SINAMICS DCM

DC Converter

Application
SINAMICS DCM 2Q unit -
Braking to defined speed using field reversal

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SINAMICS drives

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SINAMICS DCM
SINAMICS DCM 2Q unit -
Application "Braking to defined speed" using field reversal
Compact User Manual

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE
indicates that an unintended result or situation can occur if the relevant information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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1 Instructions

Note

This application document does not claim to contain all details and versions of units, or to take into account all conceivable operational cases and applications.

The standard applications do not represent specific customer solutions, but are only intended to provide support in the implementation of typical applications. The operator is responsible for the correct operation of the products described.

Should you require further information or encounter specific problems which have not been handled in enough detail, please contact your local Siemens office.

The contents of this application document are not part of an earlier or existing contract, agreement or legal relationship, nor do they change such contracts, agreements or legal relationships. The contract of sale in each case outlines all the obligations of the I DT Drive Technologies Division of Siemens AG. The warranty conditions specified in the contract between the parties are the only warranty conditions accepted by the I DT Drive Technologies Division. Any statements contained herein neither create new warranties nor modify the existing warranty.

⚠ WARNING

The units listed here contain dangerous electric voltages, dangerous rotating machine parts (fans) and control rotating mechanical parts (drives). Failure to follow the relevant Operating Instructions may result in death, serious injury or extensive material damage.

Technical Support

You can also find help for technical issues through our Technical Support:
www.siemens.de/automation/support-request (German)
www.siemens.com/automation/support-request (English)

2 Range of application

With the "Braking to defined speed" application, it is possible to implement a braking function in a 2Q SINAMICS DCM. In contrast to the 4Q SINAMICS DCM, where the braking process is carried out automatically by means of an appropriate setpoint change, the braking process of this application is initiated by a binary signal and the specification of a lower setpoint.

Note

The setpoint must be positive, since the polarity of the speed actual value is reversed through the internal procedure for field reversal and the control direction would otherwise no longer be correct.

This application document is particularly suitable for applications in which the functionality of the 4Q device is not required, but a brake function to defined speed of > 0 is required (e.g. paper machines, operating mode changes from "Operation" to "Creep").

The function is implemented via the free function blocks.

The existing function "Direction of rotation reversal using field reversal", which is described in the chapter "Descriptions of functions" of the SINAMICS DMC Operating Instructions, is used as basis.

3 Description of function

The braking is initiated via a binary signal. The setpoint is thereby switched over to the braking setpoint and the opposite field direction is requested. According to the procedure described in the Operating Instructions, field reversal and hence the braking process take place. When the braking setpoint is reached, the original field direction is re-established by resetting of the RS flip-flop (RSR 1). The braking setpoint remains active until the RS flip-flop is reset for saving of the braking command (RSR 0).

In this example, the braking signal comes from terminal X177.11.

The source for the reset signal is "Set braking command to zero". The braking signal is therefore inverted (NOT 1). The braking process and hence the field reversal can be canceled at any time by resetting this flip-flop (AFU signal).

In order to prevent the braking setpoint from being larger than the main setpoint, the braking setpoint is limited to the main setpoint using a limiter.

It must be noted that the braking setpoint (BSW) is not permitted to change during the braking process. In this example, the fixed setpoint of p50401 is therefore used as braking setpoint (see chapter 4).

Please note that the motor coasts down uncontrolled during field reversal. The interval limit L of the limit monitor LVM 0 (p20268) should therefore be selected such that the limit monitor responds before the desired speed value is reached.

The interval limit L depends, among other things, on the rotating mass, as well as on the friction of the drive. If this is not taken into account, it may happen that the speed falls below the braking setpoint, which causes the drive to accelerate after changing to the original field direction and enabling of the armature current.

If the braking setpoint is already in the interval limit L of the BSW limited minus actual value, the execution of the "Braking to n*" signal is blocked. Neither switchover of the setpoint nor field reversal are then carried out.

4 Basic circuit configuration of the control
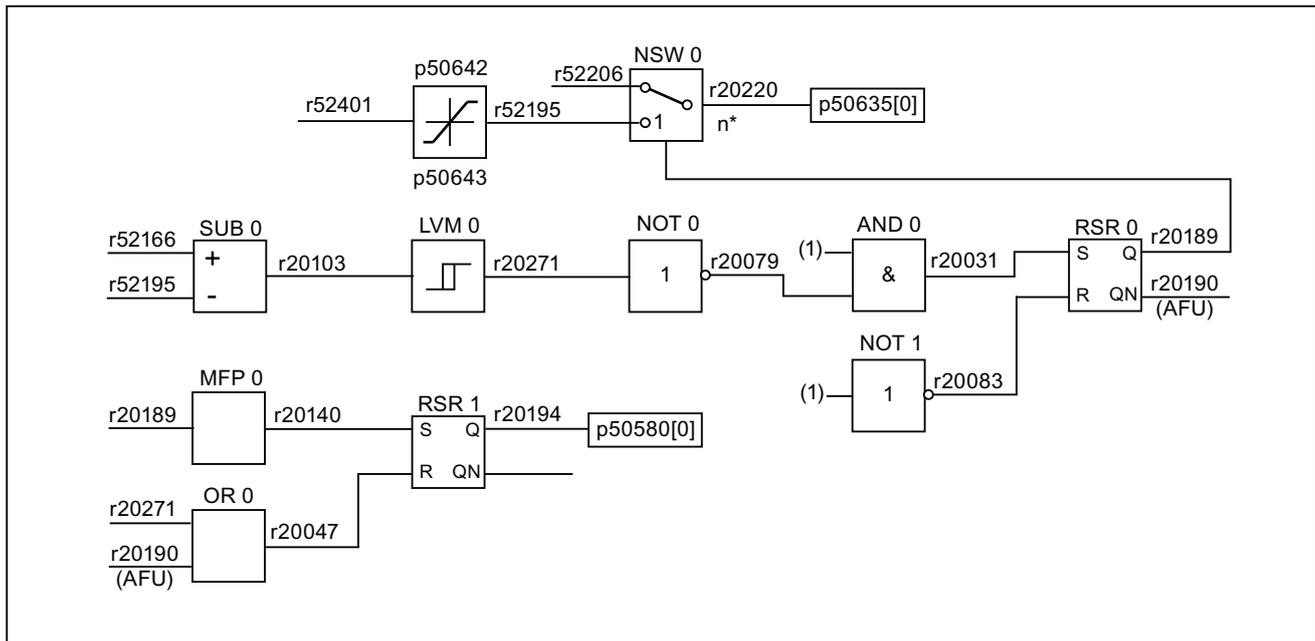
r52206   Main setpoint

r52401   Braking setpoint BSW,   r52195   BSW limited
            setting of value in p50401

n*   Speed setpoint r20220   r52166   Speed actual value absolute

(1) Braking request; terminal X177.11 High signal

Switchover from main setpoint to braking setpoint when (1) = High and LVM 0 = 0
 (n act minus BSW limited not equal to zero);

Output Q of RSR 0 actuates switchover, NSW 0

LVM 0 = High if n act absolute minus BSW limited is equal to zero;

The braking setpoint is limited to the main setpoint to ensure that it can maximal have the value of the main setpoint.

The output Q of RSR 1 activates the field reversal (p50580 = 20194),
deactivated by BSW limited = n act: LVM 0 = 1 or (AFU) = 1 (cancellation of field reversal)

5 Parameter list

Selecting a function module

Parameter	Meaning
	These parameters are in DO1, can also be set with BOP20
p003 = 3	Expert
p009 = 2	Define the drive type/function module
p108[1]	Bit 18 Free function blocks; hex 00040000
	Bit 31 PROFINET; hex 80000000
	80040000 hex: Bit 18 + Bit 31
p009 = 0	The device is now reinitialized
	The following parameters are in DO2
p20000[0] = 8	Runtime group 0 is calculated with 8 ms

Control of the field reversal

Parameter	Meaning
	Changeover switch NSW 0, changeover from main setpoint to BSW limited
p20218[0]=52206	Main setpoint to X0 of NSW 0
p20218[1] =52195	BSW limited r52195 to X1 of NSW 0
p20219 = 20189	Switchover of output Q of RSR 0
p20221 = 0	Runtime group 0 for NSW 0
p20222 = 1060	Run sequence for NSW 0
p50635[0] = 20220	Output NSW 0, r20220 as the speed setpoint n*
	Limiter for BSW limitation; FBD3135 (FBD = function block diagram)
p50642[0] = 52206	Upper setpoint limit of the main setpoint r 52206 (FBD3130)
p50643[0] = 0	Lower setpoint limit 0%
p50644[0] = 52401	Input limiter of the BSW r52401; setting of setpoint via p50401[0]
p50401[0] = xxx	Braking setpoint BSW
	Subtracter SUB 0, n act minus n*
p20102[0] =52166	r52166 n act absolute to X1 of SUB 0
p20102[1] = 52195	r52195 BSW limited to X2 of SUB 0
p20104 = 0	Runtime group 0 for SUB 0
p20105 = 1000	Run sequence for SUB 0
	Limit monitor LVM 0 for querying of n act minus BSW limited is 0
p20267 = 0.0	Interval mean value M for LVM 0
p20268 = 0.03	3% as interval limit L for LVM 0 (set according to system conditions)
p20273 = 0	Runtime group 0 for LVM 0
p20274 = 1010	Run sequence for LVM 0
	Inverter NOT 0
p20078 = 20271	Output LVM 0 r20271 as input for NOT 0
p20080 = 0	Runtime group 0 for NOT 0
p20081 = 1020	Run sequence for NOT 0
	AND element AND 0
p20030[0] = 53010.0	Braking request of r53010.00, terminal X177.11 High signal to I0 for AND 0
p20030[1]=20079	Output of NOT 0, r20079 to I1 of AND 0
p20030[2] = p20030[3] = 1	1 signal to I2 and I3 of AND 0

Parameter	Meaning
p20032 = 0	Runtime group 0 for AND 0
p20033 = 1030	Run sequence for AND 0
	Inverter NOT 1
p20082 = 53010.0	Braking request r53010.00 of X177.11 to input of NOT 1
p20084 = 0	Runtime group 0 for NOT 1
P20085 = 1040	Run sequence for NOT 1
	RS flip-flop RSR 0 for switchover to braking setpoint
p20188[0] = 20031	Output AND 0 r20031 to input S of RSR 0
p20188[1] = 20083	Output of NOT 1 r20083 to input R of RSR 0
p20191 = 0	Runtime group 0 for RSR 0
p20192 = 1050	Run sequence for RSR 0
	Pulse generator MFP 0
p20138 = 20189	Output RSR 0 r20189 to input I of MFP 0
p20139 = 100	Pulse duration of MFP 0 100 ms
p20141 = 0	Runtime group 0 for MFP 0
p20142 = 1070	Run sequence for MFP 0
	OR element OR 0
p20046[0]=20271	Output LVM 0 r20271 to input I0 of OR 0
p20046[1]=20190	Output QN of RSR 0 r20190 to input I1 of OR 0
p20046[2] = p20046[3] = 0	0 signal for input I2 and I3 of OR 0
p20048 = 0	Runtime group 0 for OR 0
p20049 = 1080	Run sequence for OR 0
	RS flip-flop RSR 1 for the field reversal command
p20193[0] = 20140	Output MFP 0 r20140 as input S for RSR 1
p20193[1] = 20047	Output OR 0 to input R of RSR 1
p20196 = 0	Runtime group 0 for RSR 1
p20197 = 1090	Run sequence for RSR 1

Execution of field reversal (FBD6920)

Parameter	Meaning
p50580[0] = 20194	Direction of rotation reversal using field reversal command from output Q of RSR 1
p50771 = 53195.0	Activate field direction 1 via binary output terminals X177.19/23
p50772 = 53195.1	Activate field direction 2 via binary output terminals X177.20/23

Trademarks

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