FAULHABER

Motion Controller CANopen: Homing to Hard Stop

Operation

The Home or "0" position of a drive can be reset at a hard stop.
A flow program is defined that allows the motor to find a home position by performing a sequence to look for a hard stop. The motor current is monitored while a homing motion profile is executed and when the current exceeds a defined limit the controller will stop and set the position counter to "0". In this homing sequence a reference travel limit switch is not needed.

Applies To

FAULHABER Motion Controllers of generation V2.5 with CAN interface.

Limitations

- Problems may occur in drive systems with a gearhead. The current rises slowly in this configuration. The gearhead can act like a mechanical spring and take some time to wind up. This causes a slow current rise in the motor. Due to the slow rise the homing point for the system may not be consistent.
- Binding in the gearhead can cause the homing sequence to terminate prematurely, resulting in homing position error.
- This sequence is not reccomended for motors with low power consumption because of the inaccuracy of the current measurement for motor currents less than 100mA.

Explanation

Continuous and peak current are set to the same value. This should be greater than 100 mA to detect the hard stop safely. Care should be taken to keep the current below the maximum continuous current (LCC) of the motor. See the datasheet of the motor for maximum continuous current ratings.

After movement is initiated in the direction of the expected hard stop, the program flow goes into a continuous loop. When the motor reaches the hard stop, causing the current to increases to its maximum permitted value, a current error will occur. The current error generates an interrupt, leaving the continuous loop for an interrupt service routine.

The service routine for the interrupt then stops the motion and resets the position counter to "0".

The current limit values must be increased after motion stops and the position resets. This must be done as it may require a higher torque to leave the blocked position due to tension in the mechanical system.

Procedure/Method

To identify the point at which the hard stop occurs there must be a continuous monitoring of the overcurrent or emergency error.

Evaluation of the Emergency Error

Excerpt from MCxx Manual Page 35

The Emergency Object informs other bus subscribers of errors that have occurred.
The Emergency Object is always 8 bytes in size and structured as follows:

11 bit identifier	8 bytes user data							
0x80 (128D) + Node-ID	Error0 (LB)	Error1 (HB)	Error-Reg.	0	0	0	0	0

Example
When in Faulhaber Fault Register 0x2320 under Subindex 2, Bit 1 is set an Emergency Message with the 8 databytes 0x10, 0x23, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00 is sent when the LCC (Continuous Current Limit) is exceeded for more than the DCE (Delay Current Error) set time.

Continuous Query

A continuous query can be made on the Faulhaber channel via the command OST. The drive does not automatically signal when the overcurrent is reached or when a value changes in the status register as the command OST is taking place. Extract from the manual page 93

OST	0x57	0	Operation Status	Display current operating status. Return value binary coded (LSB = Bit 0): Bit 0: Homing running Bit 1-3: Reserved Bit 4: Current limitation active Bit 5: Deviation error Bit 6: Overvoltage Bit 7: Overtemperature Bit 8: Status input 1 Bit 9: Status input 2 Bit 10: Status input 3 Bit 11: Status input 4 Bit 12: Status input 5 Bit 13-15: Res. for further inputs Bit 16: Position attained

In the DSP402 profile the continuous query can be performed by monitoring Error register 1001.

Error Register

Index	Subindex	Name	Type	Attrb.	Default value	Meaning
0x1001	0	error register	Unsigned8	ro	No	Error register

Internal device errors are displayed in this byte as follows:

Bit	M/O	Meaning
0	M	generic error
1	O	current
2	O	voltage
3	O	temperature
4	O	communication error (overrun, error state)
5	O	device profile specific
6	O	reserved (always 0)
7	O	manufacturer specific

When the overcurrent is detected by the CAN master the drive must be stopped. This can be done by sending the drive a speed command of 0..

The internal position counter can be reset to 0 by using Homing Method 35.

Homing Method

Index	Subindex	Name	Type	Attrb.	Default value	Meaning
0x6098	0	Homing Method	Integer8	rw	20	Homing Method

All Homing Methods defined in DSP402 V2 are supported:

1 to 14:   Homing with index pulse (if present)
17 to 30: Homing without index pulse
33, 34:   Homing at index pulse (if present)
35:        Homing at current position

After homing to the LCC and LPC parameters are reset to the desired operational values for the application. The current limit values must be increased after motion stops and the position resets. This must be done as it may require a higher torque to leave the blocked position due to tension in the mechanical system.

Rechtliche Hinweise

Legal notices

No liability. Owing to the non-binding character of the Application Note Dr. Fritz Faulhaber & Co. KG will not accept any liability for losses arising in connection with it.

Amendments to the Application Note. Dr. Fritz Faulhaber & Co. KG reserves the right to amend Application Notes. The current version of this Application Note may be obtained from Dr. Fritz Faulhaber & Co. KG by calling +49 7031 638 385 or sending an e-mail to mcsupport@faulhaber.de.