9. FUNCTION DESCRIPTION

The standard factory-loaded Flexmax application (or firmware) allows torque, speed, position and electric shaft regulation. The drive is supplied defaulted to run as a speed regulator. The four regulation modes are correlated one with the other and are enabled via a suitable bit parameter which can be addressed as a digital input.

9.1. MONITOR

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
ACTUAL SPEED (rpm)	20040	float	0	10000	-	R	
MOTOR CURRENT (A)	20041	float	0	Drive size	-	R	
DC LINK VOLTAGE (V)	20043	float	0	1000	-	R	
DRIVE TEMPERATURE (°C)	20044	word	0	100	-	R	

Axvt91

ACTUAL SPEED — Motor present speed (read only).

MOTOR CURRENT — Motor present current (read only).

DCLINK VOLTAGE — DC link voltage (read only).

DRIVE TEMPERATURE — Drive heatsink temperature (read only).

9.2. DRIVE PARAMETERS

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
DRIVE MAXIMUM CURRENT (A)	20000	float	0	Drive size	6	R/Z	
DRIVE ADDRESS	20021	word	0	127	0	R/Z	
DRIVE CONFIGURATION	20023	enum	0	16	Speed	R/W	ID
Current						1	
Speed						2	
Position						4	
els						8	
encoder phasing						16	
DRIVE BAUDRATE	20024	enum	1200	38400	38400	R/W	
DRIVE SERIAL CONFIG	20025	enum	32785	32927	32785	R/W *	
DRIVE SER DELAY TIME	20026	word	0.000	1.000	0.000	R/W	
DRIVE FAST LINK	18110	enum	0	2	0	R/W *	
OFF						0	
Master [X 3]						1	
Slave [X 4]						2	
DRIVE FIRMWARE	20022	float				R	
DRIVE ACTUAL CONFIG	29004	enum	0	17	Speed	R/W	ID
Current						1	
Speed						2	
Position						4	
els						8	
encoder phasing						16	
ATTENTION:encoder phasing						17	

Axvt92

DRIVE MAXIMUM CURRENT

Setting the drive maximum current output to the motor.

DRIVE ADDRESS

Drive address when it is connected via the RS485 serial line.

DRIVE CONFIGURATION

Configuration of the drive working mode. It is possible to select four different modes: torque, speed, electric axis and position control (as for the selection see the table below).

The drive is factory programmed for speed control.

It is also possible to phase a new encoder, in case the old one has to be replaced.

Function configuration	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5...15 (*)
Drive disabled	0	0	0	0	0	0
Torque control	1	0	0	0	0	0
Speed control	0	1	0	0	0	0
Position control	0	0	1	0	0	0
Electric line shaft control	0	0	0	1	0	0
Encoder phasing	0	0	0	0	1	0

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(*) These bits have to be set at 0 to be compatible with future versions.

The different working modes can be selected also via a suitably programmed digital input. See the chapter “Digital input programming” for further details.

DRIVE BAUDRATE

Configuration of the communication speed (baudrate) of the drive serial line. It is possible to select one of the following values:

- 1200 **- 2400** **- 4800**

- 9600 **- 19200** **- 38400**

The value in the factory configuration is 38400.

If this value is modified, it is advisable to mark the drive with a label if you change the default to highlight the different serial line configuration; in this way, possible communication problems between the drive and the WinPX configurator, whose default setting is 38400, will be avoided.

DRIVE SERIAL CONFIG

Configuration of the drive RS485 serial port. It is possible to select one of the following values:

-32785 (NO parity, 8 data bit, 1 stop bit)

-36919 (Odd parity, 8 data bit, 1 stop bit)

-32823 (Even parity, 8 data bit, 1 stop bit)

-32793 (No parity, 8 data bit, 2 stop bit)

-36927 (Odd parity, 8 data bit, 2 stop bit)

-32831 (Even parity, 8 data bit, 2 stop bit)

The factory configuration is 32785 (no, 8, 1)

In this case too, as for the previous parameter, it is advisable to mark the drive with a label.

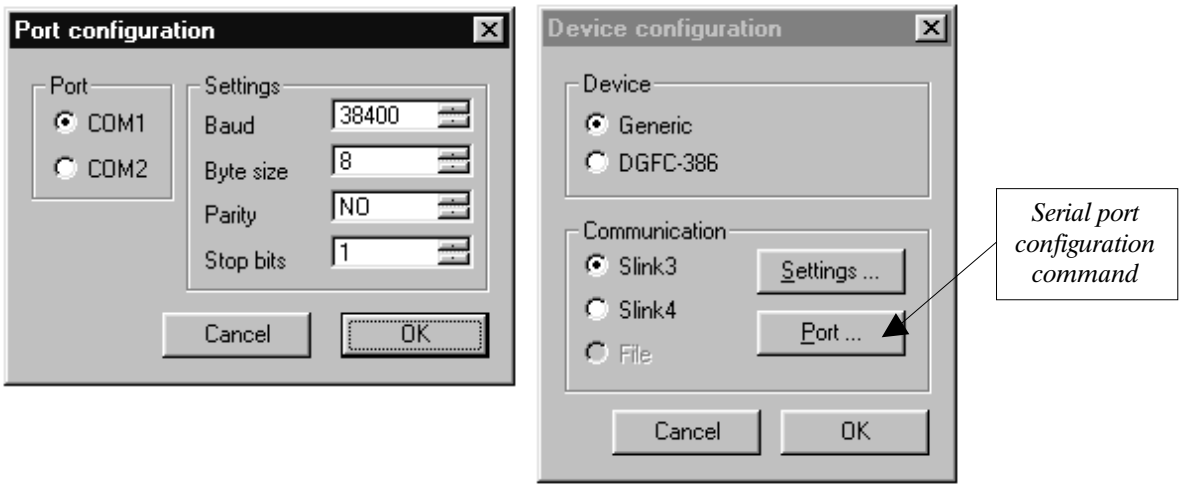


Figure 9.2.1: Serial port configuration

ATTENTION: The modification of the serial port configuration (**Drive baudrate** and **Drive serial config** parameters**)** becomes active only after a drive **Reset**.

It is necessary to configure the drive and the WinPX configurator in the same way.

Command **Target** →

→ **communication setting** →

→ **Port** (Enter the required parameters by using the same values set in the drive).

DRIVE SER DELAY TIME

Setting of the minimum delay between the drive reception of the last byte and the beginning of its response. Such delay avoids any conflict on the serial line when the RS485 interface is not set for an automatic TX/RX switching.

DRIVE FAST LINK

Enable of fast link on the X3 and X4 connectors.

Using fast link in electrical line shaft configuration, it is necessary configure this parameter

OFF The fast link is disabled

Master XT-OUT Fast link enable (configure as master)

Slave XT-IN Fast link enable (configure as slave).

The enable of this parameter is active only after a reset command.

Fast link communication can be used installing the EXP-BRS optional board.

DRIVE FIRMWARE

Displaying of the firmware version active on the drive Flash Eprom.

DRIVE ACTUAL CONFIG

Only-reading parameter: it states the selected functioning method (see the DRIVE CONFIGURATION parameter).

9.3. MOTOR PARAMETERS

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
MOTOR NUMBER OF POLES	20002	word	2	8	8	R/Z *	
MOTOR MAXIMUM SPEED (rpm)	20003	float	0	10000	3000	R/Z	

Axvt93

MOTOR NUMBER OF POLES — Setting the motor poles. All the motors made by Powertec are either 4, 6, or 8 poles. PacTorq motors are 6 and 8 poles, while Ferrite motors are 4 and 8 poles.

MOTOR MAXIMUM SPEED — Setting of the motor maximum speed (unit of measure **Rpm**). The drive maximum speed is limited according to the value set in this parameter.

9.4. ENCODER PARAMETERS

The signals coming from the position sensors are mainly used in two points of the brushless motor control system: First is to modulate the three stator currents in order to obtain an equivalent field presenting a 90 electric degree phase shift as compared to the field of the permanent magnets. They are also used for feedback of the speed/space loop. These two functions are usually performed by two different position sensors, which are usually integrated into one single encoder. The features of the two sensors are, in fact, different. One determines commutation, the other, speed and sinewave accuracy.

In order to keep the stator field in the desired position, it is necessary to know, also at power-on, the absolute position in the electrical revolution; for this purpose resolvers are normally used, but digital encoders with hall channels are also supported. The original Powertec feedback device is also supported but the output of the drive will be a distored sinewave, possibly creating extra motor heating in a PacTorq motor (not with Ferrite motors).

The feedback of the speed/space loop requires the maximum possible resolution; the loop quality defines the limit of the control loop. We recommend for best accuracy and smoothness, the resolver, or a Sin-Cos type encoder.

The Flexmax drive digitizes the data of the sinewave in a resolver or SinCos encoder to a resolution of 2^{14} (16,384 pulses equivalent), thus obtaining a high precision level and very good behavior in conditions of low speed and locked shaft.

In the Flexmax drives, after passing of first index when using a digital encoder, the field modulation is based on the reading of the sensor with the highest resolution, which becomes absolute since the sensor mechanical position is known.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
ENCODER TYPE	20010	enum	0	6	Sin. 5 traces	R/Z *	
Sincos 5 tracks						1	
Dig + Hall port XE						2	
Dig + Hall port XFR						3	
Hall						4	
sincos 2 traks						5	
sincos+ hall						6	
Resolver						8	
ENCODER PULSES	20011	word	0	32767	2048	R/Z	
ENCODER SUPPLY (V)	20012	float	4.8V	14.4V	5,25V	R/W	

txv0350

ENCODER TYPE	Software setting of the encoder type used for the feedback, to be connected to the S2 connector (standard connection).
Sincos 5 tracks	Absolute sine and cosine once per revolution, incremental and sinusoidal A and B, I zero slot or index.
Digital+Hall Port XE	Hall sensors, incremental digital A-B channel, I zero marker or index. Encoder connections on XE connector (25 pins).
Digital+Hall Port XFR	Hall sensors, incremental digital A-B channel, I zero marker or index. Encoder connections on XFR connector (15 pins).
Hall	Hall sensors. Connections on XE connector (25 pins).
Sincos 2 tracks	Absolute sine and cosine once per revolution. Connections on S2 connector (25 pins).
Sin + Hall	Hall sensors, sinusoidal incremental A-B channel, I zero marker or index.
Resolver	Connection on the optional board EXP-BRS.

To select the encoder type the Flexmax drives needs a software parameter setting and also a hardware setting through jumpers. This is necessary to allow so many kinds with so few connectors.

ENCODER PULSES	Number of pulses per revolution of the encoder. Use 2048 for all resolvers. The actual resolution of the resolver is much higher but the speed (rpm) reporting is based on 2048.
ENCODER SUPPLY	It is possible to program the encoder supply level between the minimum 5,25V and the maximum 6,0V value, in order to balance possible voltage drops on a long encoder cable, so that the level of the motor feedback signals is suitable to be read by the drive.

9.5. RAMP

The acceleration and deceleration of the speed reference is set by the **Ramp acc/dec CW** parameters for clockwise rotation direction and by **Ramp acc/dec CCW** for counterclockwise rotation direction.

The ***Fast stop*** function allows stopping the motor in the shortest possible time in case of emergency regardless of the normal ramps set.. Set a digital input as **Fast/stop.**

These parameters are active in the only in the speed control configuration; for a position control application see the specific paragraph.

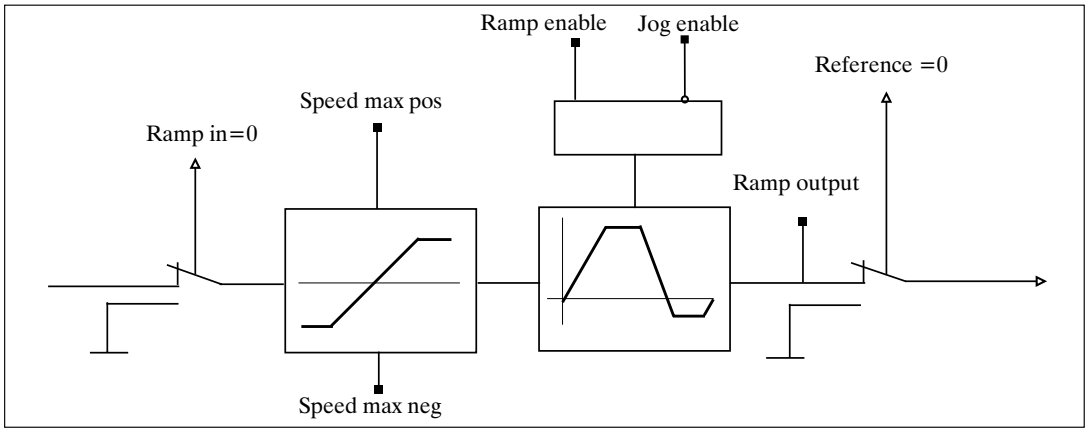


Figure 9.5.1: Ramp circuit

The drive behavior after the **Start** command depends on the parameter settings:

- If the ramp circuit is used (**Enable ramp = enable**) the motor reaches the desired speed at set ramp rate. If commanded to stop, the drive stops with the deceleration ramp time. If during the deceleration time a new start command is given, the drive regains the set speed.

- If the ramp circuit is not used (**Enable ramp = disable**) the motor reaches the desired speed in the shortest possible time limited only by current.

When the motor is stopped, the drive is torque-enabled. The drive can be disabled by opening the **Enable drive** command.

The **Jog** function does not require the **Start** command, but requires the enable.

In case the **Start** and **Jog+** or **Jog-** commands are given simultaneously, the start command has the priority.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
RAMP ACC CW (msec/rpm)	21102	float	0	17476/enc pul	0,330	R/W	
RAMP ACC CCW (msec/rpm)	21103	float	0	17476/enc pul	0,330	R/W	
RAMP DEC CW (msec/rpm)	21104	float	0	17476/enc pul	0,330	R/Z	
RAMP DEC CCW (msec/rpm)	21105	float	0	17476/enc pul	0,330	R/W	
RAMP ENABLE	21210	enum	0	1	Enable	R/Z	
Disable						0	
Enable						1	
RAMP OUTPUT (rpm)	21212	float	-10000	10000	0	R	
txv0360							

RAMP ACC CW — Setting of the clockwise acceleration time.
Unit of measure (msec/rpm).

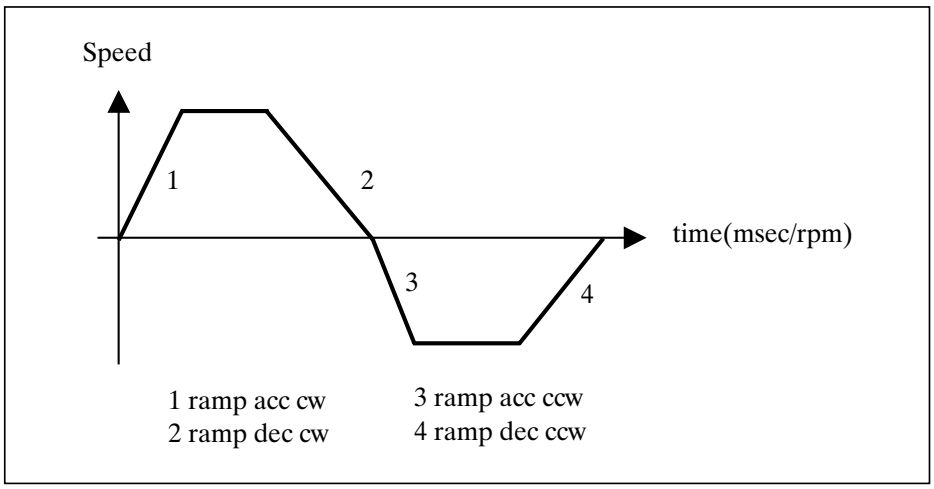
RAMP ACC CCW — Setting of the counterclockwise acceleration time.
Unit of measure (msec/rpm).

RAMP DEC CW — Setting of the clockwise deceleration time.
Unit of measure (msec/rpm).

RAMP DEC CCW — Setting of the counterclockwise deceleration time.
Unit of measure (msec/rpm) .

RAMP ENABLE — Ramp enabling command.

RAMP OUTPUT — Parameter reading the speed reference on the output of the ramp block. It is read-only.



Fast stop (Fast stop)

The fast stop command is used in emergency and dangerous situations in order to stop the drive in the shortest possible time. If a digital input is set as Fast stop, this imput ***must be high*** to run in any mode.

The fast stop command must be present before the drive enabling command (Enable command).

By disabling the voltage on this input while the drive is active, it is possible to cause a braking stop with the shortest possible time.

With a start following a Fast/stop command it is necessary to set the Enable digital input with a low logic status and the Fast/stop digital input with a high logic status before a og function can be performed.

9.6. SPEED

The value of the speed reference determines the value of the motor speed, while the sign defines the rotation direction.

When the ramp is enabled (parameter **Ramp Enable = enable**), the speed reference (**Speed ref**) follows the time set in the **acc** and **dec** parameters **(CW - CCW)**.

The **Speed ref1**, **Speed ref 2**, **Speed max pos** and **Speed max neg** parameters are active only in the **Speed loop** configuration. See the specific paragraph for the **Position loop** configuration.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
SPEED REF1 (rpm)	21200	float	-10000	10000	0	R/W	
SPEED REF2 (rpm)	21201	float	-10000	10000	0	R/W	
SPEED MAX POS (rpm)	21204	float	0	10000	3000	R/W	
SPEED MAX NEG (rpm)	21205	float	0	10000	3000	R/W	
SPEED THR (rpm)	21206	float	0	10000	1000	R/W	
SPEED THR OFFSET (rpm)	21207	float	0	10000	10	R/W	
SPEED THR DELAY (sec)	21213	float	0	10	0	R/W	

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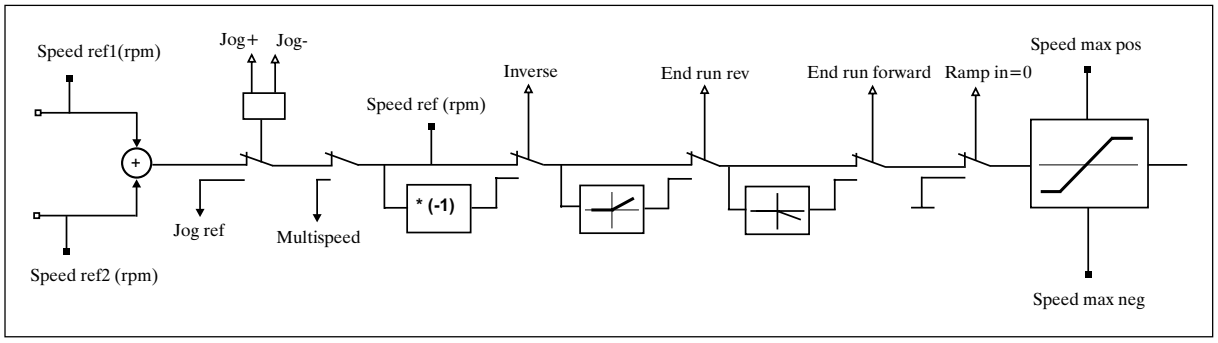


Figure 9.6.1: Speed reference

SPEED REF1

Speed reference 1.

Setting of the speed reference if no analog input has been set as SPEED REF .

In case an analog input is set as SPEED REF, the **Speed Ref 1** parameter is read-only. Unit of measure (rpm).

SPEED REF2

Speed reference 2 .

Setting of the speed reference 2 if no analog input has been set as SPEED REF .

In case an analog input is set as SPEED REF, the **Speed Ref 2** parameter is read-only. Unit of measure (rpm).

The total reference is the result of the sum of the values of **Speed ref 1** and **Speed ref 2** .

Example 1: Speed ref 1 = 1500 rpm Speed ref 2 = 500 rpm

Speed ref = 1500 + 500 = 2000 rpm

Example 2: Speed ref 1 = 1500 Rpm Speed ref 2 = -500 rpm

Speed ref = 1500 - 500 = 1000 rpm

SPEED MAX POS

Setting of the maximum speed for motor clockwise rotation direction. Unit of measure (rpm).

SPEED MAX NEG

Setting of the maximum speed for motor counterclockwise rotation direction. Unit of measure (rpm).

The analog speed reference is scaled with the two parameters “SPEED MAX POS” and “SPEED MAX NEG”.

SPEED THR

Setting of the threshold value for overspeed. Such threshold is stated as an absolute value. When the speed is higher than the value set in this parameter, the digital output set as “speed threshold” goes to +24V.

Unit of measure (rpm)

SPEED THR OFFSET — Offset setting of the zero speed threshold. It states how much the speed can oscillate around zero before the digital output programmed as "Speed 0 thr" will be considered as active. Unit of measure (rpm).

SPEED THR DELAY — Setting of the delay time signaling that the motor has reached a speed. When the motor speed is higher than the value set in SPEED THR for a time higher than the value of this parameter, a digital output set with SPEED THR DELAY is brought to +24V. Unit of measure in seconds (sec).

9.7. CURRENT

The current loop is the fastest control section and has a sampling frequency of 16 KHz.

There are two current loops working simultaneously. The components of the forward and quadrature current are calculated directly from the phase currents read by the AD converters; both components are controlled in order to obtain the desired behavior. The quadrature component contributes to the rotating torque while the forward component is (usually) set at zero.

The operation with current or torque control is active if the **Drive configuration** parameter is set as "Current loop". In this case the motor supplies a torque proportional to the current reference Tcurr ref.

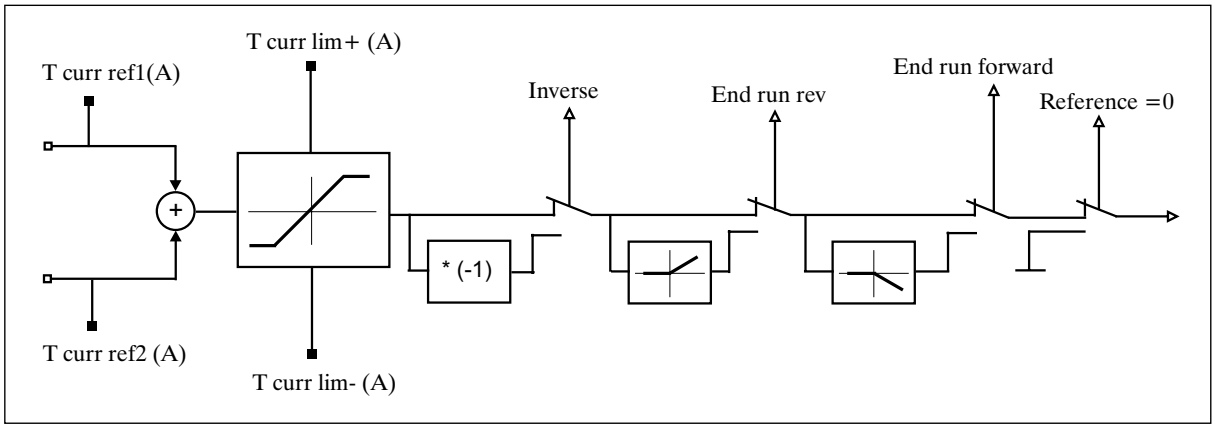


Figure 9.7.1: Current reference

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
T CURR REF1 (A)	22000	float	- drive size	+drive size	0	R/W	
T CURR REF2 (A)	22001	float	- drive size	+drive size	0	R/W	
T CURR LIM + (A)	22004	float	0	drive size	6	R/W	
T CURR LIM - (A)	22005	float	0	drive size	6	R/W	
T CURR THR (A)	22007	float	0	drive size	0	R/W	
MAX SPEED CUR LIM (rpm)	22009	float	0	10000	3000	R/W	
CURR THR DELAY (sec)	22010	float	0	10	0	R/W	

Axvt97

T CURR REF 1	Current reference 1. Setting of the current reference if no analog input has been set as T CURR REF 1 . In case an analog input is set as T CURR REF 1, the parameter is read-only. Unit of measure : Ampere.
T CURR REF 2	Current reference 2. Setting of the current reference if no analog input has been set as T CURR REF2 . In case an analog input is set as T CURR REF 2, the parameter is read-only. Unit of measure : Ampere.

The **T curr ref 1 and Tcurr ref 2** parameters are only active if the operating mode is selected as **Current loop**.
The total reference is the result of the sum of the values of **T curr ref 1 and Tcurr ref 2**.

T CURR LIM+	Setting of the positive current limit. The maximum current which will be supplied by the drive is stated by this parameter. Unit of measure : Ampere.
T CURR LIM -	Setting of the negative current limit. The maximum current which will be supplied by the drive is stated by this parameter. Unit of measure : Ampere. T CURR LIM+ and T CURR LIM- cannot exceed the **Drive maximum current** parameter, the drive will prevent settings this high.
T CURR THR	Setting of the threshold value for maximum current. Such threshold is stated as an absolute value. When the current is higher than the value set in this parameter, a digital output set as "Curr threshold" goes to +24V. Unit of measure : Ampere.
MAX SPEED CUR LIM	Setting of the speed limit in torque control. When the motor is torque controlled, the speed can not exceed the value set in this parameter.
CURR THR DELAY	Setting of the delay time signaling that the motor has reached a current level. When the current supplied by the drive is higher than the value set in T CURR THR for a time higher than the value of this parameter, a digital output set with CURR THR DELAY goes to +24V. Unit of measure in seconds (sec).

ATTENTION: In order to change the gains (proportional, integral and derivative part) of the current regulator, it is necessary to modifie the parameters in "System" menu.

Change the parameters:

SYS_IC_P_FAK	Proportional gain
SYS_IC_I _FAK	Integral gain
SYS_IC_D_FAK	Derivative gain

9.8. SPEED GAINS

The Flexmax drives are supplied with a speed/position control loop.
The position loop is supported by the DSP and has a sampling frequency of 8 kHz.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
GAIN SPEED	23000	int	0	32767	100	R/W	
GAIN POS	23001	int	0	32767	50	R/W	
GAIN INT	23002	int	0	32767	50	R/W	

Axvt98

GAIN SPEED — Speed proportional gain (this value is factory set at 100)
GAIN POS — Position proportional gain (this value is factory set at 50)
GAIN INT — Position integral gain (this value is factory set at 50)

These are conservative, relatively low performance settings, suitable for most general purpose applications, they can be set much higher if machine construction allows it and the application requires it.

9.9. DIGITAL INPUTS

The regulation board of the Flexmax drive has 8 digital inputs. Seven digital inputs can be programmed to different functions and they are located on the X1 terminal block.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
DIGITAL INPUT 0	20100	enum	1	1	enable	R	
DIGITAL INPUT 1	20101	enum	0	2007	start/stop	R/Z	
DIGITAL INPUT 2	20102	enum	0	2007	ramp in=0	R/Z	
DIGITAL INPUT 3	20103	enum	0	2007	inverse	R/Z	
DIGITAL INPUT 4	20104	enum	0	2007	end run rev	R/Z	
DIGITAL INPUT 5	20105	enum	0	2007	end run fwd	R/Z	
DIGITAL INPUT 6	20106	enum	0	2007	exter. Fault	R/Z	
DIGITAL INPUT 7	20107	enum	0	2007	failure reset	R/Z	
DIG IN NEG	20162	dword	0H	0FFFFFFFFH	0H	R/Z	
DIG IN STATUS	20163	word	0H	0FFFH	0H	R	

txv0370

DIGITAL INPUT XX — Choice of the parameters to be set on a di**gital input.**

The possibilities listed as *"Coding for the input association"* are available.

Parameter 20100, digital input 0, is read only. It cannot be programmed and it is set to the default value "enabled". It is active if high.

DIG IN NEG

This parameter allows changing the logic level of the set digital inputs. Normally digital inputs become active when switching from a low to a high logic level occurs. Through this bit-set parameter it is possible to decide whether to change the logic condition, i.e. active low logic level, inactive high logic level. This parameter cannot modify the logic level of digital input 0.

Example: The intervention of two limit switches (END RUN FORWARD and END RUN REVERSE) has to be set on two digital inputs, digital input 3 and digital input 4; the limit switch intervention has to be active with a low logic level.

DIGITAL INPUT	7	6	5	4	3	2	1	0
DIG IN NEG	0	0	0	1	1	0	0	0
	1				8			

axv6046

It is necessary to set DIG IN NEG = 18H

DIG IN STATUS

Read-only parameter stating the present condition (high logic level 1 and low logic level 2) of the digital inputs. It is an hexadecimal parameter.

Example: The digital inputs are:

DIG IN 0 = 1 DIG IN 1 = 1 DIG IN 6 = 1

DIGITAL INPUT	7	6	5	4	3	2	1	0
DIG IN STATUS	0	1	0	0	0	0	1	1
	4				3			

axv6047

The value displayed by the DIG IN STATUS parameter is 43H .

Choices for the digital input association:

OFF (0) Unconfigured input.

Failure reset (2) Alarm **Reset** command. Momentary input active on the edge. The drive must be disabled for a reset to occur.

External fault (3) **External alarm** signal. It is active on the leading edge.

Start/stop (4) **Start /stop** command. It is active on the leading edge. In the current and speed configuration this command must be programmed on a digital input.

If its value is high, it starts the drive operation; if its value is low, the drive will stop. When this command is active, if a speed reference is present, the motor goes to the set speed.

Fast/stop (5) **Emergency stop** command**.** It is active on the leading edge, it stops the speed command instantly, braking the motor with no decel ramp in the shortest possible time till zero speed has been reached (see fast/stop paragraph).

Jog+ (6) **Jog forward function** command. It is active only in the speed and position configurations. When this input is active, the speed reference and the ramp times are those set in the Jog parameter menu.

Jog-	(7)	**Jog reverse function** command. It is active only in the speed and position configurations. When this input is active, the speed reference and the ramp times are those set in the Jog parameter menu.
Ramp in=0	(8)	**Ramp In = 0** command. It is active only in the speed and position configurations. When this input is active (high logic status), it replaces the present reference with a zero reference and uses the set ramp. This digital zero keeps the motor rotor stopped in a torque condition, without any offset drift typical for A/D (analog/digital) converters.
Inverse	(9)	**Inverse** command. When the command is active, it changes the motor rotation direction by following the set ramp.
End Run Reverse	(10)	**Clockwise end run** command. It is active only in the speed and position configuration. It only allows, regardless of reference, motor rotation in a clockwise (CW) direction.
End Run Forward	(11)	**Counterclockwise end run** command. It is active only in the speed and position configuration. It only allows, regardless of reference, motor rotation in a counterclockwise (CCW) direction.
Reference=0	(12)	**Speed reference = 0**. It has the same function as Ramp In = 0 but it does not perform the decel ramp, it stops immediately.
Memo virtual zero	(13)	Storage of the **ero pulse**. Momentary input active on the edge. It makes the Index signal (or zero slot) the present position.
Current loop	(14)	Select the mode to **Current regulation.**
Speed loop	(15)	Select the mode to **Speed regulation.**
Position loop	(16)	Select the mode to **Position regulation.**
Line Shaft loop	(17)	Select the mode to **Electrical line shaft** control**.**
Disable An inp 0	(18)	Command **Disabling analog input 0** (both the value and the offset are disabled). With a high logic level analog input 0 is disabled.
Disable An inp 1	(19)	Command **Disabling analog input 1** (both the value and the offset are disabled). With a high logic level the analog input 1 is disabled.
Disable An inp 2	(20)	Command **Disabling the analog input 2** (both the value and the offset are disabled). With a high logic level analog input 2 is disabled.
Speed sel bit 0	(21)	Multi-speed function, **Bit 0 selection**. When this digital input is active, it is possible to select a digital speed reference set in the parameters of the Multi speed function.
Speed sel bit 1	(22)	Multi-speed function, **Bit 1 selection**. When this digital input is active, it is possible to select a digital speed reference set in the parameters of the Multi speed function.

Speed sel bit 2 (23) Multi-speed function, **Bit 2 selection**.
When this digital input is active, it is possible to select a digital speed reference set by the parameters of the Multi speed function.

Ramp sel bit 0 (24) Multi-ramp function, **Bit 0 selection**.
When this digital input is active, it is possible to select a ramp time set by the parameters of the Multi ramp function.

Ramp sel bit 1 (25) Multi-ramp function, **Bit 1 selection**.
When this digital input is active, it is possible to select a ramp time set by the parameters of the Multi ramp function.

Virtual DI OK (26) When the virtual digital input 14 (only this one) is set with VIRTUAL DI OK, all the set *Virtual digital inputs* are active only if this input is equal to 1 (high logic level). In other words, this enables virtual digital inpus to be used.

Pos-preset 0 (1001) **Bit 0 position preset**. Active only in the position configuration. When this digital input is active, the relative value set in the Position Preset is selected.

Pos-preset 1 (1002) **Bit 1 position preset**. Active only in the position configuration. When this digital input is active, the relative value set in the Position Preset parameters is selected.

Pos-preset 2 (1003) **Bit 2 position preset**. Active only in the position configuration. When this digital input is active, the relative value set in the Position Preset parameters is selected.

Pos-preset 3 (1004) **Bit 3 position preset**. Active only in the position configuration. When this digital input is active, the relative value set in the Position Preset parameters is selected.

Pos-preset 4 (1005) **Bit 4 position preset**. Active only in the position configuration. When this digital input is active, the relative value set in the Position Preset parameters is selected.

Pos-preset 5 (1006) **Bit 5 position preset**. Active only in the position configuration. When this digital input is active, the relative value set in the Position Preset parameters is selected.

Pos-0 search (1007) Command to **Search for the zero position.** It is active only in the position configuration. Momentary input active on the risind leading edge.
When this command is active, the motor starts rotating with a speed set in the POS SPEED REF 0 parameter and stops when reaching the zero position (see the commissioning paragraph).

Pos-Start pos (1009) **Positioning start** command. Momentary input active on the edge (see Pos config parameter). Initiates the start of a move to new position.

Pos memo 0 (1010) Command **Storing the 0 position.** Momentary input active on the rising leading edge, it allows storage of the present position as a zero position. Such function is normally used in point-to-point self-acquisition positioning procedures.

Pos memo pos (1011) **Position storing** command. Momentary input active on the rising leading edge; it allows storage of the present position as a destination position. Such function is normally used in point-to-point self-acquisition positioning procedures.

Pos-abs 0 sensor CW (1012) Command **Searching an absolute 0 position CW**. If the 0 position searching function is active, the motor rotates with the reference POS SPEED REF 0 ; when the **Pos-abs 0 search CW** digital input becomes active, the motor moves very slowly in a clockwise direction with the reference POS SPEED FINE 0 till finding the first encoder zero slot. The zero position will be stored here.

Pos-abs 0 sensor CCW (1013) Command **Searching an absolute 0 position CCW**. If the 0 position searching function is active (1007), the motor rotates with the reference POS SPEED REF 0 ; when the **Pos-abs 0 search CCW** digital input becomes active, the motor moves very slowly in a counterclockwise direction with the reference POS SPEED FINE 0 till finding the first encoder zero slot. The zero position will be stored here.

Pos- 0 sensor (1015) **Position 0** command. During the zero position searching phase, the motor is in a rotating condition: when the digital input "**Pos_0 sensor**" becomes active, the motor stops. This position is stored as a zero position. If during the stopping phase, the motor stops beyond this point, it automatically changes its rotation direction and reaches the zero position.

Els-ratio sel bit 0 (2001) Electric Line Shaft function: **Preset selection of the bit 0 ratio.** This command is active in the electric Line Shaft configuration. When this digital input is active, a speed ratio set in the parameters of the Electrical line shaft function is selected.

Els-ratio sel bit 1 (2002) Electric Line Shaft function: **Preset selection of the bit 1 ratio.** This command is active in the electric Line Shaft configuration. When this digital input is active, a speed ratio set in the parameters of the Electrical line shaft function is selected.

Els-inc ratio1 (2003) **Ratio increasing** command. When this command is active, the selected ratio between master and slave is increased with a time constant defined by the "Els delta time" and "Els delta ratio" parameters.

Els-dec ratio (2004) **Ratio decreasing** command. When this command is active, the selected ratio between master and slave is decreased with a time constant defined by the "Els delta time" and "Els delta ratio" parameters.

Els-ramp ratio dis. (2005) **Ramp disabling** command during a ratio switching phase. When this command is active, the ramp time set via the Els delta ratio parameter (ramp for ratio switching) is ignored and the change will be made immediately. Be careful when using this since new ratios will change as fast as current limit allows.

Els bend rec Cw (2006) Command to activate the correction reference (slave drive), bend recover, in CW rotation.

Els bend rec Ccw (2007) Command to activate the correction reference (slave drive), bend recover, in CCW rotation.

9.10. DIGITAL EXPANSION INPUTS

On the Flexmax drives it is possible to install an optional expansion board (EXP.D14A4F) with 8 programmable digital inputs with the same functionality of the DIG INP XX.

The standard 8 digital inputs on the main regulation board will still be avaiable.

This function will not be avaiable if the Flexmax drive has the resolver interface EXP-BRS installed.

The programming procedure is the same of the digital inputs.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
EXP DIGIT INPUT 0	20150	enum	0	2007	OFF	R/Z	
EXP DIGIT INPUT 1	20151	enum	0	2007	OFF	R/Z	
EXP DIGIT INPUT 2	20152	enum	0	2007	OFF	R/Z	
EXP DIGIT INPUT 3	20153	enum	0	2007	OFF	R/Z	
EXP DIGIT INPUT 4	20154	enum	0	2007	OFF	R/Z	
EXP DIGIT INPUT 5	20155	enum	0	2007	OFF	R/Z	
EXP DIGIT INPUT 6	20156	enum	0	2007	OFF	R/Z	
EXP DIGIT INPUT 7	20157	enum	0	2007	OFF	R/Z	
EXP DIG STATUS	20164	word	000H	0FFFH	0H	R	

txv0380

EXP DIGIT INPUT XX

Choice of the programmable parameters on a digital input.

The same possibilities stated for the digital inputs are available.

See paragraph **digital inputs**.

EXP DIGIT IN STATUS

Only-reading parameter stating the present condition (high logic level 1 and low logic level 0) of the digital inputs on the EB-DIO expansion card. It is an hexadecimal parameter.

Example: The digital inputs are:

EXP DIGIT INPUT 0 = 1
EXP DIGIT INPUT 5 = 1
EXP DIGIT INPUT 7 = 1
EXP DIGIT INPUT 9 = 1

EXP DIGIT INPUT	11	10	9	8	7	6	5	4	3	2	1	0
EXP DIG IN STATUS	0	0	1	0	1	0	1	0	0	0	0	1
			2			A				1		

axv6048

The value displayed by the EXP DIG IN STATUS parameter is = 2A1 H .

9.11. VIRTUAL DIGITAL INPUTS

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
VIRT DIGIT INPUT 0	20170	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 1	20171	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 2	20172	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 3	20173	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 4	20174	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 5	20175	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 6	20176	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 7	20177	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 8	20178	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 9	20179	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 10	20180	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 11	20181	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 12	20182	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 13	20183	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 14	20184	enum	0	2007	OFF	R/Z	
VIRT DIGIT INPUT 15	20185	enum	0	2007	OFF	R/Z	
VIRT DI STATUS	20186	word	0000H	FFFFH	0000H	R/W	
VIRT DI AT START	20187	word	0000H	FFFFH	FFFFH	R/Z	
VIRT DI AT DISABLE	20188	word	0000H	FFFFH	FFFFH	R/Z	
VIRT DI RESET AT FAIL	20189	word	0000H	FFFFH	0000H	R/Z	

Axvt911

Digital virtual inputs which are not physically present on the terminals but which are available to program possible commands, supported via the serial interface.

With an application where some command inputs are supported directly by the internal custom program (example MDPLC), it is always necessary to configure this function on a **Virtual digital input.**

By programming them in the **Virtual digital input** parameters**,** the **Digital inputs** can be used for the same commands as those via the terminal strip.

The functionality of a digital input programmed on **Digital input** or **Virtual digital input** is the same.

The programming procedure is the same as the one stated for the physical digital inputs.

DIGITAL EXP INPUT XX — Choice of the programmable parameters on a digital input.
The same possibilities stated for the digital inputs are available.
See the paragraph **Digital inputs**.

VIRTUAL DI STATUS — It displays and sets the status of the virtual digital inputs.
Hexadecimal setting.

Programming example:

If the virtual digital inputs have to be enabled via the serial input:

VIRTUAL DIGITAL INPUT 0 — Programmed as Pos preset 0
VIRTUAL DIGITAL INPUT 1 — Programmed as Pos preset 1

VIRTUAL DIGITAL INPUT 2 Programmed as Pos preset 2
VIRTUAL DIGITAL INPUT 3 Programmed as Pos preset 3

If we set to high logic level : the bit 0 referring to VIRTUAL DIGITAL INPUT **0** = 1
the bit 1 referring to VIRTUAL DIGITAL INPUT **1** = 1
the bit 2 referring to VIRTUAL DIGITAL INPUT **2** = 1
the bit 3 referring to VIRTUAL DIGITAL INPUT **3** = 1

VIRTUAL DIG IN	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
VIRTUAL DI STATUS	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1

axv6051

The drive will write in the **Virtual DI status** parameter the value obtained by adding

1 (bit 0) + 2 (bit 1) + 4 (bit 2) + 8 (bit 3) = 15 = F

Virtual DI status = 000FH

VIRTUAL DI AT START

Setting of the status of the virtual digital inputs when the drive is started. Through this parameter it is possible to state if each configured input will be reset or not at the power-on. This is a Hexadecimal setting.

1 = The parameter is not reset at each drive starting.

0 = The parameter is reset at each drive starting.

Application example:

If the virtual digital inputs 0 and 2 must be reset at the power-on, it is necessary to:

(reset) **VIRTUAL DIGITAL INPUT 0** Programmed as Pos preset 0
(do not reset) **VIRTUAL DIGITAL INPUT 1** Programmed as Pos preset 1
(reset) **VIRTUAL DIGITAL INPUT 2** Programmed as Pos preset 2
(donot reset) **VIRTUAL DIGITAL INPUT 3** Programmed as Pos preset 3

It is necessary to set with a high logic level (not reset):

bit 1 referring to **VIRTUAL DIGITAL INPUT 0** = 1
bit 3 referring to **VIRTUAL DIGITAL INPUT 1** = 1

It is necessary to set with a low logic level (reset):

bit 0 referring to **VIRTUAL DIGITAL INPUT 2** = 0
bit 2 referring to **VIRTUAL DIGITAL INPUT 3** = 0

VIRTUAL DIG IN	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
VIRTUAL DI STATUS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0

axv6052

it is therefore necessary to write in the **Virtual DI reset** parameter the value obtained by adding

0 (bit 0) + 2 (bit 1) + 0 (bit 2) + 8 (bit 3) = 10 = A

Virtual DI reset = A

VIRTUAL DI AT DISABLE

Setting of the status of the virtual digital inputs when the drive is disabled. Through this parameter it is possible to state if each configured input will be reset or not when the drive is disabled.

Hexadecimal setting.

1 = The parameter is not reset at each drive starting.

0 = The parameter is reset at each drive starting.

See the programming procedure of the VIRTUAL DI START parameter.

VIRTUAL DI RESET AT FAIL

Setting of the virtual digital input condition when a drive alarm gets active. Through this parameter it is possible to state if each configured input has to be reset or not when an alarm intervenes. Hexadecimal setting.

1 = The parameter is reset when the drive is in an alarm condition

0 = The parameter is not reset when the drive is in an alarm condition.

The procedure to be followed is the same as the one used for the VIRTUAL DI START parameter.

9.12. DIGITAL OUTPUTS

In the regulation board of the Flexmax drives there are two slow Relay Outputs (X2 terminal block) and two fast Digital Outputs (X1 terminal block). There are other 4 fast Digital Outputs on the optional expansion board EXP-BRS. All these Outputs are considered as Digital Outputs and they have the following mappings

The parameter 20207 DIGITAL OUTPUT 7 is read only, and it is related to the function “DRIVE OK”. This output will be high when drive is powered and no alarms are present.

PARAMETER	Output Type	Output Location
DIGITAL OUTPUT 0	Fast0	Regulation Board RV33
DIGITAL OUTPUT 1	Fast1	Regulation Board RV33
DIGITAL OUTPUT 2	Fast0	Expansion board EXP-BRS
DIGITAL OUTPUT 3	Fast1	Expansion board EXP-BRS
DIGITAL OUTPUT 4	Fast2	Expansion board EXP-BRS
DIGITAL OUTPUT 5	Fast3	Expansion board EXP-BRS
DIGITAL OUTPUT 6	Relay R2	Regulation Board RV33
DIGITAL OUTPUT 7	Drive Ok	Regulation Board RV33

txv0390

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
DIGITAL OUTPUT 0	20200	enum	0	1008	speed reach.	R/Z	
DIGITAL OUTPUT 1	20201	enum	0	1008	speed 0 thr	R/Z	
DIGITAL OUTPUT 2	20202	enum	0	1008	curr.limit	R/Z	
DIGITAL OUTPUT 3	20203	enum	0	1008	drive fault	R/Z	
DIGITAL OUTPUT 4	20204	enum	0	1008	exter.fault	R/Z	
DIGITAL OUTPUT 5	20205	enum	0	1008	OFF	R/Z	
DIGITAL OUTPUT 6	20206	enum	0	1008	OFF	R/Z	
DIGITAL OUTPUT 7	20207	enum	0	1008	drive ok	R	
DIG OUT NEG	20254	dword	0H	0FFFFFFFFH	00H	R/Z	
DIG OUT STATUS	20255	word	00H	0FF	00H	R	

txv0400

DIGITAL OUTPUT XX

Choice of the programmable parameters on a digital output.

The possibilities listed as "*Choices for Digital output association*" are available.

NOTE!

It is possible to set all the drive alarms on a digital output. The logic status is normally low and it becomes high when the drive is in an alarm condition.

DIG OUT NEG

This parameter allows to change the logic level of the programmed digital outputs. The digital outputs usually have a 0 logic level when they are inactive and they switch to a high logic level when they become active. Via this bit-mapped parameter it is possible to choose which output the normal logic level has to be switched to. Hexadecimal setting. It will not be possible to mogify the logic level of the DIGITAL OUTPUT 7 using this parameter.

Example: the digital outputs 1, 4 and 5 have to be programmed with an inverted condition:

DIGITAL OUTPUT	7	6	5	4	3	2	1	0
DIG OUT STATUS	0	0	1	1	0	0	1	0
			3			2		

axv6053

It is necessary to set DIG OUT NEG = 32H

DIG OUT STATUS

Only-reading parameter stating the present condition (high logic level 1 and low logic level 0) of the digital outputs. It is an hexadecimal parameter.

Example: the digital outputs are:

DIG OUT 3 = 1 DIG OUT 6 = 1 DIG OUT 7 = 1

DIGITAL OUTPUT	7	6	5	4	3	2	1	0
DIG OUT STATUS	1	1	0	0	1	0	0	0
	C				8			

axv6054

The value displayed by the DIG OUT STATUS parameter is C8H

Choices for digital output association:

OFF **(0)** Output not configured.

Drive ready to start **(1)** The digital output reaches high logic status when the drive is power supplied, enabled (enable command active) and no alarm is present.

Speed reached **(3)** **Reached speed**. The digital output reaches high logic status when the motor present speed is equal to the reference within a window defined by the **SPD THR OFF** parameter.

Speed 0 threshold **(4)** **Speed n = 0.** The digital output reaches high logic status when the motor speed is zero with an dead band (positive and negative) defined by the **SPD THR OFF** parameter.

Current limit **(5)** **Current limit**. The digital output reaches high logic status when the drive supplied current is equal to that set in the **Drive maximum current** parameter.

Current Threshold **(6)** **Exceeded high current**. The digital output reaches high logic status if the current, both positive and negative, is higher than the value set in the **Curr Thr** parameter (Current paragraph).

Speed Threshold **(7)** **Exceeded high speed**. The digital output reaches high logic status if the speed, either positive and negative, gets higher than the value set in the **Speed Thr** parameter (Speed paragraph).

XE index **(8)** Repetition of incremental encoder index connected on XE connector. the signal remains active for 8 ms.

XFR index **(9)** Repetition of incremental encoder index connected on XFR connector. The signal remains active for 8 ms.

Position error **(10)** The drive is in Position error (exceeded the threshold of "Drive max position error" set in the Service menu).

Fast link Rx **(11)** On slave drive active during reception of Fast link. This output can be used only on a slave drive.

UV active **(12)** The drive is in undervoltage alarm (the voltage of power supply is lower than the threshold set in the SYS_UV_V_MIN parameter).

UV active	**(13)**	When there is a Mains loss condition, it activates the energy recovery, braking to a stop; in this way the motor can brake in controlled mode.
Speed not 0 thr	**(14)**	**Speed n = 0.** Same meaning of **Speed 0 threshold** but with an inverted logic level.
Speed thr delayed	**(15)**	Delayed speed threshold reached. The digital output reaches a high logic level if the speed, either positive or negative, is higher than the value set in the SPEED THR parameter for a time higher than the value set in the SPEED THR DELAY parameter.
Curr thr delayed	**(16)**	Delayed current threshold reached. The digital output reaches a high logic level if the current, both positive and negative, is higher than the value set in the CURR THR parameter for a time higher than the value set in the CURR THR DELAY parameter.
Alarm warning	**(17)**	Active alarm. When a previously masked alarm goes active (see the section referring to the alarm setting), the digital output set as **Alarm warning** reaches the high logic level.
Alarm coming	**(18)**	Delayed alarm. When a previously delayed alarm gets active (see the section referring to the alarm setting), the digital output set as **Alarm coming** reaches the high logic level.
Drive fault	**(100)**	Drive in an alarm condition.
Bridge short circuit	**(101)**	Short circuit alarm of the power module.
Overcurrent	**(102)**	Overcurrent alarm.
Dc link overvoltage	**(103)**	Overcurrent alarm on the DC LINK intermediate circuit.
Heatsink	**(104)**	Heatsink overtemperature alarm.
Module unction fault	**(105)**	Junction overtemperature alarm.
Current Fbk Loss	**(106)**	Loss of Power Supply TA.
Motor overtemp fault	**(107)**	Motor overtemperature alarm.
Aux power undervoltage	**(108)**	Undervoltage alarm on the auxiliary circuits.
Dsp program error	**(109)**	DSP program alarm.
Prg 16 KH fault	**(110)**	Fast task overtime alarm.

Invalid flash parms fault (111) Invalid flash parameter alarm.

Bad flash fault (112) Flash error alarm.

Brake overtemp fault (113) Brake overpower alarm.

Power Supply fault (114) Loss of ±15V regulation supply.

Brake error fault (115) Brake alarm.

Lock drive (116) Lock drive alarm.

XFR encoder count fault (117) XFR encoder count alarm.

XE encoder count fault (118) XE econder count alarm.

Encoder simulation fault (119) Encoder simulation alarm.

Undervoltage fault (120) Undervoltage alarm.

Intake Air Overtemperature (121) Temperature of intake air too high; detected by TAC sensor.

Regulation Overtemperature (122) Overtemperature of regulation board; detected by TAR sensor on regulation board.

Module Overtemperature (123) IGBT module Overtemperature; detected by OTS sensors on Power stage.

Size Not Defined (124) Drive Size not defined.

Sequence fault (127) Alarm for a wrong sequence in the drive power supply. The drive is already enabled when the alarm gets active.

Fast link fault (128) The Fast link is interrupted.

Position fault (129) The drive is in Position error alarm.

External fault (131) External alarm for the drive.

Pos-pos 0 reacheD (1001) **Position 0 reached**. The digital output reaches high logic status when the motor present position is equal to the zero position with an dead band defined by the **Pos Thr Off** parameter.

Pos- pos reached **(1002)** **Reached position**. The digital output reaches high logic status when the motor present position is equal to the destination position.

Pos-threshold **(1003)** **Position threshold**. The digital output reaches high logic status if the position is higher than the value set in the **POS THR** parameter.

Pos-pos Abs threshold **(1004)** **Absolute position threshold**. The digital output reaches high logic status if the position is higher than the value set in the **POS ABS THR** parameter.

Pos ero found **(1005)** **Found zero position.** The digital output reaches high logic status at the end of the zero searching phase. It keeps the high logic status till the drive looses its zero position .

Pos-thr near 1 **(1006)** Reached position threshold 1. The digital output reaches the high logic status when the motor present position is equal to the destination position minus the **Pos thr near 1** parameter.

Pos-thr near 2 **(1007)** Reached position threshold 2. The digital output reaches the high logic status when the motor present position is equal to the destination position minus the **Pos thr near 2** parameter.

Pos-out of limits **(1008)** A value has been set up out of range Pos min/max preset. If a value required is out of range, it is not executed and the digital output programmed as **Pos out of limit** changes to high logic status.

9.13. VIRTUAL DIGITAL OUTPUTS

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
VIRT DIGIT OUTPUT 0	20270	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 1	20271	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 2	20272	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 3	20273	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 4	20274	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 5	20275	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 6	20276	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 7	20277	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 8	20278	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 9	20279	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 10	20280	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 11	20281	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 12	20282	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 13	20283	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 14	20284	enum	0	1008	OFF	R/Z	
VIRT DIGIT OUTPUT 15	20285	enum	0	1008	OFF	R/Z	
VIRT DO RESET AT FAIL	20289	word	0000H	FFFFH	0000H	R/Z	
VIRT DO SET AT FAIL	20290	word	0000H	FFFFH	0000H	R/Z	
VIRT DO STATUS	20286	word	0000H	FFFFH	0000H	R/Z	

Axvt913

Virtual digital outputs, which are not physically present on the terminals but which are available to set possible **Digital outputs** to be read via the serial line or the field bus.

By setting the **Virtual digital outputs,** the **Digital outputs** on the terminal strip are still available.

The function performed by a digital output programmed on a **Digital output** or on a **Virtual digital output** is the same.

The programming procedure is the same as the one stated for the digital outputs.

VIRTUAL DIGIT OUTPUT XX

Choice of the parameters to be programmed on a digital output.

The same possibilities stated for the digital outputs are available.

See the **Digital outputs** paragraph.

VIRTUAL DO RESET AT FAIL

Setting of the virtual digital output state when a drive alarm gets active. This parameter allows to state, when an alarm condition intervenes, which virtual output, corresponding to the set bit, is brought to a 0 logic level. Hexadecimal setting.

1 = The output does not change its logic level

0 = The output is reset and set with 0.

VIRTUAL DO SET AT FAIL

Setting of the virtual digital output state when a drive alarm gets active. This parameter allows to state, when a drive alarm intervenes, which virtual digital output, corresponding to the set bit, is brought to a high logic level. Hexadecimal setting.

As a setting example see VIRT DI START.

1 = The output does not change its logic level

0 = The output is reset and set with 0.

VIRTUAL DO STATUS

Only-reading parameter stating the present condition of the virtual digital outputs (high logic level 1 and low logic level 0).

Hexadecimal setting.

9.14. DIGITAL EXPANSION OUTPUTS

It is possible to install inside the drive an option card for the expansion of the digital inputs and outputs. Installing the Optional Expansion Board EXP-D14A4F it will be possible to have six Fast Digital Outputs.

Only four of these six Outputs can be programmed as the standard Digital Outputs on the regulation board; the other two additional Outputs are not handled by the basic software.

The installation of this optional board disables the standard DIG OUT 2-3-4-5. This function will not be avaiable if the Flexmax drive has the resolver interfaec EXP-BRS installed

The programming procedure is equal to the digital input one.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
EXP DIGIT OUTPUT 0	20250	enum	0	1008	OFF	R/Z	
EXP DIGIT OUTPUT 1	20251	enum	0	1008	OFF	R/Z	
EXP DIGIT OUTPUT 2	20252	enum	0	1008	OFF	R/Z	
EXP DIGIT OUTPUT 3	20253	enum	0	1008	OFF	R/Z	
EXP DIG OUT STATUS	20256	word	00H	0FH	0H	R	

Axvt914

EXP DIGITAL OUTPUT XX

Choice of the programmable parameters on a digital output. The same possibilities as the digital outputs are available. See the paragraph **digital outputs**.

EXP DIG OUT STATUS

Only-reading parameter stating the present condition (high logic level 1 and low logic level 2) of the digital outputs set on the EB-DIO expansion card.

9.15. ANALOG INPUTS

The regulation board of the Flexmax drive has two programmable analog inputs. There is actually another but it is used for the SinCos encoder input if it is used and cannot be reconfigured.

The Analog Input channels are avaiable on the X1 Terminal Block.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
ANALOG INPUT 0	20300	enum	0	24	speed ref 1	R/Z	
AN INPUT READ 0 (V)	20310	float	-10V	+10V	0V	R	
AN INPUT OFFSET 0 (V)	20320	float	-10V	+10V	0V	R/W	
AN INPUT ZPOS 0 (V)	20330	float	-10V	+10V	0V	R/W	
AN INPUT ZNEG 0 (V)	20340	float	-10V	+10V	0V	R/W	
AN INPUT SCALE 0	20350	float	-3	+3	1	R/W	
AN INPUT VALUE 0 (V)	20360	float	-10V	+10V	0V	R	
ANALOG INPUT 1	20301	enum	0	24	t curr ref 1	R/Z	
AN INPUT READ 1 (V)	20311	float	-10V	+10V	0V	R	
AN INPUT OFFSET 1 (V)	20321	float	-10V	+10V	0V	R/W	
AN INPUT ZPOS 1 (V)	20331	float	-10V	+10V	0V	R/W	
AN INPUT ZNEG 1 (V)	20341	float	-10V	+10V	0V	R/W	
AN INPUT SCALE 1	20351	float	-3	+3	1	R/W	
AN INPUT VALUE 1 (V)	20361	float	-10V	+10V	0V	R	

txv0410

ANALOG INPUT 0 — Choice of the parameter to be programmed on an analog input.

AN INPUT READ 0 — Parameter reading the voltage value of the analog input. Unit of measure : Volt.

AN INPUT OFFSET 0 — Writing parameter for the offset setting to be algebraically added to the analog signal. Unit of measure : Volt.

AN INPUT ZPOS 0 — Writing parameter for the setting of a positive reference threshold, under which the analog value is set to 0.
Unit of measure : Volt.

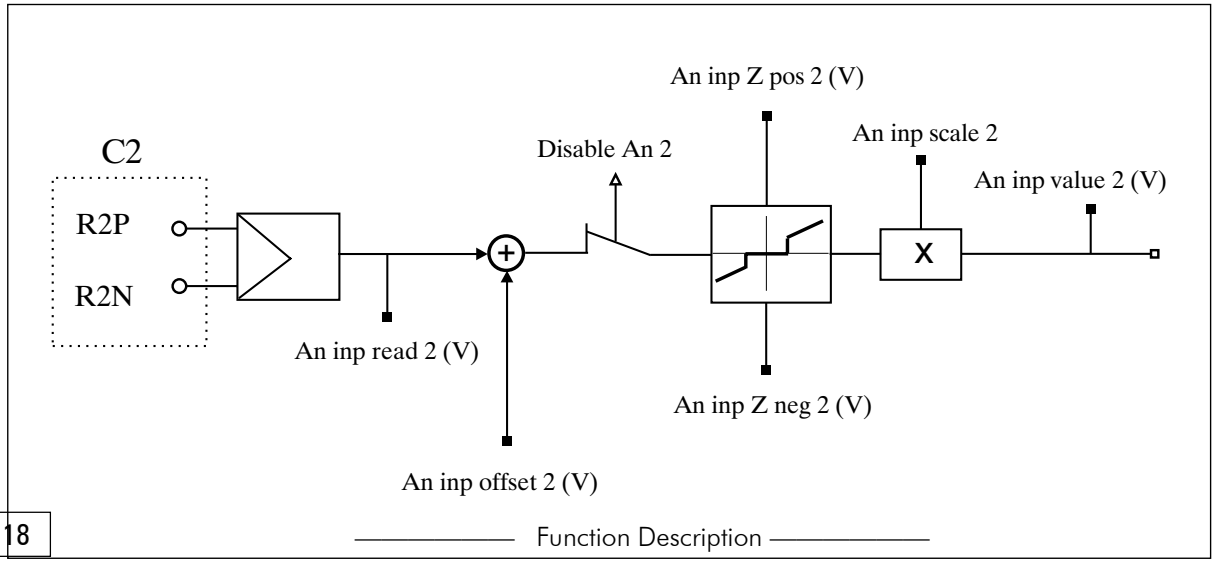


Figure 9.15.1: Differential analog inputs

AN INPUT ZNEG 0	Writing parameter for the setting of a negative reference threshold, under which the analog value is set to 0. Unit of measure : Volt.
AN INPUT SCALE 0	Writing parameter for the setting of a multiplication factor of the analog signal.
AN INPUT VALUE 0	Parameter reading the real value of the analog input. Unit of measure : Volt.
ANALOG INPUT 1	Choice of the parameter to be programmed on the analog input.
AN INPUT READ 1	Parameter reading the analog input. Unit of measure : Volt.
AN INPUT OFFSET 1	Writing parameter for the offset to be algebraically added to the analog signal. Unit of measure : Volt.
AN INPUT ZPOS 1	Writing parameter for the setting of a positive reference threshold under which the analog value is set to 0. Unit of measure : Volt.
AN INPUT ZNEG 1	Writing parameter for the setting of a negative reference threshold under which the analog value is set to 0. Unit of measure : Volt.
AN INPUT SCALE 1	Writing parameter for the setting of a multiplication factor of the analog signal.
AN INPUT VALUE 1	Parameter reading the actual voltage value of the analog input. Unit of measure : Volt.

Choices for analog input association

OFF	**(0)**	The analog input is not configured.
T curr ref 1	**(1)**	Current 1 reference signal (active only in the current loop configuration).
T curr ref 2	**(2)**	Current 2 reference signal (active only in the current loop configuration).
Speed ref 1	**(3)**	Speed 1 reference signal.
Speed ref 2	**(4)**	Speed 2 reference signal.
Speed max pos	**(5)**	Signal setting the maximum speed for clockwise rotation direction.

Speed max neg	**(6)**	Signal setting the maximum speed for counterclockwise rotation direction.
Speed limit	**(7)**	Signal setting the same maximum speed for both clockwise and a counterclockwise rotation direction.
Jog reference	**(8)**	Reference signal for jog function.
T curr lim +	**(9)**	Sets the limit of the maximum positive current.
T curr lim -	**(10)**	Sets the limit of the maximum negative current.
T curr limit	**(11)**	Sets the limit for both maximum positive and negative current.
Max speed curr lim	**(12)**	Signal for the speed limit with torque control.
Pos speed	**(13)**	Speed reference during positioning procedures.
Pos speed ref 0	**(14)**	Speed reference during zero search.
Speed threshold	**(15)**	Analog signal setting the “over-speed” threshold.
Current threshold	**(16)**	Analog signal setting the “over-current” threshold.
Multi speed 1	**(17)**	Analog input of Speed 1 reference for the multi-speed function.
Multi speed 2	**(18)**	Analog input of Speed 2 reference for the multi-speed function.
Multi speed 3	**(19)**	Analog input of Speed 3 reference for the multi-speed function.
Els RB spd ref	**(20)**	Analog signal to set the bend recover reference in electrical line shaft mode.
Els ratio (0)	**(21)**	Analog signal to set the active ratio (ratio 0) with an electric axis mode.
Els ratio (1)	**(22)**	Analog signal to set the active ratio (ratio 1) with an electric axis mode.
Els ratio (2)	**(23)**	Analog signal to set the active ratio (ratio 2) with an electric axis mode.
Els ratio (3)	**(24)**	Analog signal to set the active ratio (ratio 3) with an electric axis mode.

9.16. ANALOG OUTPUTS

The drives of the Flexmax series are equipped with 4 +/-10V differential analog outputs and a 10-bit A/D converter.

Basic Software allows to program up to four Analog Outputs located as follows:

An Out N°	Location
0	Regulation Board RV33
1	Regulation Board RV34
2	Optional Expansion Board EXP-D14A4F
3	Optional Expansion Board EXP-D14A4F

txv0420

The functions “Analog Output 2” and “Analog Output 3” will not be avaiable if the Flexmax drive has the resolver interface EXP-BRS installed.

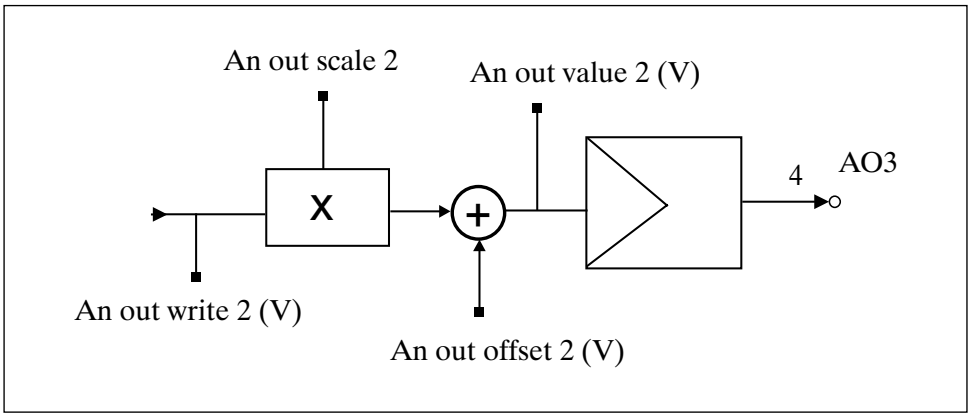


Figure 9.16.1: Differential analog outputs

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
ANALOG OUTPUT 0	20400	enum	0	9	actual speed	R/Z	
AN OUTPUT WRITE 0 (V)	20410	float	-10V	+10V	0V	R	
AN OUTPUT SCALE 0	20430	float	-3	+3	1	R/W	
AN OUTPUT OFFSET 0 (V)	20420	float	-10V	+10V	0V	R/W	
AN OUTPUT VALUE 0 (V)	20440	float	-10V	+10V	0V	R	
ANALOG OUTPUT 1	20401	enum	0	9	motor curr	R/Z	
AN OUTPUT WRITE 1 (V)	20411	float	-10V	+10V	0V	R	
AN OUTPUT SCALE 1	20431	float	-3	+3	1	R/W	
AN OUTPUT OFFSET 1 (V)	20421	float	-10V	+10V	0V	R/W	
AN OUTPUT VALUE 1 (V)	20441	float	-10V	+10V	0V	R	
ANALOG OUTPUT 2	20402	enum	0	9	+10V	R/Z	
AN OUTPUT WRITE 2 (V)	20412	float	-10V	+10V	0V	R	
AN OUTPUT SCALE 2	20432	float	-3	+3	1	R/W	
AN OUTPUT OFFSET 2 (V)	20422	float	-10V	+10V	0V	R/W	
AN OUTPUT VALUE 2 (V)	20442	float	-10V	+10V	0V	R	
ANALOG OUTPUT 3	20403	enum	0	9	+10V	R/Z	
AN OUTPUT WRITE 3 (V)	20413	float	-10V	+10V	0V	R	
AN OUTPUT SCALE 3	20433	float	-3	+3	1	R/W	
AN OUTPUT OFFSET 3 (V)	20423	float	-10V	+10V	0V	R/W	
AN OUTPUT VALUE 3 (V)	20443	float	-10V	+10V	0V	R	

Axvt916

ANALOG OUTPUT 0 — Choice of the parameter to be programmed on an analog output.

AN OUTPUT WRITE 0 — Parameter reading the analog output. Unit of measure : Volt.

AN OUTPUT SCALE 0 — Writing parameter for the setting of a multiplication factor of the analog signal.

AN OUTPUT OFFSET 0 — Writing parameter for the offset setting to be algebraically added to the analog signal. Unit of measure : Volt.

AN OUTPUT VALUE 0 — Parameter reading the actual voltage of the analog input.
Unit of measure : Volt.

ANALOG OUTPUT 1 — Choice of the parameter to be programmed on an analog output.

AN OUTPUT WRITE 1 — Parameter reading the analog output. Unit of measure : Volt.

AN OUTPUT SCALE 1 — Writing parameter for the setting of a multiplication factor of the analog signal.

AN OUTPUT OFFSET 1 — Writing parameter for the offset setting to be algebraically added to the analog signal. Unit of measure : Volt.

AN OUTPUT VALUE 1 — Parameter reading the real value of the analog input.
Unit of measure : Volt.

ANALOG OUTPUT 2 — Choice of the parameter to be programmed on an analog output.

AN OUTPUT WRITE 2 — Parameter reading the analog output. Unit of measure : Volt.

AN OUTPUT SCALE 2	Writing parameter for the setting of a multiplication factor of the analog signal.
AN OUTPUT OFFSET 2	Writing parameter for the offset setting to be algebraically added to the analog signal. Unit of measure : Volt.
AN OUTPUT VALUE 2	Parameter reading the actual voltage of the analog input. Unit of measure : Volt.
ANALOG OUTPUT 3	Choice of the parameter to be programmed on an analog output.
AN OUTPUT WRITE 3	Parameter reading the analog output. Unit of measure : Volt.
AN OUTPUT SCALE 3	Writing parameter for the setting of a multiplication factor of the analog signal.
AN OUTPUT OFFSET 3	Writing parameter for the offset setting to be algebraically added to the analog signal. Unit of measure : Volt.
AN OUTPUT VALUE 3	Parameter reading the actual voltage of the analog input. Unit of measure : Volt.

Choices for analog output association:

OFF	**(0)**	The analog output is not configured.
Actual speed	**(1)**	Analog signal proportional to the **actual motor speed.** With a scale factor equal to 1, the analog output supplies 10V when the speed is equal to the **Motor Maximum speed** parameter.
Motor current	**(2)**	Analog signal proportional to the **actual current supplied by the drive**. With a scale factor equal to 1, the analog output supplies 10V when the current is equal to the **Motor Peak current** parameter.
Output voltage	**(3)**	Analog signal proportional to the **drive output voltage.** With a scale factor equal to 1, the analog output supplies 10V when the voltage is equal to **1250 V**.
Dc link voltage	**(4)**	Analog signal proportional to the **Voltage of the DC+/ DC- drive intermediate circuit (DC Bus).** With a scale factor equal to 1, the analog output supplies 10V when the voltage is equal to **1250 V**.
Drive temperature	**(5)**	Analog signal proportional to the **drive internal temperature.** With a scale factor equal to 1, the analog output supplies 10V when the temperature is equal to **128 °C**.

ATTENTION :

The drive internal fan is normally stopped.
It becomes active when the temperature exceeds 55°C.

Ramp output **(6)** Analog signal proportional to the **output of the ramp circuit.**
With a scale factor equal to 1, the analog output supplies 10V when the output voltage of the ramp circuit is equal to the **Motor Maximum speed** parameter.

+10V **(7)** **+10V Analog signal**. Signal available for possible potentiometer connections for the drive references. Unit of measure : Volt.

-10V **(8)** **-10V Analog signal**. Signal available for possible potentiometer connections for the drive references. Unit of measure : Volt.

Position error **(9)** Analog signal proportional to the position error. The analog output reaches 10V when the position error is equal to the "**Drive max pos error A0**" parameter (32200 Service menu).

9.17. ENCODER REPETITION

The signal coming from the encoder/resolver and used as a feedback for the speed/space loop can be repeated (as a digital encoder) on the XF0 port with a desired ratio. This port can be configured both as an input (frequency reference, coming from the master encoder, for the electric axis) or as an output.

The repetition can be enabled/disabled via the software (in order to avoid possible failures the S1 connector is default configured as an input).

The maximum repetition frequency is 500 kHz; if such frequency is exceeded, a drive alarm occurs as the counting storage can not be assured.

The index can be repeated up to a total accumulated limit of 131070 pulses.

It is possible to set the position of the first repeated index pulse as compared to the first master index after the index repetition has been enabled.

The following indexes will be repeated with a frequency set independently of the master index.

To use these functions it will be necessary to install the optional expansion board EXP-BRS.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
ENC PULSES REV	20030	dword	0	131070	1024	R/W	
GAIN INDEX STEP	20032	long	0	131070	1024	R/W	
INDEX OFFSET	20033	long	0	131070	0	R/W	
INDEX OFFSET READ	20034	long	0	131070	0	R	
ENABLE ENC REPETITION	20035	enum	0	3	OFF	R/Z	
OFF						0	
Encoder only						1	
Encoder+index						3	

Axvt917

ENC PULSES REV — Parameter setting the pulse/revolution number for the encoder simulation signal.

GAIN INDEX STEP — Parameter setting the gain for the simulation of the zero slot. It states the pulse frequency with which the encoder index is repeated. For example, 100 means that a zero index is obtained every 100 repeated pulses.

INDEX OFFSET — Parameter setting the offset for the simulation of the index signal. With this parameter it is possible to program the position of the first repeated index pulse as compared to the first master index, after the index repetition has been enabled. Following indexes will be repeated with the set frequency (**Gain index step** parameter) independently of the master index.

INDEX OFFSET READ — Parameter reading the offset of the zero slot simulation.

ENABLE ENC REPETITION — Parameter enabling the encoder repetition signal.

The following possibilities are available:

OFF — Disabled signal for the encoder repetition.

Encoder only — Signal for the encoder repetition enabled only for signals A-Aneg and B-Bneg. The index signal is disabled.

Encoder+index — Signal for the encoder repetition enabled for all signals: A-Aneg, B-Bneg, C-Cneg.

9.18. JOG FUNCTION

In the speed control configuration it is possible, by programming the suitable "Jog+" and/or "Jog-" digital inputs, to replace the speed reference **Speed ref** with the jog reference.

In this case, the **Jog** function requires the **Start** command, which must occur AFTER the jog command.

In case the **Start** and **Jog+** or **Jog-** commands are assigned simultaneously, the start command has the priority.

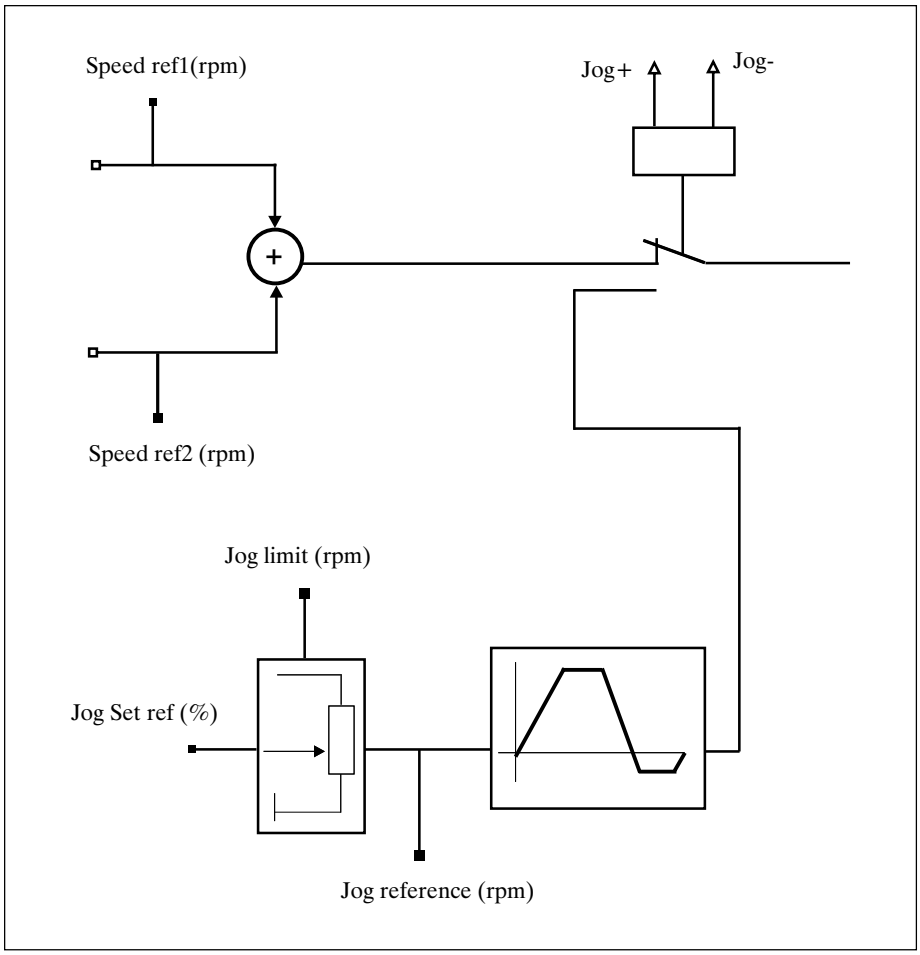


Figure 9.18.1: Jog function

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
JOG LIMIT (rpm)	21000	float	0	10000	1500	R/W	
JOG SET REFERENCE (%)	21001	float	0	100	0	R/W	
JOG REFERENCE (rpm)	21002	float	0	10000	0	R	
JOG ACC CW (msec/rpm)	21003	float	0	17476/enc pul	0,332	R/W	
JOG ACC CCW (msec/rpm)	21004	float	0	17476/enc pul	0,332	R/W	
JOG DEC CW (msec/rpm)	21005	float	0	17476/enc pul	0,332	R/W	
JOG DEC CCW (msec/rpm)	21006	float	0	17476/enc pul	0,332	R/W	

Axvt918

JOG LIMIT — Parameter setting the maximum reference limit for the jog function. Unit of measure : rpm .

JOG SET REFERENCE — Jog function reference, which can be set also via an analog input. Its percentage value states the jog reference. Unit of measure : % .

JOG REFERENCE — Read-only parameter. It runs the motor at actual jog speed reference.

JOG ACC CW — Setting of the clockwise acceleration time (active on the Jog + reference).

JOG ACC CCW — Setting of the counterclockwise acceleration time (active on the Jog - reference).

JOG DEC CW — Setting of the clockwise deceleration time (active on the Jog + reference).

JOG DEC CCW — Setting of the counterclockwise deceleration time (active on the Jog - reference).

9.19. MULTI SPEED FUNCTION

As an alternative to the Speed ref analog reference (in the speed control configuration), it is possible to enable the **Multispeed** function. Enabling some digital inputs configured as **Multi speed sel bit..** it is possible to recall up to seven fixed speeds set in the **Multi speed xx** parameters.

The references can be supplied with signs, so that their definition sets the desired rotation direction.

In case the digital inputs programmed as ***Speed sel bit*** are all at 0, the reference Speed ref 1/2 remains active.

	Speed sel bit 0	Speed sel bit 1	Speed sel bit 2
Multi speed 1	high	low	low
Multi speed 2	low	high	low
Multi speed 3	high	high	low
Multi speed 4	low	low	high
Multi speed 5	high	low	high
Multi speed 6	low	high	high
Multi speed 7	high	high	high

axv6050

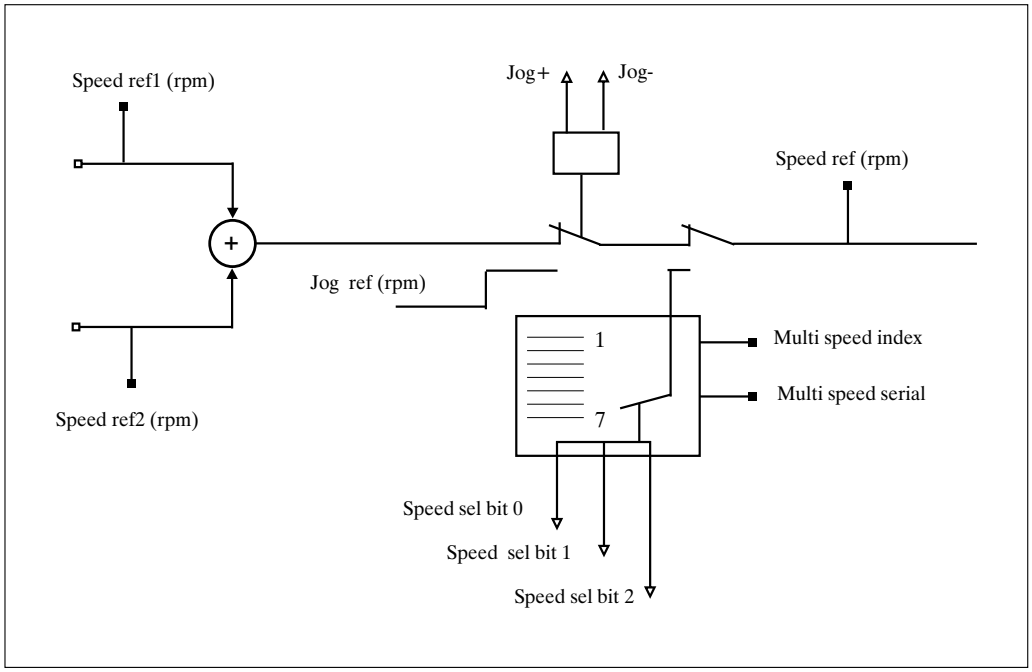


Figure 9.19.1: Multi speed function

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
MULTI SPEED 1 (rpm)	21301	float	-10000	+10000	0	R/W	
MULTI SPEED 2 (rpm)	21302	float	-10000	+10000	0	R/W	
MULTI SPEED 3 (rpm)	21303	float	-10000	+10000	0	R/W	
MULTI SPEED 4 (rpm)	21304	float	-10000	+10000	0	R/W	
MULTI SPEED 5 (rpm)	21305	float	-10000	+10000	0	R/W	
MULTI SPEED 6 (rpm)	21306	float	-10000	+10000	0	R/W	
MULTI SPEED 7 (rpm)	21307	float	-10000	+10000	0	R/W	
MULTI SPEED INDEX	21310	word	0	7	0	R/W	
MULTI SPEED SERIAL	21311	enum	0	1	Dig input	R/W	
Digital input						0	
Parameter						1	

Axvt919

MULTI SPEED 1 Setting of the multispeed 1speed reference. Unit of measure : rpm .

MULTI SPEED 2 Setting of the multispeed 2 speed reference (rpm).

MULTI SPEED 3 Setting of the multispeed 3 speed reference (rpm).

MULTI SPEED 4 Setting of the multispeed 4 speed reference (rpm).

MULTI SPEED 5 Setting of the multispeed 5 speed reference (rpm).

MULTI SPEED 6 Setting of the multispeed 6 speed reference (rpm).

MULTI SPEED 7	Setting of the multispeed 7 speed reference (rpm).
MULTI SPEED INDEX	Read parameter, if **Multi speed serial** = *Digital input.* It states the currently used speed reference. Read/write parameter if **Multi speed serial** = *Parameter.* Setting of the multi speed reference.
MULTI SPEED SERIAL	Parameter for the selection of the commands enabling the multi speed references. **0** = ***Digital input*** Reference selection via digital input **1** = ***Parameter*** Reference selection via the **Multi speed index** parameter

It is also possible to select up to 3 analog references as Multi speed (see paragraph analog input), which can be recalled via the selection of three digital inputs.

9.20. MULTI RAMP FUNCTION

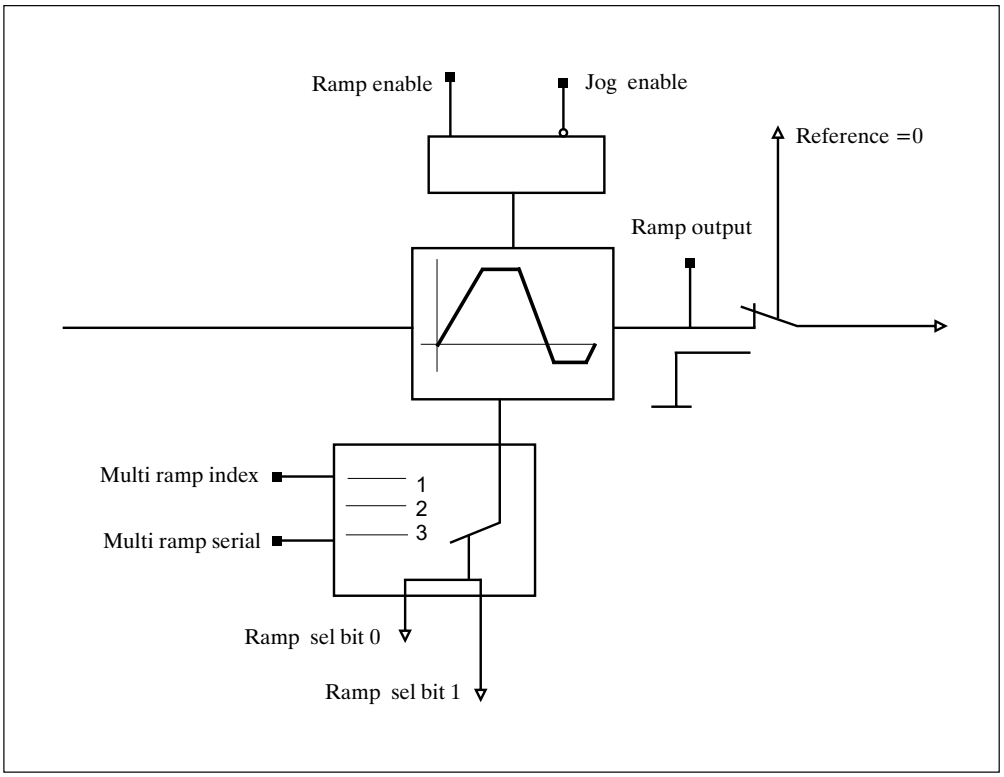


Figure 9.20.1: Multi ramp function

The ***Multiramp*** function allows to recall up to three different ramps (in addition to the main ramp). The acceleration and deceleration times can be set in an independent way. The recall of the desired ramp is carried out via a / two digital signals programmed as Ramp sel bit 0 and ramp sel bit 1.

The selection of each different ramp allows the reference to follow the new ramp during the acceleration and deceleration phase.

	Ramp sel bit 0	Ramp sel bit 1
Ramp 1	high	low
Ramp 2	low	high
Ramp 3	high	high

axv6055

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
MULTI RAMP INDEX	21440	word	0	3	0	R/W	
MULTI RAMP SERIAL	21441	enum	0	1	Dig input	R/W	
Digital input						0	
Parameter						1	
MULTI RAMP ACC CW1 (msec/rpm)	21401	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP ACC CCW 1 (msec/rpm)	21411	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP DEC CW 1 (msec/rpm)	21421	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP DEC CCW 1 (msec/rpm)	21431	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP ACC CW 2 (msec/rpm)	21402	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP ACC CCW 2 (msec/rpm)	21412	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP DEC CW 2 (msec/rpm)	21422	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP DEC CCW 2 (msec/rpm)	21432	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP ACC CW 3 (msec/rpm)	21403	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP ACC CCW 3 (msec/rpm)	21413	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP DEC CW 3 (msec/rpm)	21423	float	0	17476/enc pul	0,332	R/W	
MULTI RAMP DEC CCW 3 (msec/rpm)	21433	float	0	17476/enc pul	0,332	R/W	

Axvt920

MULTI RAMP INDEX

Read parameter if **Multi ramp serial** = *Digital input.*
It states the ramp being used.
Read/write parameter if **multi speed ramp** = *Parameter.* Setting of the multi-ramp selection.

MULTI RAMP SERIAL

Parameter for the selection of the multi-ramp enabling commands

0 = ***Digital input*** Ramp selection via digital input

1 = ***Parameter*** Ramp selection via the **Multiramp index**

MULTI RAMP ACC CW 1

Rate 1 setting of the clockwise acceleration (msec/rpm).

MULTI RAMP ACC CCW 1

Rate 1 setting of the counterclockwise acceleration (msec/rpm).

MULTI RAMP DEC CW 1

Rate 1 setting of the clockwise deceleration (msec/rpm).

MULTI RAMP DEC CCW 1

Rate 1 setting of the counterclockwise deceleration (msec/rpm).

ULTI RAMP ACC CW 2

Rate 2 setting of the clockwise acceleration (msec/rpm).

MULTI RAMP ACC CCW 2

Rate 2 setting of the counterclockwise acceleration (msec/rpm).

MULTI RAMP DEC CW 2	Rate 2 setting of the clockwise deceleration (msec/rpm).
MULTI RAMP DEC CCW 2	Rate 2 setting of the counterclockwise deceleration (msec/rpm).
MULTI RAMP ACC CW 3	Rate 3 setting of the clockwise acceleration (msec/rpm).
MULTI RAMP ACC CCW 3	Rate 3 setting of the counterclockwise acceleration (msec/rpm).
MULTI RAMP DEC CW 3	Rate 3 setting of the clockwise deceleration (msec/rpm).
MULTI RAMP DEC CCW 3	Rate 3 setting of the counterclockwise deceleration (msec/rpm).

9.21. POSITION PARAMETER

It is possible to configure the Flexmax drives in the Position mode if desired, but default is speed mode.

Drive parameter →
→ **Drive configuration** →
→ **Position**

WARNING ! In order to carry out correct positioning procedures of the desired position, it is always necessary to have initially set the drive in a 0 position (or home position). After finding the home position, each rising leading edge of the "**Pos 0 search**" input takes the axis back into the desired position.

If you need to reset the effective 0 position, it is necessary to delete the found home flag by resetting the drive, or the alarms must be reset, or disable the drive.

9.21.1. Zero sensor

It is possible to make the zero sensor active on the leading edge both from the high and from the low logic status. In order to change such configuration use the **Pos configuration** parameter**.** When the zero position has been found, the **Pos zero found** digital output reaches the high logic status.

9.21.1.1. Zero search (Pos 0 search)

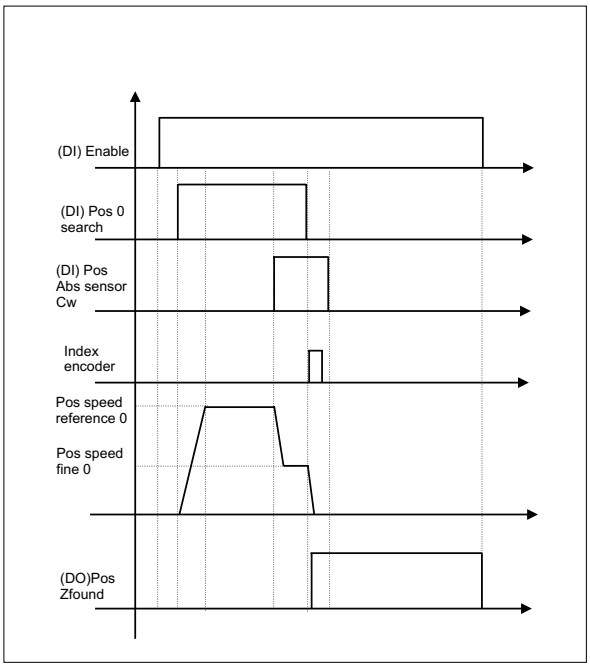
The zero search phase can be carried out with different modes:

A - Via a digital input programmed as: **Pos Abs 0 sensor CW** (absolute 0 search CW in clockwise direction)

1) Enable the drive: **"Enable"** digital input with a high logic status

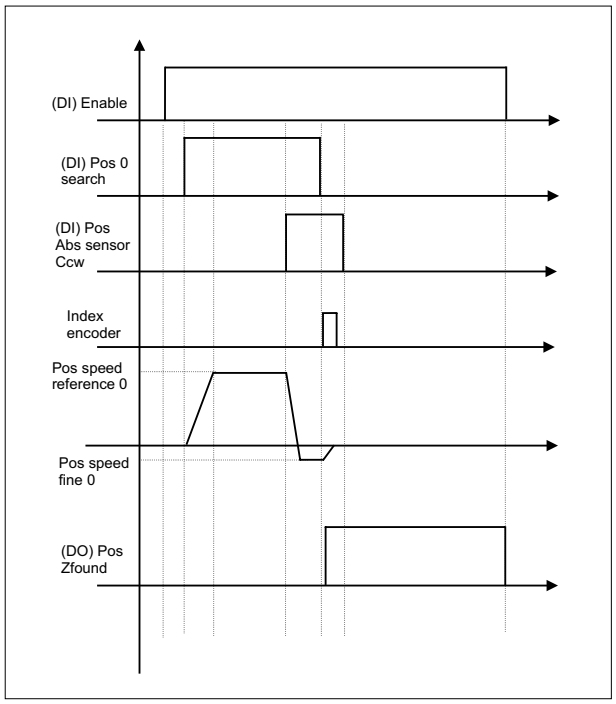
2) Enable (high logic status) a digital input programmed as **Pos 0 search**

3) When the drive receives the **Pos 0 search** command **the motor** starts rotating with the reference **Pos speed reference 0.** When the **Pos Abs 0 search CW** digital input intervenes, **Pos speed fine 0** becomes the active speed reference (clockwise rotation direction).The motor stops when the "POS ZPOS" position is detected as compared to the encoder index. This position is acquired as a zero position.



B - Via a digital input programmed as: **Pos Abs 0 search CCW** (absolute 0 search in CCW direction).

1) Enable the drive: **"Enable"** digital input with a high logic status.
2) Enable (high logic status) a digital input programmed as **Pos 0 search**.
3) When the drive receives the **Pos 0 search** command the motor starts rotating with the reference **Pos speed reference 0.** When the **Pos ABS 0 search CCW** digital input intervenes, **Pos speed fine 0** becomes the active speed reference (counterclockwise rotation direction). The motor stops when the "POS ZPOS" position is detected as compared to the encoder index. This position is acquired as a zero position.



C - Search procedure equal to mode A and B, with the possibility to add an offset after having reached the index.

When necessary due to machine limitations it is possible to change the 0 point (corresponding to the encoder index). Within one revolution of the motor it's possible to put in an offset with the parameter **Pos pos**.

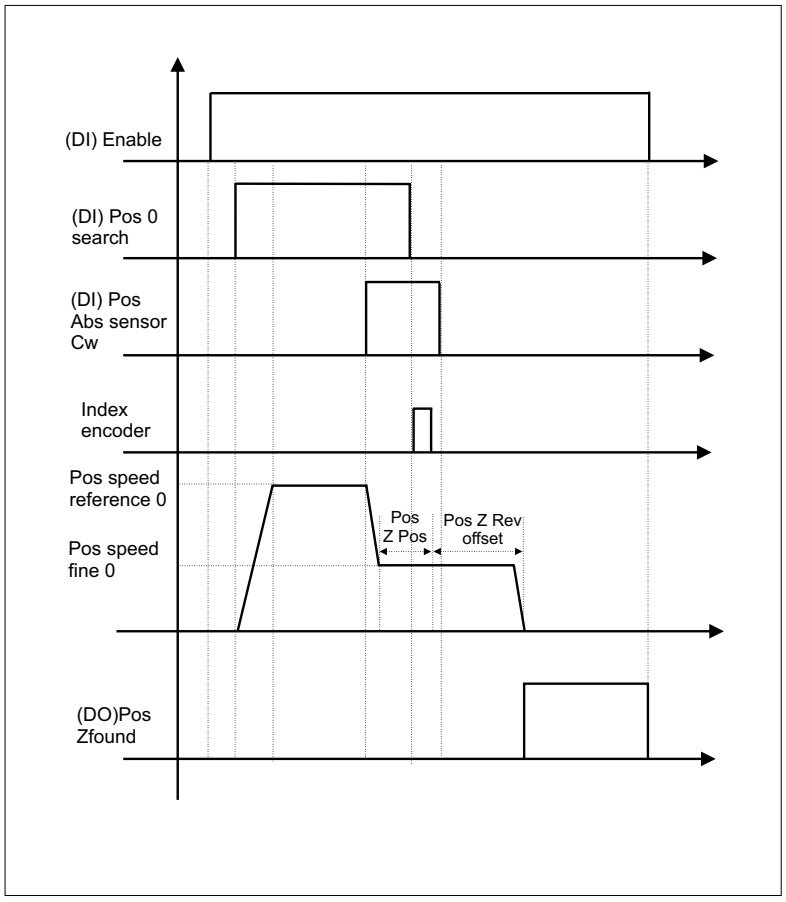
That number is from 0 up to the pulses number * 2^{14} (for example with 2048 pulses per rev: **Pos pos** from 0 up to 33554432).

When the procedure A/B has finished, upon reaching the index the motor will continue to move till the reaching of the position determined by **Pos pos**.

Moreover, it's possible to modify the 0 machine position adding an offset of n rotations with the parameter **Pos rev offset.**

When the procedure A/B has finished, at the reaching of the index the motor will continue to move till the reaching of the position determined by **Pos rev offset.**

It's possible to use both the parameter **Pos pos** and **Pos rev offset**.



After the zero position has been found, each leading edge of the **Pos 0 search** input takes the axis back to the zero position stored with the reference **Pos speed Ret 0.**

If a new zero position search sequence has to be performed, the found zero flag can be cancelled by resetting the drive and the alarms or by disabling the drive.

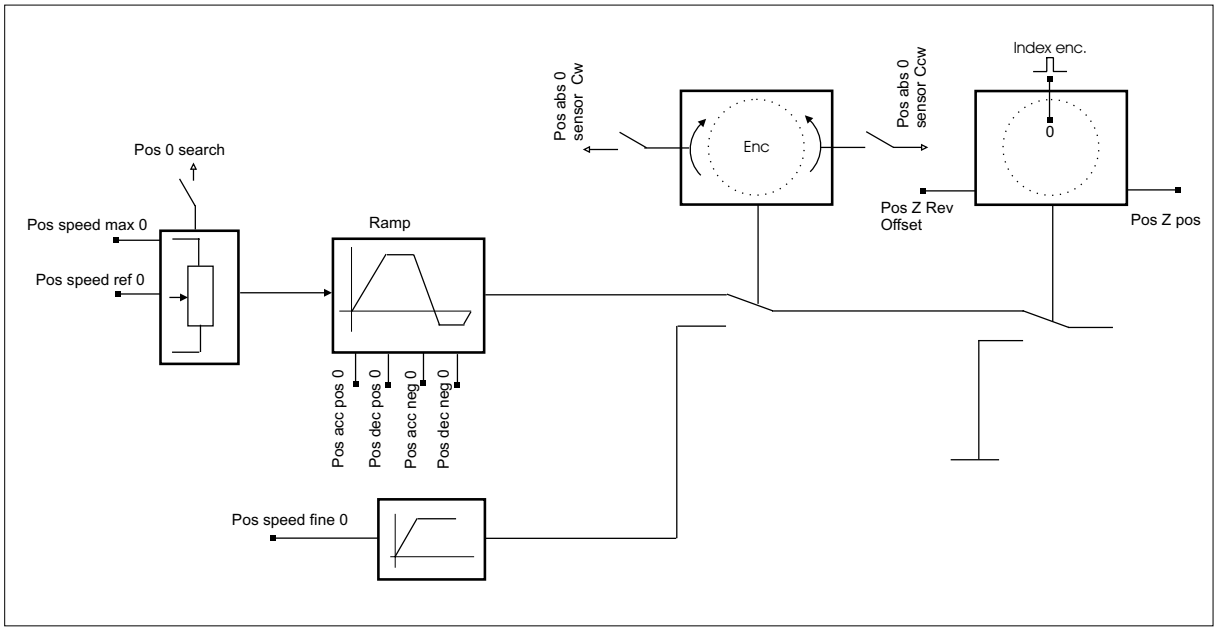


Figure 9.21.1: Home search

9.21.2. Position start

At the end of the zero search phase it is possible to carry out the position start. The motor, when the drive (enabled) receives the **Pos start pos** command**,** starts rotating with the reference **Pos speed** and reaches the set value. There are 64 registers where it is possible to store the desired values and to recall them via digital inputs programmed as **Pos preset bit 0,1,2,3,4,5.** (They are used to state in a binary way the positioning value. It is not necessary to use them all. If they have not been programmed, the bits are set at 0).

For each value of the first 8 registers it is possible to set a maximum speed and a personalized acceleration and deceleration ramp. As for the other registers, the speed, the acceleration and deceleration ramp is the same for them all.

9.21.3. Value self-acquisition

It is possible to use the value self-acquisition function:

Pos memo zero: it stores the present position as a zero position. If the zero position is stored, the value is considered to have been found (a further zero search is not necessary to perform the positioning procedure).

Pos memo pos: it stores the present position as a value xx . The register where the value has to be stored is stated by the **Pos Preset Index** parameters if the **Pos Preset serial** parameter has been set as ***Parameter*****,** or by the digital input if **Pos Preset serial** has been set as ***Digital Input*** .

9.21.4. Positioning parameters

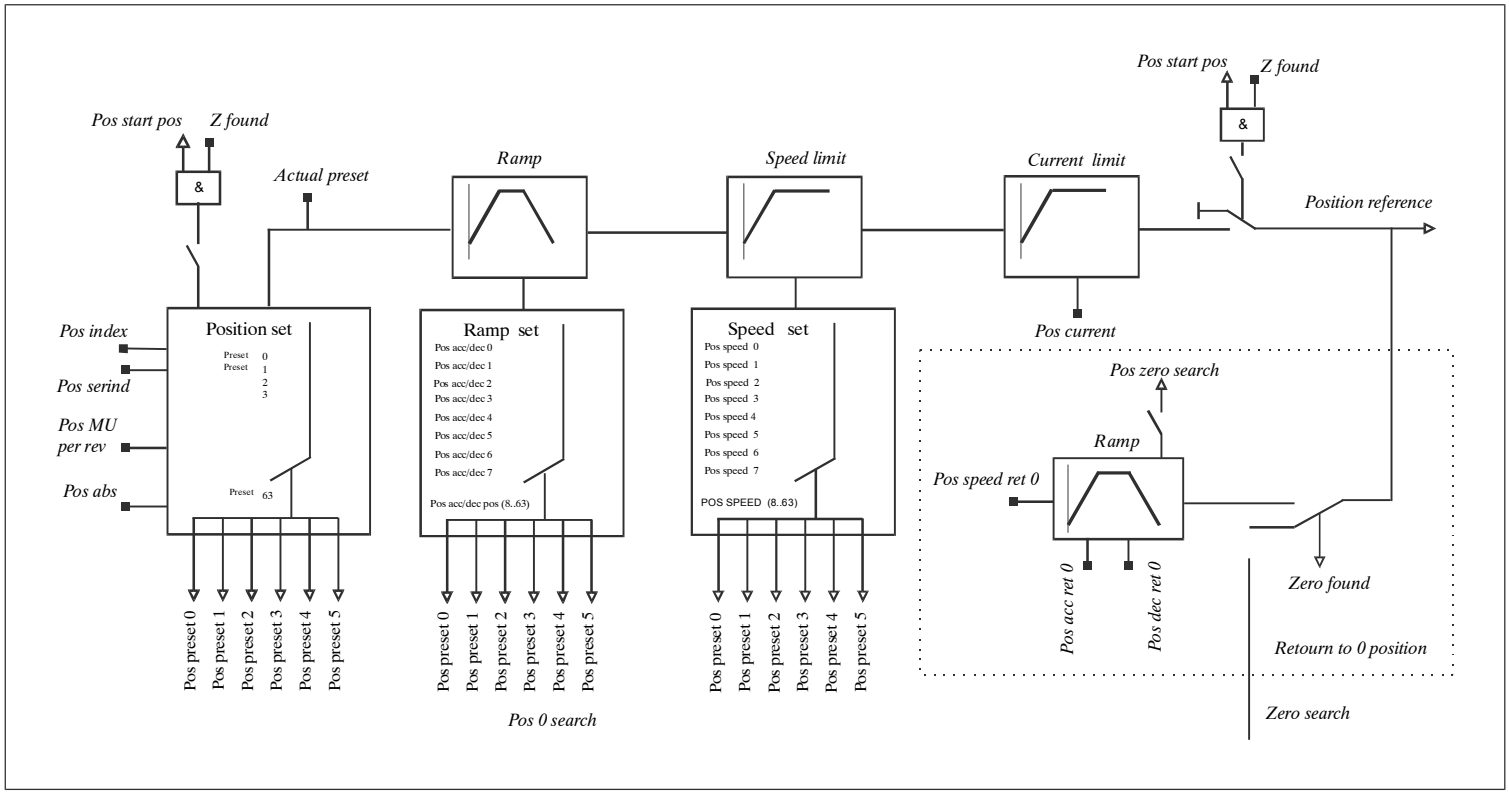


Figure 9.21.4: Value acquisition function

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
POS ACC CW (msec/rpm)	30010	float	0	17476/enc pul	0,332	R/W	
POS ACC CCW (msec/rpm)	30011	float	0	17476/enc pul	0,332	R/W	
POS DEC CW (msec/rpm)	30012	float	0	17476/enc pul	0,332	R/W	
POS DEC CCW (msec/rpm)	30013	float	0	17476/enc pul	0,332	R/W	
POS SPEED (rpm)	30014	float	0	10000	3000	R/W	
POS CURRENT (A)	30015	float	0	Drive size	6	R/W	
POS STOP DEC (msec/rpm)	30094	float	0	17476/enc pul	0,332	R/W	
POS ACTUAL POS	30016	float	0	2^{31}-1	0	R	
MEASURE UNIT PER REV	30000	dword	0	100000	1000	R/W	
POS MINIMUM PRESET	30017	float	-2^{22}	2^{22}-1	-2^{22}	R/W	
POS MAXIMUM PRESET	30018	float	-2^{22}	2^{22}-1	2^{22}-1	R/W	
POS MINIMUM ABS	30055	float	0	2^{31}-1	0	R/W	
POS MAXIMUM ABS	30056	float	0	2^{31}-1	0	R/W	
POS PRESET INDEX	30090	word	0	63	0	R/W	
POS PRESET SERIAL	30092	enum	0	1	Dig input	R/W	
Digital input						0	
Parameter						1	
POS ABS	30091	enum	0	1	Incremental	R/W	
Incremental						0	
Absolute						1	
POS CONFIGURATION	30093	dword	00000000H	0FFFFFFFFH	0H	R/W	
POS DEST REV	30080	long	-2^{22}	2^{22}-1	0	R	
POS DEST POS	30081	long	-2^{22}	2^{22}-1	0	R	
POS ABSTHR	30050	float	-2^{22}	2^{22}-1	0	R/W	
POS THR	30051	float	0	2^{22}-1	0	R/W	
POS THROFF	30052	float	0	2^{22}-1	0	R/W	
POS THR NEAR 1	30053	float	0	2^{22}-1	0	R/W	
POS THR NEAR 2	30054	float	0	2^{22}-1	0	R/W	

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POS ACC CW	Setting of the clockwise acceleration rate during the positioning procedures (ramp rate active for the positions set by the registers 8 to 63). Unit of measure : msec/rpm .
POS ACC CCW	Setting of the counterclockwise acceleration rate during the positioning procedures (ramp rate active for the positions set by the registers 8 to 63). Unit of measure : msec/rpm .
POS DEC CW	Setting of the clockwise deceleration rate during the positioning procedures (ramp rate active for the positions set by the registers 8 to 63). Unit of measure : msec/rpm .
POS DEC CCW	Setting of the counterclockwise deceleration rate during the positioning procedures (ramp rate active for the positions set by the registers 8 to 63). Unit of measure : msec/rpm .
POS SPEED	Setting of the speed reference during the positioning procedures (active for the positions set by the registers 8 to 63).
POS CURRENT	Setting of the maximum current during the positioning procedures (active for all positions set by the registers 0 to 63).
POS STOP DEC	Setting of the clockwise/counterclockwise deceleration rate active during an emergency stop before reaching the position (see **Pos configuration** parameter). Unit of measure : msec/rpm .
POS ACTUAL POS	Read-only parameter. It states the motor present position as compared to the zero position. It is active only at the end of the zero search phase. Unit of measure : user unit.
MEASURE UNIT PER REV	Setting of the space covered by the encoder during one revolution. Parameter used to state the position in engineering units. Unit of measure : user unit.
POS MINIMUM PRESET	Parameter stating the minimum value to be set in the different position registers. Unit of measure : user unit. In case the setting of a position is lower than this value, such setting is not accepted.
POS MAXIMUM PRESET	Parameter stating the maximum value to be set in the different position registers. Unit of measure : user unit. In case the setting of a position is higher than this value, such setting is not accepted.
POS MINIMUM ABS	Minimum absolute position setting. When set to 0 it is not enabled. If the user writes a position out of range, the command is not activated and the drive activates the digital output **Pos-out of limits** (1008).
POS MAXIMUM ABS	Maximum absolute position setting. When set to 0 it is not enabled. If the user writes a position out of range, the command is not activated and the drive activates the digital output **Pos-out of limits** (1008).

POS PRESET INDEX

Read parameter if **Pos preset serial** = *Digital input.*

Read/write parameter if **Pos preset serial** = *Paramater.* It states which position preset is currently used.

POS PRESET SERIAL

Parameter selecting the enabling commands of the position registers.

0 = ***Digital input*** Register selection via digital input

1 = ***Parameter*** Register selection via the **Pos preset index** parameter.

POS ABS

This parameter states if the positioning values make reference to the zero position or to the actual position. (Relative or absolute moves).

0 = ***Incremental*** It states that the value of the position register is incremental as compared to the actual position.

Example: If the currently selected position preset is 2000 u.u. (user units), with every **Pos start pos** command the position increases by 2000 u.u.

1 = ***Absolute*** It states that the value of the position register is absolute as compared to the zero position.

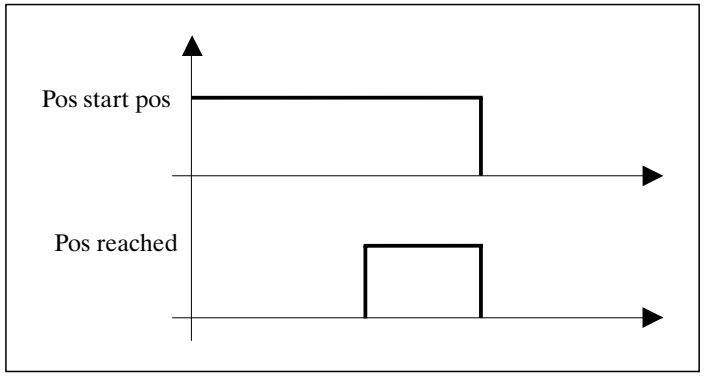
Example: If the currently selected position preset is 2000 u.u., with the first command of **Pos start pos** the destination position is 2000 u.u. (referred to the zero position); with the following commands (if the register is not modified) the position will not change.

POS CONFIGURATION

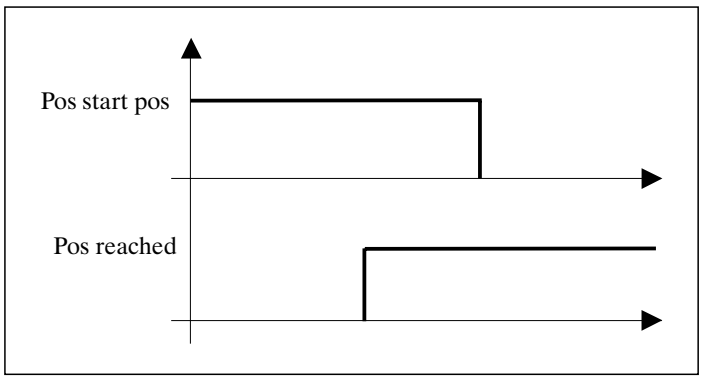
Programming of particular functions in the positioner configuration: bit-configured parameter with an hexadecimal setting.

bit 0

Set with bit 0 = 1; the digital output configured as **Pos reached** (reached position) remains with a high logic status only if the **Pos start pos** digital input is in a high logic status condition.



By setting bit 0 = 0 , the digital output configured as **Pos reached** (reached position) keeps a high logic level till the following command starting the positioning procedure is given.



Bit 1 Set with bit 1 = 1; by disabling the **Pos start pos** command during a positioning phase, the motor stops with the ramp rate **Pos dec CW/CCW**

Bit 2 Set with bit 2 = 1; by disabling the **Pos start pos** command during a positioning phase, the motor stops as fast as possible (without ramp).

Bit 3 Set with bit 3 = 1; by disabling the **Pos start pos** command during a positioning phase, the motor stops with a ramp rate set in the **Pos stop dec** parameter.

Note If bit 1, bit 2, bit 3 are all equal to 0, it is not possible to stop the motor during the positioning phase (only by disabling the drive), as the pos start pos command is active on the climbing leading edge.

Bit 4 Set with bit 4 = 1; even though the drive is disabled (enable drive command), the 0 position remains stored. In order to reset the 0 position storage, it is necessary to disable the power supply on the regulation card.

Bit 4 = 0 When the drive is disabled, the zero position is lost and it is therefore necessary to perform a new 0 search sequence.

Bit 5 Set with bit 5 = 1; the zero sensor (digital input programmed as **Pos 0 sensor CW/CCW**) is active on the sensor output leading edge (standard configuration bit 5 = 0, sensor active on the rising leading edge).

Bit 6 Set with bit 6 = 1; the zero sensor (digital input programmed as **Pos 0 sensor CW/CCW**) is active on the high logic level.

Bit 7 Set with bit 7 = 1; the zero sensor (digital input programmed as **Pos Abs 0 sensor CW/CCW**) is active on the low logic level.

Bit 8 Set up bit 8 = 1; it starts the search mode of the home position only after having passed the first encoder index.

This procedure is necessary in applications where the feedback encoder is of digital type with Hall sensor and there is the possibility of finding the 0 position before executing at least one motor turn.

Programming example

If bit 0 is to be enabled (reset of pos reached), the bit 1 (pos stop) and the bit 6 (sensor active on the high logic status) are necessary:

bit 0 = 1
bit 1 = 1
bit 6 = 1

POS CONFIGURATION	11	10	9	8	7	6	5	4	3	2	1	0
Bit	0	0	0	0	0	1	0	0	0	0	1	1
	0				4				3			

axv6056

Therefore, in the **Pos configuration** parameter it is necessary to set the value **043H**.

POS DEST REV — Read-only parameter (valid only for debug); it states the revolutions to the destination position.

POS DEST POS — Read-only parameter (valid only for debug); it states the position in the revolution of the destination position.

POS ABS THR — Setting of the threshold indicating the machine has passed the position referred to the zero position. When the position is higher than the value set in this parameter, the digital output programmed as “Pos Abs threshold” goes to +24V. Unit of measure : user unit .

POS THR — Setting of the threshold indicating the machine has passed the position referred to the last positioning: if the positioning procedure is carried out in a clockwise direction and the present value is higher than the one set in this parameter + the starting one, the “position threshold” output is set. When the positioning procedure is carried out in a counterclockwise direction and the present value is lower than the starting one - the one set in this parameter, the “position threshold” is set.

POS THR OFF — Offset setting of the zero speed threshold. It states how far the position can oscillate around the zero position before considering active the digital output programmed as “Speed 0 thr”. Unit of measure : user unit .

POS THR NEAR 1 — Reached position threshold 1. The digital output reaches high logic status when the motor present position is equal to the destination position minus the Pos thr near 1 parameter.

POS THR NEAR 2 — Reached position threshold 2. The digital output reaches high logic status when the motor present position is equal to the destination position minus the Pos thr near 2 parameter. “Speed 0 thr”. Unit of measure (u.u.).

9.21.5. Positioning inputs

Pos preset 0...5 They are used to state in a binary way the positioning value. It is not necessary to use them all. If they have not been programmed, the bits are at 0.

Pos-0 search If set at 1 the drive goes to the home value, if such value has been previously found. If not, the ramp block becomes active till a 0 sensor input intervenes.
See paragraph 9.21.3.

Pos-Abs 0 sensor CW See paragraph 9.21.1.

Pos-Abs 0 sensor CCW See paragraph 9.21.1.

Pos- 0 sensor See paragraph 9.21.1.

Pos-Start pos The drive carries out a positioning procedure with the presently selected value. The zero position must have been found previously.

Pos-Memo 0 See paragraph 9.21.3.

Pos-Memo pos See paragraph 9.21.3.

9.21.6. POSITION PRESET

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
POS PRESET [0…7]	3010.	float	-2^{22}	$2^{22}-1$	0	R/W	
POS SPEED [0…7] (rpm)	3010.	float	0	10000	0	R/W	
POS ACC [0…7] (msec/rpm)	3010.	float	0	17476/enc pul	0,332	R/W	
POS DEC [0…7] (msec/rpm)	3010.	float	0	17476/enc pul	0,332	R/W	
POS PRESET [8]	30108	float	-2^{22}	$2^{22}-1$	0	R/W	
POS PRESET [...]	301..	float	-2^{22}	$2^{22}-1$	0	R/W	
POS PRESET [63]	30163	float	-2^{22}	$2^{22}-1$	0	R/W	

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POS PRESET (0...7) Setting of the position value in the register (0...7).
Unit of measure : user unit.

POS SPEED (0...7) Maximum speed setting during the positioning phase of preset 0...7.
Unit of measure : rpm .
(Active if the **Pos speed** analog input is not programmed).
If this value is set with 0 (rpm) the **Pos speed** parameter in the **Position parameter** menu becomes active.

POS ACC (0...7) — Setting of the acceleration rate during the positioning phase of preset 0...7. Unit of measure : msec /rpm .

POS DEC (0...7) — Setting of the deceleration rate during the positioning phase of preset 0...7. Unit of measure : msec /rpm .

POS PRESET 8 — Setting of the position value in the register 8. Unit of measure : user unit .

POS PRESET (9...62) — Setting of the position value in the register 9...62. Unit of measure : user unit .

POS PRESET 63 — Setting of the position value in the register 63. Unit of measure : user unit .

9.21.7. ZERO CONFIGURATION

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
POS ACC CW 0 (msec/rpm)	30020	float	0	17476/enc pul	0,332	R/W	
POS ACC CCW 0 (msec/rpm)	30021	float	0	17476/enc pul	0,332	R/W	
POS DEC CW 0 (msec/rpm)	30022	float	0	17476/enc pul	0,332	R/W	
POS DEC CCW 0 (msec/rpm)	30023	float	0	17476/enc pul	0,332	R/W	
POS SPEED MAX 0 (rpm)	30024	float	0	10000	1500	R/W	
POS SPEED REF 0 (%)	30025	float	-100%	+100%	10%	R/W	
POS SPEED FINE 0 (rpm)	30027	float	0	10000	50	R/W	
POS ZPOS	30030	long	0	2^{31}-1	0	R/W	
POS 0 FOUND	30031	int	0	1	0	R	
POS ZREV OFFSET	30035	dword	0	10000	0	R/W	
POS ZREV	30029	long	-2^{31}	2^{31}-1	0	R	
POS SPEED RET 0 (rpm)	30026	float	0	10000	1000	R/W	
POS ACC RET 0 (msec/rpm)	30032	float	0	17476/enc pul	0,332	R/W	
POS DEC RET 0 (msec/rpm)	30033	float	0	17476/enc pul	0,332	R/W	
POS DSPEED RET 0 (rpm)	30034	float	0	10000	50	R/W	

Axvt9212

POS ACC CW 0 — Clockwise acceleration during the home search.

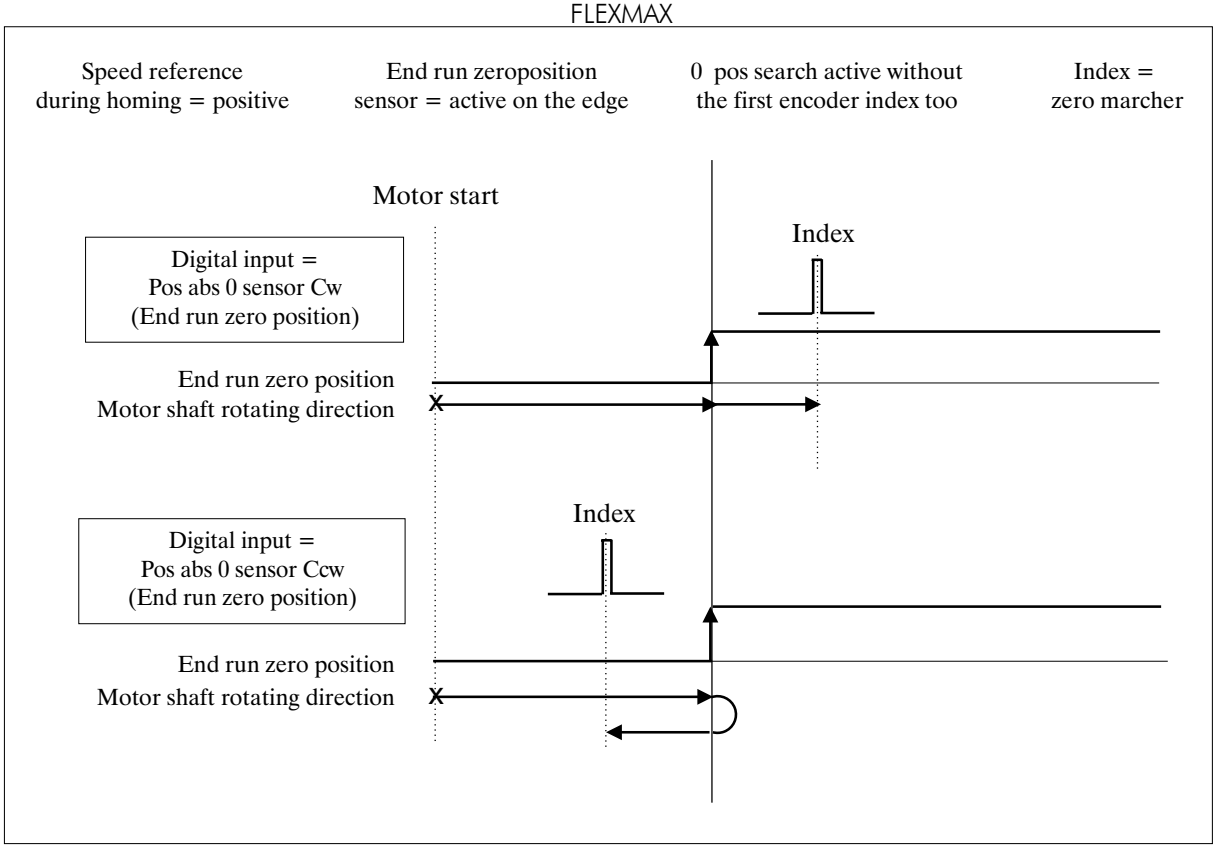
POS ACC CCW 0 — Counterclockwise acceleration during the home search.

POS DEC CW 0 — Clockwise deceleration during the home search.

POS DEC CCW 0 — Counterclockwise deceleration during the home search.

POS SPEED MAX 0 — Maximum speed during the home search.

POS SPEED REF 0	Speed reference during the home search.
POS SPEED FINE 0	Speed reference while searching the home absolute position.
POS Z POS	Zero position inside a revolution. Position setting (from 0 to n encoder pulses per 2^{14}) to shift homing in one encoder cycle.
POS 0 FOUND	Position indicator of the found home.
POS ZREV OFFSET	Motor cycle number that the user can "plus" POS Z POS parameter, to do an offset homing position.
POS ZREV	Read -only, number of revolutions of the zero position.
POS SPEED RET 0	Speed reference while returning to the home position.
POS ACC RET 0	Setting of the acceleration rate with a clockwise/counterclockwise rotation direction during the phase returning to the 0 position. Unit of measure : msec /rpm .
POS DEC RET 0	Setting of the deceleration rate with a clockwise/counterclockwise rotation direction during the phase returning to the 0 position. Unit of measure : msec /rpm .
POS DSPEED RET 0	Establish the increase of speed reference for every complete motor turn, while the axis gets back to 0. It's used to avoid high speed of the motor during short moves. Example: POS DSPEED RET 0 = 100 POS SPEED RET 0 = 1500 When there is an large distance from 0 the max speed is 1500 rpm, while from 0 up to 15 turns the speed has increased at a step of 100 rpm per revolution.



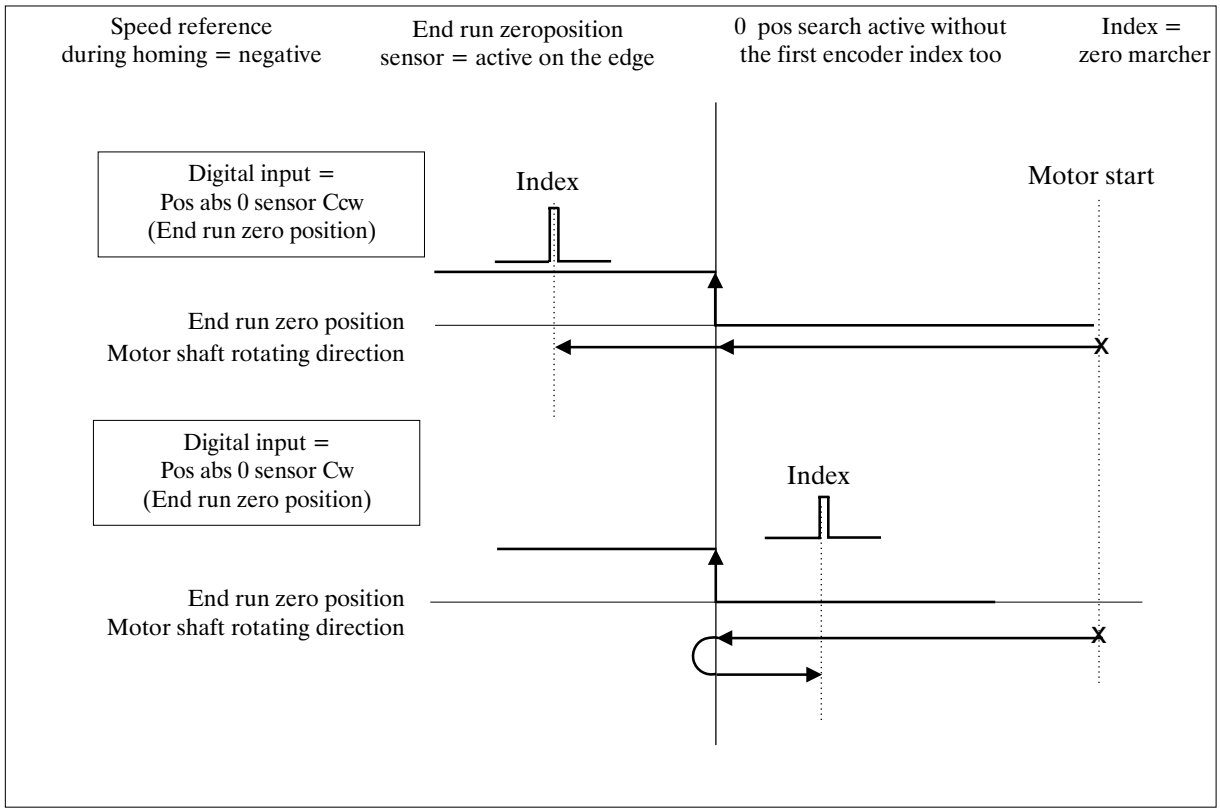
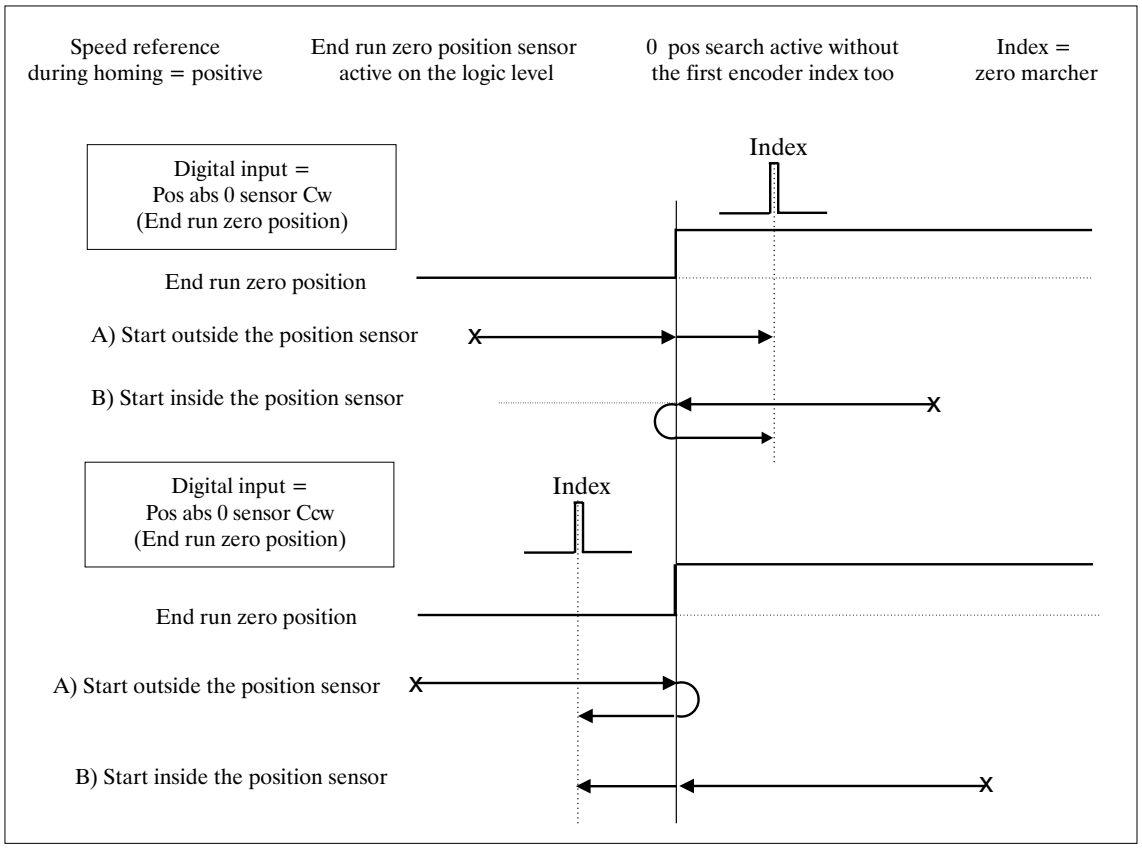


Figure 9.21.7.1: Home position search active on the positive edge



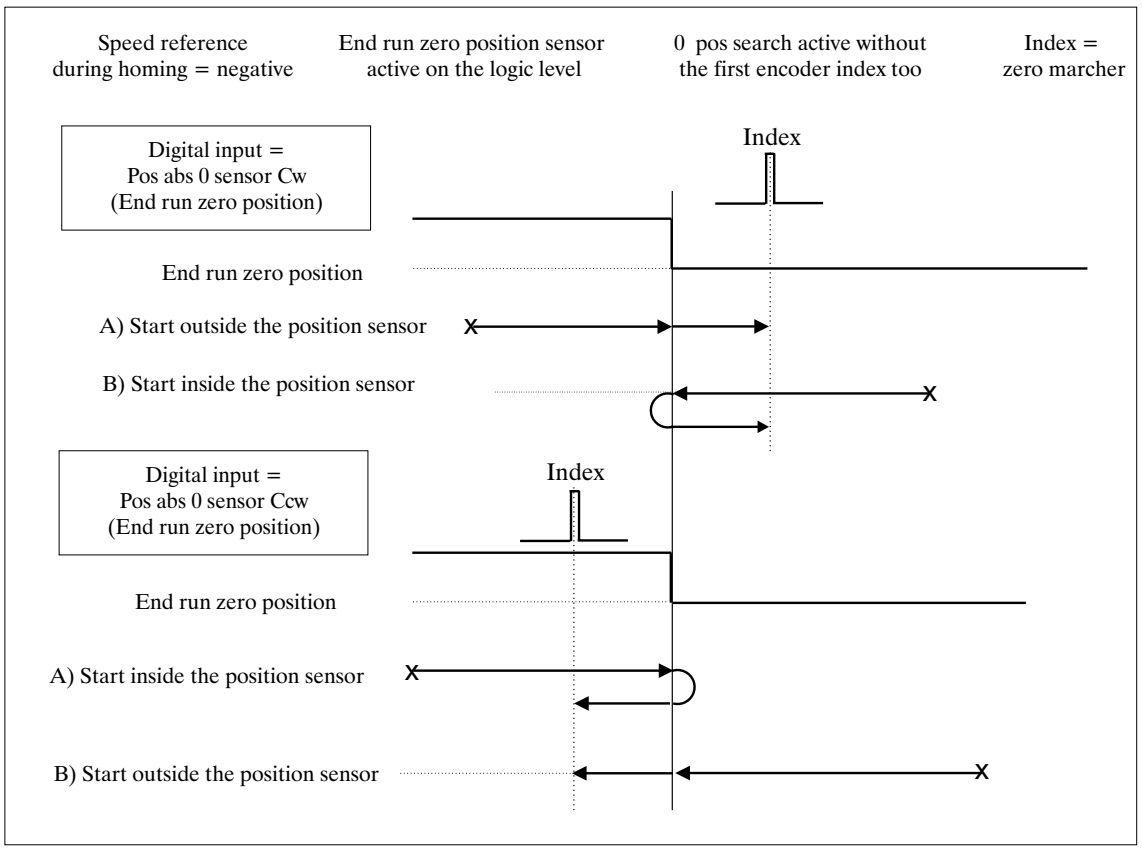


Figure 9.21.7.2: Home position search active on the logic level

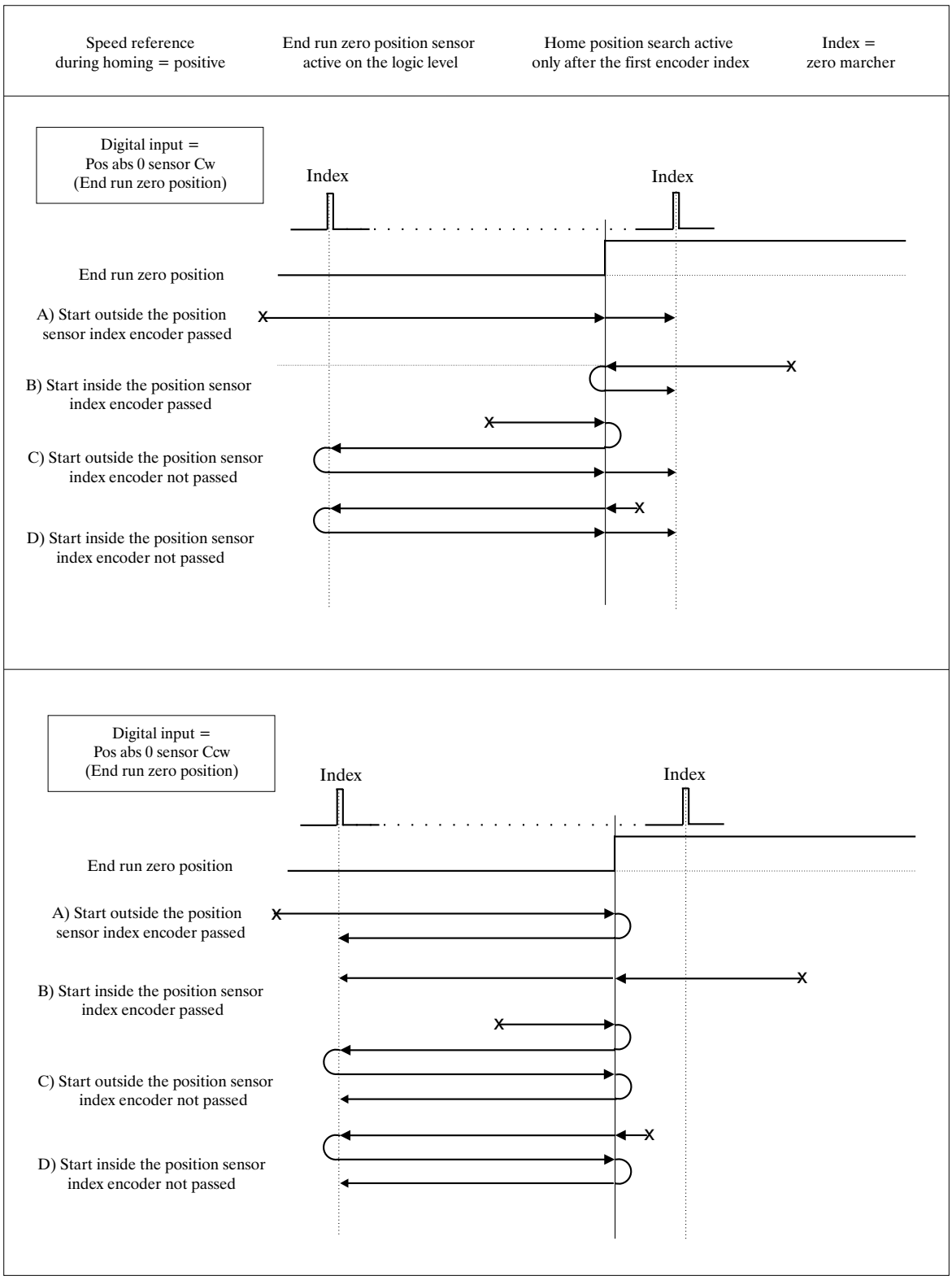


Figure 9.21.7.3: Home position search active on the logic level after the first encoder index

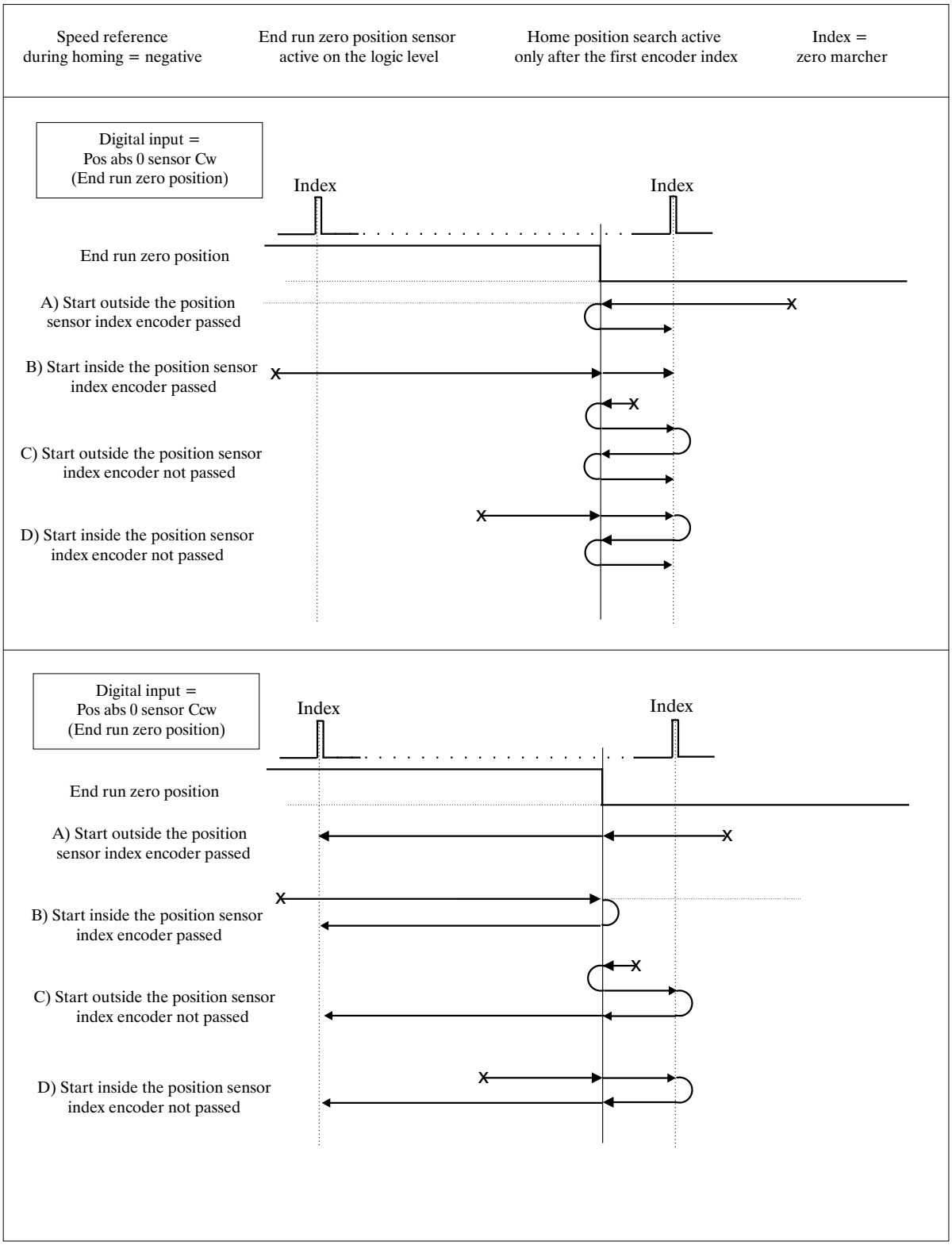


Figure 9.21.7.4: Home position search active on the logic level after the first encoder index

9.22. ELECTRICAL LINE SHAFT

In the configuration Electrical line shaft it is possible to provide synchronism between 2 or more motors. The master encoder can be connected to XFR (on EXP-BRS board) or it is possible to use the fast link.

Moreover, it is possible to save into the drive up to 4 ratios selectable through 2 programmed digital input as **Els ratio sel bit 0,1.** Whatever ratio is actually selected, it is possible to increase/decrease by two programmed digital inputs as **Els inc ratio** and **Els dec ratio**.

To use this function it will be necessary to install the optional expansion board EXP-BRS.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
ELS PULS REV MAST	32000	word	512	32767	2048	R/W	
ELS DELTA TIME (sec)	32008	float	0	10 sec	1 sec	R/W	
ELS MASTER SEL	32009	enum	0	1	Encoder	R/Z	
Encoder						0	
Fast link						1	
ELS DELTA RATIO	32014	float	10	+7.900	1	R/W	
ELS SLIP	32020	enum	0	1	Ratio	R/Z	
Ratio						0	
Slip						1	
ELS POSITION ERROR	19113	long	0	2^{22}-1	0	R	

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ELS PULS REV MASTER

Set the number pulses per turn of the master encoder present on the connector S1 or on the fast-link.

ELS DELTA TIME

This parameter is used together with the programmed digital input as **Els inc ratio** and **Els dec ratio.**

It defines the rate of change from a ratio to a new ratio.

Measurement unit (sec). This parameter is used together with the parameter **Els delta ratio.**

Example: when the inputs **Els Inc /Dec ratio** are active, the ratio changes the set value by **Els Delta ratio** (es. 0.002) within the set time in the parameter **Els Delta time** (es 0.1 sec).

ELS MASTER SEL

Set up to define the reference source of the master encoder.

Encoder Master encoder at XFR.

Fast link Connectors XT-IN , XT-OUT.

ELS DELTA RATIO

Define how much the ratio should increment (or decrement) every cycle of slow task (8msec).

Example: if through the digital input a new ratio is selected changing from 1.000 up to 2.000 the change is not immediate but follows a ramp profile with a set increase in this parameter. If els delta ratio active: 1.000 means an increment of 1.000 every 8msec, therefore it changes to the new ratio in 8msec.

If els delta ratio is active: 0.010 means a change of 0.01 every 8msec, therefore it changes to the new ratio (2.000) in 800msec.

Through a programmed digital input, **Els ramp ratio dis** it's possible to disable this time to ramp.

ELS SLIP

If set up to **Ratio** the ratio is activated.

If set up on **Slip** the parameters ELS RATIO 0, 1, 2, 3, are not set as ratio but as % of slipping from the Master. For instance 0.10 slip is 90% of the speed of the master, or ratio of 0.90.

ELS POSITION ERROR

Max position error allowed. Measurement unit encoder pulses for 2^{14}.

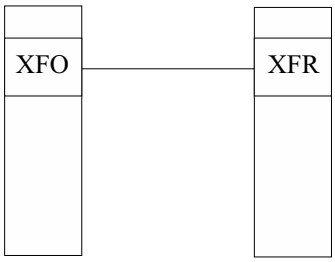
Connection of a digital encoder using repitition

Flexmax Master: connector XFO connects the channels A-Aneg, B and Bneg and 0V to the connector XFR slave.

Set up: enable the encoder repetition, parameter **Enable anc repetition** and program the correct pulses number with the parameter **Enc pulses rev**.

Flexmax Slave: connector XFR connect the channels A-Aneg, b and Bneg and 0V to the connector XFO master.

WARNING : Before connecting the connector S1 on the slave operation verify the parameter Enable enc repetition is set to disable. The factory set up is disable.This parameter is automatically disabled when the drive is set in mode Electric line shaft and configured as slave.



Fast link connection instead of encoder connection

Flexmax Master: connector XT-OUT (master) connect to the connector XT-IN (slave)

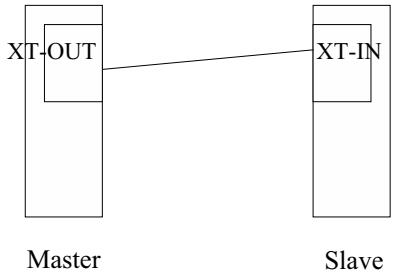
Set up: enable the fast link, parameter **Drive fast link** set as **Master XT-OUT**

Flexmax Slave: Connector XT-IN (slave) connect the connector XT-OUT (master).

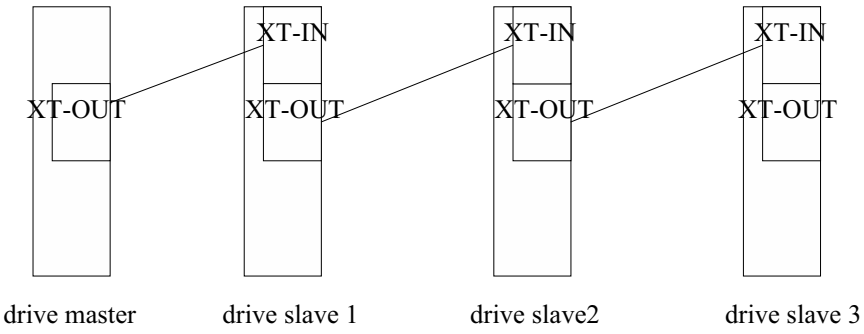
Set up: enable the fast link, parameter **Drive fast link** set as **Slave XT-IN** .

The fast link is active only after a reset drive command.

WARNING : *THE MAIN SUPPLY (+24V) FOR THE FLEXMAX REGULATOR OF THE MASTER AND SLAVE MUST BE THE SAME WITH 0V CONNECTED TOGETHER.*

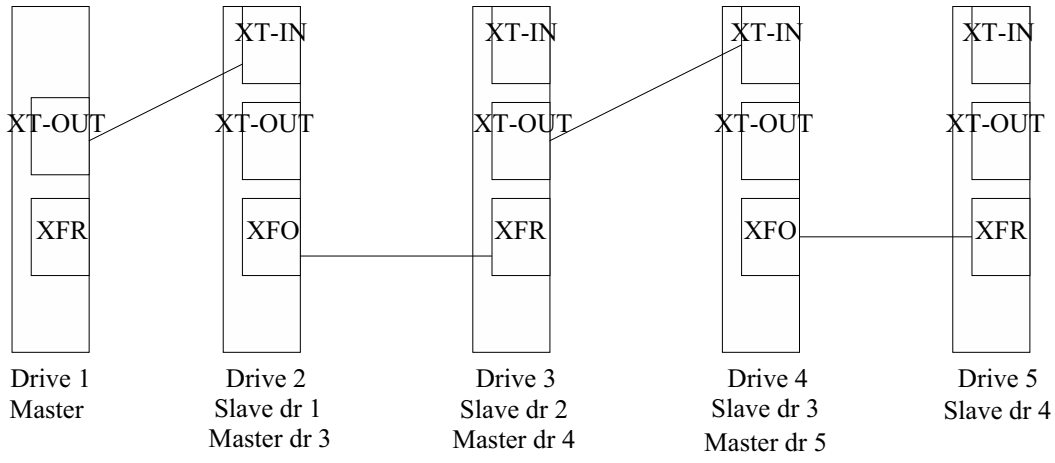


In applications with a drive master and drive slave it is possible to make a connection with fast link XT-OUT (master) -XT-IN (slave) because from the master encoder frequencyis always available at connector XT-OUT.



The drive slave 1,2,3 are all synchronized with the drive master.

In applications where it is necessary to synchronize the drive in cascade, master –slave, where the previous is always the master of the next it is necessary to use both the encoder repetition and the fast link.



9.22.1. ELECTRICAL LINE SHAFT RATIO

It is possible to load into the drive up to 4 ratios selectable through 2 programmed digital input as **Els ratio sel bit 0,1** or from configurator.

It is also possible to set the 4 ratios via the analog input.

The set ratio is calculated as: R = slave speed/master speed.

Example: if the master speed is 1000 rpm and the slave must rotate at 2000 rpm it is necessary to set a ratio: Ratio = 2000 rpm / 1000 rpm = 2.000.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
ELS RATIO [0]	32001	float	-8.000	+7.900	1.000	R/W	
ELS RATIO [1]	32002	float	-8.000	+7.900	1.000	R/W	
ELS RATIO [2]	32003	float	-8.000	+7.900	1.000	R/W	
ELS RATIO [3]	32004	float	-8.000	+7.900	1.000	R/W	
ELS ACT RATIO	32005	float	-8.000	+7.900	1.000	R	
ELS RATIO INDEX	32006	word	0	3	0	R/W	
ELS RATIO SERIAL	32007	enum	0	1	Dig input	R/W	
Digital input						0	
Parameter						1	

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ELS RATIO [0] — Set up speed ratio for electric axis. Preset 0

ELS RATIO [1] — Set up speed ratio for electric axis. Preset 1

ELS RATIO [2] — Set up speed ratio for electric axis. Preset 2

ELS RATIO [3] — Set up speed ratio for electric axis. Preset 3

ELS ACT RATIO — Read parameter, show the value of actually selected ratio.

ELS RATIO INDEX — Read parameter if **Els ratio serial** = *Digital input.*
Shows which ratio is actually in use.
Parameter reading/writing if **Els ratio serial** = *Parameter*
Set up of the ratio selection (ratio 0, 1, 2, 3).

ELS RATIO SERIAL — Parameter for the selection of the enable commands Els ratio.

0 = *Digital input* — The ratio selection (0, 1, 2, 3) is possible through 2 programmed digital inputs as **Els ratio sel bit 0,1**.

1 = *Parameter* — The ratio selection (0, 1, 2, 3) is possible through the parameter **Els Ratio Index**.

9.22.2. ELECTRICAL LINE SHAFT BEND

Through an external command it is possible to increase/decrease the motor slave speed momentarily to create a phase offset or "bend" in the shaft. To do this, for a fixed time the motor slave is not in synchronism with the master, because its reference is modified to be either faster or slower. At the end of the fixed time by parameter or when the digital input is not longer present, the slave gets back in synchronism with the master.

The modifing speed can be set on an analog input or fixed by parameter.

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
ELS RB SPEED MAX [rpm]	32100	float	-10000	+10000	1000	R/W	
ELS RB SPEED REF [%]	32104	float	-100	+100	10	R/W	
ELS RB TIME [sec]	32101	float	0	500	500 sec	R/W	
ELS RB ACC [sec]	32102	float	0	10000	1 sec	R/W	
ELS RB DEC [sec]	32103	float	0	10000	1 sec	R/W	

Axvt9222

ELS RB SPEED MAX

Parameter to set up the max limit of speed reference for the bend recover function.

Measurement unit : rpm .

ELB RB SPEED REF

Reference for bend recover function, settable also from an analog input (**Els Rb Spd Ref**).

Expressed in % of the speed reference to add to the synchronism reference.

ELS RB TIME

Time setting for the correction reference to be active.

The digital input that enables this function (**Els-bend rec CW/CCW**) must be kept activated during the recovery. At the end of the acceleration phase of the bend recover function, the timing starts. When the time is equal to that set in this parameter the bend recover reference becomes zero. The remaining bend will remain.

If the digital input that enables this function (**Els-bend rec CW/CCW**) goes low before the time expires (0V) the bend recover reference becomes zero. In other words, if time is not sufficient to recover, the bend that is left after time runs out will remain.

ELS RB ACC

Acceleration time during the speed change. Increase the speed of the set revolutions number in the parameter every 8 msec. Measurement unit : seconds .

ELS RB DEC

Deceleration time during the speed change. Decrease the speed of the set revolutions number in the parameter every 8 msec. Measurement unit : seconds .

9.23. FAILURE REGISTER

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
DRIVE FAULT	24000	dword	0	2^{32}-1	0	R	
EXTERNAL FAULT	24001	int	0	1	0	R	
BRIDGE DESATURATION	24002	int	0	1	0	R	
OVERCURRENT	24003	int	0	1	0	R	
DCLINK OVERVOLTAGE	24004	int	0	1	0	R	
HEATSINK OVERTEMP	24005	int	0	1	0	R	
MODULE JUNCTION OVERTEMP	24006	int	0	1	0	R	
CURRENT FEEDBACK LOSS	24007	int	0	1	0	R	
MOTOR OVERTEMP	24008	int	0	1	0	R	
AUX POWER UNDERVOLT	24009	int	0	1	0	R	
DSP PROG ERROR	24010	int	0	1	0	R	
PRG 16KHZ OVERTIME	24011	int	0	1	0	R	
INVALID FLASH PARMS	24012	int	0	1	0	R	
BAD FLASH DEVICE	24013	int	0	1	0	R	
BRAKE OVERPOWER	24014	int	0	1	0	R	
FAILURE POWER SUPPLY	24015	int	0	1	0	R	
BRAKE ERROR	24016	int	0	1	0	R	
LOCK DRIVE	24017	int	0	1	0	R	
DI ENCODER COUNT	24018	int	0	1	0	R	
AD ENCODER COUNT	24019	int	0	1	0	R	
ENCODER SIMULATION	24020	int	0	1	0	R	
UNDERVOLTAGE	24021	int	0	1	0	R	
INTAKE AIR OVERTEMP	24022	int	0	1	0	R	
REGULATION OVERTEMP	24023	int	0	1	0	R	
IGBT MODULE OVERTEMP	24024	int	0	1	0	R	
SIZE NOT DEFINED	24025	int	0	1	0	R	
EB-BUS LOSS	24026	int	0	1	0	R	
EB-GENERIC FAIL	24027	int	0	1	0	R	
SEQUENCE ERROR	24028	int	0	1	0	R	
FAST LINK ERROR	24029	int	0	1	0	R	
POSITION ERROR	24030	int	0	1	0	R	
FIRST ALARM	24040	word	0	31	0	R	

txv0500

DRIVE FAULT — This parameters shows the present alarms.

EXTERNAL FAULT — External alarm present (alarm code 31).

BRIDGE DESATURATION — Bridge short circuit alarm (alarm code 1).

OVERCURRENT — Overcurrent alarm (alarm code 2).

DCLINK OVERVOLTAGE — DC link overvoltage (alarm code 3).

HEATSINK OVERTEMP — Heatsink overtemperature (alarm code 4).

MODULE JUNCTION OVERTEMP	Module junction overtemperature (alarm code 5).
CURRENT FEEDBACK LOSS	Loss of power current supply TA (alarm code 6).
MOTOR OVERTEMP	Motor overtemperature alarm (alarm code 7).
AUX POWER UNDERVOLT	Undervoltage of regulator supply (alarm code 8).
DSP PROG ERROR	DSP program alarm (alarm code 9).
PRG 16KHZ OVERTIME	16 KHz program alarm (alarm code 10).
INVALID FLASH PARMS	Invalid flash parameter alarm (alarm code 11).
BAD FLASH DEVICE	Alarm on a non preset flash (alarm code 12).
BRAKE OVERPOWER	Brake overtemperature alarm (alarm code 13).
FAILURE POWER SUPPLY	Loss of reguilation ±15V supply (alarm code 14).
BRAKE ERROR	Brake Alarm (usually brake threshold too low) (alarm code 15).
LOCK DRIVE	Blocked drive alarm (alarm code 16).
DI ENCODER COUNT	Digital encoder alarm (alarm code 17).
AD ENCODER COUNT	Analog (SINCOS) encoder alarm (alarm code 18).
ENCODER SIMULATION	Encoder simulation alarm (alarm code 19).
UNDERVOLTAGE	Undervoltage, mains supply (alarm code 20).
INTAKE AIR OVERTEMP	Temperature of intake air too high; detected by TAC sensor (code 21).
REGULATION OVERTEMP	OT of reg board; detected by sensor on reg board (alarm code 22).
IGBT MODULE OVERTEMP	IGBT module OT; detected by sensors on Power stage (code 23).
SIZE NOT DEFINED	Drive size not defined (alarm code 24).
EB BUS LOSS	Loss of EB Bus (alarm code 25).
EB-GENERIC FAIL	EB-PDP card generic alarm. (alarm code 26).

SEQUENCE ERROR	Sequence error alarm (alarm code 27).
FAST LINK ERROR	PX-NET communication alarm (alarm code 28).
POSITION ERROR	Position error alarm (alarm code 29).
FIRST ALARM	This parameter shows the code of the first intervened alarm.

9.24. ALARM TO MASK

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
ALARMS TO MASK	24100	dword	0	2^{32}-1	19000000H	R/W	

txv0510

ALARMS TO MASK

This parameter allows masking the intervention of some alarms thus making them inactive. It is an hexadecimal alarm.

When the masked alarm gets active, the drive goes on functioning properly (the OK relay does not change its state) and the digital output programmed as ALARM WARNING changes its logic level.

List of possible excluded alarms:

DI encoder count	(error code 17)
AD encoder count	(error code 18)
Encoder simulation	(error code 19)
Undervoltage	(error code 20)
EB-bus loss	(error code 25)
Sequence error	(error code 27)
Fast link	(error code 28)
Position error	(error code 29)
External fault	(error code 31)

This parameter is default set with: 19000000H (it means that the Pos.error, fast link and EBbus loss parameters are excluded).

Example for a parameter setting :

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1				9				0				0				0				0				0				0			

axv6057

1° column : Alarm code

2° column : Setting of the alarm functions :

0 = active

1 = masked

3° column : Parameter hexadecimal setting

9.25. EXPANSION BOARD

Optional Expansion Boards are automatically detected and it is not necessary any parameter setting.

9.26. SYSTEM

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
SYS_ IC_P_FAK	18100	word	0	32767	256	R/W	
SYS _IC_I_ FAK	18101	word	0	32767	256	R/W	
SYS _IC_D_FAK	18102	word	0	32767	256	R/W	

Axvt927

The current loop is controlled by a PID loop; the maximum control bandwidth is 5 kHz.

The gains of this loop are factory set with appropriate values for the motors manufactured by Powertec and specifically for the motor purchased if this drive was bought with a motor.

For advanced applications such values have to be optimized according to the motor used.

SYS_ IC_P_FAK — Current loop proportional gain

SYS _IC_I_ FAK — Current loop integral gain

SYS _IC_D_FAK — Current loop derivative gain

9.27. BRAKING UNIT

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
SYS_ OV_CLM_LIM	18103	word	0	1250	850		
SYS_ OV_MAX_LIM	18104	word	0	1250	0	R/W	

txv0520

Parameters required for the optimization of the internal or external braking resistance system

(see paragraph 4.9 Braking unit)

The parameters are described in the paragraph 4.9.4.

9.28. DIGITAL OUTPUT RESET

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
SYS_DO_RESET_AT_FAIL	20005	long	00000000H	FFFFFFFFH	00000000H	R/W	
SYS_DO_SET_AT_FAIL	20006	long	00000000H	FFFFFFFFH	00000000H	R/W	

txv0530

These parameters allow to state the logic level of the digital outputs when an alarm intervenes.

SYS_DO_RESET_AT_FAIL

This parameter allows to set the digital outputs with a low logic level when an alarm intervenes.

Bit-mapped parameter with a value hexadecimal setting.

0 = the output does not change

1 = the output is set with 0V

SYS_DO_SET_AT_FAIL

This parameter allows to set the digital outputs with a high logic level when an alarm intervenes.

Bit-mapped parameter with a value hexadecimal setting.

0 = the output does not change

1 = the output is set with +24V

9.29. UNDERVOLTAGE LIMITS

PARAMETER	No.	Format	Value			Access via	
			min	max	Factory	RS485	Terminal
SYS_UV_V_MIN	18120	word	0	460	400	R/W	
SYS_UV_P_FAK	18121	word	0	32767	30	R/W	

txv0540

SYS_UV_V_MIN

This parameter allows to set the intervention value of the undervoltage alarm on the power section.

The value is factory set with 400V (power supply voltage on the drive power section).