Connecting different safety outputs to safety inputs of SINAMICS V90

SINAMICS V90 / Safety / STO

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1 Introduction

1.1 Preliminary remark

This frequently asked question (FAQ) describes the topic “The wiring for the V90 STO input”. The document explains how to connect different safety outputs from different sources to the safety inputs of SINAMICS V90 PN/PTI.

1.2 Safety integrated function

The integrated safety function “Safe Torque Off” (STO) prevents the drive from restarting unexpectedly.

The safety function “STO” will be controlled via terminals and the terminal is shown in figure 1-1:

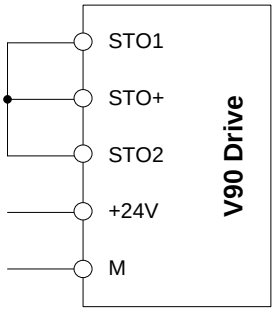

Figure 1-1: Standard configuration for the STO function

In the figure 1-1 STO1 and STO2 are the safety input pins. In the standard configuration both inputs are bridged with STO+ to deselect STO (STO is not active). The standard configuration explains the type of the safety input: P/P switched input.

The STO+ pin is supplied by the standard 24V supply from the drive itself. The STO+ pin is used to supply external safety devices / components which are redirected to the V90 STO1/2 inputs.

The common pin of the safety inputs is the M pin which is also the M pin for the standard 24V power supply of the drive.

NOTE	If the customer is using the STO function then the bridge between STO1 --STO+ - STO2 has to be removed. The wiring to the external safety outputs / devices has to be installed.

CAUTION	**Safety function STO will deactivate the drive sporadically caused by different 24V level with a fault message F01611.** If the application contains 2 or more different 24V DC power supply for the drive and the safety components / devices then the error F01611 can occur. The sporadic error is a result of an open loop between the STOx 24V-pin and the necessary M-pin which is connected from another 24V power supply of the drive. The problem can be avoided by connecting the common terminal of both power supplies together.

The behavior of the SINAMICS V90 STO function is shown in table 1-1:

Table 1-1

Terminal		State	Action
STO1	STO2		
HIGH	HIGH	STO not active	The servo motor will run when you power on the servo drive. STO is now deactivated. There is no other error shown by the inverter.
LOW	LOW	STO active	The servo motor will not run when you power on the servo drive. The pulses from the inverter are deactivated by selecting STO. There is no error shown by the inverter.
HIGH	LOW	Error active/ Internal STO	Error F01611 occurs and the pulses from the drive have been deactivated with the error.
LOW	HIGH	Error active/ Internal STO	Error F01611 occurs and the pulses from the drive have been deactivated with the error.

The STO function integrated in SINAMICS V90 drive is a smart function. Customer doesn’t need to set any parameters to activate or adjust this function.

2 SINAMICS V90 connected directly to S7-1200F F-DQ

Figure 2-1

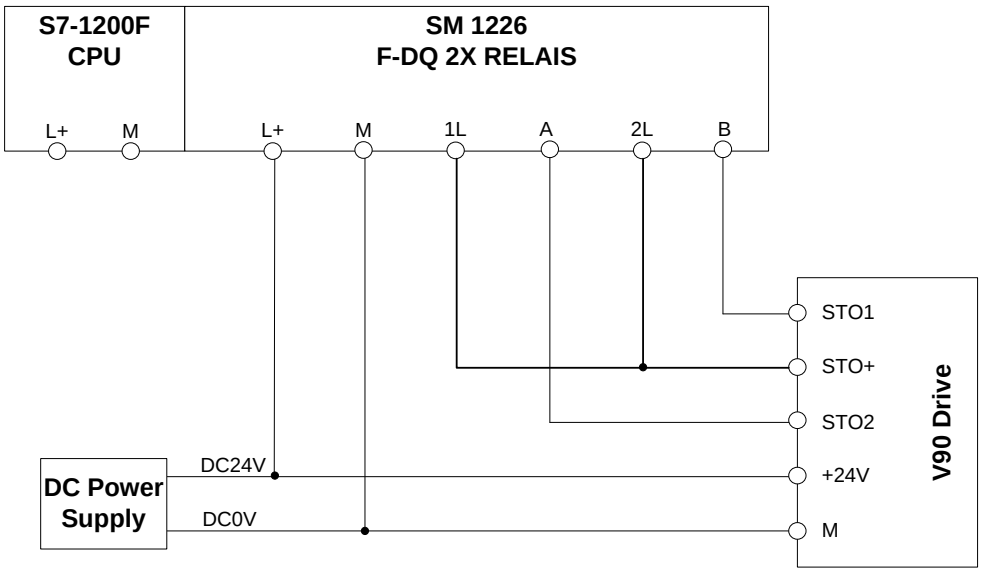

Figure 2-1 shows the case that only one DC 24V power supply used for the SM1226 and for the V90 drive.

The S7-1200F CPU can be connected to the same or a different DC power supply.

Additional components:

- SM1226: 6ES7226-6RA32-0XB0

3 SINAMICS V90 connected to ET 200S F-RO

Figure 3-1

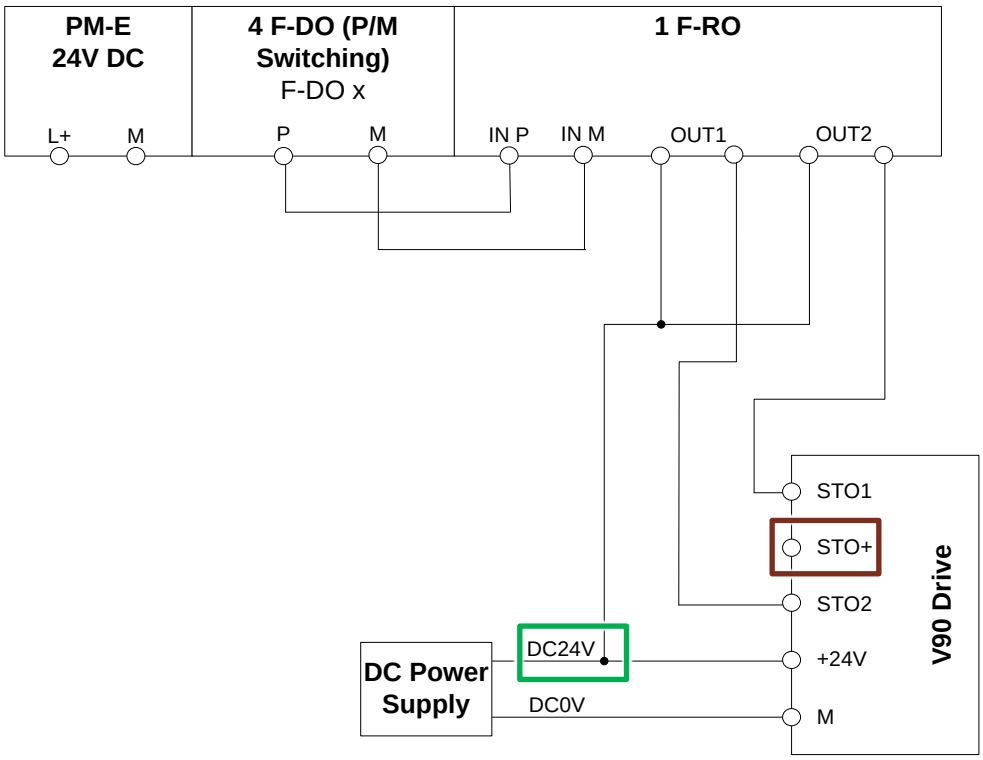

Figure 3-2

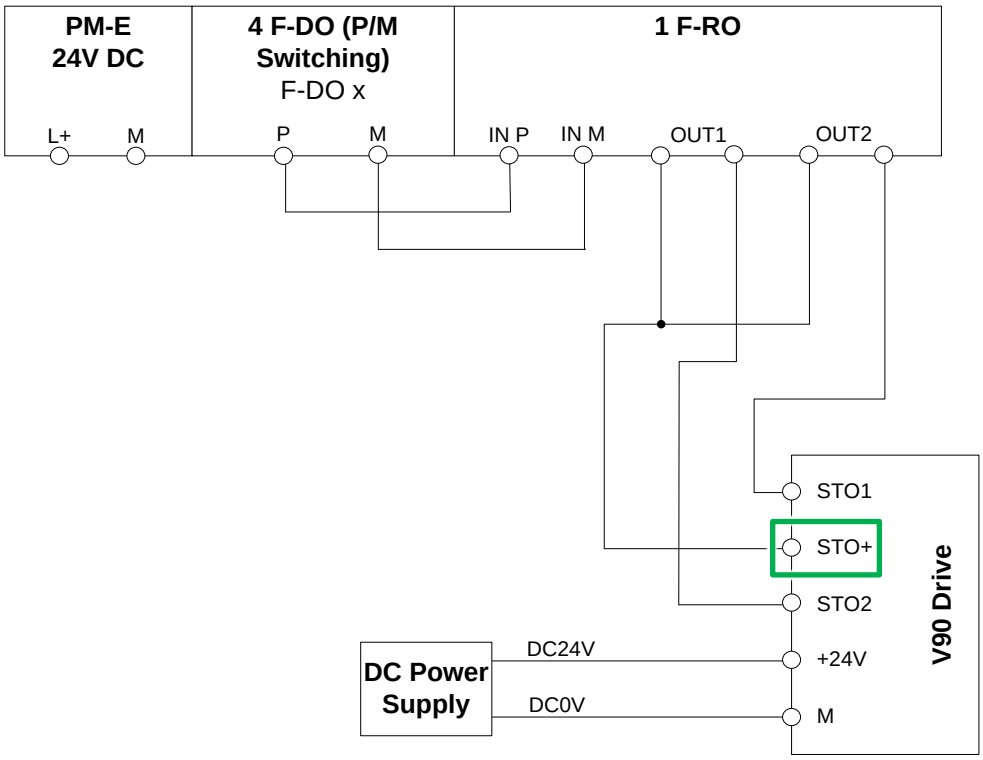

Figure 3-1 shows the direct supplied safety component / device from one DC24V power supply. The STO+ pin is not used in this case.

Figure 3-2 shows the case that the DC power supply for the safety component / device is supplied by the STO+ pin output of the V90.

Both solutions are equal because the main supply for the drive and the safety component / device is the same.

Additional components:

- 4 F-DO: 6ES7138-4FB03-0AB0
- 1 F-RO: 6ES7138-4FR00-0AA0

4 SINAMICS V90 connected to SIRIUS 3SK1 safety relays

Figure 4-1

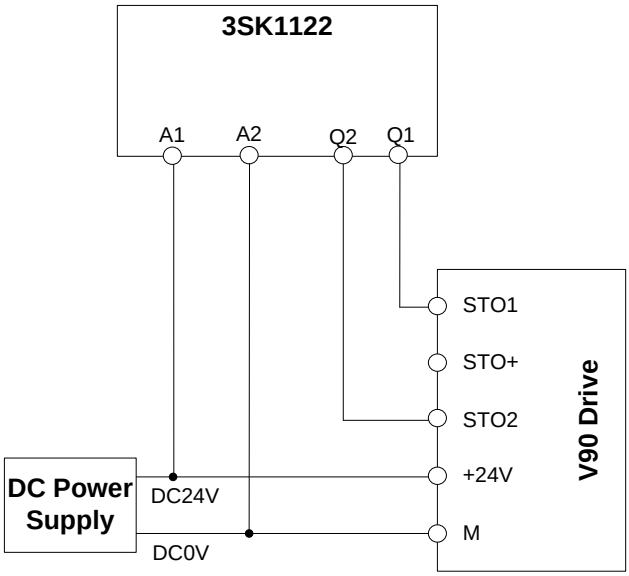

Figure 4-1 shows the wiring example of the SIRIUS 3SK1 safety relay which is connected to the V90 STO terminal.

Drive and relay are using the same DC 24V power supply.

Additional component:

- SIRIUS 3SK1 Advanced safety relay: 3SK1122-1CB41

NOTE You can download the application manual about SIRIUS safety integrated from the following link:

https://support.industry.siemens.com/cs/ww/en/view/81366718

5 SINAMICS V90 combined with an emergency button

Figure 5-1

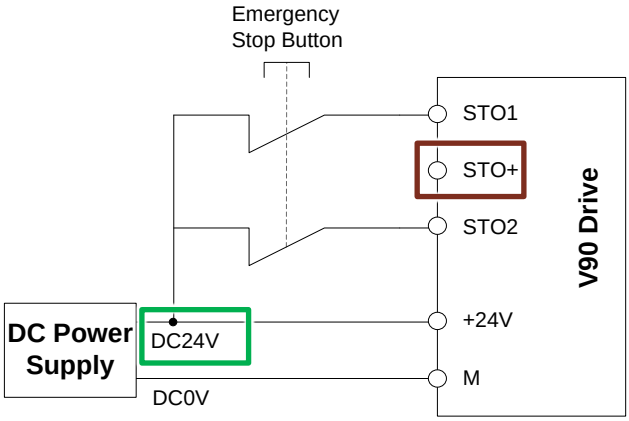

Figure 5-2

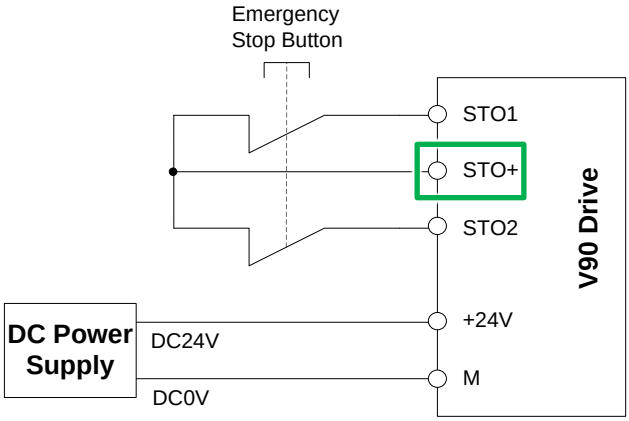

Figure 5-1 shows the direct supplied emergency button from one DC24V power supply. The STO+ pin is not used in this case.

Figure 5-2 shows the case that the DC power supply for the emergency button is supplied by the STO+ pin output of the V90.

Both solutions are equal because the main supply for the drive and the safety component / device is the same.

6 Connecting multiple SINAMICS V90 drives to one emergency button

Figure 6-1

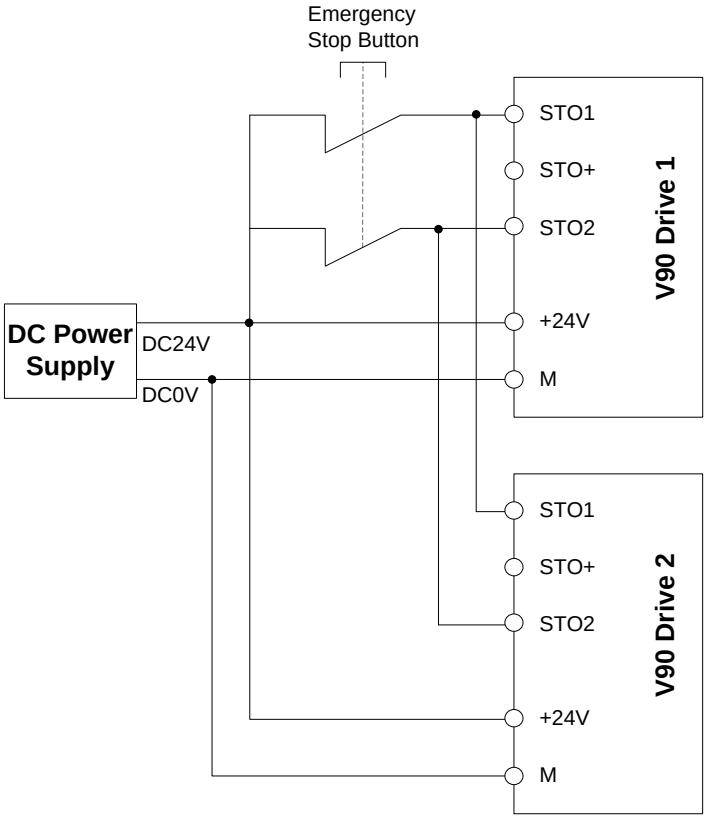

Figure 6-1 shows the wiring example of the emergency button connected to two V90 drives. The emergency button is supplied directly from one DC 24V power supply.

7 Appendix

7.1 Contact

Siemens Ltd., China
DF M3-BF GMC
No. 18 Siemens Road
Jiangning Development Zone
Nanjing, 211100
China
mailto: mc_gmc_mp_asia.cn@siemens.com

7.2 History

Table 8-1

Version	Date	Modifications
V1.0	09/2016	First version
V1.1	11/2016	Textual update
V1.2	06/2017	Connected with S7-1200F F-DQ update
V1.21	08/2017	Text corrections