

Using the motor holding brake function and the reverse command

SINAMICS G120 (CU2x0x-2)

FAQ • June 2013



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The functions and solutions described in this article confine themselves to the realization of the automation task predominantly. Please take into account furthermore that corresponding protective measures have to be taken up in the context of Industrial Security when connecting your equipment to other parts of the plant, the enterprise network or the Internet. Further information can be found under the Content-ID 50203404.

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Question

Can I use the motor holding brake function and the reverse command at the same time?

Answer

The instructions and notes listed in this document provide a detailed answer to this question.

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1 Motor holding brake parameterization

A better solution for controlling the motor direction of rotation would be to use the commands "RUN left" and "RUN right". By use of this control method, the holding brake is always activated with the minimum frequency when the OFF or ON command is issued. This ensures that the motor can always supply the full torque when the brake is released.

Using the motor holding brake function and the reverse command at the same time is not recommended.

In the reserve run of the inverter, the frequency drops up to zero without the holding brake being activated. This can cause problems in installations where the loss of torque at low speed can lead to loss of control.

A detailed description of the motor holding brake parameter assignment can be found in the Operating Instructions of the [SINAMICS G120](#) in chapter "Application specific-functions" point 8.9.2.6 "Motor holding brake".

NOTE

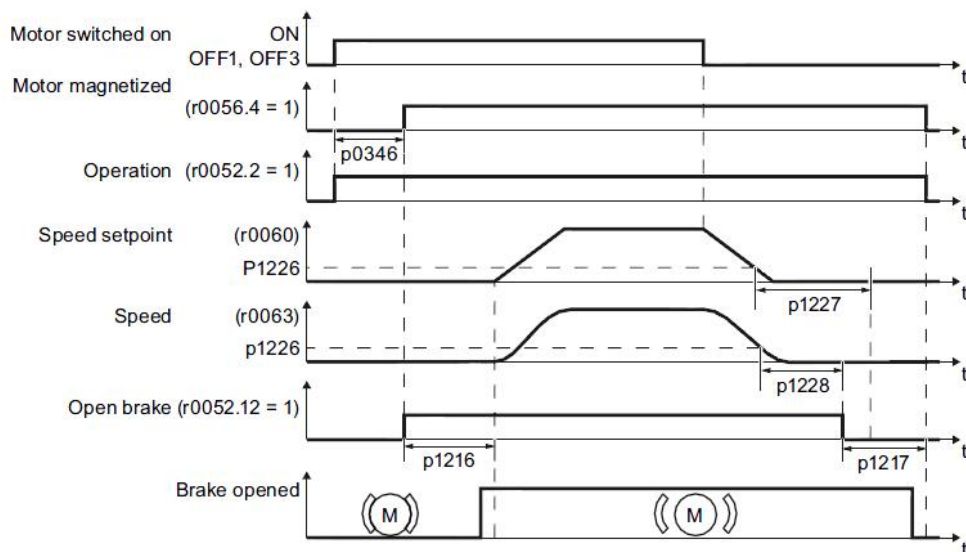
This FAQ applies only to the SINAMICS G120/G120D/G120P Control Units with "-2" in the product name.

1.1 Brake activation

The inverter disposes of an internal logic for the optimal control of a motor holding brake.

By switching off the engine with the OFF1 / OFF3 command, the motor goes down with ramp-down time. By underrun the speed threshold (p1226), the delay times are started. At the end of the first delay time the status bit r0052.12 „brake is open" becomes low signal. In this time the engine remains on magnetized, the actual closing time of the brake can last some milliseconds. At the end of the brake closing time the motor is switched off.

Figure 1-1



1.1.1 Motor holding brake and reverse command

To realize the clockwise rotation and the counter clockwise rotation, you have to use the “Two wire control, method 2” ([Operating Instructions chapter “Functions”: under point “Two-wire-control”](#)).

With this method a reverse command is only accepted while the motor isn't still running. If the Motor turns clockwise, a new “counter-clockwise” -command will not identified.

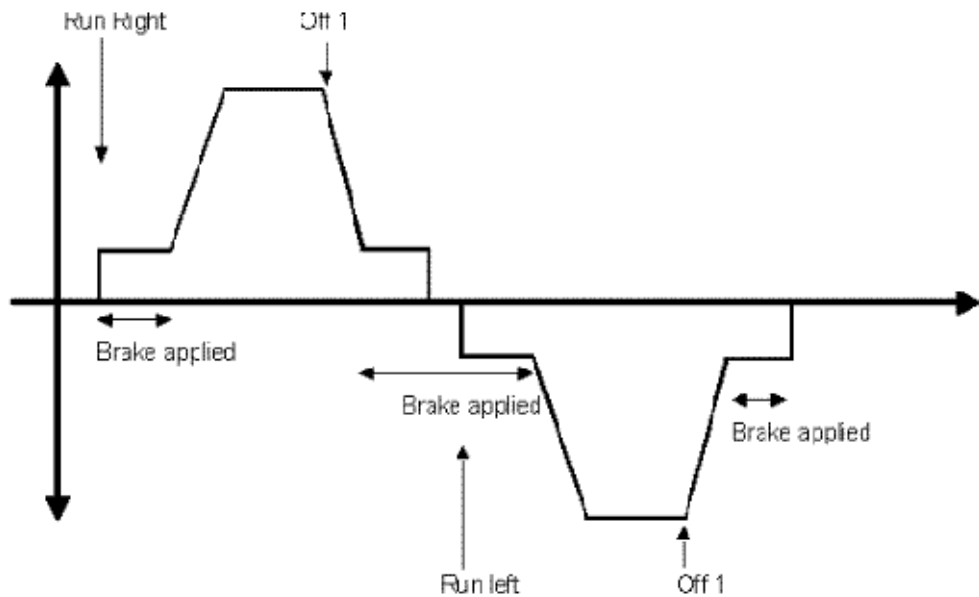
By using the motor holding brake function and the reverse command, the following settings show a possible parameterization. For this example an analogue setpoint is used, but other setpoint are also possible.

Table 1-1

Function	Parameter	Description	Setting	description
Macro drive unit	p0015	Runs the corresponding macro	17	Two-wire-control (for/rev1)
Status word 1	r0052	Displays status word 1	2	Operation enabled
			12	mhb open
Status word, closed loop control	r0056	Displays status word of the closed loop control	4	Magnetizing completed
ON/ OFF 1	p0840	Signal source for ON/OFF 1	r3333	2-wire-control control word
Speed setpoint selection	p1000	Source for the speed setpoint	2	Analog setpoint
Main setpoint	p1070	Source for the main setpoint	r755.1	AIN 1
Motor holding brake configuration	p1215	Sets the holding brake configuration	1	mhb to sequence control
Motor holding brake opening time	p1216	Sets the time for opening the brake	100ms	Factory setting
Motor holding brake closing time	p1217	Sets the time for closing the brake	100ms	Factory setting
Threshold for zero speed detection	p1226	When threshold is undershoot, standstill is identified	20 1/min	Factory setting
Zero speed detection monitoring time	p1227	Sets the monitoring time for the standstill identification (setpoint)	4s	
Pulse suppression delay time	p1228	Pulse suppression after p1228 <u>OR</u> p1227 has elapsed	0,01s	Factory setting
2/3 wire control command 1	p3330	ON/OFF1 clockwise rotation	r722.0	DIN1
2/3 wire control command 2	p3331	ON/OFF1 counter clockwise rotation	r722.1	DIN2

After on command the inverter magnetized the motor. At the end of the magnetizing time (p0346), the inverter issues the command to open the brake. The motor remains at a standstill until the end of the brake opening time p1216. The motor holding brake must open within this time. After that the motor accelerates to the setpoint.

Figure 1-2



The brake applied, when the OFF1 command is given and the delay time (p1227/ p1228) has elapsed.

1.2 Motor holding brake control

For the SINAMICS G120, the brake relay and the Safe Brake Relay are available for controlling the motor holding brake.

The brake relays serve as an interface between the control unit/ power module and the motor's brake solenoid.

1.2.1 Brake Relay (6SL3252-0BB00-0AA0)

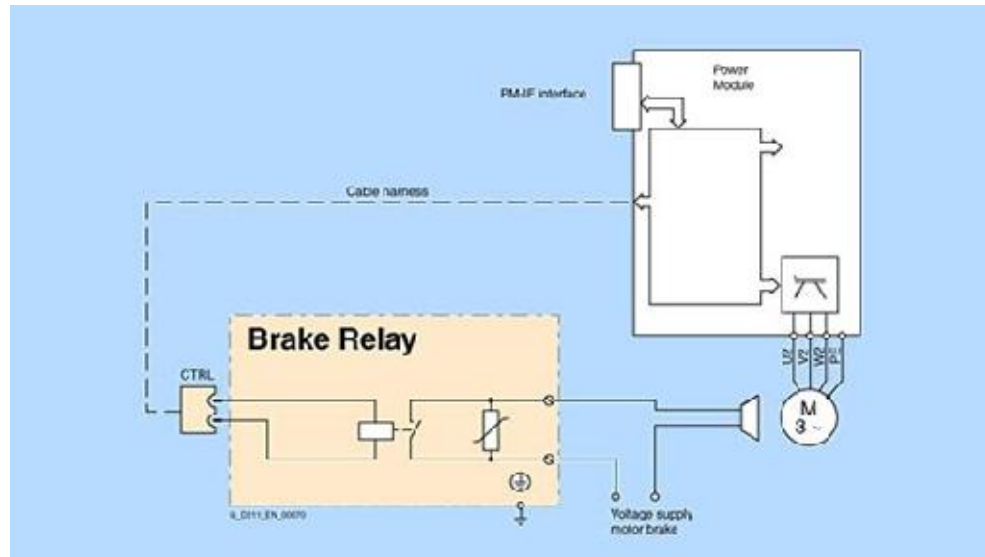
The brake relay (6SL3252-0BB00-0AA0) provides the basic brake control functions. The brake relay allows the Power Module to be connected to an electromechanical motor brake, thereby allowing the motor brake to be driven directly by the Control Unit.

The brake relay has the following interfaces:

- A switch contact (NO contact) to control the motor brake solenoid.

- A connection for the cable harness (CTRL), for connection to the Power Module.

Figure 1-3



Triggering brake control with standard units:

The motor braking function can be activated and deactivated via P1215. It controls a brake relay that is connected to the power module. This brake relay controls an electromechanical brake which is always closed (engaged) when it is off.

P1215 = 0: (motor brake not active – factory setting). This means that a brake (if one is being used) is engaged in order to prevent unintentional motor movement; for example, after parameters have been loaded.

P1215 = 1: (motor brake active). The brake is controlled via terminals A and B on the power module.

NOTE Triggering via a brake relay is not fail safe!

Further information on connecting the brake relay can be found at: ["SINAMICS G120 Brake Module Instructions Relay Brake Module, Safe Brake Module", ID: 23623179.](#)

1.2.2 Safe Brake Relay (6SL3252-0BB01-0AA0)

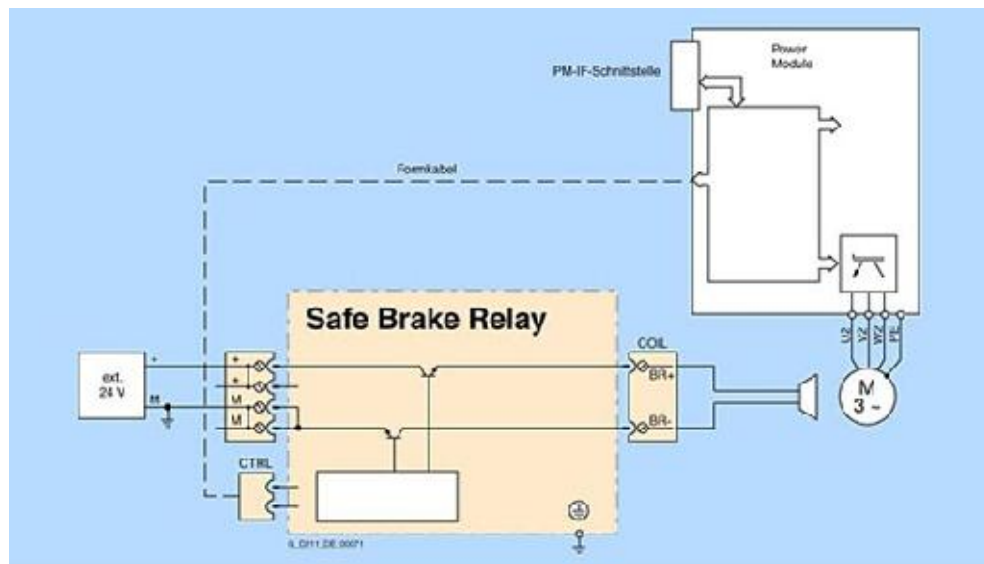
The Safe Brake Relay (6SL3252-0BB01-0AA0) provides the brake control function in a Safety Integrated system. To comply with the requirements of an integrated safety system, the Safe Brake Relay has been designed in such a way that the brake relay can be checked to ensure it is working correctly by applying a variable voltage without actually activating the brake function. The Safe Brake Relay allows

the power module to be safely connected to an electromechanical motor brake, thus enabling the brake to be controlled directly and safely by the Control Unit in accordance with EN 954-1 (EN ISO 13849-1), safety category 3, and IEC 61508 SIL 2.

The Safe Brake Relay has the following interfaces:

- A two-channel transistor output stage for controlling the motor brake coil.
- A terminal for a 24 VDC power supply.
- A connection for the cable harness (CTRL), for connection to the power module.

Figure 1-4



Triggering brake control in the case of Control Units with safety-related functions:

Precondition:

P1215 = 1

To control a Safe Brake Relay in a safety-related way, the following parameters must be set: P9602 = 9802 = 1 (factory setting = 0). If P9602 ≠ P9802, a fault code is generated.

If P9602 = 9802 = 1, a test signal for the signal to the safe brake control (SBC) function is generated and monitored.

This test signal does not impede the normal function of the mechanical brake. If the mechanical brake is installed and this test indicates a negative result, the converter will report a fault state.

If safe brake control is deactivated by setting P9602 = 9802 = 0, the Safe Brake Relay continues to function as required, although it is not monitored by a safety mode.

NOTE

For safe brake control (SBC) a Control Unit CU250S-2 is essential.

Further information:

With the Safe Brake Relay, 24 V motor brakes can be operated up to a power requirement of 2 A. An externally stabilized power supply for 2.5 A and output voltage that can be adjusted to 26 V (e.g. SITOP modular) are required for this purpose. The increased output voltage is required to compensate for the voltage drop in the lines from the coil to the brake. For fail-safety reasons, using the Control Unit's 24 V power supply is not permitted. A separate power supply must be used to ensure the power supply for the Safe Brake Relay is available.

When the converter is switched on, the Safe Brake Relay must be supplied with current first so that the Control Unit can check whether it is working correctly; otherwise, fault F01601 will occur.

Further information on connecting the brake relay can be found at: ["SINAMICS G120 Brake Module Instructions Relay Brake Module, Safe Brake Module", ID: 23623179.](#)

The brake relays can be mounted on a mounting plate, on the wall, or on the gland plates and shield connection kit. Installation instructions for the brake relay and the Safe Brake Relay can be found at ["How are the brake relay and the safety brake module of SINAMICS G120 mounted?", Entry ID: 24222272.](#)

2 Appendix

2.1 Internet links

Further information and technical specifications for the brake relay and Safe Brake Relay can be found in the [Hardware Installation Manual: Power Module PM240](#).

Information about the integrated safety functions of the inverter you will find in [SINAMICS G120 Safety Integrated Function Manual](#)