1</td><td>Constant speed 3 (1204)</td></tr></tbody></table> • Can be set up as a so-called fault speed, which is activated if the control signal is lost. Refer to parameter 3001 AI<MIN function and parameter 3002 PANEL COMM ERR. 8 = DI2,3 – Selects one of three Constant Speeds (1 3) using DI2 and DI3. • See above (DI1,2) for code. 9 = DI3,4 – Selects one of three Constant Speeds (1 3) using DI3 and DI4. • See above (DI1,2) for code. 10 = DI4,5 – Selects one of three Constant Speeds (1 3) using DI4 and DI5. • See above (DI1,2) for code. 11 = DI5,6 – Selects one of three Constant Speeds (1 3) using DI5 and DI6. • See above (DI1,2) for code.	DI1	DI2	Function	0	0	No constant speed	1	0	Constant speed 1 (1202)	0	1	Constant speed 2 (1203)	1	1	Constant speed 3 (1204)	-14 ...19	1	3	✓
DI1	DI2	Function																		
0	0	No constant speed																		
1	0	Constant speed 1 (1202)																		
0	1	Constant speed 2 (1203)																		
1	1	Constant speed 3 (1204)																		

Group 12: Constant Speeds

Code	Description	Range	Resolution	Default	S																																				
	12 = DI1,2,3 – Selects one of seven Constant Speeds (1 7) using DI1, DI2 and DI3. • Uses three digital inputs, as defined below (0 = DI de-activated, 1 = DI activated):																																								
	<table><tr><th>DI1</th><th>DI2</th><th>DI3</th><th>Function</th></tr><tr><td>0</td><td>0</td><td>0</td><td>No constant speed</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Constant speed 1 (1202)</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Constant speed 2 (1203)</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Constant speed 3 (1204)</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Constant speed 4 (1205)</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Constant speed 5 (1206)</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Constant speed 6 (1207)</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Constant speed 7 (1208)</td></tr></table>	DI1	DI2	DI3	Function	0	0	0	No constant speed	1	0	0	Constant speed 1 (1202)	0	1	0	Constant speed 2 (1203)	1	1	0	Constant speed 3 (1204)	0	0	1	Constant speed 4 (1205)	1	0	1	Constant speed 5 (1206)	0	1	1	Constant speed 6 (1207)	1	1	1	Constant speed 7 (1208)				
DI1	DI2	DI3	Function																																						
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1	0	0	Constant speed 1 (1202)																																						
0	1	0	Constant speed 2 (1203)																																						
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1	0	1	Constant speed 5 (1206)																																						
0	1	1	Constant speed 6 (1207)																																						
1	1	1	Constant speed 7 (1208)																																						
	13 = DI3,4,5 – Selects one of seven Constant Speeds (1 7) using DI3, DI4 and DI5. • See above (DI1,2,3) for code.																																								
	14 = DI4,5,6 – Selects one of seven Constant Speeds (1 7) using DI5, DI6 and DI7. • See above (DI1,2,3) for code.																																								
	15 18 = TIMER 1 4 – Specifies the timer used to select a Constant Speed as the reference. The reference selection depends on the state of the selected timer, and the value of 1209 TIMED MODE SEL. See table. To enable and set timers, see Group 36, Timer Functions.																																								
	<table><tr><th>1201 =</th><th>15</th><th>16</th><th>17</th><th>18</th><th colspan="2">Reference</th></tr><tr><th>Timer:</th><th>1</th><th>2</th><th>3</th><th>4</th><th>1209 = 1</th><th>1209 = 2</th></tr><tr><td>Timer State</td><td>0</td><td></td><td></td><td></td><td>External reference</td><td>Constant Speed 1</td></tr><tr><td></td><td>1</td><td></td><td></td><td></td><td>Constant Speed 1</td><td>Constant Speed 2</td></tr></table>	1201 =	15	16	17	18	Reference		Timer:	1	2	3	4	1209 = 1	1209 = 2	Timer State	0				External reference	Constant Speed 1		1				Constant Speed 1	Constant Speed 2												
1201 =	15	16	17	18	Reference																																				
Timer:	1	2	3	4	1209 = 1	1209 = 2																																			
Timer State	0				External reference	Constant Speed 1																																			
	1				Constant Speed 1	Constant Speed 2																																			
	19 = TIMER 1&2 – Specifies that Timers 1 and 2 are used together to select a Constant Speed as the reference. The reference selection depends on the states of these timers, and the value of 1209 TIMED MODE SEL. See table. To enable and set timers, see Group 36, Timer Functions.																																								
	<table><tr><th colspan="2">1201 = 19</th><th colspan="2">Reference</th></tr><tr><th>Timer 1</th><th>Timer 2</th><th colspan="2"></th></tr><tr><th>(used together)</th><th></th><th>1209 = 1</th><th>1209 = 2</th></tr><tr><td>0</td><td>0</td><td>External reference</td><td>Constant Speed 1</td></tr><tr><td>1</td><td>0</td><td>Constant Speed 1</td><td>Constant Speed 2</td></tr><tr><td>0</td><td>1</td><td>Constant Speed 2</td><td>Constant Speed 3</td></tr><tr><td>1</td><td>1</td><td>Constant Speed 3</td><td>Constant Speed 4</td></tr></table>	1201 = 19		Reference		Timer 1	Timer 2			(used together)		1209 = 1	1209 = 2	0	0	External reference	Constant Speed 1	1	0	Constant Speed 1	Constant Speed 2	0	1	Constant Speed 2	Constant Speed 3	1	1	Constant Speed 3	Constant Speed 4												
1201 = 19		Reference																																							
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0	0	External reference	Constant Speed 1																																						
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0	1	Constant Speed 2	Constant Speed 3																																						
1	1	Constant Speed 3	Constant Speed 4																																						
	-1 = DI1(INV) – Selects Constant Speed 1 with digital input DI1. • Inverse operation: Digital input de-activated = Constant Speed 1 activated.																																								
	-2 - 6 = DI2(INV) DI6(INV) – Selects Constant Speed 1 with digital input. See above.																																								
	-7 = DI1,2(INV) – Selects one of three Constant Speeds (1 3) using DI1 and DI2. • Inverse operation uses two digital inputs, as defined below (0 = DI de-activated, 1 = DI activated):																																								
	<table><tr><th>DI1</th><th>DI2</th><th>Function</th></tr><tr><td>1</td><td>1</td><td>No constant speed</td></tr><tr><td>0</td><td>1</td><td>Constant speed 1 (1202)</td></tr><tr><td>1</td><td>0</td><td>Constant speed 2 (1203)</td></tr><tr><td>0</td><td>0</td><td>Constant speed 3 (1204)</td></tr></table>	DI1	DI2	Function	1	1	No constant speed	0	1	Constant speed 1 (1202)	1	0	Constant speed 2 (1203)	0	0	Constant speed 3 (1204)																									
DI1	DI2	Function																																							
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1	0	Constant speed 2 (1203)																																							
0	0	Constant speed 3 (1204)																																							
	-8 = DI2,3(INV) – Selects one of three Constant Speeds (1 3) using DI2 and DI3. • See above (DI1,2(INV)) for code.																																								
	-9 = DI3,4(INV) – Selects one of three Constant Speeds (1 3) using DI3 and DI4. • See above (DI1,2(INV)) for code.																																								
	-10 = DI4,5(INV) – Selects one of three Constant Speeds (1 3) using DI4 and DI5. • See above (DI1,2(INV)) for code.																																								
	-11 = DI5,6(INV) – Selects one of three Constant Speeds (1 3) using DI5 and DI6. • See above (DI1,2(INV)) for code.																																								

Group 12: Constant Speeds																																									
Code	Description	Range	Resolution	Default	S																																				
	-12 = DI1,2,3(INV) – Selects one of seven Constant Speeds (1 7) using DI1, DI2 and DI3. - Inverse operation uses three digital inputs, as defined below (0 = DI de-activated, 1 = DI activated): <table><tr><th>DI1</th><th>DI2</th><th>DI3</th><th>Function</th></tr><tr><td>1</td><td>1</td><td>1</td><td>No constant speed</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Constant speed 1 (1202)</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Constant speed 2 (1203)</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Constant speed 3 (1204)</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Constant speed 4 (1205)</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Constant speed 5 (1206)</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Constant speed 6 (1207)</td></tr><tr><td>0</td><td>0</td><td>0</td><td>Constant speed 7 (1208)</td></tr></table> -13 = DI3,4,5(INV) – Selects one of seven Constant Speeds (1 3) using DI3, DI4 and DI5. - See above (DI1,2,3(INV)) for code. -14 = DI4,5,6(INV) – Selects one of seven Constant Speeds (1 3) using DI4, DI5 and DI6. - See above (DI1,2,3(INV)) for code.					DI1	DI2	DI3	Function	1	1	1	No constant speed	0	1	1	Constant speed 1 (1202)	1	0	1	Constant speed 2 (1203)	0	0	1	Constant speed 3 (1204)	1	1	0	Constant speed 4 (1205)	0	1	0	Constant speed 5 (1206)	1	0	0	Constant speed 6 (1207)	0	0	0	Constant speed 7 (1208)
DI1	DI2	DI3	Function																																						
1	1	1	No constant speed																																						
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1	0	1	Constant speed 2 (1203)																																						
0	0	1	Constant speed 3 (1204)																																						
1	1	0	Constant speed 4 (1205)																																						
0	1	0	Constant speed 5 (1206)																																						
1	0	0	Constant speed 6 (1207)																																						
0	0	0	Constant speed 7 (1208)																																						
1202	CONST SPEED 1	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	360 (US)/ 6.0 (US)																																					
	Sets value for Constant Speed 1. - The range and units depend on parameter 9904 MOTOR CTRL MODE. - Range: 0 30000 rpm when 9904 = 1 (VECTOR: SPEED). - Range: 0 500 Hz when 9904 = 3 (SCALAR: FREQ).																																								
1203	CONST SPEED 2	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	360 (US)/ 12.0 (US)																																					
	Sets a value for a Constant Speed. (See CONST SPEED 1 above.)																																								
1204	CONST SPEED 3	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	720 (US)/ 18.0 (US)																																					
1205	CONST SPEED 3	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	1080 (US)/ 18.0 (US)																																					
	Sets a value for a Constant Speed. (See CONST SPEED 1 above.)																																								
1206	CONST SPEED 3	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	1440 (US)/ 24.0 (US)																																					
	Sets a value for a Constant Speed. (See CONST SPEED 1 above.)																																								
1207	CONST SPEED 3	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	1800 (US)/ 30.0 (US)																																					
	Sets a value for a Constant Speed. (See CONST SPEED 1 above.)																																								
1208	CONST SPEED 3	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	2880 (US)/ 48.0 (US)																																					
	Sets a value for a Constant Speed. (See CONST SPEED 1 above.)																																								
1209	TIMED MODE SEL	1...2	1	2	✓																																				
	Uses the timer(s) specified by parameter 1201, values 15 19, to override the reference defined in Group 11, Reference Select. This override applies only if the timer function is enabled (parameter 3601). 1 = EXT/CS1/2/3 – The state of the timer(s) specified by param 1201, values 15 19, determines the reference used. See tables in 1201 at appropriate value. 2 = CS1/2/3/4 – The state of the timer(s) specified by param 1201, values 15 19, determines the reference used. See tables in 1201 at appropriate value.																																								

Group 13: Analog Inputs

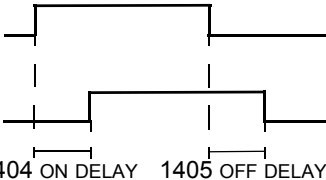
This group defines the limits and the filtering for analog inputs.

Group 13: Analog Inputs					
Code	Description	Range	Resolution	Default	S
1301	MINIMUM AI1 Defines the minimum value of the analog input. - Define value as a percent of the full analog signal range. See example below. - The minimum analog input signal corresponds to 1104 REF1 MIN or 1107 REF2 MIN. - MINIMUM AI cannot be greater than MAXIMUM AI. - These parameters (reference and analog min. and max. settings) provide scale and offset adjustment for the reference. - See figure at parameter 1104. Example. To set the minimum analog input value to 4 mA: - Configure the analog input for 0 – 20 mA current signal. - Calculate the minimum (4 mA) as a percent of full range (20 mA) = $4 \text{ mA} / 20 \text{ mA} * 100\% = 20\%$	0.0...100.0%	0.1%	20.0%	
1302	MAXIMUM AI1 Defines the maximum value of the analog input. - Define value as a percent of the full analog signal range. - The maximum analog input signal corresponds to 1105 REF1 MAX or 1108 REF2 MAX. - See figure at parameter 1104.	0.0...100.0%	0.1%	100.0%	
1303	FILTER AI1 Defines the filter time constant for analog input 1 (AI1). The filtered signal reaches 63% of a step change within the time specified.	0.0...10.0 s	0.1 s	0.1 s	
1304	MINIMUM AI2 Defines the minimum value of the analog input. See MINIMUM AI1 above.	0.0...100.0%	0.1%	20.0%	
1305	MAXIMUM AI2 Defines the maximum value of the analog input. See MAXIMUM AI1 above.	0.0...100.0%	0.1%	100.0%	
1306	FILTER AI2 Defines the filter time constant for analog input 2 (AI2). See FILTER AI1 above.	0.0...10.0 s	0.1 s	0.1 s	

Group 14: Relay Outputs

This group defines the condition that activates each of the relay outputs.

Group 14: Relay Outputs					
Code	Description	Range	Resolution	Default	S
1401	RELAY OUTPUT 1 Defines the event or condition that activates relay 1 – what relay output 1 means. 0 = NOT SEL – Relay is not used and is de-energized. 1 = READY – Energize relay when drive is ready to function. Requires: • Run enable signal present. • No faults exist. • Supply voltage is within range. • Emergency Stop command is not on. 2 = RUN – Energize relay when the drive is running. 3 = FAULT (-1) – Energize relay when power is applied. De-energizes when a fault occurs. 4 = FAULT – Energize relay when a fault is active. 5 = ALARM – Energize relay when an alarm is active. 6 = REVERSED – Energize relay when motor rotates in reverse direction. 7 = STARTED – Energize relay when drive receives a start command (even if Run Enable signal is not present). De-energized relay when drive receives a stop command or a fault occurs. 8 = SUPRV1 OVER – Energize relay when first supervised parameter (3201) exceeds the limit (3203). • See "Group 32: Supervision" starting on page 98. 9 = suprv1 under – Energize relay when first supervised parameter (3201) drops below the limit (3202). • See "Group 32: Supervision" starting on page 98. 10 = suprv2 over – Energize relay when second supervised parameter (3204) exceeds the limit (3206). • See "Group 32: Supervision" starting on page 98. 11 = suprv2 under – Energize relay when second supervised parameter (3204) drops below the limit (3205). • See "Group 32: Supervision" starting on page 98. 12 = suprv3 over – Energize relay when third supervised parameter (3207) exceeds the limit (3209). • See "Group 32: Supervision" starting on page 98. 13 = suprv3 under – Energize relay when third supervised parameter (3207) drops below the limit (3208). • See "Group 32: Supervision" starting on page 98. 14 = AT SET POINT – Energize relay when the output frequency is equal to the reference frequency. 15 = FAULT (RST) – Energize relay when the drive is in a fault condition and will reset after the programmed auto-reset delay. • See parameter 3103 delay time. 16 = FLT/ALARM – Energize relay when fault or alarm occurs. 17 = EXT CTRL – Energize relay when external control is selected. 18 = REF 2 SEL – Energize relay when EXT2 is selected. 19 = CONST FREQ – Energize relay when a constant speed is selected. 20 = REF LOSS – Energize relay when reference or active control place is lost. 21 = OVERCURRENT – Energize relay when an overcurrent alarm or fault occurs. 22 = OVERVOLTAGE – Energize relay when an overvoltage alarm or fault occurs. 23 = DRIVE TEMP – Energize relay when a drive overtemperature alarm or fault occurs. 24 = UNDERVOLTAGE – Energize relay when an undervoltage alarm or fault occurs. 25 = AI1 LOSS – Energize relay when AI1 signal is lost. 26 = AI2 LOSS – Energize relay when AI2 signal is lost. 27 = MOTOR TEMP – Energize relay when a motor overtemperature alarm or fault occurs. 28 = STALL – Energize relay when a stall alarm or fault exists. 29 = UNDERLOAD – Energize relay when an underload alarm or fault occurs. 30 = PID SLEEP – Energize relay when the PID sleep function is active. 31 = PFA – Use relay to start/stop motor in PFA control (See Group 81: PFA Control). • Use this option only when PFA control is used. • Selection activated / deactivated when drive is not running. 32 = AUTOCHANGE – Energize relay when PFA autochange operation is performed. • Use this option only when PFA control is used. 33 = FLUX READY – Energize relay when the motor is magnetized and able to supply nominal torque (motor has reached nominal magnetizing). 34 = USER S2 – Energize relay when User Parameter Set 2 is active.	0...45	1	1	

Group 14: Relay Outputs																																																																							
Code	Description	Range	Resolution	Default	S																																																																		
	35 = COMM – Energize relay based on input from fieldbus communication. • Fieldbus writes binary code in parameter 0134 that can energizes relay 1 relay 6 according to the following:																																																																						
	<table><tr><th>Par. 0134</th><th>Binary</th><th>RO6</th><th>RO5</th><th>RO4</th><th>RO3</th><th>RO2</th><th>RO1</th></tr><tr><td>0</td><td>000000</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>000001</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>2</td><td>000010</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>3</td><td>000011</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>4</td><td>000100</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>5 62</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>63</td><td>111111</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	Par. 0134	Binary	RO6	RO5	RO4	RO3	RO2	RO1	0	000000	0	0	0	0	0	0	1	000001	0	0	0	0	0	1	2	000010	0	0	0	0	1	0	3	000011	0	0	0	0	1	1	4	000100	0	0	0	1	0	0	5 62								63	111111	1	1	1	1	1	1						
Par. 0134	Binary	RO6	RO5	RO4	RO3	RO2	RO1																																																																
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1	000001	0	0	0	0	0	1																																																																
2	000010	0	0	0	0	1	0																																																																
3	000011	0	0	0	0	1	1																																																																
4	000100	0	0	0	1	0	0																																																																
5 62																																																																							
63	111111	1	1	1	1	1	1																																																																
	• 0 = De-energize relay, 1 = Energize relay.																																																																						
	36 = COMM(-1) – Energize relay based on input from fieldbus communication. • Fieldbus writes binary code in parameter 0134 that can energizes relay 1 relay 6 according to the following:																																																																						
	<table><tr><th>Par. 0134</th><th>Binary</th><th>RO6</th><th>RO5</th><th>RO4</th><th>RO3</th><th>RO2</th><th>RO1</th></tr><tr><td>0</td><td>000000</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>000001</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>2</td><td>000010</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>3</td><td>000011</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>4</td><td>000100</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>5 62</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>63</td><td>111111</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table>	Par. 0134	Binary	RO6	RO5	RO4	RO3	RO2	RO1	0	000000	1	1	1	1	1	1	1	000001	1	1	1	1	1	0	2	000010	1	1	1	1	0	1	3	000011	1	1	1	1	0	0	4	000100	1	1	1	0	1	1	5 62								63	111111	0	0	0	0	0	0						
Par. 0134	Binary	RO6	RO5	RO4	RO3	RO2	RO1																																																																
0	000000	1	1	1	1	1	1																																																																
1	000001	1	1	1	1	1	0																																																																
2	000010	1	1	1	1	0	1																																																																
3	000011	1	1	1	1	0	0																																																																
4	000100	1	1	1	0	1	1																																																																
5 62																																																																							
63	111111	0	0	0	0	0	0																																																																
	• 0 = De-energize relay, 1 = Energize relay.																																																																						
	37 = TIMER 1 – Energize relay when timer 1 is activated. See Group 36, Timer Functions.																																																																						
	38 40 = TIMER 2 4 – Energize relay when Timer 2 4 is active. See Timer 1 above.																																																																						
	41 = M.TRIG FAN – Energize relay when cooling fan counter is triggered.																																																																						
	42 = M.TRIG REV – Energize relay when revolutions counter is triggered.																																																																						
	43 = M. TRIG RUN – Energize relay when run time counter is triggered.																																																																						
	44 = M.TRIG MWH – Energize relay when power consumption counter is triggered.																																																																						
	45 = OVERRIDE – Energize relay when override is activated.																																																																						
1402	RELAY OUTPUT 2	0...45	1	2																																																																			
	Defines the event or condition that activates relay 2 – what relay output 2 means. • See 1401 RELAY OUTPUT 1.																																																																						
1403	RELAY OUTPUT 3	0...45	1	3																																																																			
	Defines the event or condition that activates relay 3 – what relay output 3 means. • See 1401 RELAY OUTPUT 1.																																																																						
1404	RO 1 ON DELAY	0.0...3600.0 s	0.1 s	0.0 s																																																																			
	Defines the switch-on delay for relay 1. • On / off delays are ignored when relay output 1401 is set to PFA.																																																																						
					Control event 																																																																		
1405	RO 1 OFF DELAY	0.0...3600.0 s	0.1 s	0.0 s																																																																			
	Defines the switch-off delay for relay 1. • On / off delays are ignored when relay output 1401 is set to PFA.																																																																						
1406	RO 2 ON DELAY	0.0...3600.0 s	0.1 s	0.0 s																																																																			
	Defines the switch-on delay for relay 2. • See RO 1 ON DELAY.																																																																						

Group 14: Relay Outputs					
Code	Description	Range	Resolution	Default	S
1407	RO 2 OFF DELAY Defines the switch-off delay for relay 2. • See RO 1 OFF DELAY.	0.0...3600.0 s	0.1 s	0.0 s	
1408	RO 3 ON DELAY Defines the switch-on delay for relay 3. • See RO 1 ON DELAY.	0.0...3600.0 s	0.1 s	0.0 s	
1409	RO 3 OFF DELAY Switch-off delay for relay 3. • See RO 1 OFF DELAY.	0.0...3600.0 s	0.1 s	0.0 s	
1410 1412	RELAY OUTPUT 4...6 Defines the event or condition that activates relay 4 6 – what relay output 4 6 means. • See 1401 RELAY OUTPUT 1.	0...45	1	0	
1413	RO 4 ON DELAY Defines the switch-on delay for relay 4. • See RO 1 ON DELAY.	0.0...3600.0 s	0.1 s	0.0 s	
1414	RO 4 OFF DELAY Defines the switch-off delay for relay 4. • See RO 1 OFF DELAY.	0.0...3600.0 s	0.1 s	0.0 s	
1415	RO 5 ON DELAY Defines the switch-on delay for relay 5. • See RO 1 ON DELAY.	0.0...3600.0 s	0.1 s	0.0 s	
1416	RO 5 OFF DELAY Defines the switch-off delay for relay 5. • See RO 1 OFF DELAY.	0.0...3600.0 s	0.1 s	0.0 s	
1417	RO 6 ON DELAY Defines the switch-on delay for relay 6. • See RO 1 ON DELAY.	0.0...3600.0 s	0.1 s	0.0 s	
1418	RO 6 OFF DELAY Defines the switch-off delay for relay 6. • See RO 1 OFF DELAY.	0.0...3600.0 s	0.1 s	0.0 s	

Group 15: Analog Outputs

This group defines the drive's analog (current signal) outputs. The drive's analog outputs can be:

- Any parameter of the Operating Data group (Group 01).
- Limited to programmable minimum and maximum values of output current.
- Scaled (and/or inverted) by defining the minimum and maximum values of the source parameter (or content). Defining an maximum value (parameter 1503 or 1509) that is less than the content minimum value (parameter 1502 or 1508) results in an inverted output.
- Filtered

Group 15: Analog Outputs					
Code	Description	Range	Resolution	Default	S
1501	AO1 CONTENT SEL Defines the content for analog output AO1. 99 = EXCITE PTC – Provides a current source for sensor type PTC. Output = 1.6 mA. See Group 35. 100 = EXCITE PT100 – Provides a current source for sensor type Pt100. Output = 9.1 mA. See Group 35. 101 – 145 – Output corresponds to a parameter in the Operating Data group (Group 01). • Parameter defined by value (value 102 = parameter 0102) 146 – 199 – Not assigned.	99...199	1	103 (Output Freq.)	
1502	AO1 CONTENT MIN Sets the minimum content value. • Content is the parameter selected by parameter 1501. • Minimum value refers to the minimum content value that will be converted to an analog output. • These parameters (content and current min. and max. settings) provide scale and offset adjustment for the output. See figure.	Depends on selection	-	0.0 Hz	
1503	AO1 CONTENT MAX Sets the maximum content value • Content is the parameter selected by parameter 1501. • Maximum value refers to the maximum content value that will be converted to an analog output.	Depends on selection	-	60.0 Hz	
1504	MINIMUM AO1 Sets the minimum output current.	0.0...20.0 mA	0.1 mA	4.0 mA	
1505	MAXIMUM AO1 Sets the maximum output current.	0.0...20.0 mA	0.1 mA	20.0 mA	

Group 15: Analog Outputs					
Code	Description	Range	Resolution	Default	S
1506	FILTER AO1 Defines the filter time constant for AO1. • The filtered signal reaches 63% of a step change within the time specified. • See figure in parameter 1303.	0...10 s	0.1 s	0.1 s	
1507	AO2 CONTENT SEL Defines the content for analog output AO2. See AO1 CONTENT above.	99...199	1	104	
1508	AO2 CONTENT MIN Sets the minimum content value. See AO1CONTENT MIN above.	Depends on selection	-	0.0 A	
1509	AO2 CONTENT MAX Sets the maximum content value. See AO1 CONTENT MAX above.	Depends on selection	-	4.6 A	
1510	MINIMUM AO2 Sets the minimum output current. See MINIMUM AO1 above.	0.0...20.0 mA	0.1 mA	4.0 mA	
1511	MAXIMUM AO2 Sets the maximum output current. See MAXIMUM AO1 above.	0.0...20.0 mA	0.1 mA	20.0 mA	
1512	FILTER AO2 Defines the filter time constant for AO2. See FILTER AO1 above.	0.0...10.0 s	0.1 s	0.1 s	

Group 16: System Controls

This group defines a variety of system level locks, resets and enables.

Group 16: System Controls					
Code	Description	Range	Resolution	Default	S
1601	RUN ENABLE Selects the source of the run enable signal. 0 = NOT SEL – Allows the drive to start without an external run enable signal. 1 = DI1 – Defines digital input DI1 as the run enable signal. • This digital input must be activated for run enable. • If the voltage drops and de-activates this digital input, the drive will coast to stop and not start until the run enable signal resumes. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the run enable signal. • See DI1 above. 7 = COMM – Assigns the fieldbus Command Word as the source for the run enable signal. • Bit 6 of the Command Word 1 (parameter 0301) activates the run disable signal. • See fieldbus user's manual for detailed instructions. -1 = DI1(INV) – Defines an inverted digital input DI1 as the run enable signal. • This digital input must be de-activated for run enable. • If this digital input activates, the drive will coast to stop and not start until the run enable signal resumes. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the run enable signal. • See DI1(INV) above.	-6...7	1	0	✓
1602	PARAMETER LOCK Determines if the control panel can change parameter values. • This lock does not limit parameter changes made by macros. • This lock does not limit parameter changes written by fieldbus inputs. 0 = LOCKED – You cannot use the control panel to change parameter values. • The lock can be opened by entering the valid pass code to parameter 1603. 1 = OPEN – You can use the control panel to change parameter values. 2 = NOT SAVED – You can use the control panel to change parameter values, but they are not stored in permanent memory. • Set parameter 1607 PARAM SAVE to 1 (SAVE) to store changed parameter values to memory.	0...2	1	1	
1603	PASS CODE Entering the correct pass code unlocks the parameter lock. • See parameter 1602 above. • The code 358 opens the lock. • This entry reverts back to 0 automatically.	0...65535	1	0	
1604	FAULT RESET SEL Selects the source for the fault reset signal. The signal resets the drive after a fault trip if the cause of the fault no longer exists. 0 = KEYPAD – Defines the control panel as the only fault reset source. • Fault reset is always possible with control panel. 1 = DI1 – Defines digital input DI1 as a fault reset source. • Activating the digital input resets the drive. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as a fault reset source. • See DI1 above. 7 = START/STOP – Defines the Stop command as a fault reset source. • Do not use this option when fieldbus communication provides the start, stop and direction commands. 8 = COMM – Defines the fieldbus as a fault reset source. • The Command Word is supplied through fieldbus communication. • The bit 4 of the Command Word 1 (parameter 0301) resets the drive. -1 = DI1(INV) – Defines an inverted digital input DI1 as a fault reset source. • De-activating the digital input resets the drive. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as a fault reset source. • See DI1(INV) above.	-6...8	1	0	

Group 16: System Controls					
Code	Description	Range	Resolution	Default	S
1605	USER PAR SET CHG Defines control for changing the user parameter set. - See parameter 9902 (APPLIC MACRO). - The drive must be stopped to change User Parameter Sets. - During a change, the drive will not start. Note: Always save the User Parameter Set after changing any parameter settings, or performing a motor identification. - Whenever the power is cycled, or parameter 9902 (APPLIC MACRO) is changed, the drive loads the last settings saved. Any unsaved changes to a user parameter set are lost. Note: The value of this parameter (1605) is not included in the User Parameter Sets, and does not change if User Parameter Sets change. Note: You can use a relay output to supervise the selection of User Parameter Set 2. - See parameter 1401. 0 = NOT SEL – Defines the control panel (using parameter 9902) as the only control for changing User Parameter Sets. 1 = DI1 – Defines digital input DI1 as a control for changing User Parameter Sets. - The drive loads User Parameter Set 1 on the falling edge of the digital input. - The drive loads User Parameter Set 2 on the rising edge of the digital input. - The User Parameter Set changes only when the drive is stopped. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as a control for changing User Parameter Sets. - See DI1 above. -1 = DI1(INV) – Defines an inverted digital input DI1 as a control for changing User Parameter Sets. - The drive loads User Parameter Set 1 on the rising edge of the digital input. - The drive loads User Parameter Set 2 on the falling edge of the digital input. - The User Parameter Set changes only when the drive is stopped. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as a control for changing User Parameter Sets. - See DI1(INV) above.	-6...6	1	0	
1606	LOCAL LOCK Defines control for the use of the HAND mode. The HAND mode allows drive control from the control panel. - When LOCAL LOCK is active, the control panel cannot change to HAND mode. 0 = NOT SEL – Disables the lock. The control panel can select HAND and control the drive. 1 = DI1 – Defines digital input DI1 as the control for setting the local lock. - Activating the digital input locks out local control. - De-activating the digital input enable the HAND selection. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the control for setting the local lock. - See DI1 above. 7 = ON – Sets the lock. The control panel cannot select HAND, and cannot control the drive. 8 = COMM – Defines bit 14 of the Command Word 1 as the control for setting the local lock. - The Command Word is supplied through fieldbus communication. - The Command Word is 0301. -1 = DI1(INV) – Defines an inverted digital input DI1 as the control for setting the local lock. - De-activating the digital input locks out local control. - Activating the digital input enable the HAND selection. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the control for setting the local lock. - See DI1(INV) above.	-6...8	1	0	
1607	PARAM. SAVE Saves all altered parameters to permanent memory. - Parameters altered through a fieldbus are not automatically saved to permanent memory. To save, you must use this parameter. - If 1602 PARAMETER LOCK = 2 (NOT SAVED), parameters altered from the control panel are not saved. To save, you must use this parameter. - If 1602 PARAMETER LOCK = 1 (OPEN), parameters altered from the control panel are stored immediately to permanent memory. 0 = DONE – Value changes automatically when all parameters are saved. 1 = SAVE – Saves altered parameters to permanent memory.	0, 1	1	0	

Group 16: System Controls					
Code	Description	Range	Resolution	Default	S
1608	START ENABLE 1 Selects the source of the start enable 1 signal. Note: Start enable functionality differs from the run enable functionality. 0 = NOT SEL – Allows the drive to start without an external start enable signal. 1 = DI1 – Defines digital input DI1 as the start enable 1 signal. – This digital input must be activated for start enable 1 signal. – If the voltage drops and de-activates this digital input, the drive will coast to stop and show alarm 2021 on panel display. The drive will not start until start enable 1 signal resumes. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the start enable 1 signal. – See DI1 above. 7 = COMM – Assigns the fieldbus Command Word as the source for the start enable 1 signal. – Bit 2 of the Command word 2 (parameter 0302) activates the start disable 1 signal. – See fieldbus user's manual for detailed instructions. (-1) = DI1(INV) – Defines an inverted digital input DI1 as the start enable 1 signal. (-2) (-6) = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the start enable 1 signal. – See DI1(INV) above.	-6...7	1	4	

Group 16: System Controls					
Code	Description	Range	Resolution	Default	S
1609	START ENABLE 2 Selects the source of the start enable 2 signal. Note: Start enable functionality differs from the run enable functionality. 0 = NOT SEL – Allows the drive to start without an external start enable signal. 1 = DI1 – Defines digital input DI1 as the start enable 2 signal. This digital input must be activated for start enable 2 signal. If the voltage drops and de-activates this digital input, the drive will coast to stop and show alarm 2022 on panel display. The drive will not start until start enable 2 signal resumes. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the start enable 2 signal. See DI1 above. 7 = COMM – Assigns the fieldbus Command Word as the source for the start enable 2 signal. Bit 3 of the Command word 2 (parameter 0302) activates the start disable 2 signal. See fieldbus user's manual for detailed instructions. (-1) = DI1(INV) – Defines an inverted digital input DI1 as the start enable 2 signal. (-2) (-6) = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the start enable 2 signal. See DI1(INV) above.	-6...7	1	0	

Group 17: Override

This group defines the source for the override activation signal, the override speed/frequency and pass code and how the override is enabled and disabled.

When override DI is activated, the drive stops and then accelerates to the preset speed or frequency. When the DI is deactivated the drive stops and reboots. If the start command, run enable and start enables are active in the AUTO mode the drive starts automatically and continues normally after override mode. In the HAND mode the drive returns to OFF mode.

When override is active:

- Drive runs at preset speed
- Drive ignores all keypad commands
- Drive ignores all commands from communication links
- Drive ignores all digital inputs except override activation/deactivation, RUN ENABLE and START ENABLE
- Drive displays alarm message "2020 OVERRIDE MODE"

The following faults are ignored:

3	DEVICE OVERTEMP
5	OVERLOAD
6	DC UNDERVOLT
7	AI1 LOSS
8	AI2 LOSS
9	MOTOR TEMP
10	PANEL LOSS
12	MOTOR STALL
14	EXTERNAL FLT 1
15	EXTERNAL FLT 2
17	UNDERLOAD
18	THERM FAIL
21	CURR MEAS
22	SUPPLY PHASE
24	OVERSPEED
28	SERIAL 1 ERR
29	EFB CONFIG FILE
30	FORCE TRIP
31	EFB 1
32	EFB 2
33	EFB 3
34	MOTOR PHASE
1001	PAR PFC REFNEG

1002	PAR PFC IOCONF
1003	PAR AI SCALE
1004	PAR AO SCALE
1006	PAR EXTROMISSING
1007	PAR FBUSMISSING
1008	PAR PFCWOSCALAR

Commissioning the Override Mode:

1. Enter the parameters in all groups as needed, except group 17.
2. Select the digital input that will activate override mode P1701.
3. Enter the frequency or speed reference for override mode, P1702 and P1703, according to the motor control mode P9904.
4. Enter the pass code P1704 (358).
5. Enable the override mode P1705.

Changing the Override Parameters:

1. If override mode is already enabled, disable it:
 - Enter the pass code P1704.
 - Disable the override mode P1705.
2. If needed, load the override parameter set P9902.
3. Change the parameters as needed, except group 17.
4. Change the parameters in group 17 as needed:
 - Digital input for override mode P1701.
 - Frequency or speed reference, P1702 or P1703.
5. Enter the pass code P1704.

Enable the override mode P1705. The drive replaces the override parameter set with new values of all parameters.

Group 17: Override				
Code	Description	Range	Resolution	DefaultS
1701	OVERRIDE SEL Selects the source of the override activation signal. 0 = NOT SEL – Override activation signal not selected. 1 = DI1 – Defines digital input DI1 as the override activation signal. • This digital input must be activated for override activation signal. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the override activation signal. • See DI1 above. (-1) = DI1(INV) – Defines an inverted digital input DI1 as the override activation signal. (-2) (-6) = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the override activation signal. • See DI1(INV) above.	-6...6	1	0 YORK Default DI6

Group 17: Override				
Code	Description	Range	Resolution	DefaultS
1702	OVERRIDE FREQ Defines a preset frequency for the override. Note! Set this value if motor control mode (Par. 9904) is SCALAR: FREQ (3).	-500...500 Hz	0.1	0.0
1703	OVERRIDE SPEED Defines a preset speed for the override. Note! Set this value if motor control mode (Par.9904) is VECTOR: SPEED (1).	-30.000...30.000 rpm	1	0
1704	OVERR PASS CODE Entering the correct override pass code unlocks parameter 1705 for one change. • Enter the pass code always before changing the value of the parameter 1705. • See parameter 1705 below. • The pass code is 358. • The entry reverts back to zero automatically.	0...65535	1	0
1705	OVERRIDE ENABLE Selects whether the override is enabled or disabled. 0 = OFF – Override disabled. 1 = ON – Override enabled. • When enabled, the drive stores the values of all parameters into an override parameter set (see parameter 9902) and the parameters in Group 17 will be write protected (except parameter 1704). To change the other parameters in the Group 17, override has to be disabled.	0...1	1	0

Group 20: Limits

This group defines minimum and maximum limits to follow in driving the motor – speed, frequency, current, torque, etc.

Group 20: Limits					
Code	Description	Range	Resolution	Default	S
2001	MINIMUM SPEED Defines the minimum speed (rpm) allowed. - A positive (or zero) minimum speed value defines two ranges, one positive and one negative. - A negative minimum speed value defines one speed range. - See figure.	-30000...30000 rpm	1 rpm	0 rpm	✓
	2001 value is < 0 Speed range allowed 2001 value is ≥ 0 Speed range allowed Speed range allowed				
2002	MAXIMUM SPEED Defines the maximum speed (rpm) allowed.	0...30000 rpm	1 rpm	1800 (US)	✓
2003	MAX CURRENT Defines the maximum output current (A) supplied by the drive to the motor.	0.0... 1.3 * I_{2N}	0.1 A	1.3 * I_{2N}	✓
2006	UNDERVOLT CTRL Sets the DC undervoltage controller on or off. When on: - If the DC bus voltage drops due to loss of input power, the undervoltage controller decreases the motor speed in order to keep the DC bus voltage above the lower limit. - When the motor speed decreases, the inertia of the load causes regeneration back into the drive, keeping the DC bus charged, and preventing an undervoltage trip. - The DC undervoltage controller increases power loss ride-through on systems with a high inertia, such as a centrifuge or a fan. 0 = DISABLE – Disables controller. 1 = ENABLE(TIME) – Enables controller without a maximum time limit for operation.	0, 1	1	1	

Note! 2001 and 2002 are only used in vector mode. HVAC uses scalar mode and limits are set in 2007 and 2008 min/max frequency.

Group 20: Limits					
Code	Description	Range	Resolution	Default	S
2007	MINIMUM FREQ Defines the minimum limit for the drive output frequency. - A positive or zero minimum speed value defines two ranges, one positive and one negative. - A negative minimum speed value defines one speed range. See figure. Note! Keep MINIMUM FREQ ≤ MAXIMUM FREQ. YORK Default 15 Hz	-500.0...500.0 Hz	0.1 Hz	0.0 Hz	✓
2008	MAXIMUM FREQ Defines the maximum limit for the drive output frequency. Note! Operating over 60 Hz will damage duct work.	0.0...500.0 Hz	0.1 Hz	60.0 Hz (US)	✓
2013	MIN TORQUE SEL Defines control of the selection between two minimum torque limits (2015 MIN TORQUE 1 and 2016 MIN TORQUE 2). 0 = MIN TORQUE 1 – Selects 2015 MIN TORQUE 1 as the minimum limit used. 1 = DI1 – Defines digital input DI1 as the control for selecting the minimum limit used. - Activating the digital input selects MIN TORQUE 2 value. - De-activating the digital input selects MIN TORQUE 1 value. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the control for selecting the minimum limit used. - See DI1 above. 7 = COMM – Defines bit 15 of the Command Word 1 as the control for selecting the minimum limit used. - The Command Word is supplied through fieldbus communication. The Command Word is a parameter 0301. -1 = DI1(INV) – Defines an inverted digital input DI1 as the control for selecting the minimum limit used. - Activating the digital input selects MIN TORQUE 1 value. - De-activating the digital input selects MIN TORQUE 2 value. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the control for selecting the minimum limit used. - See DI1(INV) above.	-6...7	1	0	
2014	MAX TORQUE SEL Defines control of the selection between two maximum torque limits (2017 MAX TORQUE 1 and 2018 MAX TORQUE 2). 0 = MAX TORQUE 1 – Selects 2017 MAX TORQUE 1 as the maximum limit used. 1 = DI1 – Defines digital input DI1 as the control for selecting the maximum limit used. Activating the digital input selects MAX TORQUE 2 value. De-activating the digital input selects MAX TORQUE 1 value. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the control for selecting the maximum limit used. - See DI1 above. 7 = COMM – Defines bit 15 of the Command Word 1 as the control for selecting the maximum limit used. - The Command Word is supplied through fieldbus communication. The Command Word is a parameter 0301. -1 = DI1(INV) – Defines an inverted digital input DI1 as the control for selecting the maximum limit used. - Activating the digital input selects MAX TORQUE 1 value. - De-activating the digital input selects MAX TORQUE 2 value. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the control for selecting the maximum limit used. - See DI1(INV) above.	-6...7	1	0	

Group 20: Limits					
Code	Description	Range	Resolution	Default	S
2015	MIN TORQUE 1 Sets the first minimum limit for torque (%). Value is a percent of the motor nominal torque.	-600.0%...0.0%	0.1%	-300.0%	
2016	MIN TORQUE 2 Sets the second minimum limit for torque (%). Value is a percent of the motor nominal torque.	-600.0%...0.0%	0.1%	-300.0%	
2017	MAX TORQUE 1 Sets the first maximum limit for torque (%). Value is a percent of the motor nominal torque.	0.0%...600.0%	0.1%	300.0%	
2018	MAX TORQUE 2 Sets the second maximum limit for torque (%). Value is a percent of the motor nominal torque.	0.0%...600.0%	0.1%	300.0%	

21: Start/Stop

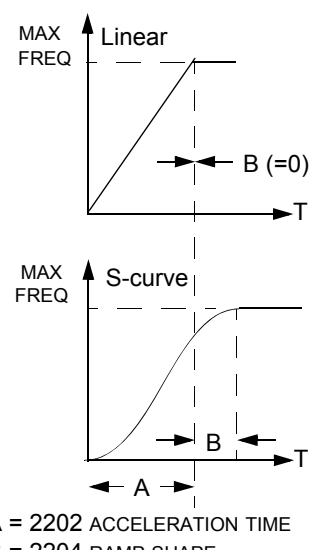
This group defines how the motor starts and stops. The AYK550 supports several start and stop modes.

Group 21: Start/Stop					
Code	Description	Range	Resolution	Default	S
2101	START FUNCTION Selects the motor start method. 1 = AUTO – Selects the automatic start mode. • VECTOR control modes: Optimal start in most cases. Flying start function to a rotating axis and start at zero speed. • SCALAR: FREQ mode: Immediate start from zero frequency. 2 = DC MAGN – Selects the DC Magnetizing start mode. Note! The DC Magnetizing start mode cannot start a rotating motor. Note! The drive starts when the set pre-magnetizing time (param. 2103) has passed, even if motor magnetization is not complete. • VECTOR control modes: Magnetizes the motor within the time determined by the parameter 2103 DC MAGN TIME using DC current. The normal control is released exactly after the magnetizing time. This selection guarantees the highest possible break-away torque. • SCALAR SPEED mode: Magnetizes the motor within the time determined by the parameter 2103 DC MAGN TIME using DC current. The normal control is released exactly after the magnetizing time. 3 = SCALAR FLYSTART – Selects the flying start mode. • VECTOR control modes: Not applicable. • SCALAR control mode: The drive will automatically select the correct output frequency to start a rotating motor. Useful if the motor is already rotating and the drive will start smoothly at the current frequency. 4 = TORQ BOOST – Selects the automatic torque boost mode (SCALAR SPEED mode only). • May be necessary in drives with high starting torque. • Torque boost is only applied at start, ending when output frequency exceeds 20 Hz or when output frequency is equal to reference. • In the beginning the motor magnetizes within the time determined by the parameter 2103 DC MAGN TIME using DC current. • See parameter 2110 TORQ BOOST CURR. 5 = FLYSTART + TORQ BOOST – Selects both the flying start and the torque boost mode (SCALAR SPEED mode only). • Flying start routine is performed first and the motor is magnetized. If the speed is found to be zero, the torque boost is done.	1...5	1	1 YORK Default 3 Flying Start	✓
2102	STOP FUNCTION Selects the motor stop method. 1 = COAST – Selects cutting off the motor power as the stop method. The motor coasts to stop. 2 = RAMP – Selects using a deceleration ramp • Deceleration ramp is defined by 2203 DECELER TIME 1 or 2206 DECELER TIME 2 (whichever is active).	1, 2	1	1	
2103	DC MAGN TIME Defines the pre-magnetizing time for the DC Magnetizing start mode. • Use parameter 2101 to select the start mode. • After the start command, the drive pre-magnetizes the motor for the time defined here, and then starts the motor. • Set the pre-magnetizing time just long enough to allow full motor magnetization. Too long a time heats the motor excessively.	0.00...10.00 s	0.01 s	0.30 s	
2104	DC CURR CTL Selects whether DC current is used for braking. 0 = NOT SEL – Disables the DC current operation. 1 = DC BRAKING – Enables the DC Injection Braking. • Enables DC Injection braking after modulation has stopped. • If parameter 2102 STOP FUNCTION is 1 (COAST), braking is applied after start is removed. • If parameter 2102 STOP FUNCTION IS 2 (RAMP), braking is applied after ramp.	0...2	-	0	✓
2106	DC CURR REF Defines the DC current control reference as a percentage of parameter 9906 (MOTOR NOM CURR).	0...100%	1%	30%	
2107	DC BRAKE TIME Defines the DC brake time after modulation has stopped, if parameter 2104 is 2 (DC BRAKING).	0...250 s	0.1 s	0 s	

Group 21: Start/Stop					
Code	Description	Range	Resolution	Default	S
2108	START INHIBIT Sets the Start inhibit function on or off. The Start inhibit function ignores a pending start command in any of the following situations (a new start command is required): • A fault is reset. • Run Enable (parameter 1601) activates while start command is active. • Mode changes from local to remote. • Mode changes from remote to local. • Control switches from EXT1 to EXT2. • Control switches from EXT2 to EXT1. 0 = OFF – Disables the Start inhibit function. 1 = ON – Enables the Start inhibit function.	0, 1	1	0	✓
2109	EM STOP SEL Defines control of the Emergency stop command. When activated: • Emergency stop decelerates the motor using the emergency stop ramp (parameter 2208 EM DEC TIME). • Requires an external stop command and removal of the emergency stop command before drive can restart. 0 = NOT SEL – Disables the Emergency stop function through digital inputs. 1 = DI1 – Defines digital input DI1 as the control for Emergency stop command. • Activating the digital input issues an Emergency stop command. • De-activating the digital input removes the Emergency stop command. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the control for Emergency stop command. • See DI1 above. -1 = DI1(INV) – Defines an inverted digital input DI1 as the control for Emergency stop command. • De-activating the digital input issues an Emergency stop command. • Activating the digital input removes the Emergency stop command. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the control for Emergency stop command. • See DI1(INV) above.	-6...6	1	0	
2110	TORQ BOOST CURR Sets the maximum supplied current during torque boost. • See parameter 2101 START FUNCTION.	0...300%	1	100%	

Group 22: Accel/Decel

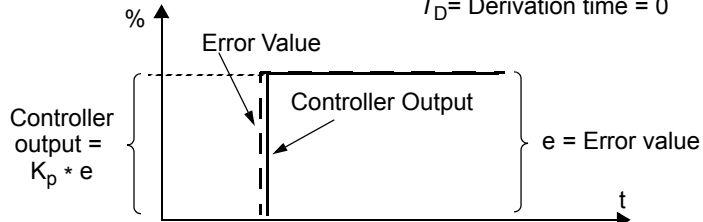
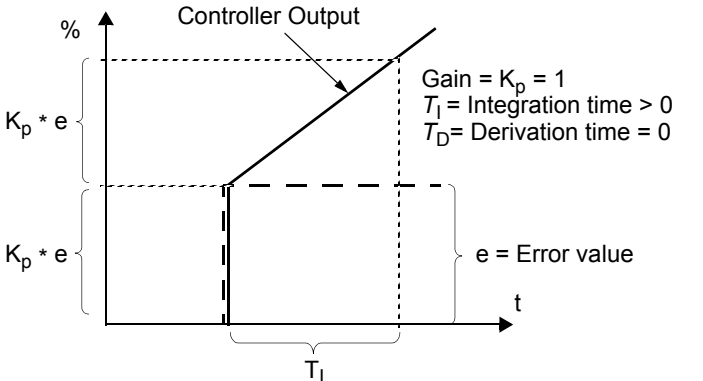
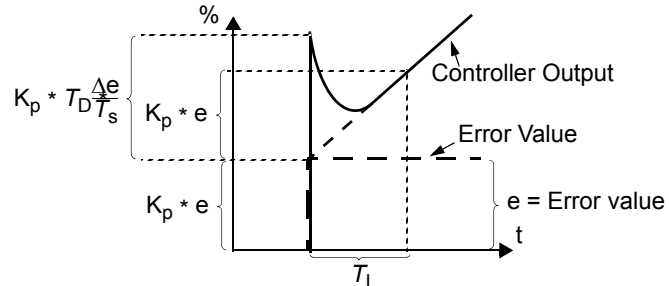
This group defines ramps that control the rate of acceleration and deceleration. You define these ramps as a pair, one for acceleration and one for deceleration. You can define two pairs of ramps and use a digital input to select one or the other pair.

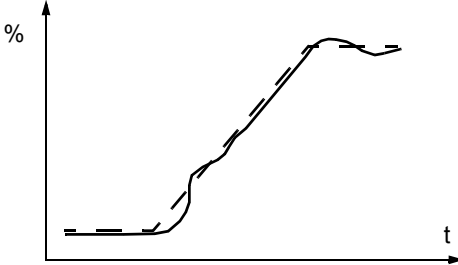
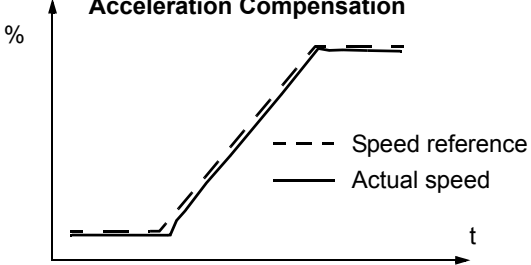
Group 22: Accel/Decel					
Code	Description	Range	Resolution	Default	S
2201	ACC/DEC 1/2 SEL Defines control for selection of acceleration/deceleration ramps. - Ramps are defined in pairs, one eAYK for acceleration and deceleration. - See below for the ramp definition parameters. 0 = NOT SEL – Disables selection, the first ramp pair is used. 1 = DI1 – Defines digital input DI1 as the control for ramp pair selection. - Activating the digital input selects ramp pair 2. - De-activating the digital input selects ramp pair 1. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the control for ramp pair selection. - See DI1 above. 7 = COMM – Defines serial communication as the control for ramp pair selection. -1 = DI1(INV) – Defines an inverted digital input DI1 as the control for ramp pair selection. - De-activating the digital input selects ramp pair 2 - Activating the digital input selects ramp pair 1. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the control for ramp pair selection. - See DI1(INV) above.	-6...7	1	0	
2202	ACCELER TIME 1 Sets the acceleration time for zero to maximum frequency for ramp pair 1. See A in figure. - Actual acceleration time also depends on 2204 RAMP SHAPE. - See 2008 MAXIMUM FREQUENCY.	0.0...1800.0 s	0.1 s	30.0 s	
2203	DECELER TIME 1 Sets the deceleration time for maximum frequency to zero for ramp pair 1. - Actual deceleration time also depends on 2204 RAMP SHAPE. - See 2008 MAXIMUM FREQUENCY.	0.0...1800.0 s	0.1 s	30.0 s	
2204	RAMP SHAPE 1 Selects the shape of the acceleration/deceleration ramp for ramp pair 1. See B in figure. - Shape is defined as a ramp, unless additional time is specified here to reach the maximum frequency. A longer time provides a softer transition at eAYK end of the slope. The shape becomes an s-curve. - Rule of thumb: 1/5 is a suitable relation between the ramp shape time and the acceleration ramp time. 0.0 = LINEAR – Specifies linear acceleration/deceleration ramps for ramp pair 1. 0.1 1000.0 = S-CURVE – Specifies s-curve acceleration/deceleration ramps for ramp pair 1.	0...1000.0 s	0.1 s	0.0	
	 A = 2202 ACCELERATION TIME B = 2204 RAMP SHAPE				
2205	ACCELER TIME 2 Sets the acceleration time (s) for zero to maximum frequency for ramp pair 2. See 2002 ACCELER TIME 1.	0.0...1800.0 s	0.1 s	60.0 s	
2206	DECELER TIME 2 Sets the deceleration time for maximum frequency to zero for ramp pair 2. See 2003 DECELER TIME 1.	0.0...1800.0 s	0.1 s	60.0 s	

Group 22: Accel/Decel					
Code	Description	Range	Resolution	Default	S
2207	RAMP SHAPE 2 Selects the shape of the acceleration/deceleration ramp for ramp pair 2. See 2004 RAMP SHAPE 1.	0...1000.0 s	0.1 s	0.0	
2208	EM DEC TIME Sets the deceleration time for maximum frequency to zero for an emergency. • See parameter 2109 EM STOP SEL. • Ramp is linear.	0.0...1800 s	0.1 s	1.0 s	
2209	RAMP INPUT 0 Defines control for forcing the ramp input to 0. 0 = NOT SEL – 1 = DI1 – Defines digital input DI1 as the control for forcing the ramp input to 0. • Activating the digital input forces ramp input to 0. Ramp output will ramp to 0 according to the currently used ramp time, after which it will stay at 0. • De-activating the digital input: ramp resumes normal operation. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the control for forcing the ramp input to 0. • See DI1 above. -1 = DI1(INV) – Defines an inverted digital input DI1 as the control for forcing the ramp input to 0. • De-activating the digital input forces ramp input to 0. • Activating the digital input: ramp resumes normal operation. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the control for forcing the ramp function generator input to 0. • See DI1(INV) above.	-6...6	1	0	

Group 23: Speed Control

This group defines variables used for speed control operation.

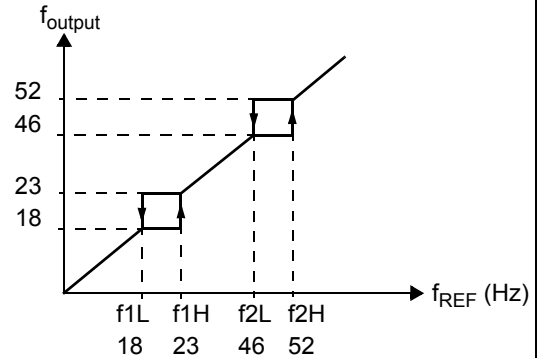
Group 23: Speed Control					
Code	Description	Range	Resolution	Default	S
2301	PROP GAIN Sets the relative gain for the speed controller. • Larger values may cause speed oscillation. • The figure shows the speed controller output after an error step (error remains constant). Note! You can use parameter 2305, AUTOTUNE RUN, to automatically set proportional gain.	0.00...200.00	0.01	3.00	
	 Gain = $K_p = 1$ T_i = Integration time = 0 T_D = Derivation time = 0				
2302	INTEGRATION TIME Sets the integration time for the speed controller. • The integration time defines the rate at which the controller output changes for a constant error value. • Shorter integration times correct continuous errors faster. • Control becomes unstable if the integration time is too short. • The figure shows the speed controller output after an error step (error remains constant). Note! You can use parameter 2305, AUTOTUNE RUN, to automatically set proportional gain.	0.00...600.00 s	0.01 s	2.50	
	 Gain = $K_p = 1$ T_i = Integration time > 0 T_D = Derivation time = 0				
2303	DERIVATION TIME Sets the derivation time for the speed controller. • Derivative action makes the control more responsive to error value changes. • The longer the derivation time, the more the speed controller output is boosted during the change. • If the derivation time is set to zero, the controller works as a PI controller, otherwise as a PID controller. The figure shows the speed controller output after an error step when the error remains constant.	0...10000 ms	1 ms	0	
	 Gain = $K_p = 1$ T_i = Integration time > 0 T_D = Derivation time > 0 T_s = Sample time period = 2 ms Δe = Error value change between two samples				

Group 23: Speed Control					
Code	Description	Range	Resolution	Default	S
2304	ACC COMPENSATION Sets the derivation time for acceleration compensation. • Adding a derivative of the reference to the output of the speed controller compensates for inertia during acceleration. • 2303 DERIVATION TIME describes the principle of derivative action. • Rule of thumb: Set this parameter between 50 and 100% of the sum of the mechanical time constants for the motor and the driven machine. • The figure shows the speed responses when a high inertia load is accelerated along a ramp. No Acceleration Compensation  Acceleration Compensation  -- -- Speed reference ——— Actual speed	0.00...600.00 s	0.01 s	0.00	
2305	AUTOTUNE RUN Starts automatic tuning of the speed controller. 0 = OFF— Disables the Autotune creation process. (Does not disable the operation of Autotune settings.) 1 = ON – Activates speed controller autotuning. Automatically reverts to OFF. Procedure: Note! The motor load must be connected. • Run the motor at a constant speed of 20 to 40% of the rated speed. • Change the autotuning parameter 2305 to ON. The drive: • Accelerates the motor. • Calculates values for proportional gain and integration time. • Changes parameters 2301 and 2302 to these values. • Resets 2305 to OFF.	0...1	1	0	

Group 25: Critical Speeds

This group defines up to three critical speeds or ranges of speeds that are to be avoided due, for example, to mechanical resonance problems at certain speeds.

Group 25: SCritical Speeds					
Code	Description	Range	Resolution	Default	S
2501	CRIT SPEED SEL Sets the critical speeds function on or off. The critical speed function avoids specific speed ranges. 0 = OFF – Disables the critical speeds function. 1 = ON – Enables the critical speeds function. Example: To avoid speeds at which a fan system vibrates badly: • Determine problem speed ranges. Assume they are found to be: 18 23 Hz and 46 52 Hz. • Set 2501 CRIT SPEED SEL = 1. • Set 2502 CRIT SPEED 1 LO = 18 Hz. • Set 2503 CRIT SPEED 1 HI = 23 Hz. • Set 2504 CRIT SPEED 2 LO = 46 Hz. • Set 2505 CRIT SPEED 2 HI = 52 Hz.	0, 1	1	0	
2502	CRIT SPEED 1 LO Sets the minimum limit for critical speed range 1. • The value must be less than or equal to 2503 CRIT SPEED 1 HI. • Units are rpm, unless 9904 MOTOR CTRL MODE = 3 (SCALAR SPEED), then units are Hz.	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	0 rpm / 0.0 Hz	
2503	CRIT SPEED 1 HI Sets the maximum limit for critical speed range 1. • The value must be greater than or equal to 2502 CRIT SPEED 1 LO. • Units are rpm, unless 9904 MOTOR CTRL MODE = 3 (SCALAR SPEED), then units are Hz.	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	0 rpm / 0.0 Hz	
2504	CRIT SPEED 2 LO Sets the minimum limit for critical speed range 2. • See parameter 2502.	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	0 rpm / 0.0 Hz	
2505	CRIT SPEED 2 HI Sets the maximum limit for critical speed range 2. • See parameter 2503.	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	0 rpm / 0.0 Hz	
2506	CRIT SPEED 3 LO Sets the minimum limit for critical speed range 3. • See parameter 2502.	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	0 rpm / 0.0 Hz	
2507	CRIT SPEED 3 HI Sets the maximum limit for critical speed range 3. • See parameter 2503.	0...30000 rpm / 0.0...500.0 Hz	1 rpm / 0.1 Hz	0 rpm / 0.0 Hz	



Group 26: Motor Control

This group provides controls for fine-tuning the motor control.

Group 26: Motor Control																							
Code	Description	Range	Resolution	Default	S																		
2601	FLUX OPTIMIZATION Changes the magnitude of the flux depending on the actual load. Flux Optimization can reduce the total energy consumption and noise, and should be enabled for drives that usually operate below nominal load. 0 = OFF – Disables the feature. 1 = ON – Enables the feature.	0...1	1	1																			
2602	FLUX BRAKING Provides faster deceleration by raising the level of magnetization in the motor when needed, instead of limiting the deceleration ramp. By increasing the flux in the motor, the energy of the mechanical system is changed to thermal energy in the motor. 0 = OFF – Disables the feature. 1 = ON – Enables the feature.	0...1	1	0																			
2603	IR COMP VOLT Sets the IR compensation voltage used for 0 Hz. - Requires parameter 9904 MOTOR CTRL MODE = 3 (SCALAR SPEED). - Keep IR compensation as low as possible to prevent overheating. - Typical IR compensation values are: <table border="1"> <thead> <tr> <th colspan="6">380...480 V Units</th></tr> <tr> <th>P_N (kW)</th><td>3</td><td>7.5</td><td>15</td><td>37</td><td>132</td></tr> <tr> <th>IR comp (V)</th><td>21</td><td>18</td><td>15</td><td>10</td><td>4</td></tr> </thead></table> IR Compensation - When enabled, IR Compensation provides an extra voltage boost to the motor at low speeds. Use IR Compensation, for example, in applications that require a high breakaway torque.	380...480 V Units						P _N (kW)	3	7.5	15	37	132	IR comp (V)	21	18	15	10	4	0.0...100.0 V	0.1	0.0	
380...480 V Units																							
P _N (kW)	3	7.5	15	37	132																		
IR comp (V)	21	18	15	10	4																		
2604	IR COMP FREQ Sets the frequency at which IR compensation is 0 V (in % of motor frequency).	0...100%	1	80																			
2605	U/f RATIO Selects the form for the U/f (voltage to frequency) ratio below field weakening point. 1 = LINEAR – Preferred for constant torque applications. 2 = SQUARED – Preferred for centrifugal pump and fan applications. (Square is more silent for most operating frequencies.)	1, 2	1	2																			

Group 26: Motor Control					
Code	Description	Range	Resolution	Default	S
2606	SWITCHING FREQ Sets the switching frequency for the drive. • Higher switching frequencies mean less noise.	1, 4, 8 kHz	-	4 kHz	
2607	SW FREQ CTRL The switching frequency may be reduced if the AYK550 internal temperature rises above 90 °C. See Figure. This function allows the highest possible switching frequency to be used based on operating conditions. Higher switching frequency results in lower acoustic noise. 0 = OFF – The function is disabled. 1 = ON – The switching frequency is limited according to the figure.	0, 1	-	1	
2608	SLIP COMP RATIO Sets gain for slip compensation (in %). • A squirrel-cage motor slips under load. Increasing the frequency as the motor torque increases compensates for the slip. • Requires parameter 9904 MOTOR CTRL MODE = SCALAR SPEED. 0 = No slip compensation. 1 200 = Increasing slip compensation. 100% means full slip compensation.	0...200%	1	0	

Group 29: Maintenance Trig

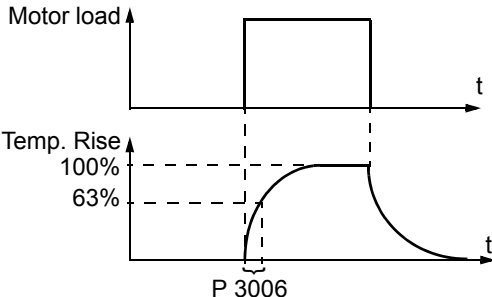
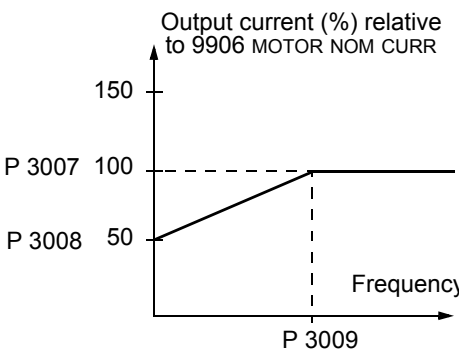
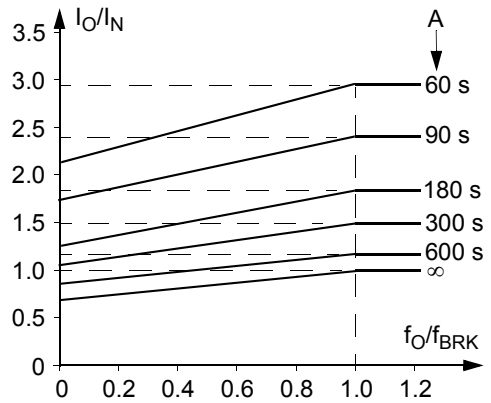
This group contains usage levels and trigger points. When usage reaches the set trigger point, a notice displayed on the control panel signals that maintenance is due.

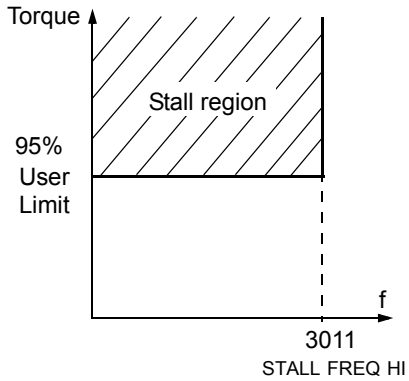
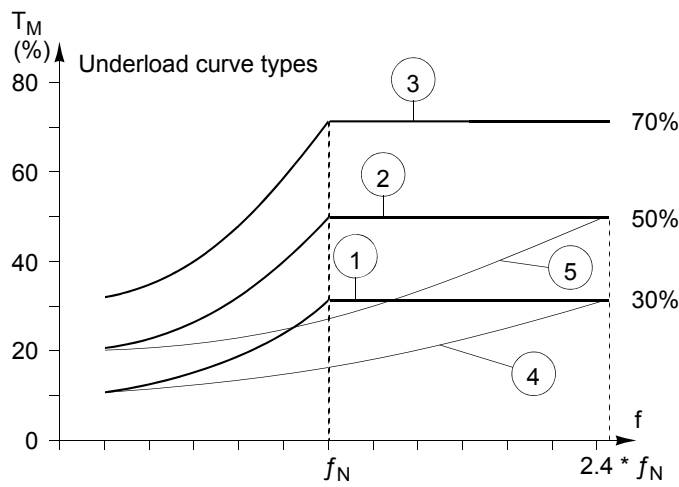
Group 29: Maintenance Trig					
Code	Description	Range	Resolution	Default	S
2901	COOLING FAN TRIG Sets the trigger point for the drive's cooling fan counter. • 0.0 = NOT SEL	0.0...6553.5 kh	0.1 kh	0.0	
2902	COOLING FAN ACT Defines the actual value of the drive's cooling fan counter. • The parameter is reset by writing 0.0 to it.	0.0...6553.5 kh	0.1 kh	0.0	
2903	REVOLUTION TRIG Sets the trigger point for the motor's accumulated revolutions counter. • 0.0 = NOT SEL	0...65535 MRev	1 MRev	0	
2904	REVOLUTION ACT Defines the actual value of the motor's accumulated revolutions counter. • The parameter is reset by writing 0 to it.	0...65535 MRev	1 MRev	0	
2905	RUN TIME TRIG Sets the trigger point for the drive's run time counter. • 0.0 = NOT SEL	0.0...6553.5 kh	0.1 kh	0.0	
2906	RUN TIME ACT Defines the actual value of the drive's run time counter. • The parameter is reset by writing 0.0 to it.	0.0...6553.5 kh	0.1 kh	0.0	
2907	USER MWh TRIG Sets the trigger point for the drive's accumulated power consumption (in megawatt hours) counter. • 0.0 = NOT SEL	0.0...6553.5 MWh	0.1 MWh	0.0	
2908	USER MWh ACT Defines the actual value of the drive's accumulated power consumption (in megawatt hours) counter. • The parameter is reset by writing 0.0 to it.	0.0...6553.5 MWh	0.1 MWh	0.0	

Group 30: Fault Functions

This group defines situations that the drive should recognize as potential faults and defines how the drive should respond if the fault is detected.

Group 30: Fault Functions					
Code	Description	Range	Resolution	Default	S
3001	AI<MIN FUNCTION Defines the drive response if the analog input (AI) signal drops below the fault limits and AI is used in reference chain. • 3021 AI1 FAULT LIMIT and 3022 AI2 FAULT LIMIT set the minimum limits 0 = NOT SEL – No response. 1 = FAULT – Displays a fault (7, AI1 LOSS or 8, AI2 LOSS) and the drive coasts to stop. 2 = CONST SP 7 – Displays a warning (2006, AI1 LOSS or 2007, AI2 LOSS) and sets speed using 1208 CONST SPEED 7. 3 = LAST SPEED – Displays a warning (2006, AI1 LOSS or 2007, AI2 LOSS) and sets speed using the last operating level. This value is the average speed over the last 10 seconds. Warning! If you select CONST SP 7 or LAST SPEED, make sure that continued operation is safe when the analog input signal is lost.	0...3	1	0	
3002	PANEL COMM ERR Defines the drive response to a control panel communication error. 1 = FAULT – Displays a fault (10, PANEL LOSS) and the drive coasts to stop. 2 = CONST SP 7 – Displays a warning (2008, PANEL LOSS) and sets speed using 1208 CONST SPEED 7. 3 = LAST SPEED – Displays a warning (2008, PANEL LOSS) and sets speed using the last operating level. This value is the average speed over the last 10 seconds. Warning! If you select CONST SP 7 or LAST SPEED, make sure that continued operation is safe when the control panel communication is lost.	1...3	1	1	
3003	EXTERNAL FAULT 1 Defines the External Fault 1 signal input and the drive response to an external fault. 0 = NOT SEL – External fault signal is not used. 1 = DI1 – Defines digital input DI1 as the external fault input. • Activating the digital input indicates a fault. The drive displays a fault (14, EXTERNAL FAULT 1) and the drive coasts to stop. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the external fault input. • See DI1 above. -1 = DI1(INV) – Defines an inverted digital input DI1 as the external fault input. • De-activating the digital input indicates a fault. The drive displays a fault (14, EXTERNAL FAULT 1) and the drive coasts to stop. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the external fault input. • See DI1(INV) above.	-6...6	1	0	
3004	EXTERNAL FAULT 2 Defines the External Fault 2 signal input and the drive response to an external fault. • See parameter 3003 above.	-6...6	1	0	
3005	MOT THERM PROT Defines the drive response to motor overheating. 0 = NOT SEL – No response and/or motor thermal protection not set up. 1 = FAULT – When the calculated motor temperature exceeds 90 C, displays a warning (2010, MOT OVERTEMP). When the calculated motor temperature exceeds 110 C displays a fault (9, MOT OVERTEMP) and the drive coasts to stop. 2 = WARNING – When the calculated motor temperature exceeds 90 C, displays a warning (2010, MOT OVERTEMP).	0, 2	1	1	

Group 30: Fault Functions					
Code	Description	Range	Resolution	Default	S
3006	MOT THERM TIME Sets the motor thermal time constant for the motor temperature model. - This is the time required for the motor to reach 63% of the final temperature with steady load. - For thermal protection according to UL requirements for NEMA class motors, use the rule of thumb: MOTOR THERM TIME equals 35 times t_6, where t_6 (in seconds) is specified by the motor manufacturer as the time that the motor can safely operate at six times its rated current. - The thermal time for a Class 10 trip curve is 350 s, for a Class 20 trip curve 700 s, and for a Class 30 trip curve 1050 s.	256...9999 s	1	1050 s	
					
3007	MOT LOAD CURVE Sets the maximum allowable operating load of the motor. - When set to 100%, the maximum allowable load is equal to the value of Start-up Data parameter 9906 MOTOR NOM CURRENT. - Adjust the load curve level if the ambient temperature differs from nominal.	50...150%	1	100%	
					
3008	ZERO SPEED LOAD Sets the maximum allowable current at zero speed. Value is relative to 9906 MOTOR NOM CURR.	25...150%	1	70%	
3009	BREAK POINT FREQ Sets the break point frequency for the motor load curve. Example: Thermal protection trip times when parameters 3006 MOT THERM TIME, 3007 MOT LOAD CURVE and 3008 ZERO SPEED LOAD have default values.	1...250 Hz	1	35 Hz	
				 I_O = Output current I_N = Nominal motor current f_O = Output frequency f_{BRK} = Break point frequency A = Trip time	

Group 30: Fault Functions					
Code	Description	Range	Resolution	Default	S
3010	STALL FUNCTION This parameter defines the operation of the Stall function. This protection is active if the drive operates in the stall region (see figure) for the time defined by 3012 STALL TIME. The "User Limit" is defined in Group 20 by 2017 MAX TORQUE 1, 2018 MAX TORQUE 2, or the limit on the COMM input. 0 = NOT SEL – Stall protection is not used. 1 = FAULT – When the drive operates in the stall region for the time set by 3012 STALL TIME: • The drive coasts to stop. • A fault indication is displayed. 2 = WARNING – When the drive operates in the stall region for the time set by 3012 STALL TIME: • A warning indication is displayed. • The warning disappears when the drive is out of the stall region for half the time set by parameter 3012 STALL TIME.	0...2	1	0	
					
3011	STALL FREQUENCY This parameter sets the frequency value for the Stall function. Refer to Figure.	0.5...50.0 Hz	0.1 Hz	20.0 Hz	
3012	STALL TIME This parameter sets the time value for the Stall function.	10...400 s	1 s	20 s	
3013	UNDERLOAD FUNCTION Removal of motor load may indicate a process malfunction. The protection is activated if: • The motor torque drops below the load curve selected by parameter 3015 UNDERLOAD CURVE. • This condition has lasted longer than the time set by parameter 3014 UNDERLOAD TIME. • Output frequency is higher than 10% of the nominal frequency. 0 = NOT SEL – Underload protection is not used. 1 = FAULT – When the protection is activated the drive coasts to stop. A fault indication is displayed. 2 = WARNING – A warning indication is displayed.	0...2	-	0	
3014	UNDERLOAD TIME Time limit for underload protection.	10...400 s	1 s	20 s	
3015	UNDERLOAD CURVE This parameter provides five selectable curves shown in the figure. • If the load drops below the set curve for longer than the time set by parameter 3014, the underload protection is activated. • Curves 1–3 reach maximum at the motor rated frequency set by parameter 9907 MOTOR NOM FREQ. • T_M = nominal torque of the motor. • f_N = nominal frequency of the motor.	1...5	1	1	
					
3017	EARTH FAULT Defines the drive response if the drive detects a ground fault in the motor or motor cables. 0 = DISABLE – No response. 1 = ENABLE – Displays a fault (16, EARTH FAULT) and the drive coasts to stop.	0...1	1	1	

Group 30: Fault Functions					
Code	Description	Range	Resolution	Default	S
3018	COMM FAULT FUNC Defines the drive response if the fieldbus communication is lost. 0 = NOT SEL – No response. 1 = FAULT – Displays a fault (28, SERIAL 1 ERR) and the drive coasts to stop. 2 = CONST SP7 – Displays a warning (2005, IO COMM) and sets speed using 1208 CONST SPEED 7. This “alarm speed” remains active until the fieldbus writes a new reference value. 3 = LAST SPEED – Displays a warning (2005, IO COMM) and sets speed using the last operating level. This value is the average speed over the last 10 seconds. This “alarm speed” remains active until the fieldbus writes a new reference value. Caution: If you select const speed 7, or last speed, make sure that continued operation is safe when fieldbus communication is lost.	0...3	1	0	
3019	COMM FAULT TIME Sets the communication fault time used with 3018 COMM FAULT FUNC. • Brief interruptions in the fieldbus communication are not treated as faults if they are less than the COMM FAULT TIME value.	0.0...60.0 s	0.1 s	10.0 s	
3021	AI1 FAULT LIMIT Sets a fault level for analog input 1. See 3001 AI<MIN FUNCTION.	0.0...100.0%	0.1%	0.0%	
3022	AI2 FAULT LIMIT Sets a fault level for analog input 2. See 3001 AI<MIN FUNCTION.	0.0...100.0%	0.1%	0.0%	
3024	CB TEMP FAULT Defines the drive response to control board overheating. 0 = DISABLE - No drive response to overheating. 1 = ENABLE - Displays Fault 37 (CB OVERTEMP) and (if running) the drive coasts to stop.				

Group 31: Automatic Reset

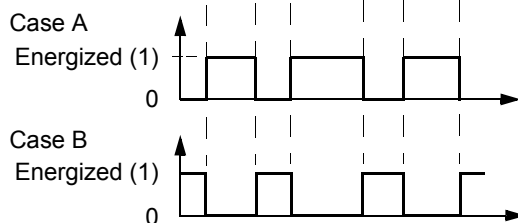
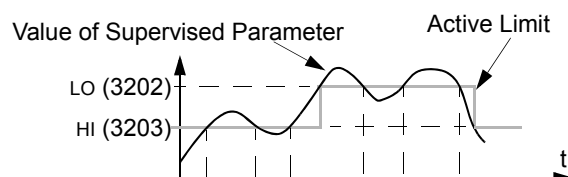
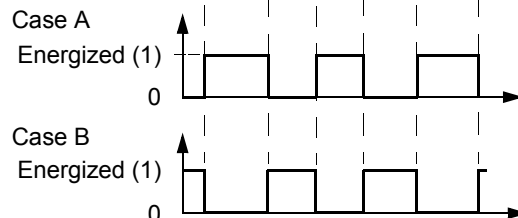
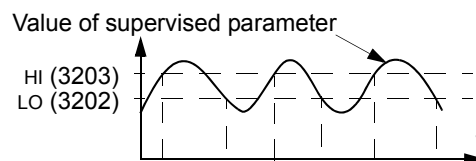
This group defines conditions for automatic resets. An automatic reset occurs after a particular fault is detected. The drive holds for a set delay time, then automatically restarts. You can limit the number of resets in a specified time period, and you can set up automatic resets for a variety of faults.

Group 31: Automatic Reset					
Code	Description	Range	Resolution	Default	S
3101	NR OF TRIALS Sets the number of allowed automatic resets within a trial period defined by 3102 TRIAL TIME. - If the number of automatic resets exceeds this limit (within the trial time), the drive prevents additional automatic resets and remains stopped. - Starting then requires a successful reset performed from the control panel or from a source selected by 1604 FAULT RESET SEL. Example: Three faults have occurred in the trial time. The last is reset only if the value for 3101 NR OF TRIALS is 3 or more.	0...5	1	5	
	Trial time x = Automatic reset				
3102	TRIAL TIME Sets the time period used for counting and limiting the number of resets. See 3101 NR OF TRIALS.	1.0...600.0 s	0.1 s	30.0 s	
3103	DELAY TIME Sets the delay time between a fault detection and attempted drive restart. If DELAY TIME = zero, the drive resets immediately.	0.0...120.0 s	0.1 s	6.0 s	
3104	AR OVERCURRENT Sets the automatic reset for the overcurrent function on or off. 0 = DISABLE – Disables automatic reset. 1 = ENABLE – Enables automatic reset. Automatically resets the fault (OVERCURRENT) after the delay set by 3103 DELAY TIME, and the drive resumes normal operation.	0, 1	1	0	
3105	AR OVERVOLTAGE Sets the automatic reset for the overvoltage function on or off. 0 = DISABLE – Disables automatic reset. 1 = ENABLE – Enables automatic reset. Automatically resets the fault (DC OVERVOLT) after the delay set by 3103 DELAY TIME, and the drive resumes normal operation.	0, 1	1	1	
3106	AR UNDERVOLTAGE Sets the automatic reset for the undervoltage function on or off. 0 = DISABLE – Disables automatic reset. 1 = ENABLE – Enables automatic reset. Automatically resets the fault (DC UNDERVOLTAGE) after the delay set by 3103 DELAY TIME, and the drive resumes normal operation.	0, 1	1	1	
3107	AR AI<MIN Sets the automatic reset for the analog input less than minimum value function on or off. 0 = DISABLE – Disables automatic reset. 1 = ENABLE – Enables automatic reset. Automatically resets the fault (AI<MIN) after the delay set by 3103 DELAY TIME, and the drive resumes normal operation. Warning! When the analog input signal is restored, the drive may restart, even after a long stop. Make sure that automatic, long delayed starts will not cause physical injury and/or damage equipment.	0, 1	1	1	
3108	AR EXTERNAL FLT Sets the automatic reset for external faults function on or off. 0 = DISABLE – Disables automatic reset. 1 = ENABLE – Enables automatic reset. Automatically resets the fault (EXTERNAL FAULT 1 or EXTERNAL FAULT 2) after the delay set by 3103 DELAY TIME, and the drive resumes normal operation.	0, 1	1	1	

Group 32: Supervision

This group defines supervision for up to three signals from Group 01, Operating Data. Supervision monitors a specified parameter and energizes a relay output if the parameter passes a defined limit. Use Group 14, Relay Outputs, to define the relay and whether the relay activates when the signal is too low or too high.

Group 32: Supervision					
Code	Description	Range	Resolution	Default	S
3201	SUPERV 1 PARAM Selects the first supervised parameter. - Must be a parameter number from Group 01 Operating Data. - If the supervised parameter passes a limit, a relay output is energized. - The supervision limits are defined in this group. - The relay outputs are defined in Group 14 Relay Outputs (definition also specifies which supervision limit is monitored). LO ≤ HI Operating data supervision using relay outputs, when $LO \leq HI$. - Case A = Parameter 1401 RELAY OUTPUT 1 (or 1402 RELAY OUTPUT 2, etc.) value is SUPRV1 OVER or SUPRV2 OVER. Use for monitoring when/if the supervised signal exceeds a given limit. The relay remains active until the supervised value drops below the low limit. - Case B = Parameter 1401 RELAY OUTPUT 1 (or 1402 RELAY OUTPUT 2, etc.) value is SUPRV1 UNDER or SUPRV2 UNDER. Use for monitoring when/if the supervised signal falls below a given limit. The relay remains active until the supervised value rises above the high limit. Note! Case $LO \leq HI$ represents a normal hysteresis. LO > HI Operating data supervision using relay outputs, when $LO > HI$. The lowest limit (HI 3203) is active initially, and remains active until the supervised parameter goes above the highest limit (LO 3202), making that limit the active limit. That limit remains active until the supervised parameter goes below the lowest limit (HI 3203), making that limit active. - Case A = Parameter 1401 RELAY OUTPUT 1 (or 1402 RELAY OUTPUT 2, etc.) value is SUPRV1 OVER or SUPRV2 OVER. Initially the relay is de-energized. It is energized whenever the supervised parameter goes above the active limit. - Case B = Parameter 1401 RELAY OUTPUT 1 (or 1402 RELAY OUTPUT 2, etc.) value is SUPRV1 UNDER or SUPRV2 UNDER. Initially the relay is energized. It is de-energized whenever the supervised parameter goes below the active limit. Note! Case $LO > HI$ represents a special hysteresis with two separate supervision limits.	101...199	1	103	
3202	SUPERV 1 LIM LO Sets the low limit for the first supervised parameter. See 3201 SUPERV 1 PARAM above.	Depends on selection	-	60.0 Hz	
3203	SUPERV 1 LIM HI Sets the high limit for the first supervised parameter. See 3201 SUPERV 1 PARAM above.	Depends on selection	-	60.0 Hz	
3204	SUPERV 2 PARAM Selects the second supervised parameter. See 3201 SUPERV 1 PARAM above.	101...199	1	104	



Group 32: Supervision					
Code	Description	Range	Resolution	Default	S
3205	SUPERV 2 LIM LO Sets the low limit for the second supervised parameter. See 3204 SUPERV 2 PARAM above.	Depends on selection		4.6 A	
3206	SUPERV 2 LIM HI Sets the high limit for the second supervised parameter. See 3204 SUPERV 2 PARAM above.	Depends on selection		4.6 A	
3207	SUPERV 3 PARAM Selects the third supervised parameter. See 3201 SUPERV 1 PARAM above.	101...199	1	105	
3208	SUPERV 3 LIM LO Sets the low limit for the third supervised parameter. See 3207 SUPERV 3 PARAM above.	Depends on selection		100.0%	
3209	SUPERV 3 LIM HI Sets the high limit for the third supervised parameter. See 3207 SUPERV 3 PARAM above.	Depends on selection		100.0%	

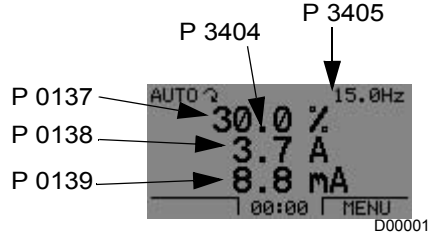
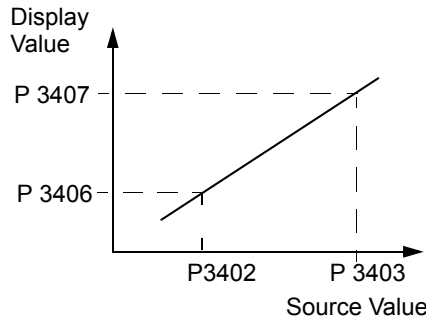
Group 33: Information

This group provides access to information about the drive's current programs: versions and test date.

Group 33: Information					
Code	Description	Range	Resolution	Default	S
3301	FW VERSION Contains the version of the drive's firmware.	0000...FFFF hex	1	Firmware ver.	
3302	LP VERSION Contains the version of the loading package.	0000...FFFF hex	1	0	
3303	TEST DATE Contains the test date (yy.ww).	yy.ww	1	0	
3304	DRIVE RATING Indicates the drive's current and voltage rating. The format is XXXY, where: • XXX = The nominal current rating of the drive in amps. If present, an "A" indicates a decimal point in the rating for the current. For example XXX = 8A8 indicates a nominal current rating of 8.8 Amps. • Y = The voltage rating of the drive, where Y = 2 indicates a 208 240 Volt rating, and Y = 4 indicates a 380 480 Volt rating.	-	-	-	

Group 34: Panel Display Process Variables

This group defines the content for control panel display (middle area), when the control panel is in the control mode.

Group 34: Panel Display Process Variables																										
Code	Description	Range	Resolution	Default	S																					
3401	SIGNAL1 PARAM Selects the first parameter (by number) displayed on the control panel. • Definitions in this group define display content when the control panel is in the control mode. • Any Group 01 parameter number can be selected. • Using the following parameters, the display value can be scaled, converted to convenient units, and/or displayed as a bar graph. • The figure identifies selections made by parameters in this group. 100 = not selected – First parameter not displayed. 101 199 = Displays parameter 0101 0199. If parameter does not exist, the display shows “n.a.”.	100...199	1	103																						
																										
3402	SIGNAL1 MIN Defines the minimum expected value for the first display parameter. Use parameters 3402, 3403, 3406, and 3407, for example to convert a Group 01 parameter, such as 0102 SPEED (in rpm) to the speed of a conveyor driven by the motor (in ft/min). For such a conversion, the source values in the figure are the min. and max. motor speed, and the display values are the corresponding min. and max. conveyor speed. Use parameter 3405 to select the proper units for the display. Note! Selecting units does not convert values.	Depends on selection -		0.0 Hz																						
																										
3403	SIGNAL1 MAX Defines the maximum expected value for the first display parameter.	Depends on selection -		600.0 Hz																						
3404	OUTPUT1 DSP FORM Defines the decimal point location for the first display parameter. 1 7 – Defines the decimal point location. • Enter the number of digits desired to the right of the decimal point. • See table for example using pi (3.14159). 8 = BAR METER – Specifies a bar meter display.	0...8	1	5																						
	<table><tr><th>3404 Value</th><th>Display</th><th>Range</th></tr><tr><td>0</td><td>+ 3</td><td rowspan="4">-32768 +32767 (Signed)</td></tr><tr><td>1</td><td>+ 3.1</td></tr><tr><td>2</td><td>+ 3.14</td></tr><tr><td>3</td><td>+ 3.142</td></tr><tr><td>4</td><td>3</td><td rowspan="4">0 65535 (Unsigned)</td></tr><tr><td>5</td><td>3.1</td></tr><tr><td>6</td><td>3.14</td></tr><tr><td>7</td><td>3.142</td></tr></table>					3404 Value	Display	Range	0	+ 3	-32768 +32767 (Signed)	1	+ 3.1	2	+ 3.14	3	+ 3.142	4	3	0 65535 (Unsigned)	5	3.1	6	3.14	7	3.142
3404 Value	Display	Range																								
0	+ 3	-32768 +32767 (Signed)																								
1	+ 3.1																									
2	+ 3.14																									
3	+ 3.142																									
4	3	0 65535 (Unsigned)																								
5	3.1																									
6	3.14																									
7	3.142																									

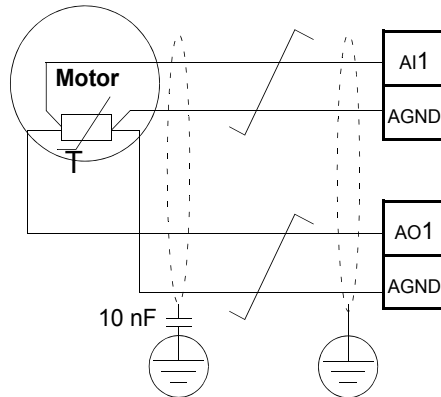
Group 34: Panel Display Process Variables					
Code	Description	Range	Resolution	Default	S
3405	OUTPUT1 DSP UNIT Selects the units used with the first display parameter. • Enter positive values in parameter 3405 for a numeric display. • Enter negative values in parameter 3405 for a bar-graph display. 0 = NOT SEL 8 = kh 16 = °F 24 = GPM 32 = kHz 40 = m ³ /m 48 = gal/m 56 = FPS 1 = A 9 = °C 17 = hp 25 = PSI 33 = Ohm 41 = kg/s 49 = gal/h 57 = ft/s 2 = V 10 = lb ft 18 = MWh 26 = CFM 34 = ppm 42 = kg/m 50 = ft ³ /s 58 = inH ₂ O 3 = Hz 11 = mA 19 = m/s 27 = ft 35 = pps 43 = kg/h 51 = ft ³ /m 59 = in wg 4 = % 12 = mV 20 = m ³ /h 28 = MGD 36 = l/s 44 = mbar 52 = ft ³ /h 60 = ft wg 5 = s 13 = kW 21 = dm ³ /s 29 = inHg 37 = l/min 45 = Pa 53 = lb/s 61 = lbsi 6 = h 14 = W 22 = bar 30 = FPM 38 = l/h 46 = GPS 54 = lb/m 62 = ms 7 = rpm 15 = kWh 23 = kPa 31 = kb/s 39 = m ³ /s 47 = gal/s 55 = lb/h 63 = Mrev 117 = %ref 119 = %dev 121 = % SP 123 = Iout 125 = Fout 127 = Vdc 118 = %act 120 = % LD 122 = %FBK 124 = Vout 126 = Tout	-128...127	1	4	
3406	OUTPUT1 MIN Sets the minimum value displayed for the first display parameter.	Depends on selection	-	0.0%	
3407	OUTPUT1 MAX Sets the maximum value displayed for the first display parameter.	Depends on selection	-	1000.0%	
3408	SIGNAL 2 PARAM Selects the second parameter (by number) displayed on the control panel. See parameter 3401.	100...199	1	104	
3409	SIGNAL 2 MIN Defines the minimum expected value for the second display parameter. See parameter 3402.	Depends on selection	-	4.3 A	
3410	SIGNAL 2 MAX Defines the maximum expected value for the second display parameter. See parameter 3403.	Depends on selection	-	9.2 A	
3411	OUTPUT 2 DSP FORM Defines the decimal point location for the second display parameter. See parameter 3404.	0...8	1	5	
3412	OUTPUT 2 DSP UNIT Selects the units used with the second display parameter. See parameter 3405.	-128...127	1	1	
3413	OUTPUT 2 MIN Sets the minimum value displayed for the second display parameter. See parameter 3406.	Depends on selection	-	0.0 A	
3414	OUTPUT 2 MAX Sets the maximum value displayed for the second display parameter. See parameter 3407.	Depends on selection	-	9.2 A	
3415	SIGNAL 3 PARAM Selects the third parameter (by number) displayed on the control panel. See parameter 3401.	100...199	1	120	
3416	SIGNAL 3 MIN Defines the minimum expected value for the third display parameter. See parameter 3402.	Depends on selection	-	0.0%	
3417	SIGNAL 3 MAX Defines the maximum expected value for the third display parameter. See parameter 3403.	Depends on selection	-	100.0%	
3418	OUTPUT 3 DSP FORM Defines the decimal point location for the third display parameter. See parameter 3404.	0...8	1	5	
3419	OUTPUT 3 DSP UNIT Selects the units used with the third display parameter. See parameter 3405.	-128...127	1	11	
3420	OUTPUT 3 MIN Sets the minimum value displayed for the third display parameter. See parameter 3406.	Depends on selection	-	0.0 mA	

Group 34: Panel Display Process Variables					
Code	Description	Range	Resolution	Default	S
3421	OUTPUT 3 MAX Sets the maximum value displayed for the third display parameter. See parameter 3407.	Depends on selection		20.0 mA	

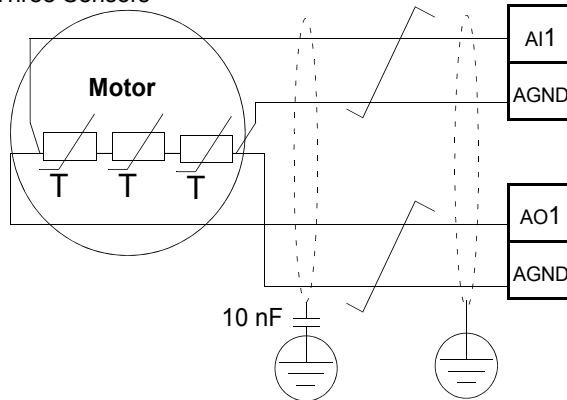
Group 35: Motor Temp Meas

This group defines the detection and reporting for a particular potential fault – motor overheating, as detected by a temperature sensor. Typical connections are defined below.

One Sensor



Three Sensors

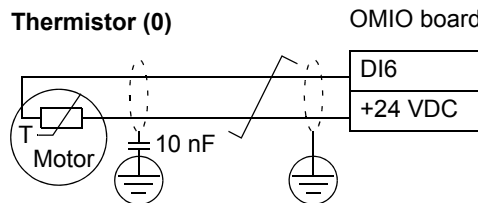
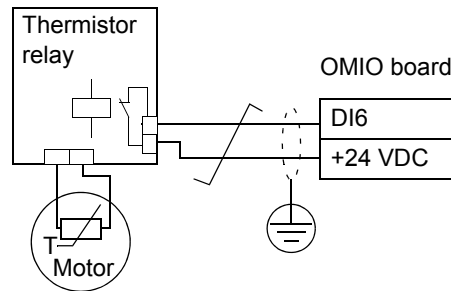


Warning! IEC 60664 requires double or reinforced insulation between live parts and the surface of accessible parts of electrical equipment which are either non-conductive or conductive but not connected to the protective earth.

To fulfil the insulation requirement, connect a thermistor (and other similar components) to the drive's control terminals using any of these alternatives:

- Separate the thermistor from live parts of the motor with double reinforced insulation.
- Protect all circuits connected to the drive's digital and analog inputs. Protect against contact, and insulate from other low voltage circuits with basic insulation (rated for the same voltage level as the drive's main circuit).
- Use an external thermistor relay. The relay insulation must be rated for the same voltage level as the drive's main circuit.

The figure below shows alternate thermistor connections. At the motor end the cable shield should be earthed through a 10 nF capacitor. If this is not possible, leave the shield unconnected.



For other faults, or for anticipating motor overheating using a model, see Group 30: Fault Functions.

Group 35: Motor Temp Meas

Code	Description	Range	Resolution	Default	S						
3501	SENSOR TYPE Identifies the type of motor temperature sensor used, PT100 (°C) or PTC (ohms). See parameters 1501 and 1507. 0 = NONE 1 = 1 x PT100 – Sensor configuration uses one PT 100 sensor. - Analog output AO1 or AO2 feeds constant current through the sensor. - The sensor resistance increases as the motor temperature rises, as does the voltage over the sensor. - The temperature measurement function reads the voltage through analog input AI1 or AI2 and converts it to degrees centigrade. 2 = 2 x PT100 – Sensor configuration uses two PT 100 sensors. - Operation is the same as for above 1 x PT100. 3 = 3 x PT100 – Sensor configuration uses three PT 100 sensors. - Operation is the same as for above 1 x PT100. 4 = PTC – Sensor configuration uses one PTC. - The analog output feeds a constant current through the sensor. - The resistance of the sensor increases sharply as the motor temperature rises over the PTC reference temperature (T_{ref}), as does the voltage over the resistor. The temperature measurement function reads the voltage through analog input AI1 and converts it into ohms. - The figure shows typical PTC sensor resistance values as a function of the motor operating temperature.	0...6	1	0							
	<table> <tr> <th>Temperature</th><th>Resistance</th></tr> <tr> <td>Normal</td><td>0 1.5 kohm</td></tr> <tr> <td>Excessive</td><td>≥ 4 kohm</td></tr> </table>	Temperature	Resistance	Normal	0 1.5 kohm	Excessive	≥ 4 kohm				
Temperature	Resistance										
Normal	0 1.5 kohm										
Excessive	≥ 4 kohm										

The graph illustrates the characteristic of a Positive Temperature Coefficient (PTC) sensor. The vertical axis represents Resistance in Ohms, with major grid lines at 100, 550, 1330, and 4000. The horizontal axis represents Temperature (T). The curve shows that as temperature increases, the resistance remains relatively low and stable for a period before rising sharply in an exponential-like fashion, which is typical for PTC sensors used for over-temperature protection.

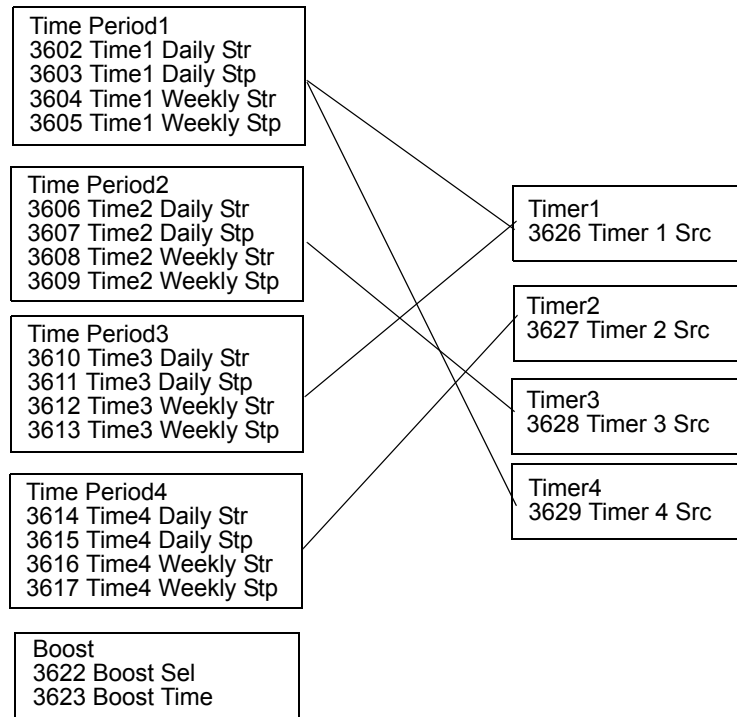
Group 35: Motor Temp Meas					
Code	Description	Range	Resolution	Default	S
	5 = THERMISTOR (0) – Sensor configuration uses a thermistor. • Motor thermal protection is activated through a digital input. Connect either a PTC sensor or a normally closed thermistor relay to a digital input. The drive reads the digital input states as shown in the above table. • When the digital input is '0' the motor is overheated. • See the figures in the introduction to this Group. 6 = THERMISTOR (1) – Sensor configuration uses a thermistor. • Motor thermal protection is activated through a digital input. Connect a normally open thermistor relay to a digital input. The drive reads the digital input states as shown in the above table. • When the digital input is '1' the motor is overheated. See the figures in the introduction to this Group.				
3502	INPUT SELECTION	1...8	1	1	
	Defines the input used for the temperature sensor. 1 = AI1 – PT100 and PTC. 2 = AI2 – PT100 and PTC. 3 8 = DI1 DI6 – Thermistor				
3503	ALARM LIMIT	-10...200 °C / 0...5000 Ohm / 0...1	1	110 °C / 1500 Ohm / 0	
	Defines the alarm limit for motor temperature measurement. • At motor temperatures above this limit, the drive displays an alarm (2010, MOTOR OVERTEMP) For thermistors: 0 = de-activated 1 = activated				
3504	FAULT LIMIT	-10...200 °C / 0...5000 Ohm / 0...1	1	130 °C / 4000 Ohm / 0	
	Defines the fault limit for motor temperature measurement. • At motor temperatures above this limit, the drive displays a fault (9, MOTOR OVERTEMP) and stops the drive. For thermistors: 0 = de-activated 1 = activated				

Group 36: Timer Functions

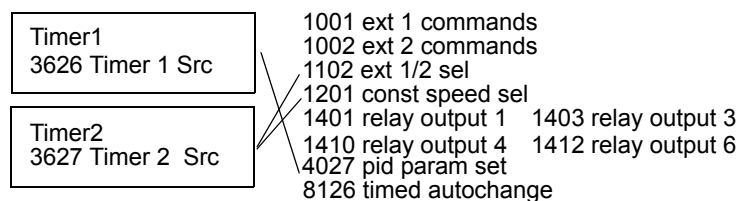
This group defines the timer functions. The timer functions include:

- Four daily start and stop times.
- Four weekly start, stop and boost times.
- Four timers for collecting selected periods together.

A timer can be connected to multiple time periods and a time period can be in multiple timers.

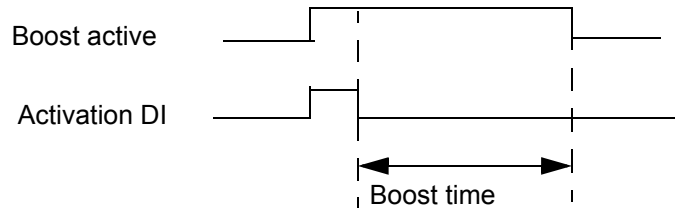


A parameter can be connected to only one time.



Group 36: Timer Functions					
Code	Description	Range	Resolution	Default	S
3601	TIMERS ENABLE Selects the source for the timer enable signal. 0 = NOT SEL – Timed functions are disabled. 1 = DI1- Defines digital input DI1 as the timed function enable signal. • The digital input must be activated for timed functions enable. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the timed function enable signal. 7 = ENABLED – Timed functions are enabled. -1 = DI1(INV) – Defines an inverted digital input DI1 as the timed function enable signal. • This digital input must be de-activated for timed function enable. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the timed function enable signal.	-6...7	1	0	
3602	START TIME 1 Defines the daily start time. • The time can be changed in steps of 2 seconds. • If parameter value is 07:00:00, then the period will be activated at 7 a.m. • The figure shows multiple periods on different weekdays. When editing parameters to set times: • Use arrow keys to select desired hour setting. • Press NEXT to advance to minutes. • Use arrow keys to select desired minutes setting. • Press NEXT to advance to minutes. • Use arrow keys to select desired seconds setting. • Press SAVE.	00:00:00...23:59:58	2 s	12:00:00	
3603	STOP TIME 1 Defines the daily stop time. • The time can be changed in steps of 2 seconds. • If the parameter value is 09:00:00, then the period will be deactivated at 9 a.m.	00:00:00...23:59:58	2 s	12:00:00	
3604	START DAY 1 Defines the weekly start day. 1 = Monday 7 = Sunday. • If parameter value is 1, then period 1 weekly is active from Monday midnight (00:00:00).	1...7	1	1	
3605	STOP DAY 1 Defines weekly stop day. 1 = Monday 7 = Sunday. • If parameter value is 5, then timer 1 weekly will be deactivated on Friday midnight (23:59:58).	1...7	1	1	
3606	START TIME 2 Defines timer2 daily start time. • See parameter 3602	00:00:00...23:59:58	2 s	12:00:00	
3607	STOP TIME 2 Defines timer2 daily stop time. • See parameter 3603	00:00:00...23:59:58	2 s	12:00:00	
3608	START DAY 2 Defines timer 2 weekly start day. • See parameter 3604	1...7	1	1	

Group 36: Timer Functions					
Code	Description	Range	Resolution	Default	S
3609	STOP DAY 2 Defines timer 2 weekly stop day. • See parameter 3605	1...7	1	1	
3610	START TIME 3 Defines timer 3 daily start time. • See parameter 3602	00:00:00...23:59:58	2 s	12:00:00	
3611	STOP TIME 3 Defines timer 3 daily stop time. • See parameter 3603	00:00:00...23:59:58	2 s	12:00:00	
3612	START DAY 3 Defines timer 3 weekly start day. • See parameter 3604	1...7	1	1	
3613	STOP DAY 3 Defines timer 3 weekly stop day. • See parameter 3605	1...7	1	1	
3614	START TIME 4 Defines timer 4 daily start time. • See parameter 3602	00:00:00...23:59:58	2 s	12:00:00	
3615	STOP TIME 4 Defines timer 4 daily stop time. • See parameter 3603	00:00:00...23:59:58	2 s	12:00:00	
3616	START DAY 4 Defines timer 4 weekly start day. • See parameter 3604	1...7	1	1	
3617	STOP DAY 4 Defines timer 4 weekly stop day. • See parameter 3605	1...7	1	1	
3622	BOOST SEL Selects the source for the boost signal. 0 = NOT SEL- Boost signal is disabled. 1 = DI1-Defines DI1 as the boost signal. 2 6 = DI2 DI6 – Defines DI2 DI6 as the boost signal. -1 = DI1(INV) – Defines an inverted digital input DI1 as the boost signal. -2 -6 = Defines an inverted digital input DI2 DI6 as the boost signal.	-6...6	1	0	
3623	BOOST TIME Defines the boost ON time. Time is started when boost sel signal is released. If parameter range is 01:30:00, then boost is active for 1 hour and 30 minutes after activation DI is released.	00:00:00-23:59:58	2 s	00:00:00	



Group 36: Timer Functions					
Code	Description	Range	Resolution	Default	S
3626	TIMER 1 SRC Collects all wanted timers to a timer function. 0 = NOT SEL- No timers have been selected. 1 = P1- Time Period 1 selected in the timer. 2 = P2- Time Period 2 selected in the timer. 3 = P2 + P1 – Time Periods 1 and 2 selected in the timer. 4 = P3 – Time Period 3 selected in the timer. 5 = P3 + P1 – Time Periods 1 and 3 selected in the timer. 6 = P3 + P2 – Time Periods 2 and 3 selected in the timer. 7 = P3 + P2 + P1- Time Periods 1, 2 and 3 selected in the timer. 8 = P4 – Time Period 4 selected in the timer. 9 = P4+ P1- Time Periods 4 and 1 selected in the timer. 10 = P4 + P2 – Time Periods 4 and 2 selected in the timer. 11 = P4 + P2 + P1- Time Periods 4,2 and 1 selected in the timer. 12 = P4 + P3 – Time Periods 4 and 3 selected in the timer. 13 = P4 + P3 + P1- Time Periods 4,3 and 1 selected in the timer. 14 = P4 + P3 + P2 – Time Periods 4,3 and 2 selected in the timer. 15 = P4 + P3 + P2 + P1- Time Periods 4,3,2 and 1 selected in the timer. 16 = BOOST (B)- Boost selected in the timer. 17 = B + P1 – Boost and Time Period 1 selected in the timer. 18 = B+ P2- Boost and Time Period 2 selected in the timer. 19 = B + P2 + P1 – Boost and Time Periods 1 and 2 selected in the timer. 20 = B + P3- Boost and Time Period 3 selected in the timer function. 21 = B + P3 + P1- Boost and Time Period 3 and 1 selected in the timer. 22 = B + P3 + P2 – Boost and Time Periods 3 and 2 selected in the timer. 23 = B + P3 + P2 + P1 – Boost and Time Periods 3,2 and 1 selected in the timer. 24 = B + P4 – Boost and Time Periods 4 selected in the timer. 25 = B + P4 + P1- Boost and Time Period 4 and Timer 1 selected in the timer. 26 = B + P4 + P2 – Boost and Time Period 4 and 2 selected in the timer. 27 = B + P4 + P2 + P1 – Boost and Time Periods 4,2 and 1 selected in the timer. 28 = B + P4 + P3 – Boost and Time Periods 4, 3 29 = B + P4 + P3 +P1 – Boost and Time Periods 4, 3 and 1 selected in the timer. 30 = B + P4 + P3 + P2- Boost and Time Periods 4, 3 and 2 selected. 31 = B+ P4 + P3 + P2 + P1- Boost and Time Periods 4, 3, 2 and 1 selected.	0...31	1	0	
3627	TIMER 2 SRC • See parameter 3626.	0...31	1	0	
3628	TIMER 3 SRC • See parameter 3626.	0...31	1	0	
3629	TIMER 4 SRC • See parameter 3626.	0...31	1	0	

Group 40: Process PID Set 1

This group defines a set of parameters used with the Process PID (PID1) controller.

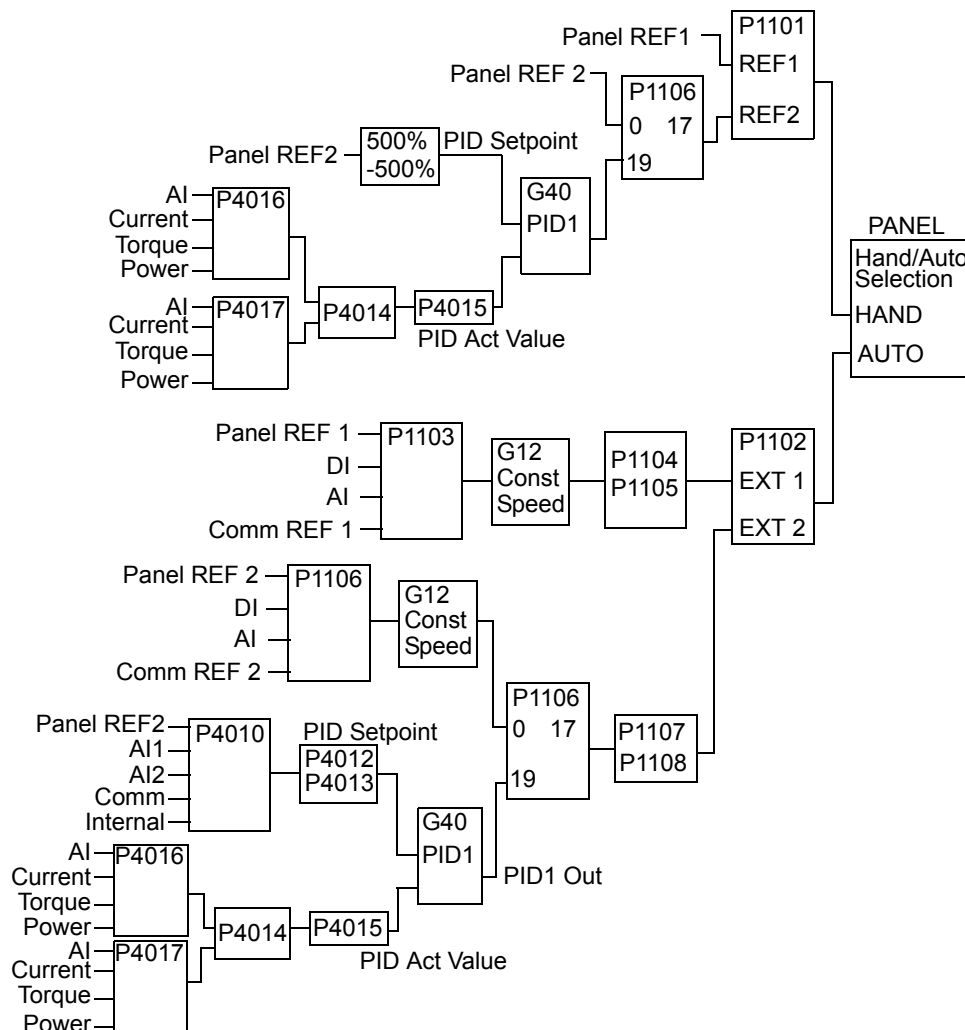
Typically only parameters in this group are needed.

PID Controller – Basic Set-up

In PID control mode, the drive compares a reference signal (setpoint) to an actual signal (feedback), and automatically adjusts the speed of the drive to match the two signals. The difference between the two signals is the error value.

Typically PID control mode is used, when the speed of a fan or pump needs to be controlled based on pressure, flow or temperature. In most cases – when there is only 1 transducer signal wired to the AYK550 – only parameter group 40 is needed.

A Schematic of setpoint/feedback signal flow using parameter group 40 is presented.



Note! In order to activate and use the PID controller Parameter 1106 must be set to value 19.

PID Controller – Advanced

AYK550 has 2 separate PID Controllers:

- Process PID (PID1) and
- External PID (PID2)

Process PID (PID1) has 2 separate sets of parameters:

- Process PID (PID1) SET1, defined in Group 40 and
- Process PID (PID1) SET2, defined in Group 41

You can select between the 2 different sets by using parameter 4027.

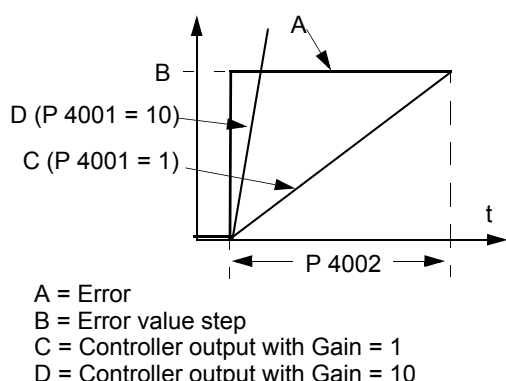
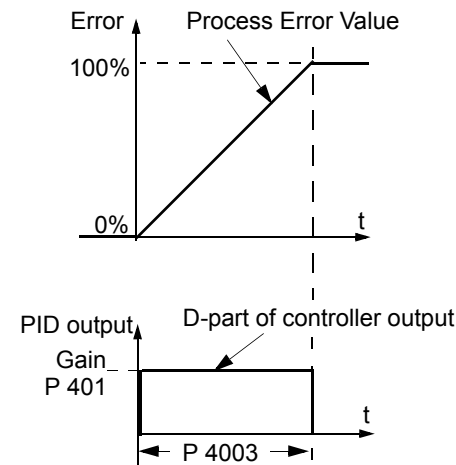
Typically two different PID-Controller sets are used when the load of the motor changes considerably from one situation to another.

You can use External PID (PID2), defined in Group 42, in 2 different ways:

- Instead of using additional PID-controller hardware, you can set outputs of the AYK550 to control a field instrument like a damper or a valve. In this case, set Parameter 4230 to value 0. (0 is the default value.)
- You can use External PID (PID2) as an additional PID-controller to Process PID (PID1) to trim or fine-tune the speed of the AYK550.

An example of the trimming is a return fan that follows the speed of the supply fan. As the return fan needs to run faster or slower than the supply fan in order to create under- or overpressure, correction factors to the supply fan speed are needed. Use External PID (PID2) in the return fan drive to provide these corrections.

Group 40: Process PID Set 1					
Code	Description	Range	Resolution	Default	S
4001	GAIN Defines the PID Controller's gain. • The setting range is 0.1 – 100. • At 0.1, the PID Controller output changes one-tenth as much as the error value. • At 100, the PID Controller output changes one hundred times as much as the error value. Use the proportional gain and integration time values to adjust the responsiveness of the system. • A low value for proportional gain and a high value for integral time ensures stable operation, but provides sluggish response. If the proportional gain value is too large or the integral time too short, the system can become unstable. Procedure: • Initially, set: • 4001 GAIN = 0.0. • 4002 INTEGRATION TIME = 20 seconds. • Start the system and see if it reaches the set point quickly while maintaining stable operation. If not, increase GAIN (4001) until the actual signal (or drive speed) oscillates constantly. It may be necessary to start and stop the drive to induce this oscillation. • Reduce GAIN (4001) until the oscillation stops. • Set GAIN (4001) to 0.4 to 0.6 times the above value. • Decrease the INTEGRATION TIME (4002) until the feedback signal (or drive speed) oscillates constantly. It may be necessary to start and stop the drive to induce this oscillation. • Increase INTEGRATION TIME (4002) until the oscillation stops. • Set INTEGRATION TIME (4002) to 1.15 to 1.5 times the above value. • If the feedback signal contains high frequency noise, increase the value of Parameter 1303 FILTER AI1 or 1306 FILTER AI2 until the noise is filtered from the signal.	0.1...100.0	0.1	2.5	

Group 40: Process PID Set 1																				
Code	Description	Range	Resolution	Default	S															
4002	INTEGRATION TIME Defines the PID Controller's integration time. Integration time is, by definition, is the time required to increase the output by the error value: - Error value is constant and 100%. - Gain = 1. - Integration time of 1 second denotes that a 100% change is Achieved in 1 second. 0.0 = NOT SEL – Disables integration (I-part of controller). 0.1 600.0 = Integration time (seconds). See 4001 for adjustment procedure.	0.0...600.0 s	0.1 s	3.0 s																
																				
4003	DERIVATION TIME Defines the PID Controller's derivation time. - You can add the derivative of the error to the PID controller output. The derivative is the error value's rate of change. For example, if the process error value changes linearly, the derivative is a constant added to the PID controller output. - The error-derivative is filtered with a 1-pole filter. The time constant of the filter is defined by parameter 4004 PID DERIV FILTER. 0.0 = NOT SEL – Disables the error-derivative part of the PID controller output 0.1 10.0 = Derivation time (seconds)	0.0...10.0 s	0.1 s	0.0 s																
																				
4004	PID DERIV FILTER Defines the filter time constant for the error-derivative part of the PID controller output. - Before being added to the PID controller output, the error-derivative is filtered with a 1-pole filter. - Increasing the filter time smooths the error-derivative, reducing noise. 0.0 = NOT SEL – Disables the error-derivative filter. 0.1 10.0 = Filter time constant (seconds).	0.0...10.0 s	0.1 s	1.0 s																
4005	ERROR VALUE INV Selects either a normal or inverted relationship between the feedback signal and the drive speed. 0 = NO – Normal, a decrease in feedback signal increases drive speed. Error = Ref - Fbk 1 = YES – Inverted, a decrease in feedback signal decreases drive speed. Error = Fbk - Ref	0, 1	-	0																
4006	UNIT Selects the unit for the PID controller actual values. (PID1 parameters 0128, 0130, and 0132). See parameter 3405 for list of available units.	0...31	-	4																
4007	DSP FORMAT Defines the decimal point location in PID controller actual values. - Enter the decimal point location counting in from the right of the entry. - See table for example using pi (3.14159).	0...4	1	1																
	<table><tr><th>4007 Value</th><th>Entry</th><th>Display</th></tr><tr><td>0</td><td>0003</td><td>3</td></tr><tr><td>1</td><td>0031</td><td>3.1</td></tr><tr><td>2</td><td>0314</td><td>3.14</td></tr><tr><td>3</td><td>3142</td><td>3.142</td></tr></table>					4007 Value	Entry	Display	0	0003	3	1	0031	3.1	2	0314	3.14	3	3142	3.142
4007 Value	Entry	Display																		
0	0003	3																		
1	0031	3.1																		
2	0314	3.14																		
3	3142	3.142																		

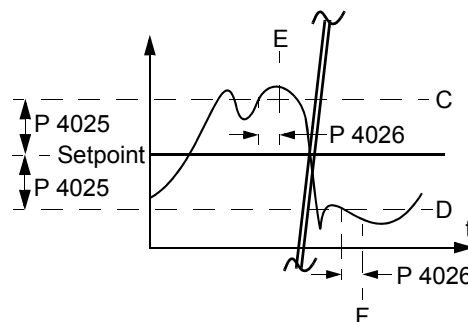
Group 40: Process PID Set 1					
Code	Description	Range	Resolution	Default	S
4008	0 % VALUE Defines (together with the next parameter) the scaling applied to the PID controller's actual values (PID1 parameters 0128, 0130, and 0132). • Units and scale are defined by parameters 4006 and 4007.	-1000.0...1000.0%	0.1%	0.0%	
4009	100 % VALUE Defines (together with the previous parameter) the scaling applied to the PID controller's actual values. • Units and scale are defined by parameters 4006 and 4007.	-1000.0...1000.0%	0.1%	100.0%	
4010	SET POINT SEL Defines the reference signal source for the PID controller. • Parameter has no significance when the PID regulator is by-passed (see 8121 REG BYPASS CTRL). 0 = KEYPAD – Control panel provides reference. 1 = AI1 – Analog input 1 provides reference. 2 = AI2 – Analog input 2 provides reference. 8 = COMM – Fieldbus provides reference. 9 = COMM + AI1 – Defines a fieldbus and analog input 1 (AI1) combination as the reference source. See Analog Input Reference Correction below. 10 = COMM * AI1 – Defines a fieldbus and analog input 1 (AI1) combination as the reference source. See Analog Input Reference Correction below. 11 = DI3U, 4D(RNC) – Digital inputs, acting as a motor potentiometer control, provide reference. • DI3 increases the speed (the U stands for “up”). • DI4 decreases the reference (the D stands for “down”). • Parameter 2205 ACCELER TIME 2 controls the reference signal's rate of change. • R = Stop command resets the reference to zero. • NC = Reference value is not copied. 12 = DI3U, 4D(NC) – Same as DI3U, 4D(RNC) above, except: • Stop command does not reset reference to zero. At restart the motor ramps up, at the selected acceleration rate, to the stored reference. 13 = DI5U, 6D(NC) – Same as DI3U, 4D(NC) above, except: • Uses digital inputs DI5 and DI6. 14 = AI1 + AI2 – Defines an analog input 1 (AI1) and analog input 2 (AI2) combination as the reference source. See Analog Input Reference Correction below. 15 = AI1 * AI2 – Defines an analog input 1 (AI1) and analog input 2 (AI2) combination as the reference source. See Analog Input Reference Correction below. 16 = AI1 - AI2 – Defines an analog input 1 (AI1) and analog input 2 (AI2) combination as the reference source. See Analog Input Reference Correction below. 17 = AI1/AI2 – Defines an analog input 1 (AI1) and analog input 2 (AI2) combination as the reference source. See Analog Input Reference Correction below. 19 = INTERNAL – A constant value set using parameter 4011 provides reference.	0...19	1	1	✓

Group 40: Process PID Set 1															
Code	Description	Range	Resolution	Default	S										
	Analog Input Reference Correction Parameter values 9, 10, and 14 17 use the formula in the following table.														
	<table><tr><th>Value Setting</th><th>AI reference is calculated as following:</th></tr><tr><td>C + B</td><td>C value + (B value - 50% of reference value)</td></tr><tr><td>C * B</td><td>C value * (B value / 50% of reference value)</td></tr><tr><td>C - B</td><td>(C value + 50% of reference value) - B value</td></tr><tr><td>C / B</td><td>(C value * 50% of reference value) / B value</td></tr></table>	Value Setting	AI reference is calculated as following:	C + B	C value + (B value - 50% of reference value)	C * B	C value * (B value / 50% of reference value)	C - B	(C value + 50% of reference value) - B value	C / B	(C value * 50% of reference value) / B value				
Value Setting	AI reference is calculated as following:														
C + B	C value + (B value - 50% of reference value)														
C * B	C value * (B value / 50% of reference value)														
C - B	(C value + 50% of reference value) - B value														
C / B	(C value * 50% of reference value) / B value														
	Where: • C = Main Reference value (= COMM for values 9, 10 and = AI1 for values 14 17). • B = Correcting reference (= AI1 for values 9, 10 and = AI2 for values 14 17).														
	Example: The figure shows the reference source curves for value settings 9, 10, and 14 17, where: • C = 25%. • P 4012 SETPOINT MIN = 0. • P 4013 SETPOINT MAX = 0. • B varies along the horizontal axis.														
4011	INTERNAL SETPNT	-1000.0...1000.0%	0.1%	40.0%											
	Sets a constant value used for the process reference. • Units and scale are defined by parameters 4006 and 4007.														
4012	SETPOINT MIN	-500.0%...500.0%	0.1%	0.0%											
	Sets the minimum value for the reference signal source. See parameter 4010.														
4013	SETPOINT MAX	-500.0%...500.0%	0.1%	100.0%											
	Sets the maximum value for the reference signal source. See parameter 4010.														
4014	FBK SEL	1...10	1	1											
	Defines the PID controller feedback (actual signal). • You can define a combination of two actual values (ACT1 and ACT2) as the feedback signal. • Use parameter 4016 to define the source for actual value 1 (ACT1). • Use parameter 4017 to define the source for actual value 2 (ACT2). 1 = ACT1 – Actual value 1 (ACT1) provides the feedback signal. 2 = ACT1-ACT2 – ACT1 minus ACT2 provides the feedback signal. 3 = ACT1+ACT2 – ACT1 plus ACT2 provides the feedback signal. 4 = ACT1*ACT2 – ACT1 times ACT2 provides the feedback signal. 5 = ACT1/ACT2 – ACT1 divided by ACT2 provides the feedback signal. 6 = MIN (A1, A2) – The smaller of ACT1 or ACT2 provides the feedback signal. 7 = MAX (A1, A2) – The greater of ACT1 or ACT2 provides the feedback signal. 8 = SQRT (A1-A2) – Square root of the value for ACT1 minus ACT2 provides the feedback signal. 9 = SQA1 + SQA2 – Square root of ACT1 plus the square root of ACT2 provides the feedback signal. 10 = SQRT (ACT1) – Square root of ACT1 provides the feedback signal.														

Group 40: Process PID Set 1					
Code	Description	Range	Resolution	Default	S
4015	FBK MULTIPLIER Defines an extra multiplier for the PID FBK value defined by parameter 4014. • Used mainly in applications where the flow is calculated from the pressure difference. 0 = NOT USED. -32.768 32.767 = Multiplier applied to the signal defined by parameter 4014 FBK SEL. Example: $FBK = \text{Multiplier} \times \sqrt{A1 - A2}$	-32.768...32.767	0.001	0.000	
4016	ACT1 INPUT Defines the source for actual value 1 (ACT1). 1 = AI 1 – Uses analog input 1 for ACT1. 2 = AI 2 – Uses analog input 2 for ACT1. 3 = Current – Uses current for ACT1, scaled so: • Min ACT1 = 0 current • Max ACT1 = 2 x nominal current 4 = Torque – Uses torque for ACT1, scaled so: • Min ACT1 = -2 x nominal torque • Max ACT1 = 2 x nominal torque 5 = Power – Uses power for ACT1, scaled so: • Min ACT1 = -2 x nominal power • Max ACT1 = 2 x nominal power	1...5	1	2	✓
4017	ACT2 INPUT Defines the source for actual value 2 (ACT2). 1 = AI 1 – Uses analog input 1 for ACT2. 2 = AI 2 – Uses analog input 2 for ACT2. 3 = Current – Uses current for ACT2, scaled so: • Min ACT2 = 0 current • Max ACT2 = 2 x nominal current 4 = Torque – Uses torque for ACT2, scaled so: • Min ACT2 = -2 x nominal torque • Max ACT2 = 2 x nominal torque 5 = Power – Uses power for ACT2, scaled so: • Min ACT2 = -2 x nominal power • Max ACT2 = 2 x nominal power	1...5	1	2	✓
4018	ACT1 MINIMUM Sets the minimum value for ACT1. • Used with analog input min/max settings (e.g. 1301 MINIMUM AI1, 1302 MAXIMUM AI1). • Scales analog inputs used as actual values. • See figure: A= Normal; B = Inversion (ACT1 MINIMUM > ACT1 MAXIMUM)	-1000...1000%	1%	0%	
4019	ACT1 MAXIMUM Sets the maximum value for ACT1. • See 4018 ACT1 MINIMUM.	-1000...1000%	1%	100%	
4020	ACT2 MINIMUM Sets the minimum value for ACT2. • See 4018 ACT1 MINIMUM.	-1000...1000%	1%	0%	

Group 40: Process PID Set 1					
Code	Description	Range	Resolution	Default	S
4021	ACT2 MAXIMUM Sets the maximum value for ACT2. • See 4018 ACT1 MINIMUM.	-1000...1000%	1%	100%	
4022	SLEEP SELECTION Defines the control for the PID sleep function. 0 = NOT SEL– Disables the PID sleep control function. 1 = DI1 – Defines digital input DI1 as the control for the PID sleep function. • Activating the digital input activates the sleep function. • De-activating the digital input restores PID control. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the control for the PID sleep function. • See DI1 above. 7 = INTERNAL – Defines the output rpm/frequency, process reference, and process actual value as the control for the PID sleep function. Refer to parameters 4025 WAKE-UP DEV and 4023 PID SLEEP LEVEL. -1 = DI1(INV) – Defines an inverted digital input DI1 as the control for the PID sleep function. • De-activating the digital input activates the sleep function. • Activating the digital input restores PID control. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the control for the PID sleep function. • See DI1(INV) above.	-6...7	-	0	
4023	PID SLEEP LEVEL Sets the motor speed / frequency that enables the PID sleep function – a motor speed / frequency below this level, for at least the time period 4024 PID SLEEP DELAY enables the PID sleep function (stopping the drive). • Requires 4022 = 7 INTERNAL. • See figure: A = PID output level; B = PID process feedback.	0.0...120.0 Hz / 0...7200 rpm	0.1 Hz / 1 rpm	0.0 Hz	
	The figure contains three graphs illustrating the PID sleep function logic: Graph 1: Shows PID output level (A) over time (t). A horizontal dashed line represents the threshold P 4023. The output level A starts above this threshold, then drops below it. A time delay P 4024 is indicated between the output dropping below the threshold and the sleep function being activated. The output then rises back above the threshold, and the sleep function is deactivated. Graph 2: Shows PID process feedback (B) over time (t). A horizontal dashed line represents the threshold P 4025. The feedback signal B starts above this threshold, then drops below it. A time delay P 4026 is indicated between the feedback dropping below the threshold and the sleep function being activated. The feedback then rises back above the threshold, and the sleep function is deactivated. The graph is labeled 'Stop' and 'Start'. Graph 3: Shows Setpoint over time (t). A horizontal dashed line represents the threshold P 4025. The setpoint starts above this threshold, then drops below it. A time delay P 4026 is indicated between the setpoint dropping below the threshold and the sleep function being activated. The setpoint then rises back above the threshold, and the sleep function is deactivated. The graph is labeled 'C' and 'D' for 4005 = 1 and 4005 = 0.				
4024	PID SLEEP DELAY Sets the time delay for the PID sleep function – a motor speed / frequency below 4023 PID SLEEP LEVEL for at least this time period enables the PID sleep function (stopping the drive). • See 4023 PID SLEEP LEVEL above.	0.0...3600.0 s	0.1 s	60.0 s	

Group 40: Process PID Set 1					
Code	Description	Range	Resolution	Default	S
4025	WAKE-UP DEVIATION Defines the wake-up deviation – a deviation from the setpoint greater than this value, for at least the time period 4026 WAKE-UP DELAY, re-starts the PID controller. - Parameters 4006 and 4007 define the units and scale. - Parameter 4005 = 0, Wake-up level = Setpoint – Wake-up deviation. - Parameter 4005 = 1, Wake-up level = Setpoint + Wake-up deviation. - Wake-up level can be above or below setpoint. See figures: - C = Wake-up level when parameter 4005 = 1 - D = Wake-up level when parameter 4005 = 0 - E = Feedback is above wake-up level and lasts longer than 4026 WAKE-UP DELAY – PID function wakes up. - F = Feedback is below wake-up level and lasts longer than 4026 WAKE-UP DELAY – PID function wakes up.	0.0...1000%	0.1	0.0	
4026	WAKE-UP DELAY Defines the wake-up delay – a deviation from the setpoint greater than 4025 WAKE-UP DEVIATION, for at least this time period, re-starts the PID controller. See 4023 PID SLEEP LEVEL above.	0.00...60.00 s	0.01 s	0.50 s	
4027	PID 1 PARAM SET Defines how selections are made between PID Set 1 and PID Set 2. PID parameter set selection. When set 1 is selected, parameters 4001 4026 are used. When set 2 is selected, parameters 4101 4126 are used. 0 = SET 1 – PID Set 1 (parameters 4001 4026) is active. 1 = DI1 – Defines digital input DI1 as the control for PID Set selection. - Activating the digital input selects PID Set 2. - De-activating the digital input selects PID Set 1. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the control for PID Set selection. - See DI1 above. 7 = SET 2 – PID Set 2 (parameters 4101 4126) is active. 8 11 = TIMER 1 4 – Defines the Timer as the control for the PID Set selection (Timer de-activated = PID Set 1; Timer activated = PID Set 2) See parameter Group 36: Timer Functions. -1 = DI1(INV) – Defines an inverted digital input DI1 as the control for PID Set selection. - Activating the digital input selects PID Set 1. - De-activating the digital input selects PID Set 2. -2 -6 = DI2(INV) DI6(INV) – Defines an inverted digital input DI2 DI6 as the control for PID Set selection. - See DI1(INV) above.	-6...11	1	0	



Group 41: Process PID Set 2

This group defines second set of parameters used with the Process PID (PID1) controller.

The operation of parameters 4101 4126 is analogous with Process PID set 1 (PID1) parameters 4001 4026.

PID parameter set 2 can be selected by parameter 4027 PID 1 PARAM SET.

Group 41: Process PID Set 2					
Code	Description	Range	Resolution	Default	S
4101	See 4001 4026				
4126					

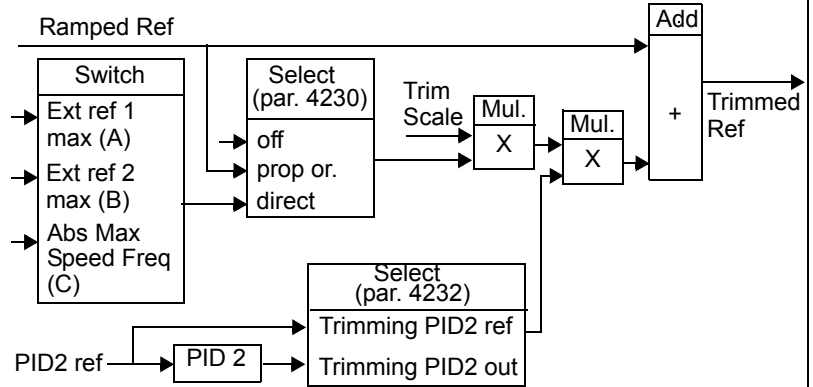
Group 42: External PID

This group defines the parameters used for the second PID controller (PID2) of AYK550

The operation of parameters 4201 4221 is analogous with Process PID set 1 (PID1) parameters 4001 4021.

Group 42: External PID					
Code	Description	Range	Resolution	Default	S
4201	See 4001 4021				
4221					
4228	ACTIVATE Defines the source for enabling the external PID function. • Requires 4230 TRIM MODE = 0 NOT SEL. 0 = NOT SEL – Disables external PID control. 1 = DI1 – Defines digital input DI1 as the control for enabling external PID control. • Activating the digital input enables external PID control. • De-activating the digital input disables external PID control. 2 6 = DI2 DI6 – Defines digital input DI2 DI6 as the control for enabling external PID control. • See DI1 above. 7 = DRIVE RUN – Defines the start command as the control for enabling external PID control. • Activating the start command (drive is running) enables external PID control. 8 = ON – Defines the power-on as the control for enabling external PID control. • Activating power to the drive enables external PID control. 9 12 = TIMER 1 4 – Defines the Timer as the control for enabling external PID control (Timer active enables external PID control). • See parameter Group 36: Timer Functions. -1 = DI1(INV) – Defines an inverted digital input DI1 as the control for enabling external PID control. • Activating the digital input disables external PID control. • De-activating the digital input enables external PID control. -2 -6 = DI2(INV) DI6(INV) – Defines digital input DI2 DI6 as the control for enabling external PID control. • See DI1(INV) above.	-6...12	-	0	
4229	OFFSET Defines the offset for the PID output. • When PID is activated, output starts from this value. • When PID is deactivated, output resets to this value. • Parameter is not active when 4230 TRIM MODE not = 0 (trim mode is active).	0.0...100.0%	0.1%	0.0%	
4230	TRIM MODE Selects the type of trim, if any. Using the trim it is possible to combine a corrective factor to the drive reference. 0 = NOT SEL – Disables the trim function. 1 = PROPORTIONAL – Adds a trim factor that is proportional to the rpm/Hz reference. 2 = DIRECT – Adds a trim factor based on the control loop's maximum limit.	0...2	1	0	
4231	TRIM SCALE Defines the multiplier (as a percent, plus or minus) used in the trim mode.	-100.0%...100.0%	0.1%	0.0%	

Group 42: External PID					
Code	Description	Range	Resolution	Default	S
4232	CORRECTION SRC Defines the trimming reference for the correction source. 1 = PID2 REF – Uses appropriate REF MAX (SWITCH A OR B): • 1105 REF 1 MAX when REF1 is active (A). • 1108 REF 2 MAX when REF2 is active (B). 2 = PID2 OUTPUT – Uses the absolute maximum speed or frequency (Switch C): • 2002 MAXIMUM SPEED if 9904 MOTOR CONTROL MODE = 1 SPEED or 2 TORQUE. • 2008 MAXIMUM FREQUENCY IF 9904 MOTOR CONTROL MODE = 3 SCALAR.	1...2	1	1	



Group 51: Ext Comm Module

This group defines set-up variables for a fieldbus adaptor (FBA) communication module. For more information on these parameters, refer to the user's manual supplied with the FBA module. FBAs are modules that plug into the drive.

Group 51: Ext Comm Module					
Code	Description	Range	Resolution	Default	S
5101	FBA TYPE Displays the type of the connected fieldbus adapter module. 0 = NOT DEFINED – Module not found, or not properly connected, or parameter 9802 is not set to 4 (EXT FBA). 1 = PROFIBUS-DP – 16 = INTERBUS – 21 = LONWORKS – 32 = CANOPEN – 37 = DEVICENET – 64 = MODBUS PLUS – 101 = CONTROLNET – 128 = ETHERNET –	-	1	0	
5102	FB PAR 2...FB PAR 26 For more information on these parameters, refer to the user's manual supplied with the FBA module.	0...65535	1	0	
5126					
5127	FBA PAR REFRESH Validates any changed fieldbus parameter settings. • After refreshing, the value reverts automatically to DONE.	0, 1	1	0	
5128	FILE CPI FW REV Displays the CPI firmware revision of the drive's fieldbus adapter configuration file. Format is xyz where: • x = major revision number • y = minor revision number • z = correction number Example: 107 = revision 1.07	0000...FFFF hex	1	0000 hex	
5129	FILE CONFIG ID Displays the revision of the drive's fieldbus adapter module's configuration file identification. • File configuration information is drive application program-dependent.	0000...FFFF hex	1	0000 hex	
5130	FILE CONFIG REV Contains the revision of the drive's fieldbus adapter module configuration file. Example: 1 = revision 1	0000...FFFF hex	1	0000 hex	
5131	FBA STATUS Contains the status of the adapter module. 0 = IDLE – Adapter not configured. 1 = EXEC. INIT – Adapter is initializing. 2 = TIME OUT – A timeout has occurred in the communication between the adapter and the drive. 3 = CONFIG ERROR – Adapter configuration error. • The major or minor revision code of the adapter's CPI firmware revision differs from that stated in the drive's configuration file. 4 = OFF-LINE – Adapter is off-line. 5 = ON-LINE – Adapter is on-line. 6 = RESET – Adapter is performing a hardware reset.	0...6	1	0	
5132	FBA CPI FW REV Contains the revision of the module's CPI program. Format is xyz where: • x = major revision number • y = minor revision number • z = correction number Example: 107 = revision 1.07	0000...FFFF hex	1	0000 hex	

Group 51: Ext Comm Module					
Code	Description	Range	Resolution	Default	S
5133	FBA APPL FW REV Contains the revision of the module's application program Format is xyz where: • x = major revision number • y = minor revision number • z = correction number Example: 107 = revision 1.07	0000...FFFF hex	1	0000 hex	

Group 52: Panel Communication

This group defines the communication settings for the control panel port on the drive. Normally, when using the supplied control panel, there is no need to change settings in this group.

In this group, parameter modifications take effect on the next power-up.

Group 52: Panel Communication					
Code	Description	Range	Resolution	Default	S
5201	STATION ID Defines the address of the drive. • Two units with the same address are not allowed on-line. • Range: 1 247	1...247	1	1	
5202	BAUDRATE Defines the communication speed of the drive in kbits per second (kbits/s). 9.6 19.2 38.4 57.6 115.2	9.6...115.2 kbits/s	-	9.6 kbits/s	
5203	PARITY Sets the character format to be used with the panel communication. 0 = 8N1 – No parity, one stop bit. 1 = 8N2 – No parity, two stop bits. 2 = 8E1 – Even parity, one stop bit. 3 = 8O1 – Odd parity, one stop bit.	0...3	1	0	
5204	OK MESSAGES Contains a count of valid Modbus messages received by the drive. • During normal operation, this counter is increasing constantly.	0...65535	1	-	
5205	PARITY ERRORS Contains a count of the characters with a parity error that is received from the fieldbus. For high counts, check: • Parity settings of devices connected on the fieldbus – they must not differ. • Ambient electro-magnetic noise levels – high noise levels generate errors.	0...65535	1	-	
5206	FRAME ERRORS Contains a count of the characters with a framing error that the fieldbus receives. For high counts, check: • Communication speed settings of devices connected on the fieldbus – they must not differ. • Ambient electro-magnetic noise levels – high noise levels generate errors.	0...65535	1	-	
5207	BUFFER OVERRUNS Contains a count of the characters received that cannot be placed in the buffer. • Longest possible message length for the drive is 128 bytes. • Received messages exceeding 128 bytes overflow the buffer. The excess characters are counted.	0...65535	1	-	
5208	CRC ERRORS Contains a count of the messages with a CRC error that the drive receives. For high counts, check: • Ambient electro-magnetic noise levels – high noise levels generate errors. • CRC calculations for possible errors.	0...65535	1	-	

Group 53: EFB Protocol

This group defines set-up variables used for an embedded fieldbus (EFB) communication protocol. Refer to communication protocol documentation for more information on these parameters. EFBs are internal embedded protocols selected in Group 98.

Group 53: EFB Control					
Code	Description	Range	Resolution	Default	S
5301	EFB PROTOCOL ID Contains the identification and program revision of the protocol. • Format: XYY, where xx = protocol ID, and YY = program revision.	0000...FFFF hex	1	0000 hex	
5302	EFB STATION ID Defines the node address of the RS485 link. • The node address on eAYK unit must be unique.	0...65535	1	1	✓
5303	EFB BAUD RATE Defines the communication speed of the RS485 link in kbits per second (kbits/s). 1.2 kbits/s 2.4 kbits/s 4.8 kbits/s 9.6 kbits/s 19.2 kbits/s 38.4 kbits/s 57.6 kbits/s	1.2...57.6 kbits/s	-	9.6 kbits/s	
5304	EFB PARITY Defines the data length parity and stop bits to be used with the RS485 link communication. • The same settings must be used in all on-line stations. 0 = 8N1 – 8 data bits, No parity, one stop bit. 1 = 8N2 – 8 data bits, No parity, two stop bits. 2 = 8E1 – 8 data bits, Even parity, one stop bit. 3 = 8O1 – 8 data bits, Odd parity, one stop bit.	0...3		0	
5305	EFB CTRL PROFILE Selects the communication 1=AYK550 profile used by the EFB protocol. 0 = YORK/ABB DRIVES – Operation of Control Word and Status Word conforms to YORK Drives Profile. 1 = AYK550 – Alternate 32 bit profile (Advanced users only).	0, 1	1	0	
5306	EFB OK MESSAGES Contains a count of valid messages received by the drive. • During normal operation, this counter is increasing constantly.	0...65535	1	0	
5307	EFB CRC ERRORS Contains a count of the messages with a CRC error received by the drive. For high counts, check: • Ambient electro-magnetic noise levels – high noise levels generate errors. • CRC calculations for possible errors.	0...65535	1	0	
5308	EFB UART ERRORS Contains a count of the messages with a character error received by the drive.	0...65535	1	0	
5309	EFB STATUS Contains the status of the EFB protocol. 0 = IDLE – EFB protocol is configured, but not receiving any messages. 1 = EXEC. INIT – EFB protocol is initializing. 2 = TIME OUT – A timeout has occurred in the communication between the network master and the EFB protocol. 3 = CONFIG ERROR – EFB protocol has a configuration error. 4 = OFF-LINE – EFB protocol is receiving messages that are NOT addressed to this drive. 5 = ON-LINE – EFB protocol is receiving messages that are addressed to this drive. 6 = RESET – EFB protocol is performing a hardware reset. 7 = LISTEN ONLY – EFB protocol is in listen-only mode.	0...7	1	0	

Group 53: EFB Control					
Code	Description	Range	Resolution	Default	S
5310	EFB PAR 10 Specifies the parameter mapped to Modbus Register 40005.	0...65535	1	0	
5311	EFB PAR 11 Specifies the parameter mapped to Modbus Register 40006.	0...65535	1	0	
5312	EFB PAR 12 Specifies the parameter mapped to Modbus Register 40007.	0...65535	1	0	
5313	EFB PAR 13 Specifies the parameter mapped to Modbus Register 40008.	0...65535	1	0	
5314	EFB PAR 14 Specifies the parameter mapped to Modbus Register 40009.	0...65535	1	0	
5315	EFB PAR 15 Specifies the parameter mapped to Modbus Register 40010.	0...65535	1	0	
5316	EFB PAR 16 Specifies the parameter mapped to Modbus Register 40011.	0...65535	1	0	
5317	EFB PAR 17 Specifies the parameter mapped to Modbus Register 40012.	0...65535	1	0	
5318	EFB PAR 18...EFB PAR 20 Reserved.	0...65535	1	0	
5320					

Group 81: PFA

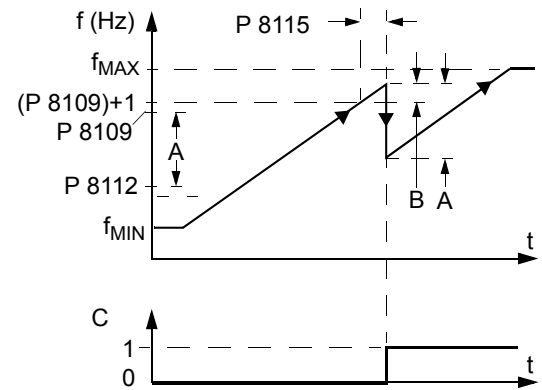
This group defines a Pump and Fan Alternation (PFA) mode of operation. The major features of PFA are:

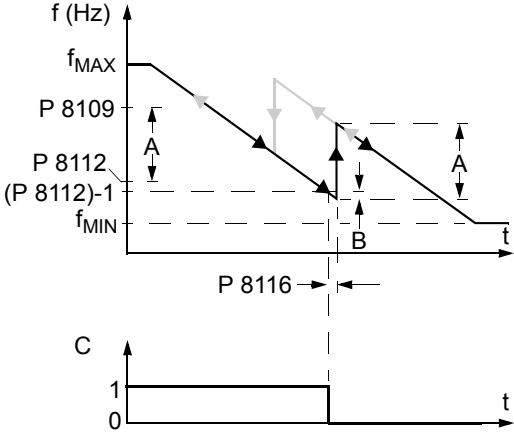
- The AYK550 controls the motor of pump no. 1, varying the motor speed to control the pump capacity. This motor is the speed regulated motor.
- Direct line connections power the motor of pump no. 2 and pump no.3, etc. The AYK550 switches pump no. 2 (and then pump no. 3, etc.) on and off as needed. These motors are auxiliary motors.
- The AYK550 PID control uses two signals: a process reference and an actual value feedback. The PID controller adjusts the speed (frequency) of the first pump such that the actual value follows the process reference.
- When demand (defined by the process reference) exceeds the first motor's capacity (user defined as a frequency limit), the PFA automatically starts an auxiliary pump. The PFA also reduces the speed of the first pump to account for the auxiliary pump's addition to total output. Then, as before, the PID controller adjusts the speed (frequency) of the first pump such that the actual value follows the process reference. If demand continues to increase, PFA adds additional auxiliary pumps, using the same process.
- When demand drops, such that the first pump speed falls below a minimum limit (user defined by a frequency limit), the PFA automatically stops an auxiliary pump. The PFA also increases the speed of the first pump to account for the auxiliary pump's missing output.
- An Interlock function (when enabled) identifies off-line (out of service) motors, and the PFA skips to the next available motor in the sequence.

An Autochange function (when enabled and with the appropriate switchgear) equalizes duty time between the pump motors. Autochange periodically increments the position of eAYK motor in the rotation – the speed regulated motor becomes the last auxiliary motor, the first auxiliary motor becomes the speed regulated motor, etc.

Group 81: PFA					
Code	Description	Range	Resolution	Default	S
8103	REFERENCE STEP 1 Sets a percentage value that is added to the process reference. • Applies only when <u>at least one</u> auxiliary (constant speed) motor is running. • Default value is 0%. Example: An AYK550 operates three parallel pumps that maintain water pressure in a pipe. • 4011 INTERNAL SETPNT sets a constant pressure reference that controls the pressure in the pipe. • The speed regulated pump operates alone at low water consumption levels. • As water consumption increases, first one constant speed pump operates, then, the second. • As flow increases, the pressure at the output end of the pipe drops relative to the pressure measured at the input end. As auxiliary motors step in to increase the flow, the adjustments below correct the reference to more closely match the output pressure. • When the first auxiliary pump operates, increase the reference with parameter 8103 REFERENCE STEP 1. • When both auxiliary pumps operate, increase the reference with parameter 8103 reference step 1 + parameter 8104 reference step 2. • When three auxiliary pumps operate, increase the reference with parameter 8103 REFERENCE STEP 1 + parameter 8104 REFERENCE STEP 2 + parameter 8105 REFERENCE STEP 3.	0.0...100.0%	0.1%	0.0%	

Group 81: PFA					
Code	Description	Range	Resolution	Default	S
8104	REFERENCE STEP 2 Sets a percentage value that is added to the process reference. • Applies only when <u>at least two</u> auxiliary (constant speed) motors are running. • See parameter 8103 REFERENCE STEP1.	0.0...100.0%	0.1%	0.0%	
8105	REFERENCE STEP 3 Sets a percentage value that is added to the process reference. • Applies only when <u>at least three</u> auxiliary (constant speed) motors are running. • See parameter 8103 REFERENCE STEP1.	0.0...100.0%	0.1%	0.0%	
8109	START FREQ 1 Sets the frequency limit used to start the first auxiliary motor. The first auxiliary motor starts if: • No auxiliary motors are running. • AYK550 output frequency exceeds the limit: 8109 + 1 Hz. • Output frequency stays above a relaxed limit (8109 - 1 Hz) for at least the time: 8115 AUX MOT START D. After the first auxiliary motor starts: • Output frequency decreases by the value = (8109 START FREQ 1) - (8112 LOW FREQ 1). • In effect, the output of the speed regulated motor drops to compensate for the input from the auxiliary motor. See figure, where: • A = (8109 START FREQ 1) - (8112 LOW FREQ 1) • B = Output frequency increase during the start delay. • C = Diagram showing auxiliary motor's run status as frequency increases (1 = On). Note! 8109 START FREQ 1 value must be between: • 8112 LOW FREQ 1 • (2008 MAXIMUM FREQ) -1.	0.0...500.0 Hz	0.1 Hz	60.0 (US)	
8110	START FREQ 2 Sets the frequency limit used to start the second auxiliary motor. • See 8109 START FREQ 1 for a complete description of the operation. The second auxiliary motor starts if: • One auxiliary motor is running. • AYK550 output frequency exceeds the limit: 8110 + 1. • Output frequency stays above the relaxed limit (8110 - 1 Hz) for at least the time: 8115 AUX MOT START D.	0.0...500.0 Hz	0.1 Hz	60.0 (US)	
8111	START FREQ 3 Sets the frequency limit used to start the third auxiliary motor. • See 8109 START FREQ 1 for a complete description of the operation. The third auxiliary motor starts if: • Two auxiliary motors are running. • AYK550 output frequency exceeds the limit: 8111 + 1 Hz. • Output frequency stays above the relaxed limit (8111 - 1 Hz) for at least the time: 8115 AUX MOT START D.	0.0...500.0 Hz	0.1 Hz	60.0 (US)	



Group 81: PFA					
Code	Description	Range	Resolution	Default	S
8112	LOW FREQ 1 0.0...500.0 Hz 0.1 Hz 30.0 (US) Sets the frequency limit used to stop the first auxiliary motor. The first auxiliary motor stops if: • The first auxiliary motor is running alone. • AYK550 output frequency drops below the limit: 8112 - 1. • Output frequency stays below the relaxed limit (8112 + 1 Hz) for at least the time: 8116 AUX MOT STOP D. After the first auxiliary motor stops: • Output frequency increases by the value = (8109 START FREQ 1) - (8112 LOW FREQ 1). • In effect, the output of the speed regulated motor increases to compensate for the loss of the auxiliary motor. See figure, where: • A = (8109 START FREQ 1) - (8112 LOW FREQ 1) • B = Output frequency decrease during the stop delay. • C = Diagram showing auxiliary motor's run status as frequency decreases (1 = On). • Grey path = Shows hysteresis – if time is reversed, the path backwards is not the same. For details on the path for starting, see the diagram at 8109 START FREQ 1. Note! Low Frequency 1 value must be between: • (2007 MINIMUM FREQ) +1. • 8109 START FREQ 1	0.0...500.0 Hz 0.1 Hz 30.0 (US) 			
8113	LOW FREQ 2 0.0...500.0 Hz 0.1 Hz 30.0 Hz (US) Sets the frequency limit used to stop the second auxiliary motor. • See 8112 LOW FREQ 1 for a complete description of the operation. The second auxiliary motor stops if: • Two auxiliary motors are running. • AYK550 output frequency drops below the limit: 8113 - 1. • Output frequency stays below the relaxed limit (8113 + 1 Hz) for at least the time: 8116 AUX MOT STOP D.	0.0...500.0 Hz 0.1 Hz 30.0 Hz (US)			
8114	LOW FREQ 3 0.0...500.0 Hz 0.1 Hz 30.0 Hz (US) Sets the frequency limit used to stop the third auxiliary motor. • See 8112 LOW FREQ 1 for a complete description of the operation. The third auxiliary motor stops if: • Three auxiliary motors are running. • AYK550 output frequency drops below the limit: 8114 - 1. • Output frequency stays below the relaxed limit (8114 + 1 Hz) for at least the time: 8116 AUX MOT STOP D.	0.0...500.0 Hz 0.1 Hz 30.0 Hz (US)			
8115	AUX MOT START D 0.0...3600.0 s 0.1 s; 1 s 5.0 s Sets the Start Delay for the auxiliary motors. • The output frequency must remain above the start frequency limit (parameter 8109, 8110, or 8111) for this time period before the auxiliary motor starts. • See 8109 START FREQ 1 for a complete description of the operation.	0.0...3600.0 s 0.1 s; 1 s 5.0 s			
8116	AUX MOT STOP D. 0.0...3600.0 s 0.1 s; 1 s 3.0 s Sets the Stop Delay for the auxiliary motors. • The output frequency must remain below the low frequency limit (parameter 8112, 8113, or 8114) for this time period before the auxiliary motor stops. • See 8112 LOW FREQ 1 for a complete description of the operation.	0.0...3600.0 s 0.1 s; 1 s 3.0 s			

Group 81: PFA

Code	Description	Range	Resolution	Default	S
8117	NR OF AUX MOT	0...3	1	1	✓

Sets the number of auxiliary motors.

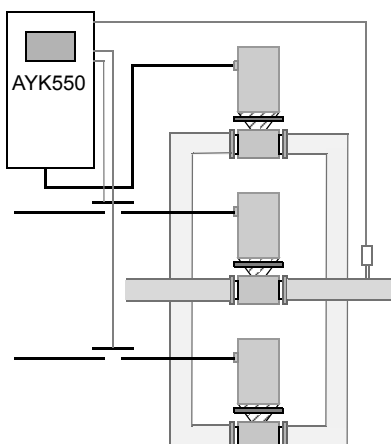
- EAYK auxiliary motor requires a relay output, which the drive uses to send start/stop signals.
- The Autochange function, if used, requires an additional relay output for the speed regulated motor.

The following describes the set-up of the required relay outputs.

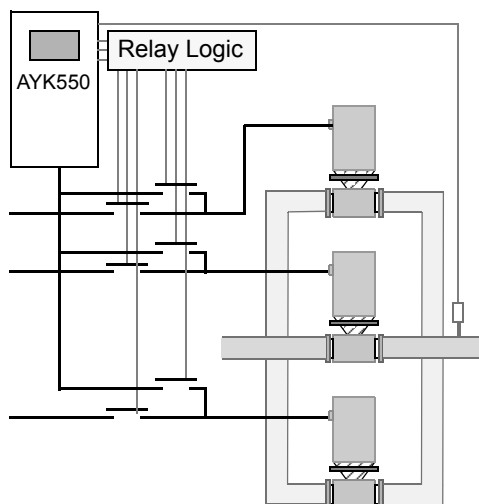
Relay Outputs

As noted above, eAYK auxiliary motor requires a relay output, which the drive uses to send start/stop signals. The following describes how the drive keeps track of motors and relays.

- The AYK550 provides relay outputs RO1 RO3.
- An external digital output module can be added to provide relay outputs RO4 RO6.
- Parameters 1401 1403 and 1410 1412 define, respectively, how relays RO1 RO6 are used – the parameter value 31 PFA defines the relay as used for PFA.
- The AYK550 assigns auxiliary motors to relays in ascending order. If the Autochange function is disabled, the first auxiliary motor is the one connected to the first relay with a parameter setting = 31 PFA, and so on. If the Autochange function is used, the assignments rotate. Initially, the speed regulated motor is the one connected to the first relay with a parameter setting = 31 PFA, the first auxiliary motor is the one connected to the second relay with a parameter setting = 31 PFA, and so on



Standard PFA mode



PFA with Autochange mode

- The table below shows the AYK550 PFA motor assignments for some typical settings in the Relay Output parameters (1401 1403 and 1410 1412), where the settings are either =31 (PFA), or =X (anything but 31), and where the Autochange function is disabled (8118 AUTOCHNG INTERV = 0).

Parameter Setting								AYK550 Relay Assignment					
1	1	1	1	1	1	1	8	Autochange Disabled					
4	4	4	4	4	4	4	1	RO1	RO2	RO3	RO4	RO5	RO6
0	0	0	1	1	1	1	1						
1	2	3	0	1	2	7							
31	X	X	X	X	X	X	1	Aux.	X	X	X	X	X
31	31	X	X	X	X	X	2	Aux.	Aux.	X	X	X	X
31	31	31	X	X	X	X	3	Aux.	Aux.	Aux.	X	X	X
X	31	31	X	X	X	X	2	X	Aux.	Aux.	X	X	X
X	X	X	31	X	31	2	X	X	X	X	Aux.	X	Aux.
31	31	X	X	X	X	1*	X	Aux.	Aux.	X	X	X	X

* =One additional relay output for the PFA that is in use.

One motor is in "sleep" when the other is rotating.

Group 81: PFA																																																																																			
Code	Description							Range			Resolution		Default	S																																																																					
	The table below shows the AYK550 PFA motor assignments for some typical settings in the Relay Output parameters (1401 1403 and 1410 1412), where the settings are either =31 (PFA), or =X (anything but 31), and where the Autochange function is enabled (8118 AUTOCHNG INTERV = value > 0).v																																																																																		
	<table><tr><th colspan="7">Parameter Setting</th><th colspan="6">AYK550 Relay Assignment</th></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>8</td><td colspan="6">Autochange Enabled</td></tr><tr><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td><td>1</td><td>RO1</td><td>RO2</td><td>RO3</td><td>RO4</td><td>RO5</td><td>RO6</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1</td><td>2</td><td>3</td><td>0</td><td>1</td><td>2</td><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>							Parameter Setting							AYK550 Relay Assignment						1	1	1	1	1	1	1	8	Autochange Enabled						4	4	4	4	4	4	4	1	RO1	RO2	RO3	RO4	RO5	RO6	0	0	0	1	1	1	1	1							1	2	3	0	1	2	7														
Parameter Setting							AYK550 Relay Assignment																																																																												
1	1	1	1	1	1	1	8	Autochange Enabled																																																																											
4	4	4	4	4	4	4	1	RO1	RO2	RO3	RO4	RO5	RO6																																																																						
0	0	0	1	1	1	1	1																																																																												
1	2	3	0	1	2	7																																																																													
	31	31	X	X	X	X	1	PFA	PFA	X	X	X	X																																																																						
	31	31	31	X	X	X	2	PFA	PFA	PFA	X	X	X																																																																						
	x	31	31	X	X	X	1	X	PFA	PFA	X	X	X																																																																						
	X	X	X	31	X	31	1	X	X	X	PFA	X	PFA																																																																						
	31	31	X	X	X	X	0**	PFA	PFA	X	X	X	X																																																																						

** = No auxiliary motors, but the autochange function is in use. Working as standard PID-control.

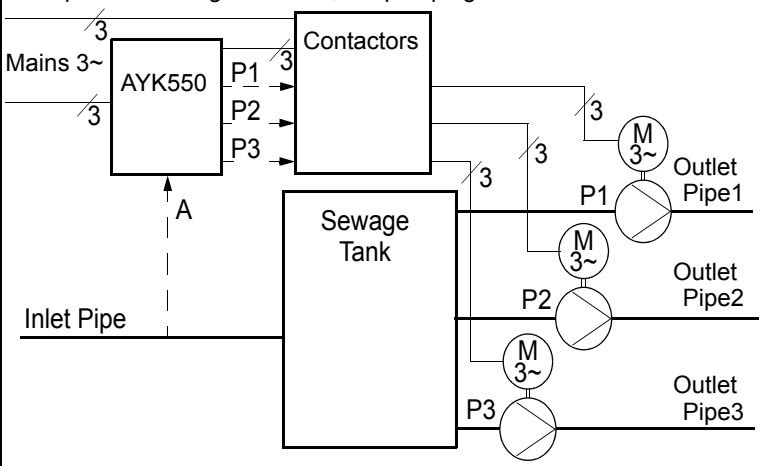
	8118	**AUTOCHNG INTERV**							**0.0...336.0 h**			**0.1 h**		**0.0**	✓
	Controls operation of the Autochange function and sets the interval between changes. - The Autochange time interval only applies to the time when the speed regulated motor is running. - See parameter 8119 AUTOCHNG LEVEL for an overview of the Autochange function. - The drive always coasts to a stop when autochange is performed. - Autochange enabled requires parameter 8120 INTERLOCKS = value > 0. 0.0 = NOT SEL – Disables the Autochange function. 0.1 336 = The operating time interval (the time when the start signal is on) between automatic motor changes. **Warning! When enabled, the Autochange function requires the interlocks (8120 interlocks = value > 0) enabled. During autochange the drive's power output is interrupted and the drive coasts to stop, preventing damage to the contacts.**													PFA with Autochange mode	
8119	**AUTOCHNG LEVEL**							**0.0...100.0%**			**0.1%**		**50.0%**		
	Sets an upper limit, as a percent of output capacity, for the autochange logic. When the output from the PID/PFA control block exceeds this limit, autochange is prevented. For example, use this parameter to deny autochange when the Pump-Fan system is operating near maximum capacity. **Autochange Overview** The purpose of the autochange operation is to equalize duty time between multiple motors used in a system. At each autochange operation: - A different motor takes a turn connected to the AYK550 output – the speed regulated motor. - The starting order of the other motors rotates. The Autochange function requires: - External switchgear for changing the drive's output power connections. - Parameter 8120 INTERLOCKS = value > 0. Autochange is performed when: - The running time since the previous autochange reaches the time set by 8118 AUTOCHNG INTERV - The PFA input is below the level set by this parameter, 8119 AUTOCHNG LEVEL. **Note!** The AYK550 always coasts to stop when autochange is performed.														

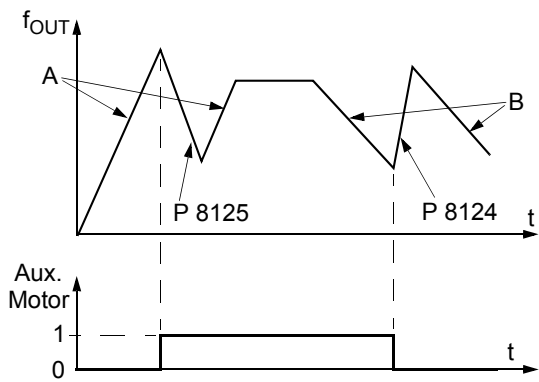
Group 81: PFA						
Code	Description	Range	Resolution	Default	S	
	In an autochange, the Autochange function does all of the following (see figure): • Initiates a change when the running time, since the last autochange, reaches 8118 AUTOCHNG INTERV, and PFA input is below limit 8119 AUTOCHNG LEVEL. • Stops the speed regulated motor. • Switches off the contactor of the speed regulated motor. • Increments the starting order counter, to change the starting order for the motors. • Identifies the next motor in line to be the speed regulated motor. • Switches off the above motor's contactor, if the motor was running. Any other running motors are not interrupted. • Switches on the contactor of the new speed regulated motor. The autochange switchgear connects this motor to the AYK550 power output. • Delays motor start for the time 8122 PFA START DELAY. • Starts the speed regulated motor. • Identifies the next constant speed motor in the rotation. • Switches the above motor on, but only if the new speed regulated motor had been running (as a constant speed motor) – This step keeps an equal number of motors running before and after autochange. • Continues with normal PFA operation. Starting Order Counter The operation of the starting-order counter: • The relay output parameter definitions (1401 1403 and 1410 1412)) establish the initial motor sequence. (The lowest parameter number with a value 31 (PFA) identifies the relay connected to 1PFA, the first motor, and so on.) • Initially, 1PFA = speed regulated motor, 2PFA = 1st auxiliary motor, etc. • The first autochange shifts the sequence to: 2PFA = speed regulated motor, 3PFA = 1st auxiliary motor, , 1PFA = last auxiliary motor. • The next autochange shifts the sequence again, and so on. • If the autochange cannot start a needed motor because all inactive motors are interlocked, the drive displays an alarm (2051, PFA INTERLOCK). • When AYK550 power supply is switched off, the counter preserves the current Autochange rotation positions in permanent memory. When power is restored, the Autochange rotation starts at the position stored in memory. • If the PFA relay configuration is changed (or if the PFA enable value is changed), the rotation is reset. (See the first bullet above.)	A = Area above 8119 AUTOCHNG LEVEL – autochange not allowed. B = Autochange occurs. 1PFA, etc. = PID output associated with eAYK motor.				
8120	INTERLOCKS Defines operation of the Interlock function. When the Interlock function is enabled: • An interlock is active when its command signal is absent. • An interlock is inactive when its command signal is present. • The AYK550 will not start if a start command occurs when the speed regulated motor's interlock is active – the control panel displays an alarm (2015, PFA INTERLOCK). Wire eAYK Interlock circuit as follows: • Wire a contact of the motor's On/Off switch to the Interlock circuit – the drive's PFA logic can then recognize that the motor is switched off, and start the next available motor. • Wire a contact of the motor thermal relay (or other protective device in the motor circuit) to the Interlock input – the drive's PFA logic can then recognize that a motor fault is activated and stop the motor. 0 = NOT SEL – Disables the Interlock function. All digital inputs are available for other purposes. • Requires 8118 AUTOCHNG INTERV = 0 (The Autochange function must be disabled if Interlock function is disabled.) 1 = DI1 – Enables the Interlock function, and assigns a digital input (starting with DI1) to the interlock signal for eAYK PFA relay. These assignments are defined in the following table and depend on: The number of PFA relays (number of parameters 1401 1403 and 1410 1412) with value = 31 (PFA).	0...6	1	4	✓	

Group 81: PFA					
Code	Description	Range	Resolution	Default	S
	The Autochange function status (disabled if 8118 AUTOCHNG INTERV = 0, and otherwise enabled).				
	No. PFA Relays	Autochange Disabled (P 8118)	Autochange Enabled (P 8118)		
	0	DI1: Speed Reg Motor DI2 DI6: Free	Not allowed		
	1	DI1: Speed Reg Motor DI2: First PFA Relay DI3 DI6: Free	DI1: First PFA Relay DI2 DI6: Free		
	2	DI1: Speed Reg Motor DI2: First PFA Relay DI3: Second PFA Relay DI4 DI6: Free	DI1: First PFA Relay DI2: Second PFA Relay DI3 DI6: Free		
	3	DI1: Speed Reg Motor DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5 DI6: Free	DI1: First PFA Relay DI2: Second PFA Relay DI3: Third PFA Relay DI4 DI6: Free		
	4	DI1: Speed Reg Motor DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5: Fourth PFA Relay DI6: Free	DI1: First PFA Relay DI2: Second PFA Relay DI3: Third PFA Relay DI4: Fourth PFA Relay DI5 DI6: Free		
	5	DI1: Speed Reg Motor DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5: Fourth PFA Relay DI6: Fifth PFA Relay	DI1: First PFA Relay DI2: Second PFA Relay DI3: Third PFA Relay DI4: Fourth PFA Relay DI5: Fifth PFA Relay DI6: Free		
	6	Not allowed	DI1: First PFA Relay DI2: Second PFA Relay DI3: Third PFA Relay DI4: Fourth PFA Relay DI5: Fifth PFA Relay DI6: Sixth PFA Relay		

Group 81: PFA																													
Code	Description	Range	Resolution	Default	S																								
	2 = DI2 – Enables the Interlock function, and assigns a digital input (starting with DI2) to the interlock signal for eAYK PFA relay. These assignments are defined in the following table and depend on: • The number of PFA relays (number of parameters 1401 1403 and 1410 1412) with value = 31 (PFA). • The Autochange function status (disabled if 8118 AUTOCHNG INTERV = 0, and otherwise enabled).																												
	<table><tr><th>No. PFA Relays</th><th>Autochange Disabled (P 8118)</th><th>Autochange Enabled (P 8118)</th></tr><tr><td>0</td><td>DI1: Free DI2: Speed Reg Motor DI3 DI6: Free</td><td>Not allowed</td></tr><tr><td>1</td><td>DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4 DI6: Free</td><td>DI1: Free DI2: First PFA Relay DI3 DI6: Free</td></tr><tr><td>2</td><td>DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4: Second PFA Relay DI5 DI6: Free</td><td>DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4 DI6: Free</td></tr><tr><td>3</td><td>DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4: Second PFA Relay DI5: Third PFA Relay DI6: Free</td><td>DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5 DI6: Free</td></tr><tr><td>4</td><td>DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4: Second PFA Relay DI5: Third PFA Relay DI6: Fourth PFA Relay</td><td>DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5: Fourth PFA Relay DI6: Free</td></tr><tr><td>5</td><td>Not allowed</td><td>DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5: Fourth PFA Relay DI6: Fifth PFA Relay</td></tr><tr><td>6</td><td>Not allowed</td><td>Not allowed</td></tr></table>					No. PFA Relays	Autochange Disabled (P 8118)	Autochange Enabled (P 8118)	0	DI1: Free DI2: Speed Reg Motor DI3 DI6: Free	Not allowed	1	DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4 DI6: Free	DI1: Free DI2: First PFA Relay DI3 DI6: Free	2	DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4: Second PFA Relay DI5 DI6: Free	DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4 DI6: Free	3	DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4: Second PFA Relay DI5: Third PFA Relay DI6: Free	DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5 DI6: Free	4	DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4: Second PFA Relay DI5: Third PFA Relay DI6: Fourth PFA Relay	DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5: Fourth PFA Relay DI6: Free	5	Not allowed	DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5: Fourth PFA Relay DI6: Fifth PFA Relay	6	Not allowed	Not allowed
No. PFA Relays	Autochange Disabled (P 8118)	Autochange Enabled (P 8118)																											
0	DI1: Free DI2: Speed Reg Motor DI3 DI6: Free	Not allowed																											
1	DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4 DI6: Free	DI1: Free DI2: First PFA Relay DI3 DI6: Free																											
2	DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4: Second PFA Relay DI5 DI6: Free	DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4 DI6: Free																											
3	DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4: Second PFA Relay DI5: Third PFA Relay DI6: Free	DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5 DI6: Free																											
4	DI1: Free DI2: Speed Reg Motor DI3: First PFA Relay DI4: Second PFA Relay DI5: Third PFA Relay DI6: Fourth PFA Relay	DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5: Fourth PFA Relay DI6: Free																											
5	Not allowed	DI1: Free DI2: First PFA Relay DI3: Second PFA Relay DI4: Third PFA Relay DI5: Fourth PFA Relay DI6: Fifth PFA Relay																											
6	Not allowed	Not allowed																											

Group 81: PFA					
Code	Description	Range	Resolution	Default	S
	5 = DI5 – Enables the Interlock function, and assigns a digital input (starting with DI5) to the interlock signal for eAYK PFA relay. These assignments are defined in the following table and depend on: 6 = DI6 – Enables the Interlock function, and assigns digital input DI6 to the interlock signal for the speed regulated motor.				
8121	REG BYPASS CTRL 0...1 1 0 Selects Regulator by-pass control. When enabled, Regulator by-pass control provides a simple control mechanism without a PID regulator. 0 = NO – Disables Regulator by-pass control. The drive uses the normal PFA reference: 1106 REF2 SELECT. 1 = YES – Enables Regulator by-pass control.				

Group 81: PFA					
Code	Description	Range	Resolution	Default	S
	Example: In the diagram below, the pumping station's outlet flow is controlled by the measured inlet flow (A). 				
8122	PFA START DELAY Sets the start delay for speed regulated motors in the system. Using the delay, the drive works as follows: • Switches on the contactor of the speed regulated motor – connecting the motor to the AYK550 power output. • Delays motor start for the time 8122 PFA START DELAY. • Starts the speed regulated motor. • Starts auxiliary motors. See parameter 8115 for delay. Warning! Motors equipped with star-delta starters require a PFA Start Delay. • After the AYK550 relay output switches a motor On, the star-delta starter must switch to the star-connection and then back to the delta-connection before the drive applies power. • So, the PFA Start Delay must be longer than the time setting of the star-delta starter.	0.00...10.00 s	0.01 s	0.50 s	
8123	PFA ENABLE Selects PFA control. When enabled, PFA control: • Switches in, or out, auxiliary constant speed motors as output demand increases or decreases. Parameters 8109 START FREQ 1 to 8114 LOW FREQ 3 define the switch points in terms of the drive output frequency. • Adjusts the speed regulated motor output down, as auxiliary motors are added, and adjusts the speed regulated motor output up, as auxiliary motors are taken off line. • Provides Interlock functions, if enabled. • Requires 9904 MOTOR CTRL MODE = 3 SCALAR. 0 = NOT SEL – Disables PFA control. 1 = ACTIVE – Enables PFA control.	0...1	-	0	✓
8124	ACC IN AUX STOP Sets the PFA acceleration time for a zero-to-maximum frequency ramp. This PFA acceleration ramp: • Applies to the speed regulated motor, when an auxiliary motor is switched off. • Replaces the acceleration ramp defined in Group 22: Accel / Decel. • Applies only until the output of the regulated motor increases by an amount equal to the output of the switched off auxiliary motor. Then the acceleration ramp defined in Group 22: Accel / Decel applies.	0.0...1800.0 s	0.1 s	0.0	

Group 81: PFA					
Code	Description	Range	Resolution	Default	S
	0 = NOT SEL. 0.1 1800 = Activates this function using the value entered as the acceleration time.  • A = speed regulated motor accelerating using Group 22 parameters (2202 or 2205). • B = speed regulated motor decelerating using Group 22 parameters (2203 or 2206). • At aux. motor start, speed regulated motor decelerates using 8125 DEC IN AUX START. • At aux. motor stop, speed regulated motor accelerates using 8124 ACC IN AUX STOP.				
8125	DEC IN AUX START	0.0...1800.0 s	0.1 s	0.0 s	
	Sets the PFA deceleration time for a maximum-to-zero frequency ramp. This PFA deceleration ramp: • Applies to the speed regulated motor, when an auxiliary motor is switched on. • Replaces the deceleration ramp defined in Group 22 ACCEL / DECEL. • Applies only until the output of the regulated motor decreases by an amount equal to the output of the auxiliary motor. Then the deceleration ramp defined in Group 22 ACCEL / DECEL applies. 0 = NOT SEL. 0.1 1800 = Activates this function using the value entered as the acceleration time.				
8126	TIMED AUTOCHANGE	0...4	1	0	
	Sets the autochange with timer. When enables, autochange is controlled with the timer functions. 0 = NOT SEL. 1 = Timer 1 – Enables autochange when Timer 1 is active. 2 4 Timer 2 4 – Enables autochange when Timer 2 4 is active.				
8127	ACT NR OF MOT	0, 1, 4	1	2	✓
	Sets the actual number of PFA controlled motors (maximum 6 motors, 1 speed regulated, 3 connected direct-on-line and 2 spare motors). • This value includes also the speed regulated motor. • This value must be compatible with number of relays allocated to PFA if the autochange function is used. • If Autochange function is not used, the speed regulated motor does not need to have a relay output allocated to PFA but it needs to be included in this value.				
8128	AUX START ORDER				
	Sets the start order of auxiliary motors. 1 = EVEN RUN TIME - The time sharing is active, start order depends on run times. 2 = RELAY ORDER - Start order is fixed to the order of the relays.				

Group 98: Options

This group configures for options, in particular, enabling serial communication with the drive.

Group 98: Options					
Code	Description	Range	Resolution	Default	S
9802	COMM PROT SEL Selects the communication protocol. 0 = NOT SEL – No communication protocol selected. 1 = STD MODBUS – Enables fieldbus communication with the drive using Modbus protocol via the RS485 serial link (X1-communications terminal). • See also parameter Group 53 EFB PROTOCOL. 2 = N2 – Enables fieldbus communication with the drive using Metasys N2 protocol via the RS485 serial link (X1-communications terminal). 3 = FLN – Enables fieldbus communication with the drive using FLN protocol via the RS485 serial link (X1-communications terminal). 4 = EXT FBA – The drive communicates via a fieldbus adapter module in option slot 2 of the drive. • See also parameter Group 51 EXT COMM MODULE. 5 = BACNET – Enables fieldbus communication with the drive using BACnet protocol via the RS485 serial link (X1-communications terminal).	0, 1, 4	1	0	

Note! YORK Drives include the following embedded protocols:

1. Standard MODBUS
2. Johnson N2
3. Siemens FLN

Options:

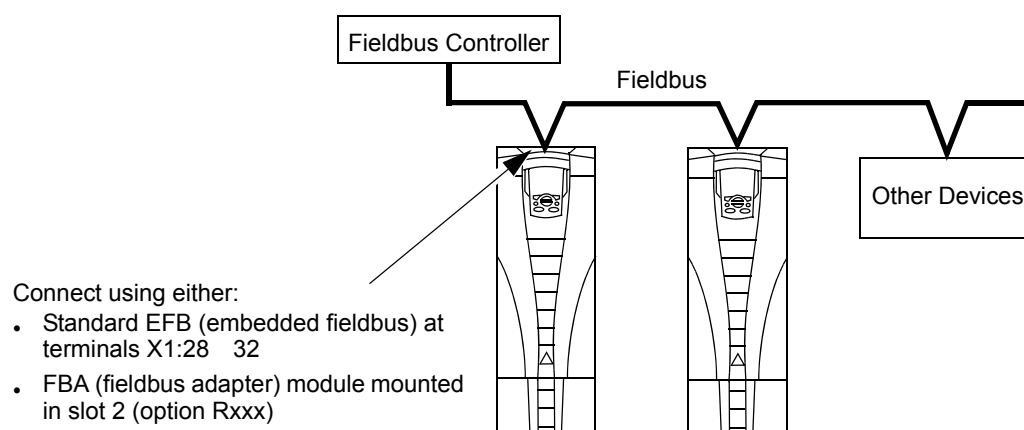
4. Ext FBA requires external communication card
5. BACnet® requires flash download done at factory.

Serial Communication – EFB

Overview

The AYK550 can be set up to accept control from an external system using standard serial communication protocols. When using serial communication, the AYK550 can either:

- Receive all of its control information from the fieldbus, or
- Be controlled from some combination of fieldbus control and other available control locations, such as digital or analog inputs, and the control panel.



Two basic serial communications configurations are available:

- EFB (embedded fieldbus) – Using the RS485 interface at terminals X1:28 – 32 on the control board, a control system can communicate through the drive's standard EFB using one of the following protocols (For protocol descriptions, see "Modbus Protocol Technical Data", "YORK Drives Profile Technical Data", etc. starting on page 152.):
 - Modbus®
 - Metasys® N2
 - APOGEE® FLN
 - BACnet® requires factory download.
- FBA (fieldbus adapter) – See "Serial Communication – FBA" on page 193.
- Lon Works and others.