



DF-S 50XXX & 51XXX Series AC Laboratory Power Supplies User's Manual

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1. Connection

Our devices are pre-configured to the power grid chosen with order (if not specified otherwise, our devices are manufactured for the EU power grid 230V 50Hz). Subsequent adjustment after delivery is not possible. Connecting the device to an unsuitable power source will void any warranty.

1 Phase / EU Power Grid	
Voltage (Recommended)	230V ± 10% AC
Voltage (Max.)	250V AC
Frequency	50Hz - 60Hz
Circuit breaker minimum requirements	The maximum current of the device shall be determined as follows: $I = (\text{maximum power of the device} / 230) + 2$
1 Phase / American Power Grid	
Voltage (Recommended)	115V ± 10% AC
Voltage (Max.)	130V AC
Frequency	50Hz - 60Hz
Circuit breaker minimum requirements	The maximum current of the device shall be determined as follows: $I = (\text{maximum power of the device} / 115) + 4$

3 Phase / EU Power Grid (TN-S Network)	
Voltage (Recommended)	380V - 410V
Voltage (Max.)	430V
Frequency	50Hz
Circuit breaker Minimum requirements	The maximum phase current of the device shall be determined as follows: $I = ((\text{maximum power of the device} / 400) / 1,73) + 2$

2. General

Please read through and understand this Operation Manual before operating the product. After reading always keep the manual nearby so that you may refer to it as needed. When moving the product to another location, be sure to bring the manual as well.

Calibration

Before shipment, the instrument has been calibrated carefully in our factory. The calibration procedures and standards are compliant to the national regulations and standards for electronic calibration. If you have requested a certificate with your order, this is enclosed with your device. With ordered off-site calibration (DaKKS) the calibration was not performed in-house, please refer to the laboratory calibration protocol for details.

Warranty

We guarantee that the instrument has undergone a strict quality test before shipment and has passed all prescribed functional tests. We provide our customers with a warranty period of three years from receipt of the device. During the warranty period, all repairs, as well as spare parts are always free of charge. The warranty is void in the case of defects which have been caused by user's fault, or in case of unauthorized opening.

2.1 Safety Instructions

This chapter contains important safety instructions that you must follow when operating the instrument and when keeping it in storage. Read the following before any operation to insure your safety and to keep the device in a proper condition.

Safety Symbols

The following safety symbols may appear in this manual or on the instrument:



WARNING

Identifies conditions or practices that could result in injury or loss of life.



CAUTION

Identifies conditions or practices that could result in damage to the instrument or to other properties.



DANGER

High Voltage



ATTENTION

Refer to the Manual



Protective Earth (PE)



Earth (Ground)

2.2 Safety Guidelines

Please follow the safety guidelines when using and putting the device into operation in order to prevent safety risks and to ensure the correct operation of the product.

- **Before connecting the device to the local power supply, make sure that the device is switched off.**
- **Check if the product is compatible with the local power supply before connecting it.**
- **Be careful on the correct earthing of the device (PE connection)**
- **Do not use the product in humid environments**
- **Do not touch the output terminals of the product with unprotected hands while it is switched on.**
- **Do not use the device in extremely dusty rooms**
- **Do not use the device outside the parameters specified in the data sheet**

2.3 Unpacking and Examination

Our products are delivered carefully packed in cardboard boxes or in wooden crates, depending on place of destination and the type of the device (dimensions, weight). We pay attention to the environmental compatibility of the upholstery and packaging materials used and ask you to dispose the filling material correctly if present.

Please unpack the device and check the packaging as well as the product for transport damage. Should you notice any damage to the packaging or the device, we ask you to log it with photos and inform us immediately.

ATTENTION: If the device has been delivered in a wooden box, please do not dispose it as it can be used for eventual return transport for service procedures. Also the packaging material of smaller devices can be stored in order to be used if necessary for a return transport.

3. Operation Instructions

3.1 Front Panel Description 50XXX & 51XXX Series

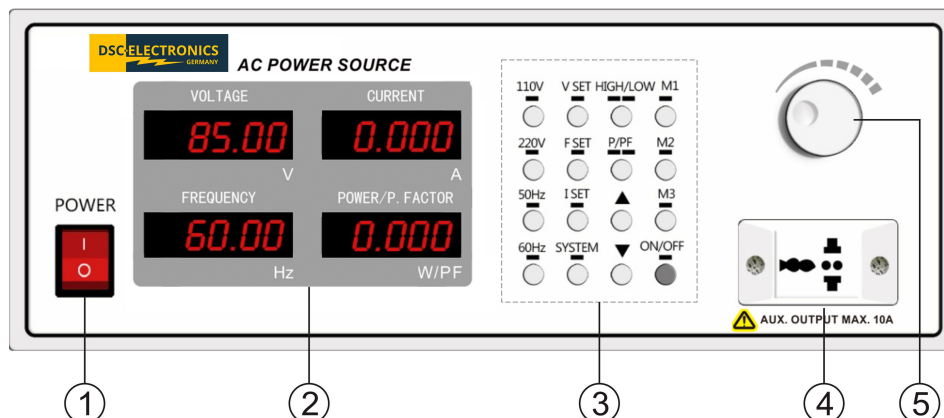


Fig.1: Front Panel 50XXX & 51XXX Series

No.	Description	
1	Power switch	Power on or off the AC power source.
2	Display meter	
	Frequency meter	Display the set frequency and output frequency.
	Voltage meter	Display set voltage and output voltage.
	Current meter	Display set current and output current.
	Watt meter	Display output power or power factor.
3	Function keys	
	110V	Fast key for 110V voltage output.
	220V	Fast key for 220V voltage output.
	50Hz	Fast key for 50Hz frequency output.
	60Hz	Fast key for 60Hz frequency output.
	V Set	Voltage setting.
	F Set	Frequency setting.
	I Set	Enter current limit (maximum current).
	SYSTEM	System configuration.
	HIGH/LOW	Switch between high range and low range.
P/PF	Press to switch between power and power factor on the watt meter.	
3	Function keys	
	▲	Upper key. Press to increase parameter (voltage/frequency/current) value.
	▼	Lower key. Press to decrease parameter (voltage/frequency/current) value.
	M1, M2, M3	Memory keys. Make a short press to recall parameters. Make a long press (>1s) to store parameters.
	ON/OFF	Press to turn on or off the output.
4	Output socket	Auxiliary output socket for maximum 10A.
5	Rotary knob	Infinite knob. Press one time to adjust output voltage. Press two times to adjust output frequency. The adjustment speed changes according to rotary speed of the knob, minimum 0.001/step.

3.2 Front Panel Description 61XXX Series

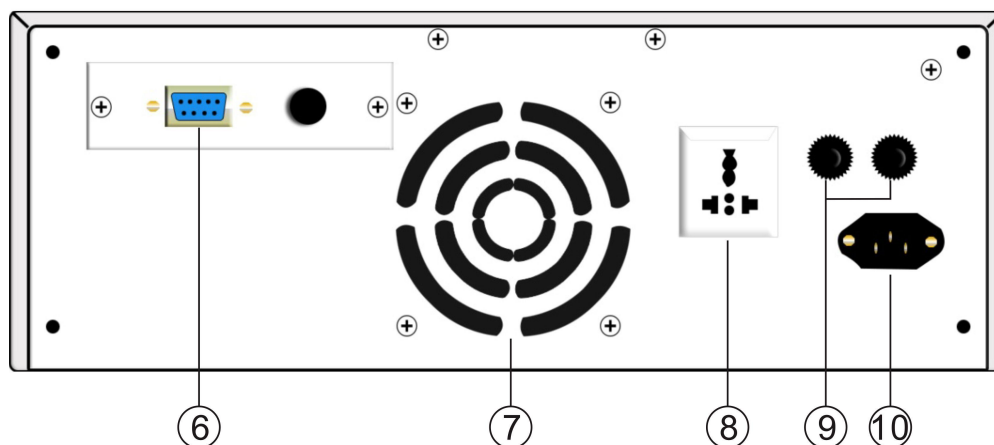


Fig.2: Front Panel 50XXX & 51XXX Series

No.	Description
6	RS232 interface
7	Cooling fan
8	Output socket
9	Over current protector
10	Input socket

3.3 Power ON

Set the „ON / OFF“ switch to the ON position to turn on the device. The device is equipped with a soft-start delay which slowly charges the capacities in the power supply to limit the high inrush currents. After about 5 seconds, the power supply will switch into stand-by mode.

3.3.1 Stand-By Mode

The output is switched off in stand-by mode and the device is ready to set the desired output values. The displays show a voltage of 0V and a current of 0A, which corresponds to the actual values at the output.

Press the SET V, SET A or SET F button once to enter the setup menu for the selected parameter (V for Voltage, A for Current and F for Frequency).

3.3.2 Enabling the Output

Press the ON/OFF key to power on the output using the values set, the corresponding indicator lights on.

If an error occurs during operation, the output will be shut down immediately and the output indicator will flash. To reset the error, press ON/OFF key, then press the ON/OFF key once more to enable the output again.

3.3.3 Voltage Setting

Press the V SET key to enter the voltage setting. Press ▲ or ▼ keys to increase or decrease the voltage value. The voltage value can be set in four adjustment steps: 0.01V, 0.1V, 1V and 10V. On a long press of the V SET key, the adjustment resolution changes from low to high every 0.3 seconds. If the set voltage value is not changed for 2s, the voltage meter flashes for two times and the new voltage value is set and displayed.

3.3.4 Frequency Setting

Press the F SET key to enter the frequency setting. Press ▲ or ▼ keys to increase or decrease the frequency value. The frequency value can be set in four adjustment steps: 0.01Hz, 0.1Hz, 1Hz and 10Hz. On a long press of the F SET key, the adjustment resolution changes from low to high every 0.3 seconds. If the set frequency value is not changed for 2s, the frequency meter flashes for two times and the new frequency value is set and displayed.

3.3.5 Current Limit Setting

Press the A SET key to enter the current limit setting. Press ▲ or ▼ keys to increase or decrease the current limit value. The current value can be set in four adjustment steps: 0.01A, 0.1A, 1A and 10A. On a long press of the A SET key, the adjustment resolution changes from low to high every 0.3 seconds. If the set current value is not changed for 2s, the current meter flashes for two times and the new current value is set and displayed.

3.3.6 Low Voltage / High Voltage Range Setting

There are two output voltage ranges: Low range 0-150V and high range 0-300V. The voltage range is set by default at high range. The output voltage can be adjusted within the selected range only.




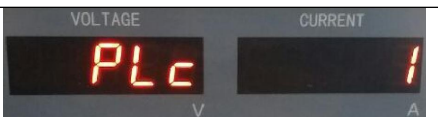
Press the HIGH/LOW key to switch between high range and low range. The rated current in high range is half of the rated current in low range. Please refer to specifications of rated current in the datasheet.



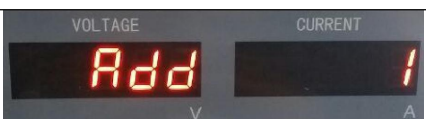
3.3.7 Memory

There power source can store three sets of voltage, current and frequency settings. There is one key for each memory slot: M1, M2 and M3. After setting up voltage, current and frequency values, press one of the memory keys (long press) to store the settings. The stored settings can be recalled by making a short press on the related memory key.

3.3.8 System Settings

Press the SYSTEM key to enter the system setup menu. Make a short press on the SYSTEM key to display system parameters: Baud rate, panel lock, output, commands, delay time and address, press ▲ and ▼ keys to change the values.

Parameter	Display	Description
Baud rate		Press ▲ or ▼ key to change baud rate as 2400, 4800, 9600, 19200 or 38400. Default: 9600
Panel lock		The panel lock can be set to ON or OFF by pressing ▲ or ▼ key. If set tot ON, the front panel keys are locked. Only "ON/OFF" key and "SYSTEM" key is active in this mode. Default: OFF
Output status		The output status can be set to ON or OFF by pressing ▲ or ▼ key. If set to ON, the AC power source enables output right after it is powered on. The front panel keys are locked. Default: OFF
Commands		Communication protocol type used can be chosen by pressing ▲ or ▼ keys: "0": turn off remote communication "1": use ASCII commands "2": use HEX commands Default: 1

		Developer use only.
Delay time		The output delay time can be set by pressing ▲ or ▼ keys from 0.001s to 99.999s. Default: 0.3s
Address		The communication address can be set by pressing ▲ or ▼ keys from 0 to 30. Default: 1

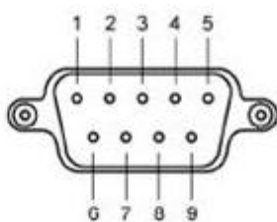
4. Optional [A]: Interlock

A security connection shutting down the output of the power supply immediately if at low state and triggering an internal alarm.

5. Serial Port & Communication Protocol

Devices of the DF-S 51XXX series are equipped with an RS232 interface, supporting commands in ASCII and HEX codes and an open protocol which allows an easy integration into any new and existing infrastructure.

5.1 Interface Specifications



Pin-out:

Pin	Pin description	Pin function
1	+5V	VCC
2	TXD	Send data
3	RXD	Receive data
5	GND	Ground

5.2 Communication Protocol

5.2.1 ASCII Commands to Query Parameters

Commands	Parameters	Description
?MAXPOW	-	Query the maximum power.
?MAXVOL	-	Query the maximum voltage.
?MAXCUR	-	Query the maximum current.
?MAXFRE	-	Query the maximum frequency.
?MINFRE	-	Query the minimum frequency.

5.2.2 ASCII Commands to Set Parameters

Commands	Parameters	Description
PON	-	Turn on output.
POFF	-	Turn off output.

SVOL n	Voltage	Set voltage.
SFRE n	Frequency	Set frequency.
SCUR N	Current	Set current limit.
?SVOL	-	Query the voltage setting.
?SFRE	-	Query the frequency setting.
?SCUR	-	Query the current limit setting.
?MVOL	-	Query the output voltage.
?MFRE	-	Query the output frequency.
?MCUR	-	Query the output current.
?MPF	-	Query the output power factor.
?MPOW	-	Query the output power.

5.2.3 HEX Command Frame

5.2.3.1 HEX Request Frame

Frame format: ID (1 byte) + command type (1 byte) + function code (1 byte) + data (4 byte) + check code (1 byte)

Command		Description
Instrument ID	1-28	ID of the power source.
Command Type	0x52	Read access
	0x57	Write access
	0x58	Reset
Function code		The operation parameter.
Data	High byte follows low byte.	Write data: Write data to the AC power source.
		Read data: Data response.
		Reset command: Ignored.
Check code		The sum of the first seven bytes.

Note: The power supply will not return a reply after receiving a reset command.

5.2.3.2 HEX Function Codes

Function Code	Function Description	Data Description	Data Read	Data Write	
0x30	Output mode	0 byte	Over current active	1: Over current 0: Normal	0: Reset over current alarm
		1 byte	Malfunction alarm active	1: Malfunction 0: Normal	1: Reset alarm
		2 byte	High range or low range	1: High range 0: Low range	Ignored
		3 byte	Output on or off	1: Output on 0: Output off	Ignored
0x31	Targeted frequency	Frequency value, 4 bytes, unit 0.1Hz, range 450-2500.	The present frequency	The new frequency	
0x32	Targeted voltage in high range	Voltage value, 4 bytes, unit 0.1V, range 0-3000.	The present voltage	The new voltage. If the previous voltage is in low range, device will be switched to high range.	
0x33	Targeted voltage for auto range	Voltage value, 4 bytes, unit 0.1V, range 0-3000.	The present voltage	The new voltage. Voltage range will change accordingly.	
0x34	Max. output current	Current in 4 bytes, unit 0.001A, range below 30000.	Current limit value.	Current limit value.	
0x35	Output on/off	Output status, 4 bytes (only read status).	1: Output on	Turn on output.	
			0: Output off.		

0x36	Output on/off	Output status, 4 bytes (only read status).	1: Output on 0: Output off.	Turn off output.
0x4A	Serial number	4 bytes	Serial number	-

0x60	Irms	RMS current, 4 bytes, unit 0.001A	RMS current value	-
0x61	Vrms	RMS voltage, 4 bytes, unit 0.1V	RMS voltage value	-
0x62	Ipeak	RMS peak current, 4 bytes, unit 0.001A	Peak current value	-
0x63	Vpeak	RMS peak voltage, 4 bytes, unit 0.1V	Peak voltage value	-
0x64	Pva	Apparent power, 4 bytes, unit 0.1VA	Apparent power value	-
0x65	Pw	Active power, 4 bytes, unit 0.1W	Active power value	-
0x66	Pf	Power factor, 4 bytes, unit 0.001	Power factor value	-
0x67	Freq	Frequency, 4 bytes, unit 0.1Hz	Frequency value	-

5.3.4 HEX Examples of Command Frames

The following examples of command frames are given in HEX code, with instrument ID as 0x01.

- | | |
|---|--|
| <p>1) Set voltage of auto range to 120V
Request frame: 01 57 33 B0 04 00 00 3F
Replay frame: 01 57 33 B0 04 00 00 3F</p> <p>2) Set voltage of auto range to 240V
Request frame: 01 57 33 60 09 00 00 F4
Replay frame: 01 57 33 60 09 00 00 F4</p> <p>3) Set voltage of high range to 120V
Request frame: 01 57 32 B0 04 00 00 3E
Replay frame: 01 57 32 B0 04 00 00 3E</p> <p>4) Set voltage of high range to 240V
Request frame: 01 57 32 60 09 00 00 F3
Replay frame: 01 57 32 60 09 00 00 F3</p> | <p>5) Set frequency to 60Hz
Request frame: 01 57 31 58 02 00 00 E3
Reply frame: 01 57 31 58 02 00 00 E3</p> <p>6) Set output ON
Request frame: 01 57 35 00 00 00 00 8D
Reply frame: 01 57 35 01 00 00 00 8E</p> <p>7) Set output OFF
Request frame: 01 57 36 00 00 00 00 8E
Reply frame: 01 57 36 00 00 00 00 8D</p> <p>8) Clear error
Request frame: 01 57 30 00 01 00 00 89
Reply frame: 01 57 30 00 00 00 00 88</p> |
|---|--|