DP-M Series
High Power Laboratory Power Supplies
User's Manual

by DSC-Electronics Germany • Georgstraße 36 • 53111 Bonn

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 / 400V 50Hz). Subsequent adjustment after delivery is not possible. Connecting the device to an unsuitable power source will void any warranty.

Note: Devices of the DP-M series in the performance class 4.000W - 9.000W can cause a high starting current when switched on. Therefore, the use of circuit breakers of classes C, D or K is recommended.

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 = (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 = (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 = ((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. Product Description

The DP-M power supply can operate in constant voltage (CV) or constant current (CC) mode within the rated output range. This allows continuous switching between the modes in response to the load change.

In CV mode, a regulated output voltage is provided. The output voltage remains constant as the load increases while the output current changes in response to the load changes, until the preset current limit is reached. At that point, the output current becomes constant and the output voltage drops in proportion to the further increases in load. The current mode is indicated on the front panel display.

Similarly in CC mode switching from CC to CV mode automatically occurs from a decrease of the load. A regulated output current is provided. The output current remains constant as the load decreases while the output voltage changes in response to the load changes.

3.1 Capacitive load

Note: Can be ignored for devices with optional passive reverse current protection.

In the basic version, power supplies of the DP-M series are not protected against reverse currents, which can lead to a reverse current flowing from the capacitive load after switching off the output voltage of the power supply. Never connect pre-charged capacities to the power supply unit unless you have connected a serial protection diode between the load and the power supply. The protection diode is always recommended for operation with large capacities, please pay attention to a correct dimensioning.

3.2 Pulse Load

Even if the peak current of the load is within the output power of the power supply, a high pulse load can cause voltage fluctuations. To compensate these voltage fluctuations, expand your circuit by a serial induction. For low currents, you can add a capacity in parallel for an even better result (1000uF / 1A).

3.3 Inductive load

Note: Can be ignored for devices with optional passive reverse current protection.

If the power supply is used with large inductive loads, voltage spikes with an amplitude of up to 5 times the output voltage can occur, this may damage the power supply or lead to unstable operation. To protect the power supply from damage, a freewheeling diode has to be used in parallel with the load.

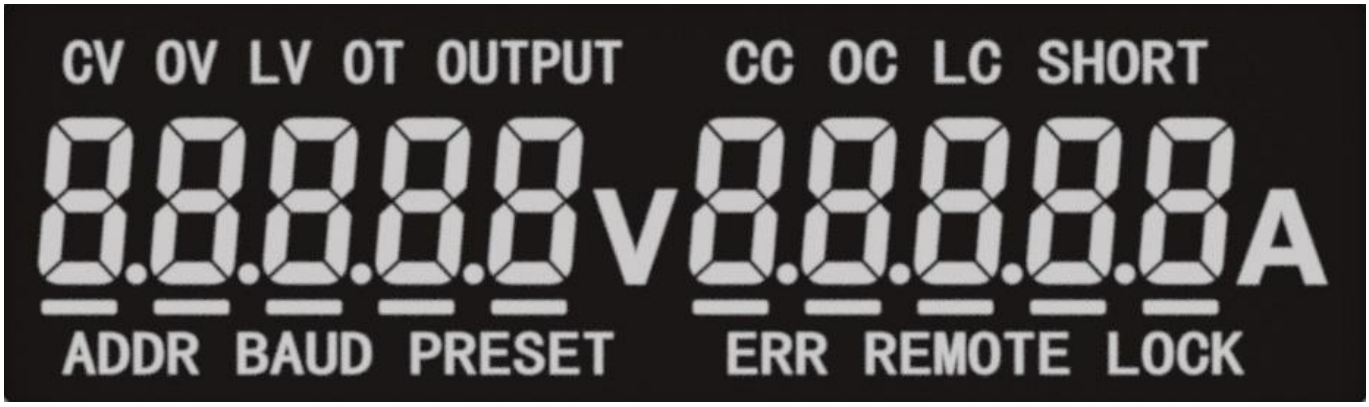
3.4 Switches

If a mechanic switch is used to connect or disconnect the power supply from the load, electric discharge can occur during switching on currents over 100A. This may cause unstable output. To prevent this behaviour, connect a RC circuit to the switch contact point.

4. Front Panel Description

1	Power switch	3	Function keys
2	Display meter	4	Adjustment knob

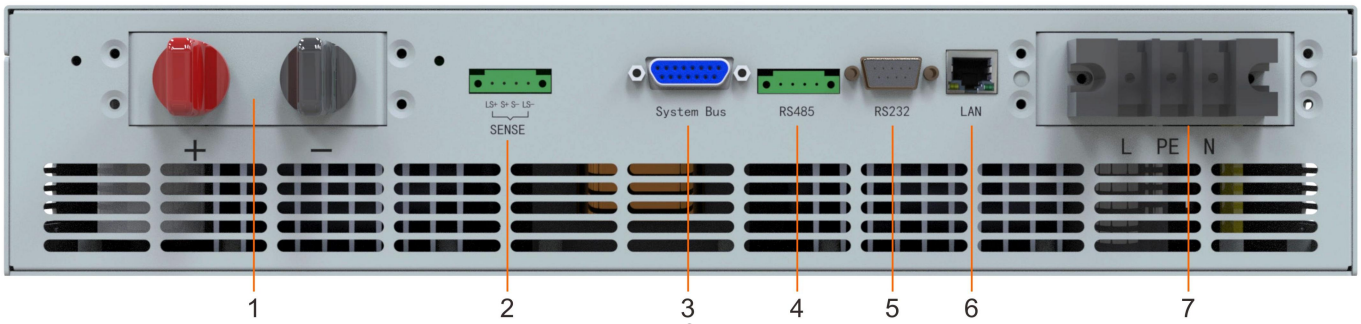
No.	Name	Description
1	V-set	Press to enter output voltage setup mode.
2	I-set	Press to enter output current setup mode.
3	Preset	Press to enter or exit preset voltage/current mode.
4	OV-set	Press to enter over voltage setup mode.
5	OI-set	Press to enter over current setup mode.
6	OK	Press to confirm the input value.
7	ADDR	Press to enter address setup mode.
8	BAUD	Press to enter baud rate setup mode.
9	ON/OFF	Press to turn on or off the output.
10	←	Press to move cursor to the left.
11	→	Press to move cursor to the right.
12	Lock	Press to lock front panel buttons.



No.	Name	Description
1		Voltmeter: Voltage value is Volt (V).
2		Ammeter: Current value unit is Amp (A).
3	CV	CV indicator: "CV" appears when the power supply is operating in constant voltage operation mode.
4	OV	OV indicator: "OV" appears when the power supply is in over voltage value setup or in over voltage protection mode.
5	LV	LV indicator: This indicator is reserved for special functions made to customer's request. (Optional)
6	OT	"OT" shows that the power supply is in over temperature protection mode.
7	OUTPUT	Output indicator: "OUTPUT" appears when the power supply's output is ON.
8	CC	CC indicator: "CC" appears when the power supply is operating in constant current operation mode.
9	OC	OC indicator: "OC" appears when the power supply is in over current value setup or in over current protection mode.
10	LC	LC indicator: This indicator is reserved for special functions made to customer's request. (Optional)
11	SHORT	Short indicator: "SHORT" appears when the power supply is in short circuit protection mode.
12	ADDR	ADDR indicator: "ADDR" appears when the power supply is in remote address setup mode.
13	BAUD	BAUD indicator: "BAUD" appears when the power supply is in baud rate setup mode.
14	PRESET	PRESET indicator: "PRESET" appears when the power supply is in voltage and current preset mode.
15	ERR	ERR indicator: "ERR" appears when the power supply has detected a malfunction or incorrect operation.
16	REMOTE	REMOTE indicator: "REMOTE" appears when the power supply is in remote control mode.
17	LOCK	LOCK indicator: "LOCK" appears when the front panel buttons are locked.

4.1 Rear Panel Description

Rear panel of 1/2 1U cabinet



Rear panel of 2U cabinet

No.	Name	Description
1	Output terminals	Positive output terminal (Red). Negative output terminal (Black).
2	Sense	Remote sense interface (optional)
3	System Bus	System bus interface (optional)
4	RS485	RS485 interface
5	RS232 / Analog adapter interface (1U devices only)	RS232 interface / Analog adapter interface on 1U devices only
6	LAN	LAN interface (optional)
7	AC input terminals	Connection to local AC mains.

5. Operation Instructions

Caution: Always check that the output is switched off and the capacitors are discharged before connecting the load to the power supply. The load can be connected either after or before the power supply is switched on - but always before the output is switched on!

5.1 Power On

1. After power on, all characters on the display meter flash for a short time (refer to fig.5-1). Then the display meter displays the last voltage and current values set before power off for a short time (refer to fig.5-2), then the power supply enters standby mode (refer to fig.5-3). Please do not connect any loads to the power supply during self-test.

Fig.5-1

Fig.5-2

Fig.5-3

5.2 Output Voltage Setup

1. Press the V-set key to enter voltage setup mode.
2. Tune the adjustment knob to set a desired voltage value.
3. As you should see, there is an underscore under the voltage value. It means that the voltage value is under setup mode and can be adjusted. Tune the rotary knob to adjust the voltage value up or down. Use the direction keys ← and → to move the cursor to the next digit for adjustment. Under voltage setup mode, the displayed voltage value is the setup value, not the real measured output value. The displayed current however, is the real measured output value.
4. Press OK key to confirm the set value and exit voltage setup mode. Now the displayed voltage and current values are real output values.
5. Press the ON/OFF key to turn on output.
6. After the output is turned on, the OUTPUT indicator lights up and the CV or CC indicators show the current operation mode.

Note: If the voltage or current values are being adjusted during operation (output on), the output values will change immediately while you adjust the set values.

5.3 Output Current Setup

7. Press the I-set key to enter current setup mode.
8. Tune the adjustment knob to set a desired current value.
9. As you should see, there is an underscore under the current value. It means that the current value is under setup mode and can be adjusted. Tune the rotary knob to adjust the current value up or down. Use the direction keys ← and → to move the cursor to the next digit for adjustment. Under current setup mode, the displayed current value is the setup value, not the real measured output value. The displayed voltage however, is the real measured output value.
10. Press OK key to confirm the set value and exit current setup mode. Now the displayed voltage and current values are real output values.
11. Press the ON/OFF key to turn on output.
12. After the output is turned on, the OUTPUT indicator lights up and the CV or CC indicators show the current operation mode.

Note: If the voltage or current values are being adjusted during operation (output on), the output values will change immediately while you adjust the set values.

5.4 Preset Setup

The preset functionality can be used to save one set of current and voltage settings to quickly recall these during operation.

1. Press the V-set key, then press the PRESET key to enter preset voltage mode. An underscore beneath the voltage value and the PRESET icon will appear at the same time.
2. Tune the adjustment knob to set a desired voltage value.
3. Press OK key to confirm the above value. After confirmation, the underscore stops flashing, and the output voltage changes to the newly preset value.
4. To change the value tune the adjustment knob again, the preset voltage value changes and the underscore flashes again. The output voltage value changes only after pressing OK to confirm the newly preset value.
5. Repeat the same process using the I-set key, to change the current preset.

Note: If you set the preset values while the output is turned off, the output will not start with the preset values but will use the normal set values instead. You can however apply the preset values instantly by pressing the OK key or the rotary knob while the output is turned on.

5.5 OVP and OCP Protection Limits

The over voltage and over current protection limits can be adjusted to meet your requirements. By default, these are set to the maximum value.

1. Press the OV-set or OI-set key to enter OVP or OCP limit setup mode.
2. Tune the adjustment knob to set an OVP or OCP limit value and press OK to confirm.

If the output value exceeds either the set OVP or OCP value, the output is shut down immediately and the ERR icon along with the OC or OV icon appears. To disable the alarm press the OK button once.

5.6 Front Panel LOCK

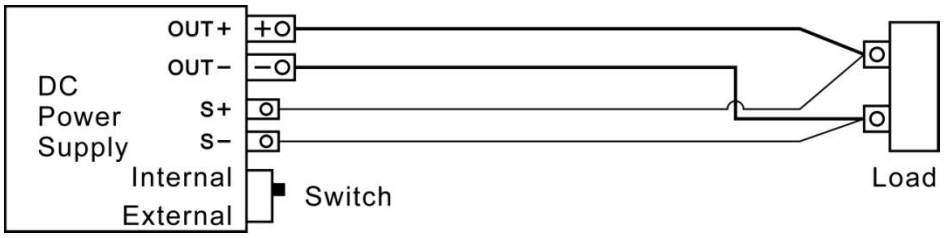
To lock the front panel buttons press the LOCK button once. All buttons and the rotary knob are now disabled, to unlock please press the LOCK button once again.

5.6 Locking the Front Panel

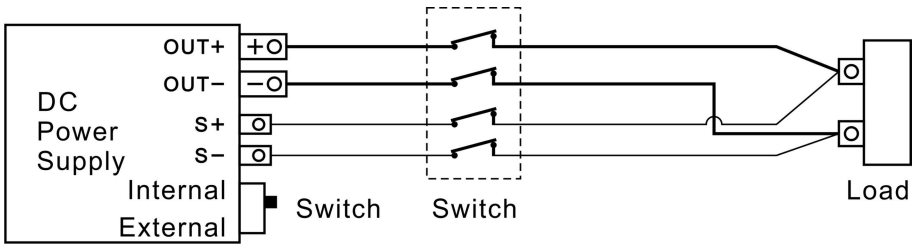
Press the current knob for 3 seconds to lock or unlock the front panel. The current and voltage knob as well as the SET button are not operational when the front panel is locked.

5.7 Remote Sensing (Optional)

The power supply is optionally equipped with remote sensing terminals, which can read the voltage at the load and therefore compensate losses. Refer to below figure on how to connect the load to remote sensing terminals. The remote sensing input can be connected optionally, and is automatically deactivated if not connected.



WARNING: In case you physically disconnect the output leads from the load, also disconnect the remote sensing leads at the same time.



6. Parallel operation

Devices of the DP-M series can be operated with up to 99 units in parallel to increase the total available power and current. However some limitations apply:

- Only devices ordered with the option to operate in parallel are compatible
- The master device has to have equal or higher voltage and current specifications compared to all slave devices
- Neither the master, nor the slave devices can be operated over external analog connections while in parallel mode

6.1 Configuration

Every power supply has to be configured for either the slave or the master mode, while only one master device can exist in a group of connected devices. The configuration is performed by encoding the parameters in the device address, **before connecting the devices to each other**.

The device address consists of 5 digits, to which we will refer in the following order from left to right as shown on the device display: 1, 2, 3, 4, 5.

Master configuration

(1) - The first digit selects the type of the device in a group, for master set this digit to „2" while for slave set a „1".

(2 & 3) - The second and third digits set the number of devices in total in a group, including the master device and starting with „00". For example for 10 connected devices including the master, you would set digit two to „0" and digit three to „9" resulting in „09" for a group of ten devices.

(4 & 5) - The last two digits, the fourth and fifth, represent the communication address of the master device for communication with an external controller (computer) via Modbus. While the device is operating in a group of devices in parallel connection, the master can only have the address „01".

Slave configuration

(1) - The first digit selects the type of the device in a group, for master set this digit to „2" while for slave set a „1".

(2 & 3) - The second and third digits have to be set to „00" on all slave devices.

(4 & 5) - The last two digits, the fourth and fifth, represent the communication address of the slave device for communication with the master device. Set these to a value between „02" and „99". Please note that every device of a group of devices including the master has to have a unique address, and the address „01" is reserved for the master.

Setting the address

1. While the device is powered on, press the ADDR button to enter the device address settings.
2. Set the device address in regards with the above mentioned instructions.
3. Press OK
4. Power off the device and connect it to the group.

Example addresses

For a group of two devices, the configuration would look like the following example.

Master: 2 0 2 0 1
Slave: 1 0 0 0 2

6.2 Connection

The devices in a group are connected over the „System Bus" to each other, suitable cables are either included in the shipment or can be ordered for custom groups with up to 99 devices. The power grid inputs can either be bridged to the master device with cables provided with your order (in case you ordered several devices for parallel operation) or can be connected to the power grid independently. The outputs of the devices have to be bridged to the master device with suitable connections (copper bars) to provide the maximum stability and precision of operation.

6.3 Operation

Please note that the master has to be powered on first (min. 2s delay), and shut down either last or together with all slave devices.

1. Power on the master and with a delay of min. 2s power on all slaves. Now you will notice that the slave panels are locked and the LOCK led is active. This indicates that the slaves are correctly operating in slave mode.
2. Now you can operate the master device the same way you would operate a stand alone power supply, the slaves will follow.
3. To shut down the group, power off all devices at the same time including the master, or power off the slaves first followed by the master.

NOTES (IMPORTANT):

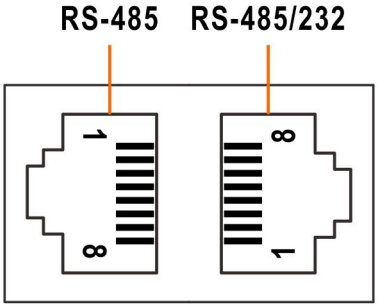
- Please under no circumstances change device addresses while devices are connected in a group and powered on.
- Please avoid pressing the ADDR button while the devices are connected in a group and powered on. This might lead to short loss of connection between master and slave devices, and cause unstable operation.
- Devices connected in a group can be removed from group and immediately operated independently without re-configuration.

7. Remote Control

The device is equipped with RS232 and RS485 interfaces supporting the Modbus-RTU protocol, as well as optionally a LAN interface.

7.1 RS-232 / RS485 Interface (1U Frame)

Following the pin description of the RS-232 / RS485 interface of the DP-M series in a 1U frame.



Pin	Pin out RS-485	Pin out RS-485/232
1	A (D+)	A (D+)
2	B (D-)	B (D-)
3	NC	RXD
4	NC	TXD
5	NC	GND
6	NC	NC
7	NC	NC
8	NC	NC

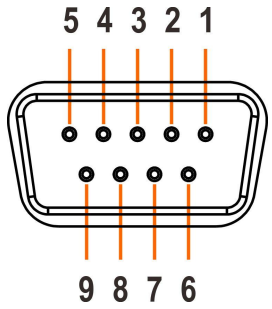
7.1.1 Analog adapter interface (1U Frame)

DP-M series 1U frame devices are supplied with an external analog adapter interface (box) which can be plugged into the right RJ45 socket on the rear of the device. The pin-out of the analog adapter interface is mentioned on the adapter and depends on the options chosen with order, the adapter interface is designed only for the specific power supply it was ordered for and is not compatible with other devices even of the same series.

Pin	Description
VCC 12V 10mA	Supply voltage for external circuits, can supply up to 10mA at 12Vdc. This pin uses the common GND.
V Control	Positive input of the output voltage control signal. This pin uses the common GND.
I Control	Positive input of the output current control signal. This pin uses the common GND.
Output Control	Output status (ON/OFF) control loop, activating the device output if bridged to Pin „VCC 12V".
V Control Enable	Enables the external analog control of the output voltage if bridged to Pin „VCC 12V". The power supply has to be restarted to take effect!
I Control Enable	Enables the external analog control of the output current if bridged to Pin „VCC 12V". The power supply has to be restarted to take effect!
GND	Common GND

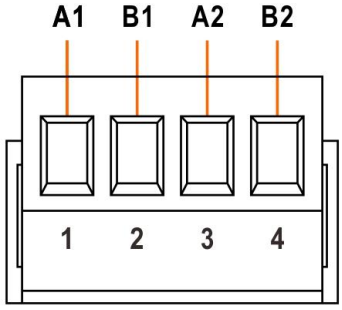
7.2 RS-232 / RS485 Interface (Non-1U Frame)

RS-232 interface:



Pin	Pin out RS-232
1	NC
2	TXD
3	RXD
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

RS-485 interface:



Pin	Pin out RS-485
1	A1 (D+)
2	B1 (D-)
3	A2 (D+)
4	B2 (D-)

Communication Protocol for DSC-Electronics DP-M Series power supplies

Interface: RS-232 / RS-485
Command format: Asynchronous, 1 start bit, 8 data bits, 1 stop bit
Baud rate: 1200; 2400; 4800; 9600; 14400; 19200; 38400; 43000; 57600; 115200; default at 9600
Communication mode: Master-Slave mode
Controller respond time:

Command Format

1st part: ID number of the DC power supply, 1-16 (If the ID number is 0, all devices will respond)
2nd part: Control command
3rd part: Data length (how many values are supplied to the device in this command)
Data part: 16-bit data, high bit in the front
CRC part: MODBUS format, low byte in the front

Feedback Command Format

1st part: ID number of the DC power supply, 1-16
2nd part: control command
3rd part: data length (how many values are supplied to the device in this command)
Data part: 16-bit data, high bit in the front
CRC check: MODBUS format, low byte in the front

Note: The power supply automatically switches to remote operation mode as soon as contacted through one of the digital interfaces.

8. Command Examples

8.1 Output ON/OFF

Control command:

ID	Function Code	Register Address	Data (On/Off)	CRC Check Code
01	05	0085	FF00	9DD3
01	05	0085	0000	DC23

Feedback: Equal to command.

8.2 Read Output Status

Control command:

ID	Function Code	Address of Start Register	Numbers of Registers	CRC Check Code
01	01	0085	0001	EC23

Feedback:

ID	Function Code	Address of First Register	Output Status (On/Off)	CRC Check Code
01	01	01	01	9048
01	01	01	00	5188

8.3 Read Output Voltage Value

Control command:

ID	Function Code	Address of First Register	Numbers of Registers	CRC Check Code
01	04	0064	0001	7015

Feedback:

ID	Function Code	Bytes	Output Voltage	CRC Check Code
01	04	02	0283	F9F1

Voltage: 0x0283 in decimal equals to 643.
643 divided by 10 (1 decimal point) is 64.3, thus a voltage value of 64.3V.

8.4 Read Output Voltage and Current Value

Control command:

ID	Function Code	Address of First Register	Numbers of Registers	CRC Check Code
01	04	0064	0002	7015

Feedback:

ID	Function Code	Bytes	Output Voltage	Output Current	CRC Check Code
01	04	02	0283	0001	CA14

Voltage: 0x0001 in decimal equals to 1.
1 divided by 100 is (2 decimal points) 0.01, thus a current value of 0.01A.

8.5 Read Rated Voltage Value

Control command:

ID	Function Code	Address of First Register	Numbers of Registers	CRC Check Code
01	04	0067	0001	8015

Feedback:

ID	Function Code	Bytes	Output Voltage	CRC Check Code
01	04	02	03E8	B98E

Voltage: 0x03E8 into decimal system is 1000.
1000 divided by 10 is (1 decimal point) 100.0, thus the voltage value is 100.0V.

8.6 Set Output Voltage Value

Control command:

ID	Function Code	Register Address	Data	CRC Check Code
01	06	0095	01F4	99F1

Feedback:

ID	Function Code	Register Address	Data	CRC Check Code
01	06	0095	01F4	99F1

Set output voltage to 50V. There is 1 decimal point for voltage value (50.0).The value should be 500 in the decimal system. 500 into hex is 0x01F4.

8.7 Set Output Voltage and Current Value

Control command:

ID	Function Code	Address of First Register	Numbers of Registers	Bytes	Voltage	Current	CRC Check Code
01	10	0095	0002	04	0190	01F4	3B3A

Feedback:

ID	Function Code	Address of First Register	Numbers of Registers	CRC Check Code
01	10	0095	0002	51E4

9. Command Frame

9.1 Function Code

Below function codes are supported.

Function Code	Function Code HEX	Description	Bit Operation / Byte Operation	Numbers of Operation
01	0x01	Read cycle status	Bit Operation	Single or multiple
02	0x02	Read discrete input status	Bit Operation	Single or multiple
03	0x03	Read holding register	Byte Operation	Single or multiple
04	0x04	Read input register	Byte Operation	Single or multiple
05	0x05	Write single cycle	Bit Operation	Single
06	0x06	Write single holding register	Byte Operation	Single
15	0x0f	Write multiple cycles	Bit Operation	Multiple
16	0x10	Write Multiple holding register	Byte Operation	Multiple

Bit operation: Read/write cycle, read/write data bit by bit.
Byte Operation: Read/write register, read/write data byte by byte.

9.2 Register Definition

Input Register						
No	Type	Description	Address (Decimal)	Address (Hex)	Target	Function Code 04 (Read)
1	Read	Output voltage (feedback value)	100	0x0064	Byte	√
2	Read	Output current (feedback value)	101	0x0065	Byte	√
3	Read	Rated voltage	103	0x0067	Byte	√
4	Read	Rated current	104	0x0068	Byte	√
5	Read	Voltage decimal point	106	0x006a	Byte	√
6	Read	Current decimal point	107	0x006b	Byte	√

Discrete Input Status						
No	Type	Description	Address (Decimal)	Address (Hex)	Target	Function Code 02 (Read)
1	Read	Constant Current mode (CC)	116	0x0074	Bit	√
2	Read	Constant Voltage mode (CV)	117	0x0075	Bit	√
3	Read	Over Voltage Protection (OVP)	120	0x0078	Bit	√
4	Read	Over Current Protection (OCP)	121	0x0079	Bit	√
5	Read	Over Temperature Operation (OTP)	122	0x007a	Bit	√

Cycle								
No	Type	Description	Address (Decimal)	Address (Hex)	Target	Function Code		
						01 (Read)	05 (Write single)	15 (Write multiple)
1	R/W	Output switch	133	0x0085	Bit	√	√	√
2	R/W	Lock	134	0x0086	Bit	√	√	√
3	R/W	OVP allowed	136	0x0088	Bit	√	√	√
4	R/W	OCP allowed	137	0x0089	Bit	√	√	√
5	R/W	Power on allowed	142	0x008e	Bit	√	√	√

Holding Register								
No	Type	Description	Address (Decimal)	Address (Hex)	Target	Function Code		
						03 (Read)	06 (Write single)	16 (Write multiple)
1	R/W	ID	148	0x0094	Byte	√	√	√
2	R/W	Voltage setup value	149	0x0095	Byte	√	√	√
3	R/W	Current setup value	150	0x0096	Byte	√	√	√
4	R/W	Baud rate (Remark 1)	156	0x009c	Byte	√	√	√
5	R/W	OVP limit	157	0x009d	Byte	√	√	√
6	R/W	OCP limit	158	0x009e	Byte	√	√	√

Place for your notes:

Remark 1:
Supported baud rates: 1200; 2400; 4800; 9600; 14400; 19200; 38400; 43000; 57600; 76800; 115200; 128000
Due to the limitation of single register data range (0~65535), the baud rate needs to be divided by 10, that is, remove a 0 at the end and write it.

Specifications		
Line regulation	Voltage	≤0.1%FS rms
	Current	≤0.1%FS rms
Load regulation	Voltage	≤0.1%FS rms
	Current	≤0.1%FS rms
Ripple & Noise (20Hz ... 20MHz)	Voltage	≤0.3%FS +50mVrms
	Current	≤0.3%FS +10mArms
Time drift	Voltage	≤0.5%FS rms
	Current	≤1%FS rms
Temperature drift	Voltage	≤0.1%FS rms/℃
	Current	≤0.3%FS rms/℃
Setting accuracy	Voltage	≤0.1% FS +20mV (≤100V) ≤0.1% FS +100mV (300V) ≤0.1% FS +300mV (≥600V)
	Current	≤0.3% FS +10mA
Setting resolution	Voltage	0.01V / 0.1V / 1V
	Current	0.001A / 0.01A / 0.1A / 1A
Readback accuracy	Voltage	≤0.1% FS +20mV (≤100V) ≤0.1% FS +100mV (300V) ≤0.1% FS +300mV (≥600V)
	Current	≤0.3% FS +10mA
Readback resolution	Voltage	0.01V / 0.1V / 1V
	Current	0.001A / 0.01A / 0.1A / 1A
Transient response time		≤5ms (10% ... 90% load change)
Protection		OVP, OCP, OTP and short circuit protection
OVP setting range		0.1V to 110% of rated voltage
OCP setting range		0.1A to 110% of rated voltage
Digital interface		RS232 & RS485, ModBus-RTU (LAN Optional)
Analog interface (optional)		0-5V, 0-10V o 4-20mA interface for voltage/current control and feedback
Cooling method		Forced AIR
Operating environment		0℃ ... 40℃, 10% ... 80%RH
Storage environment		-20℃ ... 70℃, 10% ... 90%RH
Input voltage		≤6KW: 1φ2W, 230V±10% 50Hz/60Hz >6KW: 3φ4W, 400V±10% 50Hz/60Hz
Input module		Power socket or terminal block
Accessories		Operation manual: 1EA