SID1812v2
Manual

DC motor driver 12 A

with regulation of velocity, direction and MODBUS-RTU interface

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Contains

Thank you for selecting our product!

This instruction will help you at correct service and accurate exploitation of described device.

Information included in this instruction were prepared with high attention by our specialists and is description of the product without any responsibilities within the meaning of the commercial law. Based on the information should not be inferred a certain features or suitability for a particular application. This information does not release the user from the obligation of own judgment and verification. P.P.H. WObit E.K.J. Ober s.c. reserves the right to make changes without prior notice.

- Please read instructions below carefully and adhere to its recommendation
- Please pay special attention to the following characters:

CAUTION!
Not adhere to instruction can cause damage or impede the use of hardware or software.

1. Safety and assembly rules

1.1. Safety rules

- Prior to first start-up of the device please refer to this manual and keep it for further use.
- Prior to first start-up of the device please make sure all cables are correctly connected.
- Provide appropriate working conditions, in compliance with the device specification (e.g.: power supply voltage, temperature, maximum current consumption).
- Before making any modifications to wiring connections, disconnect the power supply voltage.
- Do not disassemble and alter the device on your own. In case please contact with WObit company specialists. Non authorized changes can cause hurts or fire. It also results in invalidation of the warranty.
- Usage of described device in special meaning systems (e.g.: medical applications, vehicles, etc.) requires use of additional safety measures against operational errors.
- This device can't be used in open space. It can cause an electric shock and shorten lifetime of the device.
- Exceeding of recommended operational parameters can lead to damage of the device or to fire.
- Basic features, which knowledge and use will provide safe use consonant with its designation will be demonstrate on the device, or in this manual.
- The device, with its parts is manufactured in way to provide its safe mounting and connection.
- The device is designed and manufactured as to conform to the principles of protection against the threats mentioned above, provided that the device is used in a manner consistent with its purpose and that it is properly maintained.

1.2. Mounting recommendations

In the environments of unknown levels of interruptions it is recommended to use the following means preventing against possible interruptions of the device operation:

- Ground or reset metal rails, on which are mounted instruments,
- Do not power devices on the same line as the device without a corresponding high power line filters;
- Please use screening of the supply, sensor and signal cables, with the ground for the screen should be connected only on one side, as close to the device;
- For motor power supply please use twisted pair cables, and if possible use a ferrite bead assumed on the wire;
- Please avoid of leading control cables (Signal) parallel or in close to electrical and power wires;
- Please avoid proximity to devices that generate high levels of electromagnetic interferences and/or pulse (high-power loads, the burden of the phase or power control group).

2. Driver description

2.1 Device designation

SID1812v2 is a driver designed for regulation of velocity and direction of rotation of DC motors. Control of motor operation is made by DIR, EN, 0-10V external signals, Modbus-RTU interface or by build-in potentiometer and switches.

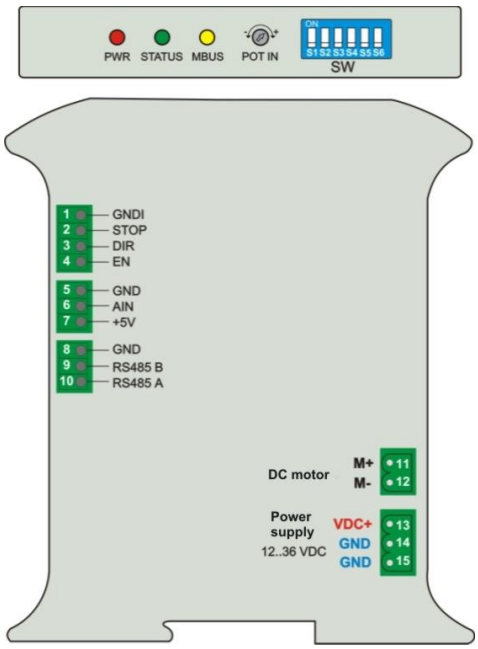
In case of control using Modbus protocol it is possible to preview driver internal parameters such as load (rougher current value), value of 0-10V input signal or driver operation temperature.

Driver is equipped with soft start function, which provides smooth start high power motors with high rotor inertia.

2.2 Features

- Operation with DC motors with power up to 150 W
- Max. direct current 12A / 12V (6A/24V)
- Max. peak current30A
- Power supply 10…36 V DC
- Build-in RS-485 interface with Modbus-RTU protocol
- Regulation of rotational velocity by build-in potentiometer or by external voltage 0…5 V
- Opt insulated start input (EN), change of direction (DIR) and braking (STOP) with option of setting level of controlling signal
- Soft start function
- LED indicator for signalizing power supply, operating status and overload of the driver
- Current, short-circuit and thermal protection
- Housing adapted for mounting on DIN rail

2.3 Description of connectors and front panel



Picture. 1 Description of connectors and front panel

No	Connectors description	
Opt insulated controlling inputs		
1	GNDI	Ground of controlling inputs
2	STOP	Motor braking input
3	DIR	Change direction input
4	EN	Enable input
0-5V input for velocity regulation		
5	GND	Ground
6	AIN	0-5V analog input
7	+5V	+5V output (max. 200mA)
RS485 MODBUS-RTU		
8	GND	Ground
9	A	+ R485 signal
10	B	– R485 signal
Transistor outputs		
8	OUT1	1 transistor output, max. 0,5A
9	OUT2	2 transistor output, max. 0,5A
10	GND	Ground of outputs
Motor output		
11	M+	+ output of motor connection
12	M-	- output of motor connection
Power supply		
13	VDC+	Driver power supply (+12…36 VDC)
14	GND	Ground of driver power supply
15	GND	Ground of driver power supply

Description of front panel	
PWR	Signalization of power supply
STATUS	Signalization of operation status
MBUS	Signalization of MODBUS communication
POT IN	Build-in potentiometer for setting velocity. To activate it, please set switch in position S3=ON. Non active at MODBUS mode.
ON S1 S2 S3 S4 S5 S6	Configuration switches, functions at ON position: S1-SOFTST – soft start function S2-POTMODE – function of bidirectional controlling from analog input S3-POTINT – activation of internal potentiometer (AIN input non active) S4-DIRLEV – activation of DIR input S5-ENLEV – activation of EN input S6-MODBUS – activation of MODBUS-RTU interface

2.4 Power supply

For supplying the driver please use power supply unit (PSU). The best solution is non PSU with output voltage equal to rated voltage of connected motor. PSU should be equipped with large electrolytic capacitors on output to receive returning energy from driver (BACK EMF). It is recommended 1000µF per 1A consumed current by the motor. While connecting power supply to the driver please check polarity, because exchange + with – can cause damage of the driver.

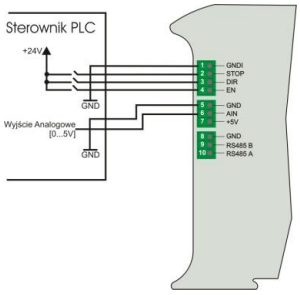
CAUTION

Do not exceed maximal power supply of the driver, it can cause its damage.

2.5 Description of control inputs

Control inputs EN, DIR and STOP are opt insulated. To GNDI input pleas connect ground of controlling signal. Inputs will be active after giving high state on selected line (5..24 V positive voltage).

It is possible to reverse active state on EN and DIR line by S4 (DIRLEV) and S5 (ENLEV) configuration switches. For DIRLEV(ENLEV) switch in ON position activation of DIR(EN) input is made using low state.



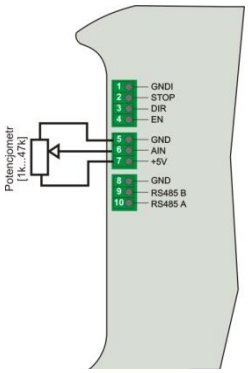
Picture. 2 Control of inputs

State/ Input state	EN	DIR	STOP	LED STATUS
Motor is stopped (motor clamps opened)	0	X	X	ON constantly
CW rotation (conventionally right)	1 (0*)	0 (1**)	0	ON constantly
CCW rotation (conventionally left)	1 (0*)	1 (0**)	0	ON constantly
Motor braking (motor clamps closed)	1 (0*)	X	1	ON constantly
Thermal protection active	X	X	X	1 blink, pause
Current protection active	X	X	X	2 blinks, pause

1 –active input, high state
0 – input non active, low state
*- for ENLEV switch in ON position
**- for DIRLEV switch in ON position

2.6 Control of motor velocity

Control of motor velocity is made by change of voltage given on AIN (**S3=ON**) analog input**,** or by build-in potentiometer (**S3=OFF**). There is an option to connect external potentiometer to AIN input (Picture. 3).
CAUTION: On AIN input you can give max. 5V!



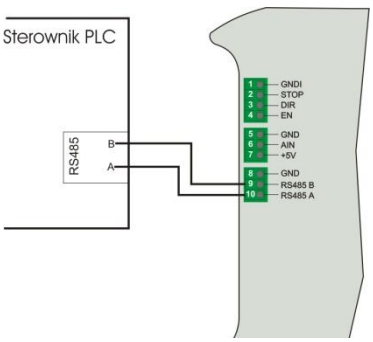
Picture. 3 Connection of potentiometer to AIN input.

Velocity control can be unidirectional (**S2=OFF**). Change of direction is made by giving signal on **DIR** input.

In case of bidirectional control (**S2=ON)** motor remain still in medium potentiometer range or for input voltage = 2,5V. Change of voltage from 2,5…0V answer for velocity regulation into CCW direction and change from 2,5..5V is regulating velocity into CW direction.

2.7 RS485 MODBUS-RTU interface

SID1812v2 driver is equipped with RS485 interface operating in MODBUS-RTU protocol. To activate interface please set switch **S6=ON**.



Picture. 4 Connection of RS485 interface.

2.8 Soft start function

Driver is equipped with soft start function (**S1=ON**) with option of configuration speed up time. This function allows to reduce current shock while motor starting or return. Driver enables to define time of rising control signal in range 0-100% in ms. Default value is 2s. For this value while motor starting up to max. power controlling signal will achieve full value after 2s. In case of full return, delay of controlling signal will be 4s (braking 2 sec.+ 2 sec. speeding up).

Time of soft start can be configured by Modbus interface in range 1ms to 10s. This parameter is saved in driver non violate memory, so there is no need to configure it after decline of power supply.

3. Description of driver operation

Driver after connecting of voltage supply execute initialization procedure, which is finished by activation of **READY** diode.

If MODBUS control function is non active (**S6 = OFF**), then control can be made by external signal (DIR/ AIN), S1...S5 switches and/or build-in potentiometer.

Control of enable input (**EN**) cause start of the motor. Motor will be speed up to velocity set at analog input. Direction input (**DIR**) is used for change of direction of motor rotation. Activation of **STOP** input while motor operation cause it stop (braking) irrespectively of selected operations mode and driver configuration. **SOFTST** switch is used for activation of soft start and soft motor return. Then acceleration of motor rotation is internally limited by the driver.

When control by MODBUS is active (**S6=ON**), S1….S5 switches serves function of selection device address (1…32). Then all controlling signals (except EN and STOPU inputs) are inactive. Control of velocity and other functions is made by MODBUS interface.

3.1 Signalization and deleting errors

Orange diode **STATUS** at driver panel indicates overload/ action status of any protection measure according to table below:

Diode status	Cause / Driver state
Turned on	No errors / normal operation of the driver
1 blink, pause	Overheat / stopped
2 blinks, pause	Current overload / stopped

If driver will stop (diode status blinks) please delete error by turning off for 1sec. and activation ENABLE input or by turning off and on driver power supply. Please remove cause of overload/ short circuit.

3.2 Notifications and recommendations

At driver operation with high currents it is necessary to provide its proper cooling. It is not recommended to mount the driver in closed cabinet without additional enforced air circulation. Do not cover ventilator or do not block/stop it in any way. Driver can achieve high temperatures at longer operation with full load.

4. RS485 MODBUS communication

RS485 can be used for communication with PLC driver, HMI panel or other device operating in MODBUS-RTU protocol. RS485 port in SID1812v2 has no galvanic insulation, so you should provide the same ground potential for driver and master device.
Transmission parameters:

- Baudrate: **38400bps**, bits: 8, Stop bit: 1, parity: none
- Device Modbus address can be set by S1…S5 switches, according to way presented below **:**

*Address = 1+ 1*S1 + 2*S2 + 4*S3 + 8*S4 + 16*S5*

Map of SID1812v2 registers

Register address	Name	Type of variable	Mode (Modbus function)	Description
Values stored in registers WORD/ INT type (integer)				
0 (*1)	ADC_POT	WORD	R (0x03)	Value from 0-5V input or from potentiometer (depends on S3 switch setting)
1 (*3)	PWM	WORD	R (0x03)	Current velocity value (PWM execution)
2 (*3)	M_CURRENT_X10	WORD	R (0x03)	Rougher current value x 10
3 (*4)	DRV_TEMP	WORD	R (0x03)	Driver temperature
4 (*5)	SET_PWM	INT	R (0x03),W(0x06)	Set velocity value (PWM execution)
5 (*6)	SOFTSTART_TIME	WORD	R (0x03),W(0x06)	Time of soft start in ms [1..10000]
1 – bit values				
3000 (*3001)	STATUS_DIR	BIT	R (0x01/0x02), W(0x05)	Status of rotation direction
3001 (*3002)	STATUS_STOP	BIT	R (0x01/0x02), W(0x05)	Status of STOP input
3002 (*3003)	STATUS_EN	BIT	R (0x01/0x02), W(0x05)	Status of EN input
3003 (*3004)	STATUS_SOFT_START	BIT	R (0x01/0x02), W(0x05)	Status of soft start function
3004 (*3005)	STATUS_ERR_TERM	BIT	R (0x01/0x02), W(0x05)	Overheat
3005 (*3006)	STATUS_ERR_CURR	BIT	R (0x01/0x02), W(0x05)	Current overload
3006 (*3007)	STATUS_OK	BIT	R (0x01/0x02), W(0x05)	Correct operation of the driver

* for addressing start from 1 (address offset +1).

R – register readout, W - record

Exemplary MODBUS communication frames

Readout temperature value from DRV_TEMP register(Driver address: 1 ,Function: 03, Register address: 0)

Query (MODBUS MASTER -> ADT42)		Response (ADT42-> MODBUS MASTER)	
Device address	0x01	Device address	0x01
Function	**0x03**	Function	**0x03**
Hi register address	**0x00**	Number of Bytes	0x02
Lo register address	**0x03**	0x03 Hi register	WORD (Byte 1)
Number of Hi registers	0x00	0x03 Lo register	WORD (Byte 0)
Number of Lo registers	0x01	CRC Hi	8 bit
CRC Hi	0x74	CRC Lo	8 bit
CRC Lo	0x0A		

ENABLE signal – setting of bit STATUS_EN register (Function: 05, Register address:3002)

Query (MODBUS MASTER -> SID1812V2)		Response (SID1812V2-> MODBUS MASTER)	
Device address	0x01	Device address	0x01
Function	**0x05**	Function	0x05
Hi register address	**0x0B**	Hi register address	0x0B
Lo register address	**0xBA**	Lo register address	0xBA
Value of Hi register	0xFF	Hi register address	0xFF
Value of Lo register	0x00	Lo register address	0x00
CRC Hi	0xAF	CRC Hi	0xAF
CRC Lo	0xFB	CRC Lo	0xFB

ENABLE signal – deleting of bit STATUS_EN register (Function: 05, Register address:3002)

Query (MODBUS MASTER -> SID1812V2)		Response (SID1812V2-> MODBUS MASTER)	
Device address	0x01	Device address	0x01
Function	**0x05**	Function	0x05
Hi register address	**0x0B**	Hi register address	0x0B
Lo register address	**0xBA**	Lo register address	0xBA
Value of Hi register	0x00	Value of Hi register	0x00
Value of Lo register	0x00	Value of Lo register	0x00
CRC Hi	0xEE	CRC Hi	0xEE
CRC Lo	0x0B	CRC Lo	0x0B

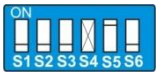
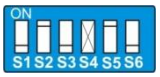
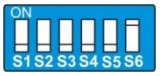
Set signal SET_PWM - record of 255 values to register (Driver address:1 ,Function: 06, Register address: 4)

Query (MODBUS MASTER -> SID1812V2)		Response (SID1812V2-> MODBUS MASTER)	
Device address	0x01	Device address	0x01
Function	**0x06**	Function	0x06
Hi register address	**0x00**	Hi register address	0x00
Lo register address	**0x04**	Lo register address	0x04
Value of Hi register	0x00	Value of Hi register	0x00
Value of Lo register	0xFF	Value of Lo register	0xFF
CRC Hi	0x88	CRC Hi	0x88
CRC Lo	0x4B	CRC Lo	0x4B

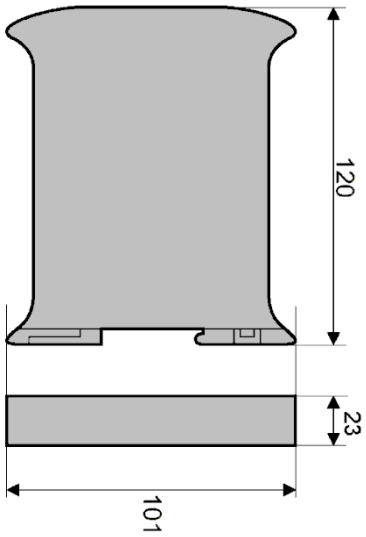
Set signal SET_PWM - readout of earlier set position 255 from register (Driver address:1 ,Function: 03, Register address: 4)

Query (MODBUS MASTER -> SID1812V2)		Response (SID1812V2-> MODBUS MASTER)	
Device address	0x01	Device address	0x01
Function	**0x03**	Function	0x03
Hi register address	**0x00**	Number of Bytes	0x02
Lo register address	**0x04**	0x04 Hi register	0x00
Number of Hi registers	0x00	0x04 Lo register	0xFF
Number of Lo registers	0x01	CRC Hi	0xF8
CRC Hi	0xC5	CRC Lo	0x04
CRC Lo	0xCB		

5. Fast configuration

Mode	Configuration	Description
Velocity control AIN (0…5V) (unidirectional)	 **S2 = OFF** **S6 = OFF**	ENABLE –> external EN signal or S5 DIR –> external DIR signal or S4 VELOCITY –> AIN input (0V – stopped, 5V – max. velocity). SOFT START–> S1
Velocity control AIN (0..2,5V..5V) (bidirectional)	 **S2 = ON** **S6 = OFF**	ENABLE –> external EN signal or S5 DIR –> Dependent on AIN (reverse of direction S4) VELOCITY –> AIN input (0V – max. velocity towards CCW direction, 2.5V – stopped, 5V – max. velocity towards CW direction). SOFT START–> S1
Constant velocity	 **S3 = ON** **S6 = OFF**  POT IN	ENABLE –> external EN signal or S5 DIR –> external DIR signal or S4 VELOCITY –> internal potentiometer SOFT START–> S1
MODBUS-RTU	 **S1…S5** – address **S6 = ON**	ADDRESS –> 1+ [S1:S5] (see 4 chapter) ENABLE –> external EN signal STOP –> external STOP signal DIR –> parameter *STATUS_DIR (3000)* VELOCITY–> parameter *SET_PWM(4)* (-255 – max. velocity towards CCW direction, 0 – stopped, 255 – max. velocity towards CW direction) SOFT START–> parameter *STATUS_SOFT_START (3003)* ERROR –> when *STATUS_OK(3006)=0 means failure/driver overload*

6. Technical parameters



Mechanical parameters	
Housing dimensions:	120 x 101 x 23 mm
Weight:	About 200g
Operating temperature (environment):	0..50°C
Driver operating temperature	<70°C
Cooling	ventilator
Degree of protection:	IP20,
Way of mounting	Handle for DIN rail

Electrical parameters	
Power supply	**10…36 VDC**,
Max. constant current	12A (for VDC= 12V) 6A (for VDC= 24V) 4A (for VDC= 36V)
Max. peak current	30A
Regulation of velocity	Digital (PWM signal, 1kHz)
Control inputs DIR, EN, STOP	Opt insulated, >5..24 VDC (active input), <2V – non active input
Analog input 0..5V	Input resistance 47k, max. 5V
Communication	RS485 MODBUS-RTU, (default 38400bps, 8:n:1, address: 1)