Hoist & Crane - HC Application

ADV200

Instruction manual

Language: English

INDEX

1. INTRODUCTION

Information about this manual

This manual describes the HOIST and CRANE software specifically for load handling applications, supplementing the description in the ADV200 drive manual.

Revisions index	Date	Author	Description of changes
V 0.00	25 February 2015	DLG - BNM	
V 0.01	9 March 2015	DLG - BNM - BRI	Changes on pages 4, 6, 13, 16 15, 31, 36, 38 and 40.
V 1.00	22 January 2016	DLG - BNM	ADV200-HC v3.0.3
V 1.1	05 February 2016	DLG - BNM	Changes on pages 4-5-10-11-12-18-19-24-26-28-31-32-33-34-35- 38-40-41-43-45-46-49-51-53-54. Updated diagrams on pages 7-33-34-36-37.
V 1.2	13 June 2019	BNM	ADV200-HC v3.0.3. Menu ANALOG INPUTS to HC DIG INPUTS, menu DIGITAL OUTPUTS to HC DIG OUTPUTS, menu ALARM CONFIG to HC ALARM CONFIG. On menu HC ALARM CONFIG add table BIT-Alarm-Description. Delected section 4.2.8
V 1.3	17 Novembre 2022	BRI	New covers WEG.
V 1.4	24 Giugno 2024	SPR	Integration of motopotentiometer and overloading.
V 1.5	23 Settembre 2024	SPR	The ADV200-HC is transformed into an application.

ADV200 software version

This manual applies to the following software version of the ADV200 drives.

	V/f	FOC OL	FOC CL
ADV200 ASY 7.7.20 (or higher)	√	√	√
ADV200 SYN 7.7.20 (or higher)	NO	NO	√

and to its optional cards for acquisition from encoder and expansion of inputs.

Application version

This manual applies to software version ADV200 HC V 4.0.1 (or later).

General information

Please read this instruction manual carefully before using the product.
Keep the manual in a safe place and available to engineering and installation personnel during the product functioning period.

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Thank you for choosing this WEG product.
We would be happy to receive at the e-mail address: techdoc@weg.net any information that could help us improve this manual.

2.   GENERAL DESCRIPTION

The application lets you control motors and manage commands and sensors for fixed applications used to handle loads, such as:

- rail mounted crane;
- double cantilever crane;
- gantry cranes;
- overhead cranes;
- shipyard cranes;
- oil platform cranes;
- container handling cranes;
- steel mill cranes.
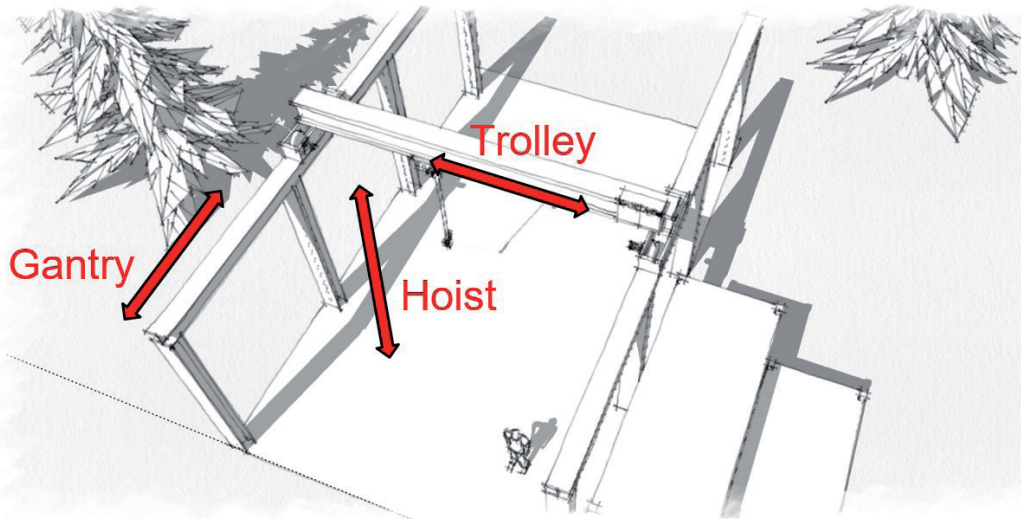
Typical structure of a load handling system:

A solid structure supports the trolley and its support beam, which moves forward and reverse on parallel rails. The trolley moves the lift equipment to the left and right.
Drive connected to electric motors supply motion: Gantry (forward), Trolley (translation) and Hoist.
HOIST&CRANE software applied to every drive of each mechanical shaft lets you control and set its speed as well as manage all of its main components (joystick, brake, and limit switch) without having to use an external PLC.
You can control and run multiple synchronized motors by using the **Electric Shaft** or **Helper** functions.
The drives communicate with each other by means of these functions, coordinating system movements and management.
The type is configured with the **H&C SERVICE\Movement type IPA11002** parameter, and includes:

Hoist		
Gantry		Drives used individually.
Trolley		
Hoist-ELS-VM	Hoist-ELS	Drives connected via FastLink.
Gantry-ELS-VM	Gantry-ELS	In electric shaft, the movement of drives is controlled in position.
Trolley-ELS-VM	Trolley-ELS	See ELS chapter for more information.
Hoist-HL-M	Hoist-HL-S	Drives connected via FastLink.
Gantry-HL-M	Gantry-HL-S	In Helper (HL) the slave (S) drive follows the torque reference generated by master (M) drive.
Trolley-HL-M	Trolley-HL-S	See HELPER chapter for more information.

3. TYPICAL CONNECTION DIAGRAM

The Hoist&Crane application for ADV200 drives does not require a higher-level control device such as a PLC. Therefore, the application can be controlled via discrete digital I/Os (digital input and output terminals of the ADV200 control card and optional expansion cards) or via the fieldbus configuration channel (**COMMUNICATION** menu of drive regardless of the type of fieldbus used).

Nell'esempio sotto riportato viene illustrata una configurazione tipica degli ingressi ed uscite digitali del drive con scheda di espansione **EXP-IO-D6A4R1-ADV** (opzionale) ed encoder (opzionale) per applicazioni che richiedono l'uso di un solo drive per asse meccanico.

The following example shows a typical configuration of the digital inputs and outputs of the drive with the optional **EXP-IO-D6A4R1-ADV** expansion card and the optional encoder for applications requiring a single drive for each mechanical shaft.

This configuration lets you connect a joystick/button panel for movement commands, brake/feedback management, limit switch sensors, enabling of AntiImpact function, and alarm reset button.
Digital input signals must be set on the **HOIST&CRANE / HC DIG INPUTS** menu.
Digital output signals must be set on the **HOIST&CRANE / HC DIG OUTPUTS** menu.
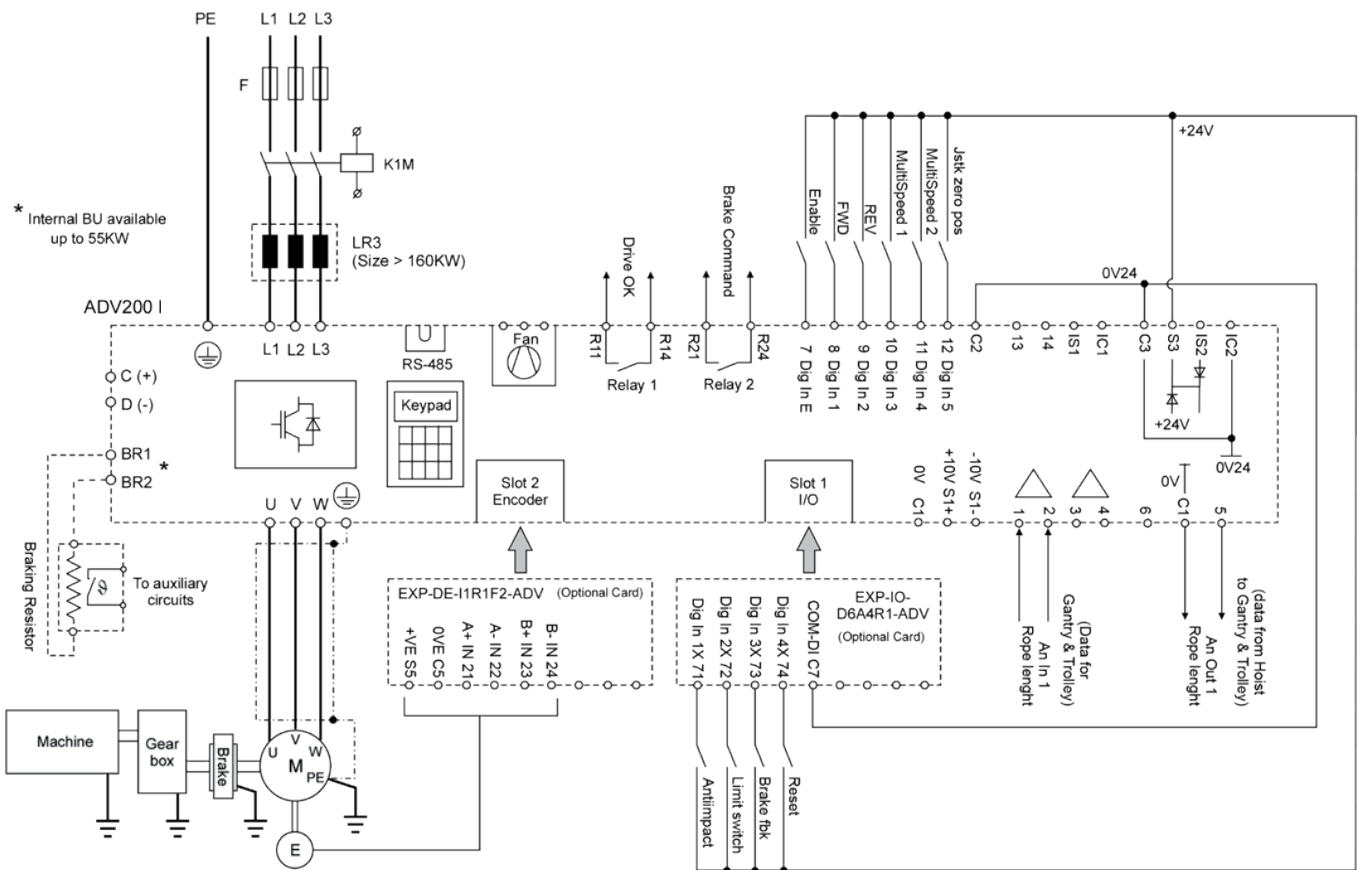
4. DESCRIPTION OF FUNCTIONS AND LIST OF PARAMETERS

26.01 MONITOR

The **MONITOR** parameters let you identify the operating state of the drive and of user-enabled functions.
States 1 and 3 indicate if the motor is running (**RUN**), driven by the drive and with handbrake open, or if the motor is stopped with the handbrake closed (**STOP**).
States 5-6-7-8-9-10-12-13 indicate that the corresponding function has been activated (if conditions allow and if the function is enabled) and is acting on the drive setting.
State 4 indicates that an alarm has tripped.
State 5 indicates that a limit switch contact has tripped: the user can handle the load only in the direction opposite the limit switch until the tripped contact returns to normal position.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.01.01	12000	**Drive state mon**	-	ENUM	-	-	-	R

1 STOP	Brake closed, drive disabled.
2 pre RUN	Wait to exceed min. time for brake release.
3 RUN	Brake open, drive enabled.
4 ALARM	Active alarm.
5 Limit switch	Limit switch tripped.
6 RUN cmd ctrl	COMMAND CONTROL function ON.
7 RUN spd up	HOIST SPEED UP function ON.
8 RUN pwr up	SPEED UP function ON.
9 RUN low speed	LOW SPEED ZONE function ON.
10 RUN anti sway	ANTI SWAY function ON.
11 RUN anti impact	ANTI IMPACT function ON.
12 RUN align	ALIGNEMENT function ON.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.01.02	12002	**Movement type mon**	-	ENUM	-	-	-	R

Displays type of movement and drive configuration.

Stand Alone		Electric Shaft		Master Follower	
0 Hoist		3 Hoist-ELS-VM		9 Hoist-HL-M	
1 Gantry		4 Gantry-ELS-VM		10 Gantry-HL-M	
2 Trolley		5 Trolley-ELS-VM		11 Trolley-HL-M	
		6 Hoist-ELS		12 Hoist-HL-S	
		7 Gantry-ELS		13 Gantry-HL-S	
		8 Trolley-ELS		14 Trolley-HL-S	

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.01.03	12004	**Anti Sway mon**	-	BOOL	-	-	-	R

Monitor activation anti-sway function.

| 26.01.04 | 12006 | **Brake FWD cur mon** | - | BOOL | - | - | - | R |

Monitor current limit exceeded for brake opening, FWD.

| 26.01.05 | 12008 | **Brake FWD trq mon** | - | BOOL | - | - | - | R |

Monitor torque limit exceeded for brake opening, FWD.

| 26.01.06 | 12010 | **Brake FWD spd mon** | - | BOOL | - | - | - | R |

Monitor speed limit exceeded for brake opening, FWD.

| 26.01.07 | 12012 | **Brake REV cur mon** | - | BOOL | - | - | - | R |

Monitor current limit exceeded for brake opening, REV.

| 26.01.08 | 12014 | **Brake REV trq mon** | - | BOOL | - | - | - | R |

Monitor torque limit exceeded for brake opening, REV.

| 26.01.09 | 12016 | **Brake REV spd mon** | - | BOOL | - | - | - | R |

Monitor speed limit exceeded for brake opening, REV.

| 26.01.10 | 12018 | **Brake cmd mon** | - | BOOL | - | - | - | R |

Monitor brake command.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.01.11	12020	**Brake fbk mon**	-	BOOL	-	-	-	R
		Monitor brake feedback.						
26.01.12	12022	**H Speed up FWD mon**	-	BOOL	-	-	-	R
		Monitor limit exceeded for enabling of Hoist speed up function, FWD.						
26.01.13	12024	**H Speed up REV mon**	-	BOOL	-	-	-	R
		Monitor limit exceeded for enabling of Hoist speed up function, REV.						
26.01.14	12026	**Pwr Speed up mon**	-	BOOL	-	-	-	R
		Monitor to enable Power speed up function.						
26.01.15	12030	**OL1 mon**	-	BOOL	-	-	-	R
		Monitor limit 1 exceeded for Over Load function.						
26.01.16	12032	**OL2 mon**	-	BOOL	-	-	-	R
		Monitor limit 2 exceeded for Over Load function.						
26.01.17	12034	**Anti Impact mon**	-	BOOL	-	-	-	R
		Monitor limit exceeded for Anti Impact function.						
26.01.18	12036	**LSZ mon**	-	BOOL	-	-	-	R
		Monitor, indicates entry in speed reduction zone set in Low Speed Zone function.						
26.01.19	12038	**Limit switch FWD mon**	-	BOOL	-	-	-	R
		Limit switch tripped in FWD.						
26.01.20	12040	**Limit switch REV mon**	-	BOOL	-	-	-	R
		Limit switch tripped in REV.						
26.01.21	12042	**Speed ref mon**	rpm	FLOAT	0	-	-	R
		Monitor of speed reference set by joystick (speed_1, speed_2, speed_3 or speed_4). It is NOT the real speed reference in output from the drive.						
26.01.22	12044	**Position mon**	m	FLOAT	0	-	-	R
		Monitor of position of mechanical part driven (hook, trolley) compared to mechanical shaft zero.						
26.01.23	12046	**ELS align**	-	BOOL	-	-	-	R
		Speed reference for shaft alignment.						

26.02 H&C SERVICE

This menu allows the main parameters defining the system to be set. See chapter **COMMISSIONING PROCEDURE** for further clarification.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.01	11002	**Movement type**	-	ENUM	Hoist	-	-	R/W

Displays type of movement and drive configuration.

Stand Alone	Electric Shaft	Master Follower
0 Hoist 1 Gantry 2 Trolley	3 Hoist-ELS-VM 4 Gantry-ELS-VM 5 Trolley-ELS-VM	9 Hoist-HL-M 10 Gantry-HL-M 11 Trolley-HL-M
	6 Hoist-ELS 7 Gantry-ELS 8 Trolley-ELS	12 Hoist-HL-S 13 Gantry-HL-S 14 Trolley-HL-S

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.02	11046	**Jstk Motopot Enable**	-	BOOL	Off	-	-	R/W

Enable for the Motopotentiometer function for the joystick.

The motopotentiometer function allows the user to control the speed of the drive continuously.

When the start/reverse button is pressed, the drive reaches the speed set in parameter Speed 1 (IPA 11004).

If the button is fully pressed, the drive accelerates according to the acceleration parameters set in the CMD SPEED menu (IPA: 11084, 11092, 11094, 11096).

The maximum speed it can reach is the speed set in Speed 2 (IPA 11006).

If the button is no longer pressed all the way down, the speed stabilises at the current value.

If the button is released, the drive decelerates.
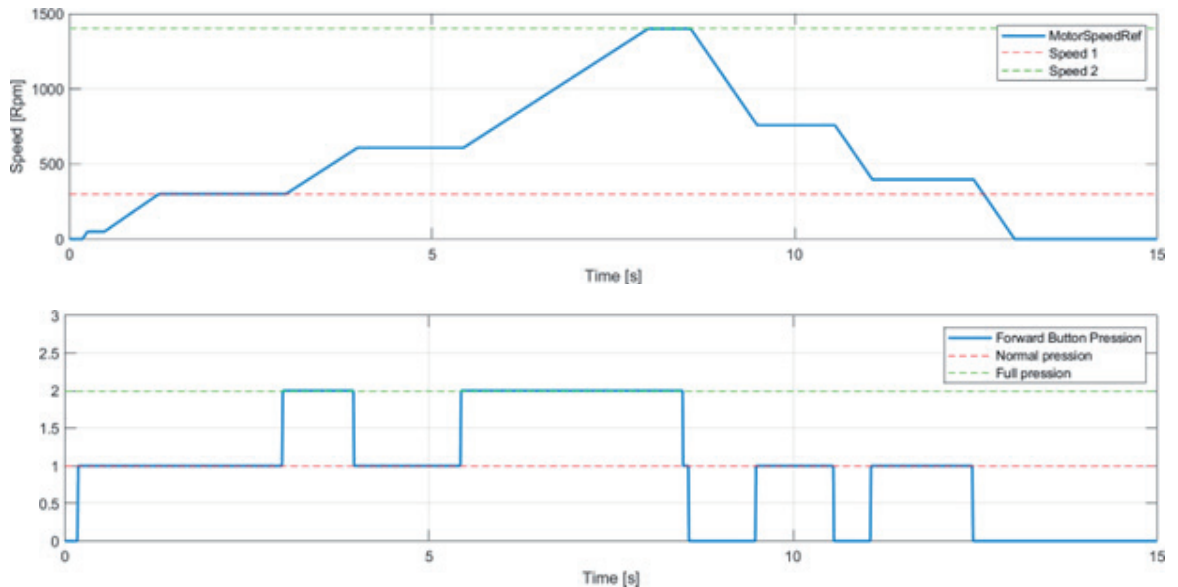
Recommendations / Notes:

- To enable the function, the joystick must be set to SF&SR mode. If the user selects SF&R mode, the drive will behave as standard SF&R (drive is disabled).
- Jskt Speed Type (IPA 11062) must be set to "Digital".
- The antisway function cannot be selected while the motor potentiometer is enabled. If the motor potentiometer is enabled, the antisway will be automatically disabled.
- Speed 1 (IPA 11004) must be lower than Speed 2 (IPA 11006). If Speed 1 is greater than Speed 2 while the function is enabled, the value of Speed 1 is forced to the value of Speed 2.
- The button, if normally pressed, must trigger one Digital Input. If, instead, it is fully pressed, it must trigger also another digital Input (without releasing the first one).

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.03	11060	**Jstk Decoding**	-	ENUM	StFWD & StREV	-	-	R/W

The "Jstk Decoding" parameter lets you choose 2 different methods for managing the Joystick and commands received: StartFwd&StartRev or StartFwd&Rev.

StartFwd&StartRev

This configuration uses 2 digital inputs to command the direction of movement (FWD or REV). The FWD and REV commands depend on the following table.

HC DIG Inputs	Direction		State
	FWD	REV	
FWD cmd src (IPA 11152)	√		START FWD
REV cmd src (IPA 11154)		√	START REV

The simultaneous reception of both commands (FWD+REV) generates the "JOYSTICK" alarm.
If "Jstk Speed Type" is set as Digital, 2 digital inputs set via "Multi spd 1 src" and "Multi spd 2 src" allow the selection of 4 possible speed references (CMD SPEED \ ...) according to the table below.

HC DIG Inputs	Speed			
	Speed 1 (IPA 11004)	Speed 2 (IPA 11006)	Speed 3 (IPA 11010)	Speed 4 (IPA 11054)
Multi spd 1 src (IPA 11156)	0	1	0	1
Multi spd 2 src (IPA 11158)	0	0	1	1

If "Jstk Speed Type" is set as Analog, the speed reference depends on the value of the analog input selected via ANALOG INPUT \ Speed ref src.
The maximum value of the analog input matches the "Speed 1" parameter on the CMD SPEED menu.

StartFwd&Rev

This configuration uses 2 digital inputs to command the direction of movement (FWD or REV) and 2 digital inputs or an analog input for the speed reference.
In this mode, START is run with only the FWD command; for REVERSE you have to command both digital inputs (FWD + REV) as shown in the following table.
Reception of only the REV command (without FWD) generates the "JOYSTICK ERROR" alarm.

HC DIG Inputs	Direction		State
	FWD	REV	
FWD cmd src (IPA 11152)	√		START FWD
REV cmd src (IPA 11154)	√	√	START REV

If "Jstk Speed Type" is set as Digital, 2 digital inputs set via "Multi spd 1 src" and "Multi spd 2 src" let you choose 4 possible speed references (CMD SPEED \ …) according to the following table.

| HC DIG Inputs	Speed			
	Speed 1 (IPA 11004)	Speed 2 (IPA 11006)	Speed 3 (IPA 11010)	Speed 4 (IPA 11054)
Multi spd 1 src (IPA 11156)	0	1	0	1
Multi spd 2 src (IPA 11158)	0	0	1	1

If "Jstk Speed Type" is set as Analog, the speed reference depends on the value of the analog input selected via ANALOG INPUT\ Speed ref src.
The maximum value of the analog input matches the "Speed 1" parameter on the CMD SPEED menu.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.04	11062	**Jstk speed type**	-	ENUM	Digital	-	-	R/W

Input type for speed reference: digital or analog.
0 **Digital** = Speed reference depends on value set in CMD SPEED \ Speed 1, Speed 2, Speed 3, Speed 4 parameters and on commands assigned to digital inputs set as DIGITAL INPUT \ Multi speed 1 src and Multi speed 2 src
1 **Analog** = Speed reference depends on analog input set via ANALOG INPUT \ Speed ref src.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.05	11064	**Jstk zero position**	-	BOOL	Off	-	-	R/W

Enable check of joystick Zero position.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.06	11074	**Rotate inversion**	-	BOOL	Off	-	-	R/W

Reverse direction of movement of commands received.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.07	11114	**Brake**	-	BOOL	On	-	-	R/W

Enable brake management.
ON = Limits specified in the BRAKE CONTROL command will be used for brake opening.
OFF = Only the delay settable in the "BRAKE CONTROL / OPEN delay" parameter will be used for brake opening.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.08	11122	**Brake fbk**	-	ENUM	None	-	-	R/W

Brake feedback setting.
0 **Norm Close** = Normally Closed when brake is active (motor locked).
1 **Norm Open** = Normally Open when brake is active (motor locked).
2 **None** = (brake feedback not reported to drive).

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.09	11142	**Limit switch**	-	ENUM	None	-	-	R/W

Enabling management of limit switches.
0 **Norm Close** = Normally closed when position of controlled element does not exceed allowed limit (limit switch OFF).
1 **Norm Open** = Normalmente aperto quando il freno è attivo (motore bloccato).
2 **None** = Limit switches not wired.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.10	11144	**App Load Default**	-	BOOL	Off	-	-	R/W

Command for loading default parameters; ONLY parameters for HOIST&CRANE application will be reloaded.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.11	11146	**Define axis length**	-	ENUM	Define length	-	-	R/W

Activation of procedure for defining rope length.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.12	11148	**Mpr**	m/gir	FLOAT	0.01	0	1000	R/W

Reduction ratio of motor rpms to movement of mechanical shaft.
This parameter can be entered manually or calculated by the application via the rope length definition procedure.
This parameter can also be written outside the procedure.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.13	11192	**Measure 1**	m	FLOAT	0	0	1000	R/W

During the procedure for defining rope length, you are asked to enter the measured length in this parameter (for details, see "ROPE LENGTH DEFINITION PROCEDURE").
This parameter can be changed ONLY in this procedure.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.14	11198	**Known position**	m	FLOAT	0	0	1000	R/W

During the rope length definition procedure, you will be asked to enter a "known position" in this parameter, i.e., to position the hook (for a hoist) in a position where you can measure the distance between the hook and the axis of the rope winder drum and enter the distance in this parameter.
This parameter can also be written outside the procedure, which will change the specification of hook position (trolley or beam).

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.02.15	11200	**Measure load**	m	FLOAT	0	0	1000	R/W

During the procedure for defining rope length, you are asked to enter the distance between the hoist hook groove and the center of gravity of the load in this parameter.
This parameter can be changed outside this procedure.

26.03 CMD CONTROL AND ZERO CROSSING

This function lets you manage and change the run and keeping times of commands received.
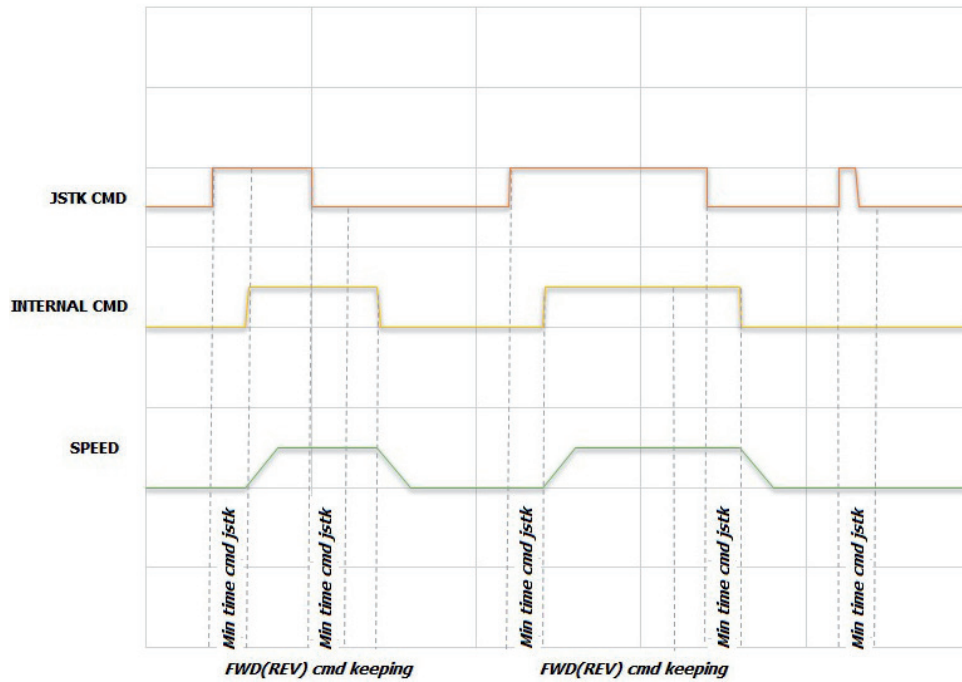
Commands received are executed only after it is checked that they have a minimum keeping time equal to "Min time cmd jstk," otherwise there is no action.). This is done to prevent false contacts or accidental movements of the joystick (button panel) from causing unwanted actions.
The action triggered by the command is kept for a minimum time equal to "FWD (REV) cmd keeping".
Thus, if you release the command before the preset time expires, the action will be held until that time expires.
On the other hand, if you release the command after the "FWD (REV) cmd keeping" time has elapsed, you will have an immediate reaction.
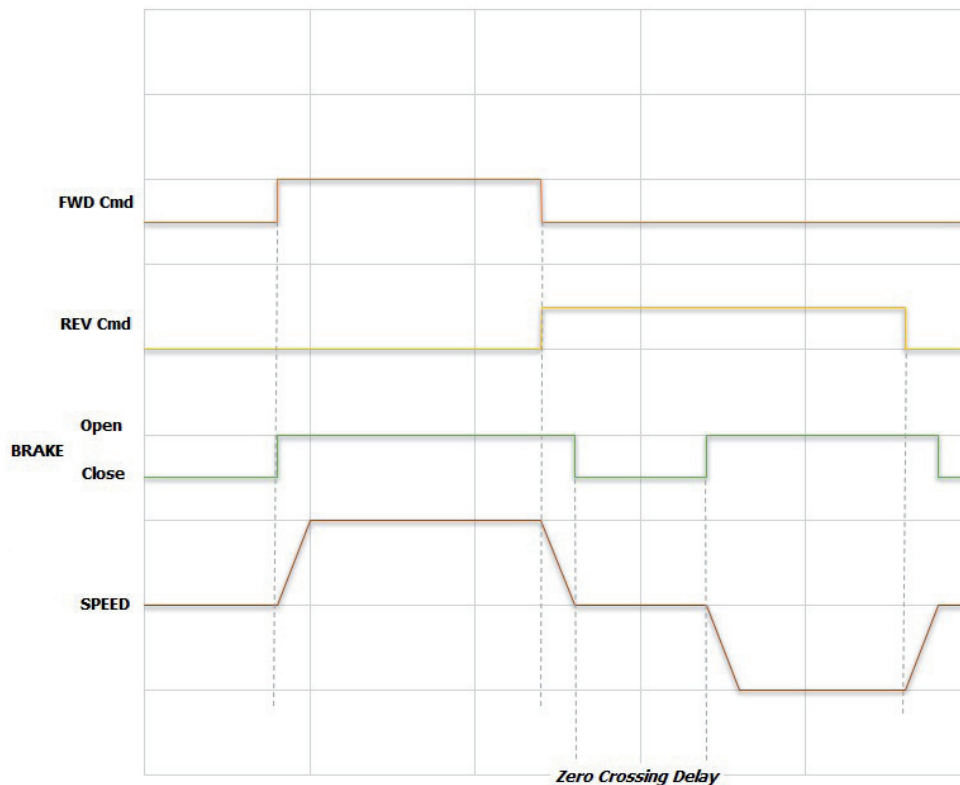
If the "ZERO CROSSING" function is enabled, the reversal of direction is blocked without closing of the brake; when a command in the opposite direction is received during movement, if the "ZERO CROSSING" function is enabled the close brake sequence is activated, the brake remains closed for a time equal to "Zero Crossing delay," after which the brake is opened and the new command is executed.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.03.01	11012	**FWD cmd keeping**	ms	FLOAT	0	0	5000	R/W
		Command keeping time in FWD direction.						
26.03.02	11014	**REV cmd keeping**	ms	FLOAT	0	0	5000	R/W
		Command keeping time in REV direction.						
26.03.03	11034	**Min time cmd jstk**	ms	FLOAT	10	0	1000	R/W
		Minimum keeping time of a command, beyond which the command is executed.						
26.03.04	11100	**Zero crossing**	-	BOOL	Off	-	-	R/W
		Enabling of Zero Crossing function.						
26.03.05	11110	**Zero crossing delay**	ms	FLOAT	200	0	5000	R/W
		Delay for restart after brake close for reversal of direction.						

Warning! The "ZERO CROSSING" function cannot be enabled on drives configured as ...-ELS-M, …ELS.

26.04 CMD SPEED

This menu manages multi-speeds and acceleration/deceleration times in both directions.

*Note!* If you set a speed reference exceeding nominal, you also have to change the "REFERENCE/Full scale speed" parameter (IPA 680) and "ALARM CONFIG/Over-speed threshold" parameter (IPA 4540).

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.04.01	11004	**Speed 1**	rpm	FLOAT	200	0	6000	R/W
		Speed reference 1.						
26.04.02	11006	**Speed 2**	rpm	FLOAT	200	0	6000	R/W
		Speed reference 2.						
26.04.03	11010	**Speed 3**	rpm	FLOAT	200	0	6000	R/W
		Speed reference 3.						
26.04.04	11054	**Speed 4**	rpm	FLOAT	200	0	6000	R/W
		Speed reference 4.						
26.04.05	11084	**FWD Acc time**	s	INT	2	0,01	1000	R/W
		Acceleration in FWD direction.						
26.04.06	11092	**FWD Dec time**	s	INT	2	0,01	1000	R/W
		Deceleration in FWD direction.						
26.04.07	11094	**REV Acc time**	s	INT	2	0,01	1000	R/W
		Acceleration in REV direction.						
26.04.08	11096	**REV Dec time**	s	INT	2	0,01	1000	R/W
		Deceleration in REV direction.						

26.05 BRAKE CONTROL

This function manages brake opening and closing.
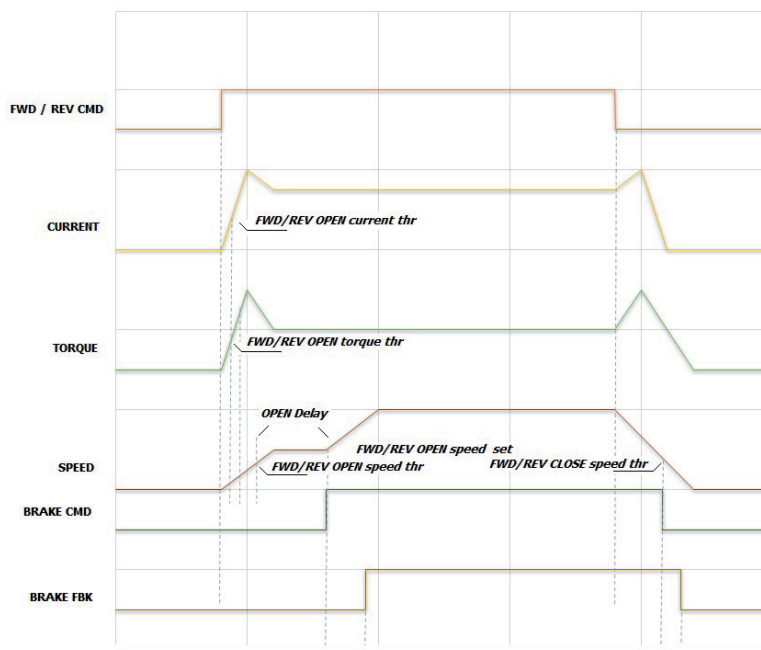
Brake opening is subject to exceeding thresholds, differentiable in the 2 directions:
- current and speed reference if the drive is configured in V/f;
- torque and speed reference if it is configured in Flux Vector Open Loop mode or Flux Vector Close Loop mode.

The speed reference during brake opening equals "FWD/REV OPEN Speed set" and remains the same until the brake open command is given. During this phase the state monitor is "pre RUN".
Brake closing is subject to exceeding the (speed) threshold, differentiable in the 2 directions. You can also insert a delay time for disabling the drive after brake closing.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.05.01	11026	**FWD OPEN current thr**	A	FLOAT	1	0	1000	R/W
		Current threshold for brake opening, FWD. Set this parameter only in control mode V/f.						
26.05.02	11028	**FWD OPEN torque thr**	%	FLOAT	0	0	200	R/W
		Torque threshold for brake opening, FWD Set this parameter only in control mode FOC OL or FOC CL.						
26.05.03	11030	**FWD OPEN speed thr**	rpm	FLOAT	20	0	1000	R/W
		Speed threshold for brake opening, FWD.						
26.05.04	11036	**FWD OPEN speed set**	rpm	FLOAT	50	0	1000	R/W
		Speed reference for brake opening, FWD.						
26.05.05	11038	**FWD CLOSE speed thr**	rpm	FLOAT	100	1	1000	R/W
		Speed threshold for brake closing, FWD.						
26.05.06	11040	**REV OPEN current thr**	A	FLOAT	1	0	1000	R/W
		Current threshold for brake opening, REV. Set this parameter only in control mode V/f.						
26.05.07	11042	**REV OPEN torque thr**	%	FLOAT	0	0	200	R/W
		Torque threshold for brake opening, REV. Set this parameter only in control mode FOC OL or FOC CL.						
26.05.08	11044	**REV OPEN speed thr**	rpm	FLOAT	20	0	1000	R/W
		Speed threshold for brake opening, REV.						

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.05.09	11048	**REV OPEN speed set**	rpm	FLOAT	50	0	1000	R/W
		Speed threshold for brake opening, REV.						
26.05.10	11050	**REV CLOSE speed thr**	rpm	FLOAT	100	1	1000	R/W
		Speed threshold for brake closing, REV.						
26.05.11	11052	**OPEN pre torque**	%	FLOAT	50	0	200	R/W
		Torque injected at time of brake opening. Not active in V/f mode.						
26.05.12	11120	**CLOSE delay disable**	ms	FLOAT	10	0	10000	R/W
		Delay for disabling drive after brake closing.						
26.05.13	11138	**OPEN delay**	ms	FLOAT	10	0	10000	R/W
		Delay for brake opening. This time starts when the speed and current thresholds are exceeded.						

26.06 HOIST SPEED UP AND POWER SPEED UP

When the load to be hoisted is less than a settable value, this function lets you shorten hoisting times by letting the motor reach a speed higher than its nominal value.

The maximum reachable speed is a function of the load applied to the motor compared to its nominal load and of the typical torque curve of the motor used.

Approximately, if the load is less than 50% of nominal, the maximum reachable speed is about twice the nominal value. For a more precise value, contact the motor manufacturer and the hoisting machine designer.

The "Speed Up Selector" parameter lets you choose 2 different ways to manage motor overspeed: Hoist Speed Up or Power Speed Up.

Hoist Speed Up
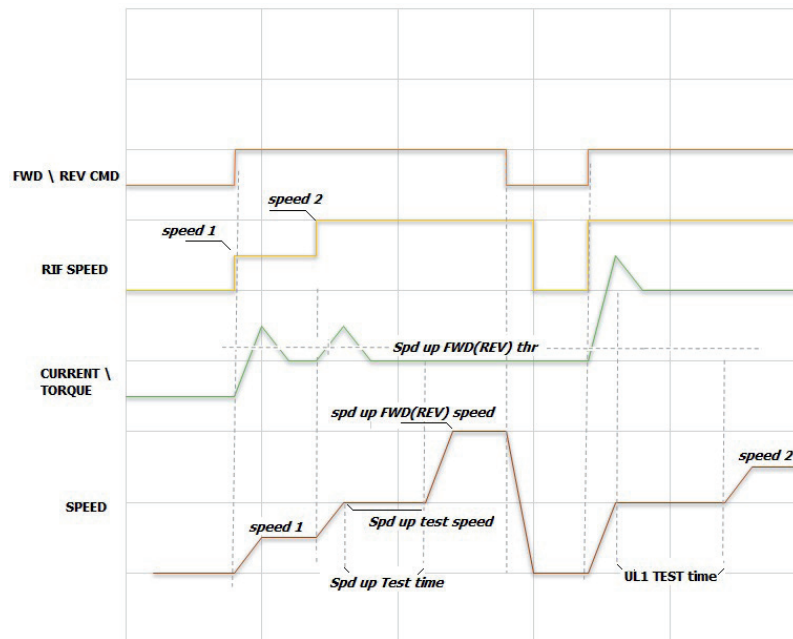
If Hoist Speed Up mode is chosen, when "Spd up test speed" is reached, the speed is temporarily held constant and a test is run to check if the current absorbed by the motor (drive configured in V/F mode) or the torque delivered by the motor (drive configured in Flux Vector Close Loop or Flux Vector Open Loop mode) is below the "Spd up FWD(REV) thr" threshold.

The test period is divided into 2 phases: for 1/3 of the time, "Spd up Test time" does not perform any measurement so that the torque (current) can stabilize; for the next 2/3 of the time, torque (current) is monitored. If it stays below the "Spd up FWD(REV) trq thr" threshold, the speed reference goes to "Spd up FWD(REV) speed", otherwise the speed reference is as defined on the "CMD SPEED" menu.

After the test is run, if results are positive, whenever a speed reference higher than "Spd up test speed" is commanded, the speed reference will go to "Spd up FWD(REV) speed."
The HOIST SPEED UP condition is reset only after a brake close or a direction reverse.

Power Speed Up

The purpose of this function is to obtain the maximum possible speed of vertical movement based on the load.
In case of light loads the motor works in the defluxing zone with consequent reduction of available torque. There are different conditions depending on the direction (up or down). The more critical direction is down, where the load must be braked to stop it.

Work regions: Stable/Unstable
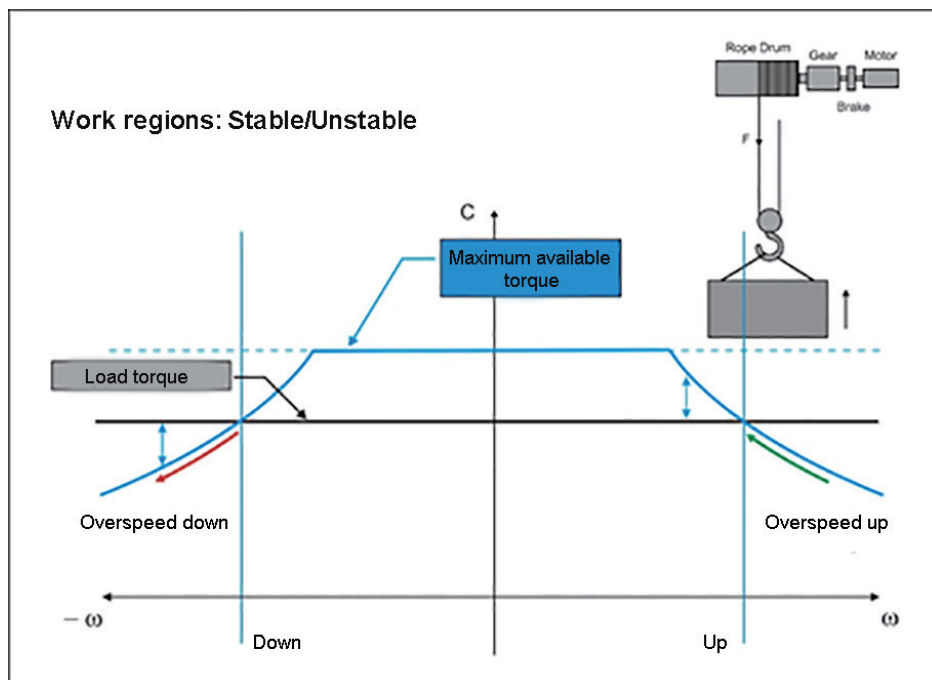
Overspeed up
A rise in the speed reference beyond the work limit at constant torque may lead to a condition where available motor torque is insufficient to move the load. This automatically causes a decrease in motor speed and an increase in available torque. The system is therefore stable.

Overspeed down
A rise in the speed reference beyond the work limit at constant torque may lead to a condition where available motor torque is insufficient to support the load. The motor drags, speed increases further where available torque is still insufficient. The system is therefore unstable.

The Power Speed Up function must therefore avoid an excessive speed that is incompatible with the load moved.

The control algorithm monitors available power and the power absorbed by the motor in the various phases of movement. Via regulator P, it reduces motor acceleration value and gradually brings it to zero when absorbed power reaches the set limit, thereby defining the work speed.

test013.txt
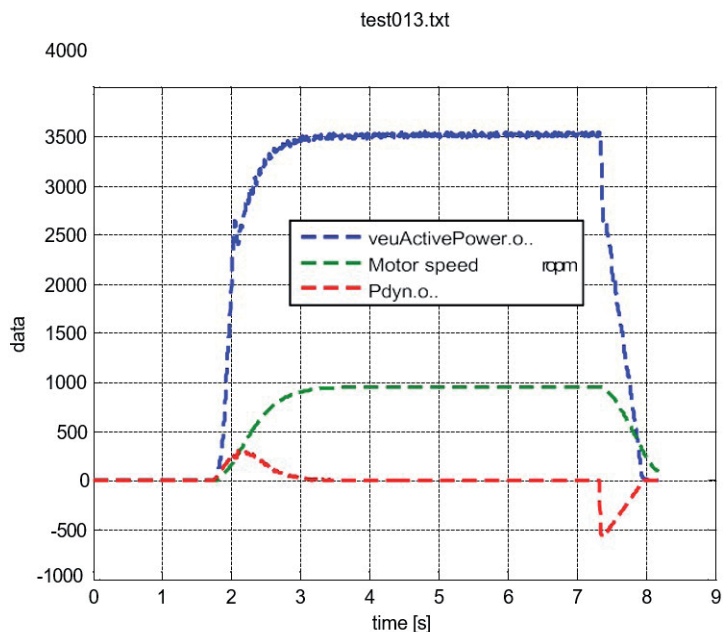
Since the up and down phases of the load have different work conditions, they use two individually settable power setpoints (target values).

Therefore, if the motor is sized to devote 50% of its nominal power to supporting the load and 50% to acceleration:

- when the load rises, since the force of gravity helps in the deceleration phase, a value approaching nominal value of the motor (default = 90%) can be used as the maximum limit.
- when the load descends, because additional braking power must be supplied during deceleration, the power limit must be set at 50%.

Nota!

If you use -ELS (electric shaft) configuration:
- The thresholds are set in % only on the drive defined as "virtual master" …-ELS-VM. The "virtual master" receives the load %s of each shaft from the slaves.
- The action if the threshold is exceeded must be specified only on drive…-ELS-VM.
- Function activation state will be shown on the monitor on drive …-ELS-VM.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.06.01	11024	**Speed Up Selector**	-	ENUM	None	-	-	R/W
		Selector to enable the HOIST SPEED UP or POWER SPEED UP function. 0 **None** 1 **Speed up** 2 **Power up**						
26.06.02	11070	**Spd up FWD trq thr**	%	INT	30	0	200	R/W
		SPEED UP Threshold (FWD), used to determine if handled load is "light." In V/f mode, the parameter is a % of nominal current of the motor. In FOC CL or FOC OL mode, the Spd up FWD thr parameter is a % of nominal torque of the motor.						
26.06.03	11072	**Spd up FWD speed**	rpm	FLOAT	3000	0	6000	R/W
		SPEED UP Speed reference (FWD) used after it is determined that the load is "light".						
26.06.04	11076	**Spd up REV trq thr**	%	INT	30	0	200	R/W

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Menù	PAR	Descrizione	UM	Tipo	Def	Min	Max	Acc
		SPEED UP Threshold (REV), used to determine if handled load is "light." In V/f mode, the parameter is a % of nominal current of the motor. In FOC CL or FOC OL mode, the parameter is a % of nominal torque of the motor.						
26.06.05	11078	**Spd up REV speed**	rpm	FLOAT	3000	0	6000	R/W
		SPEED UP Speed reference (REV) used after it is determined that the load is "light".						
26.06.06	11080	**Spd up Test time**	ms	INT	600	0	10000	R/W
		SPEED UP Duration of test, during which it is determined that the torque (current) delivered (absorbed) by the motor is below "Spd up FWD (REV) thr". *Warning!* — If the entered value is too high, the test may take longer than necessary and slow the operations.						
26.06.07	11082	**Spd up test speed**	rpm	FLOAT	700	0	6000	R/W
		SPEED UP Speed temporarily maintained during the test.						
26.06.08	11102	**PWR UP FWD pwr ref**	%	INT	90	0	120	R/W
		POWER UP This is the maximum power to be delivered to lift the load. Net of friction it equals the product of: Mass[kg] x 9.81 x linear speed of load [m/s] It refers to motor power. This parameter refers to the rise, where the load helps braking. The set default value refers to a lift system where at nominal load 50% of motor torque is used to support the load and 50% for acceleration.						
26.06.09	11170	**PWR UP REV pwr ref**	%	INT	50	0	120	R/W
		This is the maximum power to be delivered to lower the load. Net of friction it equals the product of: Mass[kg] x 9.81 x linear speed of load [m/s] It refers to motor power. This parameter refers to the descent, where the load impedes braking and tends to drag the motor. The set default value refers to a lift system where at nominal load 50% of motor torque is used to support the load and 50% for acceleration.						
26.06.10	11218	**PWR UP gain**	-	FLOAT	0,01	0	10000	R/W
		POWER UP This parameter decreases acceleration when absorbed power approaches the set power limit (up or down). The lower the value, the earlier the motor deceleration zone begins. Values that are too high delay engagement of the function and cause a more sudden action. Values that are too low cause the function to engage too early and prevent reaching of the target power.						

26.07 OVERLOAD

This function protects the hoist system if you try to handle a load that exceeds system capacity, which would damage the mechanism.
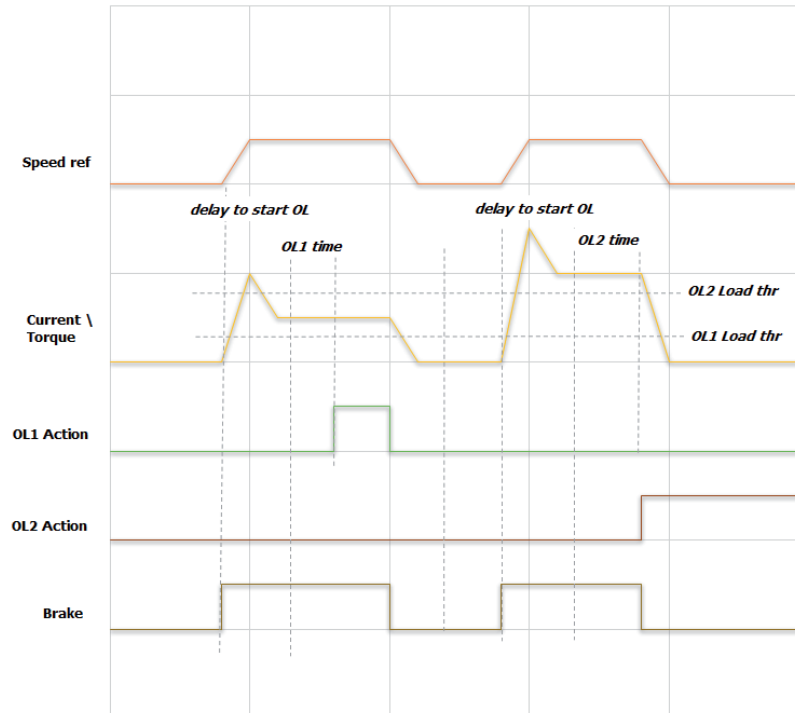
To determine if a load is excessive, the system measures the torque current (inverter configured in V/F mode) or the torque delivered by the motor (inverter configured in Flux Vector Close Loop or Flux Vector Open Loop mode).
The load is measured after the drive has received the Start (FW or REV) command and the "delay to start OL" time has elapsed.

Two thresholds, OL1 and OL2 Load thr, are available, settable in % of motor torque current / torque. Exceeding each threshold for a time set in "OL1 time" and "OL2 time" causes a user-settable action.
Threshold "OL2 Load thr" must be set to a value higher than "OL1 Load thr," otherwise the value of "OL2 Load thr" is automatically forced to 0.
The actions to be taken if thresholds are exceeded are specified in the "OL1/OL2 time" and "OL1/OL2 Action" parameters on the ALARM CONFIG menu.
The actions must be increasing (example: OL1 Action = Warning / OL2 Action = Alarm).

Nota!

||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
If you use -ELS (electric shaft) configuration:
- The thresholds are set in % only on the drive defined as "virtual master" …-ELS-VM. The "virtual master" receives the load %s of each shaft from the slaves.
- The action if the threshold is exceeded must be specified only on drive…-ELS-VM.
- Function activation state will be shown on the monitor on drive …-ELS-VM.
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||

Possible configurations for "OL1 Action" and "OL2 Action":

	Signal		Reset condition	On drive action	Azione sul freno
	Warning	Allarm			
Warning	√		Automatic: when value is within limits	Normal operation	Normal operation
Warning & Spd	√			Freezes deceleration ramp	
Alarm Rst		√	Automatic: at brake close	STOP in ramp commanded	Brought to close
Alarm		√	Manual	Disabled	Closed

In the graph shown on previous page, parameter ALARM CONFIG\ OL1 Action is set as "Warning" and therefore does not interfere with any command to the drive. The warning state resets automatically when the value returns within the allowed torque (torque current) limits.

Parameter ALARM CONFIG\ OL2 ACTION is set as "Alarm" and therefore forces the drive into alarm and closes the mechanical brake. The alarm must be reset manually.

Differentiable Reverse Overload Thresholds

It is possible to customize overload thresholds while drive it is working in reverse (REV) direction.

For each of the two thresholds (OL1 and OL2 Load thr), it is possible to select a new value (percentage) to be used when the drive is working in the backward (REV) direction.

The following example reports OL1 threshold new behaviour. OL2 has the same one.
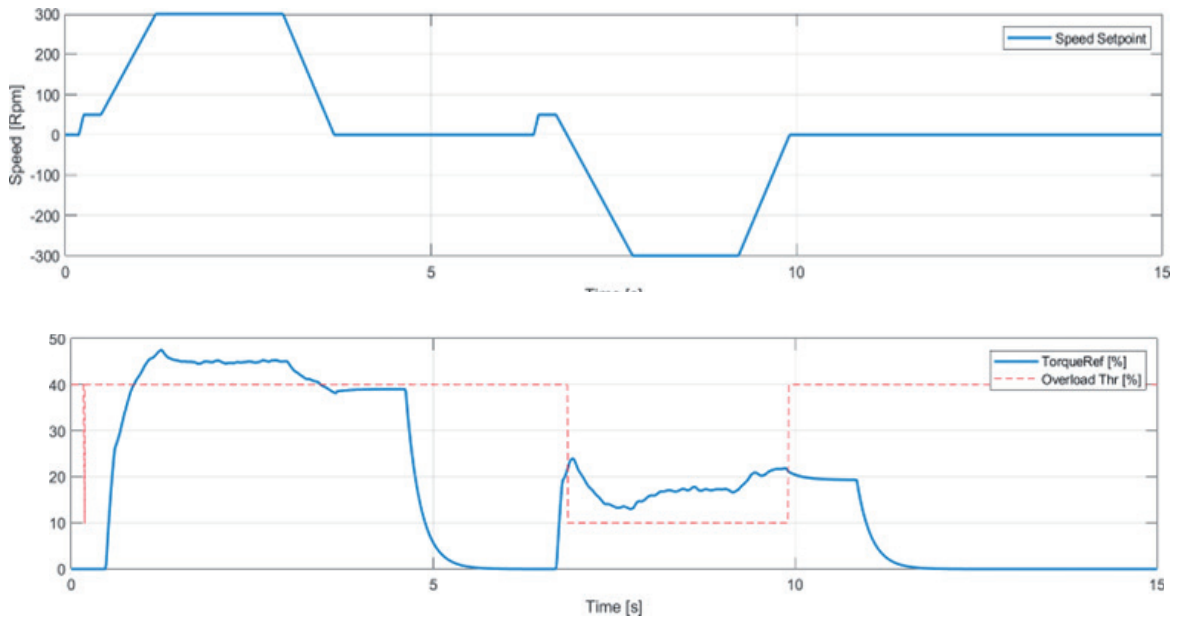
Overload Forward Hold Off

It is possible to keep the forward direction disabled (for a defined time) after an overload event (Overload Fwd Hold Off).

Note! This function is only enabled if the overload action of interest is set to Alarm-Rst.

If an overload is recognized, the standard Alarm-Rst behaviour is the following:
-   The drive goes in alarm condition, stopping the motion of the system;
-   Alarm is automatically reset when the motor stops (basing also on brake status);
-   If the alarm has been reset, it is possible to use the drive normally in both directions.

If Fwd Hold Off Overload function is active, after the alarm is reset, the forward direction (FWD) of the motor is kept disabled for a user defined time.
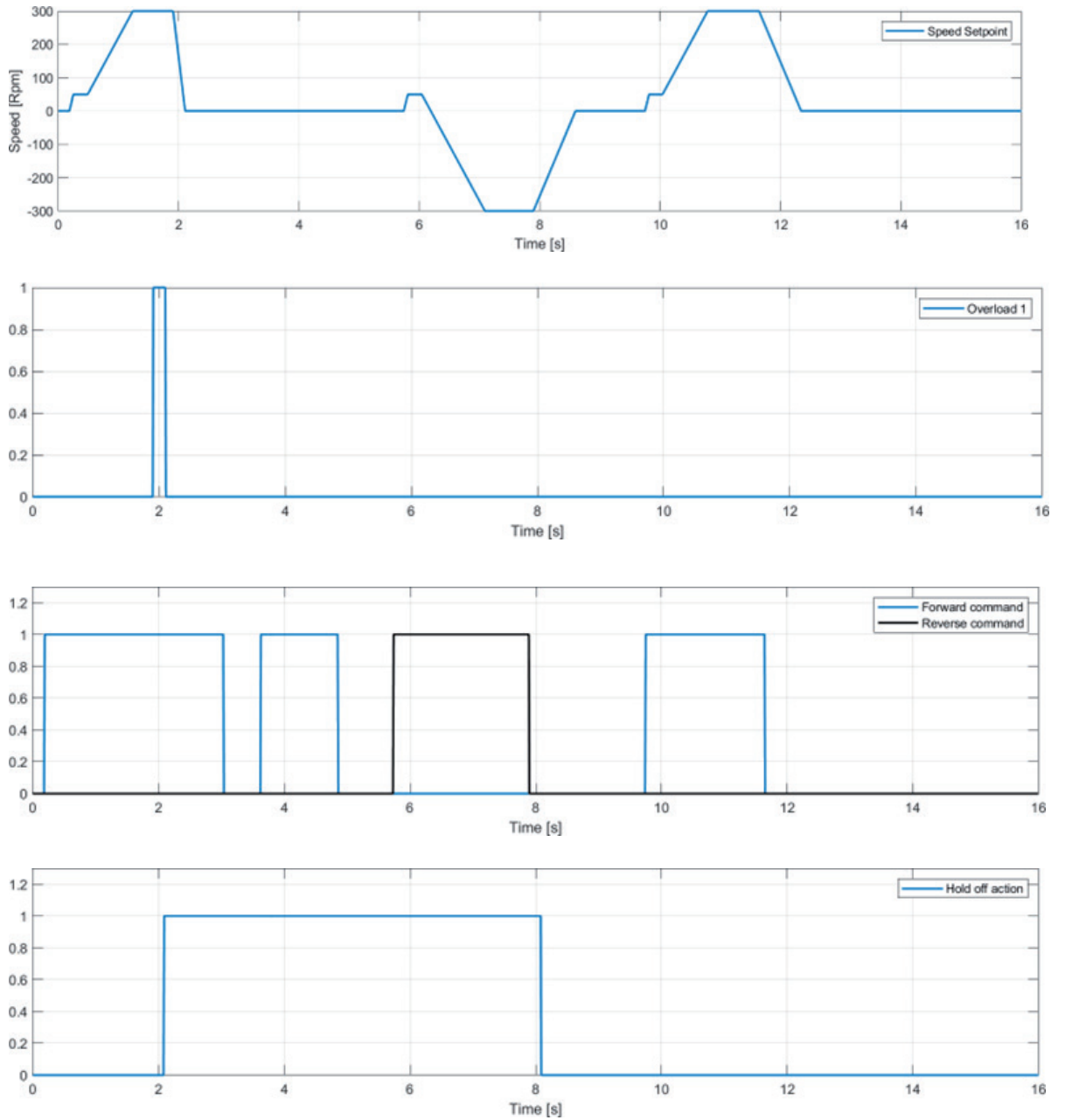
Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.07.01	11032	**Enable Overload**	-	BOOL	Off	-	-	R/W
		Enable OVERLOAD function.						
26.07.02	11106	**Diff Rev Thr Enable**	-	BOOL	Off	-	-	R/W
		Enable for the different overload threshold for reverse direction.						
26.07.03	11124	**OL1 Load thr**	%	FLOAT	80	0	200	R/W
		Threshold 1, to identify an excessive load. In V/f mode, the OL1 Load thr parameter is a % of torque current of the motor. In FOC CL or FOC OL mode, the OL1 Load thr parameter is a % of nominal torque of the motor.						
26.07.04	11130	**OL2 Load thr**	%	FLOAT	120	0	200	R/W
		Threshold 2, to identify an excessive load. In V/f mode, the OL2 Load thr parameter is a % of torque current of the motor. In FOC CL or FOC OL mode, the OL2 Load thr parameter is a % of nominal torque of the motor.						
26.07.05	11136	**Delay to start OL**	ms	FLOAT	300	0	2000	R/W
		Delay at brake opening. This time starts when thresholds are exceeded.						

26.07.06	11234	**OL1 Rev Thr**	%	FLOAT	100	0	200	R/W
		Overload 1 Threshold (percent) in reverse cmd.							
26.07.07	11236	**OL2 Rev Thr**	%	FLOAT	100	0	200	R/W
		Overload 2 Threshold (percent) in reverse cmd.							
26.07.08	11238	**OL Fwd Hold Off En**	-	BOOL	Off	-	-	R/W
		Enabling of positive movement lockout (only active if Alm-Rst mode is set in IPA parameters 11128 or 11134).							
26.07.09	11240	**OL Fwd Hold Off Time**	s	FLOAT	10	0,1	60	R/W
		Hold Off Time forward direction remains disabled after OL action.							

26.08 OVERTRAVEL AND LOW SPEED ZONE

This function prevents the trolley, hook, or beam from moving out of permitted zones. The control is performed with limit switches (settable NC or NO).

You can also use the "Low Speed Zone" function to automatically decelerate when approaching limit switches. To do this, the drive has to have an encoder (used to measure available stroke) that is correctly connected to the command drive, and you have to initialize the rope length measurement procedure (see "Initialization procedure for calculation of rope length" for more information). Otherwise, do not enable the function.
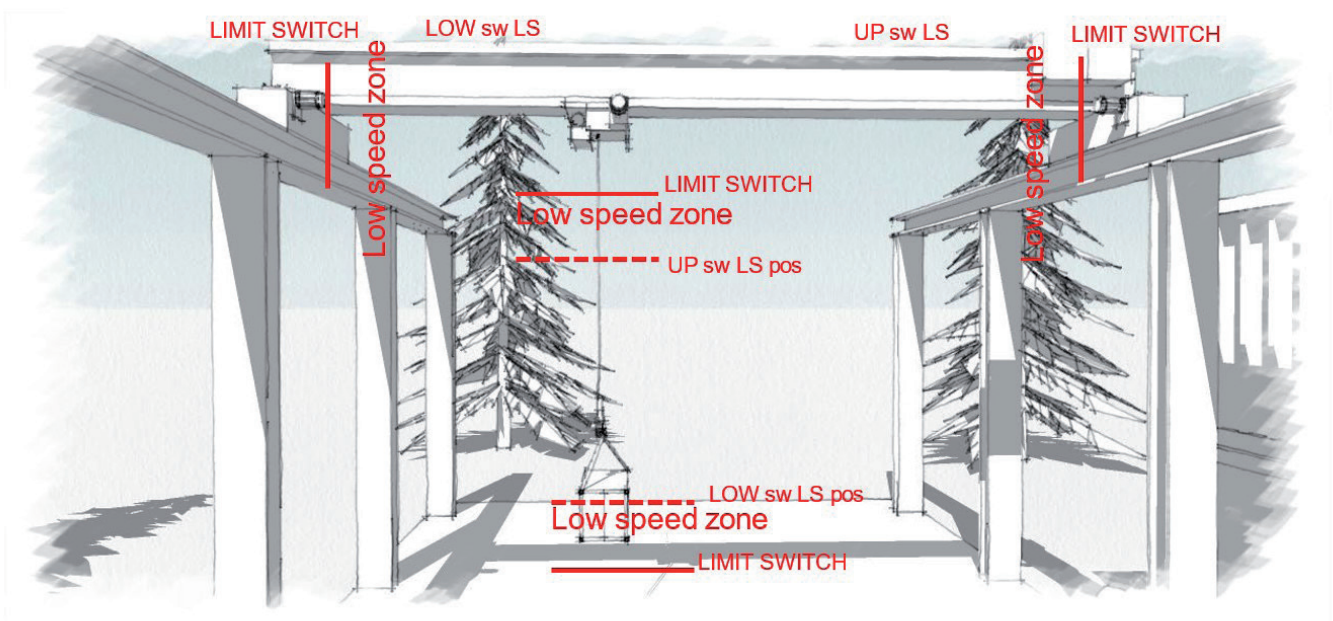
Overtravel:
The "Low Speed Zone" function, if enabled, defines a zone in which speed of movement is forced to the value set in the "LSZ speed" parameter.
The input in this zone is defined via limit switch software, i.e., by specifying the position in absolute value in the "Up sw LS abs pos" and "Low sw LS abs pos" parameters.

Low speed zone:
The "Low Speed Zone" function, if enabled, defines a zone in which speed of movement is forced to the value set in the "LSZ speed" parameter.
The input in this zone is defined via limit switch software, i.e., by specifying the position in absolute value in the "Up sw LS abs pos" and "Low sw LS abs pos" parameters.

For the Hoist movement, if a load is attached to the hook and the "Measure Load" parameter is defined (distance between hook groove and center of gravity of load), the center of gravity of the load will determine low-speed entry into the area.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.08.01	11056	**En Low speed zone**	-	BOOL	Off	-	-	R/W
		Enable Low Speed Zone function.						
26.08.02	11058	**LSZ Speed**	rpm	FLOAT	350	0	6000	R/W
		Speed reference in Low Speed Zone.						
26.08.03	11112	**Up sw LS abs pos**	-	FLOAT	1	0	1000	R/W
		Limit switch software absolute position high.						
26.08.04	11116	**Low sw LS abs pos**	%	FLOAT	5	0	1000	R/W
		Limit switch software absolute position low.						

26.09 ANTI SWAY

This function keeps the load from swaying during movement and when it stops. An expert user stops swaying by accelerating and braking the load based on its movement. This function, based on rope length, changes the speed references given by the control button panel just as an expert user would.

To use the "Anti Sway" function, the Hoist motor has to have an encoder (used to measure available stroke) that is correctly connected to the command drive, and you have to initialize the rope length measurement procedure (see "Initialization procedure for calculation of rope length" for more information). Otherwise, do not enable the function.
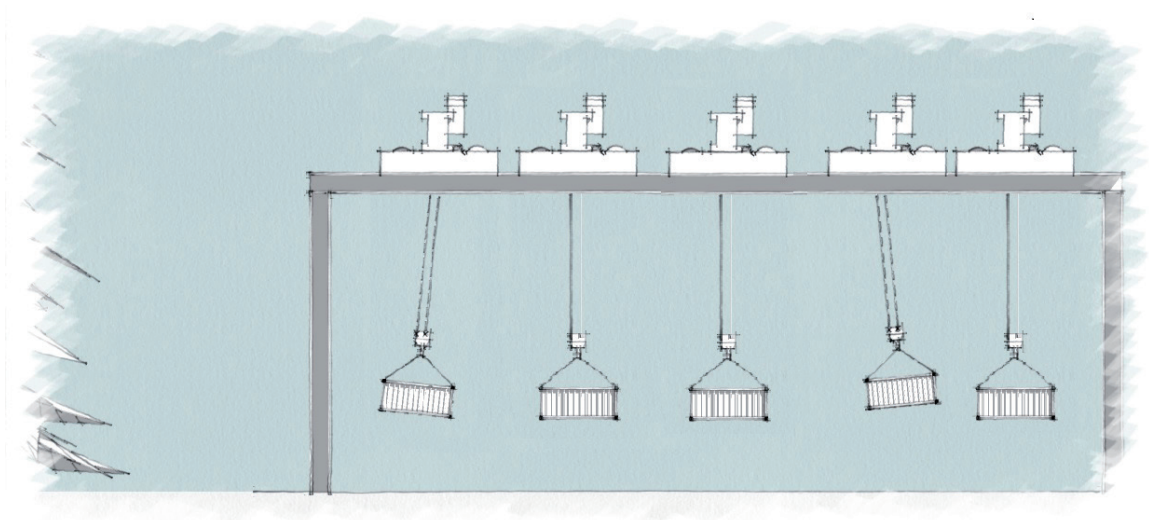
The Hoist drive calculates rope length and sends it, to the Gantry and Trolley drives, which perform the adjustment.

The above figure shows the movement of the Trolley and of the hoisted load.
1. At start, the load is delayed compared to Trolley movement and, if not properly controlled, it will continue to sway with a period depending on rope length. The Anti Sway function reduces sway when the swaying load is perpendicular to the trolley.
2. When the acceleration phase is done, the load is no longer subject to swaying.
3. When the speed is reduced, the load shifts in advance of Trolley movement. The Anti Sway function reduces sway when the swaying load is perpendicular to the trolley.

The following graphs show the results obtained by handling a load giving longer or shorter movement commands.

The first graph shows speed. The speed reference (given by a movement command) is in magenta, with the function off. The reference changed by the anti sway function is in yellow.
The second graph shows load angle in the various movements. Note that there is no residual sway when the load stops.
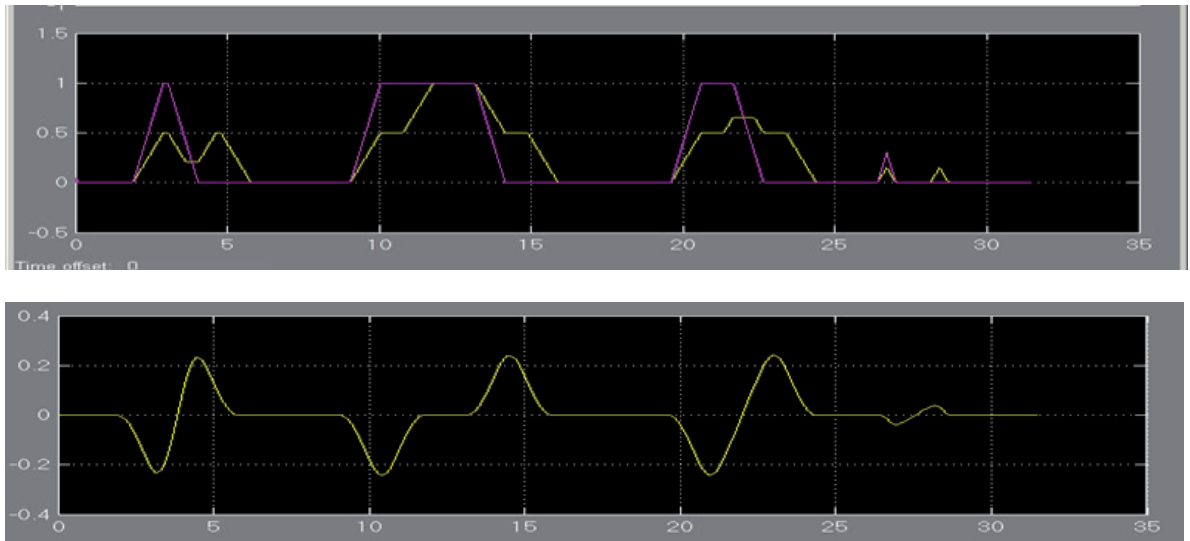
To use the function correctly and improve its performance, you have to:
• Activate the function before commanding a movement (it cannot be activated while running).
• Hoist the load to the height set for handling, and only then engage the drive. Hoisting during transverse movement is possible but may decrease function performance.

Warning!

When the function is activated, stopping time may be longer than the set deceleration value.

The Anti Sway function must be available to the operator when needed. Therefore, an On/Off switch will be installed on the control panel to command the related digital input of the drive.

Wiring needed for Anti Sway function
To use the "Anti Sway" function, the Hoist motor has to have an encoder that is correctly connected to the command drive.
An analog or digital connection (via fast link, with EXP-FL-XCAN-ADV card) is needed to transmit the rope length measurement from the hoist drive to the Gantry and Trolley drives.
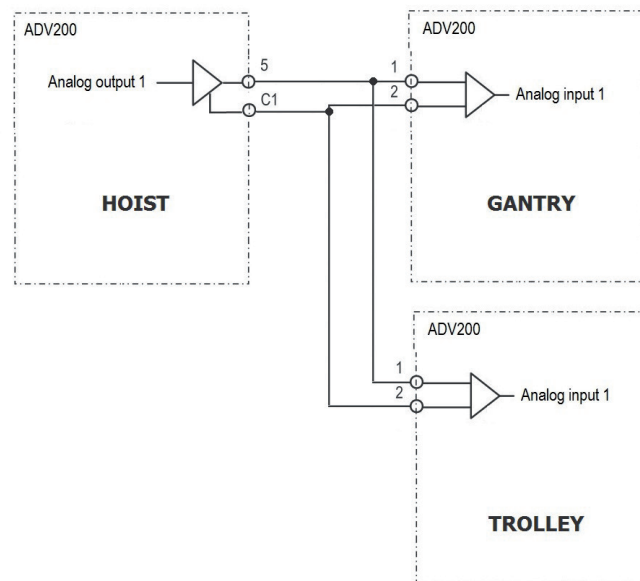
The "ANTISWAY \ Rope length src" and "ANTISWAY \ Rope length dest" parameters let you configure the output and input to be used.

Two steps are required to change the outputs:
If you use an **analog connection:**
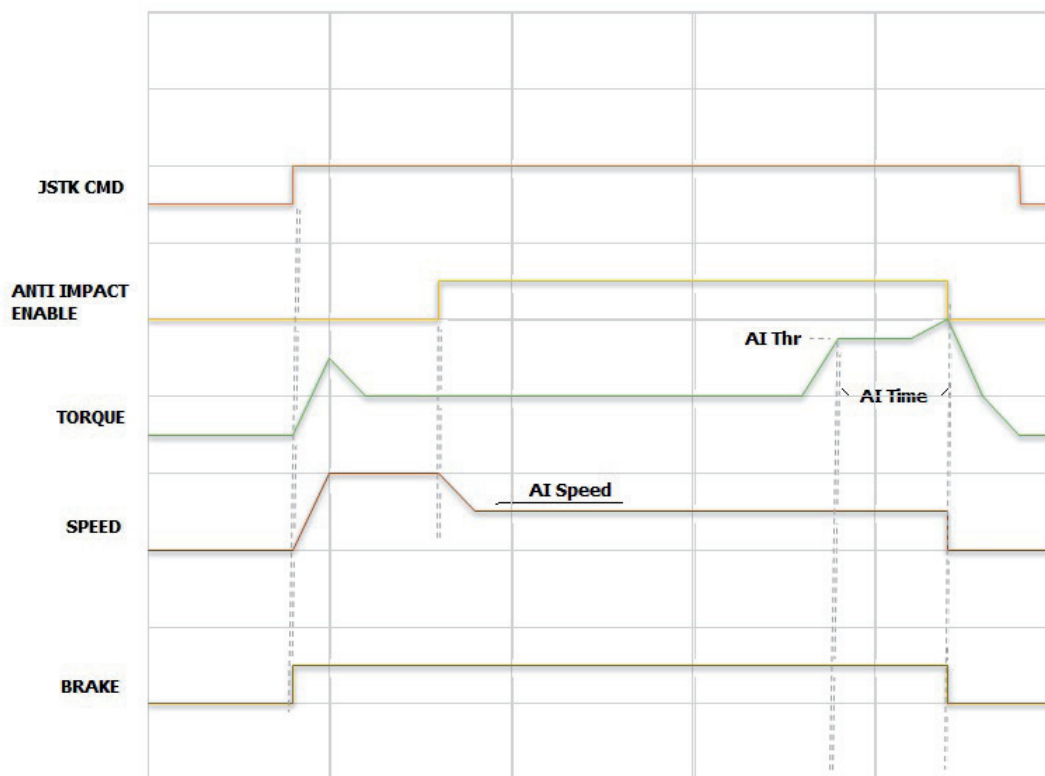(For example, changing the PAD, that transmits the hoist rope length via analog output 1).

• In the ANTISWAY function, specify which PAD to write on: HOIST&CRANE \ ANTISWAY \ Rope length dest = PADxx;
• On the ADV menu, link PADxx to analog output 1: Main menu\ ANALOG OUTPUTS\Analog out 1 src = PADxx.

If you use a **FastLink connection**:
(For example, changing the PAD, that transmits the hoist rope length via FastLink channel 1).

• In the ANTISWAY function, specify which PAD to write on: HOIST&CRANE \ ANTISWAY \ Rope length dest = PADxx;
• On the ADV menu, link PADxx (i.e., the measurement) to the FastLink channel: Main menu\ COMMUNICATION\ FASTLINK\FL Fwd xx src = PADxx.

The rope length input for the GANTRY and TROLLEY drives is set directly without having to execute the two steps.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.09.01	11000	**Enable Anti Sway**	-	ENUM	Off	-	-	R/W
		ON = ANTI SWAY function ready to be activated. The function will be activated by the command on the related digital input (HC DIG INPUTS menu \ Anti Sway src = Dig inp ...). Activation/deactivation only in Stop. If movement starts with AntiSway engaged, function stays on until movement stops (brake closing).						
26.09.02	11108	**Rope length src**	-	ENUM	FL Fwd 1 mon	-	-	R/W
		Analog input to receive rope length measurement (required for "Anti sway" function) between Hoist drive and Gantry /Trolley.						
26.09.03	11174	**Rope length scale**	-	FLOAT	10	0	1000	R/W
		Write the full-scale to be used to send and receive rope length measurement (value must be greater than maximum rope length). The parameter must be the same on the HOIST GANTRY and TROLLEY drives linked for antisway.						
26.09.04	11178	**Rope length dest**	-	ENUM	Pad 5	-	-	R/W
		Output to send rope length measurement (required for "Anti sway" function) between Hoist and Gantry/Trolley drives.						
26.09.05	11208	**Shaper type**	-	ENUM	ZV	-	-	R/W
		0 ZVD **1** ZV There are two different ways to manage sway. ZVD offers smaller sways and greater insensitivity to changes in rope length, but provides slower movements.						
26.09.06	12112	**Rope length**	m	FLOAT	-	-	-	R/W
		Rope length measurement.						

26.10 ANTI IMPACT

The function can be activated by the operator via digital input, and is active after the drive has been enabled and the brake has been opened.

Once activated, the speed reference is changed to the value indicated in the "AI speed" parameter.

If a change in torque (drives configured in FOC CL and FOC OL mode) or in torque current (drives configured in V/f mode) greater than "AI Thr" is detected during operation, the programmed action is commanded.

The action to be taken if thresholds is exceeded is specified in the "AI time" and "AI Action" parameters on the ALARM CONFIG menu.

Note!

If you use -ELS (electric shaft) configuration:

- La soglia viene impostata in % sul solo drive definito come "master virtuale" …-ELS-VM. The "virtual master" receives the load %s of each shaft from the slaves.

- The action if the threshold is exceeded must be specified only on drive …-ELS-VM.

- The function activation status will be shown on the monitor of drive …-ELS-VM.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.10.01	11016	**Enable Anti Impact**	-	ENUM	Off	-	-	R/W
		ON = ANTI IMPACT function ready to be activated. The function will be activated by the command on the related digital input (HC DIG INPUTS menu \ Antimpact src = Dig inp ...)						
26.10.02	11018	**AI speed**	rpm	FLOAT	200	0	6000	R/W
		Speed reference set when function activation command is received from operator.						
26.10.03	11020	**AI Thr**	%	FLOAT	50	0	200	R/W
		Impact is identified when, during a movement, current or torque increases instantaneously by a percentage equal to or greater than this parameter. In V/f mode, the parameter is a % of nominal current of the motor. In FOC CL or FOC OL mode, the AI Thr parameter is a % of nominal torque of the motor.						

Warning!

The Anti Impact function must be available to the operator when needed. Therefore, an On / Off switch will be placed on the control panel to command the relative digital input of the drive.

26.11 ELS

This menu let you set the electric shaft function.
Electric Shaft (ELS) configuration allows a group of drives (maximum of 4) to work with a position limit.
All the participants are Slave elements of a Virtual Master. All of the Slave have the option to follow/not follow the Virtual Master position.

The Virtual Master is generated in an ADV200 defined as "Virtual Master".
The Virtual Master transmits commands and handshake between regulator and drives via bi-directional Fast Link.

You have to install the Fast Link card EXP-FL-XCAN-ADV and an encoder interface on all of the drives for the Electric Shaft function. The motors must have encoders.

The system is divided into 3 blocks (see ELS Control figure):
- Command
- Virtual Master Management
- Follower Regulator
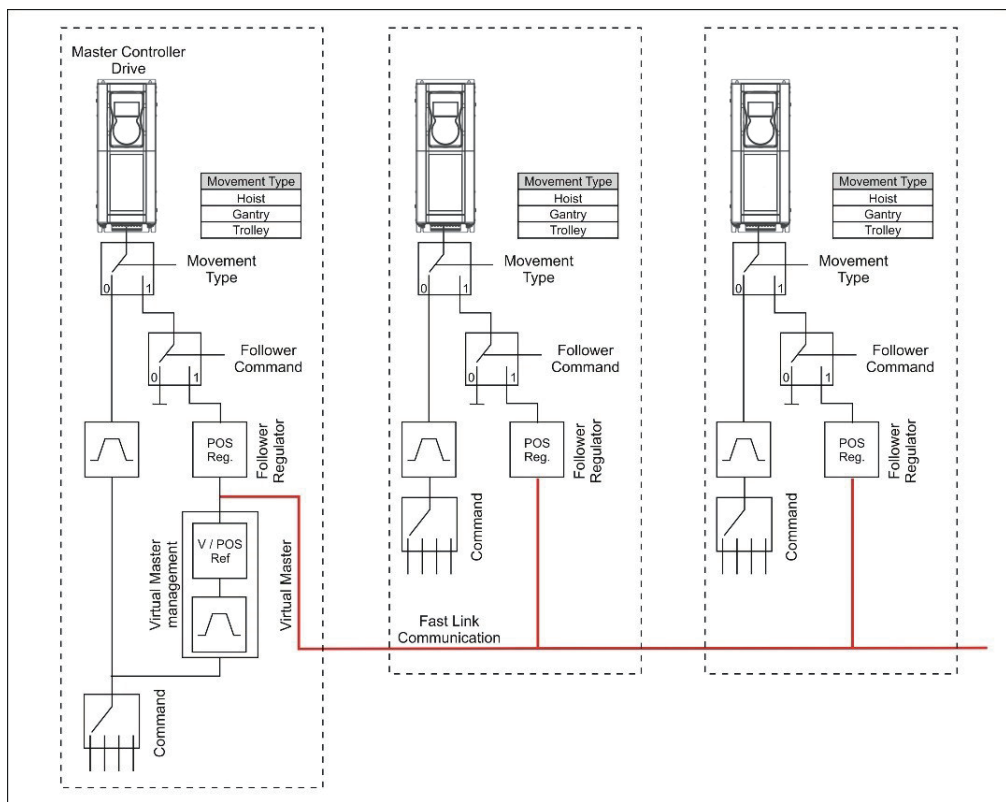
Figure ELS Control

"Command" Block
Receives movement commands (FWD and REV) and the speed reference (from digital or analog input).
In Electric Shaft function (Follower command activated), the "Command" block is active only on the drive defined as "Virtual Master" (for example, "H&C SERVICE \ Movement type" = Trolley-ELS-VM).

"Virtual Master" Block
Enabled only on the drive defined as "Virtual Master" (for example, "H&C SERVICE \ Movement type" = Trolley- ELS-VM).
The speed/position reference generated by the Virtual Master is acquired by all of the drives where the Follower command has been activated, including the drive set as "Virtual Master".

The "Virtual Master" block:
- Generates a position and a speed with linear ramp based on set speed reference.
- Manages brake opening.
  At system Start, the standard procedure to check exceeding of speed reference and torque thresholds is run on each drive. When all monitors are active (thresholds exceeded), the block sends the command to open all of the brakes. At Stop, each drive independently manages brake closing by the standard method.
- Manages the stopping of all shafts if the limit switch (HW or SW) trips on a single shaft configured as Follower and allows its operation only in the opposite direction.
- Manages the disabling of drives. If a drive is disabled for any reason during function in Follower, the block commands closing of all brakes and then disabling of drives.
- Manages any shaft errors by stopping the entire system.
- Manages a common reset of all drives. The "Virtual Master" …-ELS-VM sends the reset command to all drives connected to Fast Link. The command can also be sent locally to a single drive.

Follower Regulator Block

Active on all drives where the Follower command has been activated, including on the "Virtual Master". It regulates drive speed to follow the position reference indicated by the Virtual Master.
The Follower setting can be enabled as needed by the operator. Therefore, an On/Off switch will be placed on the control panel to command the relative digital input of the drive.

In Follower mode, the drive no longer accepts movement commands configured locally, but, via the Follower Regulator block, repeats the commands and speed reference received from the "Virtual Master".
The block receives the position and speed reference from the Virtual Master, the position is compared to the position generated by the encoder, then an error is generated that consequently changes the speed reference. The position error is managed by a PI regulator with limitation of output value.
There is a maximum threshold of the position error beyond which you can activate a Warning or an Alarm and the related consequent activity.

The block manages the initial positioning function, which allows each shaft to individually align with its ELS align pos reference.
Even if a procedure to identify the travel was initially executed, the current position of the shaft will always be calculated.
So that the ELS function may operate correctly, during commissioning you have to run a position recognition procedure for each shaft. To do this, use the same function and parameters provided for Anti sway control for the Hoist shaft and for Low Speed Zone control (SW limit switch) for the Trolley and Gantry.

Typical connection diagrams for -ELS-VM (Virtual Master) and -ELS (slave) configuration

The following is an example of a typical configuration of the -ELS-VM (Virtual Master) drive with EXP-IO- D6A4R1-ADV expansion card (optional), encoder (required) and EXP-FL-XCAN-ADV card (required).
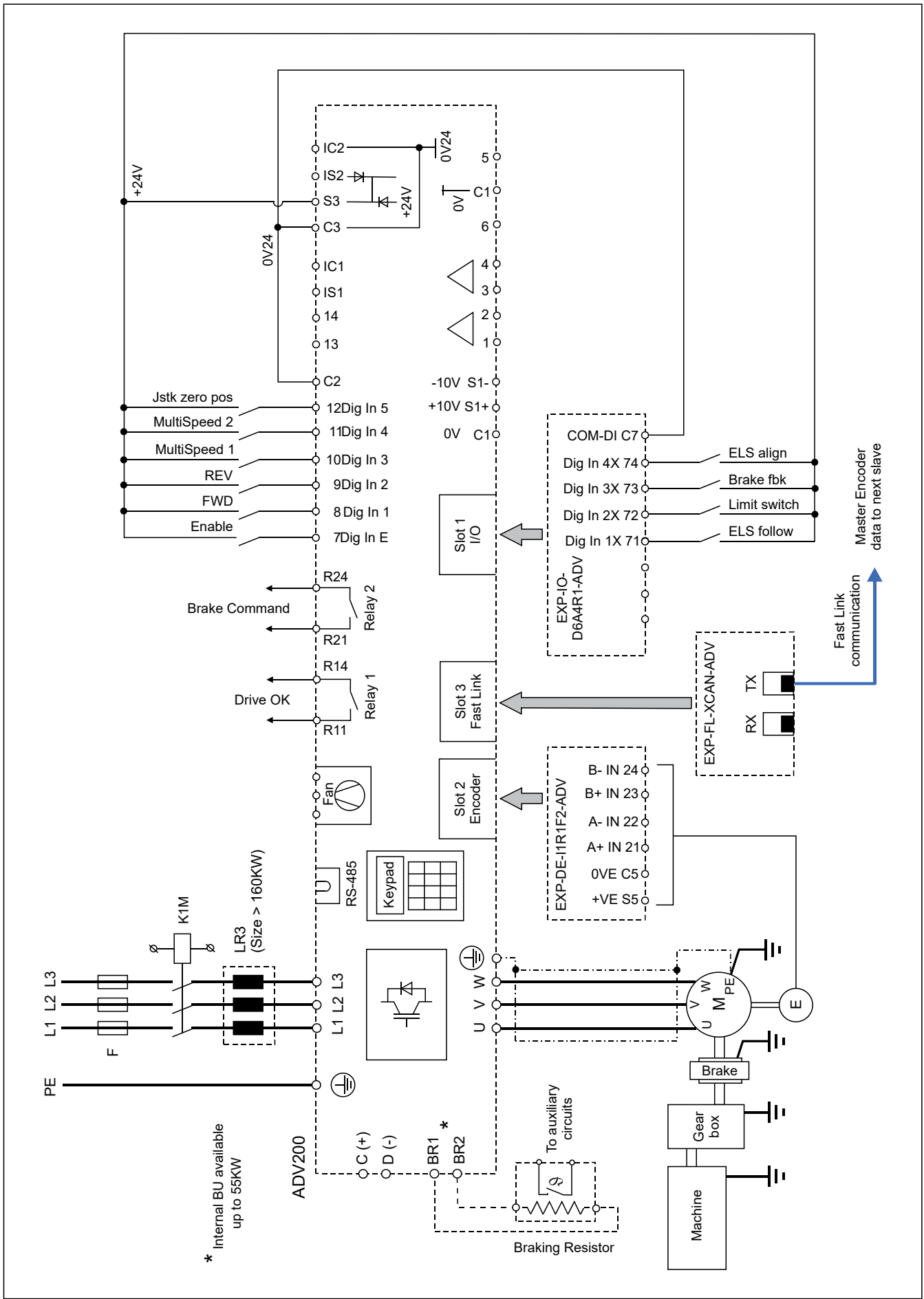For installation and parameterisation of the boards, please refer to the dedicated manual. See the specific manual for information on installing and parameterizing the cards.
This configuration lets you connect a joystick/button panel for movement commands, brake/feedback management, limit switch sensors, alarms reset button, "ELS src" and "ELS align" selector.
Digital input signals are set on the HOIST&CRANE / HC DIG INPUTS menu. Digital output signals are set on the HOIST&CRANE / HC DIG OUTPUTS menu.

Warning!   To enable drives in Electric Shaft, all Enable signals (including on drives set as NOT Follow) must up.
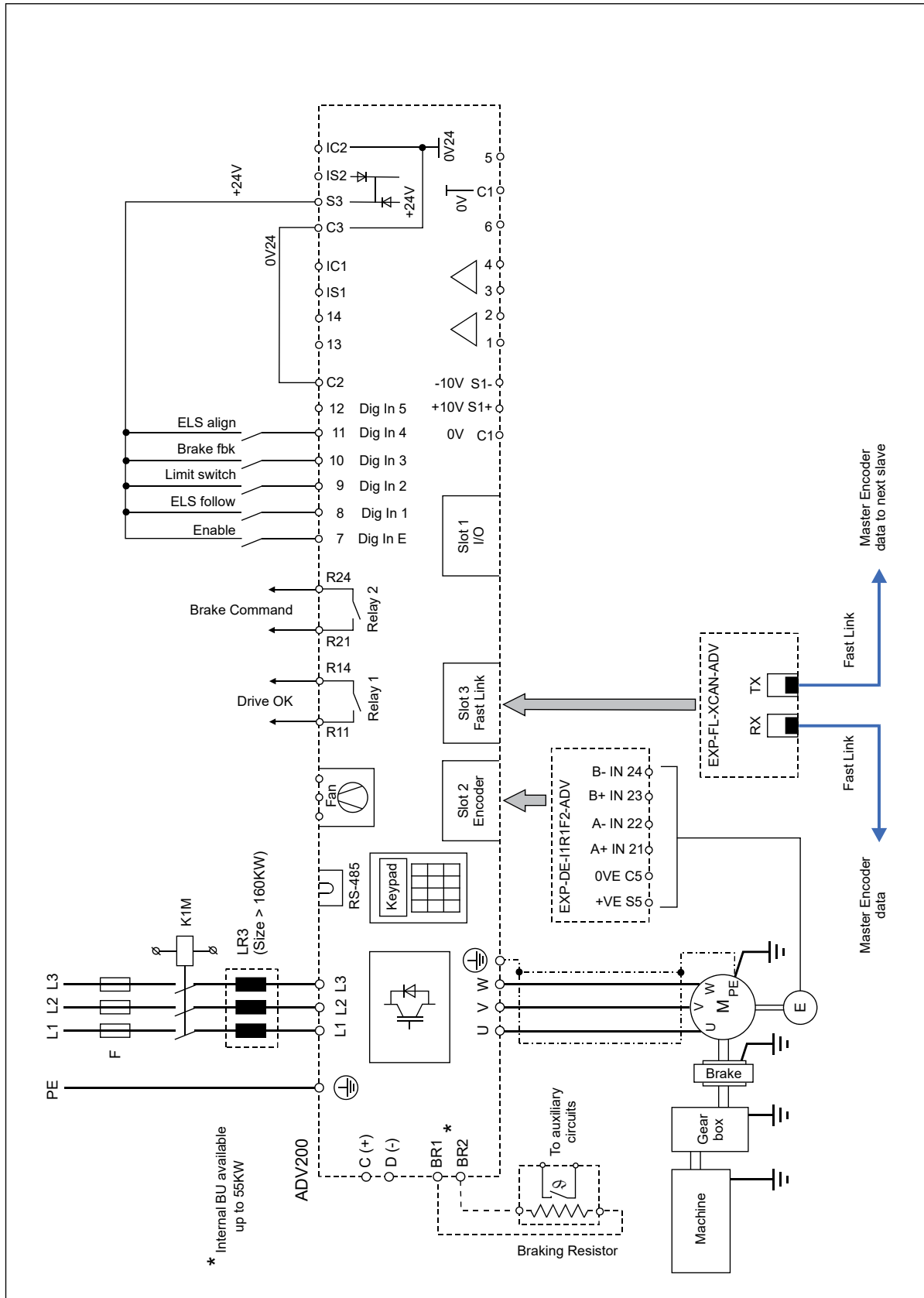
Typical drive connection -ELS-VM (Virtual Master)

The following is an example of a typical configuration of -ELS drives with encoder card (required) and EXP- FL-XCAN-ADV card (required).

See the specific manual for information on installing and parameterizing the cards.

This configuration lets you manage brake/feedback, limit switch sensors, and "ELS src" selector. Digital input signals are set on the HOIST&CRANE / HC DIG INPUTS menu.

Digital output signals are set on the HOIST&CRANE / HC DIG OUTPUTS menu.

Typical drive connection -ELS

L'ingresso digitale di Enable deve essere riportato in ogni drive ed è predominante rispetto al comando d'abilitazione ricevuto dal "master virtuale".

The digital Enable input must be shown on every drive and takes precedence over the enable command received from the "Virtual Master".

The operator must be able to enable the "ELS src" and "ELS Align" commands whenever he wants. Therefore, On/Off switches will be placed on the control panel to command the relative digital inputs of the drive.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.11.01	11118	**Ki gain**	-	FLOAT	2000	0	10000	R/W
		Integral gain of position regulator.						
26.11.02	11150	**Kp gain**	-	FLOAT	0,1	0	10000	R/W
		Proportional gain of position regulator.						
26.11.03	11172	**ELS align spd**	rpm	FLOAT	1000	0	6000	R/W
		Speed reference used for realignment.						
26.11.04	11216	**ELS align pos**	m	FLOAT	2	0	1000	R/W
		Absolute position reached in case of realignment command.						
26.11.05	12028	**ELS pos err**	m	FLOAT	1	-	-	R
		Error between position of hook (trolley or rope) and position reference indicated by Virtual Master block.						
26.11.06	12056	**ELS mode**	-	ENUM	Not follow	-	-	R

0 Not Follow
  Drive does NOT follow commands and references sent by master block.
1 Follow
  Drive follows commands and references sent by master block.

26.12 HELPER

Helper (HL) configuration allows a group of drives (maximum of 4) to work with a torque limit on the same mechanical shaft.

The torque reference is generated by the master drive (-M), which receives movement commands (FWD, REV) and the speed reference (from digital or analog input) and sends the torque reference to the slave(-S) drives via the FastLink synchronous communication bus.

This function is allowed only in FLUX VECTOR OL or FLUX VECTOR CL regulation mode.

The following example shows a typical configuration of the digital inputs and outputs of the ...HL-M drive with EXP-IO-D6A4R1-ADV expansion card (optional), EXP-FL-XCAN-ADV card (required) and encoder for applications that require the use of one or more drives per mechanical shaft.

This configuration lets you connect a joystick/button panel for movement commands, brake/feedback management, limit switch sensors, enabling of AntiImpact function, alarms reset button, and communication with the other drives of the mechanical shaft.

Digital input signals are set on the HOIST&CRANE / HC DIG INPUTS menu. Digital output signals are set on the HOIST&CRANE / HC DIG OUTPUTS menu.
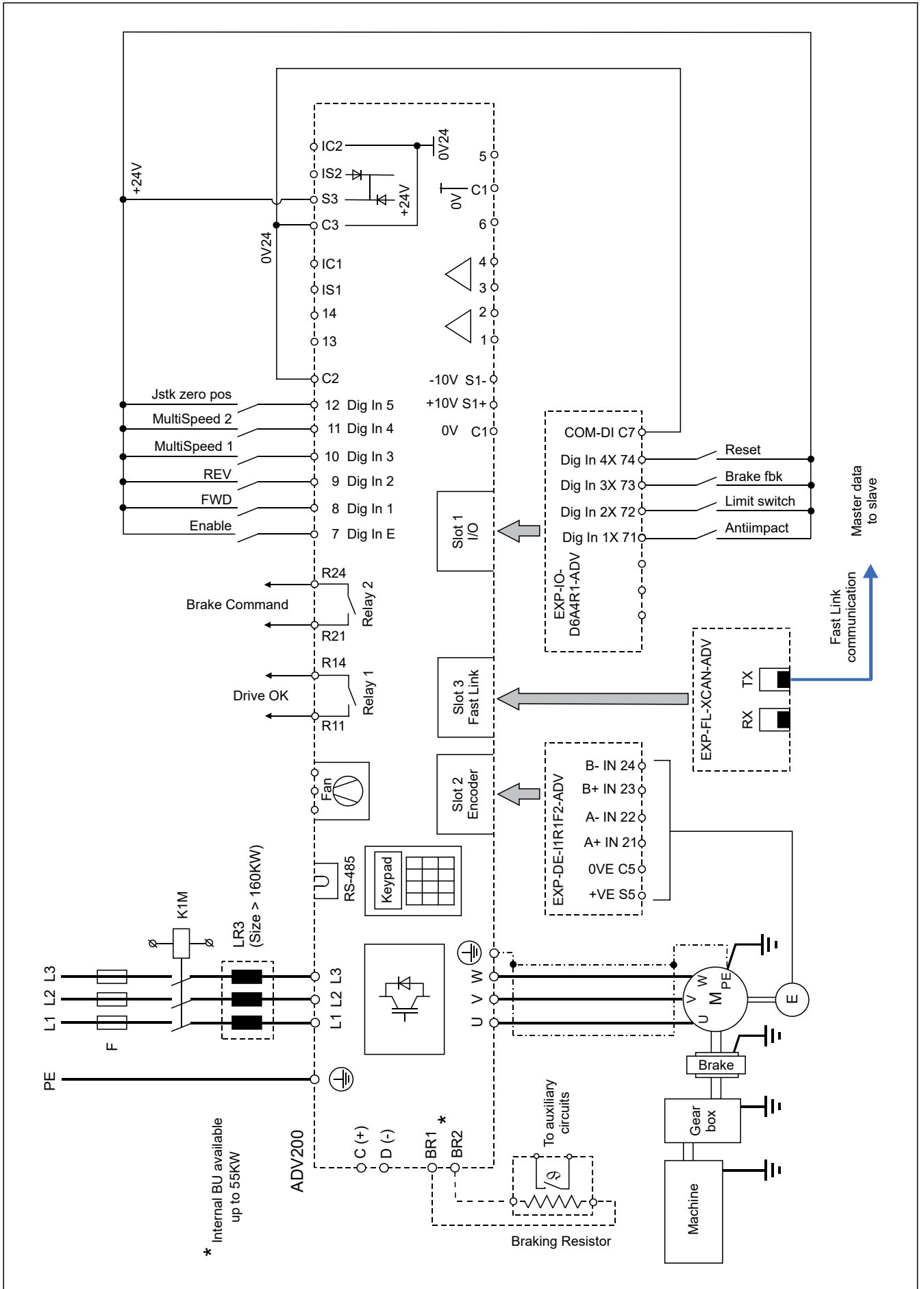
Typical drive connection -HL-M

The following is an example of a typical configuration of the digital inputs and outputs of the ...HL-S drive with EXP-FL-XCAN-ADV expansion card (required) and encoder.
This configuration lets the drive communicate with the master drive of its mechanical shaft.
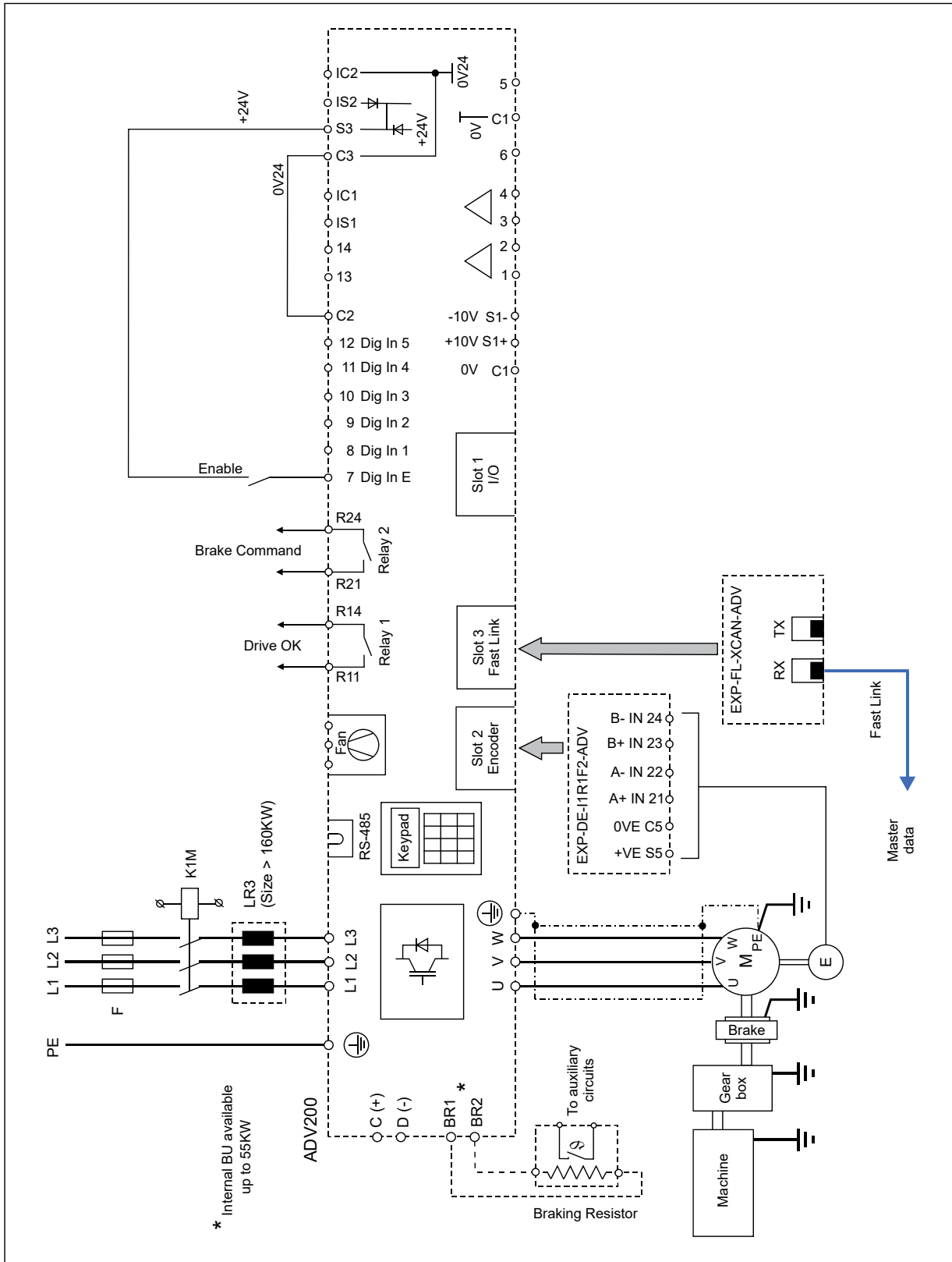
Typical drive connection -HL-S

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.12.01	11068	**HL-S trq inversion**	-	BOOL	Off	-	-	R/W
		Parameter to be set only on drives configured as …-HL-S Inversion of torque reference.						

26.13 HC DIG INPUTS

This menu lets you set the digital inputs.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.13.01	11152	**FWD cmd src**	-	ENUM	Dig inp 1	-	-	R/W
		Digital input for Forward command.						
26.13.02	11154	**REV cmd src**	-	ENUM	Dig inp 2	-	-	R/W
		Digital input for Reverse command.						
26.13.03	11156	**Multi spd 1 src**	-	ENUM	Dig inp 3	-	-	R/W
		Digital input for multispeed 1 command.						
26.13.04	11158	**Multi spd 2 src**	-	ENUM	Dig inp 4	-	-	R/W
		Digital input for multispeed 2 command.						
26.13.05	11160	**Jstk Zero pos src**	-	ENUM	Dig inp 5	-	-	R/W
		Digital input for joystick ZERO position.						
26.13.06	11162	**Anti Impact src**	-	ENUM	Dig inp 1x	-	-	R/W
		Digital input to activate Anti Impact.						
26.13.07	11164	**Limit switch src**	-	ENUM	Dig inp 2x	-	-	R/W
		Digital input for limit switch contacts.						
26.13.08	11166	**Brake fbk src**	-	ENUM	Dig inp 3x	-	-	R/W
		Digital input for brake feedback.						
26.13.09	11168	**ELS src**	-	ENUM	Dig inp 4x	-	-	R/W
		Digital input to activate following. Input to be set only on drives configured as …-ELS-VM, …-ELS.						
26.13.10	11180	**Reset src**	-	ENUM	Dig inp 5x	-	-	R/W
		Digital input for Reset alarms command.						
26.13.11	11194	**Anti sway src**	-	ENUM	Dig inp 6x	-	-	R/W
		Torque threshold for brake opening, direction REV. Set this parameter only in FOC CL control mode.						
26.13.12	11196	**ELS align src**	-	ENUM	Dig inp 7x	-	-	R/W
		Digital input to activate alignment of drives in Electric Shaft. Input to be set only on drives configured as …-ELS-VM, …-ELS.						

Parameters source "src" can be assigned to any digital input.
If the source is used to enable a function, for example Anti Sway, you can set the value of Anti sway src = One. In this case, the function is always active.

26.14 HC DIG OUTPUTS

This menu contains the digital output settings.

Two steps are required for changing the digital outputs:
(The example shows a change in the PAD, which controls the brake via digital output 2).

- Specify in the HOIST&CRANE application the PAD on which to write the command: Main menu\ HOIST&CRANE \ HC DIG
  OUTPUTS\ Brake cmd dest = PADxx.
- On the ADV menu, link PADxx (i.e., the brake command) to digital output 2: Main menu\ HC DIG OUTPUTS\Digital output 2
  src = PADxx.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.14.01	11008	**Anti Impact dest**	-	ENUM	Null	-	-	R/W
		Digital output to signal Anti Impact function active.						
26.14.02	11176	**Brake cmd dest**	-	ENUM	Pad 1	-	-	R/W
		Digital output to control brake contactor.						
26.14.03	11182	**Hoist Spd up dest**	-	ENUM	Null	-	-	R/W
		Digital output to signal Hoist speed up active.						
26.14.04	11184	**Power Spd up dest**	-	ENUM	Null	-	-	R/W
		Digital output to signal Power speed up active.						
26.14.05	11186	**Low Spd Zone dest**	-	ENUM	Null	-	-	R/W
		Digital output to signal handling in Low Speed zone.						
26.14.06	11188	**Over Load 1 dest**	-	ENUM	Null	-	-	R/W
		Digital output to signal excessive load, threshold 1 exceeded.						
26.14.07	11190	**Over Load 2 dest**	-	ENUM	Null	-	-	R/W
		Digital output to signal excessive load, threshold 2 exceeded.						
26.14.08	11202	**Limit switch dest**	-	ENUM	Null	-	-	R/W
		Digital output to signal state of limit switches.						
26.14.09	11204	**Anti sway dest**	-	ENUM	Null	-	-	R/W
		Digital output to signal anti sway function active.						

26.15 ANALOG INPUTS

This menu contains the analog input settings.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.15.01	11104	**Speed ref src**	-	ENUM	Analog inp 1	-	-	R/W
		Analog input for setting speed reference.						

26.16 HC ALARM CONFIG

This menu contains the application alarm settings.
The action of an alarm depends on how its "Action" parameter was set:

	Signal		Reset condition	On drive action	On brake action
	Warning	Alarm			
None				Normal operation	Normal operation
Warning	√		Automatic: when fault condition is eliminated	Normal operation	Normal operation
Alarm		√	Manual	Disable	Closed

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.16.01	11022	**Brake fbk time**	ms	FLOAT	400	0	10000	R/W

Maximum time allowed from sending of brake command to reception of brake feedback.
If, after the set time, the FW detects that the feedback state does not match the command, the action provided in "BRAKE FBK action" is activated.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.16.02	11066	**Brake fbk action**	-	ENUM	Alarm	-	-	R/W

Action to be taken if brake feedback does not match command within time set in "Brake fbk time".

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.16.03	11086	**Jstk time**	ms	FLOAT	400	0	10000	R/W

Maximum allowed time for reception of multiple commands from joystick.
If, after the set time, the software detects multiple commands (ex: FWD + REV) the action provided in "Jstk action" is activated.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.16.04	11088	**Jstk action**	-	ENUM	Alarm	-	-	R/W

Action to be taken if software detects multiple commands for a time exceeding "Jstk time".

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.16.05	11090	**AI time**	ms	FLOAT	500	0	10000	R/W

Maximum allowed time after which, if torque (drive in FOC CL and FOC OL mode) or current (drive in V/f mode) exceeds the impact threshold set in "AI Thr," the action provided in "AI action" is activated.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.16.06	11098	**AI action**	-	ENUM	Alarm	-	-	R/W

Action to be taken if software detects that torque (current) exceeds the impact threshold for a time set in "AI time".

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.16.07	11126	**OL1 time**	ms	FLOAT	100	0	10000	R/W

Maximum allowed time after which, if torque (in FOC CL and FOC OL mode) or current (in V/f mode) exceeds the Overload threshold set in "OL1 Load thr," the action provided in "OL1 action" is activated.

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.16.08	11128	**OL1 Action**	-	INT	Warning	-	-	R/W

Action to be taken if software detects that torque (current) exceeds the "OL1 Load threshold beyond the time set in "OL1 time".

	Signal		Reset condition	On drive action	On brake action
	Warning	Alarm			
Warning	√		Automatic: when value returns within limits	Normal operation	Normal operation
Warning & Spd	√			Freezes deceleration ramp	
Alarm Rst		√	Automatica: alla chiusura del freno	STOP in ramp commanded	Brought to close
Alarm		√	Manual	Disabled	Closed

Menu	PAR	Description	UM	Type	Def	Min	Max	Access
26.16.09	11132	**OL2 time**	ms	FLOAT	200	0	10000	R/W

Maximum allowed time after which, if torque (in FOC CL and FOC OL mode) or current (in V/f mode) exceeds the Overload threshold set in "OL2 Load thr," the action provided in "OL2 action" is activated.

| 26.16.10 | 11134 | **OL2 Action** | - | INT | Alarm | - | - | R/W |

Action to be taken if FW detects that torque (current) exceeds the "OL2 Load thr" threshold beyond the time set in "OL2 time".

	Signal		Reset condition	On drive action	On brake action
	Warning	Alarm			
Warning	√		**Automatic**: when value returns within limits	Normal operation	Normal operation
Warning & Spd	√			Freezes deceleration ramp	
Alarm Rst		√	**Automatic**: at brake close	STOP in ramp commanded	Brought to close
Alarm		√	**Manual**	Disabled	Closed

| 26.16.11 | 11140 | **Alarm dec time** | ms | FLOAT | 1000 | 0 | 10000 | R/W |

Deceleration time if an alarm trips.

| 26.16.12 | 11206 | **ELS pos error** | m | FLOAT | 1 | 0 | 10 | R/W |

Maximum position error allowed between Virtual Master and commanded shaft.

| 26.16.13 | 11210 | **ELS error time** | ms | INT | 500 | 0 | 10000 | R/W |

If position error between Virtual Master and commanded shaft exceeds value of "ELS pos error" for a time exceeding "ELS error time", the action programmed in "ELS Action" is activated.

| 26.16.14 | 11212 | **ELS Action** | - | ENUM | None | - | - | R/W |

Action to be taken if threshold indicated in ELS pos error parameter is exceeded: position error between Virtual Master and commanded shaft.

| 26.16.15 | 11214 | **Slave enable time** | ms | INT | 2000 | 0 | 10000 | R/W |

Parameter to be set only on drives configured as …-ELS-VM, …-HL-M.
Maximum time allowed to open or close brakes; this parameter must be greater than the time taken by the drives to exceed the brake open/close thresholds.
After the set time has elapsed, if even one drive has not executed the command, the action programmed in "Slave fbk action" is activated.

| 26.16.16 | 11220 | **Slave brake time** | ms | INT | 2000 | 0 | 10000 | R/W |

Parameter to be set only on drives configured as …-ELS-VM, …-HL-M.
Maximum time allowed to enable/disable drives after a movement is commanded.
After the set time has elapsed, if even one drive has not executed the command, the action programmed in "Slave fbk action" is activated.

| 26.16.17 | 11222 | **Slave fbk Action** | - | ENUM | Alarm | - | - | R/W |

Parameter to be set only on drives configured as …-ELS-VM, …-HL-M.
Action to be taken if an alarm trips on "slave" drives or if thresholds indicated in the Slave brake time or Slave enable time parameters are not respected.

| 26.16.18 | 11224 | **HL error time** | ms | INT | 500 | 0 | 10000 | R/W |

Parameter to be set only on drives configured as …-ELS-VM
If torque error between …-HL-M shaft and …-HL-S drive exceeds "HL torque error" value for a time exceeding "HL error time", the action programmed in "HL Action" is activated.

| 26.16.19 | 11226 | **HL torque error** | % | FLOAT | 10 | 0 | 150 | R/W |

Parameter to be set only on drives configured as …-HL-M.
Maximum torque error allowed between …-HL-M shaft and …-HL-S drive. Value is expressed as % of nominal torque of motors.

| 26.16.20 | 11228 | **HL Action** | - | ENUM | None | - | - | R/W |

Parameter to be set only on drives configured as …-ELS-VM
If torque error between …-HL-M shaft and …-HL-S drive exceeds "HL torque error" value for a time exceeding "HL error time", the action programmed in "HL Action" is activated.

| 26.16.21 | 12054 | **Allarm state** | - | DINT | - | - | - | R |

Word signaling active alarms.

BIT	ALARM	DESCRIPTION
0	Parameter	Error in the parameters setting
1	Joystick multi cmd	Multiple commands received from the keypad or joystick active simultaneously
2	Joystick no cmd	With zero position active, no commands received from the keypad or joystick.
3	Brake err OPEN	Error opening the brake
4	Brake err CLOSE	Error closing the brake
5	OL1	With Over Load function active, excessive load detected (threshold 1 exceeded)
6	OL2	With Over Load function active, excessive load detected (threshold 2 exceeded)
7	AI	With active anti-impact function, impact detected.
8	ELS pos err	With active electric axis function, misalignment between master and slave drives detected.
9	FLW err	With active Follower function, a running error is detected on a Slave drive.
10	SLAVE enable err	With electric axis or helper function active, error detected when enabling a slave drive.
11	SLAVE brake err	With electric axis or active helper function, error detected in brake management of a slave drive.
12	HL trq err	With active helper function, detected error on the torque reference applied to a slave drive.

26.17 FIRMWARE

Read-only menu showing the application version and release.

Menù	PAR	Descrizione	UM	Tipo	Def	Min	Max	Acc
26.17.01	12102	**Version**	-	INT	-	-	-	R
		Application version.						

4.1 ALARMS

The table shows the alarms for the application, displayable on the keypad.

DISPLAY	DESCRIPTION	OPERATION
PARAMETERS	Parameter setting error.	Check parameter settings.
JOYSTICK	Error in commands received from joystick or button panel.	Check that no multiple commands are entered. Check wiring and setting of joystick or button panel.
BRAKE	Inequality detected between brake command and feedback beyond allowed time.	Check brake feedback wiring or setting of "ALLARM CONFIG\Brake fbk time" parameter.
OVERLOAD 1	Overload detected.	Check load weight or setting of OVERLOAD function parameters.
OVERLOAD 2	Overload detected.	Check load weight or setting of OVERLOAD function parameters.
IMPACT	Impact detected.	Check if load has struck an obstacle or check setting of ANTI IMPACT function parameters.
LIMIT SWITCH	Limit switch tripped.	You can move only in the direction opposite that of the tripped limit switch.
ELS FAULT	ONLY FOR …-ELS-VM DRIVE Position error threshold between Virtual Master and commanded shaft exceeded.	Check cause of fault on "slave" drive.
HL FAULT	ONLY FOR ...-HL-M DRIVE Torque error threshold between master motor and slave motor exceeded.	Check cause of fault on "slave" drive.
SLAVE FAULT	ONLY FOR …-ELS-VM or ...-HL-M DRIVE "Slave" drive in alarm or "slave" drive has not executed command to open/close brake or to enable drive.	Check cause of fault on "slave" drive.

4.2 COMMISSIONING PROCEDURE

4.2.1 General information

The following chapter describes a commissioning procedure for the application.
Preliminary commissioning operations for ADV200 drives are described in chapter 7 of the manual "ADV200 Rapid installation guide – Specifications and connections".

4.2.2 Installation

A PC, WEG eXpress software (≥ 1.0.0) with Catalogue version 1.0.6 or higher, the RS485 - PCI COM drive connection kit and the Hoist and Crane application file are required to install the application.

The application file (APL-ADV200-HC-fw...-r...exe) can be downloaded from the WEG website at the path:
https://www.weg.net/catalog/weg/ER/en/Drives/Variable-Speed-Drives/System-Drives/Variable-Speed-Drive-ADV200/Variable-speed-drive-ADV200/p/MKT_WDC_GLOBAL_PRODUCT_INVERTER_ADV200, sezione APPLICATION SOFTWARE

The application installation setup contains an automatic procedure that copies the necessary files into the appropriate folders in the WEG eXpress catalogue.

Nota!   Before running the application installation setup, close any open WEG eXpress sessions..

Through WEG eXpress, it is possible to use the 'Download firmware' command on the toolbar.
This command will open a drop-down menu showing the list of downloadable applications (and compatible with the fw of the drive).
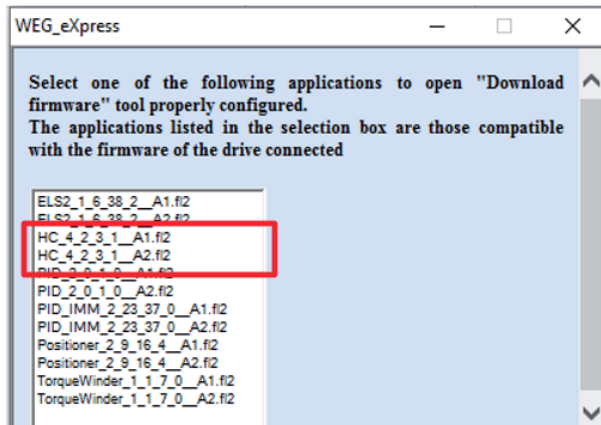
If no applications are installed (only the PID is installed by default as application 1), the 'Firmware Download' window will be empty and the user must manually select the '.fl2' file to download.

After selecting the application, a window will appear (see image below). Then click on 'Download'. The process of downloading the application to the drive will begin.
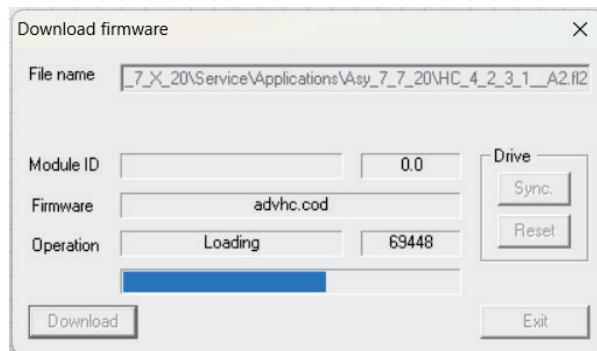
4.2.3 Initial operations

- Check all connections. Pay particular attention to shieldings in order to minimize noise, especially with regard to the encoder.
- To connect to the drive, you need a PC, WEG eXpress configuration software with catalog version equal to or later than 1.0.6, and the RS485 PCI COM drive connection kit.
- Launch the WEG eXpress software and click on DRIVES, then select INVERTER and ADV200 in the drop-down menu;
  the following screen shows the drives connected to the PC, if no drives are detected open the Manual screen and check the connection settings.
- Click PARAMETERS.
- Load the default parameters and run the "Load default drive values" command on the WEG eXpress parameters menu.
- First perform a 'Save parameter into target' command and then a 'Drive reset'.
- Run the startup wizard where a procedure is proposed that allows a quick startup of the of the drives with a reduced number of settings. For advanced customisation, it is necessary to use the individual performance parameters required. For this operation, refer to the procedure described in chapter 7.1.1 Startup Wizard of the 'Quick Installation Guide (ADV200 QS)' manual. Use "stand-still" mode to self-calibrate the motor.

For motor self-tuning, use the stand-still mode.

4.2.4 Drive parameters managed by the application

Load the application default values by running the "H&C SERVICE \App Load default" command (IPA 11144).

4.2.4.1 List of ADV parameters changed when loading application default parameters

Menu	PAR	Description	UM	Type	Def
22.14.01	556	**Control mode select**	-	ENUM	Speed
06.22	752	**Ramp out Zero src**	-	ENUM	One
11.01	1000	**Set cmd remot**	-	BOOL	Digital
11.03	1004	**Enable / disable Mode**	-	BOOL	Off
11.06	1010	**Comando Safe start**	-	BOOL	On
11.10	1018	**Sorgente dig Enable**	-	BOOL	Pad 6
11.11	1020	**Sorgente dig Start**	-	BOOL	Pad 3
11.17	1042	**FR forward src**	-	BOOL	Pad 2
11.18	1044	**FR reverse src**	-	BOOL	Pad 4
13.02	1312	**Sorgente dig Output 2**	-	BOOL	Pad 1
		This parameter can be changed from default.			
19.18	2310	**Flux weakening OL**	-	ENUM	Enable
20.13	2382	**Torque Ref 1 Src**	-	ENUM	Dig Torque Ref 1
21.03	2404	**Voltage torque boost**	-	ENUM	Enable
24.01	4500	**Fault reset src**	-	ENUM	Null
23.08.05	5712	**FL N Fwd slave chg**	-	INT	0
23.08.06	5714	**FL fault enable src**	-	ENUM	One
23.08.02	5818	**FL bidirectional**	-	BOOL	Enable
23.08.03	5820	**FL N of slave**	-	INT	1
23.08.11	5830	**FL Rev 1 src**	-	ENUM	Pad 7
23.08.12	5832	**FL Rev 2 src**	-	ENUM	Pad 8

4.2.5 Essential steps for drive configuration

See the relative chapters for specific brake and function settings.

	Description	Menu / Parameter	IPA
1	Load application default values.	H&C SERVICE \ App Load default	11144
2	Specify the type of movement controlled by the drive and its configuration (Hoist, Trolley or Gantry) …–ELS, -HL.	HOIST&CRANE \ H&C SERVICE \ Movement type 26.02.01	11002
3	Specify type of input for speed reference (joystick) - digital or analog.	HOIST&CRANE \ H&C SERVICE \ Jstk Speed Type position 26.02.03	11062
4	Specify digital/analog inputs and outputs to read and control main system components.	HOIST&CRANE \ HC DIG INPUTS 26.12 HOIST&CRANE \ ANALOG INPUTS 26.14 ADV200 HO \ HC DIG OUTPUTS 26.13	
5	Specify the type of joystick to use.	HOIST&CRANE \ H&C SERVICE \ Decodifica Jstk 26.02.02	11060
6	Specify if the joystick ZERO position contact is present.	HOIST&CRANE \ H&C SERVICE \ Jstk zero position 26.02.04	11064
7	Specify if the brake is wired and has to be managed by the drive.	HOIST&CRANE \ H&C SERVICE \ Brake 26.02.06	11114
8	Specify the type of brake feedback contact (NONE, NC, NO).	HOIST&CRANE \ H&C SERVICE \ Brake fdk 26.02.07	11122
9	If brake is present (Brake = ON; IPA11114), set thresholds for brake opening. If brake is not present, specify only the delay for brake opening (OPEN delay; IPA11138).	HOIST&CRANE \ ALARM CONFIG	
10	Specify if the limit switch contacts are wired and the type.	HOIST&CRANE \ H&C SERVICE \ Limit switch 26.02.08	11142
11	Specify multispeeds of commands received. If digital (JSTK SPEED TYPE; IPA 11062) set all 4 parameters. If analog (JSTK SPEED TYPE; IPA 11062), set only first parameter (SPEED 1; IPA 11004) as maximum commanded speed.	HOIST&CRANE \ CMD SPEED \ Speed 1(..4) 26.04.01(..04)	11004 11006 11010 11054
Set only for drives ..-ELS-.. and ..-HL-..	Configure FastLink address on each drive, setting drive ..-ELS-VM (or …-HL-M) to 1 followed by other drives …-ELS (or …-HL-S).	COMMUNICATION\FL address 23.08.01	5702
	Only on drive ELS-VM (or …-HL-M), specify which slave drive …-ELS (or …-HL-S) the master should interrogate. Given that the parameter is bit-coded, write: 1: if only one slave is connected 3: if two slaves are connected 7: if three slaves are connected	COMMUNICATION\FL N of slave 23.08.03	5820
	Save and reset the drive.		
12	On the HOIST drive, check that when the FWD command is given the hook moves up and that there is a positive speed reference.		
13	Run rope length definition procedure. As an alternative, enter mechanical ratio "Mpr" directly, bring hook (Trolley or Beam) to a known position and write it in the "Known position" parameter.	HOIST&CRANE \ H&C SERVICE \ Define axis length 26.02.10 HOIST&CRANE \ H&C SERVICE \ Mpr 26.02.11 HOIST&CRANE \ H&C SERVICE \ Known position 26.02.13	11146 11148 11198
Only for drives with Antisway active	Specify analog input and write the full- scale to be used to send and receive rope length measurement (value must be greater than maximum rope length). The parameter must be the same on the HOIST GANTRY and TROLLEY drives linked for antisway.	HOIST&CRANE \ ANTISWAY \ Rope length src 26.09.03 HOIST&CRANE \ ANTISWAY \ Rope length scale 26.09.04	11108 11174
14	Activate and configure the selected functions.		

15	Configure thresholds and activities for alarms.	HOIST&CRANE \ ALARM CONFIG 26.16
16	Save and reset the drive.	

4.2.6 Procedure for manual calibration of inertia

Acquire an up and down phase with SoftScope. The acquired variables are vTorque_Nm and vSpeed_Rad_sec (see chapter "List of parameters monitorable with SoftScope SW oscilloscope for more information). If system inertia is dominated by the constant, the hoisted load is not important (it can also be zero).

The magenta line shows speed, the blue line shows torque. A rise (positive speed) and a descent are recorded. The torque line clearly shows the gap between acceleration (blue cursor) and movement at constant speed (red cursor). The difference between the two torques is the torque needed to accelerate (TorqueAcc). The maximum speed reached in rad/s is shown in Vmax. Acceleration time (tAcc) is the time taken to reach it from zero. The values are easily derived from the graph. The moment of inertia in kg/m^2, is given by:

J = TorqueAcc * tAcc / Vmax
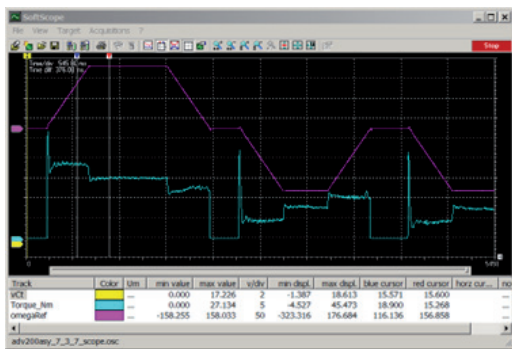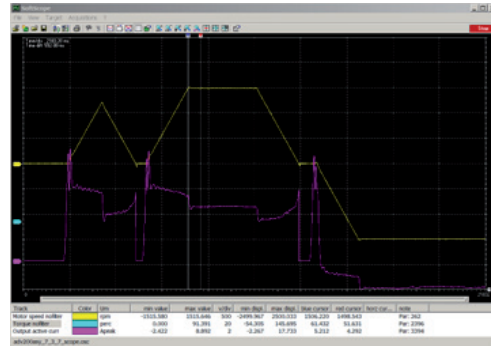
Figure 1: Foc and Sls acquisition   Figure 2: V/f acquisition

Note!

In V/f, torque is not constant during acceleration. This is due to the less precise estimation method used for V/f. In any case, torque delta value is used at the end of acceleration.

4.2.7 Calculating the rope length

If the rope length is unknown, you can calculate its length by means of the period of oscillation of the hook, as follows:
• Swing the hook and measure the time it takes for 10 complete oscillations (an oscillation is the time the hook takes to swing and return to starting position).
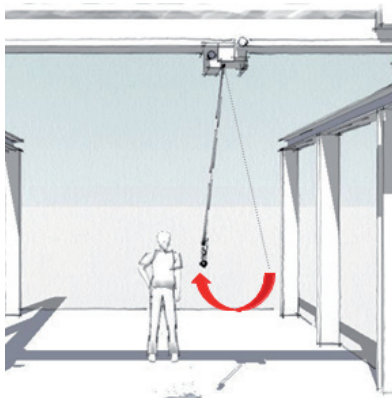
- Calculate the period of oscillation
  T = measurement [in seconds] / 10

- Calculate rope length with the formula:
  $L = g * (T / 2\pi)^2$

Where:
L = rope length in meters.
g = gravity constant [9,81 m/s^2]
T = period of oscillation

Enter the result in the "H&C SERVICE \known position" parameter when requested during the "rope length definition procedure", leaving the hook (trolley or beam) in the same position.

4.2.8 Initialization procedure for calculating rope length

This operation has to be done only when the machine is commissioned.

Warning! ⁣⁣
When setting a default load for drive parameters, you have to reload the application parameters (see the COMMISSIONING PROCEDURE).
 ⁣⁣

If the distance between the hook and the center of gravity of the load changes significantly (replacement of anchor ropes, etc.), you will have to change the "H&C SERVICE\Measure load" parameter (IPA11200).

You can use two ways to initialize the rope length calculation procedure, depending on whether the mechanical ratio of motor rpm / distance is known or not:

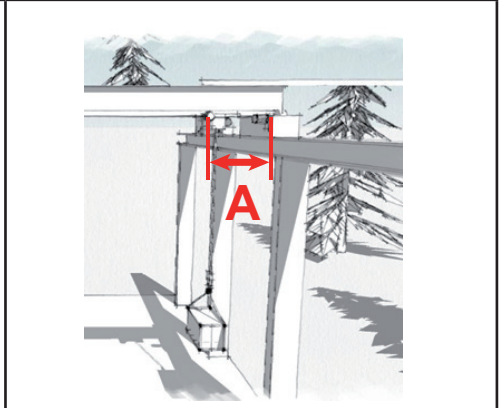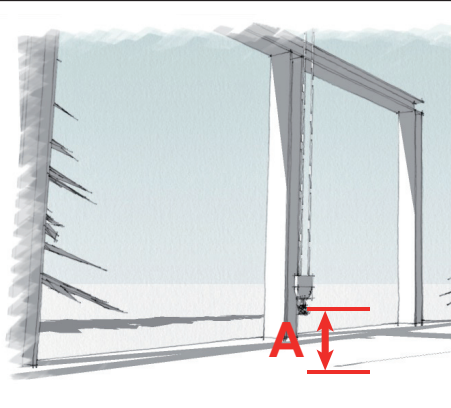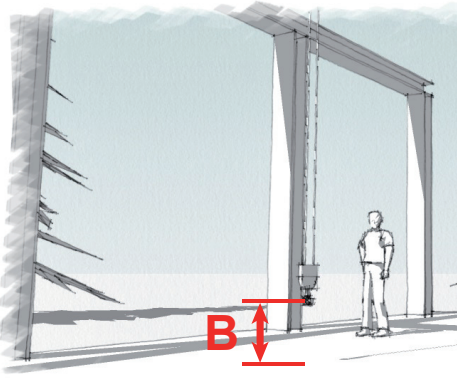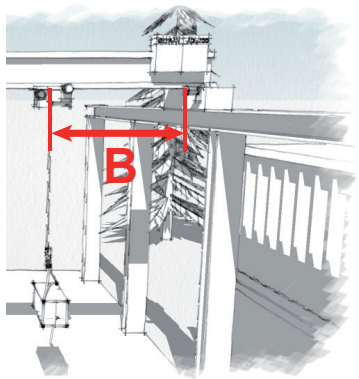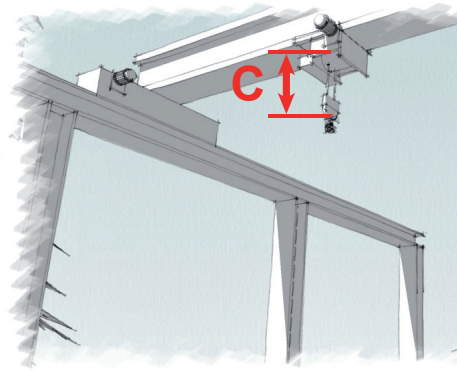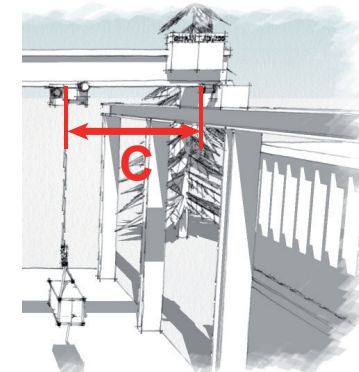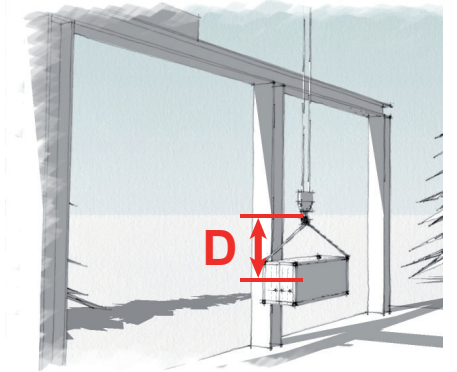| PROCEDURE for known conversion ratio		
Write coefficient of ratio motor rpm/distance in "H&C SERVICE \ mpr" parameter (IPA 11148).		
Bring hook to a "known position" and write distance (expressed in meters) between hook and rope winder drum or from pulleys, if present (C) in "H&C SERVICE \ Known position" parameter (IPA 11198). This operation lets the software calculate its position on the rope. <u>On Hoist only:</u> If distance is not known, see chapter "Calculation of rope length" and enter the result in the "known position" parameter.		
In the "H&C SERVICE \ Measure load" parameter (IPA11200), enter the distance between the hook groove and the hypothetical center of gravity of the load (D).		
Save and reset the drives.		
PROCEDURE for unknown conversion ratio		
Set Define axis length parameter = Init, "Define axis length" parameter goes to "Move to limit switch" state. Move hook until limit switch trips. If for any reason you cannot make the limit switch trip, move the trolley (or beam) as far as possible and bring the "H&C SERVICE \ Define length" parameter (IPA 11146) to Measure 1. Measure (A) and make a note of the distance between the hook and the ground.		
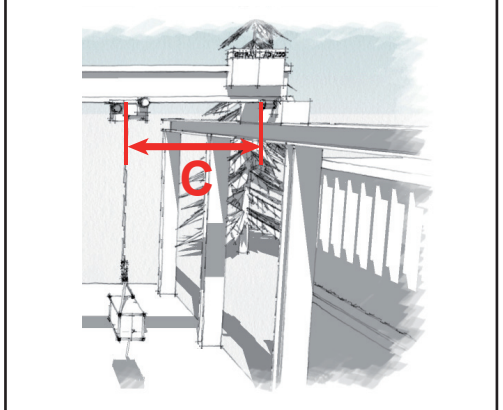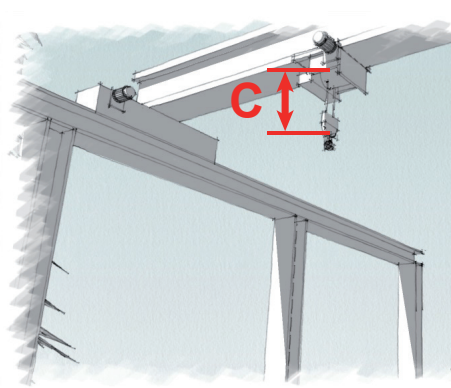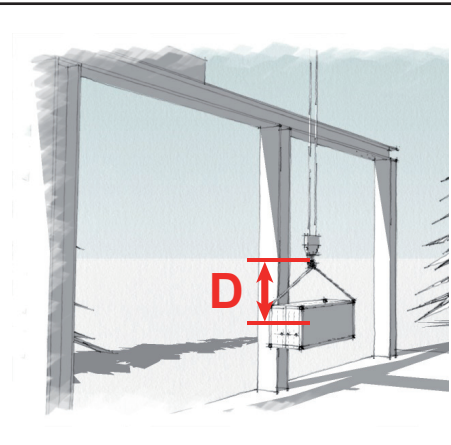
Raise the hook by about 1 meter. Measure (B) and enter the shift (Measure 1 = B - A) in the "H&C SERVICE \ Measure 1" parameter (IPA 11192). This operation lets you determine the ratio between motor rpms and actual shift on the rope. The "Define axis length" parameter goes to "Known position".		
Bring hook to a "known position" and write distance (expressed in meters) between hook and rope winder drum or from pulleys, if present (C) in "H&C SERVICE \ Known position" parameter (IPA 11198). This operation lets the software calculate its position on the rope. On Hoist only: If distance is not known, see chapter "Calculation of rope length" and enter the result in the "known position" parameter.		
In the "H&C SERVICE \Measure load" parameter (IPA11200), enter the distance between the hook groove and the hypothetical center of gravity of the load (D).		
Save and reset the drives.		

Warning! Movements of the hook (trolley or beam) with the drive off will cause misalignment between the real position and the position specified by the drive, making it necessary to repeat the rope length definition procedure

Instruction manual
Series: ADV200
Revision: 1.5
Date: 04/10/2024
Code: 1S9HCEN

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