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# How to connect and configure the SINAMICS V90 motor brake

Product / version / specification / keyword

<https://support.industry.siemens.com/cs/ww/en/view/109747422>

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# 1 Overview

Motor brake is used to prevent the load to start an unexpected movement while servo drive is served off or the power supply has been shut down.

The V90 drive can control the brake directly. This FAQ describes the wiring and the configuration of the brake control between the V90 drive and the motor brake.

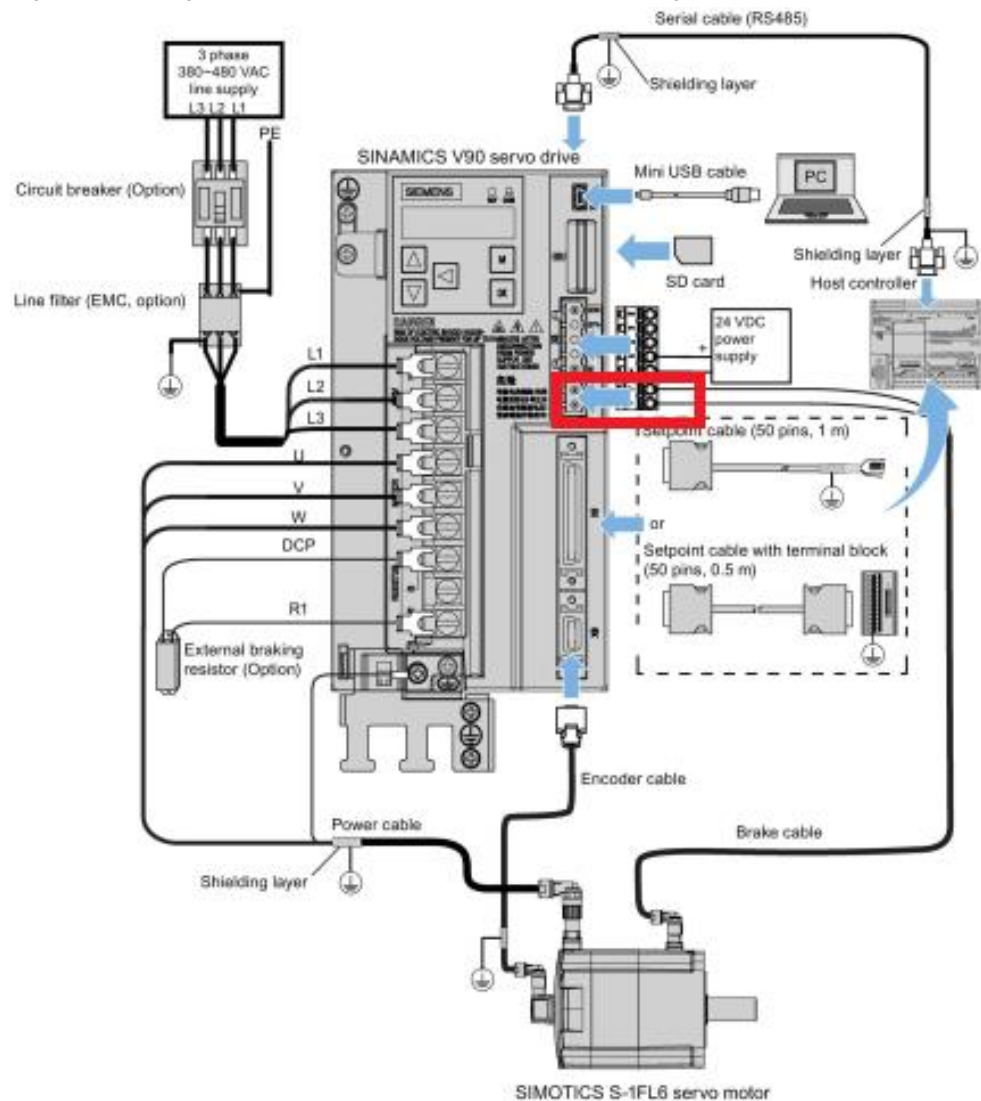
## 2 Connection of V90 and motor brake

In this chapter you find information to find the motor cable and motor cable connector ordering numbers.

### 2.1 Configuration between V90 400V drive and 1FL6 high inertia motor with brake

A brake relay is integrated in the SINAMICS V90 400V drive.

Figure 2-1 Configuration between V90 400V drive and 1FL6 high inertia motor with brake



## 2 Connection of V90 and motor brake

You can directly order the SIEMENS brake cable to connect the drive and the motor brake. But it is also possible to order the brake cable connector and make the cable yourself.

Table 2-1 Ordering information for the brake cable:

No.	Length	Article No.	Comments
1	3m	6FX3002-5BK02-1AD0	These cables are for the low inertial motor.
	5m	6FX3002-5BK02-1AF0	
	10m	6FX3002-5BK02-1BA0	
	20m	6FX3002-5BK02-1CA0	
2	3m	6FX3002-5BL02-1AD0	These cables are for the high inertial motor.
	5m	6FX3002-5BL02-1AF0	
	7m	6FX3002-5BL02-1AH0	
	10m	6FX3002-5BL02-1BA0	
	15m	6FX3002-5BL02-1BF0	
	20m	6FX3002-5BL02-1CA0	

Table 2-2 Ordering information for the connector:

No.	Article No.	
1	6FX2003-0LL52	Low inertial motor brake connector
2	6FX2003-0LL51	High inertial motor brake connector

Table 2-3 Description of the motor holding brake (drive side):


Illustration	Signal	Description
	B+	+24 V motor brake voltage positive
	B-	0 V motor brake voltage negative
Maximum conductor cross-selection: 1.5 mm <sup>2</sup> Input voltage tolerance: 24V ±10%		

Table 2-4 Description of the motor holding brake (motor side):


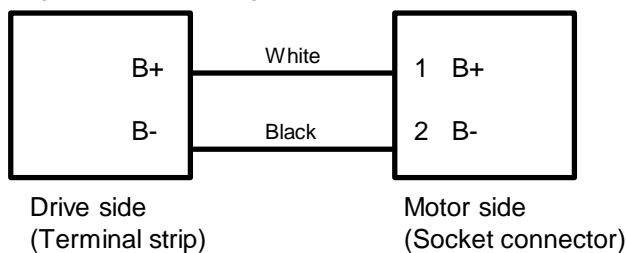
Illustration	Pin No.	Signal	Description
	1	Brake +	Phase Brake +
	2	Brake -	Phase Brake -

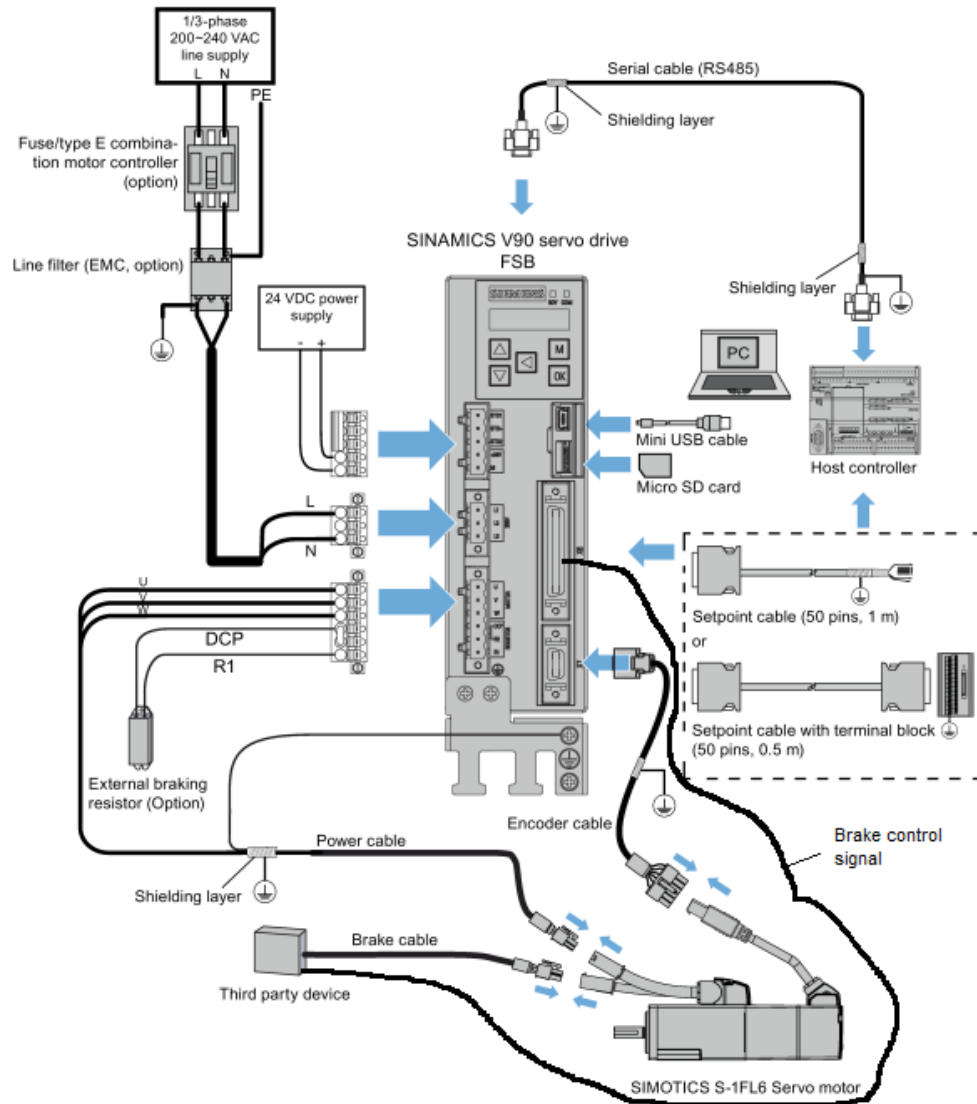
Figure 2-2 is the wiring of the brake cable between the drive side and motor side:



## 2.2 Configuration between V90 200V driver and 1FL6 low inertia motor with brake

There is no brake relay integrated in SINAMICS V90 200V drive.

Figure 2-3 Configuration between V90 200V drive and 1FL6 low inertia motor with brake



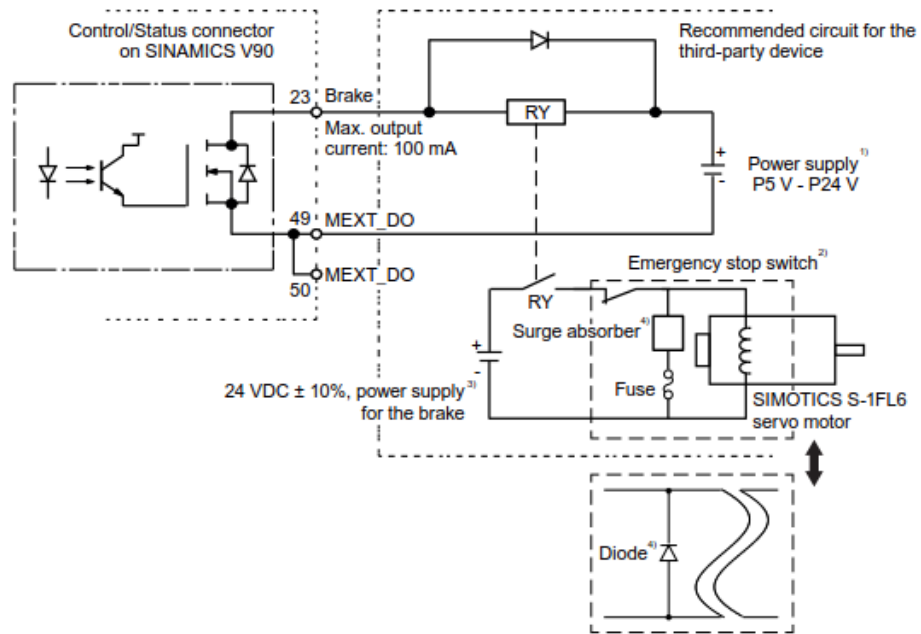
The 24V control voltage of the brake relay must be supplied outside.

The details of the third party device are described in the following chapters:

- Chapter 2.2.1 : SINAMICS V90 PTI brake control
- Chapter 2.2.2 : SINAMICS V90 PN brake control

2.2.1 SINAMICS V90 PTI brake control

Figure 2-4



This figure is for the PTI brake control. The pin 23 is the control signal output from the V90 drive. Pin 49 or pin 50 is used as the common pin for the digital output of V90 drive.

The figure shows the digital output of the pin 23 is a NPN output. So it is necessary to connect the DC24V to one terminal of the relay coin and connect the other terminal of the relay coin to the pin 23 of the drive. The DC24V supply to the coin and the DC0V supply to the V90 should be the same DC power supply.

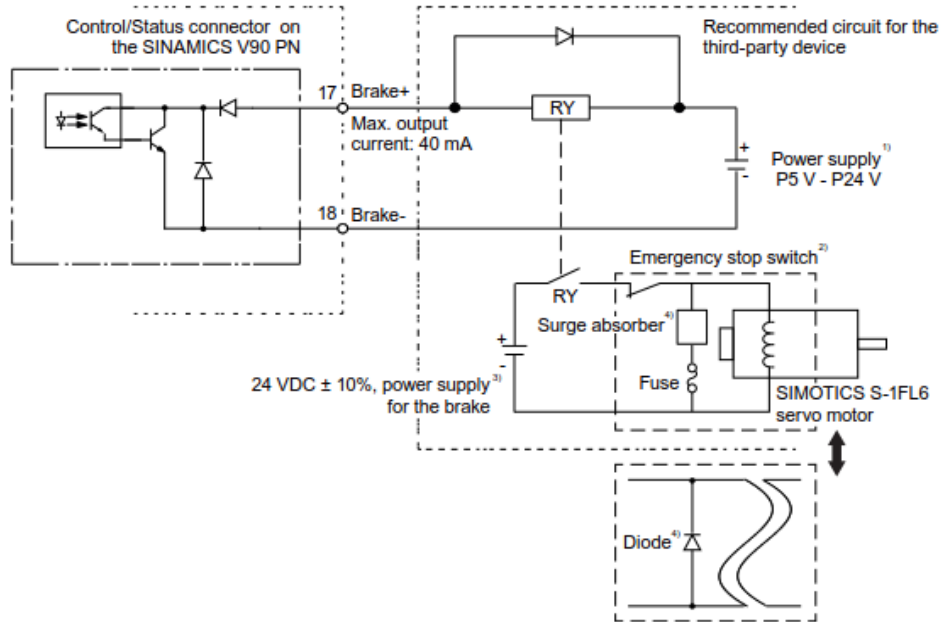
**NOTICE**

- It's recommended to parallel one diode to the coin of the relay to protect the relay coin and V90 digital output.
- It's recommended to use another DC24V power supply to control the motor brake.
- It's recommended to parallel surge absorber and fuse or diode to the motor brake coin to protect the motor brake coin.
- It's recommended to use the emergency stop switch to control the motor brake.

### 2.2.2 SINAMICS V90 PN brake control

#### Example 1

Figure 2-5



This figure is one example of the V90 PN brake control. The pin 17 and pin 18 are the control signal for the brake control. Pin 17 is the positive signal and pin 18 is the negative signal. This digital output is a NPN output. So we connect the DC24V to one terminal of the relay coil and connect the other terminal of the relay coil to the pin 17 of the drive. At the same time, it is necessary to connect the DC0V to pin 18. The DC24V supply to the coil and the DC0V supply to pin 18 should be the same DC power supply.

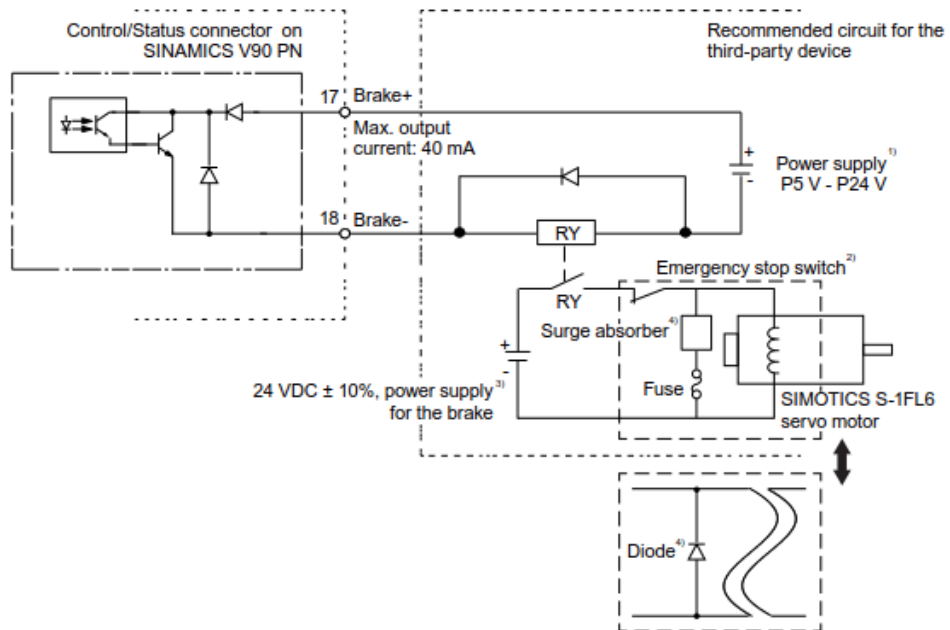
#### NOTICE

- It's recommended to parallel one diode to the coil of the relay to protect the relay coil and V90 digital output.
- It's recommended to use another DC24V power supply to control the motor brake.
- It's recommended to parallel surge absorber and fuse or diode to the motor brake coil to protect the motor brake coil.
- It's recommended to use the emergency stop switch to control the motor brake.



**Example 2**

Figure 2-6



This figure is another example of the V90 PN brake control. The pin 17 and pin 18 are the control signal for the brake control. Pin 17 is the positive signal and pin 18 is the negative signal. This digital output is a NPN output. So we connect the DC24V to the pin 17 directly, connect the DC0V to one terminal of the relay coin and connect the other terminal of the relay coin to the pin 18 of the drive. The DC24V supply to the coin and the DC0V supply to pin 18 should be the same DC power supply.

<b>NOTICE</b>	<ul style="list-style-type: none"> <li>• It's recommended to parallel one diode to the coin of the relay to protect the relay coin and V90 digital output.</li> <li>• It's recommended to use another DC24V power supply to control the motor brake.</li> <li>• It's recommended to parallel surge absorber and fuse or diode to the motor brake coin to protect the motor brake coin.</li> <li>• It's recommended to use the emergency stop switch to control the motor brake.</li> </ul>
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### 2.2.3 Specifications

Table 2-5 For the brake control needed equipment

No.	Name	Function
1	Relay	Used to control the motor brake.
2	Diode	Used to protect the relay coin or brake coin.
3	Surge absorber	Used to protect the brake coin.
4	Fuse	
5	Emergency stop switch contactor	Used to control the brake.
6	External DC24V power supply	Used to supply the energy to control the brake.

You may select an appropriate surge absorber:

Table 2-6

Power supply voltage of the brake		24 VDC±10%
Order information	Manufacturer	EPCOS
	Model	S20K20

You may select an appropriate diode:

Table 2-7

Power supply voltage of the brake		24 VDC±10%
Specification requirements	Rated current	≥1.5A
	Withstand voltage	100V to 200V

You may select an appropriate relay:

Table 2-8

Power supply voltage for the control side	5V to 24V
Power supply current for the control side	≤100mA
Power supply voltage for the load side	24 VDC±10%
Power supply current for the load side	≥0.2A + motor holding brake rated current

Siemens recommends you to select a Siemens relay (for example, relay type LZS:RT3A4L24 or LZS:PT2D5L24).

There is one digital output to indicate the brake status:

Table 2-9 Description of signal MBR

Signal type	Signal name	Setting	Description
DO	MBR	ON = high level (1)	Motor holding brake is closed.
		OFF = low level (0)	Motor holding brake is released.

## 3 Motor brake configuration

### 3.1 Related parameter

Table 3-1 Related parameter of the brake function

No.	Unit	Range	Default	Description
P1215	-	0-3	0	Configuration of the holding brake: 1. No holding brake available 2. Motor holding brake according to sequence control (SON) 3. Motor holding brake always open 4. SIEMENS internal use
P1216	ms	0-10000	Motor dependent	Motor holding brake opening time.
P1217	ms	0-10000	Motor dependent	Motor holding brake closing time.

For the 1FL6 motor with incremental encoder it's necessary to input the motor ID (from the motor nameplate) to the parameter P29000.

For the 1FL6 motor with absolute encoder, the drive can set the motor ID to parameter P29000 automatically.

According to actual situation, you can configure brake by changing the parameter P1215. If the setting P1215=1 is used, then the motor holding brake is open once the digital input signal SON (Servo-on: if this signal from 0 to 1, then powers on power circuit and makes servo drive ready to operate; if this signal from 1 to 0, then motor ramps down) has a rising edge and becomes closed once a falling edge comes to SON.

If the servo motor is used to control a vertical axis, then the movable machine part can have a slight shift when the folding brake is open or closed simultaneously with the status of SON. To eliminate such slight shift you can configure a delay time for the close or open time of the motor holding brake by setting the parameters P1216 and P1217.

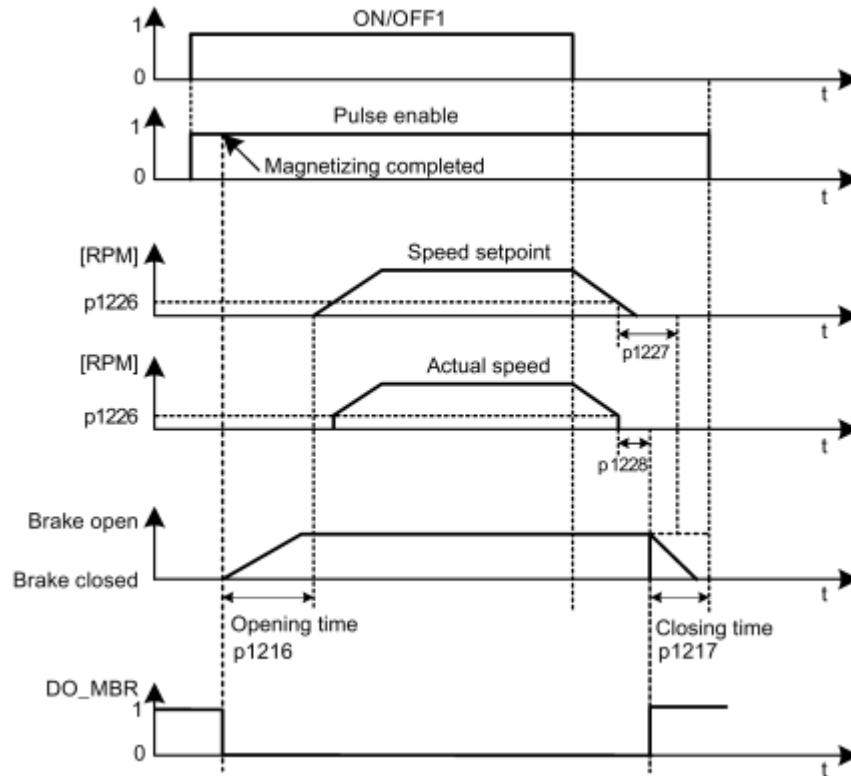
For SINAMICS V90 200 V series servo driver the actual motor brake time consists the time delay of the motor brake and the time delay of the current amplifying component. You can set the values of P1216 and P1217 as the follows:

- p1216 = motor brake opening time + relay opening time
- p1217 = motor brake closing time + relay closing time

### 3.2 Motor braking sequence

The operating principle of the holding brake is configured during motor selection for motors with incremental encoders and configured automatically for motor with absolute encoders.

Figure 3-1 Description of motor braking sequence



The start of the closing time for the brake depends on the expiration of P1227 (zero speed detection monitoring time) and P1228 (pulse suppression delay time).

## 4 Appendix

### 4.1 Service and Support

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## 4.2 Links and Literature

Table 4-1

No.	Topic
\1\	Siemens Industry Online Support <a href="https://support.industry.siemens.com">https://support.industry.siemens.com</a>
\2\	Link to this entry page of this application example <a href="https://support.industry.siemens.com/cs/ww/en/view/109747422">https://support.industry.siemens.com/cs/ww/en/view/109747422</a>
\3\	Operating instructions of the SINAMICS V90 (PTI version) <a href="https://support.industry.siemens.com/cs/ww/en/view/109480673">https://support.industry.siemens.com/cs/ww/en/view/109480673</a>
\3\	Operating instructions of the SINAMICS V90 (PN version) <a href="https://support.industry.siemens.com/cs/ww/en/view/109737880">https://support.industry.siemens.com/cs/ww/en/view/109737880</a>

## 4.3 Change documentation

Table 4-2

Version	Date	Modifications
V1.0	05/2017	First version