

## Servo Amplifier

2-Quadrant PWM for Brushless DC-Servomotors

Series BLD 5018





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## General information

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### 1. Description

The devices of the construction line BLD 5018 are 2Q Servo amplifier with electronic commutation for three-phase brushless DC-Servomotors with Hall sensors which are arranged offset at 120°.

These Servo Amplifiers assess the rotor position over the integrated hallsensors. The commutation logic controls a MOSFET power stage with high efficiency rate that supplies the specific part winding of the motor. A protection device against thermal overload is integrated.

The device can be attached nearby the motor due to the compact module construction line, the result is a better power tracking.

The adjustment of the speed set value and speed adaptation also for motor nominal current is to be set by internal potentiometers. Control inputs for the motor turning direction and enable function are included. The connection is by a robust screw terminal.

### 2. Illustration



Figure 1

## Specification & dimensions

3. Specification	BLD 5018-SC2P	
Power supply	20 ÷ 50	V DC
Switching frequency	20	kHz
Continuous output current @ TA = 22°C	18	A
Analog input command: <sup>1)</sup>		
– Voltage range	0 ÷ 5	V DC
Logic input		
	TTL	
Supply voltage for Hall sensors (max. 20 mA)		
	5	V DC
Maximum controllable speed <sup>2)</sup>		
	12 000	rpm
Minimum controllable speed <sup>3)</sup>		
	800	rpm
External inductance <sup>4)</sup>		
	0 ÷ 300	μH
Temperature range:		
– Operating temperature	–10 ... + 45	°C
– Storage temperature	–40 ... + 85	°C
Weight		
	360	g

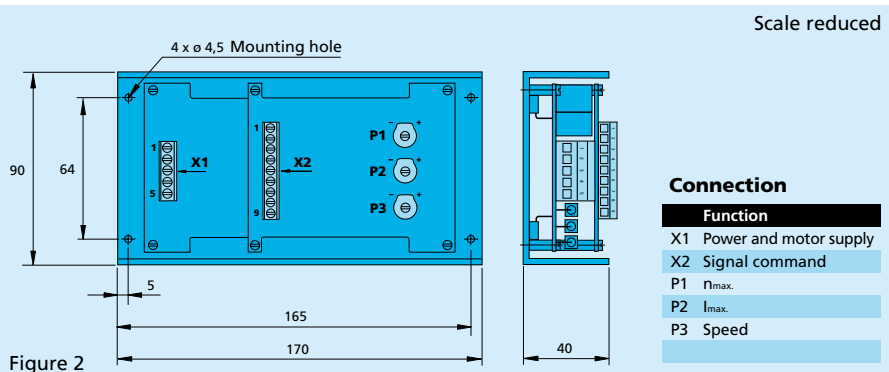
<sup>1)</sup> Analog input command may be set by an external potentiometer or an external voltage.

<sup>2)</sup> The maximum controllable speed depends on the power supply, the motor type and the load.

<sup>3)</sup> The minimum controllable speed depends on the motor type and the load.

<sup>4)</sup> The appropriate value depends on the operating cycle and working conditions.

## 4. Dimensions and weight



## Safety notes and connection informations

### 5. Safety notes

- Operating voltages exceeding the specified values or reverse-connection will destroy the devices.
- Unauthorised opening and improper repairs will put the user in danger.
- If the module is brought from a cold environment into the operating environment, there can be condensation. Wait until the module has reached the right temperature and is absolutely dry before it is put into operation.

#### 5.1 Connection informations

##### 9-pin connector (signals)

Plug loading

Nr.	Printing	Description
1	<b>H1</b>	Hall sensor 1
2	<b>H2</b>	Hall sensor 2
3	<b>H3</b>	Hall sensor 3
4	<b>UH</b>	Supply voltage for Hall sensors
5	<b>GND</b>	Ground connection for Hall sensors
6	<b>Dis</b>	Control Input disable (free circuit)
7	<b>Rev</b>	Control Input reverse (turning direction)
8	<b>GND</b>	Ground for control and set value input
9	<b>Spd</b>	Set value input for speed

##### 5-pol connectors (power)

Nr.	Printing	Description
1	<b>Ub</b>	Supply voltage +
2	<b>L1</b>	Motorwinding 1
3	<b>L2</b>	Motorwinding 2
4	<b>L3</b>	Motorwinding 3
5	<b>GND</b>	Ground for supply voltage

# Preparing

## 6. Preparing

### 6.1 Control input for turning direction (Rev)

The control input „Rev“ is for changing the turning direction and can be controlled as following:

- With external switch
- Open collector transistor
- With TTL/CMOS module

"Rev" not connected or high level	"Rev" connected to GND 8 or low level
Turning clockwise	Turning counter clockwise
Direction of rotation can be changed only when motor stopped.	

### 6.2 Control input for disable (Dis)

The control input „Dis“ is for disabling the unit and can be controlled as following:

- With external switch
- Open collector transistor
- With TTL/CMOS module

"Dis" not connected or high level	"Dis" connected to GND 8 or low level
Motor is turning	Motor does not turn

**Important notice:**

For stopping the motor it is not advisable to make the set value to 0, but support this through disable. Some motors could otherwise drift shortly. This happens through the integral part of those controllers.

## Preparing

### 6.3 Set value for speed

The set value for the speed can be preset like following:

6.3.1 By the means of the internal trimming potentiometer „speed“

6.3.2 By the means of an external potentiometer

6.3.3 By the means of external voltage

#### 6.3.1 Set value with the internal trimming potentiometer „speed“

Short circuit between „GND 8“ and „Spd 9“.

Turn trimming potentiometer „Speed“ to -: The speed is decreasing

Turn trimming potentiometer „Speed“ to +: The speed is increasing

#### 6.3.2 Set value with an external potentiometer

The built in trimming potentiometer „Speed“ has to be positioned on – for this.

An external potentiometer with 10K is required. The potentiometer is to be connected as following:

Start: at „UH4“

End: at „GND 8“

wiper: at „Spd 9“

#### 6.3.3 Set value with external voltage

The built in trimming potentiometer „speed“ has to be positioned on –

The external set value is connected as following:

Set value GND to „GND 8“

Set value at „Spd9“

Set value voltage	Speed
= 0V	Stop
> 0,1V to about 4,5V	Speed according to set value voltage with speed control
> 4,5V to about 5V	Motor turns with maximum speed, according the supply voltage and is out of regulating range

### 6.4 Adjusting motor current ( $I_{max}$ )

The current preset by trimming potentiometer „I<sub>max</sub>.“ as following:

Type	Maximum left position	Maximum right position
BLD 5018	6 -7 A	> 18A

### 6.5 Shut down at overheat

The controller shuts down automatically when the temperature at the inside of the heat sink exceeds 80°C .

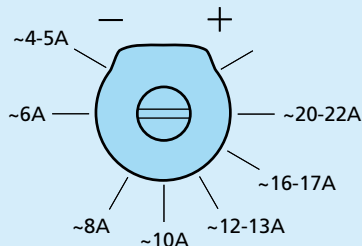
## Considerations and procedure

### 7. Considerations and procedure

#### 7.1 Considerations to put the device into operation

Please follow the sequence!

1. Connect Motor to L1, L2 and L3
2. Connect Hall sensors H1, H2, H3 as well as Hall sensor supply to „UH4“ and GND to „GND 5“ from Hall sensors.
3. Connect control inputs according to requirements.
4. Preadjust potentiometer (270°):
  - At internal set value of the speed turn trimming potentiometer speed to – (short circuit between „GND 8“ and „Spd“)
  - At external set value of the speed turn trimming potentiometer speed to – and connect 0V to „Spd 9“ against „GND 8“.
  - Turn trimming potentiometer I<sub>max.</sub> to +
  - Preadjust trimming potentiometer n<sub>max.</sub> according to required maximum speed:  
+ : max. speed  
- : min. speed
5. Connect supply voltage
6. Increase speed set value by Trimming potentiometer or by external set value.  
As long as the controller is in the active regulating range, the speed can be adjusted by trimming potentiometer speed at a constant external set value.
7. Adjust maximum current with trimming potentiometer I<sub>max.</sub>



Potentiometer I<sub>max.</sub>

## Considerations and procedure

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### 7.2 Considerations to power supply

Output voltage:

>12V und <V<sub>CC</sub> with a residual voltage of <5%

Higher voltages will destroy device.

Output current:

Corresponding to the required torque and possible reserves for acceleration.

### 7.3 Procedure for calculating the required minimum supply voltage:

Default:

Operating moment:

M<sub>B</sub> [mNm]

Operating speed:

n<sub>B</sub> [min<sup>-1</sup>]

Rated voltage of motor:

U<sub>N</sub> [V]

Idling speed with U<sub>N</sub>:

n<sub>0</sub> [min<sup>-1</sup>]

Characteristic curve slope:

$\frac{\Delta n}{\Delta M}$  [min<sup>-1</sup> mNm]

Result:

$$V_{CC} = \frac{U_N}{n_0} \cdot \left( n_B + \frac{\Delta n}{\Delta M} \cdot M_B \right) + 4V$$

## Assembly note

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### 8. Assembly note

- Optimum heat dissipation is achieved by mounting the BLD 5018 module on a cooling surface and by the use of a thermal conduction paste.
- For longer distances between the motor and the control (>30cm), shielded cables should be used for the sensor cable and the motor cable.



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