

SED2 Variable Frequency Drives

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Prerequisites

Before proceeding, familiarize yourself with SED2 Variable Frequency Drive (VFD or "drive") documentation:

SED2 VFD Installation & Startup Guide, *Document Number* 125-3201:

- Connection diagrams
- Terminal function
- Quick commissioning
- Parameter reference list

SED2 VFD Operation & Maintenance (O&M) Manual, *Document Number* 125-3202:

- Commissioning features
- Programmable features
- Troubleshooting examples

Preparing for SED2 VFD Startup

In order to provide you with the most reliable drive available, and to avoid any extra costs related to loss or reduction of warranty coverage, a factory certified specialist should complete this startup procedure. Please complete the following checklist and maintain it in a secure location as technical service personnel may request information from this checklist. Inability to provide this information may result in delays and extra costs to the end user.

Date: _____

Startup Person:

Customer (Company): _____ Location: _____

Serial Number of Drive: _____ Serial Number of Bypass: _____

Startup Company: _____ Startup person (print): _____

Phone Number: _____ Signature: _____

Application (circle one): Fan Pump

VFD Start via: _____

VFD Speed Reference via: _____

Owner's Representative:

Printed Name: _____ Phone Number: _____

Company: _____ Signature: _____

Environmental Conditions:

NOTE: Conditions of area.

Environmental Conditions During Startup:

- | | | | |
|---------------|--------------------------------|---|-----------------------|
| Dust: | () Light | () Moderate | () High |
| Contaminants: | () None | () Metal | () Corrosive |
| Moisture | () Low Humidity | () High Humidity | |
| | () Dripping Water | () Standing Water | () Equipment Flooded |
| Temperature | () 60 to 70°F
(15 to 21°C) | () 70-95°F
(21 to 35°C) | |
| | () 95-105°F
(35 to 40°C) | () Above 105°F or Below 60°F
(Above 40°C or Below 15°C) | |

Environmental Conditions that may occur after Startup: _____

Check Step

- () 1. The SED2 is thoroughly tested at the factory. Verify that the drive is free of shipping and installation damage. Shipping damage is not covered by the Siemens warranty; claims must be filed directly with the shipping company as soon as possible.
- () 2. Review the Installation & Startup Guide (*Document No. 125-3201*) and the O&M Manual (*Document No. 125-3202*). Review option instructions and schematics shipped with the drive.
- () 3. Verify that the model numbers and the voltage ratings are as specified in the purchase order by matching the nameplate data for each unit to the purchase order.
- () 4. Verify that the drive has been installed in accordance with the mechanical and electrical installation sections in the O&M Manual.



CAUTION:

Failure to comply with mechanical and electrical installation requirements may void the product warranty.

- () 5. Verify that the 50/60 Hz DIP switch has been set to the appropriate setting, as instructed in the Installation & Startup Guide.
- () 6. Inspect the security of the supply line power, ground connections, and all control circuit connections as identified in the SED2 documents.

IMPORTANT: Confirm that the incoming line power supply connects to the drive input terminals **(L1(r), L2(s), L3(t))** and NOT to the output motor terminals **(T1(u), T2(v), T3(w))**.

IMPORTANT: Double check all power wires (L1(r), L2(s), L3(t)) and motor wires (T1(u), T2(v), T3(w)) to make sure that they are securely tightened down to their respective lugs. Loose wire connections may cause problems at any time, and are not covered under warranty.

- () 7. Review the installer's "as wired" schematic. Determine where the motor "safety circuit" is connected. Verify that the customer's emergency contacts are properly terminated in the drive's safety shutdown circuit or bypass panel.

Verify that all other field-installed wires are correctly terminated (including the shields).

- () 8. Record the motor(s) nameplate information:

Voltage: _____ Service Factor: _____

Full Load Amps (FLA): _____ RPM: _____

- () 9. Verify that the input voltage matches the drive's rating.
- () 10. Verify that the *motor* is wired for the application voltage.
- () 11. **IMPORTANT:** Verify that the motor rated full load amps (FLA) does NOT exceed the rated output current of the drive controlling it.

When multiple motors are simultaneously operated by the drive, the sum of all motor rated FLA values must be less than or equal to that of the drive controlling them.

- () 12. Record any other connections to the drive by terminal number to determine if special programming is required.

Note any changes in the *Appendix: Parameter Settings*.

- () 13. If applicable, verify that the building automation system logic is ready to perform adequately for start, stop, and speed command functions.

This concludes the preparation process for SED2 VFD startup.

Keep your Installation & Startup Guide, O&M Manual, option schematics, and any other instructions sent with the drive easily accessible to assist you through the remainder of this startup process.





HVAC Startup Procedure for SED2 with Bypass Option



Review the *Preparing for SED2 VFD Startup* section in this document.



Use the following HVAC startup procedure for SED2 VFDs *with* the Bypass Option. For startup of SED2 VFDs *without* the Bypass Option, see the *HVAC Startup Procedure for SED2 without Bypass Option* section in this document.





Check Step

- () 1. Verify that the electrical supply power lines connect to the input device and that the motor leads connect to the output terminals of the overload relay. Ensure that all connections are *tight*; factory connections may come loose during shipment. Set the thermal mechanical overload for the bypass panel to the motor's FLA.
- () 2. Record all other connections to the bypass cabinet or the VFD and confirm (if applicable) that the building management system logic is ready to perform adequately for start, stop, and speed command functions.
- () 3. Before applying power, make sure that the following conditions are met:
 - The DRIVE/OFF/BYPASS switch is **OFF**.
 - For units with three contactors, the Drive Test ON/OFF switch is **OFF**.
- () 4. Apply power to the drive and bypass package. Make sure that all three phases are present and that the input voltage is correct for the system being set up. Then move the DRIVE/OFF/BYPASS switch to the **DRIVE** position.

At this time, if the display indicates a fault, press  to reset it.
- () 5. Verify that the drive display is on.
- () 6. Press  to access Parameter r0000 and to enter the SED2 programming mode. From here, you can access and change Level 1 parameters using  or .

Repeatedly press  to advance to Parameter P0010. Press  to access the parameter values level.

Press  to advance to 1. Press  to confirm and save the P0010=1 setting. The Quick Commissioning procedure starts. See the *Quick Commissioning Procedure* section in this document for details.

On completion of the Quick Commissioning procedure, continue with Step 7.
- () 7. Press  and then  to return to the drive operating mode.
- () 8. To start the Drive, press  and then  (green start key). The drive will ramp up to "10 HZ". Verify that the direction of motor rotation is correct.

NOTE: If the direction of motor rotation is wrong, turn the DRIVE/OFF/BYPASS switch to **OFF**; and *turn Power Off!* Wait for 5 minutes.

Swap wires on the motor terminals (**T1(u)**, **T2(v)**) or on the output terminals of the motor overload relay. Tighten the terminal lugs, reapply power, turn DRIVE/OFF/BYPASS switch to **DRIVE**; and recheck the direction of motor rotation.

- () 9. With correct motor rotation, manually run the drive throughout its entire operating range while observing operation.
 - If the drive trips on over-current during acceleration adjust the acceleration time rate via Parameter P1120.
 - If the drive trips on over-voltage during deceleration, adjust the deceleration time rate via Parameter P1121.
 - If excessive vibration of the driven load is noted at specific input frequencies, use Skip Frequency Parameters P1091 through P1094 to eliminate this vibration.
- () 10. Determine whether the remote speed reference is a 0 to 10 Vdc or a 4 to 20 mA signal. Connect signal wires and place analog input DIP Switch in the appropriate position.
- () 11. Check the signal for proper polarity. Observe if the remote speed command can achieve the minimum and maximum speeds desired. If not, scale as required.
- () 12. Set the DRIVE/OFF/BYPASS switch to **OFF**. When the drive is in the run mode, it will coast to a stop.

For units with three contactors, set the Drive Test ON/OFF switch to **ON**. Verify that the drive input contactor energizes.

- () 13. Make additional drive application parameter settings as required, and record them in Appendix: Parameter Settings.
- () 14. **BYPASS TEST**—Be prepared to monitor rotation of the motor in bypass operation. “Bump” the DRIVE/OFF/BYPASS switch to **BYPASS** and then quickly back to **OFF**. Check the motor rotation.



CAUTION:

Do NOT allow the motor to operate in bypass mode unless the motor rotation is correct.

- () 15. If motor rotation in bypass mode is correct, skip to the next step.
 If motor rotation in bypass mode is NOT correct, check the following and perform as described:
 - Turn OFF the incoming power feed to the drive. Since the correct rotation in drive mode was previously established, do not change any output wires at motor.
 - Instead, verify that power to the input device is OFF. Swap **L1 & L2** on the input side of the circuit breaker/disconnect switch. This will affect rotation in the bypass operation *only*. Once connections are complete and tight, reapply incoming power and repeat Step 14 to recheck the rotation direction.

- () 16. **Verify that running at full speed will NOT damage the system.**
 Run the motor in bypass by turning the DRIVE/OFF/BYPASS switch to **BYPASS**.
 Record all the phase voltages and currents at this time.

AC input voltage: Phase A _____ Phase B _____ Phase C _____

AC output voltage: Phase A _____ Phase B _____ Phase C _____

Output Current: Phase A _____ Phase B _____ Phase C _____

Display Current: _____ Software Version: _____

- () 17. Turn the DRIVE/OFF/BYPASS switch to **DRIVE** and set panel to auto start/stop. Check speed references from application specific devices for appropriate operation.

This completes the startup procedure for the SED2 VFD with Bypass Option.

Quick Commissioning Procedure

P0010 Start Quick Commissioning 0 = Ready to Run 1 = Quick Commissioning 30 = Factory Setting NOTE: P0010 <i>must always</i> be set back to 0 before operating the motor. However, if P3900 = 1 is set after commissioning, this is done automatically.	User Setting
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P0100 Operation for Europe/ N. America 0 = Power in kW; <i>f</i> default 50 Hz 1 = Power in hp; <i>f</i> default 60 Hz 2 = Power in kW; <i>f</i> default 60 Hz NOTE: Use DIP switches to permanently change settings 0 and 1.	User Setting
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* P0304 Rated Motor Voltage 10 - 2000V Nominal motor voltage (V) from rating plate.	User Setting
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* P0305 Rated Motor Current 0.01 - 10000A Nominal motor current (A) from rating plate.	User Setting
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* P0307 Rated Motor Power 0.01 - 2000 kW or hp Nominal motor power (kW or hp) from rating plate. If P0100 = 1, values will be in hp.	User Setting
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* P0310 Rated Motor Frequency 12 - 650 Hz Nominal motor frequency (Hz) from rating plate.	User Setting
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* P0311 Rated Motor Speed 0 - 40000 1/min Nominal motor speed (rpm) from rating plate.	User Setting
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** P0700 Selection of Command Source (on/off/reverse) 0 = Factory Setting 1 = Basic Operator Panel 2 = Terminal/Digital Inputs 6 = P1/N2 Communications	User Setting
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** P1000 Selection of Frequency Setpoint (on/off/reverse) 0 = No Frequency Setpoint 1 = MOP Frequency Control 2 = Analog Setpoint 6 = P1/N2 Communications	User Setting
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P1080 Minimum Motor Frequency Minimum motor frequency (0 - 650 Hz) at which the motor will run irrespective of the frequency setpoint. This value is valid for both clockwise and counterclockwise rotation.	User Setting (20-30% Max)
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P1082 Maximum Motor Frequency Maximum motor frequency (0 - 650 Hz) at which the motor will run irrespective of the frequency setpoint. This value is valid for both clockwise and counterclockwise rotation.	User Setting
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P1120 Ramp-up Time 0 - 650s Time taken for the motor to accelerate from standstill up to the maximum motor frequency.	User Setting Recommended: (Fan: 60-120s, Pump: 10-20s)
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P1121 Ramp-down Time 0 - 650s Time taken for the motor to decelerate from the maximum motor frequency down to standstill.	User Setting Recommended: (Fan: 60-120s, Pump: 10-20s)
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P3900 End Quick Commissioning 0 = End commissioning without motor calculation or factory reset. 1 = End commissioning with motor calculation and factory reset (recommended without bypass). 2 = End commissioning with motor calculation and with I/O reset. 3 = End commissioning with motor calculation but without I/O reset (recommended with bypass option).	User Setting
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* Motor related parameters.

** Parameters that have more possible settings for use in specific applications.

HVAC Startup Procedure for SED2 without Bypass Option

Review the *Preparing for SED2 VFD Startup* section in this document.

Use the following HVAC startup procedure for SED2 VFDs *without* the Bypass Option. For startup of SED2 VFDs *with* the Bypass Option, see the *HVAC Startup Procedure for SED2 with Bypass Option* section in this document.

Check Step

- () 1. Record all other connections to the drive. If applicable, verify that the building automation system logic is ready to perform adequately for start, stop, and speed command functions.
- () 2. Apply power to the drive. Make sure that all three phases are present and that the input voltage is correct for the system being set up. Verify that the drive display is on.
At this time, if the display indicates a fault, press **Fn** to reset it.
- () 3. Press **P** to access Parameter r0000 and to enter the SED2 programming mode. From here, you can access and change Level 1 parameters using **▲** or **▼**.
Press **▲** to advance to Parameter P0010. Press **P** to access the parameter values level.
Press **▲** to advance to 1. Press **P** to confirm and save the P0010=1 setting. The Quick Commissioning procedure starts. See the *Quick Commissioning Procedure* section in this document for details.
On completion of the Quick Commissioning procedure, continue with Step 4.
- () 4. Press **Fn** and **P** to return to the drive operating mode. Press **Hand** to place drive in hand mode.
- () 5. To start the Drive, press **I** (green start key). The drive will ramp up to "10 HZ". Verify that the direction of motor rotation is correct.
NOTE: If the direction of motor rotation is wrong, *turn Power Off!* Wait for 5 minutes. Swap wires on the motor terminals (**T1(u)**, **T2(v)**) or on the output terminals of the motor overload relay. Tighten the terminal lugs, reapply power, and recheck the direction of motor rotation.
- () 6. With correct motor rotation, manually run the drive throughout its entire operating range while observing operation.
- If the drive trips on over-current during acceleration adjust the acceleration time rate via Parameter P1120.
 - If the drive trips on over-voltage during deceleration, adjust the deceleration time rate via Parameter P1121.
 - If excessive vibration of the driven load is noted at specific input frequencies, use Skip Frequency Parameters P1091 through P1094 to eliminate this vibration.
- () 7. Determine whether the remote speed reference is a 0 to 10 Vdc or a 4 to 20 mA signal. Connect signal wires and place analog input DIP Switch in the appropriate position.
- () 8. Check the signal for proper polarity. Observe if the remote speed command can achieve the minimum and maximum speeds desired. If not, scale as required.
- () 9. To turn on drive, press **Auto** and **I**, and then enable by automation setup.

This completes the startup procedure for the SED2 VFD without Bypass Option.

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