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2   Introduction

The commands listed in this application note is supported by servo positioning controller of the ARS 2000 family which have the firmware:

Version 3.2.0.1.3

If necessary, in case of the need for an update, contact your sales partner or visit our homepage in http://www.metronix.de.

The commands do not differ between upper and lower case letters. Invalid letters are ignored.

3   Mode „Setpoint-Direction-Limitation"

The mode „Setpoint-Direction-Limitation" becomes active if the drive run onto a hardware limit switch. This stops further movement of the drive in the direction were the limit is. This is the case if a superposed control tries to do further position steps in that direction.
If the mode „Setpoint-Direction-Limitation" is active the drive can only move in the opposite direction.
If the drive releases the limit switch, the „Setpoint-Direction-Limitation" can be disabled by doing an error elimination. This can achieved by a falling edge of the controller enable (DIN5), or the error elimination is done by a field bus. In case of having a CANopen application this can be done by setting RESET_FAULT in the controlword 6040_00h.

The following explanation shows a way to leave the controller enable active so that the drive stays in control while the setpoint-direction-limitation is eliminated.

4 Elimination of the „Setpoint-Direction-Limitation" in CANopen

The following steps are listed exemplary:
1. The drive runs in positive direction to a limit switch
2. The drive reaches the limit switch and stops.
3. The drive moves in negative direction and releases the limit switch
4. It is regarded to move again in positive direction

Note:
To reach this the drive must be set-up in the right way to have this behavior.

4.1 States of a command sequence with CANopen

Commands send by the Transferwindow	Answer of the servo displayed in the Transferwindow:	Meaning:
Query of the starting requirements		
?60FD00		Query of the digital inputs
	=60FD00:00000000	Answering signal of the digital inputs: BIT3 = 0: Controller- and power stage enable is given BIT1 = 0: positive hardware–limit-switch is not active BIT0 = 0: negativ hardware–limit-switch is not active
?606100		Query of the operating mode for enabling the speed control mode if needed.
	=606100:01	Answering signal of the operating mode is equal to positioning mode
Set- up for switching the servo-positioning controller to speed mode if it is switched of		
=604000:0000		Reset of the state machine by use of the controlword bit DISABLE_VOLTAGE.
	=604000:0000	Feedback from the CANbus
?604100		Query of the statusword
	=604100:0250	The state is: SWITCH_ON DISABLED
=606000:03		Change of the operating mode to speed control mode
	=606000:03	Feedback of the CANbus
?606100		Query of the operating mode
	=606100:03	Feedback of the operating mode query.
Enabling the servo positioning controller (starting the state machine for switch on)		
=604000:0006		Start-up of the state machine by writes to the controlword beginning with SHUTDOWN.
	=604000:0006	Feedback of the CANbus

Commands send by the Transferwindow	Answer of the servo displayed in the Transferwindow:	Meaning:
Query of the starting requirements		
?604100		Query of the statusword
	=604100:0231	State: READY_TO_SWITCH_ON
=604000:0007		Start-up of the state machine by writes to the controlwords (SWITCH_ON).
	=604000:0007	Feedback of the CANbus
?604100		Query of the statusword
	=604100:0233	State: SWITCH_ON
=604000:000F		Further Start-up of the state machine by writes to the controlwords (ENABLE_OPERATION).
	=604000:000F	Feedback of the CANbus
?604100		Query of the statusword
	=604100:0227	State: OPERATION_ENABLE Drive is enabled.
Move the drive to the positive limit switch		
=60FF00:00000064		Speed-setpoint set to 100Rpm
	=60FF00:00000064	Feedback of the CANbus
?606C00		Query of the actual speed
	=606C00:00000064	The drive runs with 100Rpm
?604100		Query of the statusword
	=604100:0627	State: TARGET_REACHED
?60FD00		Query of the digital inputs
	=60FD00:00000002	Feedback of the digital inputs: BIT3 = 0: Controller- and power stage enable is given BIT1 = 1: Positive Limit-switch is reached BIT0 = 0: Negative limit-switch in not active
?604100		Query of the statusword
	=604100:12A7	State: BIT7 (WARNING) = 1: Setpoint-direction-limitation is active BIT12 (SPEED_0) = 1: Drive is stopped

The drive is now engaging the positive limit switch and should by moved in the opposite direction to leave the switch

=60FF00:FFFFFF9C		Speed-setpoint set to -100Rpm
	=60FF00:FFFFFF9C	Feedback of the CANbus
?606C00		Query of the actual speed
	=606C00:FFFFFF9C	The drive runs with –100Rpm
?60FD00		Query of the digital inputs
	=60FD00:00000002	Feedback of the digital inputs: BIT3 = 0: Controller- and power stage enable is given BIT1 = 1: Positive Limit-switch is reached BIT0 = 0: Negative limit-switch in not active
?604100		Query of the statusword
	=604100:02A7	State: BIT7 (WARNING) = 1: Setpoint-direction-limitation is active
?60FD00		Query of the digital inputs
	=60FD00:00000000	Feedback of the digital inputs: BIT3 = 0: Controller- and power stage enable is given BIT1 = 0: Positive Limit-switch is released BIT0 = 0: Negative limit-switch in not active
?604100		Query of the statusword
	=604100:02A7	State: BIT7 (WARNING) = 1: Setpoint-direction-limitation is active

The drive is now beside the limit switch and the setpoint-direction-limitation can be eliminated

=604000:008F		Elimination of the Setpoint-direction-limitation in that way that the controller does not need to be disabled
	=604000:008F	Feedback of the CANbus
?604100		Query of the statusword
	=604100:0227	State BIT7 (WARNING) = 0: Setpoint-direction-limitation is active

Setpoint-direction-limitation is not active and the drive can be moved in positive direction again.		
=60FF00:00000064		Speed-setpoint set to 100Rpm and the drive can be moved in positive direction again.
	=60FF00:00000064	Feedback of the CANbus
?606C00		Query of the actual speed
	=606C00:00000064	The drive runs with –100Rpm