ABB machinery drives

Supplement
ACS355 enhanced sequence program (+N830)

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List of related manuals

Drive manuals and guides	Code (English)
ACS355 user's manual	*3AUA0000066143*
ACS355 drives with IP66/67 / UL Type 4x enclosure supplement	*3AUA0000066066*
ACS355 quick installation guide	*3AUA0000092940*
ACS355 common DC application guide	*3AUA0000070130*
ACS355 enhanced sequence program (+N830) supplement	*3AXD50000017465*

Option manuals and guides	
FCAN-01 CANopen adapter module user's manual	*3AFE68615500*
FDNA-01 DeviceNet adapter module user's manual	*3AFE68573360*
FECA-01 EtherCAT® adapter module user's manual	*3AUA0000068940*
FENA-01/-11 Ethernet adapter module user's manual	*3AUA0000093568*
FLON-01 LONWORKS® adapter module user's manual	*3AUA0000041017*
FMBA-01 Modbus adapter module user's manual	*3AFE68586704*
FPBA-01 PROFIBUS DP adapter module user's manual	*3AFE68573271*
FRSA-00 RS-485 adapter board user's manual	*3AFE68640300*
MFDT-01 FlashDrop user's manual	*3AFE68591074*
MPOT-01 potentiometer module instructions for installation and use	*3AFE68591082*
MREL-01 output relay module user's manual	*3AUA0000035974*
MTAC-01 pulse encoder interface module user's manual	*3AFE68591091*
MUL1-R1 installation instructions for ACS150, ACS310, ACS320, ACS350 and ACS355	*3AFE68642868*
MUL1-R3 installation instructions for ACS310, ACS320, ACS350 and ACS355	*3AFE68643147*
MUL1-R4 installation instructions for ACS310, ACS320, ACS350 and ACS355	*3AUA0000025916*
SREA-01 Ethernet adapter module quick start-up guide	*3AUA0000042902*
SREA-01 Ethernet adapter module user's manual	*3AUA0000042896*
ACS355 and AC500-eCo application guide	*2CDC125152M0201*
AC500-eCo PLC and ACS355 quick installation guide	*2CDC125145M0201*

Maintenance manuals and guides	
Guide for capacitor reforming in ACS50, ACS55, ACS150, ACS310, ACS350, ACS355, ACS550, ACH550 and R1-R4 OINT/SINT boards	*3AFE68735190*

You can find manuals and other product documents in PDF format on the Internet. See section *Document library on the Internet* on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

Supplement

ACS355 enhanced sequence program (+N830)

Table of contents

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Table of contents

1. Introduction to the supplement

What this chapter contains . . . 7
Safety . . . 7
Scope . . . 7
Applicability . . . 8
Target audience . . . 8
Purpose of the manual . . . 8
Contents of this supplement . . . 9
Related documents . . . 9
Quick start-up flowchart . . . 10
Terms and abbreviations . . . 10

2. Control panels

What this chapter contains . . . 11
About control panels . . . 11
Applicability . . . 11
- Set sequence program parameters . . . 13
- Monitor sequence program signals . . . 13

3. Application macros

What this chapter contains . . . 15
Overview of macros . . . 15
Summary of the I/O connections of the application macros . . . 17

4. Program features

What this chapter contains . . . 19
Enhanced sequence program . . . 19
- Settings . . . 21
- State shifts . . . 22
- Example 1 . . . 24
- Example 2 . . . 25

External control . . . 29
Start, stop, direction source for External Control . . . 29
Reference source for External Control . . . 29
Programmable analog inputs . . . 29
- Settings . . . 30

Programmable analog output . . . 30
- Settings . . . 30

Programmable digital inputs . . . 30
- Settings . . . 31

Programmable relay output . . . 32
- Settings . . . 32

Transistor output 32
Settings 32
Actual signals 32
Acceleration and deceleration ramps 33
Settings 33
Supervisions 33
Settings 34
Real-time clock and timed functions 34
Settings 34
User parameter set change 34
Settings 35
Counter 35
Counter position functions 35
Settings 36
Position control example 1 37
Position control example 2 43

5. Actual signals and parameters

What this chapter contains 49
Terms and abbreviations 49
Actual signals 50
Parameters 52

1

Introduction to the supplement

What this chapter contains

The chapter describes safety issues, scope of this supplement, applicability, target audience and purpose of this supplement. It describes the contents of this supplement and refers to a list of related manuals for more information. The chapter also contains a Quick start-up flow chart which can be followed when commissioning.

Safety

Safety related instructions please refer to *ACS355 user's manual* (3AUA0000066143 [English]). The safety instructions must be followed when installing, operating and servicing the drive. Please study the complete safety instructions carefully.

Scope

This document is supplement of *ACS355 user's manual* (3AUA0000066143 [English]). This supplement covers all differences between enhanced sequence program and sequence program in ACS355 standard firmware. Only the enhanced sequence program contents are given in each chapter of this supplement.

Following chapters please refer to *ACS355 user's manual* (3AUA0000066143 [English]):

- Operation principle and hardware description
- Mechanical installation
- Planning the electrical installation
- Electrical installation
- Installation checklist
- Startup, control with I/O and ID run
- Fieldbus control with fieldbus adapter
- Fault tracing
- Maintenance and hardware diagnostics
- Technical data
- Appendixes

Applicability

The manual is applicable to the ACS355 enhanced sequence program firmware version 6.200 or later. See parameter *3301 FIRMWARE*. Option code +N830 in the drive type code shows that the drive has the enhanced sequence program installed.

Target audience

This supplement is intended for people who work with ACS355 enhanced sequence program. The reader of this supplement is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

Purpose of the manual

This manual provides information needed for commissioning, operating and maintaining the ACS355 enhanced sequence program.

Contents of this supplement

The supplement consists of the following chapters:

- *Introduction to the supplement* (this chapter, page *7*) describes safety issues, scope of supplement, applicability, target audience and purpose of this manual. It also contains a quick start-up flowchart.
- *Control panels* (page *11*) describes different control panels, interfaces to adjust sequence program parameters and monitoring related actual values.
- *Application macros* (page *15*) describes the application macros. Overview of macros shows suitable application of each macros. Default function of each I/O is also shown in section summary of I/O connections of the application macros.
- *Program features* (page *19*) describes program features. There are also lists of related user settings in each section.
- *Actual signals and parameters* (page *49*) describes the actual signals and parameters related to sequence program and gives the fieldbus equivalent values for each signal/parameter. It also contains a table of the default values for the different macros.
- *Further information* (inside of the back cover) tells how to make product and service inquiries, get information on product training, provide feedback on ABB Drives manuals and how to find documents on the Internet.

Related documents

See *List of related manuals* on page *2* (inside of the front cover).

Quick start-up flowchart

Task	See
Start the drive as usual.	See section Quick installation and commissioning flowchart in *ACS355 User's manual* (3AUA0000066143 [English]).
↓	
Set application parameters using either the control panel or the Drive window light PC Tool in Group *10 START/STOP/DIR*, *11 REFERENCE SELECT*, *13 ANALOG INPUTS*, *14 RELAY OUTPUTS*, *15 ANALOG OUTPUTS*, *18 FREQ IN & TRAN OUT*, *19 TIMER & COUNTER*,*22 ACCEL/DECEL*, *32 SUPERVISION*, *36 TIMED FUNCTIONS*, *84 SEQUENCE PROG*, *85 SEQUENCE PROG2*	See section *Actual signals and parameters* on page *49*
↓	
Monitor the inverter signals in Group *01 OPERATING DATA*.	See section *Actual signals and parameters* on page *49*

Terms and abbreviations

Term/abbreviation	Explanation
SEQ PROG	Sequence program

Other terms and abbreviations please refer to *ACS355 user's manual* (3AUA0000066143 [English]).

2

Control panels

What this chapter contains

The chapter describes different control panels compatible with ACS355 enhanced sequence program firmware, applicability panel versions and parameters or signals in enhanced sequence program which can be set or monitored using control panels.

About control panels

Use a control panel to control the ACS355 enhanced sequence program, read sequence status data, and adjust sequence program parameters. The drive works with one of following control panel types:

- Basic control panel – This panel (described in chapter control panels of *ACS355 user's manual* (3AUA0000066143 [English]) provides basic tools for manual entry of parameter values.
- Assistant control panel – This panel (described in section Assistant control panel on page 89 of *ACS355 user's manual* (3AUA0000066143 [English]) includes pre-programmed assistants to automate the most common parameter setups. The panel provides language support. It is available with different language sets.

Basic operations of Basic control panel and Assistant control panel please refer to the *ACS355 User's manual* (3AUA0000066143 [English]).

Applicability

The supplement is applicable to panels with the panel revisions and the panel firmware versions given in the table below.

Panel type	Type code	Panel revision	Panel firmware version
Basic control panel	ACS-CP-C	M or later	1.13 or later
Assistant control panel	ACS-CP-A	F or later	2.04 or later

Panel type	Type code	Panel revision	Panel firmware version
Assistant control panel (Asia)	ACS-CP-D	Q or later	2.04 or later

To find out the panel revision, see the label on the back of the panel. An example label and explanation of the label contents are shown below.

1	Panel type code
2	Serial number of format MYYWWRXXXX, where M: Manufacturer YY: 09, 10, 11, …, for 2009, 2010, 2011, … WW: 01, 02, 03, … for week 1, week 2, week 3, … R: A, B, C, … for panel revision XXXX: Integer starting every week from 0001
3	RoHS mark (the label of your drive shows the valid markings)

To find out the panel firmware version of your assistant control panel or basic control panel, please refer to chapter Control panels of *ACS355 User's manual* (3AUA0000066143 [English]).

See parameter 9901 LANGUAGE in *ACS355 User's manual* (3AUA0000066143 [English]) to find out the languages supported by the different assistant control panels.

Set sequence program parameters

Following related parameter groups in enhanced sequence program can be set with control panel:

- *10 START/STOP/DIR*, *22 ACCEL/DECEL* parameters.
- *11 REFERENCE SELECT* parameters.
- *13 ANALOG INPUTS*, *14 RELAY OUTPUTS*, *15 ANALOG OUTPUTS*, *18 FREQ IN & TRAN OUT* parameters.
- *19 TIMER & COUNTER*, *36 TIMED FUNCTIONS* parameters.
- *32 SUPERVISION* parameters.
- *84 SEQUENCE PROG*, *85 SEQUENCE PROG2* parameters.

How to set sequence program parameters

Information about setting parameters using different control panels please refer to the chapter Control panels of *ACS355 User's manual* (3AUA0000066143 [English]).

Monitor sequence program signals

Following related signals can be selected as monitored signals in control panel:

- *0167 SEQ PROG STS*
- *0168 SEQ PROG STATE*
- *0169 SEQ PROG TIMER*
- *0170 SEQ PROG AO VAL*
- *0171 SEQ CYCLE CNTR*
- *0190 POS STATUS*
- *0192 COUNTER VALUE HI*
- *0193 COUNTER VALUE LO*
- *0194 SPEED ACT POS*

How to select the monitored signals

Information about selecting the monitored signals please refer to the chapter Control panels of *ACS355 User's manual* (3AUA0000066143 [English]).

3

Application macros

What this chapter contains

The chapter describes the application macros available in ACS355 enhanced sequence program. Overview of macros shows suitable application of each macros. Default function of each I/O is also shown in section summary of I/O connections of the application macros.

Overview of macros

Basic information of application macros please refer to the chapter application macros of *ACS355 User's manual* (3AUA0000066143 [English]).

The ACS355 enhanced sequence program has seven macros and three user macros. Summary of following macros and suitable applications please refer to the chapter application macros of *ACS355 User's manual* (3AUA0000066143 [English]) and the table below.

Macro	Suitable applications
ABB standard	Ordinary speed control applications where no, one, two or three constant speeds are used. Start/stop is controlled with one digital input (level start and stop). It is possible to switch between two acceleration and deceleration times.
3-wire	Ordinary speed control applications where no, one, two or three constant speeds are used. The drive is started and stopped with push buttons.
Alternate	Speed control applications where no, one, two or three constant speeds are used. Start, stop and direction are controlled by two digital inputs (combination of the input states determines the operation).
Motor potentiometer	Speed control applications where no or one constant speed is used. The speed is controlled by two digital inputs (increase / decrease / keep unchanged).

Macro	Suitable applications
Hand/Auto	Speed control applications where switching between two control devices is needed. Some control signal terminals are reserved for one device, the rest for the other. One digital input selects between the terminals (devices) in use.
Torque control	Torque control applications. It is possible to switch between torque and speed control: Some control signal terminals are reserved for torque control, others for speed control. One digital input selects between torque and speed control.
AC500 Modbus	Applications that require a complex control logic and when several drives are connected together through a Modbus link. AC500-eCo PLC is used for controlling and monitoring the system.
User	The user can save the customized standard macro, ie the parameter settings including group 99 START-UP DATA, and the results of the motor Identification run into the permanent memory, and recall the data at a later time. For example, three user macros can be used when switching between three different motors is required.

Note: In Start-up assistant, the PID assistant can not be used because all related PID functions has been removed in ACS355 enhanced sequence program firmware.

Summary of the I/O connections of the application macros

The following table gives the summary of the default I/O connections of all application macros available in ACS355 enhanced sequence program. All of the I/O mapping diagrams of each macro please refer to *ACS355 User's manual* (3AUA0000066143 [English]).

Input/ Output	Macro					
	ABB standard	**3-wire**	**Alternate**	**Motor potentiom.**	**Hand/Auto**	**Torque control**
AI1 (0…10 V)	Freq. ref.	Speed ref.	Speed ref.	-	Speed ref. (Hand)	Speed ref. (Speed)
AI2 (0…20 mA)	-	-	-	-	Speed ref. (Auto)	Torque ref. (Torque)
AO	Output freq.	Speed	Speed	Speed	Speed	Speed
DI1	Stop/Start	Start (pulse)	Start (fwd)	Stop/Start	Stop/Start (Hand)	Stop/Start (Speed)
DI2	Fwd/Rev	Stop (pulse)	Start (rev)	Fwd/Rev	Fwd/Rev (Hand)	Fwd/Rev
DI3	Const. speed input 1	Fwd/Rev	Const. speed input 1	Speed ref. up	Hand/Auto	Speed/ Torque
DI4	Const. speed input 2	Const. speed input 1	Const. speed input 2	Speed ref. down	Fwd/Rev (Auto)	Const. speed 1
DI5	Ramp pair selection	Const. speed input 2	Ramp pair selection	Const. speed 1	Stop/Start (Auto)	Ramp pair selection
RO	Fault (-1)	Fault (-1)	Fault (-1)	Fault (-1)	Fault (-1)	Fault (-1)
DO	Fault (-1)	Fault (-1)	Fault (-1)	Fault (-1)	Fault (-1)	Fault (-1)

4

Program features

What this chapter contains

The chapter describes ACS355 enhanced sequence program features. There are also lists of related user settings in each section. Other standard program features please refer to chapter Program features in *ACS355 user's manual* (3AUA0000066143 [English]).

Control program introduction

Enhanced sequence program extends number of sequence states from 8 to 16. Together with counter positioning control function, the drive can be applied to more complicated applications, such as Stocker Machine and simple Crane applications. More state triggers and logic values are added, please refer to the related parameter list in chapter *Actual signals and parameters*. Detailed introduction and settings for each related sequence program function please refer to each section below.

Note: STx TRIG TO ST N2 and STx N2 are added to states 1-16. STx TRIG TO ST N3/4 and STx N3/4 are added to state 9 and 10.

Note: For State 8, parameter 8495 ST8 TRIG TO ST 1 remains the same function as in ACS355 standard firmware. Parameter 8510 ST8 TRIG TO ST9 is added as a new parameter in ACS355 enhanced sequence program.

Enhanced sequence program

The drive can be programmed to perform a sequence where the drive shifts typically through 1…16 states. User defines the operation rules of the whole sequence for each state. The rules of a particular state are effective when the Sequence program is active and the program has entered the state. The rules to be defined for each state are:

- Run, stop, direction commands for the drive
- Acceleration and deceleration ramp time for the drive
- Source for the drive reference value
- State duration
- RO/DO/AO status
- Signal source for triggering the shift to the next state
- Signal source for triggering the shift to any state (1…16)
- Counter reset state out control

Every state can also activate drive outputs to give an indication to external devices.

Enhanced sequence program allows state transitions either to the next state or to state N/N2/N3/N4 (State N3/N4 only available for state 9 and 10). State change can be activated with e.g. timed functions, digital inputs and supervision functions. For state 8, enhanced sequence program also allows both state transition to state 1 and state 9.

Enhanced sequence program allows definition of User Macro change state and User Macro selection.

Enhanced sequence program can be applied in simple mixer applications as well as in more complicated traverse applications. Together with counter function this can be applied in positioning control applications as well as in some simple crane applications.

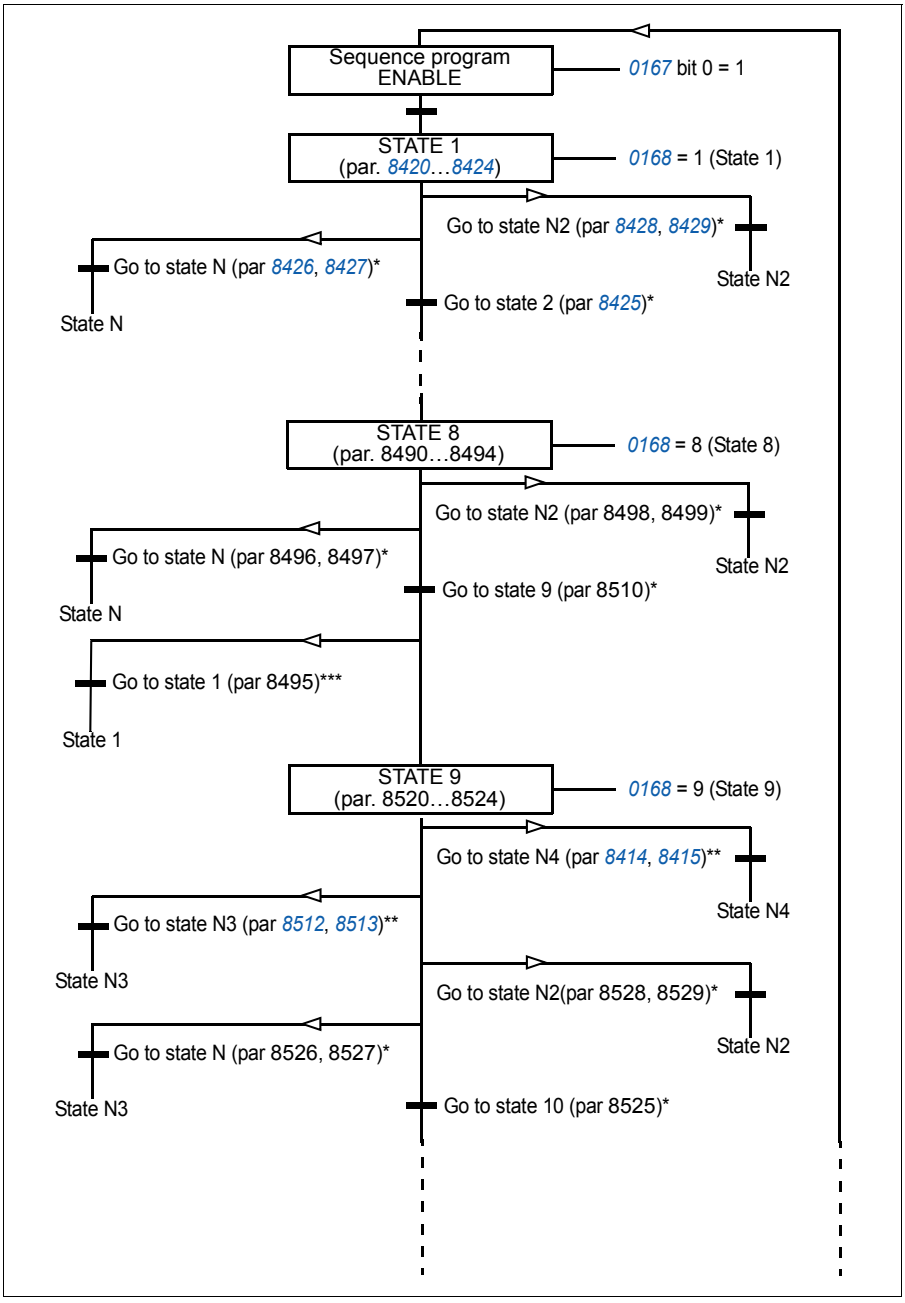
The enhanced sequence program can be implemented with control panel or a PC tool. The drive is supported by version 2.94 or later of the DriveWindow Light 2 PC tool which includes a graphical Sequence program tool supporting 16 sequence program states.

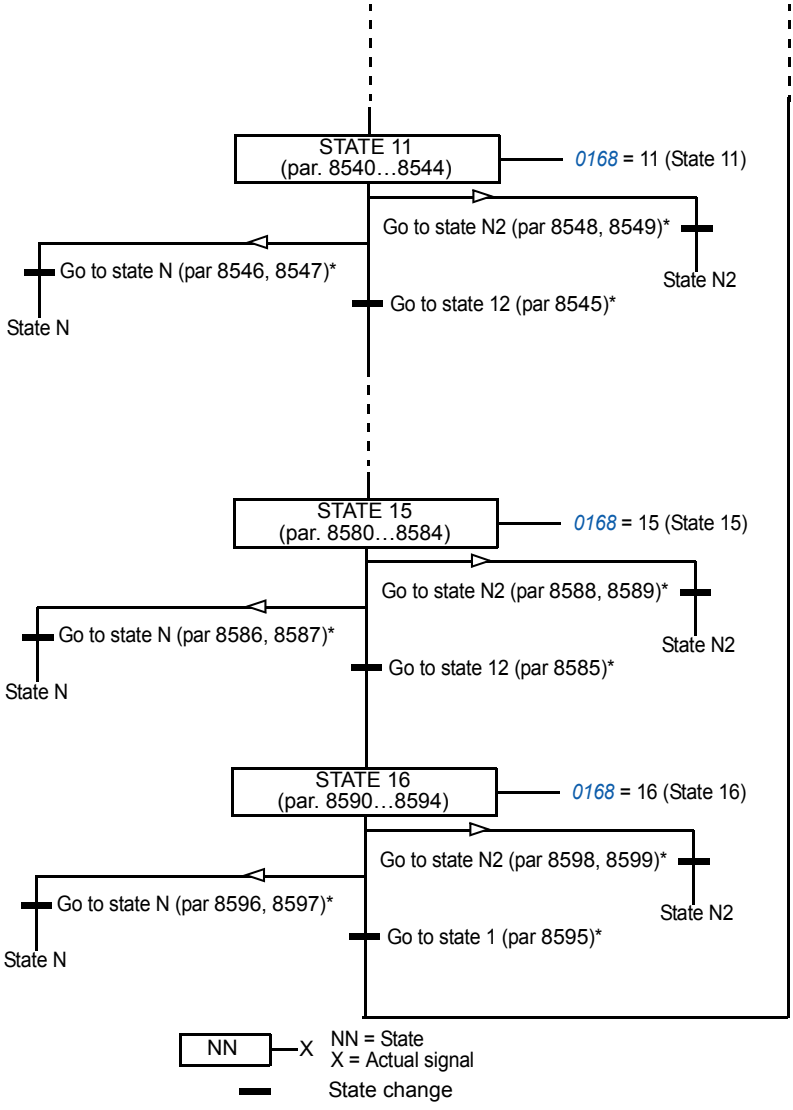
Note: By default all Sequence program parameters can be changed even when the Sequence program is active. It is recommended that after the Sequence program parameters are set, parameters are locked with parameter *1602 PARAMETER LOCK*. Related parameters are listed in table below:

Settings

Parameter	Additional information
1001/*1002*	Start, stop and direction commands for EXT1/EXT2
1102	EXT1/EXT2 selection
1103/1106	REF1/2 source
1401,1402,1403,1410	Sequence program output through RO 1/2/3/4
1501	Sequence program output through AO
1601	Run enable activation/deactivation
1605	User parameter set change by sequence program
1805	Sequence program output through DO
Group *19 TIMER & COUNTER*	State change according to counter limit
2201…*2207*	Acceleration/deceleration and ramp time settings
Group *32 SUPERVISION*	Supervision settings
Group *36 TIMED FUNCTIONS*	Timed state change
Group *84 SEQUENCE PROG* Group *85 SEQUENCE PROG2*	Sequence program settings

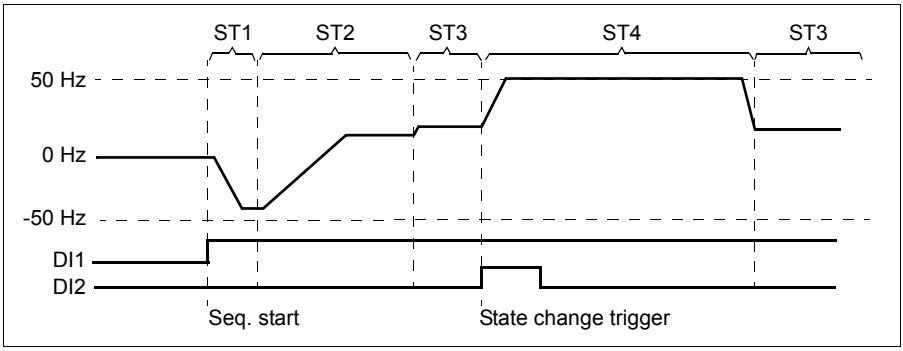
State shifts





*Trigger priority: Trigger to N4 > N3 > N2 > N > Next.
**Trigger to state N3 and N4are only available in state 9 and 10.
***State 8 trigger to state 1 has lowest priority.

Example 1



Sequence program is activated by digital input DI1.

ST1: Drive is started in reverse direction with -50 Hz reference and 10 s ramp time. State 1 is active for 40 s.

ST2: Drive is accelerated to 20 Hz with 60 s ramp time. State 2 is active for 120 s.

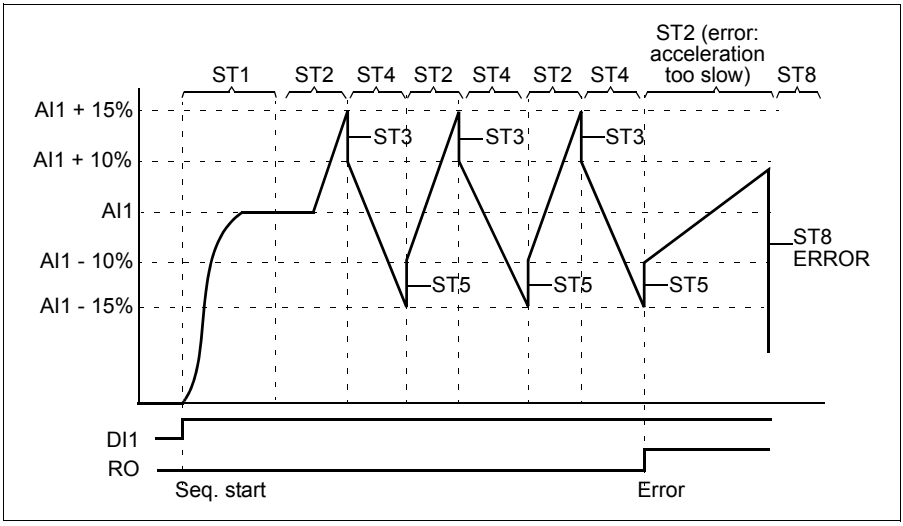
ST3: Drive is accelerated to 25 Hz with 5 s ramp time. State 3 is active until the Sequence program is disabled or until booster start is activated by DI2.

ST4: Drive is accelerated to 50 Hz with 5 s ramp time. State 4 is active for 200 s and after that the state shifts back to state 3.

Parameter	Setting	Additional information
1002 EXT2 COMMANDS	*SEQ PROG*	Start, stop, direction commands for EXT2
1102 EXT1/EXT2 SEL	*EXT2*	EXT2 activation
1106 REF2 SELECT	*SEQ PROG*	Sequence program output as REF2
1601 RUN ENABLE	*NOT SEL*	Deactivation of Run enable
2102 STOP FUNCTION	*RAMP*	Ramp stop
2201 ACC/DEC 1/2 SEL	*SEQ PROG*	Ramp as defined by parameter *8422*/…/*8452*.
8401 SEQ PROG ENABLE	*ALWAYS*	Sequence program enabled
8402 SEQ PROG START	*DI1*	Sequence program activation through digital input (DI1)
8404 SEQ PROG RESET	*DI1(INV)*	Sequence program reset (ie reset to state 1, when DI1 signal is lost (1 -> 0)

ST1		ST2		ST3		ST4		Additional information
Par.	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	
8420 ST1 REF SEL	100%	*8430*	40%	*8440*	50%	*8450*	100%	State reference
8421 ST1 COMMANDS	*START REV*	*8431*	*START FRW*	*8441*	*START FRW*	*8451*	*START FRW*	Run, direction and stop command
8422 ST1 RAMP	10 s	*8432*	60 s	*8442*	5 s	*8452*	5 s	Ramp time
8424 ST1 CHANGE DLY	40 s	*8434*	120 s	*8444*		*8454*	200 s	State change delay
8425 ST1 TRIG TO ST 2	*CHANG E DLY*	*8435*	*CHANG E DLY*	*8445*	*DI2*	*8455*		State change trigger
8426 ST1 TRIG TO ST N	*NOT SEL*	*8436*	*NOT SEL*	*8446*	*NOT SEL*	*8456*	*CHANG E DLY*	
8427 ST1 STATE N	-	*8437*	-	*8447*	-	*8457*	*STATE 3*	

Example 2



Drive is programmed for traverse control with 30 sequences.

Sequence program is activated by digital input DI1.

ST1: Drive is started in forward direction with AI1 (AI1 + 50% - 50%) reference and ramp pair 2. State shifts to the next state when reference is reached. All relay and analog outputs are cleared.

ST2: Drive is accelerated with AI1 + 15% (AI1 + 65% - 50%) reference and 1.5 s ramp time. State shifts to the next state when reference is reached. If reference is not reached within 2 s, state shifts to state 8 (error state).

ST3: Drive is decelerated with AI1 + 10% (AI1 + 60% - 50%) reference and 0 s ramp time[1)]. State shifts to the next state when reference is reached. If reference is not reached within 0.2 s, state shifts to state 8 (error state).

ST4: Drive is decelerated with AI1 - 15% (AI1 + 35% -50%) reference and 1.5 s ramp time. State shifts to the next state when reference is reached. If reference is not reached within 2 s, state shifts to state 8 (error state).[2)]

ST5: Drive is accelerated with AI1 -10% (AI1 + 40% -50%) reference and 0 s ramp time[1)]. State shifts to the next state when reference is reached. Sequence counter value is increased by 1. If sequence counter elapses, state shifts to state 7 (sequence completed).

ST6: Drive reference and ramp times are the same as in state 2. Drive state shifts immediately to state 2 (delay time is 0 s).

ST7 (sequence completed): Drive is stopped with ramp pair 1. Digital output DO is activated. If Sequence program is deactivated by the falling edge of digital input DI1, state machine is reset to state 1. New start command can be activated by digital input DI1 or by digital inputs DI4 and DI5 (both inputs DI4 and DI5 must be simultaneously active).

ST8 (error state): Drive is stopped with ramp pair 1. Relay output RO is activated. If Sequence program is deactivated by the falling edge of digital input DI1, state machine is reset to state 1. New start command can be activated by digital input DI1 or by digital inputs DI4 and DI5 (both inputs DI4 and DI5 must be simultaneously active).

[1)] 0 second ramp time = drive is accelerated/decelerated as rapidly as possible.

[2)] State reference must be between 0…100%, ie scaled AI1 value must be between 15…85%. If AI1 = 0, reference = 0% + 35% -50% = -15% < 0%.

Parameter	Setting	Additional information
1002 EXT2 COMMANDS	*SEQ PROG*	Start, stop, direction commands for EXT2
1102 EXT1/EXT2 SEL	*EXT2*	EXT2 activation
1106 REF2 SELECT	*AI1+SEQ PROG*	Sequence program output as REF2
1201 CONST SPEED SEL	*NOT SEL*	Deactivation of constant speeds
1401 RELAY OUTPUT 1	*SEQ PROG*	Relay output RO 1 control as defined by parameter *8423*/…/*8493*
1601 RUN ENABLE	*NOT SEL*	Deactivation of Run enable
1805 DO SIGNAL	*SEQ PROG*	Digital output DO control as defined by parameter *8423*/…/*8493*
2102 STOP FUNCTION	*RAMP*	Ramp stop
2201 ACC/DEC 1/2 SEL	*SEQ PROG*	Ramp as defined by parameter *8422*/…/*8452*.
2202 ACCELER TIME 1	1 s	Acceleration/deceleration ramp pair 1
2203 DECELER TIME 1	0 s	
2205 ACCELER TIME 2	20 s	Acceleration/deceleration ramp pair 2
2206 DECELER TIME 2	20 s	
2207 RAMP SHAPE 2	5 s	Shape of the acceleration/deceleration ramp 2
3201 SUPERV 1 PARAM	171	Sequence counter (signal *0171 SEQ CYCLE CNTR*) supervision
3202 SUPERV 1 LIM LO	30	Supervision low limit
3203 SUPERV 1 LIM HI	30	Supervision high limit
8401 SEQ PROG ENABLE	*EXT2*	Sequence program enabled
8402 SEQ PROG START	*DI1*	Sequence program activation through digital input (DI1)
8404 SEQ PROG RESET	*DI1(INV)*	Sequence program reset (ie reset to state 1, when DI1 signal is lost (1 -> 0)
8406 SEQ LOGIC VAL 1	*DI4*	Logic value 1
8407 SEQ LOGIC OPER 1	*AND*	Operation between logic value 1 and 2
8408 SEQ LOGIC VAL 2	*DI5*	Logic value 2
8415 CYCLE CNT LOC	*ST5 TO NEXT*	Sequence counter activation, ie sequence count increases every time the state changes from state 5 to state 6.
8416 CYCLE CNT RST	*STATE 1*	Sequence counter reset during state transition to state 1

ST1		ST2		ST3		ST4		Additional information
Par.	Setting	Par.	Setting	Par.	Setting	Par.	Setting	
8420 ST1 REF SEL	50%	*8430*	65%	*8440*	60%	*8450*	35%	State reference
8421 ST1 COMMANDS	*START FRW*	*8431*	*START FRW*	*8441*	*START FRW*	*8451*	*START FRW*	Run, direction and stop commands
8422 ST1 RAMP	-0.2 (ramp pair 2)	*8432*	1.5 s	*8442*	0 s	*8452*	1.5 s	Acceleration/ deceleration ramp time
8423 ST1 OUT CONTROL	*R=0,D=0 ,AO=0*	*8433*	*AO=0*	*8443*	*AO=0*	*8453*	*AO=0*	Relay, digital and analog output control
8424 ST1 CHANGE DLY	0 s	*8434*	2 s	*8444*	0.2 s	*8454*	2 s	State change delay
8425 ST1 TRIG TO ST 2	*ENTER SETPNT*	*8435*	*ENTER SETPNT*	*8445*	*ENTER SETPNT*	*8455*	*ENTER SETPNT*	State change trigger
8426 ST1 TRIG TO ST N	*NOT SEL*	*8436*	*CHANG E DLY*	*8446*	*CHANG E DLY*	*8456*	*CHANG E DLY*	
8427 ST1 STATE N	*STATE 1*	*8437*	*STATE 8*	*8447*	*STATE 8*	*8457*	*STATE 8*	

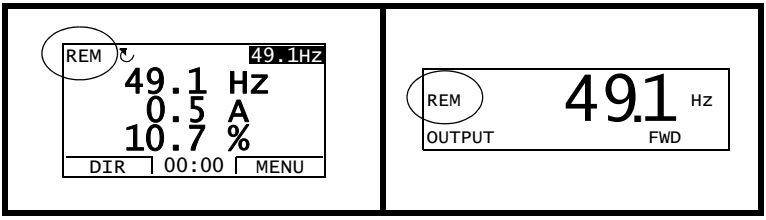
ST5		ST6		ST7		ST8		Additional information
Par.	Setting	Par.	Setting	Par.	Setting	Par.	Setting	
8460 ST5 REF SEL	40%	*8470*	65%	*8480*	0%	*8490*	0%	State reference
8461 ST5 COMMANDS	*START FRW*	*8471*	*START FRW*	*8481*	*DRIVE STOP*	*8491*	*DRIVE STOP*	Run, direction and stop commands
8462 ST5 RAMP	0 s	*8472*	1.5 s	*8482*	-0.1 (ramp pair 1)	*8492*	-0.1 (ramp pair 1)	Acceleration/ deceleration ramp time
8463 ST5 OUT CONTROL	*AO=0*	*8473*	*AO=0*	*8483*	*DO=1*	*8493*	*RO=1*	Relay, digital and analog output control

ST5		ST6		ST7		ST8		Additional information
Par.	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	
8464 ST5 CHANGE DLY	0.2 s	*8474*	0 s	*8484*	0 s	*8494*	0 s	State change delay
8465 ST5 TRIG TO ST6	*ENTER SETPNT*	*8475*	*NOT SEL*	*8485*	*NOT SEL*	*8495*	*LOGIC VAL*	State change trigger
8466 ST5 TRIG TO ST N	*SUPRV1 OVER*	*8476*	*CHANG E DLY*	*8486*	*LOGIC VAL*	*8496*	*NOT SEL*	
8467 ST5 STATE N	*STATE 7*	*8477*	*STATE 2*	*8487*	*STATE 1*	*8497*	*STATE 1*	

External control

ACS355 enhanced sequence program can only works in External control mode (Remote control). External control is indicated with REM on the panel display, see picture below. Using LOC/REM panel key, user can switch to External control.

Assistant control panel **Basic control panel**



Both two external control locations, EXT1 or EXT2 can be used for sequence program. Depending on the user selection, either one is active at a time. This function operates on a 2ms time level.

Start, stop, direction source for External Control

In order to use enhanced sequence program, Start, stop, direction source should be set for sequence program by setting parameters *1001*/*1002* to SEQ PROG.

Reference source for External Control

In order to use enhanced sequence program, Reference source of EXT1/EXT2 should be set for sequence program by setting parameters *1103*/*1106* to SEQ PROG.

Programmable analog inputs

Two programmable analog inputs can be set for references of enhanced sequence program. Related parameters are listed in table below:

Settings

Parameter	Additional information
Group *13 ANALOG INPUTS*	Analog input processing
8420, *8425*, *8426, 8428* *8520, 8525, 8526, 8528* *8430*, *8435*, *8436, 8438* *8530, 8535, 8536, 8538* … *8490*, *8495*, *8496, 8498* *8590, 8595, 8596, 8598* *8510, 8512, 8514, 8516, 8518*	AI as Sequence program reference or trigger signal
8406, *8408*, *8410*	AI as SEQ logic value 1-3 signal source
8501, *8503*, *8505*	AI as SEQ logic2 value 1-3 signal source

Programmable analog output

One programmable current output (0…20 mA) is available. Analog output can be controlled with enhanced sequence program by setting parameter *1501 AO1 CONTENT SEL* to any related SEQ PROG values:

- *0167 SEQ PROG STS*
- *0168 SEQ PROG STATE*
- *0169 SEQ PROG TIMER*
- *0170 SEQ PROG AO VAL*
- *0171 SEQ CYCLE CNTR*

Related parameters are listed in the table below:

Settings

Parameter	Additional information
Group *15 ANALOG OUTPUTS*	AO value selection and processing
8423, *8433*, …, *8493* *8523*, *8533*, …, *8593*	AO control with Sequence program

Programmable digital inputs

The drive has five programmable digital inputs which can be programmed as control source of enhanced sequence program. Related parameters are listed in the table below:

Settings

Parameter	Additional information
8402 SEQ PROG START	DI as SEQ start signal source
8403 SEQ PROG PAUSE	DI as SEQ pause signal source
8404 SEQ PROG RESET	DI as SEQ reset signal source
8406, *8408*, *8410*	DI as SEQ logic value 1-3 signal source
8501, *8503*, *8505*	DI as SEQ logic2 value 1-3 signal source
8416 CYCLE CNT RST	DI as cycle counter reset signal source
8420, *8430, 8440, 8450,..., 8490* *8520*, *8530, 8540, 8550,..., 8590*	DI as SEQ reference Mot.Pot control source
8425, *8435, 8445,..., 8485, 8510* *8525, 8535, 8545, 8555,..., 8595*	DI as SEQ state trig to next state signal source
8426, *8436, 8446, 8456,..., 8496* *8526, 8536, 8546, 8556,..., 8596*	DI as SEQ state trig to STN signal source
8428, *8438, 8448, 8458,..., 8498* *8528, 8538, 8548, 8558,..., 8598*	DI as SEQ state trig to STN2 signal source
8512, *8516*	DI as SEQ state trig to STN3 signal source
8514, *8518*	DI as SEQ state trig to STN4 signal source
8595 ST8 TRIG TO ST1	DI as ST8 trig to ST1 signal source

Programmable relay output

Relay output can be controlled by enhanced sequence program. The relay output control must be activated by setting parameter *1401 RELAY OUTPUT 1*,*1402 RELAY OUTPUT 2*, *1403 RELAY OUTPUT 3* or *1410 RELAY OUTPUT 4* to *SEQ PROG*.

Note: Extended relay output 2-4 (which is extended by MREL-01) can also be controlled by enhanced sequence program. They must be activated by setting *1402 RELAY OUTPUT 2*, *1403 RELAY OUTPUT 3* or *1410 RELAY OUTPUT 4* to SEQ PROG.

Related parameters are listed in the table below:

Settings

Parameter	Additional information
Group *14 RELAY OUTPUTS*	RO value selections and operation times
8423/*8433*/…/*8493* *8523/8533/.../8593*	RO control with Sequence program

Transistor output

The drive has one programmable transistor output can be controlled by enhanced sequence program. The transistor output must work as digital output by setting parameter *1805 DO SIGNAL* to SEQ PROG.

Related parameters are listed in the table below:

Settings

Parameter	Additional information
Group *18 FREQ IN & TRAN OUT*	Transistor output settings
8423/*8433*/…/*8493* *8523/8533/.../8593*	Transistor output control with Sequence program

Actual signals

Several related actual signals in enhanced sequence program are available:

- Active control location (EXT1 or EXT2)
- Reference values
- Digital I/O, Relay output and Analog I/O status
- COMM Value 1/2
- SEQ status parameters

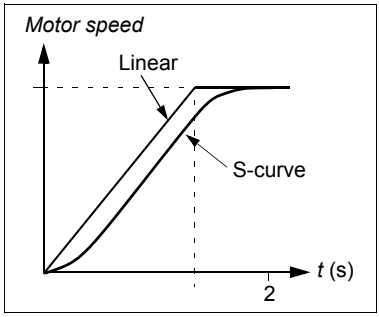
Actual signals used for position control are also available:

- Position control status word
- 32-bits counter value
- Scaled position speed actual value

Three signals can be shown simultaneously on the assistant control panel display (one signal on the basic control panel display). It is also possible to read the values through the serial communication link or through the analog outputs.

Acceleration and deceleration ramps

Two groups of user-selectable acceleration and deceleration ramps are available in ACS355 enhanced sequence program, same as in standard FW. Enhanced sequence program also offers additional ramp time for each state.



S-curve only effect on the two groups of user-selectable acceleration and deceleration ramps, doesn't effect additional ramps.

Note: Default value of Par.2102 STOP FUNCTION is changed to be RAMP in enhanced sequence program.

Related parameters are listed in the table below:

Settings

Parameter	Additional information
Group *22 ACCEL/DECEL*	Acceleration and deceleration ramp settings
8422/8432/…/8492 *8522/8532/.../8592*	Ramp settings of each sequence program states

Supervisions

Supervision status can be used as state change trigger signal and logic calculation value source in enhanced sequence program. Supervision status available are listed below:

- SUPRV1 OVER/UNDER: Supervision 1 over/under
- SUPRV2 OVER/UNDER: Supervision 2 over/under
- SUPRV3 OVER/UNDER: Supervision 3 over/under

Related parameters are listed in the table below:

Settings

Actual signal	Additional information
Group *32 SUPERVISION*	Supervision parameter settings
8425, *8426* / *8435*, *8436* /…/*8495*, *8496*, *8498* *8525*, *8526* / *8535*, *8536* /…/*8595*, *8596* *8510,8512/8514/8516/8518*	Sequence program state change according to supervision functions
8406, 8408, 8410	Logic value source of sequence program
8501, 8503, 8505	Logic2 value source of sequence program

Real-time clock and timed functions

The real-time clock can be used as state change trigger signal and also logic calculation value source in enhanced sequence program.

For more information, see section **Real-time clock and timed functions** in *ACS355 user's manual* (3AUA0000066143 [English]).

Related parameters are listed in the table below:

Settings

Parameter	Additional information
36 TIMED FUNCTIONS	Timed functions settings
8402 SEQ PROG START	Timed Sequence program activation
8425, *8426* / *8435*, *8436* /…/*8495*, *8496*, *8498* *8525*, *8526* / *8535*, *8536* /…/*8595*, *8596* *8510,8512/8514/8516/8518*	Sequence program state change trigger with timed function
8406, 8408, 8410	Logic value source of sequence program
8501, 8503, 8505	Logic2 value source of sequence program

User parameter set change

Enable the change of the User parameter set through enhance sequence program. The sequence programing of User parameter set change is activated by setting parameter *1605 USER PAR SET CHG* to *SEQ PROG*.

Related parameters are listed in the table below:

Settings

Parameter	Additional information
1605 USER PAR SET CHG	Timed functions settings

Parameter	Additional information
8406 MACRO CHG ST	Sequence program state change the User Parameter set.
8407 USER MACRO SEL	The User Macro is selected by the sequence programing.

Counter

Counter position functions

Counter function is rebuilt to fulfill simple position control requirements. The counter target value can be used as state command and the counter value can be reset by out control in sequence program.

After counter function is enabled, both DI5 and Encoder can be selected as counter pulse source. If PLS IN(DI5) is selected, DI5 directly gives the pulse signal to the counter. If Filtered DI5 is selected, pulse is given from filtered digital input DI5 as counter pulse source. If ENC W/O DIR is selected, pulse is given from encoder module but the direction of the motor is not considered. If ENC WITH DIR is selected, the counter goes up/down according to the direction of motor.

The following values are extended from 16 bits to 32 bits value (HI and LO value in two parameters):

- Counter actual value HI/LO
- Counter reset value HI/LO
- Counter limit value HI/LO

Selecting MOTOR DIR of *1910 COUNT DIRECTION* makes it is possible to count up/down with motor rotation direction. The value of counter will be increased when the direction of rotation is forward and will be decreased when the direction of rotation is reverse.

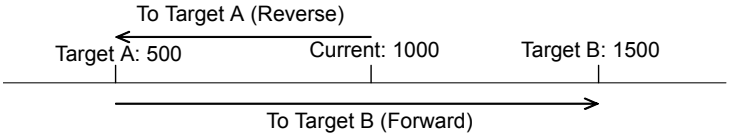
The counter can be reset by sequence program. The following conditions are added for counter reset:

- SEQ PROG: Sequence program state resets counter. Three counter reset conditions can be selected in state's out control, such as RST CNT ENT (reset counter when the state is entered), RST CNT STNX (reset counter when current state trigger to STNx) and RST CNT NEXT (reset counter when current state trigger to next state).
- SEQ OR DI1-5: Sequence program state or DI 1-5 resets counter.
- SEQ OR CV1#0-7: Sequence program state or COMM VALUE 1 (Par.0135) resets counter.

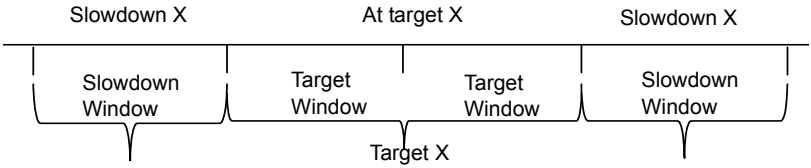
When DI5 is used as the counter input source, *1927 DI5 PPR* is preset the number of pulse per one revolution.

In enhanced sequence program, *1921 POS CORRECT* is used for positioning fine tuning parameter which is multiplied by actual speed.

Four target positions can be preset in Target A/B/C/D HI/LO VALUE parameters. In enhanced sequence program, the state command can be given as TARGET A/B/C/D and drive runs towards target automatically. Motor rotation direction follows the current position and target position.



In the following ranges, Target window defines that the “At target X” status(0190 POS STATUS) is true. Similarly, Slowdown window defines that the “Slowdown X” status is true.The “At target X” and “Slowdown X” can also be used as the trigger signal of state change in enhanced sequence program.



Counter numeration and denomination are used instead of counter divider. The following formula shows how counter value is calculated:

$$counter\ val. = old\ val. + addition\ val. * \frac{COUNTER\ NUM}{COUNTER\ DEN}$$

The counter function can also be used as the trigger signal of state change in enhanced sequence program. See section *Settings* on page *36*.

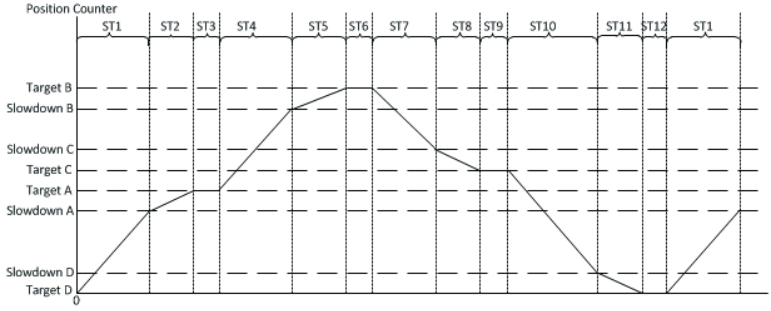
Related parameters are listed in the table below:

Settings

Parameter	Additional information
1001, *1002*	Start/Stop signal sources
Group *19 TIMER & COUNTER*	Counter for start and stop, reset sources, limit/reset value, target value, target/slowdown window, numeration/denomination, pos correct, DI5 PPR.

Parameter	Additional information
8421,8431,8441,8451/.../8491, 8521,8531,8541,8551/.../8591	Target X as the state command.
8423,8433,8443,8453/.../8493, 8523,8533,8543,8553/.../8593	Reset counter by the sequence program state out control.
8425, *8426* / *8435*, *8436* /…/*8495*, *8496, 8498* *8525*, *8526* / *8535*, *8536* /…/*8595*, *8596* *8510,8512/8514/8516/8518*	Sequence program state change trigger with counter function

Position control example 1

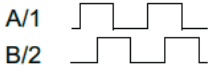


Encoder is installed in motor and connected to MTAC-01.

Sequence programing is activated by digital input DI1.

Counter value indicates the current position. Firstly, counter value is reset to 0 as the initial position.

Counter catches both rising and falling edge of the signals from phase A and phase B (shows in the picture below). So if parameter *5001 PULSE NR* is set to 1024, the counter will receive 4096 pulses per one revolution. If parameter *1929 COUNTER DEN* is set to 4096, the counter will count up/down 1 during one revolution, that is, counter will calculate the numbers of revolution.



Initial motor position (counter value) is reset to 0.

ST1: Drive is started toward Target A (forward direction) with 25Hz reference and 5s ramp time. State1 is activated until reaches the range of Target A slowdown window, and then shifts to State 2 (ST1 STATE N2).

ST2: Drive runs toward Target A (forward direction) with 5Hz reference and 2s ramp time. State 2 shifts to state 3 (ST2 STATE N) when the position value reaches the range of target A window.

ST3: Drive is stopped with ramp pair 1 and shifts to state 4 (ST3 STATE N2) after 5s delay.

ST4: Drive runs toward Target B (forward direction) with 25Hz reference and 5s ramp time. State 4 is activated until reaches the range of Target B slowdown window, and then shifts to State 5 (ST4 TRIG TO ST 5).

ST5: Drive runs toward Target B (forward direction) with 5Hz reference and 3s ramp time. State 5 shifts to state 6 (ST5 TRIG TO ST 6) when the position value reaches the range of target B window.

ST6: Drive is stopped with ramp pair 2 and shifts to state 7 (ST6 STATE N2) after 5s delay.

ST7: Drive runs toward Target C (reverse direction) with 30Hz reference and 5s ramp time. State 7 shifts to state 8 (ST7 STATE N) when the position value reaches the range of target C slowdown window.

ST8: Drive runs toward Target C (reverse direction) with 5Hz reference and 2s ramp time. State 8 is activated until reaches the range of target C window, and then shifts to State 9 (ST8 STATE N2).

ST9: Drive is stopped with 2s ramp time and shifts to state 10 (ST9 TRIG TO ST10) after 5s delay.

ST10: Drive runs toward Target D (reverse direction) with 25Hz reference and 2s ramp time. State 10 shifts to state 11 (ST10 STATE N2) when the position value reaches the range of target D slowdown window.

ST11: Drive runs toward Target D (reverse direction) with 5Hz reference and 2s ramp time. State 11 shifts to state 12 (ST11 STATE N) when the position value reaches the range of target B window.

ST12: Drive is stopped with 2s ramp time. Counter is reset. After 5s delay, state 12 shifts to state 1 (ST12 STATE N).

Parameter	Setting	Additional information
1001 EXT1 COMMANDS	*SEQ PROG*	Start, stop, direction commands for EXT1
1102 EXT1/EXT2 SEL	*EXT1*	EXT1 activation
1103 REF1 SELECT	*SEQ PROG*	Sequence program output as REF1
1201 CONST SPEED SEL	*NOT SEL*	Deactivation of constant speeds
1401 RELAY OUTPUT 1	*SEQ PROG*	Relay output RO 1 control as defined by parameter *8423*/…/*8493,8523/.../8593*
1601 RUN ENABLE	*NOT SEL*	Deactivation of Run enable

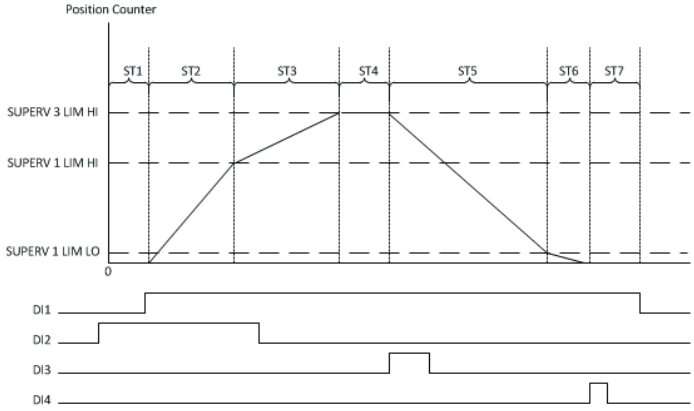
1805 DO SIGNAL	*SEQ PROG*	Digital output DO control as defined by parameter *8423/…/8493,8523/.../8593*
1904 COUNTER ENABLE	*ENABLED*	Counter enable signal
1906 COUNTER INPUT	*ENC W/O DIR*	Selects encoder as the input signal source.
1907 COUNTER RESET	*SEQ PROG*	Set the reset source to the sequence programing
1910 COUNT DIRECTION	*MOTOR DIR*	Counter direction by the motor direction.
1912 TAR A HI VALUE	0	Setting the Target A value
1913 TAR A LO VALUE	500	
1914 TAR B HI VALUE	0	Setting the Target B value
1915 TAR B LO VALUE	1000	
1916 TAR C HI VALUE	0	Setting the Target C value
1917 TAR C LO VALUE	600	
1918 TAR D HI VALUE	0	Setting the Target D value
1919 TAR D LO VALUE	0	
1920 TAR WINDOW ST	10	Defines the size of positioning status target window
1921 POS CORRECT	100%	Defines positioning fine tuning parameter
1922 SLOWDOWN WINDOW	100	Defines the size of positioning status target slowdown window
1928 COUNTER NUM	1	Defines the multiplier (numerator) for the pulse counter
1929 COUNTER DEN	4096	Defines the divider (denominator) for the pulse counter
2102 STOP FUNCTION	*RAMP*	Ramp stop
2201 ACC/DEC 1/2 SEL	*SEQ PROG*	Ramp as defined by parameter *8422/…/8492,8522/...8492*.
2202 ACCELER TIME 1	5 s	Acceleration/deceleration ramp pair 1
2203 DECELER TIME 1	5 s	
2205 ACCELER TIME 2	10 s	Acceleration/deceleration ramp pair 2
2206 DECELER TIME 2	10 s	
5001 PULSE NR	1024	The number of encoder pulses per one revolution
5002 ENCODER ENABLE	*ENABLE*	Enable the encoder
8401 SEQ PROG ENABLE	*EXT1*	Sequence program enabled
8402 SEQ PROG START	*DI1*	Sequence program activation through digital input (DI1)
8404 SEQ PROG RESET	*DI1(INV)*	Sequence program reset (ie reset to state 1, when DI1 signal is lost (1 -> 0)

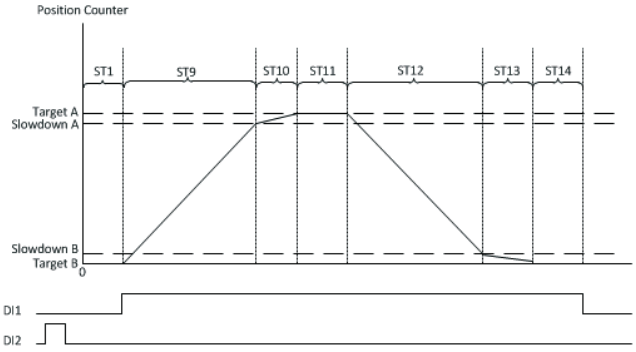
ST1		ST2		ST3		ST4		Additional information
Par.	Setting	Par.	Setting	Par.	Setting	Par.	Setting	
8420 ST1 REF SEL	50%	8430	10%	8440	0%	8450	50%	State reference
8421 ST1 COMMANDS	TARGET A	8431	TARGET A	8441	DRIVE STOP	8451	TARGET B	Run, direction, stop, Target X commands
8422 ST1 RAMP	5 s	8432	2 s	8442	-0.1 (ramp pair 1)	8452	5 s	Acceleration/ deceleration ramp time
8423 ST1 OUT CONTROL	AO=0	8433	AO=0	8443	AO=0	8453	AO=0	Relay, digital and analog output control
8424 ST1 CHANGE DLY	0 s	8434	0 s	8444	5 s	8454	0s	State change delay
8425 ST1 TRIG TO ST 2	NOT SEL	8435	NOT SEL	8445	NOT SEL	8455	SLOWDOWN B	State change trigger
8426 ST1 TRIG TO ST N	NOT SEL	8436	AT TARGET A	8446	NOT SEL	8456	NOT SEL	
8427 ST1 STATE N	STATE 1	8437	STATE 3	8447	STATE 1	8457	STATE 1	
8428 ST1 TRIG TO STN2	SLOWDOWN A	8438	NOT SEL	8448	CHANGE DLY	8458	NOT SEL	
8429 ST1 STATE N2	STATE 2	8439	STATE 1	8449	STATE 4	8459	STATE 1	

ST5		ST6		ST7		ST8		Additional information
Par.	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	
8460 ST5 REF SEL	10%	*8470*	0%	*8480*	60%	*8490*	10%	State reference
8461 ST5 COMMANDS	*TARGET B*	*8471*	*DRIVE STOP*	*8481*	*TARGET C*	*8491*	*TARGET C*	Run, direction, stop, Target X commands
8462 ST5 RAMP	3 s	*8472*	-0.2 (ramp pair 2)	*8482*	5 s	*8492*	2 s	Acceleration/ deceleration ramp time
8463 ST5 OUT CONTROL	*AO=0*	*8473*	*AO=0*	*8483*	*AO=0*	*8493*	*AO=0*	Relay, digital and analog output control
8464 ST5 CHANGE DLY	0 s	*8474*	5 s	*8484*	0 s	*8494*	0 s	State change delay
8465 ST5 TRIG TO ST6	*AT TARGET B*	*8475*	*NOT SEL*	*8485*	*NOT SEL*	*8495*	*NOT SEL*	
8466 ST5 TRIG TO ST N	*NOT SEL*	*8476*	*NOT SEL*	*8486*	*SLOWDOWN C*	*8496*	*NOT SEL*	
8467 ST5 STATE N	*STATE 1*	*8477*	*STATE 1*	*8487*	*STATE 8*	*8497*	*STATE 1*	
8468 ST5 TRIG TO ST N2	*NOT SEL*	*8478*	*CHANGE DLY*	*8488*	*NOT SEL*	*8498*	*AT TARGET C*	State change trigger
8469 ST5 STATE N2	*STATE 1*	*8479*	*STATE 7*	*8489*	*STATE 1*	*8499*	*STATE 9*	

ST9		ST10		ST11		ST12		Additional information
Par.	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	
8520 ST9 REF SEL	0%	*8530*	50%	*8540*	10%	*8550*	0%	State reference
8521 ST9 COMMANDS	*DRIVE STOP*	*8531*	*TARGET D*	*8541*	*TARGET D*	*8551*	*DRIVE STOP*	Run, direction, stop, Target X commands
8522 ST9 RAMP	2 s	*8532*	2 s	*8542*	2 s	*8552*	2s	Acceleration/ deceleration ramp time
8523 ST9 OUT CONTROL	*AO=0*	*8533*	*AO=0*	*8543*	*AO=0*	*8553*	*RST CNT ENT*	Relay, digital and analog output control
8524 ST9 CHANGE DLY	5 s	*8534*	0 s	*8544*	0 s	*8554*	5 s	State change delay
8565 ST9 TRIG TO ST10	*CHANG E DLY*	*8535*	*NOT SEL*	*8545*	*NOT SEL*	*8555*	*NOT SEL*	
8526 ST9 TRIG TO ST N	*NOT SEL*	*8536*	*NOT SEL*	*8546*	*AT TARGET D*	*8556*	*CHANG E DLY*	
8527 ST9 STATE N	*STATE 1*	*8537*	*STATE 1*	*8547*	*STATE 12*	*8557*	*STATE 1*	
8528 ST9 TRIG TO ST N2	*NOT SEL*	*8538*	*SLOWD OWN D*	*8548*	*NOT SEL*	*8558*	*NOT SEL*	State change trigger
8529 ST9 STATE N2	*STATE 1*	*8539*	*STATE 11*	*8549*	*STATE 1*	*8559*	*STATE 1*	

Position control example 2





DI5 is used as the counter input source. If there is a pulse during one motor revolution, parameter *1927 DI5 PPR* will be set to 1.

Sequence programing is activated by digital input DI1. The number of pulses captured from DI5 indicates the position value (counter value). The initial motor position (counter value) is reset to 0.

ST1: Stopped state. The counter value is reset by out control. State1 shifts to State2 (ST1 TRIG TO ST2) when DI2 is activated; State1 shifts to State9 (ST1 STATE N) when DI2 is inactivated.

ST2: Drive accelerates to 40Hz in forward direction with 5s ramp time. State2 shifts to State3 (ST2 TRIG TO ST3) when the counter value reaches *3203 SUPERV 1 LIM HI*.

ST3: Drive decelerates to 10Hz in forward direction with 5s ramp time. State3 shifts to State4 (ST3 TRIG TO ST4) when the counter value reaches *3209 SUPERV 3 LIM HI*.

ST4: Drive stops with 0.1s ramp time. When DI3 is activated, State4 shifts to state5 (ST4 TRIG TO ST5) after 10s delay time.

ST5: Drive accelerates to 50Hz with 5s ramp time in reverse direction. State5 shifts to state6 (ST5 TRIG TO ST6) when the counter value is lower than *3202 SUPERV 1 LIM LO*.

ST6: Drive runs with 5Hz reference and 2s ramp time in the reverse direction. State6 shifts to state7 (ST6 TRIG TO ST7) when DI4 is activated.

ST7: Drive stops with 0.1s ramp time. State7 shifts to state1 (ST7 STATE N) after 10s delay time.

ST9: Drive runs toward Target A (forward direction) with 40Hz reference and 5s ramp time. State 9 shifts to state10 (ST9 TRIG TO ST10) when the counter value reaches the range of Target A slowdown window.

ST10: Drive runs toward Target A (forward direction) with 5Hz reference and 2s ramp time. State10 shifts to state11 (ST10 TRIG TO ST11) when the counter value reaches the range of Target A window.

ST11: Drive stops with 0.1s ramp time. State11 shifts to state12 (ST11 TRIG TO ST12) after 10s delay time.

ST12: Drive runs toward Target B (reverse direction) with 40Hz reference and 5s ramp time. State12 shifts to state13 (ST12 TRIG TO ST13) when the counter value reaches the range of Target B slowdown window.

ST13: Drive runs toward Target B (reverse direction) with 5Hz reference and 2s ramp time. State13 shifts to state14 (ST13 TRIG TO ST14) when the counter value reaches the range of Target B window.

ST14: Drive stops with 0.1s ramp time, State14 shifts to state1 (ST14 STATE N) after 10s delay time.

Parameter	Setting	Additional information
1001 EXT1 COMMANDS	*SEQ PROG*	Start, stop, direction commands for EXT1
1102 EXT1/EXT2 SEL	*EXT1*	EXT1 activation
1103 REF1 SELECT	*SEQ PROG*	Sequence program output as REF1
1201 CONST SPEED SEL	*NOT SEL*	Deactivation of constant speeds
1601 RUN ENABLE	*NOT SEL*	Deactivation of Run enable
1904 COUNTER ENABLE	*ENABLED*	Counter enable signal
1906 COUNTER INPUT	*PLS IN(DI 5)*	Selects DI 5 as the input signal source.

1907 COUNTER RESET	*SEQ PROG*	Set the reset source to the sequence programing
1910 COUNT DIRECTION	*MOTOR DIR*	Counter direction by the motor direction.
1912 TAR A HI VALUE	0	Setting the Target A value
1913 TAR A LO VALUE	1500	
1914 TAR B HI VALUE	0	Setting the Target B value
1915 TAR B LO VALUE	10	
1916 TAR C HI VALUE	0	Setting the Target C value
1917 TAR C LO VALUE	600	
1918 TAR D HI VALUE	0	Setting the Target D value
1919 TAR D LO VALUE	0	
1920 TAR WINDOW ST	10	Defines size of positioning status target window
1921 POS CORRECT	100%	Defines positioning fine tuning parameter
1922 SLOWDOWN WINDOW	50	Defines size of positioning status target slowdown window
1927 DI5 PPR	1	Defines the number of DI5 pulses per one revolution
1928 COUNTER NUM	1	Defines the multiplier (numerator) for the pulse counter
1929 COUNTER DEN	1	Defines the divider (denominator) for the pulse counter
2102 STOP FUNCTION	*RAMP*	Ramp stop
2201 ACC/DEC 1/2 SEL	*SEQ PROG*	Ramp as defined by parameter *8422*/…/*8492,8522*/...*8492*.
2202 ACCELER TIME 1	1 s	Acceleration/deceleration ramp pair 1
2203 DECELER TIME 1	2 s	
2205 ACCELER TIME 2	10 s	Acceleration/deceleration ramp pair 2
2206 DECELER TIME 2	10 s	
3201 SUPERV 1 PARAM	CNT VALUE LO	Set the counter value low word as the supervision1 signal.
3202 SUPERV 1 LIM LO	50	Setting the low limit for the supervision1 signal.
3203 SUPERV 1 LIM HI	1000	Setting the high limit for the supervision1 signal.
3207 SUPERV 3 PARAM	CNT VALUE LO	Set the counter value low word as the supervision3 signal.
3208 SUPERV 3 LIM LO	50	Setting the low limit for the supervision3 signal.
3209 SUPERV 3 LIM HI	1500	Setting the high limit for the supervision3 signal.
5001 PULSE NR	1024	The number of encoder pulses per one revolution
5002 ENCODER ENABLE	Disable	Disable the encoder

ST1		ST2		ST3		ST4		Additional information
Par.	Setting	Par.	Setting	Par.	Setting	Par.	Setting	
8420 ST1 REF SEL	0%	*8430*	80%	*8440*	20%	*8450*	0%	State reference
8421 ST1 COMMANDS	*DRIVE STOP*	*8431*	*START FRW*	*8441*	*START FRW*	*8451*	*DRIVE STOP*	Run, direction and stop, Target X commands
8422 ST1 RAMP	0 s	*8432*	5 s	*8442*	5s	*8452*	0.1 s	Acceleration/ deceleration ramp time
8423 ST1 OUT CONTROL	*RST CNT ENT*	*8433*	*AO=0*	*8443*	*AO=0*	*8453*	*AO=0*	Relay, digital and analog output control
8424 ST1 CHANGE DLY	0 s	*8434*	0 s	*8444*	0 s	*8454*	10 s	State change delay
8425 ST1 TRIG TO ST 2	*DI2*	*8435*	*SUPRV1 OVER*	*8445*	*SUPRV3 OVER*	*8455*	*DLY AND DI3*	State change trigger
8426 ST1 TRIG TO ST N	*DI2(INV)*	*8436*	*NOT SEL*	*8446*	*NOT SEL*	*8456*	*NOT SEL*	
8427 ST1 STATE N	*STATE 9*	*8437*	*STATE 1*	*8447*	*STATE 1*	*8457*	*STATE 1*	
8428 ST1 TRIG TO STN2	*NOT SEL*	*8438*	*NOT SEL*	*8448*	*NOT SEL*	*8458*	*NOT SEL*	
8429 ST1 STATE N2	*STATE 1*	*8439*	*STATE 1*	*8449*	*STATE 1*	*8459*	*STATE 1*	

ST5		ST6		ST7		ST8		Additional information
Par.	Setting	Par.	Setting	Par.	Setting	Par.	Setting	
8460 ST5 REF SEL	100%	*8470*	10%	*8480*	0%	*8490*		State reference
8461 ST5 COMMANDS	*START REV*	*8471*	*START REV*	*8481*	*DRIVE STOP*	*8491*		Run, direction and stop commands
8462 ST5 RAMP	5 s	*8472*	2 s	*8482*	0.1 s	*8492*		Acceleration/ deceleration ramp time
8463 ST5 OUT CONTROL	*AO=0*	*8473*	*AO=0*	*8483*	*AO=0*	*8493*		Relay, digital and analog output control

ST5		ST6		ST7		ST8		Additional information
Par.	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	
8464 ST5 CHANGE DLY	0 s	*8474*	0 s	*8484*	10 s	*8494*		State change delay
8465 ST5 TRIG TO ST6	*SUPRV1 UNDER*	*8475*	*NOT SEL*	*8485*	*NOT SEL*	*8495*		
8466 ST5 TRIG TO ST N	*NOT SEL*	*8476*	*NOT SEL*	*8486*	*CHANG E DLY*	*8496*		
8467 ST5 STATE N	*STATE 1*	*8477*	*STATE 1*	*8487*	*STATE 1*	*8497*		
8468 ST5 TRIG TO ST N2	*NOT SEL*	*8478*	*DI4*	*8488*	*NOT SEL*	*8498*		State change trigger
8469 ST5 STATE N2	*STATE 1*	*8479*	*STATE 7*	*8489*	*STATE 1*	*8499*		

ST9		ST10		ST11		ST12		Additional information
Par.	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	**Par.**	**Setting**	
8520 ST9 REF SEL	80%	*8530*	10%	*8540*	0%	*8550*	80%	State reference
8521 ST9 COMMANDS	*TARGET A*	*8531*	*TARGET A*	*8541*	*DRIVE STOP*	*8551*	*TARGET B*	Run, direction and stop commands
8522 ST9 RAMP	5 s	*8532*	2 s	*8542*	0.1 s	*8552*	5 s	Acceleration/ deceleration ramp time
8523 ST9 OUT CONTROL	*AO=0*	*8533*	*AO=0*	*8543*	*AO=0*	*8553*	*AO=0*	Relay, digital and analog output control
8524 ST9 CHANGE DLY	0 s	*8534*	0 s	*8544*	10 s	*8554*	0 s	State change delay
8525 ST9 TRIG TO ST10	*SLOWD OWN A*	*8535*	*AT TARGET A*	*8545*	*CHANG E DLY*	*8555*	*SLOWD OWN B*	
8526 ST9 TRIG TO ST N	*NOT SEL*	*8536*	*NOT SEL*	*8546*	*NOT SEL*	*8556*	*NOT SEL*	
8527 ST9 STATE N	*STATE 1*	*8537*	*STATE 1*	*8547*	*STATE 1*	*8557*	*STATE 1*	
8528 ST9 TRIG TO ST N2	*NOT SEL*	*8538*	*NOT SEL*	*8548*	*NOT SEL*	*8558*	*NOT SEL*	State change trigger
8529 ST9 STATE N2	*STATE 1*	*8539*	*STATE 1*	*8549*	*STATE 1*	*8559*	*STATE 1*	

ST13		ST14		ST15		ST16		Additional information
Par.	Setting	Par.	Setting	Par.	Setting	Par.	Setting	
8560 ST13 REF SEL	10%	*8570*	0%					State reference
8561 ST13 COMMANDS	*TARGET B*	*8571*	*DRIVE STOP*					Run, direction and stop commands
8562 ST13 RAMP	2 s	*8572*	0.1 s					Acceleration/ deceleration ramp time
8563 ST13 OUT CONTROL	*AO=0*	*8573*	*AO=0*					Relay, digital and analog output control
8564 ST13 CHANGE DLY	0 s	*8574*	10 s					State change delay
8565 ST13 TRIG TO ST14	*AT TARGET B*	*8575*	*NOT SEL*					
8566 ST13 TRIG TO ST N	*NOT SEL*	*8536*	*CHANG E DLY*					
8567 ST13 STATE N	*STATE 1*	*8577*	*STATE 1*					
8568 ST13 TRIG TO ST N2	*NOT SEL*	*8578*	*NOT SEL*					State change trigger
8569 ST13 STATE N2	*STATE 1*	*8579*	*STATE 1*					

5

Actual signals and parameters

What this chapter contains

The chapter describes the actual signals and parameters related to sequence program and gives the fieldbus equivalent values for each signal/parameter. It also contains a table of the default values for the different macros available in ACS355 enhanced sequence program firmware.

Terms and abbreviations

Term	Definition
Actual signal	Sequence program related signals measured or calculated by the drive. Can be monitored by the user. No user setting possible.
Def	Parameter default value
Parameter	A user-adjustable sequence program operation instruction of the drive. **Note:** Parameter selections are shown on the basic control panel as integer values. Eg parameter *1001 EXT1 COMMANDS* selection *COMM* is shown as value 10 (which is equal to the fieldbus equivalent FbEq).
FbEq	Fieldbus equivalent: The scaling between the value and the integer used in serial communication.

Note: More information about drive parameters please refer to the section Actual signal and parameters in *ACS355 User's manual* (3AUA0000066143 [English]).

Actual signals

Actual signals			
No.	**Name/Value**	**Description**	**FbEq**
01 OPERATING DATA		Basic signals for monitoring the drive (read-only)	
0135	COMM VALUE 1	Data received from fieldbus	1 = 1
0136	COMM VALUE 2	Data received from fieldbus	1 = 1
0167	SEQ PROG STS	Status word of the Sequence program:	1 = 1
		Bit 0 = ENABLED (1 = enabled)	
		Bit 1 = STARTED	
		Bit 2 = PAUSED	
		Bit 3 = LOGIC VALUE (logic operation defined by parameters *8406*…*8410*).	
		Bit 4 = LOGIC2 VALUE (logic operation defined by parameters *8501*…*8505*).	
0168	SEQ PROG STATE	Active state of the Sequence program. 1…16 = state 1…16.	1 = 1
0169	SEQ PROG TIMER	Current state time counter of the Sequence program	1 = 2 s
0170	SEQ PROG AO VAL	Analog output control values defined by the Sequence program. See parameter *8423 ST1 OUT CONTROL*.	1 = 0.1%
0171	SEQ CYCLE CNTR	Executed sequence counter of the Sequence program. See parameters *8415 CYCLE CNT LOC* and *8416 CYCLE CNT RST*.	1 = 1
0190	POS STATUS	Active target position status word.	1 = 1
		Bit 0...3 = At Target A...D. when counter value enter the Target x range which range is defined by parameter *1920 TAR WINDOW ST*, the corresponding positioning status bit (Target x) will be set.	
		Bit 4...7 = Reserved.	
		Bit 8...11 = Slowdown A...D, see parameter *1922 SLOWDOWN WINDOW*.	
		Bit 12...14 = Reserved.	
		Bit 15 = At target. When sequence programing function enable and sequence state command set Target x(A...D), as motor running toward to Target x and at last current position running at TargetA...D, Bit 15 will be set.	
0192	COUNTER VALUE HI	High part word of pulse counter value.See parameter group *19 TIMER & COUNTER*.	1 = 1
0193	COUNTER VALUE LO	Low part word of pulse counter value.See parameter group *19 TIMER & COUNTER*.	1 = 1

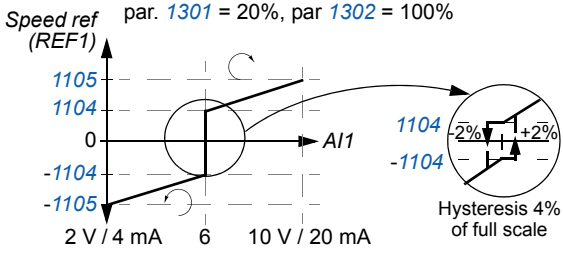
Actual signals			
No.	**Name/Value**	**Description**	**FbEq**
0194	SPEED ACT POS	Actual motor speed after tuning motor speed in the sequence programing application which is calculated results by parameter *1921 POS CORRECT* multiplied with actual motor speed.	1 = 1 rpm

Parameters

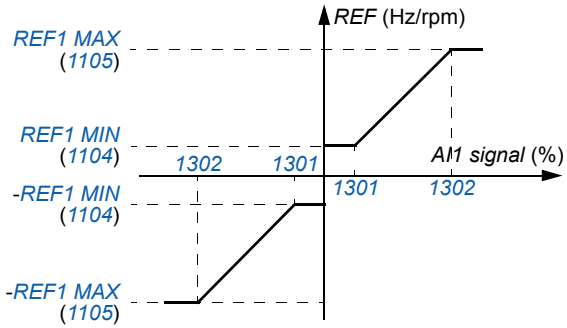
All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
10	**START/STOP/DIR**	The sources for external start, stop and direction control	
1001	EXT1 COMMANDS	Defines the connections and the source for the start, stop and direction commands for external control location 1 (EXT1). **Note:** Start signal must be reset if the drive has been stopped through STO (Safe torque off) input (see parameter *3025 STO OPERATION*) or emergency stop selection (see parameter *2109 EMERG STOP SEL*).	*DI1,2*
	NOT SEL	No start, stop and direction command source	0
	DI1	Start and stop through digital input DI1. 0 = stop, 1 = start. Direction is fixed according to parameter *1003 DIRECTION* (setting *REQUEST* = *FORWARD*).	1
	DI1,2	Start and stop through digital input DI1. 0 = stop, 1 = start. Direction through digital input DI2. 0 = forward, 1 = reverse. To control direction, parameter *1003 DIRECTION* setting must be *REQUEST*.	2
	DI1P,2P	Pulse start through digital input DI1. 0 -> 1: Start. (In order to start the drive, digital input DI2 must be activated prior to the pulse fed to DI1.) Pulse stop through digital input DI2. 1 -> 0: Stop. Direction of rotation is fixed according to parameter *1003 DIRECTION* (setting *REQUEST* = *FORWARD*). **Note:** When the stop input (DI2) is deactivated (no input), the control panel start and stop keys are disabled.	3
	DI1P,2P,3	Pulse start through digital input DI1. 0 -> 1: Start. (In order to start the drive, digital input DI2 must be activated prior to the pulse fed to DI1.) Pulse stop through digital input DI2. 1 -> 0: Stop. Direction through digital input DI3. 0 = forward, 1 = reverse. To control direction, parameter *1003 DIRECTION* setting must be *REQUEST*. **Note:** When the stop input (DI2) is deactivated (no input), the control panel start and stop keys are disabled.	4
	DI1P,2P,3P	Pulse start forward through digital input DI1. 0 -> 1: Start forward. Pulse start reverse through digital input DI2. 0 -> 1: Start reverse. (In order to start the drive, digital input DI3 must be activated prior to the pulse fed to DI1/DI2). Pulse stop through digital input DI3. 1 -> 0: Stop. To control the direction, parameter *1003 DIRECTION* setting must be *REQUEST*. **Note:** When the stop input (DI3) is deactivated (no input), the control panel start and stop keys are disabled.	5

<table>
<tr><th colspan="3">All parameters</th></tr>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq</th></tr>
<tr><td></td><td>KEYPAD</td><td>Start, stop and direction commands through control panel when EXT1 is active. To control the direction, parameter 1003 DIRECTION setting must be REQUEST.</td><td>8</td></tr>
<tr><td></td><td>DI1F,2R</td><td>Start, stop and direction commands through digital inputs DI1 and DI2.
<table><tr><th>DI1</th><th>DI2</th><th>Operation</th></tr><tr><td>0</td><td>0</td><td>Stop</td></tr><tr><td>1</td><td>0</td><td>Start forward</td></tr><tr><td>0</td><td>1</td><td>Start reverse</td></tr><tr><td>1</td><td>1</td><td>Stop</td></tr></table>Parameter 1003 DIRECTION setting must be REQUEST.</td><td>9</td></tr>
<tr><td></td><td>COMM</td><td>Fieldbus interface as the source for the start and stop commands, ie Control word 0301 FB CMD WORD 1 bits 0…1. The Control word is sent by the fieldbus controller through the fieldbus adapter or embedded fieldbus (Modbus) to the drive.</td><td>10</td></tr>
<tr><td></td><td>TIMED FUNC 1</td><td>Timed start/stop control. Timed function 1 active = start, timed function 1 inactive = stop. See parameter group 36 TIMED FUNCTIONS.</td><td>11</td></tr>
<tr><td></td><td>TIMED FUNC 2</td><td>See selection TIMED FUNC 1.</td><td>12</td></tr>
<tr><td></td><td>TIMED FUNC 3</td><td>See selection TIMED FUNC 1.</td><td>13</td></tr>
<tr><td></td><td>TIMED FUNC 4</td><td>See selection TIMED FUNC 1.</td><td>14</td></tr>
<tr><td></td><td>DI5</td><td>Start and stop through digital input DI5. 0 = stop, 1 = start. Direction is fixed according to parameter 1003 DIRECTION (setting REQUEST = FORWARD).</td><td>20</td></tr>
<tr><td></td><td>DI5,4</td><td>Start and stop through digital input DI5. 0 = stop, 1 = start. Direction through digital input DI4. 0 = forward, 1 = reverse. To control direction, parameter 1003 DIRECTION must be REQUEST.</td><td>21</td></tr>
<tr><td></td><td>TIMER STOP</td><td>Stop when timer delay defined by parameter 1901 TIMER DELAY has passed. Start with timer start signal. Source for the signal is selected by parameter 1902 TIMER START.</td><td>22</td></tr>
<tr><td></td><td>TIMER START</td><td>Start when timer delay defined by parameter 1901 TIMER DELAY has passed. Stop when timer is reset by parameter 1903 TIMER RESET.</td><td>23</td></tr>
<tr><td></td><td>COUNTER STOP</td><td>Stop when counter limit defined by parameter 1925 COUNTER LIMIT HI and 1926 COUNTER LIMIT LO has been exceeded. Start with counter start signal. Source for the signal is selected by parameter 1911 CNTR S/S COMMAND.</td><td>24</td></tr>
</table>

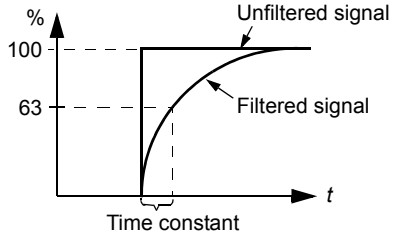
All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	COUNTER START	Start when counter limit defined by parameter *1925 COUNTER LIMIT HI* and *1926 COUNTER LIMIT LO* has been exceeded. Stop with counter stop signal. Source for the signal is selected by parameter *1911 CNTR S/S COMMAND*.	25
	SEQ PROG	Start, stop and direction commands through Sequence program. See parameter group *84 SEQUENCE PROG* and group *85 SEQUENCE PROG2*.	26
1002	EXT2 COMMANDS	Defines the connections and the source for the start, stop and direction commands for external control location 2 (EXT2).	*NOT SEL*
		See parameter *1001 EXT1 COMMANDS*.	
1003	DIRECTION	Enables the control of rotation direction of the motor, or fixes the direction.	*REQUEST*
	FORWARD	Fixed to forward	1
	REVERSE	Fixed to reverse	2
	REQUEST	Control of rotation direction allowed	3
11 REFERENCE SELECT		Panel reference type, external control location selection and external reference sources and limits	
1102	EXT1/EXT2 SEL	Defines the source from which the drive reads the signal that selects between the two external control locations, EXT1 or EXT2.	*EXT1*
	EXT1	EXT1 active. The control signal sources are defined by parameters *1001 EXT1 COMMANDS* and *1103 REF1 SELECT*.	0
	DI1	Digital input DI1. 0 = EXT1, 1 = EXT2.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	EXT2	EXT2 active. The control signal sources are defined by parameters *1002 EXT2 COMMANDS* and *1106 REF2 SELECT*.	7
	COMM	Fieldbus interface as the source for EXT1/EXT2 selection, ie Control word *0301 FB CMD WORD 1* bit 5 (with ABB drives profile *5319 EFB PAR 19* bit 11). The Control word is sent by the fieldbus controller through the fieldbus adapter or embedded fieldbus (Modbus) to the drive.	8
	TIMED FUNC 1	Timed EXT1/EXT2 control selection. Timed function 1 active = EXT2, timed function 1 inactive = EXT1. See parameter group *36 TIMED FUNCTIONS*.	9
	TIMED FUNC 2	See selection *TIMED FUNC 1*.	10

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	TIMED FUNC 3	See selection *TIMED FUNC 1*.	11
	TIMED FUNC 4	See selection *TIMED FUNC 1*.	12
	DI1(INV)	Inverted digital input DI1. 1 = EXT1, 0 = EXT2.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
1103	REF1 SELECT	Selects the signal source for external reference REF1.	*AI1*
	KEYPAD	Control panel	0
	AI1	Analog input AI1	1
	AI2	Analog input AI2	2
	AI1/JOYST	Analog input AI1 as joystick. The minimum input signal runs the motor at the maximum reference in the reverse direction, the maximum input at the maximum reference in the forward direction. Minimum and maximum references are defined by parameters *1104 REF1 MIN* and *1105 REF1 MAX*. **Note:** Parameter *1003 DIRECTION* must be set to *REQUEST*.  **WARNING!** If parameter *1301 MINIMUM AI1* is set to 0 V and analog input signal is lost (ie 0 V), the rotation of the motor is reversed to the maximum reference. Set the following parameters to activate a fault when analog input signal is lost: Set parameter *1301 MINIMUM AI1* to 20% (2 V or 4 mA). Set parameter *3021 AI1 FAULT LIMIT* to 5% or higher. Set parameter *3001 AI<MIN FUNCTION* to *FAULT*.	3
	AI2/JOYST	See selection *AI1/JOYST*.	4
	DI3U,4D(R)	Digital input DI3: Reference increase. Digital input DI4: Reference decrease. Stop command resets the reference to zero. Parameter *2205 ACCELER TIME 2* defines the rate of the reference change.	5

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI3U,4D	Digital input DI3: Reference increase. Digital input DI4: Reference decrease. The program stores the active speed reference (not reset by a stop command). When the drive is restarted, the motor ramps up at the selected acceleration rate to the stored reference. Parameter *2205 ACCELER TIME 2* defines the rate of the reference change.	6
	COMM	Fieldbus reference REF1	8
	COMM+AI1	Summation of fieldbus reference REF1 and analog input AI 1.	9
	COMM*AI1	Multiplication of fieldbus reference REF1 and analog input AI1.	10
	DI3U,4D(RNC)	Digital input DI3: Reference increase. Digital input DI4: Reference decrease. Stop command resets the reference to zero. The reference is not saved if the control source is changed (from EXT1 to EXT2, from EXT2 to EXT1 or from LOC to REM). Parameter *2205 ACCELER TIME 2* defines the rate of the reference change.	11
	DI3U,4D(NC)	Digital input DI3: Reference increase. Digital input DI4: Reference decrease. The program stores the active speed reference (not reset by a stop command). The reference is not saved if the control source is changed (from EXT1 to EXT2, from EXT2 to EXT1 or from LOC to REM). When the drive is restarted, the motor ramps up at the selected acceleration rate to the stored reference. Parameter *2205 ACCELER TIME 2* defines the rate of the reference change.	12
	AI1+AI2	Reference is calculated with the following equation: REF = AI1(%) + AI2(%) - 50%	14
	AI1*AI2	Reference is calculated with the following equation: REF = AI1(%) · (AI2(%) / 50%)	15
	AI1-AI2	Reference is calculated with the following equation: REF = AI1(%) + 50% - AI2(%)	16
	AI1/AI2	Reference is calculated with the following equation: REF = AI1(%) · (50% / AI2 (%))	17
	KEYPAD(RNC)	Defines the control panel as the reference source. Stop command resets the reference to zero (the R stands for reset). The reference is not saved if the control source is changed (from EXT1 to EXT2, from EXT2 to EXT1).	20
	KEYPAD(NC)	Defines the control panel as the reference source. Stop command does not reset the reference to zero. The reference is stored. The reference is not saved if the control source is changed (from EXT1 to EXT2, from EXT2 to EXT1).	21

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI4U,5D	See selection *DI3U,4D*.	30
	DI4U,5D(NC)	See selection *DI3U,4D(NC)*.	31
	FREQ INPUT	Frequency input	32
	SEQ PROG	Sequence program output. See parameter *8420 ST1 REF SEL*.	33
	AI1+SEQ PROG	Addition of analog input AI1 and Sequence program output	34
	AI2+SEQ PROG	Addition of analog input AI2 and Sequence program output	35
1104	REF1 MIN	Defines the minimum value for external reference REF1. Corresponds to the minimum setting of the used source signal.	0.0 Hz / 1 rpm
	0.0…500.0 Hz / 0…30000 rpm	Minimum value in rpm. Hz if parameter *9904 MOTOR CTRL MODE* setting is *SCALAR: FREQ*. **Example:** Analog input AI1 is selected as the reference source (value of parameter *1103* is *AI1*). The reference minimum and maximum correspond to the *1301 MINIMUM AI1* and *1302 MAXIMUM AI1* settings as follows:  	1 = 0.1 Hz / 1 rpm
1105	REF1 MAX	Defines the maximum value for external reference REF1. Corresponds to the maximum setting of the used source signal.	E: 50.0 Hz U: 60.0 Hz
	0.0…500.0 Hz / 0…30000 rpm	Maximum value in rpm. Hz if parameter *9904 MOTOR CTRL MODE* setting is *SCALAR: FREQ*. See the example for parameter *1104 REF1 MIN*.	1 = 0.1 Hz / 1 rpm
1106	REF2 SELECT	Selects the signal source for external reference REF2.	*AI2*
	KEYPAD	See parameter *1103 REF1 SELECT*.	0
	AI1	See parameter *1103 REF1 SELECT*.	1
	AI2	See parameter *1103 REF1 SELECT*.	2
	AI1/JOYST	See parameter *1103 REF1 SELECT*.	3
	AI2/JOYST	See parameter *1103 REF1 SELECT*.	4

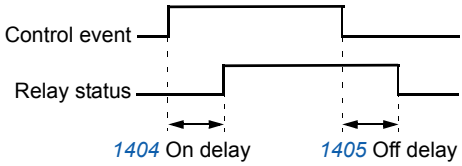
All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI3U,4D(R)	See parameter *1103 REF1 SELECT*.	5
	DI3U,4D	See parameter *1103 REF1 SELECT*.	6
	COMM	See parameter *1103 REF1 SELECT*.	8
	COMM+AI1	See parameter *1103 REF1 SELECT*.	9
	COMM*AI1	See parameter *1103 REF1 SELECT*.	10
	DI3U,4D(RNC)	See parameter *1103 REF1 SELECT*.	11
	DI3U,4D(NC)	See parameter *1103 REF1 SELECT*.	12
	AI1+AI2	See parameter *1103 REF1 SELECT*.	14
	AI1*AI2	See parameter *1103 REF1 SELECT*.	15
	AI1-AI2	See parameter *1103 REF1 SELECT*.	16
	AI1/AI2	See parameter *1103 REF1 SELECT*.	17
	KEYPAD(RNC)	See parameter *1103 REF1 SELECT*.	20
	KEYPAD(NC)	See parameter *1103 REF1 SELECT*.	21
	DI4U,5D	See parameter *1103 REF1 SELECT*.	30
	DI4U,5D(NC)	See parameter *1103 REF1 SELECT*.	31
	FREQ INPUT	See parameter *1103 REF1 SELECT*.	32
	SEQ PROG	See parameter *1103 REF1 SELECT*.	33
	AI1+SEQ PROG	See parameter *1103 REF1 SELECT*.	34
	AI2+SEQ PROG	See parameter *1103 REF1 SELECT*.	35
1107	REF2 MIN	Defines the minimum value for external reference REF2. Corresponds to the minimum setting of the used source signal.	0.0%
	0.0…100.0%	Value as a percentage of the maximum frequency / maximum speed / nominal torque. See the example for parameter *1104 REF1 MIN* for correspondence to the source signal limits.	1 = 0.1%
1108	REF2 MAX	Defines the maximum value for external reference REF2. Corresponds to the maximum setting of the used source signal.	100.0%
	0.0…100.0%	Value as a percentage of the maximum frequency / maximum speed / nominal torque. See the example for parameter *1104 REF1 MIN* for correspondence to the source signal limits.	1 = 0.1%

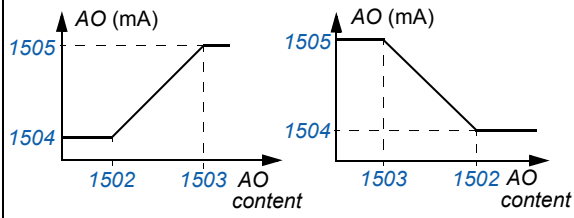
All parameters		
No. Name/Value	**Description**	**Def/FbEq**
13 ANALOG INPUTS	Analog input signal processing	
1301 MINIMUM AI1	Defines the minimum %-value that corresponds to minimum mA/(V) signal for analog input AI1. When used as a reference, the value corresponds to the reference minimum setting. 0…20 mA ≙ 0…100% 4…20 mA ≙ 20…100% -10…10 mA ≙ -50…50% **Example:** If AI1 is selected as the source for external reference REF1, this value corresponds to the value of parameter *1104 REF1 MIN*. **Note:** *MINIMUM AI1* value must not exceed *MAXIMUM AI1* value.	1.0%
-100.0…100.0%	Value as a percentage of the full signal range. **Example:** If the minimum value for analog input is 4 mA, the percentage value for 0…20 mA range is: (4 mA / 20 mA) · 100% = 20%	1 = 0.1%
1302 MAXIMUM AI1	Defines the maximum %-value that corresponds to maximum mA/(V) signal for analog input AI1. When used as a reference, the value corresponds to the reference maximum setting. 0…20 mA ≙ 0…100% 4…20 mA ≙ 20…100% -10…10 mA ≙ -50…50% **Example:** If AI1 is selected as the source for external reference REF1, this value corresponds to the value of parameter *1105 REF1 MAX*.	100.0%
-100.0…100.0%	Value as a percentage of the full signal range. **Example:** If the maximum value for analog input is 10 mA, the percentage value for 0…20 mA range is: (10 mA / 20 mA) · 100% = 50%	1 = 0.1%
1303 FILTER AI1	Defines the filter time constant for analog input AI1, ie the time within which 63% of a step change is reached. 	0.1 s
0.0…10.0 s	Filter time constant	1 = 0.1 s

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
1304	MINIMUM AI2	Defines the minimum %-value that corresponds to minimum mA/(V) signal for analog input AI2. See parameter *1301 MINIMUM AI1*.	20%
	-100.0…100.0%	See parameter *1301 MINIMUM AI1*.	1 = 0.1%
1305	MAXIMUM AI2	Defines the maximum %-value that corresponds to maximum mA/(V) signal for analog input AI2. See parameter *1302 MAXIMUM AI1*.	100.0%
	-100.0…100.0%	See parameter *1302 MAXIMUM AI1*.	1 = 0.1%
1306	FILTER AI2	Defines the filter time constant for analog input AI2. See parameter *1303 FILTER AI1*.	0.1 s
	0.0…10.0 s	Filter time constant	1 = 0.1 s
14 RELAY OUTPUTS		Status information indicated through relay output, and relay operating delays. **Note:** Relay outputs 2…4 are available only if the MREL-01 output relay module is connected to the drive. See *MREL-01 output relay module user's manual* (3AUA0000035974 [English]).	
1401	RELAY OUTPUT 1	Selects a drive status indicated through relay output RO 1. The relay energizes when the status meets the setting.	*FAULT(-1)*
	NOT SEL	Not used	0
	READY	Ready to function: Run enable signal on, no fault, supply voltage within acceptable range and emergency stop signal off.	1
	RUN	Running: Start signal on, Run enable signal on, no active fault.	2
	FAULT(-1)	Inverted fault. Relay is de-energized on a fault trip.	3
	FAULT	Fault	4
	ALARM	Alarm	5
	REVERSED	Motor rotates in reverse direction.	6
	STARTED	The drive has received start command. Relay is energized even if Run enable signal is off. Relay is de-energized when drive receives a stop command or a fault occurs.	7
	SUPRV1 OVER	Status according to supervision parameters *3201*…*3203*. See parameter group *32 SUPERVISION*.	8
	SUPRV1 UNDER	See selection *SUPRV1 OVER*.	9
	SUPRV2 OVER	Status according to supervision parameters *3204*…*3206*. See parameter group *32 SUPERVISION*.	10
	SUPRV2 UNDER	See selection *SUPRV2 OVER*.	11
	SUPRV3 OVER	Status according to supervision parameters *3207*…*3209*. See parameter group *32 SUPERVISION*.	12

<table>
<tr><th colspan="4">All parameters</th></tr>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq</th></tr>
<tr><td></td><td>SUPRV3 UNDER</td><td>See selection SUPRV3 OVER.</td><td>13</td></tr>
<tr><td></td><td>AT SET POINT</td><td>Output frequency is equal to the reference frequency.</td><td>14</td></tr>
<tr><td></td><td>FAULT(RST)</td><td>Fault. Automatic reset after the autoreset delay.</td><td>15</td></tr>
<tr><td></td><td>FLT/ALARM</td><td>Fault or alarm</td><td>16</td></tr>
<tr><td></td><td>EXT CTRL</td><td>Drive is under external control.</td><td>17</td></tr>
<tr><td></td><td>REF 2 SEL</td><td>External reference REF 2 is in use.</td><td>18</td></tr>
<tr><td></td><td>CONST FREQ</td><td>A constant speed is in use.</td><td>19</td></tr>
<tr><td></td><td>REF LOSS</td><td>Reference or active control location is lost.</td><td>20</td></tr>
<tr><td></td><td>OVERCURRENT</td><td>Alarm/Fault by overcurrent protection function</td><td>21</td></tr>
<tr><td></td><td>OVERVOLTAGE</td><td>Alarm/Fault by overvoltage protection function</td><td>22</td></tr>
<tr><td></td><td>DRIVE TEMP</td><td>Alarm/Fault by drive overtemperature protection function</td><td>23</td></tr>
<tr><td></td><td>UNDERVOLTAGE</td><td>Alarm/Fault by undervoltage protection function</td><td>24</td></tr>
<tr><td></td><td>AI1 LOSS</td><td>Analog input AI1 signal is lost.</td><td>25</td></tr>
<tr><td></td><td>AI2 LOSS</td><td>Analog input AI2 signal is lost.</td><td>26</td></tr>
<tr><td></td><td>MOTOR TEMP</td><td>Alarm/Fault by motor overtemperature protection function.</td><td>27</td></tr>
<tr><td></td><td>STALL</td><td>Alarm/Fault by stall protection function.</td><td>28</td></tr>
<tr><td></td><td>UNDERLOAD</td><td>Alarm/Fault by underload protection function.</td><td>29</td></tr>
<tr><td></td><td>FLUX READY</td><td>Motor is magnetized and able to supply nominal torque.</td><td>33</td></tr>
<tr><td></td><td>USER MACRO 2</td><td>User macro 2 is active.</td><td>34</td></tr>
<tr><td></td><td>COMM</td><td>Fieldbus control signal 0134 COMM RO WORD. 0 = de-energize output, 1 = energize output.
<table>
<tr><th>0134 value</th><th>Binary</th><th>RO4 (MREL)</th><th>RO3 (MREL)</th><th>RO2 (MREL)</th><th>DO</th><th>RO1</th></tr>
<tr><td>0</td><td>00000</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>00001</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>2</td><td>00010</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>3</td><td>00011</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>4</td><td>00100</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>5…30</td><td>…</td><td>…</td><td>…</td><td>…</td><td>…</td><td>…</td></tr>
<tr><td>31</td><td>11111</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table></td><td>35</td></tr>
</table>

<table>
<tr><th colspan="4">All parameters</th></tr>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq</th></tr>
<tr><td></td><td>COMM(-1)</td><td>Fieldbus control signal 0134 COMM RO WORD. 0 = de-energize output, 1 = energize output.
<table>
<tr><th>0134 value</th><th>Binary</th><th>RO4 (MREL)</th><th>RO3 (MREL)</th><th>RO2 (MREL)</th><th>DO</th><th>RO1</th></tr>
<tr><td>0</td><td>00000</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>00001</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>2</td><td>00010</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>3</td><td>00011</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>4</td><td>00100</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>5…30</td><td>…</td><td>…</td><td>…</td><td>…</td><td>…</td><td>…</td></tr>
<tr><td>31</td><td>11111</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table></td><td>36</td></tr>
<tr><td></td><td>TIMED FUNC 1</td><td>Timed function 1 is active. See parameter group 36 TIMED FUNCTIONS.</td><td>37</td></tr>
<tr><td></td><td>TIMED FUNC 2</td><td>Timed function 2 is active. See parameter group 36 TIMED FUNCTIONS.</td><td>38</td></tr>
<tr><td></td><td>TIMED FUNC 3</td><td>Timed function 3 is active. See parameter group 36 TIMED FUNCTIONS.</td><td>39</td></tr>
<tr><td></td><td>TIMED FUNC 4</td><td>Timed function 4 is active. See parameter group 36 TIMED FUNCTIONS.</td><td>40</td></tr>
<tr><td></td><td>M.TRIG FAN</td><td>Cooling fan running time counter is triggered.</td><td>41</td></tr>
<tr><td></td><td>M.TRIG REV</td><td>Revolutions counter is triggered.</td><td>42</td></tr>
<tr><td></td><td>M.TRIG RUN</td><td>Run time counter is triggered.</td><td>43</td></tr>
<tr><td></td><td>M.TRIG MWH</td><td>MWh counter is triggered.</td><td>44</td></tr>
<tr><td></td><td>SEQ PROG</td><td>Relay output control with Sequence program. See parameter 8423 ST1 OUT CONTROL.</td><td>50</td></tr>
<tr><td></td><td>MBRK</td><td>On/Off control of a mechanical brake.</td><td>51</td></tr>
<tr><td></td><td>JOG ACTIVE</td><td>Jogging function active.</td><td>52</td></tr>
<tr><td></td><td>STO</td><td>STO (Safe torque off) has been triggered.</td><td>57</td></tr>
<tr><td></td><td>STO(-1)</td><td>STO (Safe torque off) is inactive and the drive operates normally.</td><td>58</td></tr>
<tr><td></td><td>AT TARGET A</td><td>Parameter 0190 POS STATUS bit 0(AT TARGET A) active.</td><td>60</td></tr>
<tr><td></td><td>AT TARGET B</td><td>Parameter 0190 POS STATUS bit 1(AT TARGET B) active.</td><td>61</td></tr>
<tr><td></td><td>AT TARGET C</td><td>Parameter 0190 POS STATUS bit 2(AT TARGET C) active.</td><td>62</td></tr>
<tr><td></td><td>AT TARGET D</td><td>Parameter 0190 POS STATUS bit 3(AT TARGET D) active.</td><td>63</td></tr>
<tr><td></td><td>AT TARGET</td><td>Parameter 0190 POS STATUS bit 15(AT TARGET) active.</td><td>68</td></tr>
<tr><td>1402</td><td>RELAY OUTPUT 2</td><td>See parameter 1401 RELAY OUTPUT 1. Available only if the MREL-01 output relay module is connected to the drive.</td><td>NOT SEL</td></tr>
<tr><td>1403</td><td>RELAY OUTPUT 3</td><td>See parameter 1401 RELAY OUTPUT 1. Available only if the MREL-01 output relay module is connected to the drive.</td><td>NOT SEL</td></tr>
</table>

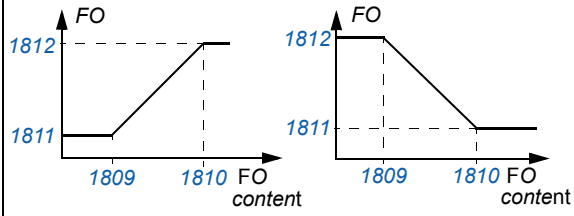
All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
1404	RO 1 ON DELAY	Defines the operation delay for relay output RO 1.	0.0 s
	0.0…3600.0 s	Delay time. The figure below illustrates the operation (on) and release (off) delays for relay output RO.  	1 = 0.1 s
1405	RO 1 OFF DELAY	Defines the release delay for relay output RO 1.	0.0 s
	0.0…3600.0 s	Delay time. See the figure for parameter *1404 RO 1 ON DELAY*.	1 = 0.1 s
1406	RO 2 ON DELAY	See parameter *1404 RO 1 ON DELAY*.	0.0 s
1407	RO 2 OFF DELAY	See parameter *1405 RO 1 OFF DELAY*.	0.0 s
1408	RO 3 ON DELAY	See parameter *1404 RO 1 ON DELAY*.	0.0 s
1409	RO 3 OFF DELAY	See parameter *1405 RO 1 OFF DELAY*.	0.0 s
1410	RELAY OUTPUT 4	See parameter *1401 RELAY OUTPUT 1*. Available only if the MREL-01 output relay extension module is connected to the drive.	*NOT SEL*
1413	RO 4 ON DELAY	See parameter *1404 RO 1 ON DELAY*.	0.0 s
1414	RO 4 OFF DELAY	See parameter *1405 RO 1 OFF DELAY*.	0.0 s
15 ANALOG OUTPUTS		Selection of the actual signals to be indicated through analog output and output signal processing.	
1501	AO1 CONTENT SEL	Connects a drive signal to analog output AO.	103
	x…x	Parameter index in group *01 OPERATING DATA*. Eg 102 = *0102 SPEED*.	

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
1502	AO1 CONTENT MIN	Defines the minimum value for the signal selected with parameter *1501 AO1 CONTENT SEL*. AO minimum and maximum correspond to the *1504 MINIMUM AO1* and *1505 MAXIMUM AO1* settings as follows: 	-
	x…x	Setting range depends on the parameter *1501 AO1 CONTENT SEL* setting.	-
1503	AO1 CONTENT MAX	Defines the maximum value for the signal selected with parameter *1501 AO1 CONTENT SEL*. See the figure for parameter *1502 AO1 CONTENT MIN*.	-
	x…x	Setting range depends on the parameter *1501 AO1 CONTENT SEL* setting.	-
1504	MINIMUM AO1	Defines the minimum value for the analog output signal AO. See the figure for parameter *1502 AO1 CONTENT MIN*.	0.0 mA
	0.0…20.0 mA	Minimum value	1 = 0.1 mA
1505	MAXIMUM AO1	Defines the maximum value for the analog output signal AO. See the figure for parameter *1502 AO1 CONTENT MIN*.	20.0 mA
	0.0…20.0 mA	Maximum value	1 = 0.1 mA
1506	FILTER AO1	Defines the filter time constant for analog output AO, ie the time within which 63% of a step change is reached. See the figure for parameter *1303 FILTER AI1*.	0.1 s
	0.0…10.0 s	Filter time constant	1 = 0.1 s
16 SYSTEM CONTROLS		Parameter view, Run enable, parameter lock etc.	
1601	RUN ENABLE	Selects a source for the external Run enable signal.	*NOT SEL*
	NOT SEL	Allows the drive to start without an external Run enable signal.	0
	DI1	External signal required through digital input DI1. 1 = Run enable. If Run enable signal is switched off, the drive will not start or coasts to stop if it is running.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	COMM	Fieldbus interface as the source for inverted Run enable signal (Run disable), ie Control word *0301 FB CMD WORD 1* bit 6 (with ABB drives profile *5319 EFB PAR 19* bit 3). The Control word is sent by the fieldbus controller through the fieldbus adapter or embedded fieldbus (Modbus) to the drive.	7
	DI1(INV)	External signal required through inverted digital input DI1. 0 = Run enable. If Run enable signal is switched on, the drive will not start or coasts to stop if it is running.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
1602	PARAMETER LOCK	Selects the state of the parameter lock. The lock prevents parameter changing from the control panel.	*OPEN*
	LOCKED	Parameter values cannot be changed from the control panel. The lock can be opened by entering the valid code to parameter *1603 PASS CODE*. The lock does not prevent parameter changes made by macros or fieldbus.	0
	OPEN	The lock is open. Parameter values can be changed.	1
	NOT SAVED	Parameter changes from the control panel are not stored into the permanent memory. To store changed parameter values, set parameter *1607 PARAM SAVE* value to *SAVE*….	2
1603	PASS CODE	Selects the pass code for the parameter lock (see parameter *1602 PARAMETER LOCK*).	0
	0…65535	Pass code. Setting 358 opens the lock. The value reverts back to 0 automatically.	1 = 1

<table>
<tr><th colspan="4">All parameters</th></tr>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq</th></tr>
<tr><td>1605</td><td>USER PAR SET CHG</td><td>Enables the change of the User parameter set through a digital input. See parameter9902 APPLIC MACRO. The change is only allowed when the drive is stopped. During the change, the drive will not start.
Note: Always save the User parameter set with parameter 9902 after changing any parameter setting, or reperforming the motor identification. The last settings saved by the user are loaded into use whenever the power is switched off and on again or the parameter 9902 setting is changed. Any unsaved changes will be lost.
Note: The value of this parameter is not included in the User parameter sets. A setting once made remains despite User parameter set change.
Note: Selection of User parameter set 2 can be supervised through relay outputs RO 1…4 and digital output DO. See parameters 1401 RELAY OUTPUT 1 … 1403 RELAY OUTPUT 3, 1410 RELAY OUTPUT 4 and 1805 DO SIGNAL.</td><td>NOT SEL</td></tr>
<tr><td></td><td>NOT SEL</td><td>User parameter set change is not possible through a digital input. Parameter sets can be changed only from the control panel.</td><td>0</td></tr>
<tr><td></td><td>DI1</td><td>User parameter set control through digital input DI1. Falling edge of digital input DI1: User parameter set 1 is loaded into use. Rising edge of digital input DI1: User parameter set 2 is loaded into use.</td><td>1</td></tr>
<tr><td></td><td>DI2</td><td>See selection DI1.</td><td>2</td></tr>
<tr><td></td><td>DI3</td><td>See selection DI1.</td><td>3</td></tr>
<tr><td></td><td>DI4</td><td>See selection DI1.</td><td>4</td></tr>
<tr><td></td><td>DI5</td><td>See selection DI1.</td><td>5</td></tr>
<tr><td></td><td>DI1,2</td><td>User parameter set selection through digital inputs DI1 and DI2. 1 = DI active, 0 = DI inactive.
<table><tr><th>DI1</th><th>DI2</th><th>User parameter set</th></tr><tr><td>0</td><td>0</td><td>User parameter set 1</td></tr><tr><td>1</td><td>0</td><td>User parameter set 2</td></tr><tr><td>0</td><td>1</td><td>User parameter set 3</td></tr></table></td><td>7</td></tr>
<tr><td></td><td>DI2,3</td><td>See selection DI1,2.</td><td>8</td></tr>
<tr><td></td><td>DI3,4</td><td>See selection DI1,2.</td><td>9</td></tr>
<tr><td></td><td>DI4,5</td><td>See selection DI1,2.</td><td>10</td></tr>
</table>

<table>
<tr><th colspan="4">All parameters</th></tr>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq</th></tr>
<tr><td></td><td>SEQ PROG</td><td>User parameter set selection through sequence programing.
Example: When parameter 8506 MACRO CHG ST is set to STATE 1 and sequence programing enter to stat1, the user macro changed to parameter 8507 USER MACRO SEL setting.</td><td>11</td></tr>
<tr><td></td><td>DI1(INV)</td><td>User parameter set control through inverted digital input DI1. Falling edge of inverted digital input DI1: User parameter set 2 is loaded into use. Rising edge of inverted digital input DI1: User parameter set 1 is loaded into use.</td><td>-1</td></tr>
<tr><td></td><td>DI2(INV)</td><td>See selection DI1(INV).</td><td>-2</td></tr>
<tr><td></td><td>DI3(INV)</td><td>See selection DI1(INV).</td><td>-3</td></tr>
<tr><td></td><td>DI4(INV)</td><td>See selection DI1(INV).</td><td>-4</td></tr>
<tr><td></td><td>DI1,2(INV)</td><td>User parameter set selection through inverted digital inputs DI1 and DI2. 1 = DI inactive, 0 =DI active.
<table><tr><th>DI1</th><th>DI2</th><th>User parameter set</th></tr><tr><td>1</td><td>1</td><td>User parameter set 1</td></tr><tr><td>0</td><td>1</td><td>User parameter set 2</td></tr><tr><td>1</td><td>0</td><td>User parameter set 3</td></tr></table></td><td>-7</td></tr>
<tr><td></td><td>DI2,3(INV)</td><td>See selection DI1,2.</td><td>-8</td></tr>
<tr><td></td><td>DI3,4(INV)</td><td>See selection DI1,2.</td><td>-9</td></tr>
<tr><td></td><td>DI4,5(INV)</td><td>See selection DI1,2.</td><td>-10</td></tr>
<tr><td colspan="2">18 FREQ IN & TRAN OUT</td><td>Frequency input and transistor output signal processing.</td><td></td></tr>
<tr><td>1804</td><td>TO MODE</td><td>Selects the operation mode for the transistor output TO.</td><td>DIGITAL</td></tr>
<tr><td></td><td>DIGITAL</td><td>Transistor output is used as a digital output DO.</td><td>0</td></tr>
<tr><td></td><td>FREQUENCY</td><td>Transistor output is used as a frequency output FO.</td><td>1</td></tr>
<tr><td>1805</td><td>DO SIGNAL</td><td>Selects a drive status indicated through digital output DO.</td><td>FAULT(-1)</td></tr>
<tr><td></td><td></td><td>See parameter 1401 RELAY OUTPUT 1.</td><td></td></tr>
<tr><td>1806</td><td>DO ON DELAY</td><td>Defines the operation delay for digital output DO.</td><td>0.0 s</td></tr>
<tr><td></td><td>0.0…3600.0 s</td><td>Delay time</td><td>1 = 0.1 s</td></tr>
<tr><td>1807</td><td>DO OFF DELAY</td><td>Defines the release delay for digital output DO.</td><td>0.0 s</td></tr>
<tr><td></td><td>0.0…3600.0 s</td><td>Delay time</td><td>1 = 0.1 s</td></tr>
<tr><td>1808</td><td>FO CONTENT SEL</td><td>Selects a drive signal to be connected to frequency output FO.</td><td>104</td></tr>
<tr><td></td><td>x…x</td><td>Parameter index in group 01 OPERATING DATA. Eg 102 = 0102 SPEED.</td><td></td></tr>
</table>

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
1809	FO CONTENT MIN	Defines the minimum frequency output FO signal value. Signal is selected with parameter *1808 FO CONTENT SEL*. FO minimum and maximum correspond to *1811 MINIMUM FO* and *1812 MAXIMUM FO* settings as follows: 	-
	x…x	Setting range depends on parameter *1808 FO CONTENT SEL* setting.	-
1810	FO CONTENT MAX	Defines the maximum frequency output FO signal value. Signal is selected with parameter *1808 FO CONTENT SEL*. See parameter *1809 FO CONTENT MIN*.	-
	x…x	Setting range depends on parameter *1808 FO CONTENT SEL* setting.	-
1811	MINIMUM FO	Defines the minimum value for frequency output FO.	10 Hz
	10…16000 Hz	Minimum frequency. See parameter *1809 FO CONTENT MIN*.	1 = 1 Hz
1812	MAXIMUM FO	Defines the maximum value for frequency output FO.	1000 Hz
	10…16000 Hz	Maximum frequency. See parameter *1809 FO CONTENT MIN*.	1 = 1 Hz
1813	FILTER FO	Defines the filter time constant for frequency output FO, ie the time within which 63% of a step change is reached.	0.1 s
	0.0…10.0 s	Filter time constant	1 = 0.1 s
19 TIMER & COUNTER		Timer and counter for start and stop control	
1904	COUNTER ENABLE	Selects the source for the counter enable signal.	*DISABLED*
	DI1(INV)	Counter enable signal through inverted digital input DI1. 0 = active, 1 = inactive.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	DISABLED	No counter enable	0
	DI1	Counter enable signal through digital input DI1. 1 = active, 0 = inactive.	1

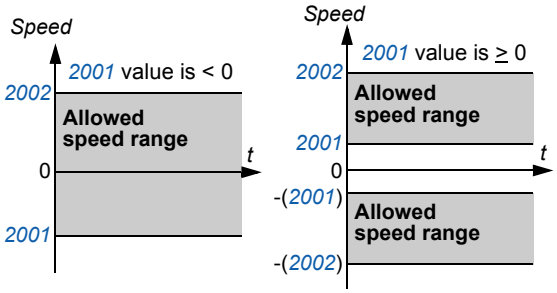
All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	ENABLED	Counter enabled	6
1906	COUNTER INPUT	Selects the input signal source for the counter.	*PLS IN(DI 5)*
	PLS IN(DI 5)	Digital input DI5 pulses. When a pulse is detected, the counter value increases by 1.	1
	ENC W/O DIR	Encoder pulse edges. When a rising or a falling edge is detected, the counter value increases by 1.	2
	ENC WITH DIR	Encoder pulse edges. The direction of rotation is taken into account. When a rising or a falling edge is detected and the direction of rotation is forward, the counter value increases by 1. When the direction of rotation is reverse, the counter value decreases by 1.	3
	FILTERED DI5	Filtered digital input DI5 pulses. When a pulse is detected, the counter value increases by 1. **Note:** Due to filtering, the maximum input signal frequency is 50 Hz.	4
1907	COUNTER RESET	Selects the source for the counter reset signal.	*NOT SEL*
	DI1(INV)	Counter reset through inverted digital input DI1. 0 = active, 1 = inactive.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	NOT SEL	No reset signal	0
	DI1	Counter reset through digital input DI1. 1 = active, 0 = inactive.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	AT LIMIT	Reset at the limit defined by parameter *1925 COUNTER LIMIT HI* and *1926 COUNTER LIMIT LO*	6
	STRT/STP CMD	Counter reset at start/stop command. Source for the start/stop is selected by parameter *1911 CNTR S/S COMMAND*.	7

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	S/S CMD(INV)	Counter reset at start/stop command (inverted), ie counter is reset when start/stop command is deactivated. Start signal source is selected by parameter *1911 CNTR S/S COMMAND*.	8
	RESET	Reset enabled	9
	SEQ PROG	Counter reset through Sequence programming state out control, ie counter is reset when Sequence programing enter to state1 and state1 out control source is selected to *RST CNT NEXT* by parameter *8423 ST1 OUT CONTROL*.	10
	SEQ OR DI1	Counter reset through Sequence programming state out control or DI1 is active.	11
	SEQ OR DI2	See selection SEQ OR DI1.	12
	SEQ OR DI3	See selection SEQ OR DI1.	13
	SEQ OR DI4	See selection SEQ OR DI1.	14
	SEQ OR DI5	See selection SEQ OR DI1.	15
	SEQ OR CV1#0	Counter reset through Sequence programming state out control or *0135 COMM VALUE 1* bit 0 (1 = reset is active).	16
	SEQ OR CV1#1	See selection SEQ OR CV1#0.	17
	SEQ OR CV1#2	See selection SEQ OR CV1#0.	18
	SEQ OR CV1#3	See selection SEQ OR CV1#0.	19
	SEQ OR CV1#4	See selection SEQ OR CV1#0.	20
	SEQ OR CV1#5	See selection SEQ OR CV1#0.	21
	SEQ OR CV1#6	See selection SEQ OR CV1#0.	22
	SEQ OR CV1#7	See selection SEQ OR CV1#0.	23
1910	COUNT DIRECTION	Defines the source for the counter direction selection.	*UP*
	DI1(INV)	Counter direction selection through inverted digital input DI1. 1 = counts up, 0 = counts down.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	UP	Counts up	0
	DI1	Counter direction selection through digital input DI1. 0 = counts up, 1 = counts down.	1

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	DOWN	Counts down	6
	MOTOR DIR	Counter direction selection by the motor rotating direction. When motor is rotating forward then counter counts upwards. When motor is rotating reverse then counter counts down.	7
1911	CNTR S/S COMMAND	Selects the source for the drive start/stop command when parameter *1001 EXT1 COMMANDS* value is set to *COUNTER START* / *COUNTER STOP*.	*NOT SEL*
	DI1(INV)	Start/stop command through inverted digital input DI1. When parameter *1001 EXT1 COMMANDS* value is *COUNTER STOP*: 0 = start. Stop when counter limit defined by parameter *1925 COUNTER LIMIT HI* and *1926 COUNTER LIMIT LO* has been exceeded. When parameter *1001* value is *COUNTER START*: 0 = stop. Start when counter limit defined by parameter *1925 COUNTER LIMIT HI* and *1926 COUNTER LIMIT LO* has been exceeded.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	NOT SEL	Not start/stop command source	0
	DI1	Start/stop command through digital input DI1. When parameter *1001 EXT1 COMMANDS* value is *COUNTER STOP*: 1 = start. Stop when counter limit defined by parameter *1925 COUNTER LIMIT HI* and *1926 COUNTER LIMIT LO* has been exceeded. When parameter *1001* value is *COUNTER START*: 1 = stop. Start when counter limit defined by parameter *1925 COUNTER LIMIT HI* and *1926 COUNTER LIMIT LO* has been exceeded.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	ACTIVATE	External start/stop command, eg through fieldbus	6

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
1912	TAR A HI VALUE	Defines Target A counts high word part (Target A counter is 32bit long double words which divide to high word and low word).	0
	0...65535	Setting the Target A high word part.	-
1913	TAR A LO VALUE	Defines Target A counts low word part.	0
	0...65535	Setting the Target A low word part.	-
1914	TAR B HI VALUE	See parameter *1912 TAR A HI VALUE*	0
	0...65535	See parameter *1912*.	-
1915	TAR B LO VALUE	See parameter *1913 TAR A LO VALUE*.	0
	0...65535	See parameter *1913*.	-
1916	TAR C HI VALUE	See parameter *1912 TAR A HI VALUE*.	0
	0...65535	See parameter *1912*.	-
1917	TAR C LO VALUE	See parameter *1913 TAR A LO VALUE*.	0
	0...65535	See parameter *1913*.	-
1918	TAR D HI VALUE	See parameter *1912 TAR A HI VALUE*.	0
	0...65535	See parameter *1912*.	-
1919	TAR D LO VALUE	See parameter *1913 TAR A LO VALUE*.	0
	0...65535	See parameter *1913*.	-
1920	TAR WINDOW ST	Defines size of positioning status target window.When the counter value enter the Target A(B...D) range which range is defined by target window, the corresponding bit (At Target A) of positioning status word (parameter *0190 POS STATUS*) will be set.	0
	0...65535	Setting the target window.	-
1921	POS CORRECT	Defines positioning fine tuning parameter.	100%
	0...300%	Value as the multiplied ratio, it is multiplied with actual speed when using the sequence programing.	1 = 1%
1922	SLOWDOWN WINDOW	Defines size of positioning status target slowdown window.	0

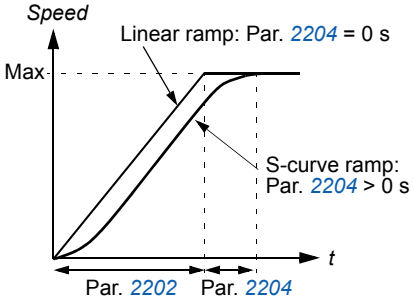
All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	0...65535	Slowdown window is used to judge range about slowdown status of each target is set or not. Example: When the counter value enter the range which form “Target A - slowdown window-target window” to “Target A - target window” or from “Target A +target window” to “Target A + slowdown window + target window”, the corresponding positioning slowdown bit (Slowdown A) of status word (parameter *0190 POS STATUS*) will be set.	-
1923	COUNTER RES HI VAL	Defines the high part for the counter reset value.	0
	0...32767	Counter value	-
1924	COUNTER RES LO VAL	Defines the low part for the counter reset value.	0
	0...65535	Counter value	-
1925	COUNTER LIMIT HI	Defines the counter limit value high part.	0
	0...32767	Limit value	-
1926	COUNTER LIMIT LO	Defines the counter limit value low part.	1000
	0...65535	Limit value	-
1927	DI5 PPR	When DI5 as the counter input source, defines the number of DI5 pulses per one revolution.	1
	0...16384	pulse number in pulses per round (ppr).	1 = 1 ppr
1928	COUNTER NUM	Defines the multiplier (numerator) for the pulse counter.	1
	1...32767	counter value = pulse counter * numerator/denominator.	-
1929	COUNTER DEN	Defines the divider (denominator) for the pulse counter.	1
	1...32767	counter value = pulse counter * numerator/denominator.	-
20 LIMITS		Drive operation limits. Speed values are used in vector control and frequency values are used in scalar control. The control mode is selected by parameter 9904 MOTOR CTRL MODE.	

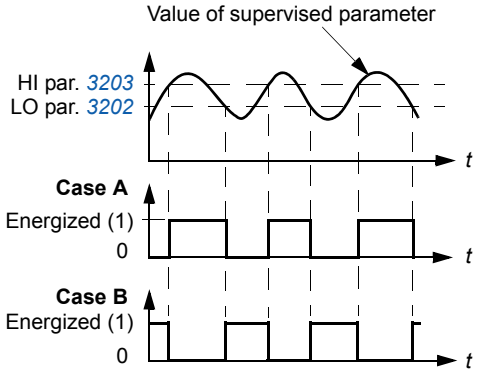
All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
2001	MINIMUM SPEED	Defines the allowed minimum speed. A positive (or zero) minimum speed value defines two ranges, one positive and one negative. A negative minimum speed value defines one speed range. 	0 rpm
	-30000… 30000 rpm	Minimum speed	1 = 1 rpm
2002	MAXIMUM SPEED	Defines the allowed maximum speed. See parameter *2001 MINIMUM SPEED*.	E: 1500 rpm / U: 1800 rpm
	0…30000 rpm	Maximum speed	1 = 1 rpm
2013	MIN TORQUE SEL	Selects the minimum torque limit for the drive.	*MIN TORQUE 1*
	MIN TORQUE 1	Value defined by parameter *2015 MIN TORQUE 1*	0
	DI1	Digital input DI1. 0 = parameter *2015 MIN TORQUE 1* value. 1 = parameter *2016 MIN TORQUE 2* value.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	COMM	Fieldbus interface as the source for the torque limit 1/2 selection, ie Control word 0301 FB CMD WORD 1 bit 15. The Control word is sent by the fieldbus controller through the fieldbus adapter or embedded fieldbus (Modbus) to the drive. Minimum torque limit 1 is defined by parameter *2015 MIN TORQUE 1* and minimum torque limit 2 is defined by parameter *2016 MIN TORQUE 2*. **Note:** This setting applies only for the DCU profile.	7
	EXT2	Value of signal 0112 EXTERNALREF 2	11

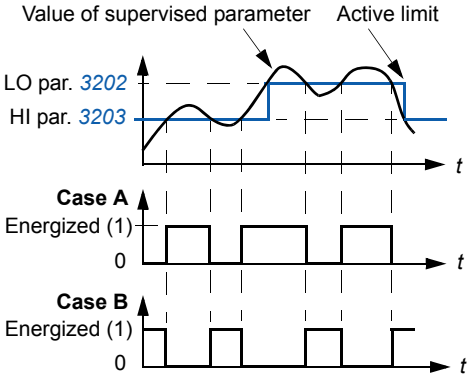
All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	SEQ OUT CTRL	Value of Sequence programing state out control negative value e.g *8423 ST1 OUT CONTROL* which range is -600%~0. If SEQ PROG is disabled, value of MIN TORQUE 1 will be used.	12
	DI1(INV)	Inverted digital input DI1. 1 = value of parameter *2015 MIN TORQUE 1* 1. 0 = value of parameter *2016 MIN TORQUE 2*.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
2014	MAX TORQUE SEL	Selects the maximum torque limit for the drive.	*MAX TORQUE 1*
	MAX TORQUE 1	Value of parameter *2017 MAX TORQUE 1*	
	DI1	Digital input DI1. 0 = parameter *2017 MAX TORQUE 1* value. 1 = parameter *2018 MAX TORQUE 2* value.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	COMM	Fieldbus interface as the source for the torque limit 1/2 selection, ie Control word 0301 FB CMD WORD 1 bit 15 bit 15. The Control word is sent by the fieldbus controller through the fieldbus adapter or embedded fieldbus (Modbus) to the drive. Maximum torque limit 1 is defined by parameter *2017 MAX TORQUE 1* and maximum torque limit 2 is defined by parameter *2018 MAX TORQUE 2*. **Note:** This setting applies only for the DCU profile.	7
	EXT2	Value of signal 0112 EXTERNALREF 2	11
	SEQ OUT CTRL	Value of Sequence programing state out control value e.g *8423 ST1 OUT CONTROL* which range is 0~600%. If SEQ PROG is disabled, value of MAX TORQUE 1 will be used.	12
	DI1(INV)	Inverted digital input DI1. 1 = parameter *2017 MAX TORQUE 1* value. 0 = parameter *2018 MAX TORQUE 2* value.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
2015	MIN TORQUE 1	Defines minimum torque limit 1 for the drive. See parameter *2013 MIN TORQUE SEL*.	-300%
	-600.0…0.0%	Value as a percentage of the motor nominal torque	1 = 0.1%
2016	MIN TORQUE 2	Defines minimum torque limit 2 for the drive. See parameter *2013 MIN TORQUE SEL*.	-300%
	-600.0…0.0%	Value as a percentage of the motor nominal torque	1 = 0.1%
2017	MAX TORQUE 1	Defines maximum torque limit 1 for the drive. See parameter *2014 MAX TORQUE SEL*.	300%
	0.0…600.0%	Value as a percentage of the motor nominal torque	1 = 0.1%
2018	MAX TORQUE 2	Defines maximum torque limit 2 for the drive. See parameter *2014 MAX TORQUE SEL*.	300%
	0.0…600.0%	Value as a percentage of the motor nominal torque	1 = 0.1%
2021	MAX SPEED SEL	Maximum speed source for torque control	*PAR 2002*
	PAR 2002	Value of parameter *2002 MAXIMUM SPEED*	0
	EXT REF 1	Value of signal 0111 EXTERNALREF 1	1
	SEQ OUT CTRL	Mutilated results of Sequence programing state out control value and max speed(*2002 MAXIMUM SPEED*) e.g *8423 ST1 OUT CONTROL* * *2002 MAXIMUM SPEED*. If SEQ PROG is disabled, value of PAR 2002 will be used.	2
22 ACCEL/DECEL		Acceleration and deceleration times	
2201	ACC/DEC 1/2 SEL	Defines the source from which the drive reads the signal that selects between the two ramp pairs, acceleration/deceleration pair 1 and 2. Ramp pair 1 is defined by parameters *2202*…*2204*. Ramp pair 2 is defined by parameters *2205*…*2207*.	*DI5*
	NOT SEL	Ramp pair 1 is used.	0
	DI1	Digital input DI1. 1 = ramp pair 2, 0 = ramp pair 1.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	COMM	Fieldbus interface as the source for ramp pair 1/2 selection, ie Control word *0301 FB CMD WORD 1* bit 10. The Control word is sent by the fieldbus controller through the fieldbus adapter or embedded fieldbus (Modbus) to the drive. **Note:** This setting applies only for the DCU profile.	7
	SEQ PROG	Sequence program ramp defined by parameter *8422 ST1 RAMP* (or *8432*/…/*8492*)	10
	DI1(INV)	Inverted digital input DI1. 0 = ramp pair 2, 1 = ramp pair 1.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
2202	ACCELER TIME 1	Defines the acceleration time 1, ie the time required for the speed to change from zero to the speed defined by parameter *2008 MAXIMUM FREQ* (in scalar control) / *2002 MAXIMUM SPEED* (in vector control). The control mode is selected by parameter *9904 MOTOR CTRL MODE*. • If the speed reference increases faster than the set acceleration rate, the motor speed will follow the acceleration rate. • If the speed reference increases slower than the set acceleration rate, the motor speed will follow the reference signal. • If the acceleration time is set too short, the drive will automatically prolong the acceleration in order not to exceed the drive operating limits. Actual acceleration time depends on parameter *2204 RAMP SHAPE 1* setting.	5.0 s
	0.0…1800.0 s	Time	1 = 0.1 s
2203	DECELER TIME 1	Defines the deceleration time 1, ie the time required for the speed to change from the value defined by parameter *2008 MAXIMUM FREQ* (in scalar control) / *2002 MAXIMUM SPEED* (in vector control) to zero. The control mode is selected by parameter *9904 MOTOR CTRL MODE*. • If the speed reference decreases slower than the set deceleration rate, the motor speed will follow the reference signal. • If the reference changes faster than the set deceleration rate, the motor speed will follow the deceleration rate. • If the deceleration time is set too short, the drive will automatically prolong the deceleration in order not to exceed drive operating limits. If a short deceleration time is needed for a high inertia application, the drive should be equipped with a brake resistor. Actual deceleration time depends on parameter *2204 RAMP SHAPE 1* setting.	5.0 s
	0.0…1800.0 s	Time	1 = 0.1 s

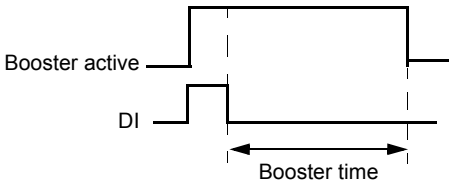
All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
2204	RAMP SHAPE 1	Selects the shape of the acceleration/deceleration ramp 1. The function is deactivated during emergency stop and jogging.	*0.0 = LINEAR*
	0.0 = LINEAR 0.1…1000.0 s	0.0: Linear ramp. Suitable for steady acceleration or deceleration and for slow ramps. 0.1…1000.0 s: S-curve ramp. S-curve ramps are ideal for conveyors carrying fragile loads, or other applications where a smooth transition is required when changing from one speed to another. The S-curve consists of symmetrical curves at both ends of the ramp and a linear part in between. A rule of thumb: A suitable relation between the ramp shape time and the acceleration ramp time is 1/5. 	1 = 0.1 s
2205	ACCELER TIME 2	Defines the acceleration time 2, ie the time required for the speed to change from zero to the speed defined by parameter *2008 MAXIMUM FREQ* (in scalar control) / *2002 MAXIMUM SPEED* (in vector control). The control mode is selected by parameter *9904 MOTOR CTRL MODE*. See parameter *2202 ACCELER TIME 1*. Acceleration time 2 is used also as jogging acceleration time.	60.0 s
	0.0…1800.0 s	Time	1 = 0.1 s
2206	DECELER TIME 2	Defines the deceleration time 2, ie the time required for the speed to change from the value defined by parameter *2008 MAXIMUM FREQ* (in scalar control) / *2002 MAXIMUM SPEED* (in vector control) to zero. The control mode is selected by parameter *9904 MOTOR CTRL MODE*. See parameter *2203 DECELER TIME 1*. Deceleration time 2 is used also as jogging deceleration time.	60.0 s
	0.0…1800.0 s	Time	1 = 0.1 s

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
2207	RAMP SHAPE 2	Selects the shape of the acceleration/deceleration ramp 2. The function is deactivated during emergency stop. During jogging, parameter value is set to zero (ie linear ramp).	*0.0 = LINEAR*
	0.0 = LINEAR 0.1…1000.0 s	See parameter *2204 RAMP SHAPE 1*.	1 = 0.1 s
32 SUPERVISION		Signal supervision. Supervision status can be monitored with relay or transistor output. See parameter groups *14 RELAY OUTPUTS* and *18 FREQ IN & TRAN OUT*.	
3201	SUPERV 1 PARAM	Selects the first supervised signal. Supervision limits are defined by parameters *3202 SUPERV 1 LIM LO* and *3203 SUPERV 1 LIM HI*. **Example 1**: If *3202 SUPERV 1 LIM LO* ≤ *3203 SUPERV 1 LIM HI* **Case A** = *1401 RELAY OUTPUT 1* value is set to *SUPRV1 OVER*. Relay energizes when value of the signal selected with *3201 SUPERV 1 PARAM* exceeds the supervision limit defined by *3203 SUPERV 1 LIM HI*. The relay remains active until the supervised value drops below the low limit defined by *3202 SUPERV 1 LIM LO*. **Case B** = *1401 RELAY OUTPUT 1* value is set to *SUPRV1 UNDER*. Relay energizes when value of the signal selected with *3201 SUPERV 1 PARAM* drops below the supervision limit defined by *3202 SUPERV 1 LIM LO*. The relay remains active until the supervised value rises above the high limit defined by *3203 SUPERV 1 LIM HI*.  	103

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
		Example 2: If *3202 SUPERV 1 LIM LO* > *3203 SUPERV 1 LIM HI* The lower limit *3203 SUPERV 1 LIM HI* remains active until the supervised signal exceeds the higher limit *3202 SUPERV 1 LIM LO*, making it the active limit. The new limit remains active until the supervised signal drops below the lower limit *3203 SUPERV 1 LIM HI*, making it the active limit. **Case A** = *1401 RELAY OUTPUT 1* value is set to *SUPRV1 OVER*. Relay is energized whenever the supervised signal exceeds the active limit. **Case B** = *1401 RELAY OUTPUT 1* value is set to *SUPRV1 UNDER*. Relay is de-energized whenever the supervised signal drops below the active limit.  	
	0, x…x	Parameter index in group *01 OPERATING DATA*. Eg 102 = *0102 SPEED*. 0 = not selected.	1 = 1
3202	SUPERV 1 LIM LO	Defines the low limit for the first supervised signal selected by parameter *3201 SUPERV 1 PARAM*. Supervision wakes up if the value is below the limit.	-
	x…x	Setting range depends on parameter *3201* setting.	-
3203	SUPERV 1 LIM HI	Defines the high limit for the first supervised signal selected by parameter *3201 SUPERV 1 PARAM*. Supervision wakes up if the value is above the limit.	-
	x…x	Setting range depends on parameter *3201* setting.	-
3204	SUPERV 2 PARAM	Selects the second supervised signal. Supervision limits are defined by parameters *3205 SUPERV 2 LIM LO* and *3206 SUPERV 2 LIM HI*. See parameter *3201 SUPERV 1 PARAM*.	104
	x…x	Parameter index in group *01 OPERATING DATA*. Eg 102 = *0102 SPEED*.	1 = 1

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
3205	SUPERV 2 LIM LO	Defines the low limit for the second supervised signal selected by parameter *3204 SUPERV 2 PARAM*. Supervision wakes up if the value is below the limit.	-
	x…x	Setting range depends on parameter *3204* setting.	-
3206	SUPERV 2 LIM HI	Defines the high limit for the second supervised signal selected by parameter *3204 SUPERV 2 PARAM*. Supervision wakes up if the value is above the limit.	-
	x…x	Setting range depends on parameter *3204* setting.	-
3207	SUPERV 3 PARAM	Selects the third supervised signal. Supervision limits are defined by parameters *3208 SUPERV 3 LIM LO* and *3209 SUPERV 3 LIM HI*. See parameter *3201 SUPERV 1 PARAM*.	105
	x…x	Parameter index in group *01 OPERATING DATA*. Eg 102 = *0102 SPEED*.	1 = 1
3208	SUPERV 3 LIM LO	Defines the low limit for the third supervised signal selected by parameter *3207 SUPERV 3 PARAM*. Supervision wakes up if the value is below the limit.	-
	x…x	Setting range depends on parameter *3207* setting.	-
3209	SUPERV 3 LIM HI	Defines the high limit for the third supervised signal selected by parameter *3207 SUPERV 3 PARAM*. Supervision wakes up if the value is above the limit.	-
	x…x	Setting range depends on parameter *3207* setting.	-
33 INFORMATION		Firmware package version, test date etc.	
3301	FIRMWARE	Displays the version of the firmware package.	
	0000…FFFF hex	Eg 6200 hex	
36 TIMED FUNCTIONS		Time periods 1 to 4 and booster signal.	
3601	TIMERS ENABLE	Selects the source for the timed function enable signal.	*NOT SEL*
	NOT SEL	Timed function is not selected.	0
	DI1	Digital input DI. Timed function enable on the rising edge of DI1.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	ACTIVE	Timed function is always enabled.	7
	DI1(INV)	Inverted digital input DI1. Timed function enable on the falling edge of DI1.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
3602	START TIME 1	Defines the daily start time 1. The time can be changed in 2-second steps.	00:00:00
	00:00:00… 23:59:58	hours:minutes:seconds. **Example:** If parameter value is set to 07:00:00, timed function 1 is activated at 7:00 (7 a.m).	
3603	STOP TIME 1	Defines the daily stop time 1. The time can be changed in 2-second steps.	00:00:00
	00:00:00… 23:59:58	hours:minutes:seconds. **Example:** If parameter value is set to 18:00:00, timed function 1 is deactivated at 18:00 (6 p.m).	
3604	START DAY 1	Defines the start day 1.	*MONDAY*
	MONDAY	**Example:** If parameter value is set to *MONDAY*, timed function 1 is active from Monday midnight (00:00:00).	1
	TUESDAY		2
	WEDNESDAY		3
	THURSDAY		4
	FRIDAY		5
	SATURDAY		6
	SUNDAY		7
3605	STOP DAY 1	Defines the stop day 1.	*MONDAY*
		See parameter *3604 START DAY 1*. **Example:** If parameter is set to *FRIDAY*, timed function 1 is deactivated on Friday midnight (23:59:58).	
3606	START TIME 2	See parameter *3602 START TIME 1*.	
		See parameter *3602 START TIME 1*.	
3607	STOP TIME 2	See parameter *3603 STOP TIME 1*.	
		See parameter *3603 STOP TIME 1*.	
3608	START DAY 2	See parameter *3604 START DAY 1*.	
		See parameter *3604 START DAY 1*.	
3609	STOP DAY 2	See parameter *3605 STOP DAY 1*.	
		See parameter *3605 STOP DAY 1*.	
3610	START TIME 3	See parameter *3602 START TIME 1*.	
		See parameter *3602 START TIME 1*.	
3611	STOP TIME 3	See parameter *3603 STOP TIME 1*.	
		See parameter *3603 STOP TIME 1*.	
3612	START DAY 3	See parameter *3604 START DAY 1*.	

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
		See parameter *3604 START DAY 1*.	
3613	STOP DAY 3	See parameter *3605 STOP DAY 1*.	
		See parameter *3605 STOP DAY 1*.	
3614	START TIME 4	See parameter *3602 START TIME 1*.	
		See parameter *3602 START TIME 1*.	
3615	STOP TIME 4	See parameter *3603 STOP TIME 1*.	
		See parameter *3603 STOP TIME 1*.	
3616	START DAY 4	See parameter *3604 START DAY 1*.	
		See parameter *3604 START DAY 1*.	
3617	STOP DAY 4	See parameter *3605 STOP DAY 1*.	
		See parameter *3605 STOP DAY 1*.	
3622	BOOSTER SEL	Selects the source for the booster activation signal.	*NOT SEL*
	NOT SEL	No booster activation signal	0
	DI1	Digital input DI1. 1 = active, 0 = inactive.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	DI1(INV)	Inverted digital input DI1. 0 = active, 1 = inactive.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
3623	BOOSTER TIME	Defines the time inside which the booster is deactivated after the booster activation signal is switched off.	00:00:00
	00:00:00… 23:59:58	hours:minutes:seconds **Example:** If parameter *3622 BOOSTER SEL* is set to *DI1* and *3623 BOOSTER TIME* is set to 01:30:00, the booster is active for 1 hour and 30 minutes after digital input DI is deactivated. 	

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
3626	TIMED FUNC 1 SRC	Selects the time periods for *TIMED FUNC 1 SRC*. Timed function can consist of 0…4 time periods and a booster.	*NOT SEL*
	NOT SEL	No time periods selected	0
	T1	Time period 1	1
	T2	Time period 2	2
	T1+T2	Time periods 1 and 2	3
	T3	Time period 3	4
	T1+T3	Time periods 1 and 3	5
	T2+T3	Time periods 2 and 3	6
	T1+T2+T3	Time periods 1, 2 and 3	7
	T4	Time period 4	8
	T1+T4	Time periods 1 and 4	9
	T2+T4	Time periods 2 and 4	10
	T1+T2+T4	Time periods 1, 2 and 4	11
	T3+T4	Time periods 4 and 3	12
	T1+T3+T4	Time periods 1, 3 and 4	13
	T2+T3+T4	Time periods 2, 3 and 4	14
	T1+T2+T3+T4	Time periods 1, 2, 3 and 4	15
	BOOSTER	Booster	16
	T1+B	Booster and time period 1	17
	T2+B	Booster and time period 2	18
	T1+T2+B	Booster and time periods 1 and 2	19
	T3+B	Booster and time period 3	20
	T1+T3+B	Booster and time periods 1 and 3	21
	T2+T3+B	Booster and time periods 2 and 3	22
	T1+T2+T3+B	Booster and time periods 1, 2 and 3	23
	T4+B	Booster and time period 4	24
	T1+T4+B	Booster and time periods 1 and 4	25
	T2+T4+B	Booster and time periods 2 and 4	26
	T1+T2+T4+B	Booster and time periods 1, 2 and 4	27
	T3+T4+B	Booster and time periods 3 and 4	28
	T1+T3+T4+B	Booster and time periods 1, 3 and 4	29
	T2+T3+T4+B	Booster and time periods 2, 3 and 4	30
	T1+2+3+4+B	Booster and time periods 1, 2, 3 and 4	31
3627	TIMED FUNC 2 SRC	See parameter *3626 TIMED FUNC 1 SRC*.	
		See parameter *3626 TIMED FUNC 1 SRC*.	

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
3628	TIMED FUNC 3 SRC	See parameter *3626 TIMED FUNC 1 SRC*.	
		See parameter *3626 TIMED FUNC 1 SRC*.	
3629	TIMED FUNC 4 SRC	See parameter *3626 TIMED FUNC 1 SRC*.	
		See parameter *3626 TIMED FUNC 1 SRC*.	
50 ENCODER		Encoder connection. For more information, see *MTAC-01 pulse encoder interface module user's manual* (3AFE68591091 [English]).	
5001	PULSE NR	States the number of encoder pulses per one revolution.	1024 ppr
	32…16384 ppr	Pulse number in pulses per round (ppr)	1 = 1 ppr
5002	ENCODER ENABLE	Enables the encoder.	*DISABLE*
	DISABLE	Disabled	0
	ENABLE	Enabled	1
5003	ENCODER FAULT	Defines the operation of the drive if a failure is detected in communication between the pulse encoder and the pulse encoder interface module, or between the module and the drive.	*FAULT*
	FAULT	The drive trips on fault ENCODER ERR (0023).	1
	ALARM	The drive generates alarm ENCODER ERR (2024).	2
5010	Z PLS ENABLE	Enables the encoder zero (Z) pulse. Zero pulse is used for position reset.	*DISABLE*
	DISABLE	Disabled	0
	ENABLE	Enabled	1
5011	POSITION RESET	Enables the position reset.	*DISABLE*
	DISABLE	Disabled	0
	ENABLE	Enabled	1
84 SEQUENCE PROG		Sequence program group 1. See section *Settings* on page *36*.	
8401	SEQ PROG ENABLE	Enables Sequence program. If Sequence program enable signal is lost, the Sequence program is stopped, Sequence program state (*0168 SEQ PROG STATE*) is set to 1 and all timers and outputs (RO/TO/AO) are set to zero.	*DISABLED*
	DISABLED	Disabled	0
	EXT2	Enabled in external control location 2 (EXT2)	1
	EXT1	Enabled in external control location 1 (EXT1)	2
	EXT1&EXT2	Enabled in external control locations 1 and 2 (EXT1 and EXT2)	3

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	ALWAYS	Enabled in external control locations 1 and 2 (EXT1 and EXT2) and in local control (LOCAL)	4
8402	SEQ PROG START	Selects the source for the Sequence program activation signal. When Sequence program is activated, the program starts from the previously used state. If Sequence program activation signal is lost, the Sequence program is stopped and all timers and outputs (RO/TO/AO) are set to zero. Sequence program state (*0168 SEQ PROG STATE*) remains unchanged. If start from the first Sequence program state is required, the Sequence program must be reset by parameter *8404 SEQ PROG RESET*. If start from the first Sequence program state is always required, reset and start signal sources (*8404* and *8402 SEQ PROG START*) must be through the same digital input. **Note**: The drive will not start if no Run enable signal is received (*1601 RUN ENABLE*).	*NOT SEL*
	DI1(INV)	Sequence program activation through inverted digital input DI1. 0 = active, 1 = inactive.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	NOT SEL	No Sequence program activation signal	0
	DI1	Sequence program activation through digital input DI1. 1 = active, 0 = inactive.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	DRIVE START	Sequence program activation at drive start	6
	TIMED FUNC 1	Sequence program is activated by timed function 1. See parameter group *36 TIMED FUNCTIONS*.	7
	TIMED FUNC 2	See selection *TIMED FUNC 1*.	8
	TIMED FUNC 3	See selection *TIMED FUNC 1*.	9
	TIMED FUNC 4	See selection *TIMED FUNC 1*.	10
	RUNNING	Sequence program is always active.	11

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
8403	SEQ PROG PAUSE	Selects the source for the Sequence program pause signal. When Sequence program pause is activated, all timers and outputs (RO/TO/AO) are frozen. Sequence program state transition is possible only by parameter *8405 SEQ ST FORCE*.	*NOT SEL*
	DI1(INV)	Pause signal through inverted digital input DI1. 0 = active, 1 = inactive.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	NOT SEL	No pause signal	0
	DI1	Pause signal through digital input DI1. 1 = active, 0 = inactive.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	PAUSED	Sequence program pause enabled	6
8404	SEQ PROG RESET	Selects the source for the Sequence program reset signal. Sequence program state (*0168 SEQ PROG STATE*) is set to the first state and all timers and outputs (RO/TO/AO) are set to zero. Reset is possible only when Sequence program is stopped.	*NOT SEL*
	DI1(INV)	Reset through inverted digital input DI1. 0 = active, 1 = inactive.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	NOT SEL	No reset signal	0
	DI1	Reset through digital input DI1. 1 = active, 0 = inactive.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	RESET	Reset. After reset parameter value is automatically set to *NOT SEL*.	6

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
8405	SEQ ST FORCE	Forces the Sequence program to a selected state. **Note:** State is changed only when Sequence program is paused by parameter *8403 SEQ PROG PAUSE* and this parameter is set to the selected state.	*STATE 1*
	STATE 1	State is forced to state 1.	1
	STATE 2	State is forced to state 2.	2
	STATE 3	State is forced to state 3.	3
	STATE 4	State is forced to state 4.	4
	STATE 5	State is forced to state 5.	5
	STATE 6	State is forced to state 6.	6
	STATE 7	State is forced to state 7.	7
	STATE 8	State is forced to state 8.	8
	STATE 9	State is forced to state 9.	9
	STATE 10	State is forced to state 10.	10
	STATE 11	State is forced to state 11.	11
	STATE 12	State is forced to state 12.	12
	STATE 13	State is forced to state 13.	13
	STATE 14	State is forced to state 14.	14
	STATE 15	State is forced to state 15.	15
	STATE 16	State is forced to state 16.	16
8406	SEQ LOGIC VAL 1	Defines the source for the logic value 1. Logic value 1 is compared to logic value 2 as defined by parameter *8407 SEQ LOGIC OPER 1*. Logic operation values are used in state transitions. See parameter *8425 ST1 TRIG TO ST 2* / *8426 ST1 TRIG TO ST N* selection *LOGIC VAL*.	*NOT SEL*
	DI1(INV)	Logic value 1 through inverted digital input DI1	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	NOT SEL	No logic value	0
	DI1	Logic value 1 through digital input DI1	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	SUPRV1 OVER	Logic value according to supervision parameters *3201*…*3203*. See parameter group *32 SUPERVISION*.	6

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	SUPRV2 OVER	Logic value according to supervision parameters *3204*…*3206*. See parameter group *32 SUPERVISION*.	7
	SUPRV3 OVER	Logic value according to supervision parameters *3207*…*3209*. See parameter group *32 SUPERVISION*.	8
	SUPRV1 UNDER	See selection *SUPRV1 OVER*.	9
	SUPRV2 UNDER	See selection *SUPRV2 OVER*.	10
	SUPRV3 UNDER	See selection *SUPRV3 OVER*.	11
	TIMED FUNC 1	Logic value 1 is activated by timed function 1. See parameter group *36 TIMED FUNCTIONS*. 1 = timed function active.	12
	TIMED FUNC 2	See selection *TIMED FUNC 1*.	13
	TIMED FUNC 3	See selection *TIMED FUNC 1*.	14
	TIMED FUNC 4	See selection *TIMED FUNC 1*.	15
	COMM VAL1 #0	Logic value 1 is activated by *0135 COMM VALUE 1* bit 0.	16
	COMM VAL1 #1	Logic value 1 is activated by *0135 COMM VALUE 1* bit 1.	17
	COMM VAL1 #2	Logic value 1 is activated by *0135 COMM VALUE 1* bit 2.	18
	COMM VAL1 #3	Logic value 1 is activated by *0135 COMM VALUE 1* bit 3.	19
	COMM VAL1 #4	Logic value 1 is activated by *0135 COMM VALUE 1* bit 4.	20
	COMM VAL1 #5	Logic value 1 is activated by *0135 COMM VALUE 1* bit 5.	21
	COMM VAL1 #6	Logic value 1 is activated by *0135 COMM VALUE 1* bit 6.	22
	COMM VAL1 #7	Logic value 1 is activated by *0135 COMM VALUE 1* bit 7.	23
	COMM VAL1 #8	Logic value 1 is activated by *0135 COMM VALUE 1* bit 8.	24
	COMM VAL1 #9	Logic value 1 is activated by *0135 COMM VALUE 1* bit 9.	25
	COMM VAL1 #10	Logic value 1 is activated by *0135 COMM VALUE 1* bit 10.	26
	COMM VAL1 #11	Logic value 1 is activated by *0135 COMM VALUE 1* bit 11.	27
	COMM VAL1 #12	Logic value 1 is activated by *0135 COMM VALUE 1* bit 12.	28
	COMM VAL1 #13	Logic value 1 is activated by *0135 COMM VALUE 1* bit 13.	29

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	COMM VAL1 #14	Logic value 1 is activated by *0135 COMM VALUE 1* bit 14.	30
	COMM VAL1 #15	Logic value 1 is activated by *0135 COMM VALUE 1* bit 15.	31
	CHANGE DLY	Logic value 1 is activated by delay time (defined by current state's CHANGE DELAY TIME) has elapsed.	32
	AI1HIGH1	Logic value 1 is activated when AI1 value > par. *8411 SEQ VAL 1 HIGH* value.	33
	AI1LOW1	Logic value 1 is activated when AI1 value < par. 8412 *SEQ VAL 1 LOW* value.	34
	AI2HIGH2	Logic value 1 is activated when AI1 value > par. 8413 *SEQ VAL 2 HIGH* value.	35
	AI2LOW2	Logic value 1 is activated when AI1 value < par. 8414 *SEQ VAL 2 LOW* value.	36
	AI1	Logic value 1 is activated if AI1 value is valid.	37
	AI2	Logic value 1 is activated if AI2 value is valid.	38
8407	SEQ LOGIC OPER 1	Selects the operation between logic value 1 and 2. Logic operation values are used in state transitions. See parameter *8425 ST1 TRIG TO ST 2* / *8426 ST1 TRIG TO ST N* selection *LOGIC VAL*.	*NOT SEL*
	NOT SEL	Logic value 1 (no logic comparison)	0
	AND	Logic function: AND	1
	OR	Logic function: OR	2
	XOR	Logic function: XOR	3
	HIGHER	Logic function: HIGHER	4
	LOWER	Logic function: LOWER	5
	EQUAL	Logic function: EQUAL	6
8408	SEQ LOGIC VAL 2	See parameter *8406 SEQ LOGIC VAL 1*.	*NOT SEL*
		See parameter *8406*.	
8409	SEQ LOGIC OPER 2	Selects the operation between logic value 3 and the result of the first logic operation defined by parameter *8407 SEQ LOGIC OPER 1*.	*NOT SEL*
	NOT SEL	Logic value 2 (no logic comparison)	0
	AND	Logic function: AND	1
	OR	Logic function: OR	2
	XOR	Logic function: XOR	3
	HIGHER	Logic function: HIGHER	4
	LOWER	Logic function: LOWER	5
	EQUAL	Logic function: EQUAL	6

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
8410	SEQ LOGIC VAL 3	See parameter *8406 SEQ LOGIC VAL 1*.	*NOT SEL*
		See parameter *8406*.	
8411	SEQ VAL 1 HIGH	Defines the high limit for the state change when parameter *8425 ST1 TRIG TO ST 2* is set to eg *AI 1 HIGH 1*.	0.0%
	0.0…100.0%	Value as a percentage	1 = 0.1%
8412	SEQ VAL 1 LOW	Defines the low limit for the state change when parameter *8425 ST1 TRIG TO ST 2* is set to eg *AI 1 LOW 1*.	0.0%
	0.0…100.0%	Value as a percentage	1 = 0.1%
8413	SEQ VAL 2 HIGH	Defines the high limit for the state change when parameter *8425 ST1 TRIG TO ST 2* is set to eg *AI 2 HIGH 1*.	0.0%
	0.0…100.0%	Value as a percentage	1 = 0.1%
8414	SEQ VAL 2 LOW	Defines the low limit for the state change when parameter *8425 ST1 TRIG TO ST 2* is set to eg *AI 2 LOW 1*.	0.0%
	0.0…100.0%	Value as a percentage	1 = 0.1%
8415	CYCLE CNT LOC	Activates the cycle counter for Sequence program. **Example:** When parameter is set to *ST6 TO NEXT*, the cycle count (*0171 SEQ CYCLE CNTR*) increases every time the state changes from state 6 to state 7.	*NOT SEL*
	NOT SEL	Disabled	0
	ST1 TO NEXT	From state 1 to state 2	1
	ST2 TO NEXT	From state 2 to state 3	2
	ST3 TO NEXT	From state 3 to state 4	3
	ST4 TO NEXT	From state 4 to state 5	4
	ST5 TO NEXT	From state 5 to state 6	5
	ST6 TO NEXT	From state 6 to state 7	6
	ST7 TO NEXT	From state 7 to state 8	7
	ST8 TO NEXT	From state 8 to state 9	8
	ST1 TO N	From state 1 to state n. State n is defined by parameter *8427 ST1 STATE N*.	9
	ST2 TO N	From state 2 to state n. State n is defined by parameter 8437 ST2 STATE N, see *8427 ST1 STATE N*.	10
	ST3 TO N	From state 3 to state n. State n is defined by parameter 8447 ST3 STATE N, see *8427 ST1 STATE N*.	11
	ST4 TO N	From state 4 to state n. State n is defined by parameter 8457 ST4 STATE N, see *8427 ST1 STATE N*.	12
	ST5 TO N	From state 5 to state n. State n is defined by parameter 8467 ST5 STATE N, see *8427 ST1 STATE N*.	13
	ST6 TO N	From state 6 to state n. State n is defined by parameter 8477 ST6 STATE N, see *8427 ST1 STATE N*.	14

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	ST7 TO N	From state 7 to state n. State n is defined by parameter 8487 ST7 STATE N, see *8427 ST1 STATE N*.	15
	ST8 TO N	From state 8 to state n. State n is defined by parameter 8497 ST8 STATE N, see *8427 ST1 STATE N*.	16
	ST9 TO NEXT	From state 9 to state 10	17
	ST10 TO NEXT	From state 10 to state 11	18
	ST11 TO NEXT	From state 11 to state 12	19
	ST12 TO NEXT	From state 12 to state 13	20
	ST13 TO NEXT	From state 13 to state 14	21
	ST14 TO NEXT	From state 14 to state 15	22
	ST15 TO NEXT	From state 15 to state 16	23
	ST16 TO NEXT	From state 16 to state 1	24
	ST9 TO N	From state 9 to state n. State n is defined by parameter 8527 ST9 STATE N, see *8427 ST1 STATE N*.	25
	ST10 TO N	From state 10 to state n. State n is defined by parameter 8537 ST10 STATE N, see *8427 ST1 STATE N*.	26
	ST11 TO N	From state 11 to state n. State n is defined by parameter 8547 ST11 STATE N, see *8427 ST1 STATE N*.	27
	ST12 TO N	From state 12 to state n. State n is defined by parameter 8557 ST12 STATE N, see *8427 ST1 STATE N*.	28
	ST13 TO N	From state 13 to state n. State n is defined by parameter 8567 ST13 STATE N, see *8427 ST1 STATE N*.	29
	ST14 TO N	From state 14 to state n. State n is defined by parameter 8577 ST14 STATE N, see *8427 ST1 STATE N*.	30
	ST15 TO N	From state 15 to state n. State n is defined by parameter 8587 ST15 STATE N, see *8427 ST1 STATE N*.	31
	ST16 TO N	From state 16 to state n. State n is defined by parameter 8597 ST16 STATE N, see *8427 ST1 STATE N*.	32
	ST1 TO N2	From state 1 to state n2. State n2 is defined by parameter *8429 ST1 STATE N2*.	33
	ST2 TO N2	From state 2 to state n2. State n2 is defined by parameter 8439 ST2 STATE N2, see *8429 ST1 STATE N2*.	34
	ST3 TO N2	From state 3 to state n2. State n2 is defined by parameter 8449 ST3 STATE N2, see *8429 ST1 STATE N2*.	35
	ST4 TO N2	From state 4 to state n2. State n2 is defined by parameter 8459 ST4 STATE N2, see *8429 ST1 STATE N2*.	36
	ST5 TO N2	From state 5 to state n2. State n2 is defined by parameter 8469 ST5 STATE N2, see *8429 ST1 STATE N2*.	37
	ST6 TO N2	From state 6 to state n2. State n2 is defined by parameter 8479 ST6 STATE N2, see *8429 ST1 STATE N2*.	38

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	ST7 TO N2	From state 7 to state n2. State n2 is defined by parameter 8489 ST7 STATE N2, see *8429 ST1 STATE N2*.	39
	ST8 TO N2	From state 8 to state n2. State n2 is defined by parameter 8511 ST8 STATE N2, see *8429 ST1 STATE N2*.	40
	ST9 TO N2	From state 9 to state n2. State n2 is defined by parameter 8429 ST9 STATE N2, see *8429 ST1 STATE N2*.	41
	ST10 TO N2	From state 10 to state n2. State n2 is defined by parameter 8539 ST10 STATE N2, see *8429 ST1 STATE N2*.	42
	ST11 TO N2	From state 11 to state n2. State n2 is defined by parameter 8549 ST11 STATE N2, see *8429 ST1 STATE N2*.	43
	ST12 TO N2	From state 12 to state n2. State n2 is defined by parameter 8559 ST12 STATE N2, see *8429 ST1 STATE N2*.	44
	ST13 TO N2	From state 13 to state n2. State n2 is defined by parameter 8569 ST13 STATE N2, see *8429 ST1 STATE N2*.	45
	ST14 TO N2	From state 14 to state n2. State n2 is defined by parameter 8579 ST14 STATE N2, see *8429 ST1 STATE N2*.	46
	ST15 TO N2	From state 15 to state n2. State n2 is defined by parameter 8589 ST15 STATE N2, see *8429 ST1 STATE N2*.	47
	ST16 TO N2	From state 16 to state n2. State n2 is defined by parameter 8599 ST16 STATE N2, see *8429 ST1 STATE N2*.	48
	ST9 TO N3	From state 9 to state n3. State n3 is defined by parameter 8513 ST9 STATE N3.	57
	ST10 TO N3	From state 10 to state n3. State n3 is defined by parameter 8517 ST10 STATE N3	58
	ST9 TO N4	From state 9 to state n4. State n4 is defined by parameter 8515 ST9 STATE N2.	73
	St10 TO N4	From state 10 to state n4. State n4 is defined by parameter 8519 ST15 STATE N2.	74
	STATE1 ENTER	The cycle count (*0171 SEQ CYCLE CNTR*) increases every time the state enter to state1 from other state.	81
	STATE2 ENTER	Enters the state 2.	82
	STATE3 ENTER	Enters the state 3.	83
	STATE4 ENTER	Enters the state 4.	84
	STATE5 ENTER	Enters the state 5.	85
	STATE6 ENTER	Enters the state 6	86
	STATE7 ENTER	Enters the state 7.	87

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	STATE8 ENTER	Enters the state 8.	88
	STATE9 ENTER	Enters the state 9.	89
	STATE10 ENTER	Enters the state 10.	90
	STATE11 ENTER	Enters the state 11.	91
	STATE12 ENTER	Enters the state 12.	92
	STATE13 ENTER	Enters the state 13.	93
	STATE14 ENTER	Enters the state 14.	94
	STATE15 ENTER	Enters the state 15.	95
	STATE16 ENTER	Enters the state 16.	96
8416	CYCLE CNT RST	Selects the source for the cycle counter reset signal (*0171 SEQ CYCLE CNTR*).	*NOT SEL*
	DI1(INV)	Reset through inverted digital input DI1. 0 = active, 1 = inactive.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	NOT SEL	No reset signal	0
	DI1	Reset through digital input DI1. 1 = active, 0 = inactive.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	STATE 1	Reset during state transition to state 1. Counter is reset, when the state has been reached.	6
	STATE 2	Reset during state transition to state 2. Counter is reset, when the state has been reached.	7
	STATE 3	Reset during state transition to state 3. Counter is reset, when the state has been reached.	8
	STATE 4	Reset during state transition to state 4. Counter is reset, when the state has been reached.	9
	STATE 5	Reset during state transition to state 5. Counter is reset, when the state has been reached.	10

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	STATE 6	Reset during state transition to state 6. Counter is reset, when the state has been reached.	11
	STATE 7	Reset during state transition to state 7. Counter is reset, when the state has been reached.	12
	STATE 8	Reset during state transition to state 8. Counter is reset, when the state has been reached.	13
	SEQ PROG RST	Reset signal source defined by parameter *8404 SEQ PROG RESET*	14
	STATE 9	Reset during state transition to state 9. Counter is reset, when the state has been reached.	15
	STATE 10	Reset during state transition to state 10. Counter is reset, when the state has been reached.	16
	STATE 11	Reset during state transition to state 11. Counter is reset, when the state has been reached.	17
	STATE 12	Reset during state transition to state 12. Counter is reset, when the state has been reached.	18
	STATE 13	Reset during state transition to state 13. Counter is reset, when the state has been reached.	19
	STATE 14	Reset during state transition to state 14. Counter is reset, when the state has been reached.	20
	STATE 15	Reset during state transition to state 15. Counter is reset, when the state has been reached.	21
	STATE 16	Reset during state transition to state 16. Counter is reset, when the state has been reached.	22
8420	ST1 REF SEL	Selects the source for the Sequence program state 1 reference. Parameter is used when parameter *1103 REF1 SELECT* or *1106 REF2 SELECT* is set to *SEQ PROG* / *AI1+SEQ PROG* / *AI2+SEQ PROG*. **Note:** Constant speeds in group *12 CONSTANT SPEEDS* overwrite the selected Sequence program reference.	0.0%
	COMM	*0136 COMM VALUE 2*.	-1.3
	AI1/AI2	Reference is calculated with the following equation: REF = AI1(%) · (50% / AI2 (%))	-1.2
	AI1-AI2	Reference is calculated with the following equation: REF = AI1(%) + 50% - AI2(%)	-1.1
	AI1*AI2	Reference is calculated with the following equation: REF = AI1(%) · (AI2(%) / 50%)	-1.0
	AI1+AI2	Reference is calculated with the following equation: REF = AI1(%) + AI2(%) - 50%	-0.9
	DI4U,5D	Digital input DI4: Reference increase. Digital input DI5: Reference decrease.	-0.8

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI3U,4D	Digital input DI3: Reference increase. Digital input DI4: Reference decrease.	-0.7
	DI3U,4DR	Digital input DI3: Reference increase. Digital input DI4: Reference decrease.	-0.6
	AI2 JOY	Analog input AI2 as joystick. The minimum input signal runs the motor at the maximum reference in the reverse direction, the maximum input at the maximum reference in the forward direction. Minimum and maximum references are defined by parameters *1104 REF1 MIN* and *1105 REF1 MAX*. See parameter *1103 REF1 SELECT* selection *AI1/JOYST* for more information.	-0.5
	AI1 JOY	See selection *AI2 JOY*.	-0.4
	AI2	Analog input AI2	-0.3
	AI1	Analog input AI1	-0.2
	KEYPAD	Control panel	-0.1
	0.0 …100.0%	Constant speed	1 = 0.1%
8421	ST1 COMMANDS	Selects the start, stop and direction for state 1. Parameter *1002 EXT2 COMMANDS* must be set to *SEQ PROG*. **Note:** If change of direction of rotation is required, parameter *1003 DIRECTION* must be set to *REQUEST*.	*DRIVE STOP*
	DRIVE STOP	Drive coast or ramps to stop depending on parameter *2102 STOP FUNCTION* setting.	0
	START FRW	Direction or rotation is fixed to forward. If the drive is not already running, it is started according to parameter *2101 START FUNCTION* settings.	1
	START REV	Direction or rotation is fixed to reverse. If the drive is not already running, it is started according to parameter *2101 START FUNCTION* settings.	2
	TARGET A	Drive make the motor toward the Target A (parameter *1912*,*1913*) automatically. Direction or rotation is fixed by current position (parameter *0192*,*0193* COUNTER VALUE) and Target A.	3
	TARGET B	Drive make the motor toward the Target B (parameter *1914*,*1915*) automatically. Direction or rotation is fixed by current position (parameter *0192*,*0193* COUNTER VALUE) and Target B.	4
	TARGET C	Drive make the motor toward the Target C (parameter *1916*,*1917*) automatically. Direction or rotation is fixed by current position (parameter *0192*,*0193* COUNTER VALUE) and Target C.	5

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	TARGET D	Drive make the motor toward the Target D (parameter *1918*,*1919*) automatically. Direction or rotation is fixed by current position (parameter *0192*,*0193* COUNTER VALUE) and Target D.	6
8422	ST1 RAMP	Selects the acceleration/deceleration ramp time for Sequence program state 1, ie defines the rate of the reference change.	0.0 s
	-0.2/-0.1/ 0.0…1800.0 s	Time When value is set to -0.2, ramp pair 2 is used. Ramp pair 2 is defined by parameters *2205*…*2207*. When value is set to -0.1, ramp pair 1 is used. Ramp pair 1 is defined by parameters *2202*…*2204*. With ramp pair 1/2, parameter *2201 ACC/DEC 1/2 SEL* must be set to *SEQ PROG*. See also parameters *2202*…*2207*.	1 = 0.1 s
8423	ST1 OUT CONTROL	Selects the relay, transistor and analog output control for Sequence program state 1. The relay/transistor output control must be activated by setting parameter *1401 RELAY OUTPUT 1* / *1805 DO SIGNAL* to *SEQ PROG*. Analog output control must be activated by parameter group *15 ANALOG OUTPUTS*. Analog output control values can be monitored with signal *0170 SEQ PROG AO VAL*.	*AO=0*
	RST CNT NEXT	When state x trigger to next and parameter *1907 COUNTER RESET* set to sequence programing, parameter *0192*,*0193* COUNTER VALUE will be reset to parameter *1923*,*1924* RESET VALUE.	-1.0
	RST CNT STNX	When state 1 trigger to STN, STN2, STN3 or STN4 and parameter *1907 COUNTER RESET* set to sequence programing, parameter *0192*,*0193* COUNTER VALUE will be reset to parameter *1923*,*1924* RESET VALUE.	-0.9
	RST CNT ENT	When enter to the state 1 and parameter *1907 COUNTER RESET* set to sequence programing, parameter *0192*,*0193* COUNTER VALUE will be reset to parameter *1923*,*1924* RESET VALUE.	-0.8
	R=0,D=1,AO=0	Relay output is de-energized (opened), transistor output is energized and analog output is cleared.	-0.7
	R=1,D=0,AO=0	Relay output is energized (closed), transistor output is de-energized and analog output is cleared.	-0.6
	R=0,D=0,AO=0	Relay and transistor outputs are de-energized (opened) and analog output value is set to zero.	-0.5
	RO=0,DO=0	Relay and transistor outputs are de-energized (opened) and analog output control is frozen to the previously set value.	-0.4

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	RO=1,DO=1	Relay and transistor outputs are energized (closed) and analog output control is frozen to the previously set value.	-0.3
	DO=1	Transistor output is energized (closed) and relay output is de-energized. Analog output control is frozen to the previously set value.	-0.2
	RO=1	Transistor output is de-energized (opened) and relay output is energized. Analog output control is frozen to the previously set value.	-0.1
	AO=0	Analog output value is set to zero. Relay and transistor outputs are frozen to the previously set value.	0.0
	0.1…600.0%	Value written to signal *0170 SEQ PROG AO VAL*. Value can be connected to control analog output AO by setting parameter *1501 AO1 CONTENT SEL* value to 170 (ie signal *0170 SEQ PROG AO VAL*). AO value is frozen to this value until it is zeroed. This parameter is also used as Torque min/max limit or Max speed limit if *2013 MIN TORQUE SEL*, *2014 MAX TORQUE SEL* or *2201 MAX SPEED SEL*selects *SEQ OUT CTRL*.	
8424	ST1 CHANGE DLY	Defines the delay time for state 1. When delay has elapsed, state transition is allowed. See parameters *8425 ST1 TRIG TO ST 2* and *8426 ST1 TRIG TO ST N*.	0.0 s
	0.0…6553.5 s	Delay time	1 = 0.1 s
8425	ST1 TRIG TO ST 2	Selects the source for the trigger signal which changes the state from state 1 to state 2. **Note:** State change to state N (*8426 ST1 TRIG TO ST N*) has a higher priority than state change to the next state (*8425 ST1 TRIG TO ST 2*).	*NOT SEL*
	DI1(INV)	Trigger through inverted digital input DI1. 0 = active, 1 = inactive.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
	NOT SEL	No trigger signal. If parameter *8426 ST1 TRIG TO ST N* setting is also *NOT SEL*, the state is frozen and can be reset only with parameter *8402 SEQ PROG START*.	0
	DI1	Trigger through digital input DI1. 1 = active, 0 = inactive.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	AI 1 LOW 1	State change when AI1 value < par. *8412 SEQ VAL 1 LOW* value.	6
	AI 1 HIGH 1	State change when AI1 value > par. *8411 SEQ VAL 1 HIGH* value.	7
	AI 2 LOW 1	State change when AI2 value < par. *8412 SEQ VAL 1 LOW* value.	8
	AI 2 HIGH 1	State change when AI2 value > par. *8411 SEQ VAL 1 HIGH* value.	9
	AI1 OR 2 LO1	State change when AI1 or AI2 value < par. *8412 SEQ VAL 1 LOW* value.	10
	AI1LO1AI2HI1	State change when AI1 value < par. *8412 SEQ VAL 1 LOW* value and AI2 value > par. *8411 SEQ VAL 1 HIGH* value.	11
	AI1LO1 ORDI5	State change when AI1 value < par. *8412 SEQ VAL 1 LOW* value or when DI5 is active.	12
	AI2HI1 ORDI5	State change when AI2 value > par. *8411 SEQ VAL 1 HIGH* value or when DI5 is active.	13
	AI 1 LOW 2	State change when AI1 value < par. *8414 SEQ VAL 2 LOW* value.	14
	AI 1 HIGH 2	State change when AI1 value > par. *8413 SEQ VAL 2 HIGH* value.	15
	AI 2 LOW 2	State change when AI2 value < par. *8414 SEQ VAL 2 LOW* value.	16
	AI 2 HIGH 2	State change when AI2 value > par. *8413 SEQ VAL 2 HIGH* value.	17
	AI1 OR 2 LO2	State change when AI1 or AI2 value < par. *8414 SEQ VAL 2 LOW* value.	18
	AI1LO2AI2HI2	State change when AI1 value < par. *8414 SEQ VAL 2 LOW* value and AI2 value > par. *8413 SEQ VAL 2 HIGH* value.	19
	AI1LO2 ORDI5	State change when AI1 value < par. *8414 SEQ VAL 2 LOW* value or when DI5 is active.	20
	AI2HI2 ORDI5	State change when AI2 value > par. *8413 SEQ VAL 2 HIGH* value or when DI5 is active.	21
	TIMED FUNC 1	Trigger with timed function 1. See parameter group *36 TIMED FUNCTIONS*.	22
	TIMED FUNC 2	See selection *TIMED FUNC 1*.	23
	TIMED FUNC 3	See selection *TIMED FUNC 1*.	24
	TIMED FUNC 4	See selection *TIMED FUNC 1*.	25
	CHANGE DLY	State change after delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	26
	DI1 OR DELAY	State change after DI1 activation or after delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	27

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DI2 OR DELAY	See selection *DI1 OR DELAY*.	28
	DI3 OR DELAY	See selection *DI1 OR DELAY*.	29
	DI4 OR DELAY	See selection *DI1 OR DELAY*.	30
	DI5 OR DELAY	See selection *DI1 OR DELAY*.	31
	AI1HI1 ORDLY	State change when AI1 value > par. *8411 SEQ VAL 1 HIGH* value or after delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	32
	AI2LO1 ORDLY	State change when AI2 value < par. *8412 SEQ VAL 1 LOW* value or after delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	33
	AI1HI2 ORDLY	State change when AI1 value > par. *8413 SEQ VAL 2 HIGH* value or after delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	34
	AI2LO2 ORDLY	State change when AI2 value < par. *8414 SEQ VAL 2 LOW* value or after delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	35
	SUPRV1 OVER	Logic value according to supervision parameters *3201*…*3203*. See parameter group *32 SUPERVISION*.	36
	SUPRV2 OVER	Logic value according to supervision parameters *3204*…*3206*. See parameter group *32 SUPERVISION*.	37
	SUPRV3 OVER	Logic value according to supervision parameters *3207*…*3209*. See parameter group *32 SUPERVISION*.	38
	SUPRV1 UNDER	See selection *SUPRV1 OVER*.	39
	SUPRV2 UNDER	See selection *SUPRV2 OVER*.	40
	SUPRV3 UNDER	See selection *SUPRV3 OVER*.	41
	SPV1OVRORDLY	State change according to supervision parameters *3201*…*3203* or when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed. See parameter group *32 SUPERVISION*.	42
	SPV2OVRORDLY	State change according to supervision parameters *3204*…*3206* or when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed. See parameter group *32 SUPERVISION*.	43
	SPV3OVRORDLY	State change according to supervision parameters *3207*…*3209* or when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed. See parameter group *32 SUPERVISION*.	44
	SPV1UNDORDLY	See selection *SPV1OVRORDLY*.	45

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	SPV2UNDORDLY	See selection *SPV2OVRORDLY*.	46
	SPV3UNDORDLY	See selection *SPV3OVRORDLY*.	47
	CNTR OVER	State change when counter value exceeds the limit defined by par. *1925 COUNTER LIMIT HI* and *1926 COUNTER LIMIT LO*. See parameters *1904*…*1911*.	48
	CNTR UNDER	State change when counter value is below the limit defined by par. *1925 COUNTER LIMIT HI* and *1926 COUNTER LIMIT LO*. See parameters *1904*…*1911*.	49
	LOGIC VAL	State change according to logic operation defined by parameters *8406*…*8410*	50
	ENTER SETPNT	State change when drive output frequency/speed enters the reference area (ie the difference is less than or equal to 4% of the maximum reference).	51
	AT SETPOINT	State change when drive output frequency/speed equals the reference value (= is within tolerance limits, ie the error is less than or equal to 1% of the maximum reference).	52
	AI1 L1 & DI5	State change when AI1 value < par. *8412 SEQ VAL 1 LOW* and when DI5 is active.	53
	AI2 L2 & DI5	State change when AI2 value < par. *8414 SEQ VAL 2 LOW* value and when DI5 is active.	54
	AI1 H1 & DI5	State change when AI1 value > par. *8411 SEQ VAL 1 HIGH* value and when DI5 is active.	55
	AI2 H2 & DI5	State change when AI2 value > par. *8413 SEQ VAL 2 HIGH* value and when DI5 is active.	56
	AI1 L1 & DI4	State change when AI1 value < par. *8412 SEQ VAL 1 LOW* value and when DI4 is active.	57
	AI2 L2 & DI4	State change when AI2 value < par. *8414 SEQ VAL 2 LOW* value and when DI4 is active.	58
	AI1 H1 & DI4	State change when AI1 value > par. *8411 SEQ VAL 1 HIGH* value and when DI4 is active.	59
	AI2 H2 & DI4	State change when AI2 value > par. *8413 SEQ VAL 2 HIGH* value and when DI4 is active.	60
	DLY AND DI1	State change when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed and DI1 is active.	61
	DLY AND DI2	State change when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed and DI2 is active.	62
	DLY AND DI3	State change when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed and DI3 is active.	63
	DLY AND DI4	State change when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed and DI4 is active.	64

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	DLY AND DI5	State change when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed and DI5 is active.	65
	DLY & AI2 H2	State change when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed and AI2 value > par. *8413 SEQ VAL 2 HIGH* value.	66
	DLY & AI2 L2	State change when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed and AI2 value < par. *8414 SEQ VAL 2 LOW* value.	67
	DLY & AI1 H1	State change when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed and AI1 value > par. *8411 SEQ VAL 1 HIGH* value.	68
	DLY & AI1 L1	State change when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed and AI1 value < par. *8412 SEQ VAL 1 LOW* value.	69
	COMM VAL1 #0	*0135 COMM VALUE 1* bit 0. 1 = state change.	70
	COMM VAL1 #1	*0135 COMM VALUE 1* bit 1. 1 = state change.	71
	COMM VAL1 #2	*0135 COMM VALUE 1* bit 2. 1 = state change.	72
	COMM VAL1 #3	*0135 COMM VALUE 1* bit 3. 1 = state change.	73
	COMM VAL1 #4	*0135 COMM VALUE 1* bit 4. 1 = state change.	74
	COMM VAL1 #5	*0135 COMM VALUE 1* bit 5. 1 = state change.	75
	COMM VAL1 #6	*0135 COMM VALUE 1* bit 6. 1 = state change.	76
	COMM VAL1 #7	*0135 COMM VALUE 1* bit 7. 1 = state change.	77
	AI2H2DI4SV1O	State change according to supervision parameters *3201*…*3203* when AI2 value > par. *8413 SEQ VAL 2 HIGH* value and DI4 is active.	78
	AI2H2DI5SV1O	State change according to supervision parameters *3201*…*3203* when AI2 value > par. *8413 SEQ VAL 2 HIGH* value and DI5 is active.	79
	STO	State change when STO (Safe torque off) has been triggered.	80
	STO(-1)	State change when STO (Safe torque off) becomes inactive and the drive operates normally.	81
	COMM VAL1 #8	*0135 COMM VALUE 1* bit 8. 1 = state change.	82
	COMM VAL1 #9	*0135 COMM VALUE 1* bit 9. 1 = state change.	83

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	COMM VAL1 #10	*0135 COMM VALUE 1* bit 10. 1 = state change.	84
	COMM VAL1 #11	*0135 COMM VALUE 1* bit 11. 1 = state change.	85
	COMM VAL1 #12	*0135 COMM VALUE 1* bit 12. 1 = state change.	86
	COMM VAL1 #13	*0135 COMM VALUE 1* bit 13. 1 = state change.	87
	COMM VAL1 #14	*0135 COMM VALUE 1* bit 14. 1 = state change.	88
	COMM VAL1 #15	*0135 COMM VALUE 1* bit 15. 1 = state change.	89
	CV1#0 & DLY	State change when *0135 COMM VALUE 1* bit 0 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	90
	CV1#1 & DLY	State change when *0135 COMM VALUE 1* bit 1 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	91
	CV1#2 & DLY	State change when *0135 COMM VALUE 1* bit 2 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	92
	CV1#3 & DLY	State change when *0135 COMM VALUE 1* bit 3 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	93
	CV1#4 & DLY	State change when *0135 COMM VALUE 1* bit 4 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	94
	CV1#5 & DLY	State change when *0135 COMM VALUE 1* bit 5 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	95
	CV1#6 & DLY	State change when *0135 COMM VALUE 1* bit 6 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	96
	CV1#7 & DLY	State change when *0135 COMM VALUE 1* bit 7 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	97
	CV1#8 & DLY	State change when *0135 COMM VALUE 1* bit 8 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	98
	CV1#9 & DLY	State change when *0135 COMM VALUE 1* bit 9 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	99

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	CV1#10 & DLY	State change when *0135 COMM VALUE 1* bit 10 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	100
	CV1#11 & DLY	State change when *0135 COMM VALUE 1* bit 11 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	101
	CV1#12 & DLY	State change when *0135 COMM VALUE 1* bit 12 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	102
	CV1#13 & DLY	State change when *0135 COMM VALUE 1* bit 13 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	103
	CV1#14 & DLY	State change when *0135 COMM VALUE 1* bit 14 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	104
	CV1#15 & DLY	State change when *0135 COMM VALUE 1* bit 15 = 1 and delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed.	105
	SPV1OVANDDLY	State change according to supervision parameters *3201*…*3203* and when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed. See parameter group *32 SUPERVISION*.	106
	SPV2OVANDDLY	State change according to supervision parameters *3204*…*3206* and when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed. See parameter group *32 SUPERVISION*.	107
	SPV3OVANDDLY	State change according to supervision parameters *3207*…*3209* and when delay time defined by parameter *8424 ST1 CHANGE DLY* has elapsed. See parameter group *32 SUPERVISION*.	108
	SPV1UNANDDLY	See selection *SPV1OVRORDLY*.	109
	SPV2UNANDDLY	See selection *SPV1OVRORDLY*.	110
	SPV3UNANDDLY	See selection *SPV1OVRORDLY*.	111
	AT TARGET A	State change when parameter *0190* POS STATUS bit 0 (AT Target A) =1.	112
	AT TARGET B	State change when parameter *0190* POS STATUS bit 1 (AT Target B) =1.	113
	AT TARGET C	State change when parameter *0190* POS STATUS bit 2 (AT Target C) =1.	114
	AT TARGET D	State change when parameter *0190* POS STATUS bit 3 (AT Target D) =1.	115

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	LOGIC2 VAL	State change according to logic operation defined by parameters *8501*....*8505*.	116
	SLOWDOWN A	State change when parameter *0190* POS STATUS bit 8 (Slowdown A) =1.	117
	SLOWDOWN B	State change when parameter *0190* POS STATUS bit 9 (Slowdown B) =1.	118
	SLOWDOWN C	State change when parameter *0190* POS STATUS bit 10 (Slowdown C) =1.	119
	SLOWDOWN D	State change when parameter *0190* POS STATUS bit 11 (Slowdown D) =1.	120
8426	ST1 TRIG TO ST N	Selects the source for the trigger signal which changes the state from state 1 to state N. State N is defined with parameter *8427 ST1 STATE N*. **Note:** State change to state N (*8426 ST1 TRIG TO ST N*) has a higher priority than state change to the next state (*8425 ST1 TRIG TO ST 2*).	*NOT SEL*
		See parameter *8425 ST1 TRIG TO ST 2*.	
8427	ST1 STATE N	Defines the state N. See parameter *8426 ST1 TRIG TO ST N*.	*STATE 1*
	STATE 1	State 1	1
	STATE 2	State 2	2
	STATE 3	State 3	3
	STATE 4	State 4	4
	STATE 5	State 5	5
	STATE 6	State 6	6
	STATE 7	State 7	7
	STATE 8	State 8	8
	STATE 9	State 9	9
	STATE 10	State 10	10
	STATE 11	State 11	11
	STATE 12	State 12	12
	STATE 13	State 13	13
	STATE 14	State 14	14
	STATE 15	State 15	15
	STATE 16	State 16	16

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
8428	ST1 TRIG TO STN2	Selects the source for the trigger signal which changes the state from state 1 to state N2. State N2 is defined with parameter *8429 ST1 STATE N2*. **Note:** State change to state N2 (*8428 ST1 TRIG TO STN2*) has a higher priority than state change to the N state (*8426 ST1 TRIG TO ST N*).	NOT SEL
		See parameter *8425 ST1 TRIG TO ST 2*.	
8429	ST1 STATE N2	Defines the state N2. See parameter *8427 ST1 STATE N*.	*STATE 1*
		See parameter *8427 ST1 STATE N*	
8430	ST2 REF SEL	See parameters *8420*…*8429*.	
…			
8495	ST8 TRIG TO ST1	See parameter *8425*. **Note:** State change to NEXT state 9 (*8510 ST8 TRIG TO ST 9*) has a higher priority than state change to state 1.	
8496	ST8 TRIG TO ST N	See parameter *8425*.	
8497	ST8 STATE N	See parameter *8426*.	
8498	ST8 TRIG TO STN2	See parameter *8428 ST1 TRIG TO STN2*.	
8499	ST8 STATE N2	See parameter *8429 ST1 STATE N2*.	
85 SEQUENCE PROG2		Sequence program group 2. See section *Settings* on page *36*.	
8501	SEQ LOGIC2 VAL 1	See parameter *8406*.	
8502	LOGIC2 OPER1	See parameter *8407*.	
8503	SEQ LOGIC2 VAL2	See parameter *8406*.	
8504	LOGIC2 OPER2	See parameter *8407*.	
8505	SEQ LOGIC2 VAL3	See parameter *8406*.	
8506	MACRO CHG ST	User Macro was changed when the sequence programing enter the setting state. **Example:** When parameter is set to state 1 and sequence programing enter to stat1, the user macro changed to parameter *8507 USER MACRO SEL* setting. Note: The sequence programing user macro changing function should activate by the parameter *1605 USER PAR SET CHG* set to *SEQ PROG*.	NOT SEL
	NOT SEL	Disable	0
	STATE 1	State 1	1

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
	STATE 2	State 2	2
	STATE 3	State 3	3
	STATE 4	State 4	4
	STATE 5	State 5	5
	STATE 6	State 6	6
	STATE 7	State 7	7
	STATE 8	State 8	8
	STATE 9	State 9	9
	STATE 10	State 10	10
	STATE 11	State 11	11
	STATE 12	State 12	12
	STATE 13	State 13	13
	STATE 14	State 14	14
	STATE 15	State 15	15
	STATE 16	State 16	16
8507	USER MACRO SEL	Defines the user macro selection.	USER LOAD1
	USER S1 LOAD	When sequence programing enter to parameter 8506 MACRO CHG ST setting, User 1 macro loaded into use. Note: The sequence programing user macro changing function should activate by the parameter *1605 USER PAR SET CHG* set to *SEQ PROG*.	1
	USER S2 LOAD	See the USER S1 LOAD.	2
	USER S3 LOAD	See the USER S1 LOAD.	3
8510	ST8 TRIG TO ST 9	See parameter *8425*.	
8512	ST9 TRIG TO STN3	Selects the source for the trigger signal which changes the state from state 9 to state N3. State N3 is defined with parameter *8513 ST9 STATE N3*. **Note:** State change to state N3 (parameter *8512 ST9 TRIG TO STN3*) has a higher priority than state change to the N2 state (parameter 8528 ST9 TRIG TO STN2).	NOT SEL
		See parameter *8425 ST1 TRIG TO ST 2*.	
8513	ST9 STATE N3	Defines the state N3. See parameter *8427 ST1 STATE N*.	STATE 1

All parameters			
No.	**Name/Value**	**Description**	**Def/FbEq**
8514	ST9 TRIG TO STN4	Selects the source for the trigger signal which changes the state from state 9 to state N4. State N4 is defined with parameter *8515 ST9 STATE N4*. **Note:** State change to state N4 (parameter *8514 ST9 TRIG TO STN4*) has a higher priority than state change to the N3 state (parameter *8512 ST9 TRIG TO STN3*).	NOT SEL
		See parameter *8425 ST1 TRIG TO ST 2*.	
8515	ST9 STATE N4	Defines the state N4. See parameter *8427 ST1 STATE N*.	STATE 1
8516	ST10 TRIG TO STN3	See parameter *8512 ST9 TRIG TO STN3*.	
8517	ST10 STATE N3	See parameter *8513 ST9 STATE N3*.	
8518	ST10 TRIG TO STN4	See parameter *8514 ST9 TRIG TO STN4*.	
8519	ST10 STATE N4	See parameter *8515 ST9 STATE N4*.	
8520	ST9 REF SEL	See parameters *8420*…*8429*.	
…			
8599	ST16 STATE N2		

Further information

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