

# SED2 Operation & Maintenance Manual Addendum

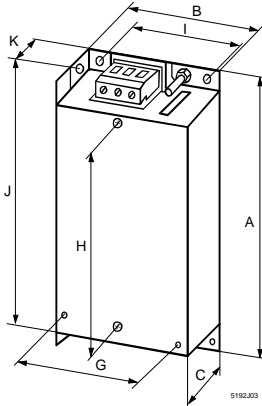
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## Table of Contents

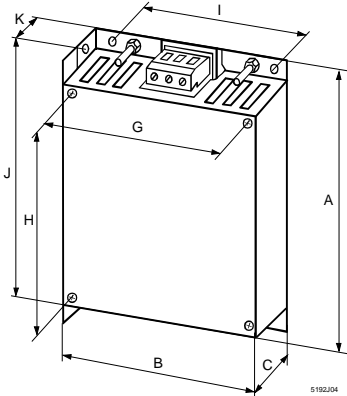
<b>Chapter 1 - Mechanical Installation.....</b>	<b>130</b>
SED2 (IP20) Filters Dimensions.....	130
<b>Chapter 2 - Electrical Installation .....</b>	<b>131</b>
EMC-Compatibility .....	131
Installation .....	131
Wiring .....	131
Power Connection for Drives with a Built-in EMC Filter .....	134
Connecting Multiple Motors .....	136
Operation with a Residual Current Device (RCD) .....	137
<b>Chapter 3 - Programming.....</b>	<b>138</b>
Bypassing the SED2.....	138
Hibernation Mode .....	140
<b>Chapter 4 - BiCo (Binector and Connector) Data Set Functions .....</b>	<b>142</b>
Introduction .....	142
How does BiCo work? .....	142
Using Control and Status Words with BiCo .....	144

# Chapter 1 - Mechanical Installation

## SED2 (IP20) Filters Dimensions



Filter for Frame Size A



Filter for Frame Sizes B and C

Frame Size	A	B	C	G	H	I	J	K
A	7.9 (200)	2.9 (73)	1.7 (44)	2.4 (60)	6.3 (160)	2.2 (56)	7.4 (187)	0.9 (22)
B	8.4 (213)	5.9 (149)	2.0 (51)	5.4 (138)	6.9 (174)	4.7 (120)	7.9 (200)	1.0 (24)
C	9.6 (245)	7.3 (185)	2.2 (56)	6.9 (174)	8.0 (204)	6.2 (156)	9.1(232)	1.4 (35)

Figure 1. Dimensions of SED2 (IP20) Filters for Frame Sizes A through C.  
Dimensions in Inches (Millimeters).

# Chapter 2 - Electrical Installation

## EMC-Compatibility

**NOTE:** The Siemens Building Technologies SED2 Variable Frequency Drives are shipped without EMC line filters. (The EMC filter is most commonly used in Europe.) Where local codes or customer/installation requirements dictate, separately orderable line filters are available. More stringent Class B line filters are also available for most models. Installation of these filters satisfies the requirements for the EU's EMC directive.

## Installation

The SED2 operates in environments where they may be exposed to high levels of electromagnetic interference (EMI). Normally, good installation practices ensure safe and interference-free operation. However, should problems associated with EMI occur, follow these guidelines:

- Ensure good electrical contact between the mounting plate and the metal housing of the SED2 via the mounting screws.
- Use serrated lock washers and electrically conductive mounting plates.
- If a footprint EMC filter is used, fit it under the SED2 and ground it via the metal backplate. When connecting the EMC filter to the inputs of the SED2, use shielded cables, and ensure that they are correctly grounded using cable clamps (Figure 2).

## Wiring

- Ensure that all equipment in the control cabinet is properly grounded. Connect all equipment by short, thick grounding conductors to a common grounding point or bus bar.
- Ensure that any control equipment connected to a SED2 (such as PLC or BACS, programmable logic controller or building automation and control system) connects with a short, thick cable to the same ground or grounding point as the SED2.
- Use shielded cables inside control cabinets. Use only shielded motor and control cables. The shielding must be continuous. Connect motor and control cables to ground at both ends. Avoid pigtailed. Use only grounding clamps to bond the shield (Figure 2).
- Lay control, mains, and motor cables separately by routing them in separate cable ducts and maintaining a minimum clearance of 7.8 inches (200 mm). See Figure 3. If you cannot avoid crossing cables, run them at a 90-degree angle.
- Motor cables should be as short as possible and should not exceed 82 ft (25 m). Connect the neutral conductor of all motors controlled by a SED2 drive directly to the ground connection (PE) of the respective SED2.
- Use ribbon cables, as they have lower impedance at high frequencies.

- Check that the contactors in the control cabinet are suppressed, either with RC circuits for AC contactors or flywheel diodes for DC contactors. In both cases, mount the suppressors to the coils. Varistor surge voltage protectors are also effective. This is important when the SED2 relay controls the contactors.

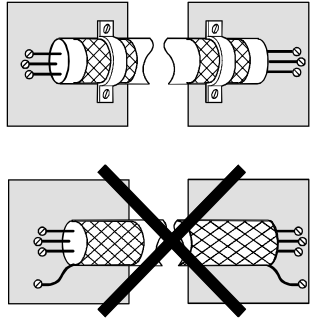


Figure 2. Use Grounding Clamps to Bond the Shield.

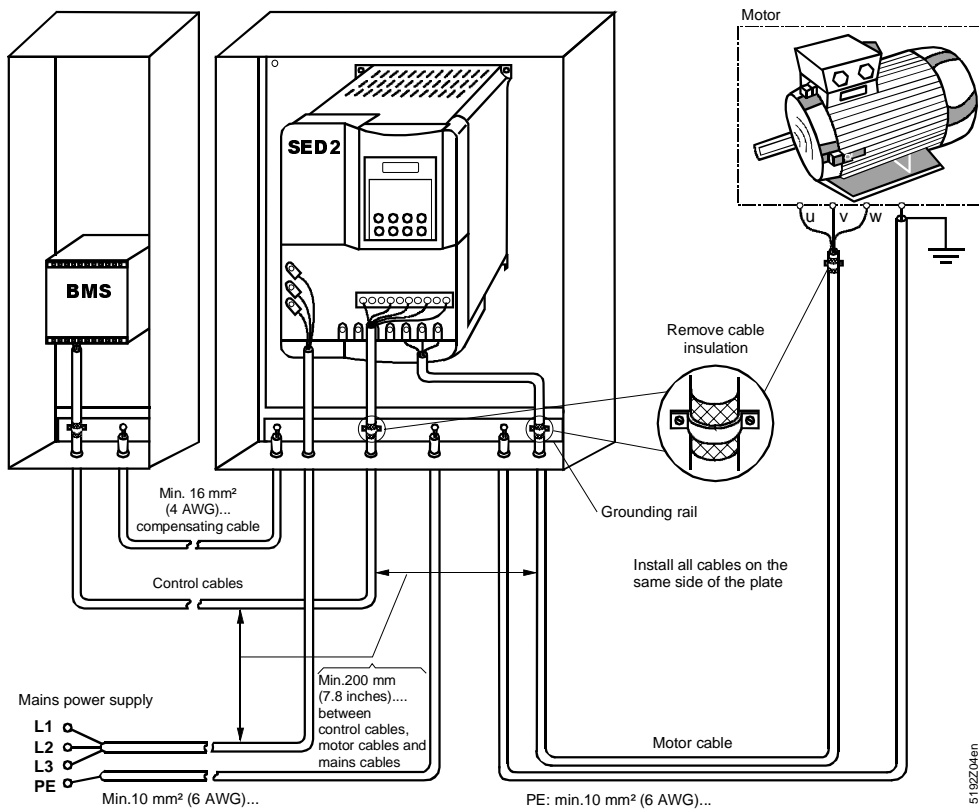


Figure 3. Routing Control, Mains, and Motor Cables.

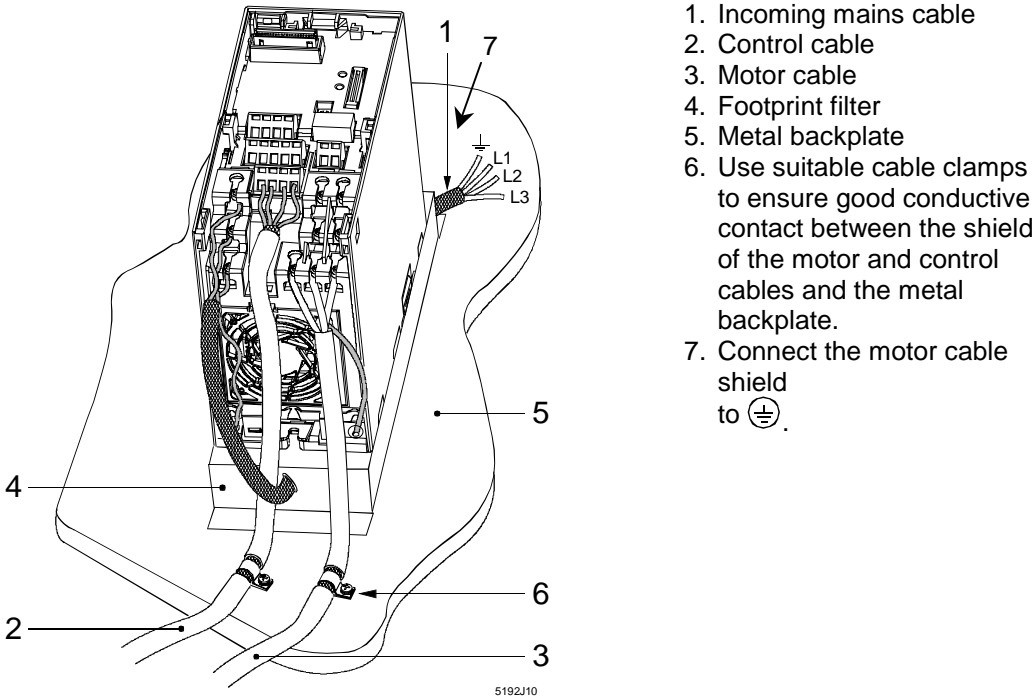


Figure 4. Cable Routing for SED2 Frame Size A with Footprint Filter.

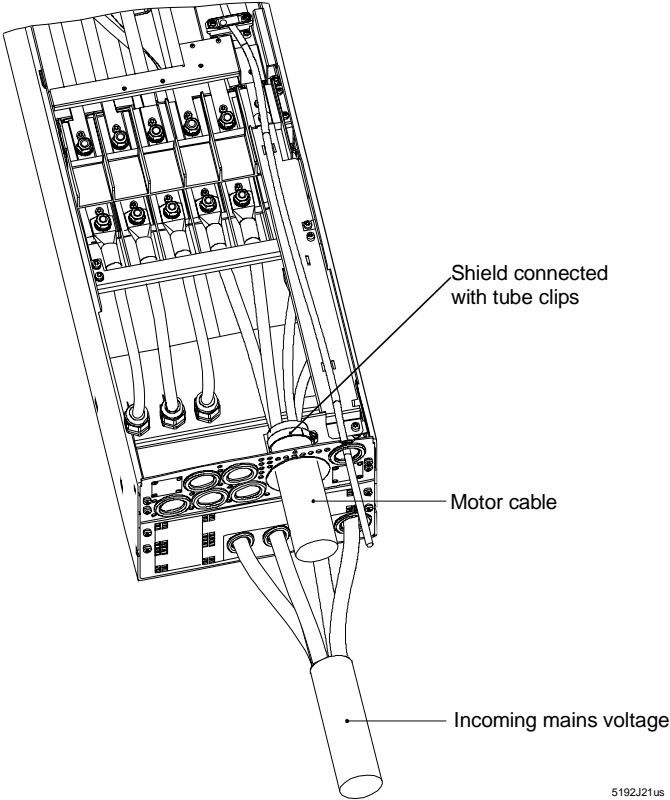
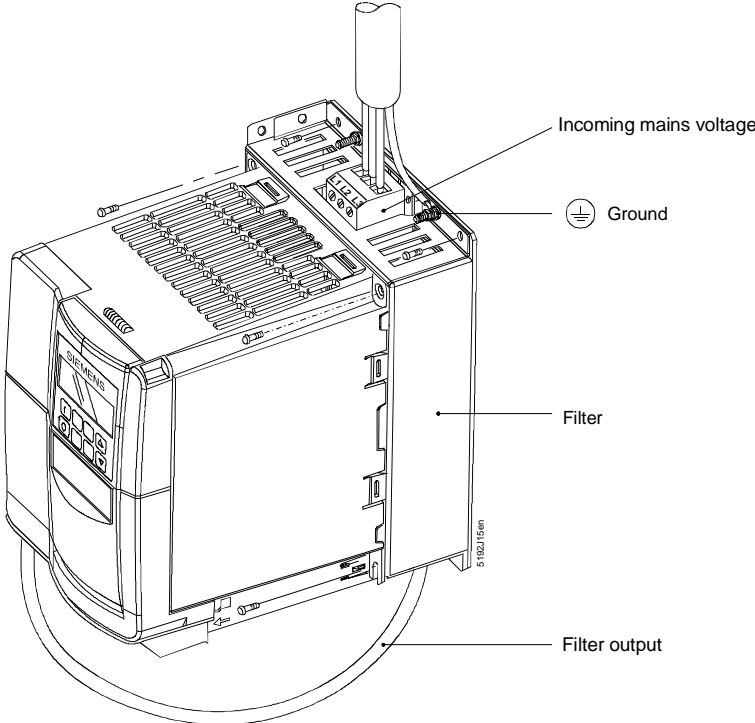


Figure 5. Cable Routing for SED2 (IP20) Frame Size D through F with EMC Filter.

### Power Connection for Drives with a Built-in EMC Filter

SED2 drives (frame sizes A, B, and C) can include a built-in, prewired, EMC footprint filter. Route and connect the mains power to the terminals of the footprint filter.



**Figure 6. Connecting Mains Power to Footprint Filter for SED2 Frame Sizes A through C.**

SED2 drives (frame sizes D, E, and F) include a built-in, prewired, EMC filter. Route and connect the mains power to the terminals of the filter.

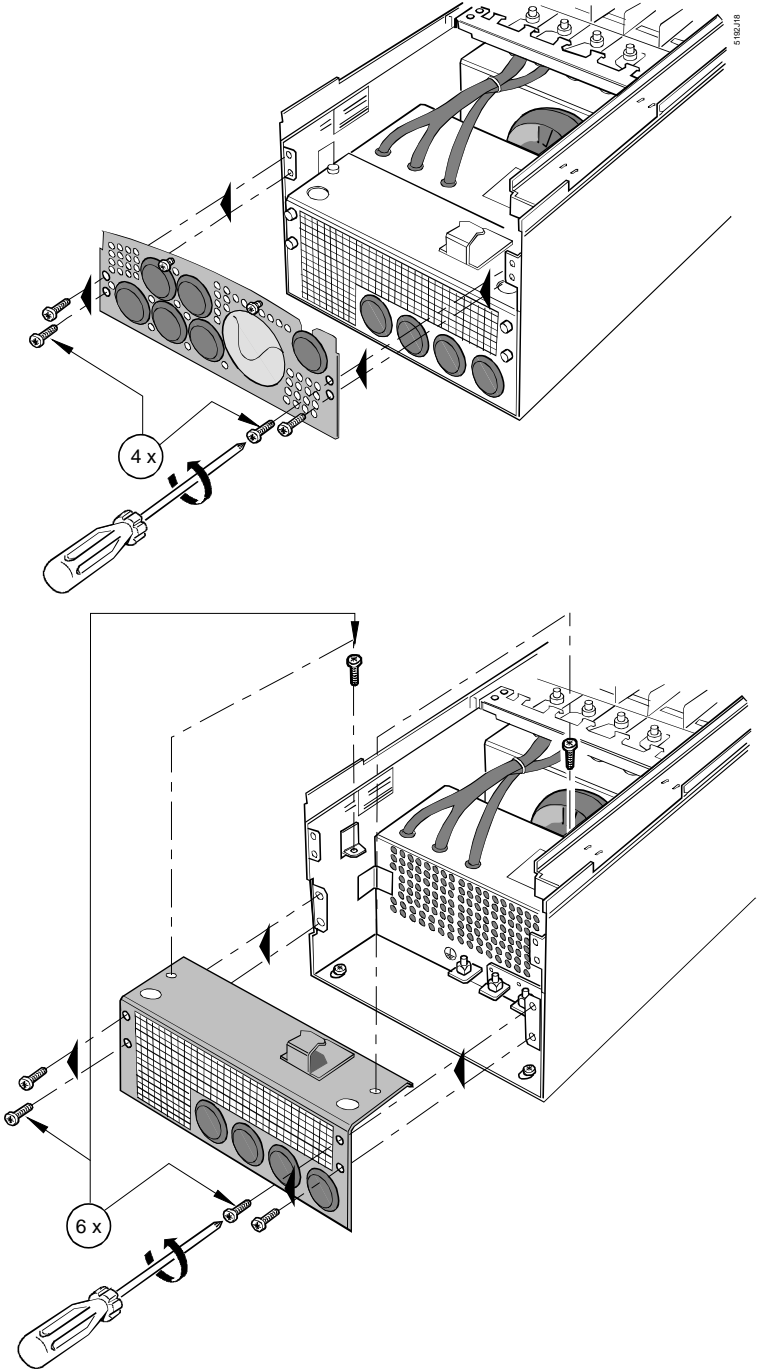


Figure 7. Connecting Mains Power to Filter for SED2 Frame Sizes D through F.

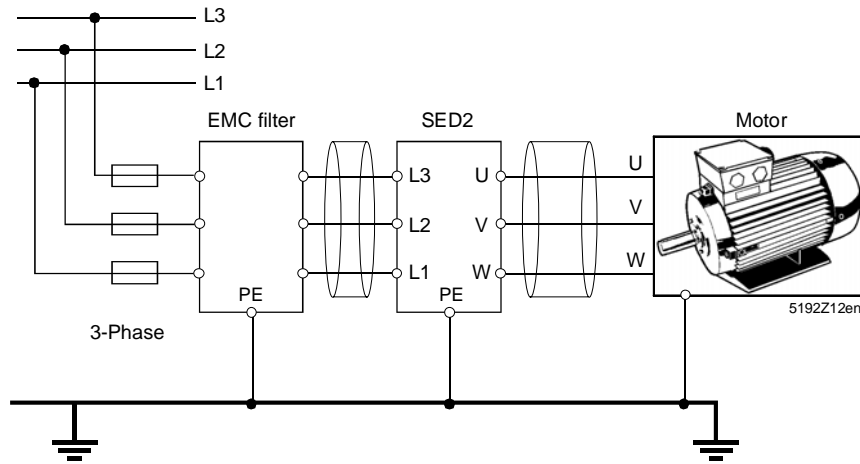


Figure 8. Typical Power Wiring for SED2 with EMC Filter.

## Connecting Multiple Motors

The SED2 can control several motors in parallel as long as all of the motors have the same power rating. When multiple motors connect to the SED2 in parallel, the motors cannot operate individually.

### NOTES:

1. When determining the required power, take into account the **total current** from all the motors (or the sum total of all ratings).
2. The sum of all individual motor cable lengths must not exceed the maximum motor cable length. (See the *Motor Cable Length* section in this manual.)

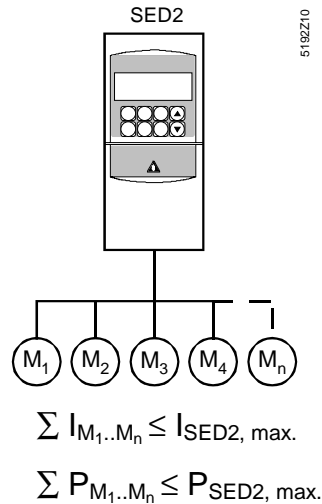


Figure 9. Connecting the SED2 to Multiple Motors.

## Operation with a Residual Current Device (RCD)

If a residual current device (also called a GLCI or RCCB) is connected, the SED2 operates with no interruptions under the following conditions:

- A RCD, Type B is used.
- The RCD must have a threshold current of 300 mA.
- The neutral conductor in the system must be grounded.
- Each RCD supplies only one SED2 (and no other loads).
- The output cables must not exceed the following:
  - 328 ft (100 m) shielded
  - 164 ft (50 m) unshielded

Do not connect machines with a 3-phase power source fitted with EMC filters to the mains via an earth leakage current circuit breaker (ELCB) or ground fault circuit interrupter (GFCI). (See DIN VDE 0160, Section 6.5.)

## Chapter 3 - Programming

### Bypassing the SED2

There are applications demanding maximum motor output. Additionally, there are applications requiring a SED2 bypass system for safety reasons. For these cases, the SED2 has an integrated bypass function.

#### Parameter setup for bypass function (commissioning)

##### **P1260, Source of changeover control**

Defines the possible sources for changing over to bypass/contactor operating mode. Possible settings:

- 0=Bypass disabled (factory setting).
- 1=Controlled by SED2 trip.
- 2=Controlled by DIN, see P1266, Bypass command.
- 3=Controlled by DIN and SED2 trip.
- 4=Controlled by SED2 frequency.
- 5=Controlled by SED2 frequency and SED2 trip.
- 6=Controlled by SED2 frequency and DIN.
- 7=Controlled by SED2 frequency and DIN and SED2 trip.

##### **r1261, Contactor control word**

r1261 is a read parameter for the bypass/contactor function. It shows how the motor is driven as follows:

Bit 00, Motor supplied by Drive:

- 0=Yes
- 1=No

Bit 01, Motor supplied by Mains:

- 0=Yes
- 1=No

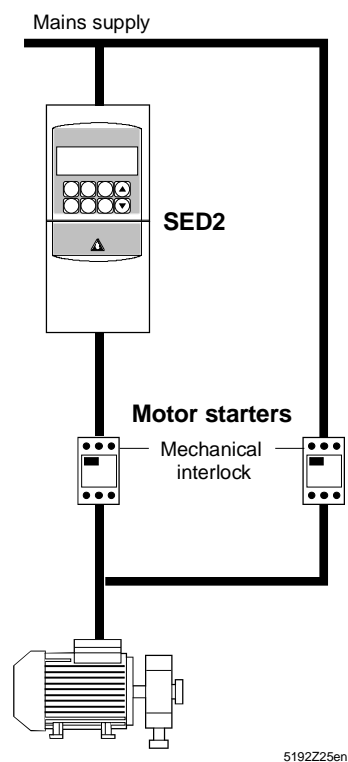


Figure 10. Bypassing the SED2.

**P1262, Bypass dead time**

Time delay between switching contactors (SED2 to bypass/contactor and vice versa) to allow motor to demagnetize (Figure 11).

**Setting range:** 0 to 20 s

**Recommended setting:** 1 second (default)

**P1263, De-bypass time**

Defines the time before a request to switch from bypass/contactor to SED2 is executed (Figure 11).

**Setting range:** 0 to 300 second

**Recommended setting:** 1 second (default).

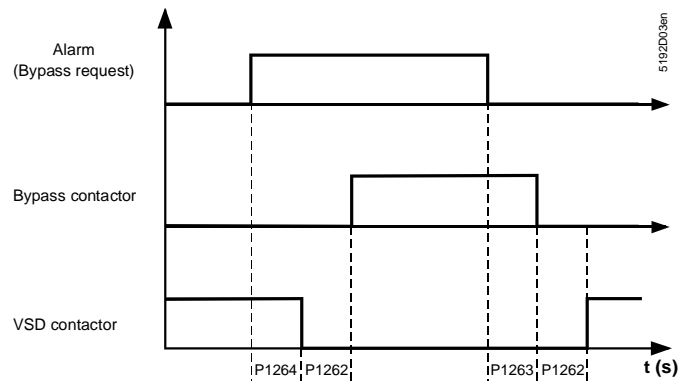
**P1264, Bypass time**

Time delay before a request to switch to mains is executed (Figure 11).

**Setting range:** 0 to 300 second

**Recommended setting:** 1 second (default).

Complete parameter setting by changing over to automatic control.



**Figure 11. Bypass Timing Diagram.**

## Hibernation Mode

If the SED2 reaches the hibernation setpoint in PID operating mode, the P2391 hibernation timer starts. After the timer expires, the SED2 drives the output frequency of the ramp to 0 Hz.

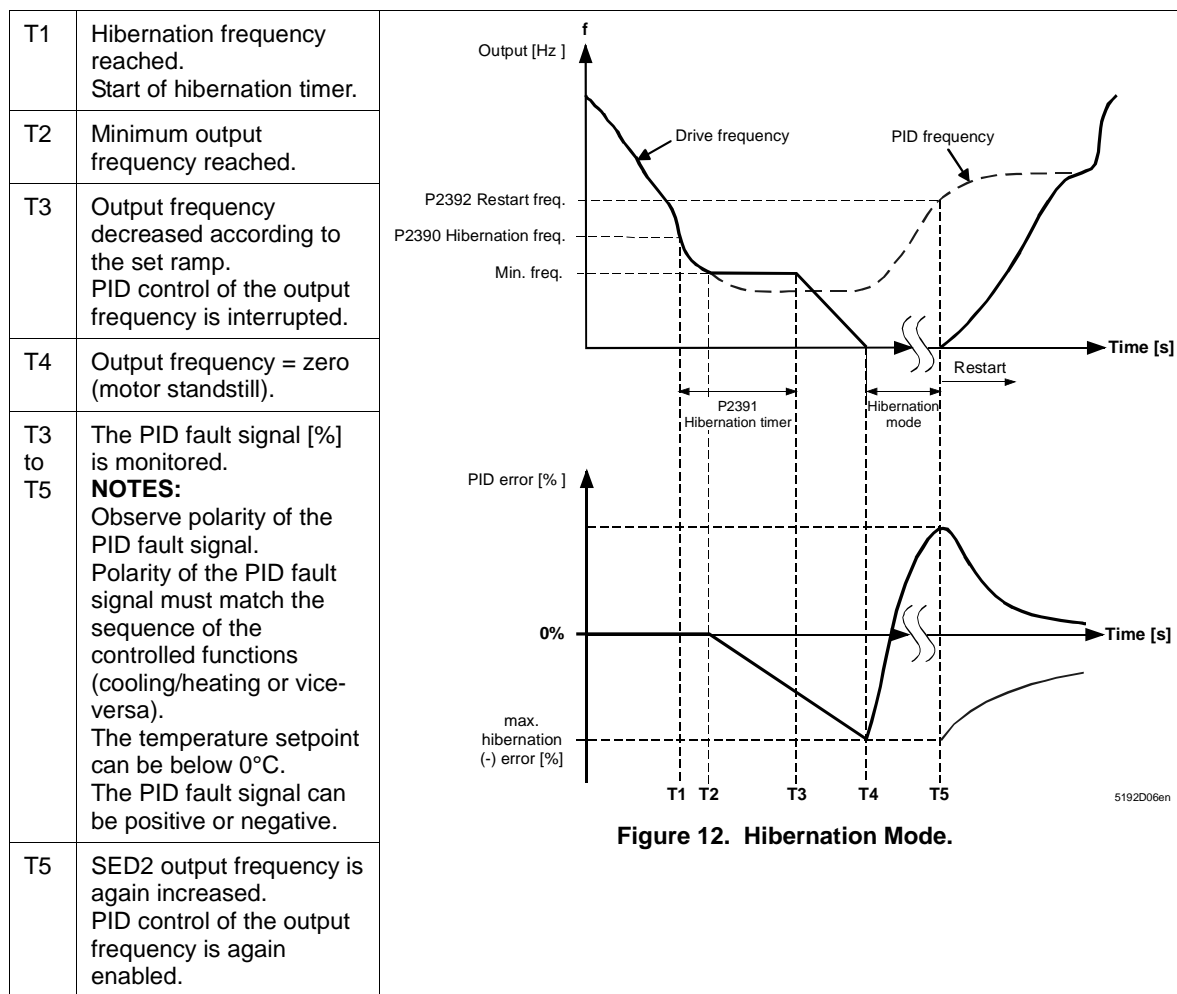


Figure 12. Hibernation Mode.

### Parameter Settings for Hibernation Mode (commissioning)

#### P2390, Hibernation frequency

Hibernation frequency setpoint (frequency that the motor output will turn off).

**Setting range:** 0 to 200%

**Recommended setting:** Value 15 to 20% greater than the minimum frequency.

The hibernation function is disabled if the hibernation frequency is set to 0 (factory setting).

#### P2391, Hibernation timer

Set the desired time T1 to T3, before hibernation mode starts (see Figure 12).

**Setting range:** 0 to 254 second

***P2392, Restart frequency***

Hibernation restart frequency (frequency that the motor output will turn on).

**Setting range:** -200 to 200%

**NOTE:** The +/- signs vary according to the application (heating or cooling sequence).

Complete parameter setting by changing over to automatic control.

# Chapter 4 - BiCo (Binector and Connector) Data Set Functions

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## Introduction

The SED2 provides user access levels, set by parameter P0003. User access level 1 gives access to the most frequently used parameters. User access level 2 gives access to more advanced parameters. For example, P0701 sets the function of Digital Input 1 with possible values such as:

1=ON right

12=Reverse

15=Fixed frequency, etc .

User access level 3 gives full access to all other parameters. (User access level 4 is for service only.)

To make use of BiCo, use access level 3 with full access to the parameters. This is detailed in the Operations & Maintenance manual. At this level, many new parameter settings are possible, including BiCo functionality. BiCo functionality is a different k more flexible way of setting and combining input and output functions. It can be used (in most cases) with the simple access level 2 parameter settings.

## How does BiCo work?

The BiCo system is used on more complex drives such as SED2 and allows complex functions to be programmed so that, for example, Boolean and mathematical relationships can be set up between inputs (digital, analog, serial, etc.) and outputs (inverter current, frequency, analog output, relays, etc.).

The SED2 uses a simplified version of BiCo, which is flexible and can be set up without using additional software or hardware.

### Example 1:

Use BiCo parameterization to enable the output relay using digital input 2.

1. Set P0003=3 to access all parameters.
2. Enable BiCo parameterization on digital input 2 by setting P0702=99.

**NOTE:** If P0701, P0702, P0703 or P0704 are set to 99, it is not possible to change them to another value and the drive must be reset to factory defaults.

3. Since digital input 2 is "open" to BiCo settings, a new value of 722.1 now appears in P0731. The value 722.1 means "connect to digital input 2" (722.0 = connect to digital input 1, 722.2 = connect to digital input 3, etc.). Set P0731 to 722.1.

- Run the SED2 using input 1 and operate the value using input 2.

**NOTE:** BiCo is a 'reverse' connection. That is, the output function connects back to the input; it is not possible to tell from P0702 (99) what the digital input is controlling. However, there are many diagnostic parameters that can assist in setting up BiCo functions (see Examples 2, 3, and 4).

**Example 2:**

Set P0771 to 37. This setting connects the analog output to the Inverter Temperature parameter r0037 so that the temperature of the inverter can be monitored remotely.

**Example 3:**

- Using OFF3 instead of OFF1, set P0701 = 99 to enable the BiCo function.
- Set P0840 = 722.0 (ON right via digital input 1) and P0848 = 722.0 (OFF3 via digital input 1).

The drive now ramps between setpoints using the normal ramp time as set in P1120 and P1121. However, at switch off from digital input 1, the drive turns off with an OFF3, using the ramp rate set in P1135, which may be different than P1121.

An additional advantage is that the OFF3 function usually requires a second digital input. The BiCo function permits digital input 1 to perform a run right and an OFF3.

**Example 4:**

This example selects an alternate ramp-up time when a certain fixed frequency is selected. Select three fixed frequencies using three digital inputs. The digital inputs are set for 'ON right'. The third digital input also sets the alternative (JOG) ramp times.

**NOTE:** This example only enables an alternative ramp-up time. When digital input 3 switches low, it also deselects the alternative ramp time and the normal ramp time is used.

- Use fixed frequencies and set P1000=3.
- Enable BiCo functionality by setting P0701, P0702, P0703 = 99.
- Define the source of the fixed frequencies by setting P1020=722.0, P1021=722.1, P1022=722.2. (This defines the source of each frequency as digital input 1, 2, and 3.)
- Define the mode of operation by setting P1016, P1017, P1018 = 2. (This sets the mode of operation of fixed frequencies to 'select fixed frequency and ON right command'.
- Select JOG ramp times instead of normal ramp times by setting P1124 = 722.2. (This enables digital input 3 with this function.)

**NOTE:** To avoid confusion, Steps 3 and 4 use BiCo functions to set digital inputs 1 and 2. This could also be set using the standard parameterization.

## Using Control and Status Words with BiCo

Many SED2 read-only parameters consist of control words. A parameter control word consists of a 16-bit number and each bit represents a particular value.

For example parameter r0052 (status word 1) gives value settings such as "Inverter Ready" (bit 0) or "Motor Current Limit" (bit b). Parameter r0052 displays the status of each bit using the vertical segments of the BOP display.

BiCo can also access these bits using the parameter number and bit state. For example, for a relay to operate at current limit, parameter P0731 is set to 52.b. (This is a level 2 setting; level 3 can select many more settings using BiCo functions.)

Each bit of the control and status words (r0052 to r0056) can connect to several output functions.

### Examples:

Setting P0731 to 56.5 indicates that starting boost is active. If Starting Boost parameter P1312 is set to enable a starting boost, the relay is active during the ramping phase as the starting boost is applied.

Similarly, if P0731 is set to 56.6 and P1311 (acceleration boost) is enabled, then the relay is energized any time that the setpoint is increased.

Setting P0731 to 56.12 enables the relay when the voltage controller is active. As this occurs during regeneration, it could indicate excessive load or too fast a ramp-down time.



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