Speed Controller

2-Quadrant PWM
configurable via PC

For combination with:
DC-Micromotors and
Brushless DC-Servomotors

Series SC 1801

		SC 1801 P	SC 1801 F	SC 1801 S	
Power supply for electronic	U_P	4,0 ... 18	4,0 ... 18	4,0 ... 18	V DC
Power supply for motor	U_{mot}	1,8 ... 18	1,8 ... 18	1,8 ... 18	V DC
Max. continuous output current [1]	I_{dauer}	1	1	1	A
Max. peak output current	I_{max}	2	2	2	A
Total standby current	$I_{el\ max}$	0,018	0,018	0,018	A
Input/output (partially free configurable)		3	3	3	
Tightening torque, terminal strip		-	0,12 ... 0,15	0,12 ... 0,15	Nm
Weight		4	10	12	g
PWM switching frequency [2]	f_{PWM}	96			kHz
Efficiency	η	95			%
Speed range:					
– BL motors with Hall sensors (digital)		500 ... 100 000			min⁻¹
– BL motors with Hall sensors (analog)		50 ... 60 000			min⁻¹
– DC motors with encoder		100 ... 30 000			min⁻¹
Scanning rate		500			µs
Resolution of encoder with DC motors		≤ 65 535			inc./rev.
Operating temperature range		– 25 ... + 60			°C
Storage temperature		– 25 ... + 85			°C

[1] at 22°C ambient temperature
[2] for brushless DC-Motors without Hall sensors: f_{PWM} 24 kHz

Versions

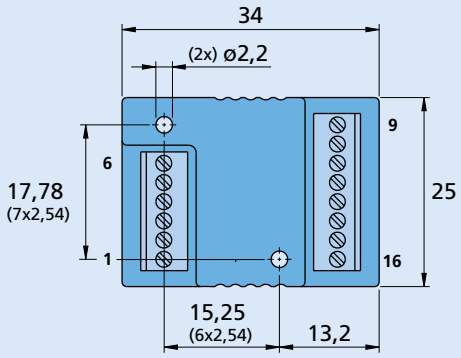
Speed Controller	Option [4]	Version: Motor Type	Version: Sensor Type	Set speed value specification [1]	Speed at U_{nsoll} =10 V	Part No.	Conformity
SC 1801 S	**3530**	BL	Hall sensors (digital) [3]	0 ... 10 V	30 000 min⁻¹	**6500.01377**	**CE**
SC 1801 S	**3531**	DC	Incremental encoder [2]	0 ... 10 V	10 000 min⁻¹	**6500.01393**	**CE**
SC 1801 F	**3533**	BL	sensorless (high speed)	0 ... 10 V	40 000 min⁻¹	**6500.01378**	**CE**
SC 1801 P	**3530**	BL	Hall sensors (digital) [3]	0 ... 10 V	30 000 min⁻¹	**6500.01379**	
SC 1801 P	**3531**	DC	Incremental encoder [2]	0 ... 10 V	10 000 min⁻¹	**6500.01394**	
SC 1801 S	**4763**	BL	Absolute encoder 2 pole	0 ... 10 V	30 000 min⁻¹	**6500.01592**	
SC 1801 P	**4763**	BL	Absolute encoder 2 pole	0 ... 10 V	30 000 min⁻¹	**6500.01593**	
SC 1801 F	**4763**	BL	Absolute encoder 2 pole	0 ... 10 V	30 000 min⁻¹	**6500.01594**	
SC 1801 S	**4289**	BL	Hall sensors (analog) 2 pole	0 ... 10 V	40 000 min⁻¹	**6500.01475**	
SC 1801 P	**4289**	BL	Hall sensors (analog) 2 pole	0 ... 10 V	40 000 min⁻¹	**6500.01476**	
SC 1801 F	**4289**	BL	Hall sensors (analog) 2 pole	0 ... 10 V	40 000 min⁻¹	**6500.01477**	
SC 1801 S	**3980**	BL	Absolute encoder 4 pole	0 ... 10 V	30 000 min⁻¹	**6500.01435**	
SC 1801 P	**3980**	BL	Absolute encoder 4 pole	0 ... 10 V	30 000 min⁻¹	**6500.01440**	
SC 1801 F	**3980**	BL	Absolute encoder 4 pole	0 ... 10 V	50 000 min⁻¹	**6500.01441**	
SC 1801 S	**4764**	BL	Hall sensors (analog) 4 pole	0 ... 10 V	10 000 min⁻¹	**6500.01595**	
SC 1801 P	**4764**	BL	Hall sensors (analog) 4 pole	0 ... 10 V	10 000 min⁻¹	**6500.01596**	
SC 1801 F	**4764**	BL	Hall sensors (analog) 4 pole	0 ... 10 V	10 000 min⁻¹	**6500.01597**	

[1] The velocity range can be configured by software. Versions with PWM and other configurations are available on request.
[2] Preset value is 512 lines
[3] Factory pre-configured for 2 pole motors. For operation with 4 pole motors the speed controller must be reconfigured with the software "FAULHABER Motion Manager".
[4] For changes to the factory setting the use of a programming adapter is required (see accessories).

Accessories

		Motor Type	for SC 1801 S Part No.
Programming adapter	**Starterkit**		**6501.00088**
Programming adapter			**6501.00097**
Motor connector adapter	**0620 ... B**	BL	**6501.00083**
	penny-motor	BL	**6501.00090**
	BX4	BL	**6501.00085**
Encoder adapter	**IE2**	DC	**6501.00084**
	HEDS	DC	**6501.00001**

Dimensional drawing and connection information SC 1801 S

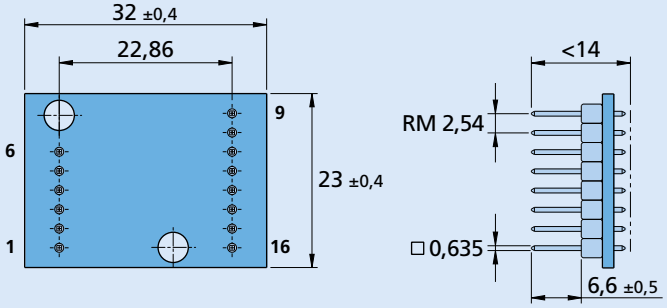


SC 1801 S

Connection

No.	Function
1	U_P
2	U_{mot}
3	GND
4	U_{nsoll}
5	DIR
6	FG
9	Mot C
10	Mot B
11	Mot A
12	SGND
13	V_{CC}
14	Sens C
15	Sens B
16	Sens A

Dimensional drawing and connection information SC 1801 P

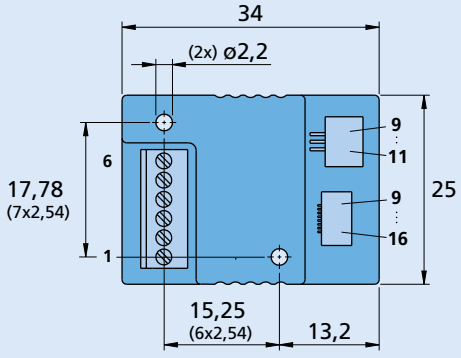


SC 1801 P

Connection

No.	Function
1	U_P
2	U_{mot}
3	GND
4	U_{nsoll}
5	DIR
6	FG
9	Mot C
10	Mot B
11	Mot A
12	SGND
13	V_{CC}
14	Sens C
15	Sens B
16	Sens A

Dimensional drawing and connection information SC 1801 F



SC 1801 F

Connector Information
LIF-Connector
3-pole and 8-pole

Connection

No.	Function
1	U_P
2	U_{mot}
3	GND
4	U_{nsoll}
5	DIR
6	FG
9	Mot C
10	Mot B
11	Mot A
12	SGND
13	V_{CC}
14	Sens C
15	Sens B
16	Sens A

SC Function

Description of connections (Motor-dependent)

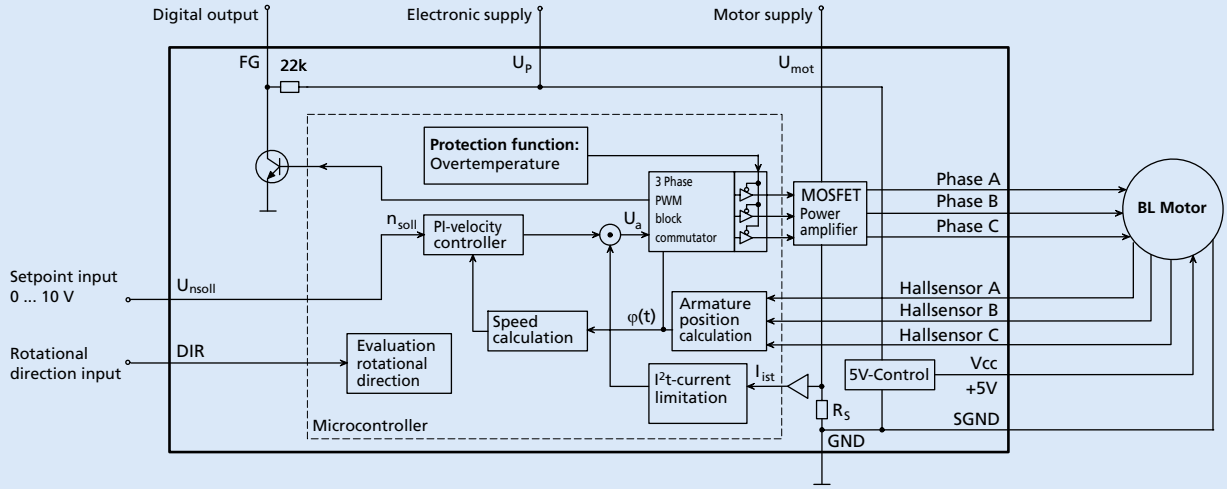
		DC-Motors with Encoder	BL-Motors with Hall sensors	BL-Motors with Absolute encoder	BL-Motors with digital Hall sensors + encoder	BL-Motors with digital Hall sensors + brake/enable
Connection "Mot A", "Mot B", "Mot C":						
– Motor connection	Mot A	Mot +	Phase A	Phase A	Phase A	Phase A
	Mot B	Mot -	Phase B	Phase B	Phase B	Phase B
	Mot C	*reserved*	Phase C	Phase C	Phase C	Phase C
Connection "Sens A", "Sens B", "Sens C":						
– Sensor input	Sens A	*reserved*	Hall sensor A	DATA	Hall sensor A	Hall sensor A
	Sens B	encoder canal A	Hall sensor B	*reserved*	Hall sensor B	Hall sensor B
	Sens C	encoder canal B	Hall sensor C	CLK	Hall sensor C	Hall sensor C
	f	≤ 400 kHz				
Connection „IO1", „IO2"						
- logic input	IO1	*reserved*	*reserved*	*reserved*	encoder B	brake
	IO2	*reserved*	*reserved*	*reserved*	encoder A	enable

Connection information (general)

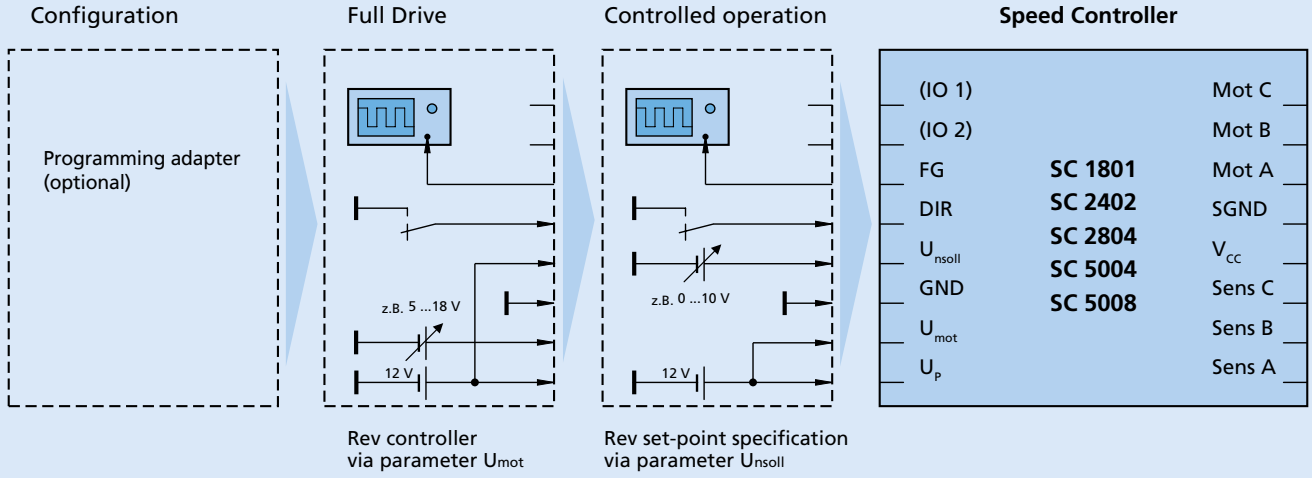
Connection "U_P":		U_P	power supply electronic
Connection "U_{mot}":		U_{mot}	power supply motor coil
Connection "GND":			ground
Connection "U_{nsoll}":		U_{in} = 0 ... 10 V / > 10 V ... max. U_P [1]	(standard version)
– analog input	set speed value	U_{in} < 0,15 V	motor stops
		U_{in} > 0,3 V (0,5 V) [2]	motor starts
– digital input	PWM for set speed value	500 ... 18 000 Hz	
	duty cycle	d = 0%	motor stopped
		d = 50%	half of maximum speed
		d = 100%	maximum speed
	input resistance	R_{in} ≥ 5 kΩ	
	signal level PLC	7,5 ... U_P	high
		0 ... 2	low
	signal level TTL [3]	2,8 ... U_P	high
		0 ... 0,5	low
Connection "DIR":			
– digital input	direction of rotation	to ground or level < 0,5 V	counterclockwise
		level > 3,0 V	clockwise
	input resistance	R_{in} ≥ 10 kΩ	
Connection "FG":		max. U_P / 15 mA	open collector with pull-up resistor [4]
– fault output		switched through to GND	no error
– frequency output (BL motor only)		1, 3, 6, 8, 16 [5]	lines per revolution
Connection "IO1", "IO2":		n.c.	*reserved*
– digital input [6]			
	signal level TTL	2,8 ... *Up*	high
		0 ... 0,5	low
	(IO2)	high	motor enabled
		low	motor disabled
	(IO1)	high	motor stopped
		low	motor run
Connection "V_{CC}":			
	output voltage	5 V DC	for external use
	max. output current for	SC 1801 S, F, P	» I_{CC} = 25 mA
		SC 2402 P	» I_{CC} = 20 mA
		SC 2804 S	» I_{CC} = 30 mA
		SC 5004 P	» I_{CC} = 100 mA
		SC 5008 S	» I_{CC} = 100 mA
Connection "SGND":			signal ground

[1] > 10 V for set speed value not defined.
[2] Data in parentheses apply to BL motors operating without sensors.
[3] Not available for SC 5004 / SC 5008
[4] 22 kΩ (SC 1801, SC 2402, SC 2804)
47 kΩ (SC 5004, SC 5008)
An additional external pull-up resistor can be added to improve the rise time.
Caution: I_{out} max. 15 mA must not be exceeded.
[5] Values apply to 2-pole motors. The given values double for 4-pole motors.
[6] With appropriate hardware.

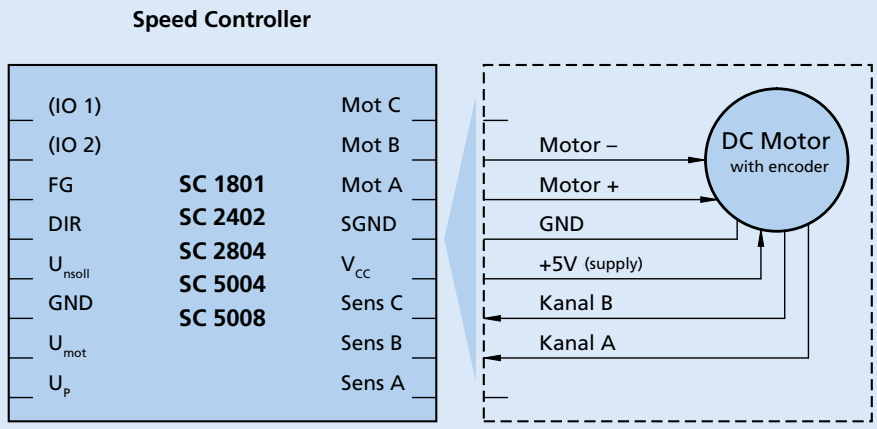
Circuit diagram - brushless with Hall sensors (Option 3530)



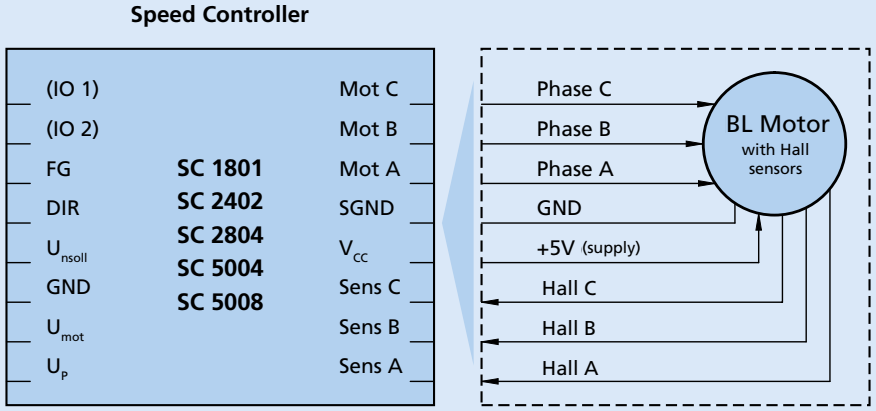
Connection diagramm supply unit



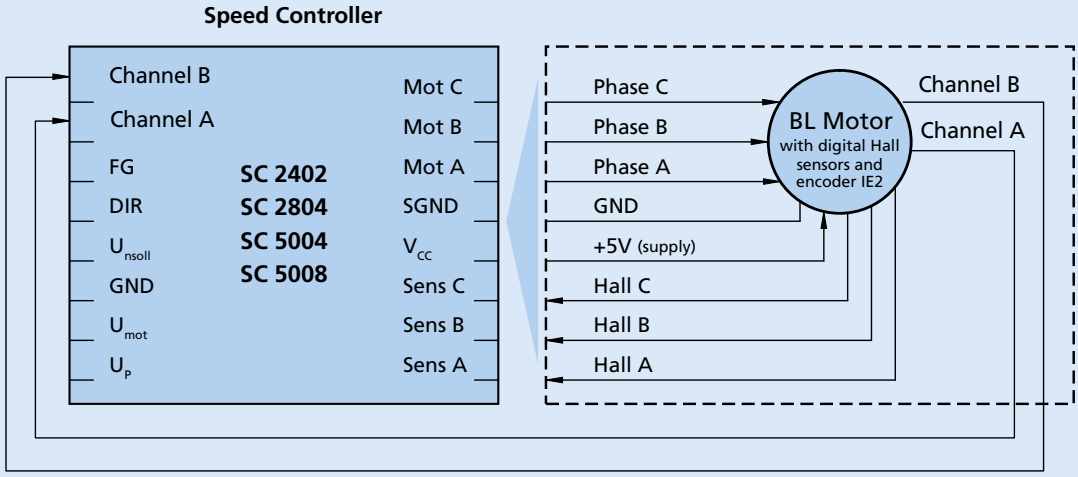
Connection diagram operation mode DC-Micromotor with encoder



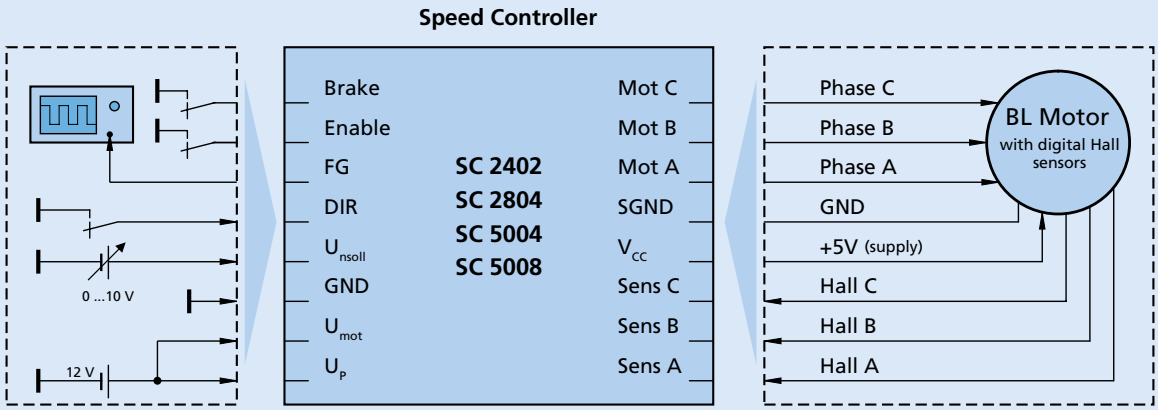
Connection diagram operation mode BL motor with Hall Sensors



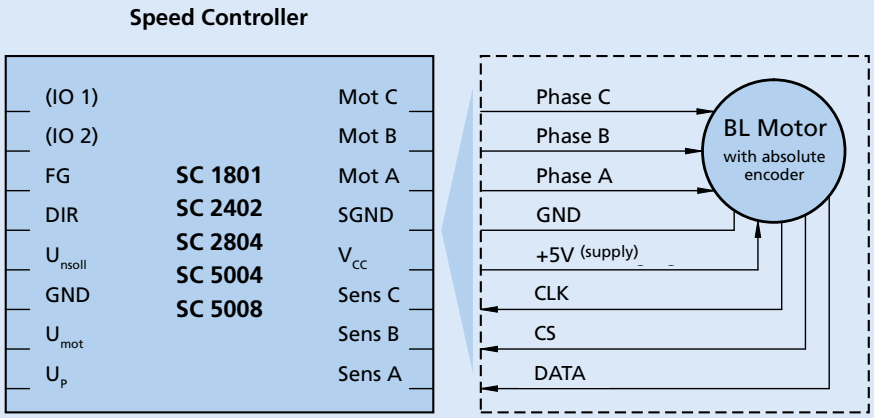
Connection diagram operation mode BL motor with digital Hall Sensors and Encoder



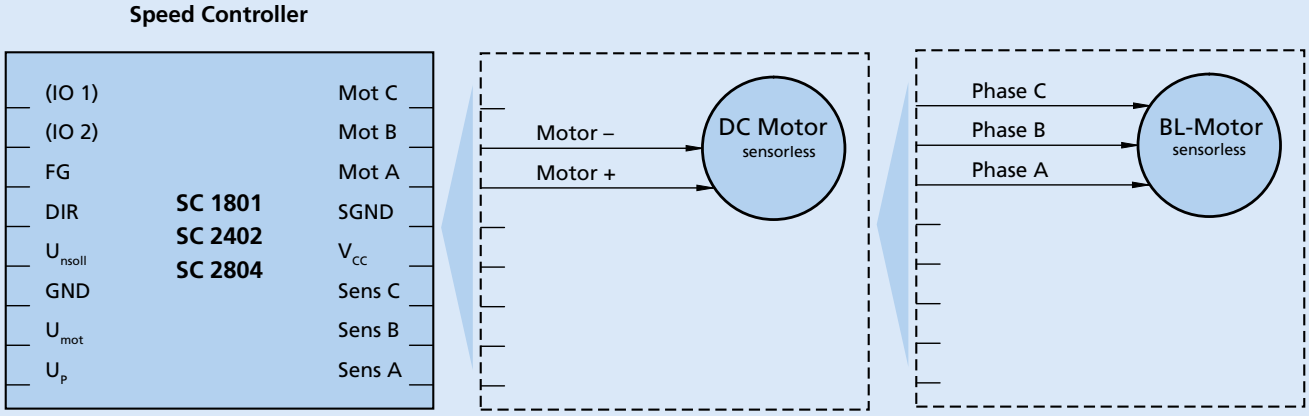
Connection diagram operation mode BL motor with digital Hall Sensors and Brake / Enable



Connection diagram operation mode BL motor with AES



Connection diagram operation mode DC and BL motor sensorless



Speed Controller

2-Quadrant PWM
configurable via PC

For combination with:
DC-Micromotors and
Brushless DC-Servomotors

Series SC 2402

		SC 2402 P	
Power supply for electronic	U_P	5 ... 24	V DC
Power supply for motor	U_{mot}	0 ... 24	V DC
Max. continuous output current [1]	I_{dauer}	2	A
Max. peak output current	I_{max}	4	A
Total standby current	$I_{el\ max}$	0,03	A
Input/output (partially free configurable)		5	
Weight		14	g
PWM switching frequency [2]	f_{PWM}	96	kHz
Efficiency	η	95	%
Speed range:			
– BL motors with Hall sensors (digital)		500 ... 100 000	min^{-1}
– BL motors with Hall sensors (analog)		50 ... 60 000	min^{-1}
– BL motors with digital Hall + encoder		50 ... 30 000	min^{-1}
– DC motors with encoder		100 ... 30 000	min^{-1}
Scanning rate		500	µs
Resolution of encoder with DC motors		≤ 65 535	inc./rev.
Operating temperature range		– 25 ... + 60	°C
Storage temperature		– 25 ... + 85	°C

[1] at 22°C ambient temperature
[2] for brushless DC-Motors without Hall sensors: f_{PWM} 24 kHz

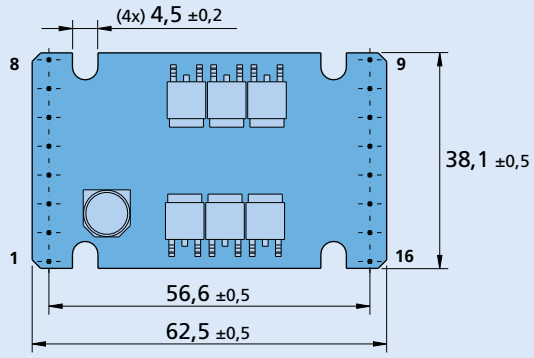
Versions

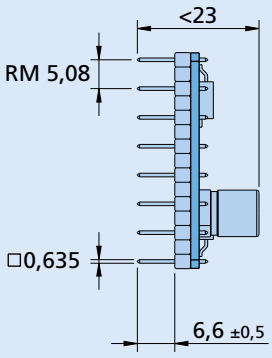
Speed Controller	Option [4]	Version Motor Type	Sensor Type	Set speed value specification [1]	Speed at U_{nsoll} =10 V	Part No.
SC 2402 P	**3530**	BL	Hall sensors (digital) [3]	0 ... 10 V	20 000 min^{-1}	**6500.01381**
SC 2402 P	**3531**	DC	Incremental encoder [2]	0 ... 10 V	10 000 min^{-1}	**6500.01392**
SC 2402 P	**4763**	BL	Absolute encoder 2 pole	0 ... 10 V	30 000 min^{-1}	**6500.01599**
SC 2402 P	**4289**	BL	Hall sensors (analog) 2 pole	0 ... 10 V	20 000 min^{-1}	**6500.01474**
SC 2402 P	**3980**	BL	Absolute encoder 4 pole	0 ... 10 V	20 000 min^{-1}	**6500.01439**
SC 2402 P	**4764**	BL	Hall sensors (analog) 4 pole	0 ... 10 V	10 000 min^{-1}	**6500.01601**
SC 2402 P	**4475**	BL	Digital Hall + encoder [3]	0 ... 10 V	20 000 min^{-1}	**6500.01520**
SC 2402 P	**4476**	BL	Digital Hall + brake/enable [3]	0 ... 10 V	20 000 min^{-1}	**6500.01522**

[1] The velocity range can be configured by software. Versions with PWM and other configurations are available on request.
[2] preset value is 512 lines
[3] Factory pre-configured for 2 pole motors. For operation with 4 pole motors the speed controller must be reconfigured with the software "FAULHABER Motion Manager"
[4] For changes to the factory setting the use of a programming adapter is required (see accessories).

Dimensional drawing and connection information SC 2402 P

Scale reduced





SC 2402 P

Connection

No.	Function
1	U_P
2	U_{mot}
3	GND
4	U_{nsoll}
5	DIR
6	FG
7	IO 2
8	IO 1
9	Mot C
10	Mot B
11	Mot A
12	SGND
13	V_{CC}
14	Sens C
15	Sens B
16	Sens A

SC Function

Description of connections (Motor-dependent)

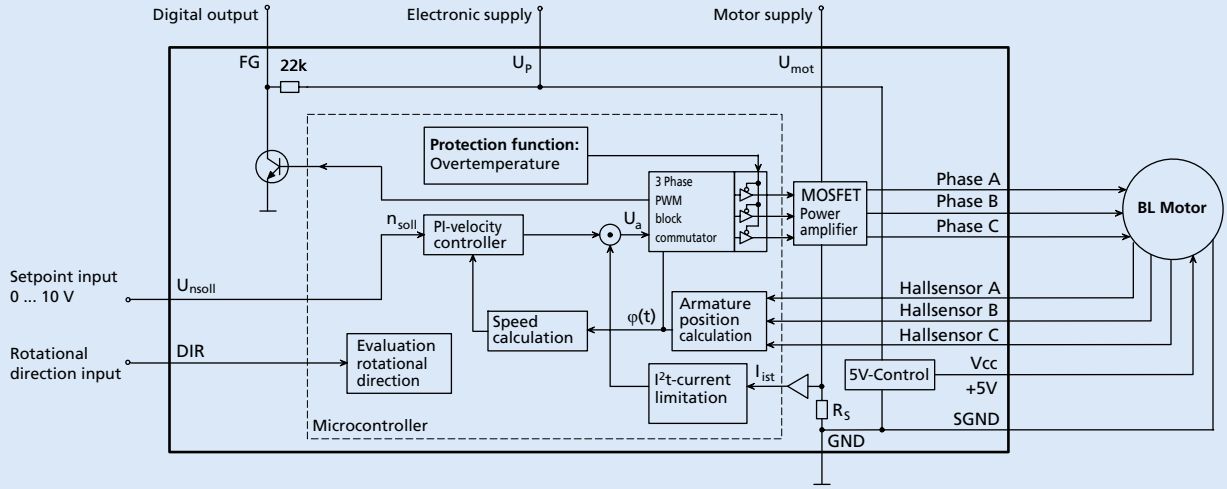
		DC-Motors with Encoder	BL-Motors with Hall sensors	BL-Motors with Absolute encoder	BL-Motors with digital Hall sensors + encoder	BL-Motors with digital Hall sensors + brake/enable
Connection "Mot A", "Mot B", "Mot C":						
– Motor connection	Mot A	Mot +	Phase A	Phase A	Phase A	Phase A
	Mot B	Mot -	Phase B	Phase B	Phase B	Phase B
	Mot C	*reserved*	Phase C	Phase C	Phase C	Phase C
Connection "Sens A", "Sens B", "Sens C":						
– Sensor input	Sens A	*reserved*	Hall sensor A	DATA	Hall sensor A	Hall sensor A
	Sens B	encoder canal A	Hall sensor B	*reserved*	Hall sensor B	Hall sensor B
	Sens C	encoder canal B	Hall sensor C	CLK	Hall sensor C	Hall sensor C
	f	≤ 400 kHz				
Connection „IO1", „IO2"						
- logic input	IO1	*reserved*	*reserved*	*reserved*	encoder B	brake
	IO2	*reserved*	*reserved*	*reserved*	encoder A	enable

Connection information (general)

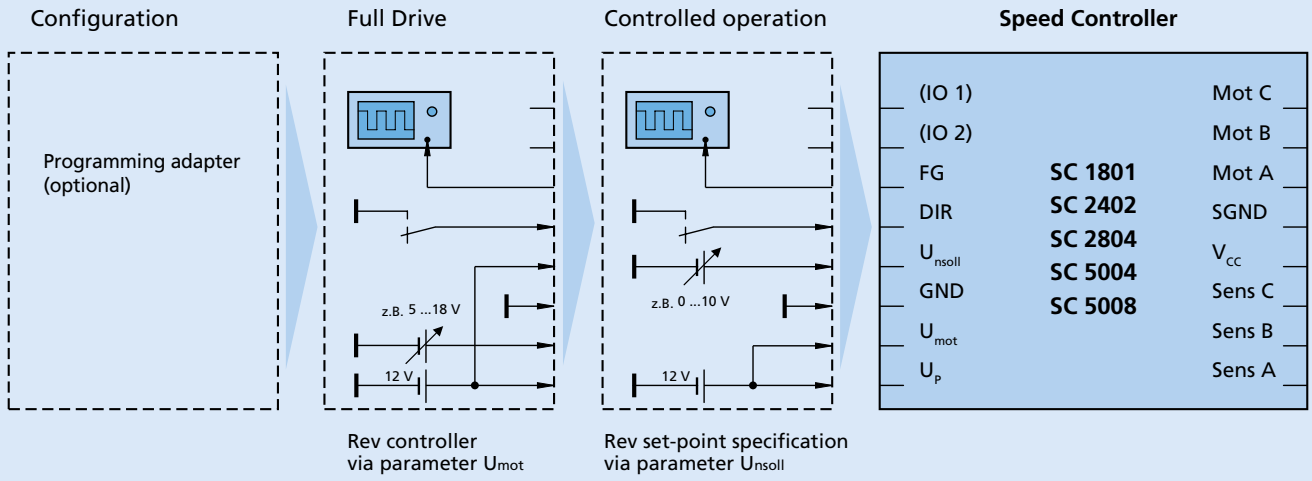
Connection "U_P":		U_P	power supply electronic
Connection "U_{mot}":		U_{mot}	power supply motor coil
Connection "GND":			ground
Connection "U_{nsoll}":		U_{in} = 0 ... 10 V / > 10 V ... max. U_P [1]	(standard version)
– analog input	set speed value	U_{in} < 0,15 V	motor stops
		U_{in} > 0,3 V (0,5 V) [2]	motor starts
– digital input	PWM for set speed value	500 ... 18 000 Hz	
	duty cycle	d = 0%	motor stopped
		d = 50%	half of maximum speed
		d = 100%	maximum speed
	input resistance	R_{in} ≥ 5 kΩ	
	signal level PLC	7,5 ... U_P	high
		0 ... 2	low
	signal level TTL [3]	2,8 ... U_P	high
		0 ... 0,5	low
Connection "DIR":			
– digital input	direction of rotation	to ground or level < 0,5 V	counterclockwise
		level > 3,0 V	clockwise
	input resistance	R_{in} ≥ 10 kΩ	
Connection "FG":		max. U_P / 15 mA	open collector with pull-up resistor [4]
– fault output		switched through to GND	no error
– frequency output (BL motor only)		1, 3, 6, 8, 16 [5]	lines per revolution
Connection "IO1", "IO2":		n.c.	*reserved*
– digital input [6]			
	signal level TTL	2,8 ... *Up*	high
		0 ... 0,5	low
	(IO2)	high	motor enabled
		low	motor disabled
	(IO1)	high	motor stopped
		low	motor run
Connection "V_{CC}":			
	output voltage	5 V DC	for external use
	max. output current for	SC 1801 S, F, P	» I_{CC} = 25 mA
		SC 2402 P	» I_{CC} = 20 mA
		SC 2804 S	» I_{CC} = 30 mA
		SC 5004 P	» I_{CC} = 100 mA
		SC 5008 S	» I_{CC} = 100 mA
Connection "SGND":			signal ground

[1] > 10 V for set speed value not defined.
[2] Data in parentheses apply to BL motors operating without sensors.
[3] Not available for SC 5004 / SC 5008
[4] 22 kΩ (SC 1801, SC 2402, SC 2804)
47 kΩ (SC 5004, SC 5008)
An additional external pull-up resistor can be added to improve the rise time.
Caution: I_{out} max. 15 mA must not be exceeded.
[5] Values apply to 2-pole motors. The given values double for 4-pole motors.
[6] With appropriate hardware.

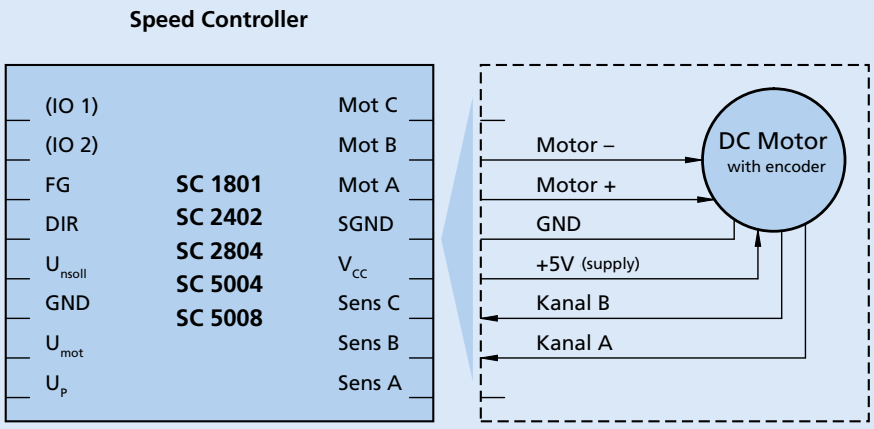
Circuit diagram - brushless with Hall sensors (Option 3530)



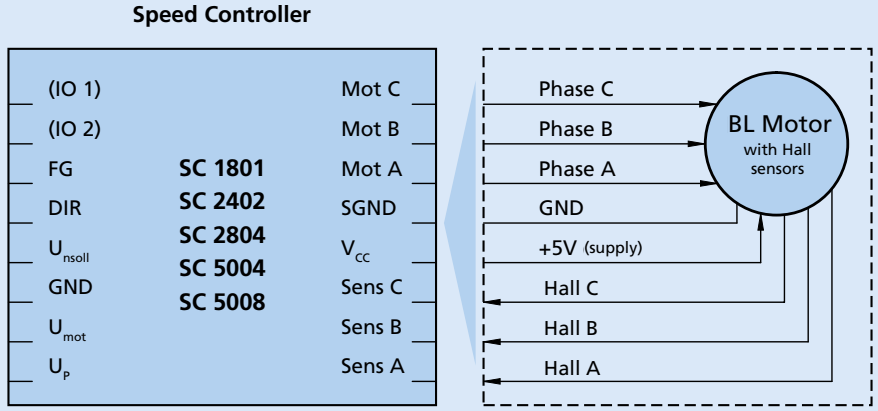
Connection diagramm supply unit



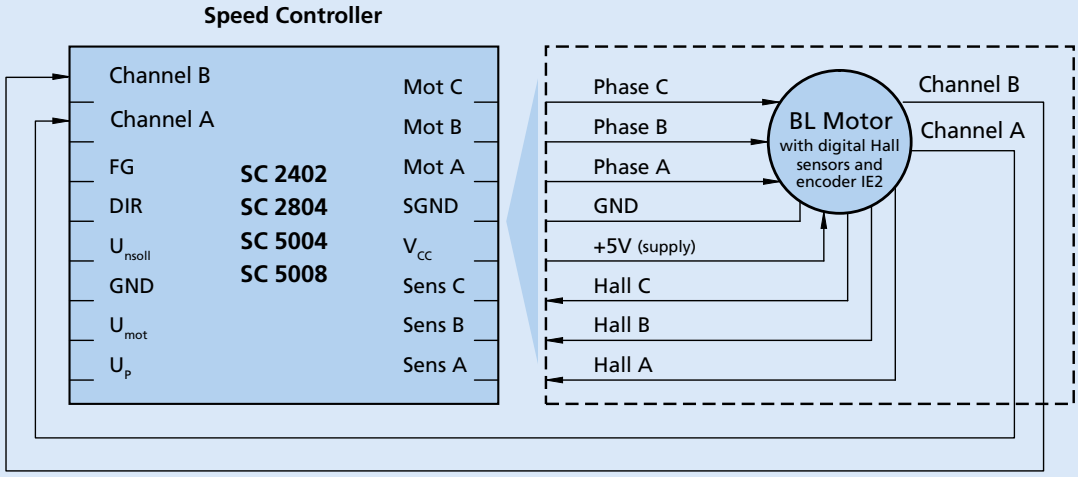
Connection diagram operation mode DC-Micromotor with encoder



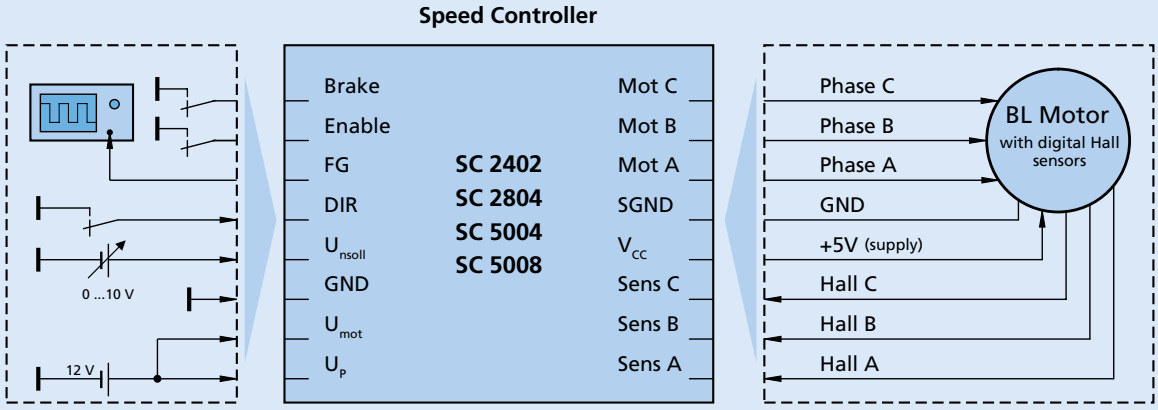
Connection diagram operation mode BL motor with Hall Sensors



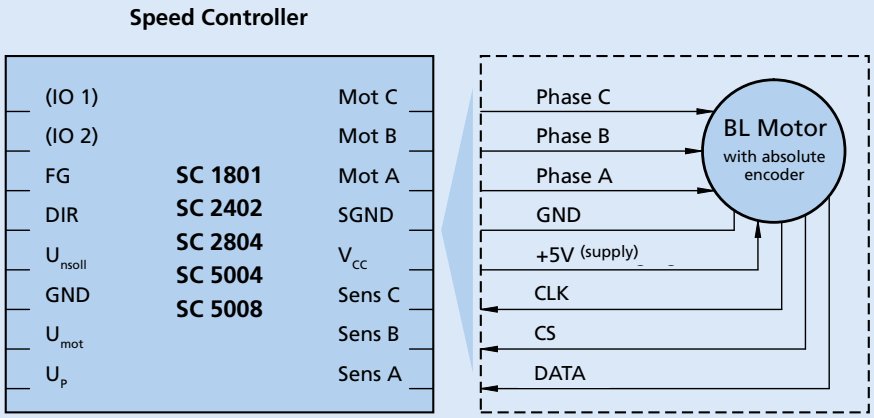
Connection diagram operation mode BL motor with digital Hall Sensors and Encoder



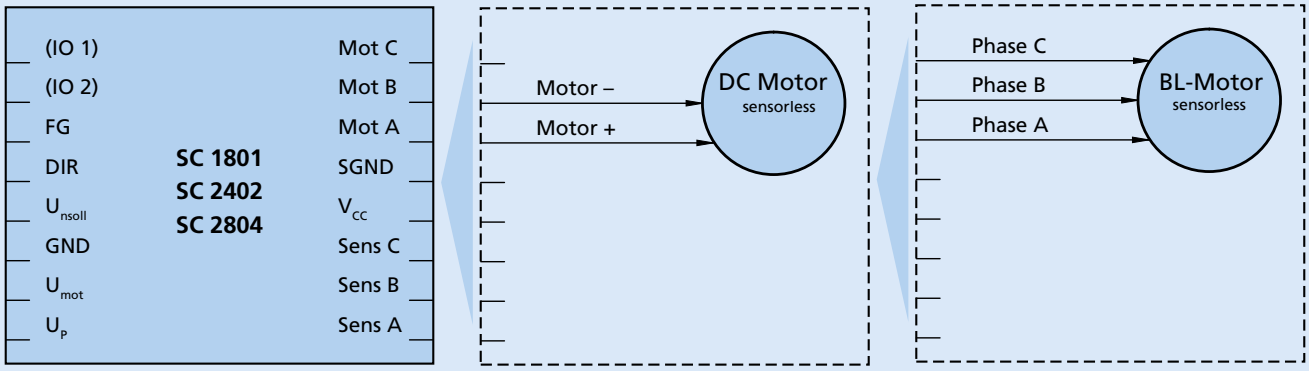
Connection diagram operation mode BL motor with digital Hall Sensors and Brake / Enable



Connection diagram operation mode BL motor with AES



Connection diagram operation mode DC and BL motor sensorless



Speed Controller

2-Quadrant PWM
configurable via PC

For combination with:
DC-Micromotors and
Brushless DC-Servomotors

Series SC 2804

		SC 2804 S	
Power supply for electronic	U_P	5 ... 28	V DC
Power supply for motor	U_{mot}	0 ... 28	V DC
Max. continuous output current [1]	I_{dauer}	4	A
Max. peak output current	I_{max}	8	A
Total standby current	$I_{el\ max}$	0,03	A
Input/output (partially free configurable)		5	
Tightening torque, terminal strip		0,5 ... 0,6	Nm
Weight		160	g
PWM switching frequency [2]	f_{PWM}	96	kHz
Efficiency	η	95	%
Speed range:			
– BL motors with Hall sensors (digital)		500 ... 100 000	min⁻¹
– BL motors with Hall sensors (analog)		50 ... 60 000	min⁻¹
– BL motors with digital Hall + encoder		50 ... 30 000	min⁻¹
– DC motors with encoder		100 ... 30 000	min⁻¹
Scanning rate		500	µs
Resolution of encoder with DC motors		≤ 65 535	inc./rev.
Operating temperature range		– 25 ... + 60	°C
Storage temperature		– 25 ... + 85	°C

[1] at 22°C ambient temperature
[2] for brushless DC-Motors without Hall sensors: f_{PWM} 24 kHz

Versions

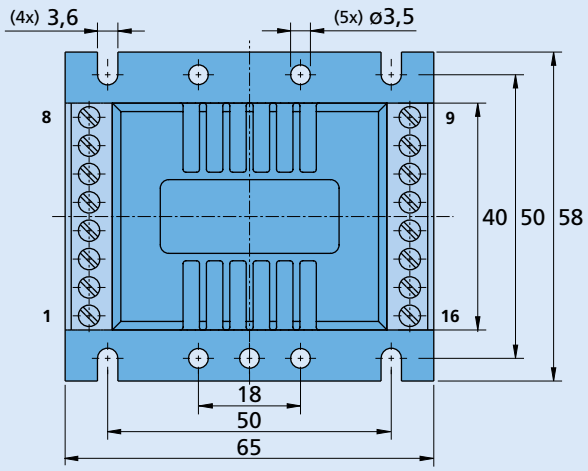
	Version						
Speed Controller	Option [4]	Motor Type	Sensor Type	Set speed value specification [1]	Speed at U_{nsoll} =10 V	Part No.	Conformity
SC 2804 S	**3530**	BL	Hall sensors (digital) [3]	0 ... 10 V	20 000 min⁻¹	**6500.01390**	**CE**
SC 2804 S	**3531**	DC	Incremental encoder [2]	0 ... 10 V	10 000 min⁻¹	**6500.01391**	**CE**
SC 2804 S	**4763**	BL	Absolute encoder 2 pole	0 ... 10 V	30 000 min⁻¹	**6500.01598**	
SC 2804 S	**4289**	BL	Hall sensors (analog) 2 pole	0 ... 10 V	20 000 min⁻¹	**6500.01473**	
SC 2804 S	**3980**	BL	Absolute encoder 4 pole	0 ... 10 V	20 000 min⁻¹	**6500.01438**	
SC 2804 S	**4764**	BL	Hall sensors (analog) 4 pole	0 ... 10 V	10 000 min⁻¹	**6500.01600**	
SC 2804 S	**4475**	BL	Digital Hall + encoder [3]	0 ... 10 V	20 000 min⁻¹	**6500.01521**	
SC 2804 S	**4476**	BL	Digital Hall + brake/enable [3]	0 ... 10 V	20 000 min⁻¹	**6500.01523**	

[1] The velocity range can be configured by software. Versions with PWM and other configurations are available on request.
[2] preset value is 512 lines
[3] Factory pre-configured for 2 pole motors. For operation with 4 pole motors the speed controller must be reconfigured with the software "FAULHABER Motion Manager"
[4] For changes to the factory setting the use of a programming adapter is required (see accessories).

Accessories

		Motor-typ	for SC 2804 S Part No.
Programming adapter	**Starterkit**		**6501.00088**
Programming adapter			**6501.00096**
Motor connector adapter	**5 mm » 2,54 mm**		**6501.00087**
	BX4	BL	**6501.00086**
Encoder adapter	**IE2**	DC	**6501.00063**
	HEDS	DC	**6501.00001**

Dimensional drawing and connection information SC 2804 S



SC 2804 S

Scale reduced

Connection

No.	Function
1	U_P
2	U_{mot}
3	GND
4	U_{nsoll}
5	DIR
6	FG
7	IO 2
8	IO 1
9	Mot C
10	Mot B
11	Mot A
12	SGND
13	V_{CC}
14	Sens C
15	Sens B
16	Sens A

SC Function

Description of connections (Motor-dependent)

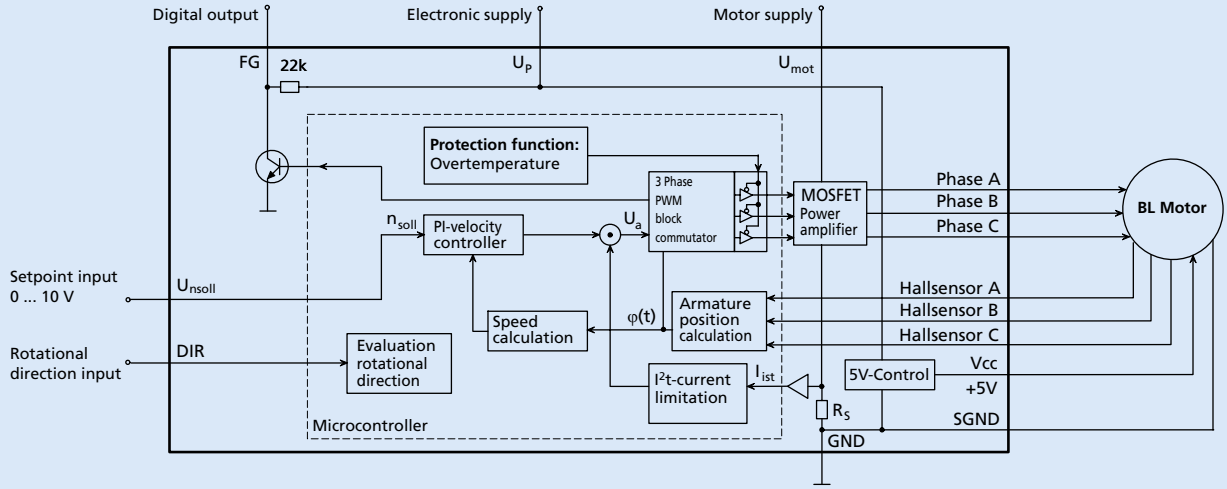
		DC-Motors with Encoder	BL-Motors with Hall sensors	BL-Motors with Absolute encoder	BL-Motors with digital Hall sensors + encoder	BL-Motors with digital Hall sensors + brake/enable
Connection "Mot A", "Mot B", "Mot C":						
– Motor connection	Mot A	Mot +	Phase A	Phase A	Phase A	Phase A
	Mot B	Mot -	Phase B	Phase B	Phase B	Phase B
	Mot C	*reserved*	Phase C	Phase C	Phase C	Phase C
Connection "Sens A", "Sens B", "Sens C":						
– Sensor input	Sens A	*reserved*	Hall sensor A	DATA	Hall sensor A	Hall sensor A
	Sens B	encoder canal A	Hall sensor B	*reserved*	Hall sensor B	Hall sensor B
	Sens C	encoder canal B	Hall sensor C	CLK	Hall sensor C	Hall sensor C
	f	≤ 400 kHz				
Connection „IO1", „IO2"						
- logic input	IO1	*reserved*	*reserved*	*reserved*	encoder B	brake
	IO2	*reserved*	*reserved*	*reserved*	encoder A	enable

Connection information (general)

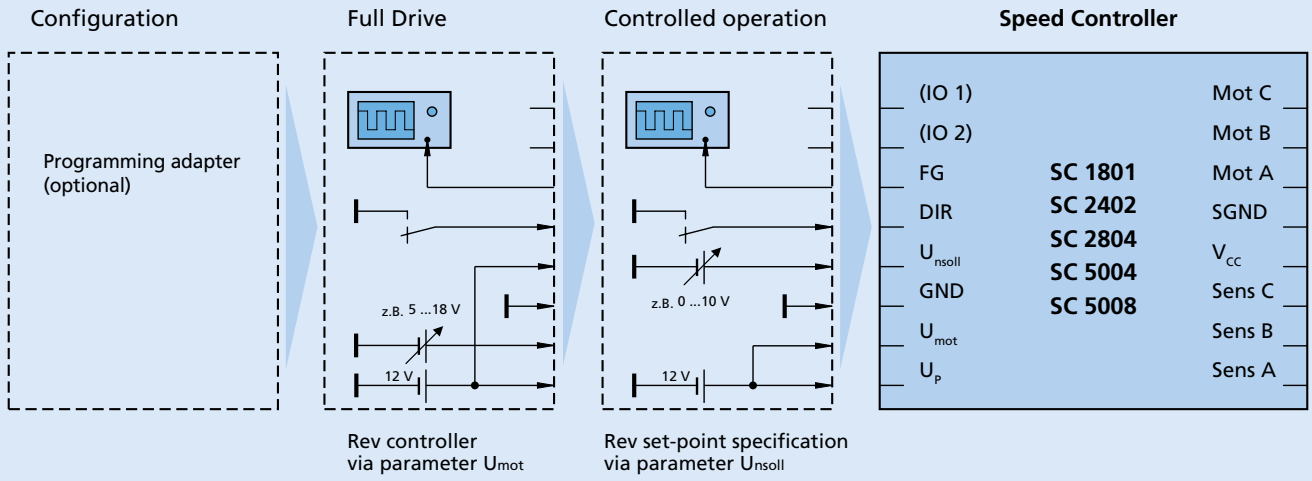
Connection "U_P":		U_P	power supply electronic
Connection "U_{mot}":		U_{mot}	power supply motor coil
Connection "GND":			ground
Connection "U_{nsoll}":		U_{in} = 0 ... 10 V / > 10 V ... max. U_P [1]	(standard version)
– analog input	set speed value	U_{in} < 0,15 V	motor stops
		U_{in} > 0,3 V (0,5 V) [2]	motor starts
– digital input	PWM for set speed value	500 ... 18 000 Hz	
	duty cycle	d = 0%	motor stopped
		d = 50%	half of maximum speed
		d = 100%	maximum speed
	input resistance	R_{in} ≥ 5 kΩ	
	signal level PLC	7,5 ... U_P	high
		0 ... 2	low
	signal level TTL [3]	2,8 ... U_P	high
		0 ... 0,5	low
Connection "DIR":			
– digital input	direction of rotation	to ground or level < 0,5 V	counterclockwise
		level > 3,0 V	clockwise
	input resistance	R_{in} ≥ 10 kΩ	
Connection "FG":		max. U_P / 15 mA	open collector with pull-up resistor [4]
– fault output		switched through to GND	no error
– frequency output (BL motor only)		1, 3, 6, 8, 16 [5]	lines per revolution
Connection "IO1", "IO2":		n.c.	*reserved*
– digital input [6]			
	signal level TTL	2,8 ... *Up*	high
		0 ... 0,5	low
	(IO2)	high	motor enabled
		low	motor disabled
	(IO1)	high	motor stopped
		low	motor run
Connection "V_{CC}":			
	output voltage	5 V DC	for external use
	max. output current for	SC 1801 S, F, P	» I_{CC} = 25 mA
		SC 2402 P	» I_{CC} = 20 mA
		SC 2804 S	» I_{CC} = 30 mA
		SC 5004 P	» I_{CC} = 100 mA
		SC 5008 S	» I_{CC} = 100 mA
Connection "SGND":			signal ground

[1] > 10 V for set speed value not defined.
[2] Data in parentheses apply to BL motors operating without sensors.
[3] Not available for SC 5004 / SC 5008
[4] 22 kΩ (SC 1801, SC 2402, SC 2804)
47 kΩ (SC 5004, SC 5008)
An additional external pull-up resistor can be added to improve the rise time.
Caution: I_{out} max. 15 mA must not be exceeded.
[5] Values apply to 2-pole motors. The given values double for 4-pole motors.
[6] With appropriate hardware.

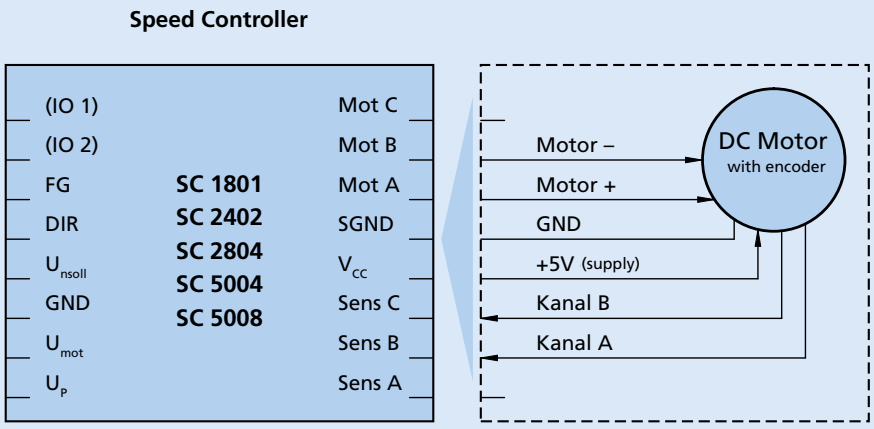
Circuit diagram - brushless with Hall sensors (Option 3530)



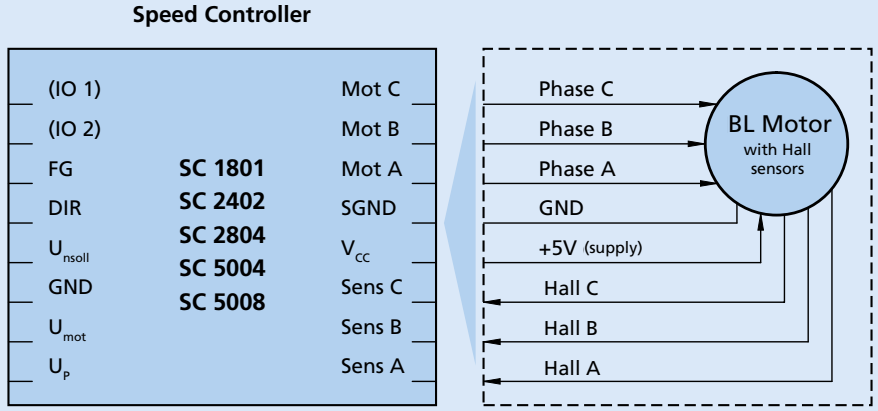
Connection diagramm supply unit



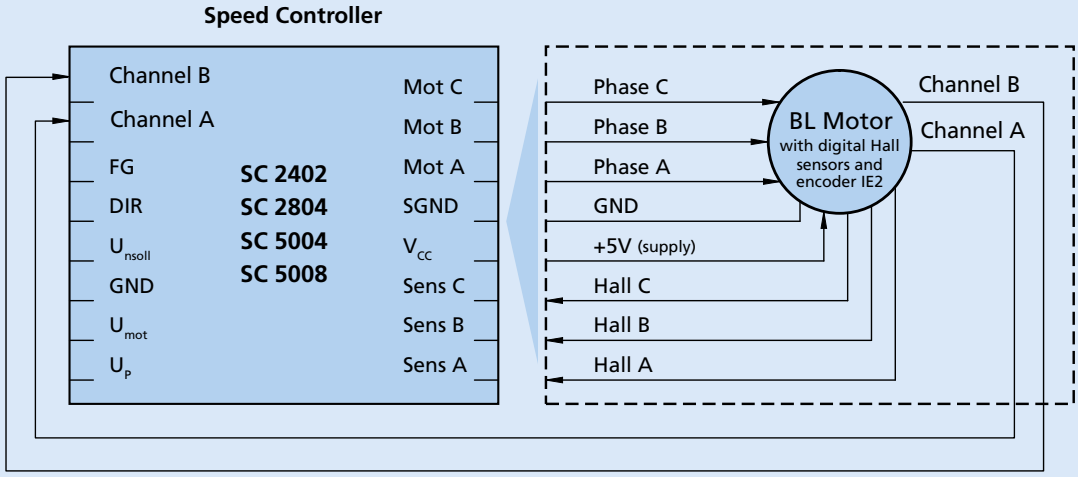
Connection diagram operation mode DC-Micromotor with encoder



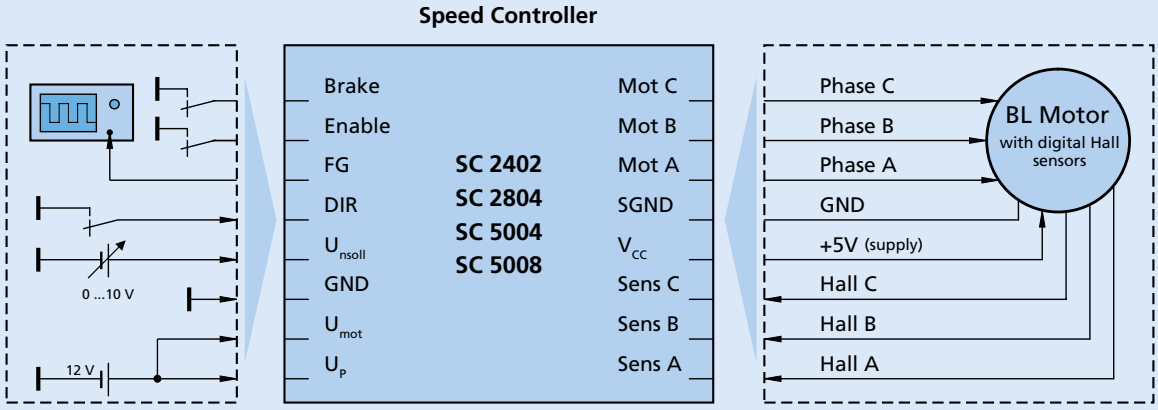
Connection diagram operation mode BL motor with Hall Sensors



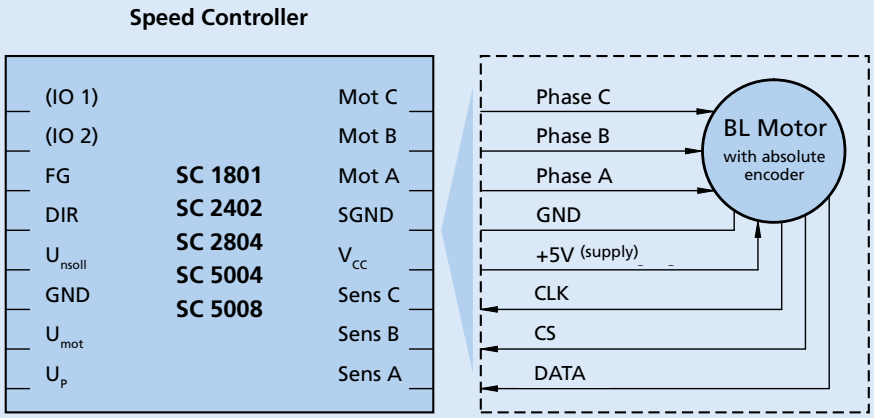
Connection diagram operation mode BL motor with digital Hall Sensors and Encoder



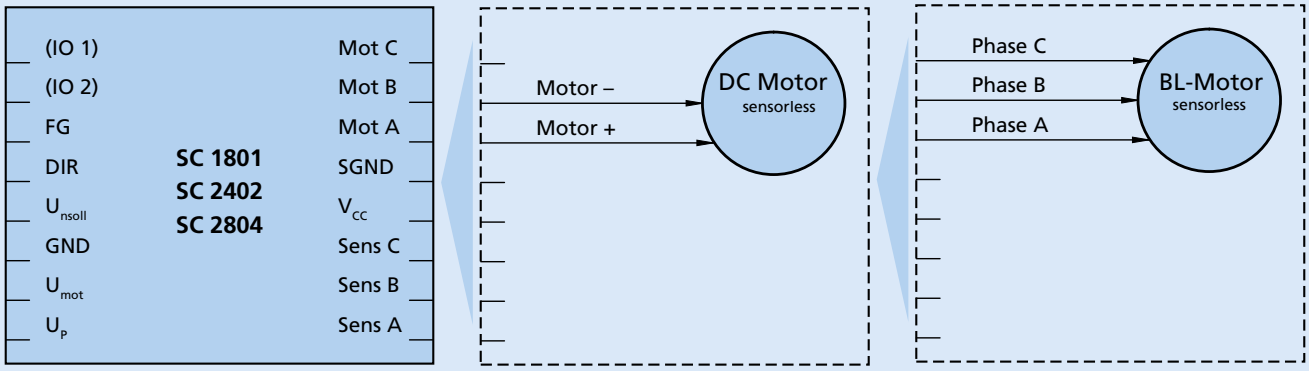
Connection diagram operation mode BL motor with digital Hall Sensors and Brake / Enable



Connection diagram operation mode BL motor with AES



Connection diagram operation mode DC and BL motor sensorless



Speed Controller

4-Quadrant PWM
configurable via PC

For combination with:
DC-Micromotors and
Brushless DC-Servomotors

Series SC 5004

		SC 5004 P	
Power supply for electronic	U_P	6 ... 50	V DC
Power supply for motor	U_{mot}	0 ... 50	V DC
Max. continuous output current [1]	I_{dauer}	4	A
Max. peak output current	I_{max}	8	A
Total standby current	$I_{el\ max}$	100	mA
Input/output (partially free configurable)		5	
Weight		14	g
PWM switching frequency [2]	f_{PWM}	96	kHz
Efficiency	η	95	%
Speed range:			
– BL motors with Hall sensors (digital)		500 ... 100 000	min^{-1}
– BL motors with Hall sensors (analog)		50 ... 60 000	min^{-1}
– BL motors with absolute encoder		50 ... 60 000	min^{-1}
– BL motors with digital Hall + encoder		50 ... 30 000	min^{-1}
– DC motors with encoder		100 ... 30 000	min^{-1}
Scanning rate		500 / 1 000	µs
Resolution of encoder with DC motors		≤ 65 535	inc./rev.
Operating temperature range		– 25 ... + 60	°C
Storage temperature		– 25 ... + 85	°C

[1] at 22°C ambient temperature
[2] for brushless DC-Motors without Hall sensors: f_{PWM} 24 kHz

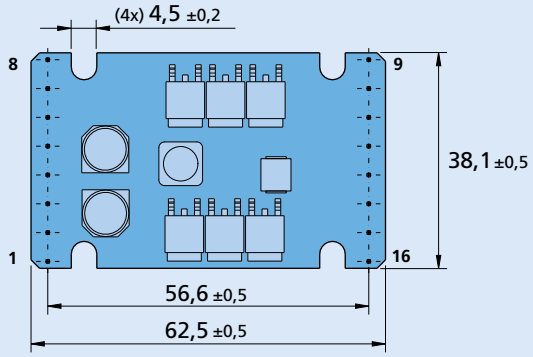
Versions

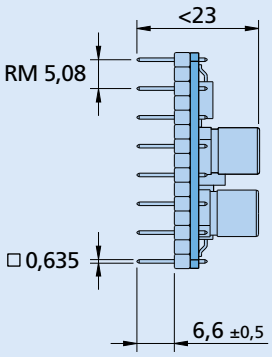
Speed Controller	Option [4]	Version: Motor Type	Version: Sensor Type	Set speed value specification [1]	Speed at U_{nsoll} =10 V	Part No.
SC 5004 P	**3530**	BL	Hall sensors (digital) [3]	0 ... 10 V	20 000 min^{-1}	**6500.01481**
SC 5004 P	**3531**	DC	Incremental encoder [2]	0 ... 10 V	10 000 min^{-1}	**6500.01483**
SC 5004 P	**4763**	BL	Absolute encoder 2 pole	0 ... 10 V	30 000 min^{-1}	**6500.01603**
SC 5004 P	**4289**	BL	Hall sensors (analog) 2 pole	0 ... 10 V	20 000 min^{-1}	**6500.01485**
SC 5004 P	**3980**	BL	Absolute encoder 4 pole	0 ... 10 V	20 000 min^{-1}	**6500.01528**
SC 5004 P	**4764**	BL	Hall sensors (analog) 4 pole	0 ... 10 V	10 000 min^{-1}	**6500.01605**
SC 5004 P	**4475**	BL	Digital Hall + encoder [3]	0 ... 10 V	20 000 min^{-1}	**6500.01524**
SC 5004 P	**4476**	BL	Digital Hall + brake/enable [3]	0 ... 10 V	20 000 min^{-1}	**6500.01526**

[1] The velocity range can be configured by software. Versions with PWM and other configurations are available on request.
[2] preset value is 512 lines
[3] Factory pre-configured for 2 pole motors. For operation with 4 pole motors the speed controller must be reconfigured with the software "FAULHABER Motion Manager"
[4] For changes to the factory setting the use of a programming adapter is required (see accessories).

Dimensional drawing and connection information SC 5004 P

Scale reduced





SC 5004 P

Connection

No.	Function
1	U_P
2	U_{mot}
3	GND
4	U_{nsoll}
5	DIR
6	FG
7	IO 2
8	IO 1
9	Mot C
10	Mot B
11	Mot A
12	SGND
13	V_{CC}
14	Sens C
15	Sens B
16	Sens A

SC Function

Description of connections (Motor-dependent)

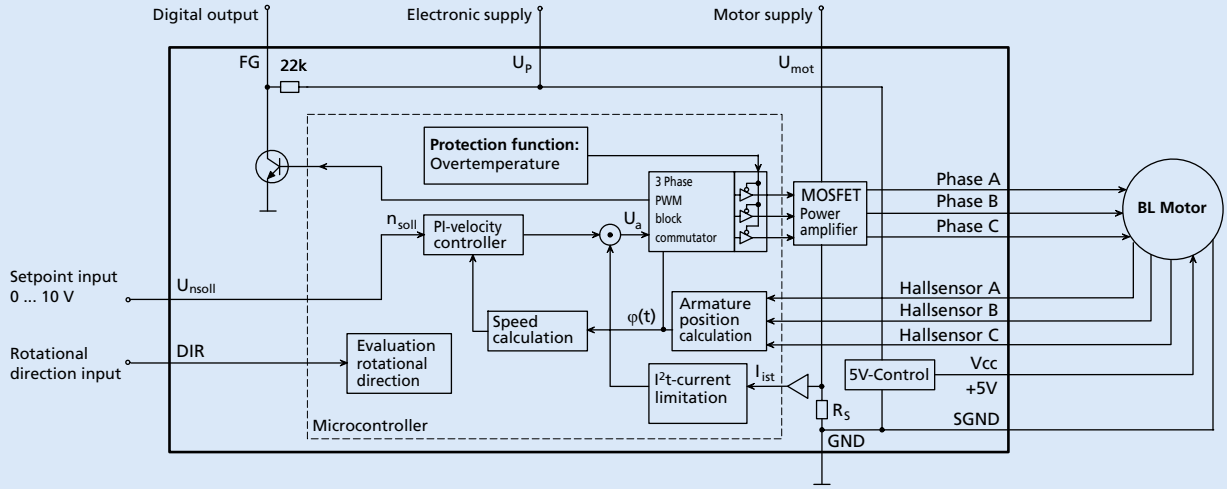
		DC-Motors with Encoder	BL-Motors with Hall sensors	BL-Motors with Absolute encoder	BL-Motors with digital Hall sensors + encoder	BL-Motors with digital Hall sensors + brake/enable
Connection "Mot A", "Mot B", "Mot C":						
– Motor connection	Mot A	Mot +	Phase A	Phase A	Phase A	Phase A
	Mot B	Mot -	Phase B	Phase B	Phase B	Phase B
	Mot C	*reserved*	Phase C	Phase C	Phase C	Phase C
Connection "Sens A", "Sens B", "Sens C":						
– Sensor input	Sens A	*reserved*	Hall sensor A	DATA	Hall sensor A	Hall sensor A
	Sens B	encoder canal A	Hall sensor B	*reserved*	Hall sensor B	Hall sensor B
	Sens C	encoder canal B	Hall sensor C	CLK	Hall sensor C	Hall sensor C
	f	≤ 400 kHz				
Connection „IO1", „IO2"						
- logic input	IO1	*reserved*	*reserved*	*reserved*	encoder B	brake
	IO2	*reserved*	*reserved*	*reserved*	encoder A	enable

Connection information (general)

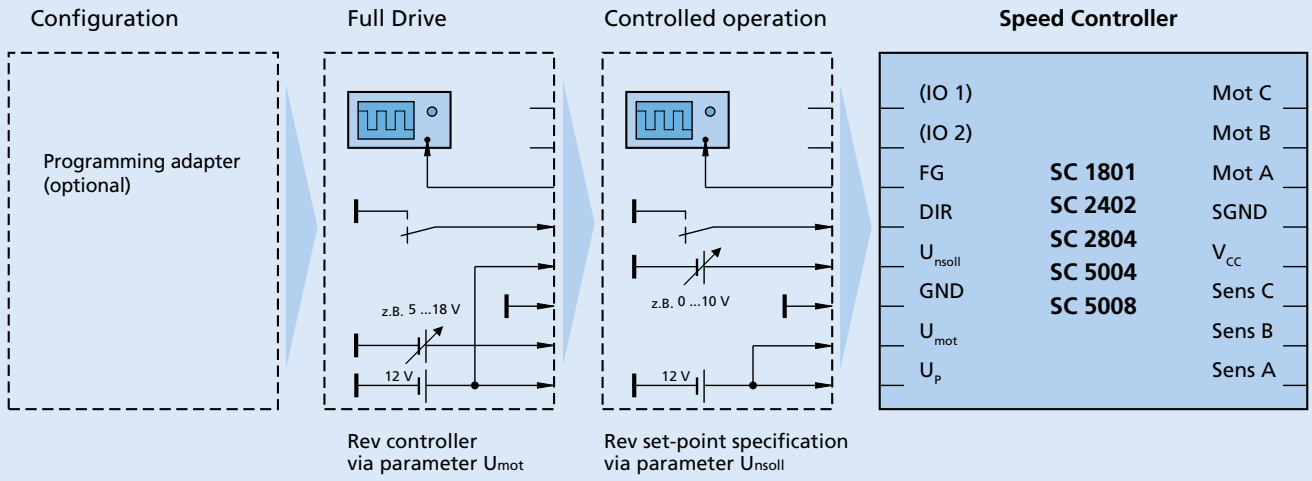
Connection "U_P":		U_P	power supply electronic
Connection "U_{mot}":		U_{mot}	power supply motor coil
Connection "GND":			ground
Connection "U_{nsoll}":		U_{in} = 0 ... 10 V / > 10 V ... max. U_P [1]	(standard version)
– analog input	set speed value	U_{in} < 0,15 V	motor stops
		U_{in} > 0,3 V (0,5 V) [2]	motor starts
– digital input	PWM for set speed value	500 ... 18 000 Hz	
	duty cycle	d = 0%	motor stopped
		d = 50%	half of maximum speed
		d = 100%	maximum speed
	input resistance	R_{in} ≥ 5 kΩ	
	signal level PLC	7,5 ... U_P	high
		0 ... 2	low
	signal level TTL [3]	2,8 ... U_P	high
		0 ... 0,5	low
Connection "DIR":			
– digital input	direction of rotation	to ground or level < 0,5 V	counterclockwise
		level > 3,0 V	clockwise
	input resistance	R_{in} ≥ 10 kΩ	
Connection "FG":		max. U_P / 15 mA	open collector with pull-up resistor [4]
– fault output		switched through to GND	no error
– frequency output (BL motor only)		1, 3, 6, 8, 16 [5]	lines per revolution
Connection "IO1", "IO2":		n.c.	*reserved*
– digital input [6]			
	signal level TTL	2,8 ... *Up*	high
		0 ... 0,5	low
	(IO2)	high	motor enabled
		low	motor disabled
	(IO1)	high	motor stopped
		low	motor run
Connection "V_{CC}":			
	output voltage	5 V DC	for external use
	max. output current for	SC 1801 S, F, P	» I_{CC} = 25 mA
		SC 2402 P	» I_{CC} = 20 mA
		SC 2804 S	» I_{CC} = 30 mA
		SC 5004 P	» I_{CC} = 100 mA
		SC 5008 S	» I_{CC} = 100 mA
Connection "SGND":			signal ground

[1] > 10 V for set speed value not defined.
[2] Data in parentheses apply to BL motors operating without sensors.
[3] Not available for SC 5004 / SC 5008
[4] 22 kΩ (SC 1801, SC 2402, SC 2804)
47 kΩ (SC 5004, SC 5008)
An additional external pull-up resistor can be added to improve the rise time.
Caution: I_{out} max. 15 mA must not be exceeded.
[5] Values apply to 2-pole motors. The given values double for 4-pole motors.
[6] With appropriate hardware.

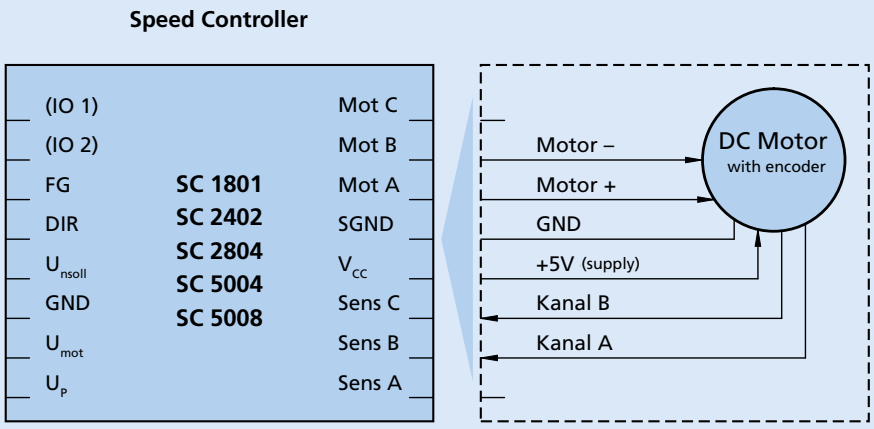
Circuit diagram - brushless with Hall sensors (Option 3530)



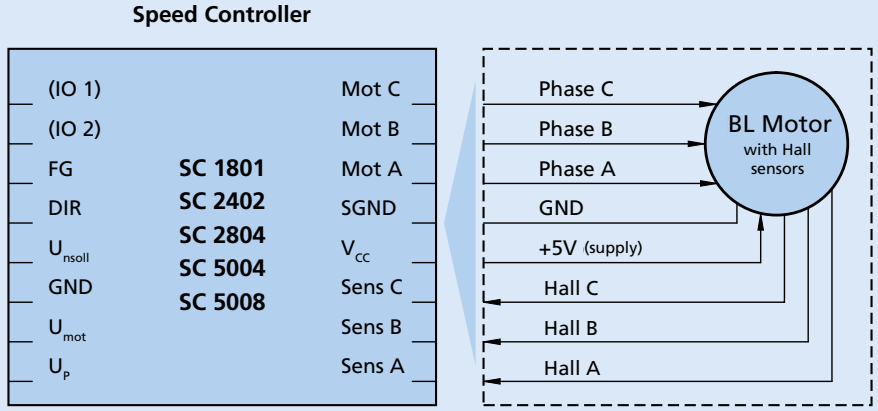
Connection diagramm supply unit



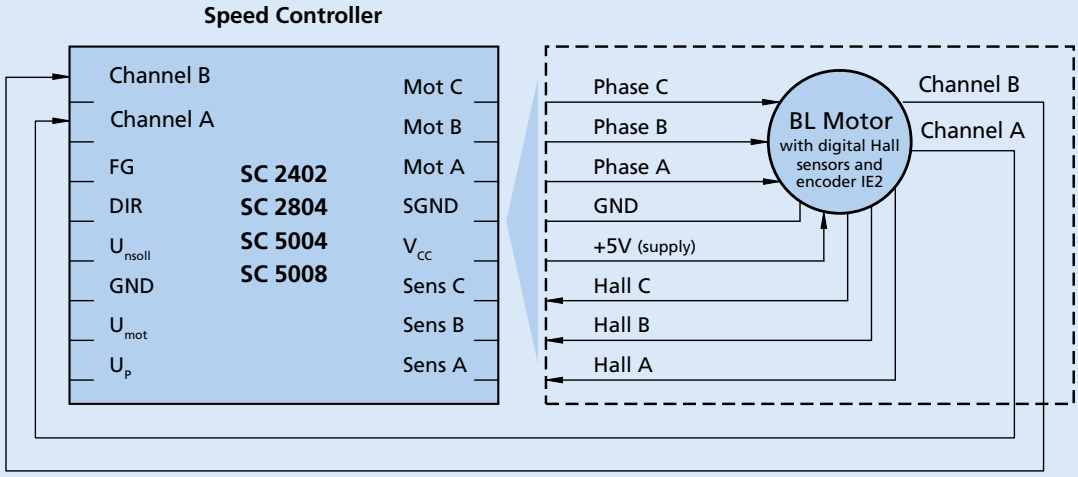
Connection diagram operation mode DC-Micromotor with encoder



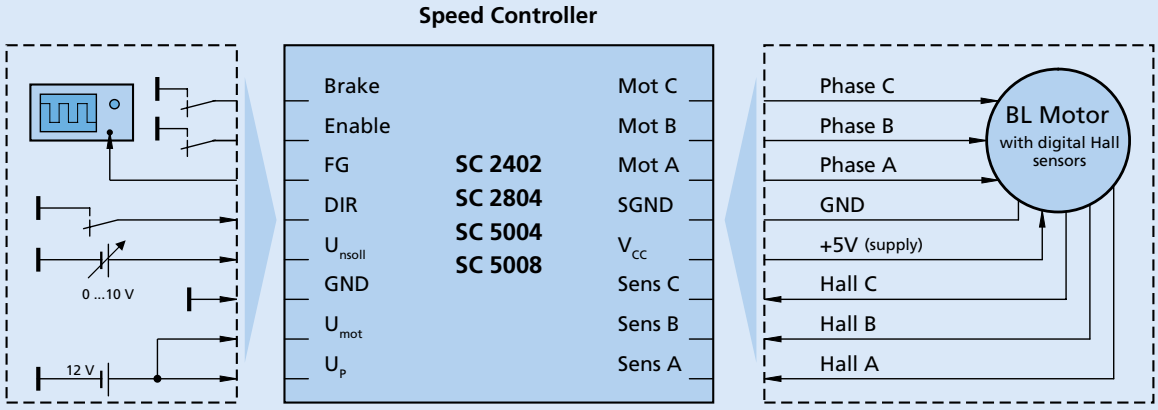
Connection diagram operation mode BL motor with Hall Sensors



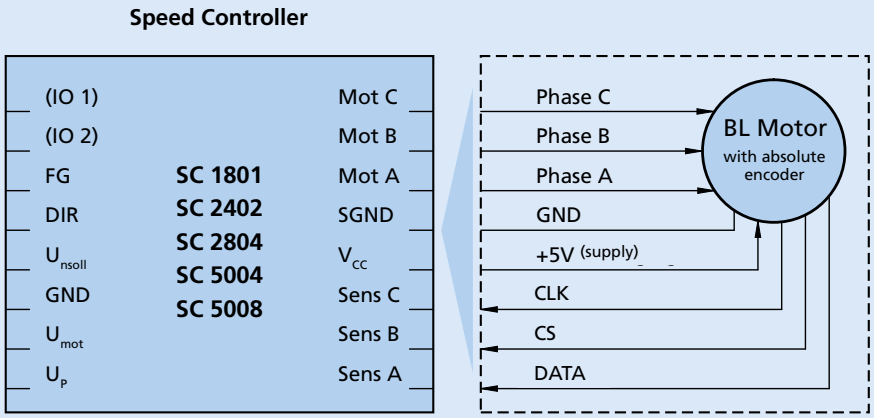
Connection diagram operation mode BL motor with digital Hall Sensors and Encoder



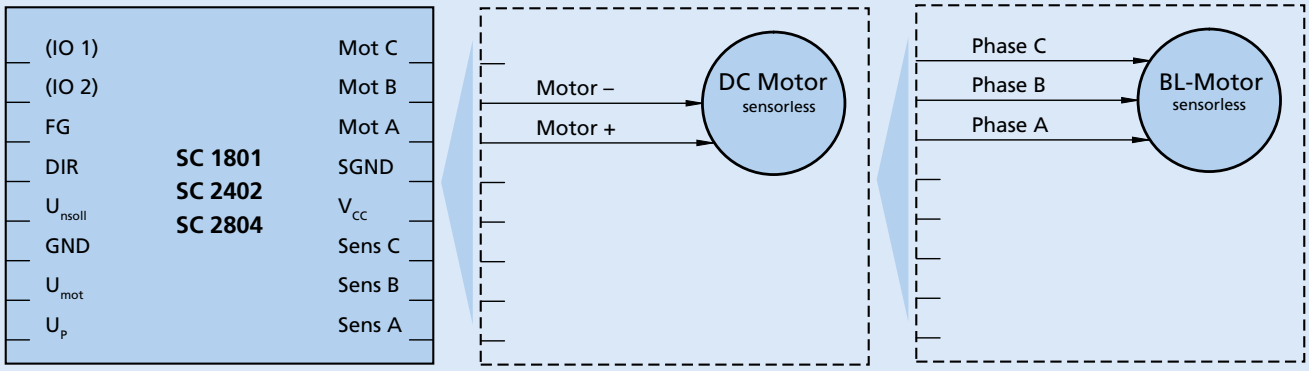
Connection diagram operation mode BL motor with digital Hall Sensors and Brake / Enable



Connection diagram operation mode BL motor with AES



Connection diagram operation mode DC and BL motor sensorless



Speed Controller

4-Quadrant PWM
configurable via PC

For combination with:
DC-Micromotors and
Brushless DC-Servomotors

Series SC 5008

		SC 5008 S	
Power supply for electronic	U_P	6 ... 50	V DC
Power supply for motor	U_{mot}	0 ... 50	V DC
Max. continuous output current [1]	I_{dauer}	8	A
Max. peak output current	I_{max}	16	A
Total standby current	$I_{el\ max}$	100	mA
Input/output (partially free configurable)		5	
Tightening torque, terminal strip		0,5 ... 0,6	Nm
Weight		160	g
PWM switching frequency [2]	f_{PWM}	96	kHz
Efficiency	η	95	%
Speed range:			
– BL motors with Hall sensors (digital)		500 ... 100 000	min^{-1}
– BL motors with Hall sensors (analog)		50 ... 60 000	min^{-1}
– BL motors with absolute encoder		50 ... 60 000	min^{-1}
– BL motors with digital Hall + encoder		50 ... 30 000	min^{-1}
– DC motors with encoder		100 ... 30 000	min^{-1}
Scanning rate		500 / 1 000	µs
Resolution of encoder with DC motors		≤ 65 535	inc./rev.
Operating temperature range		– 25 ... + 60	°C
Storage temperature		– 25 ... + 85	°C

[1] at 22°C ambient temperature
[2] for brushless DC-Motors without Hall sensors: f_{PWM} 24 kHz

Versions

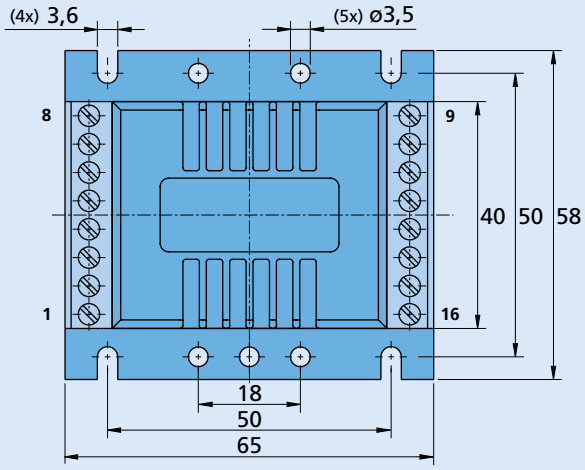
Speed Controller	Option [4]	Version: Motor Type	Sensor Type	Set speed value specification [1]	Speed at U_{nsoll} =10 V	Part No.
SC 5008 S	**3530**	BL	Hall sensors (digital) [3]	0 ... 10 V	20 000 min^{-1}	**6500.01480**
SC 5008 S	**3531**	DC	Incremental encoder [2]	0 ... 10 V	10 000 min^{-1}	**6500.01482**
SC 5008 S	**4763**	BL	Absolute encoder 2 pole	0 ... 10 V	30 000 min^{-1}	**6500.01602**
SC 5008 S	**4289**	BL	Hall sensors (analog) 2 pole	0 ... 10 V	20 000 min^{-1}	**6500.01484**
SC 5008 S	**3980**	BL	Absolute encoder 4 pole	0 ... 10 V	20 000 min^{-1}	**6500.01529**
SC 5008 S	**4764**	BL	Hall sensors (analog) 4 pole	0 ... 10 V	10 000 min^{-1}	**6500.01604**
SC 5008 S	**4475**	BL	Digital Hall + encoder [3]	0 ... 10 V	20 000 min^{-1}	**6500.01525**
SC 5008 S	**4476**	BL	Digital Hall + brake/enable [3]	0 ... 10 V	20 000 min^{-1}	**6500.01527**

[1] The velocity range can be configured by software. Versions with PWM and other configurations are available on request.
[2] preset value is 512 lines
[3] Factory pre-configured for 2 pole motors. For operation with 4 pole motors the speed controller must be reconfigured with the software "FAULHABER Motion Manager"
[4] For changes to the factory setting the use of a programming adapter is required (see accessories).

Accessories

		Motor-typ	for SC 5008 S Part No.
Programming adapter	**Starterkit**		**6501.00088**
Programming adapter			**6501.00096**
Motor connector adapter	**5 mm » 2,54 mm**		**6501.00087**
	BX4	BL	**6501.00086**
Encoder adapter	**IE2**	DC	**6501.00063**
	HEDS	DC	**6501.00001**

Dimensional drawing and connection information SC 5008 S



SC 5008 S

Scale reduced

Connection

No.	Function
1	U_P
2	U_{mot}
3	GND
4	U_{nsoll}
5	DIR
6	FG
7	IO 2
8	IO 1
9	Mot C
10	Mot B
11	Mot A
12	SGND
13	V_{CC}
14	Sens C
15	Sens B
16	Sens A

SC Function

Description of connections (Motor-dependent)

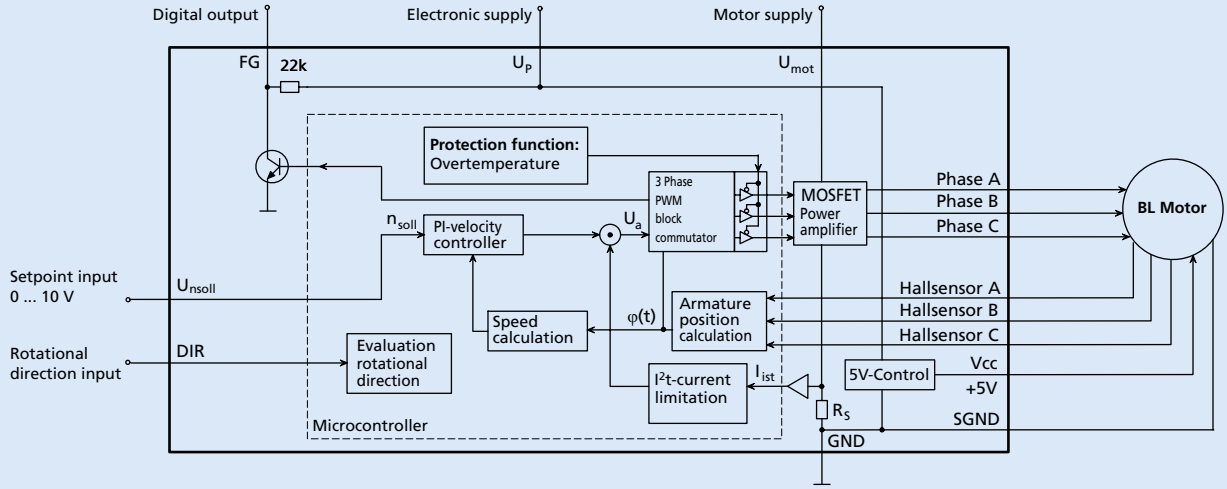
		DC-Motors with Encoder	BL-Motors with Hall sensors	BL-Motors with Absolute encoder	BL-Motors with digital Hall sensors + encoder	BL-Motors with digital Hall sensors + brake/enable
Connection "Mot A", "Mot B", "Mot C":						
– Motor connection	Mot A	Mot +	Phase A	Phase A	Phase A	Phase A
	Mot B	Mot -	Phase B	Phase B	Phase B	Phase B
	Mot C	*reserved*	Phase C	Phase C	Phase C	Phase C
Connection "Sens A", "Sens B", "Sens C":						
– Sensor input	Sens A	*reserved*	Hall sensor A	DATA	Hall sensor A	Hall sensor A
	Sens B	encoder canal A	Hall sensor B	*reserved*	Hall sensor B	Hall sensor B
	Sens C	encoder canal B	Hall sensor C	CLK	Hall sensor C	Hall sensor C
	f	≤ 400 kHz				
Connection „IO1", „IO2"						
- logic input	IO1	*reserved*	*reserved*	*reserved*	encoder B	brake
	IO2	*reserved*	*reserved*	*reserved*	encoder A	enable

Connection information (general)

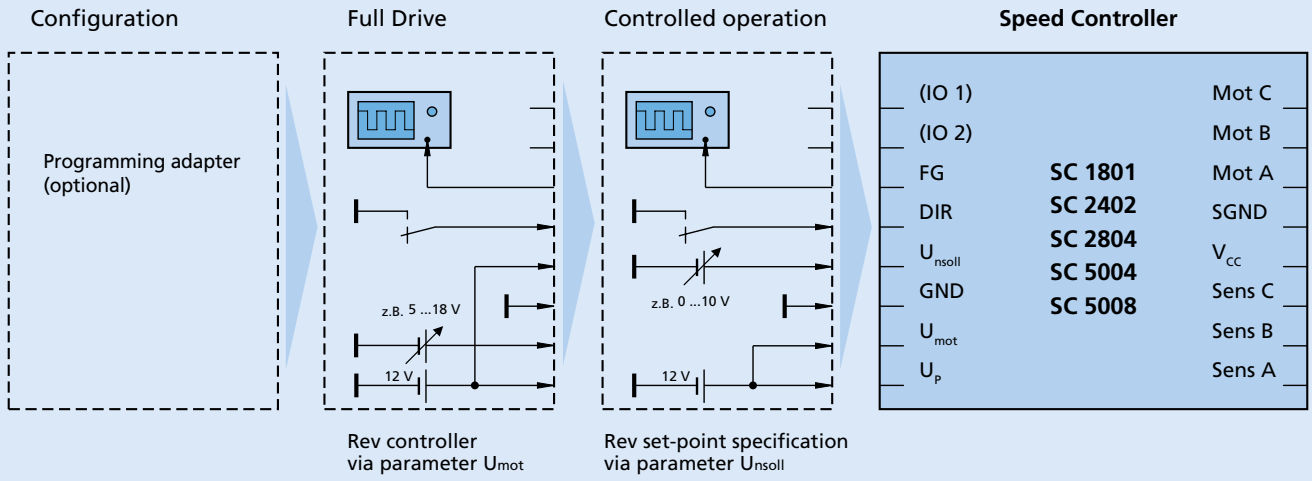
Connection "U_P":		U_P	power supply electronic
Connection "U_{mot}":		U_{mot}	power supply motor coil
Connection "GND":			ground
Connection "U_{nsoll}":		U_{in} = 0 ... 10 V / > 10 V ... max. U_P [1]	(standard version)
– analog input	set speed value	U_{in} < 0,15 V	motor stops
		U_{in} > 0,3 V (0,5 V) [2]	motor starts
– digital input	PWM for set speed value	500 ... 18 000 Hz	
	duty cycle	d = 0%	motor stopped
		d = 50%	half of maximum speed
		d = 100%	maximum speed
	input resistance	R_{in} ≥ 5 kΩ	
	signal level PLC	7,5 ... U_P	high
		0 ... 2	low
	signal level TTL [3]	2,8 ... U_P	high
		0 ... 0,5	low
Connection "DIR":			
– digital input	direction of rotation	to ground or level < 0,5 V	counterclockwise
		level > 3,0 V	clockwise
	input resistance	R_{in} ≥ 10 kΩ	
Connection "FG":		max. U_P / 15 mA	open collector with pull-up resistor [4]
– fault output		switched through to GND	no error
– frequency output (BL motor only)		1, 3, 6, 8, 16 [5]	lines per revolution
Connection "IO1", "IO2":		n.c.	*reserved*
– digital input [6]			
	signal level TTL	2,8 ... *Up*	high
		0 ... 0,5	low
	(IO2)	high	motor enabled
		low	motor disabled
	(IO1)	high	motor stopped
		low	motor run
Connection "V_{CC}":			
	output voltage	5 V DC	for external use
	max. output current for	SC 1801 S, F, P	» I_{CC} = 25 mA
		SC 2402 P	» I_{CC} = 20 mA
		SC 2804 S	» I_{CC} = 30 mA
		SC 5004 P	» I_{CC} = 100 mA
		SC 5008 S	» I_{CC} = 100 mA
Connection "SGND":			signal ground

[1] > 10 V for set speed value not defined.
[2] Data in parentheses apply to BL motors operating without sensors.
[3] Not available for SC 5004 / SC 5008
[4] 22 kΩ (SC 1801, SC 2402, SC 2804)
47 kΩ (SC 5004, SC 5008)
An additional external pull-up resistor can be added to improve the rise time.
Caution: I_{out} max. 15 mA must not be exceeded.
[5] Values apply to 2-pole motors. The given values double for 4-pole motors.
[6] With appropriate hardware.

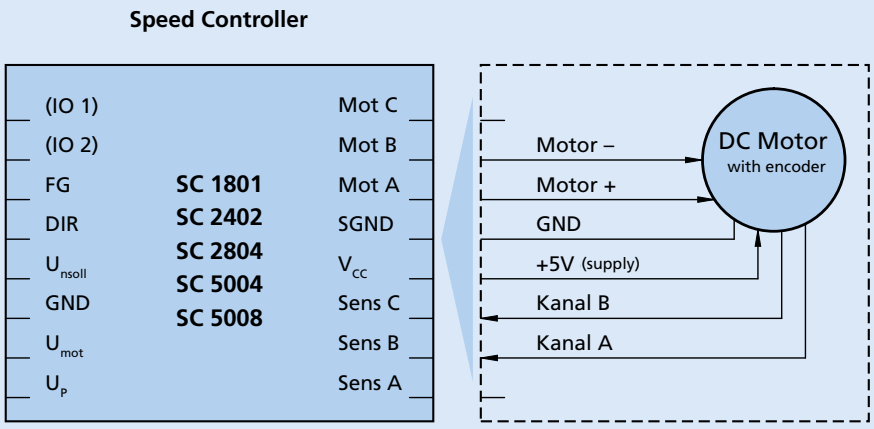
Circuit diagram - brushless with Hall sensors (Option 3530)



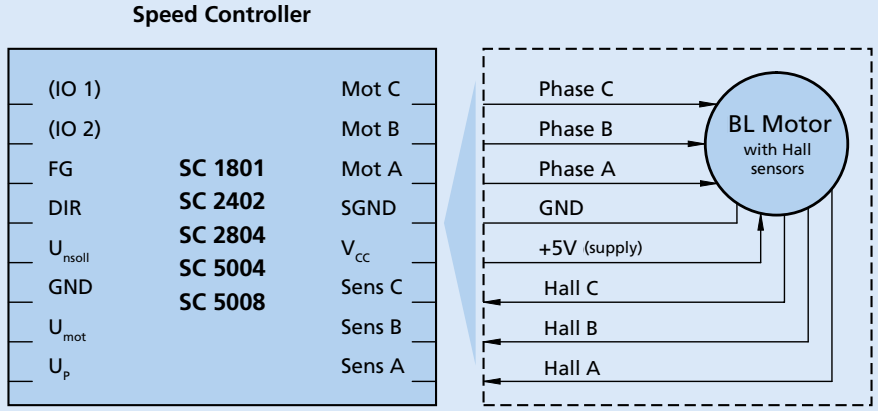
Connection diagramm supply unit



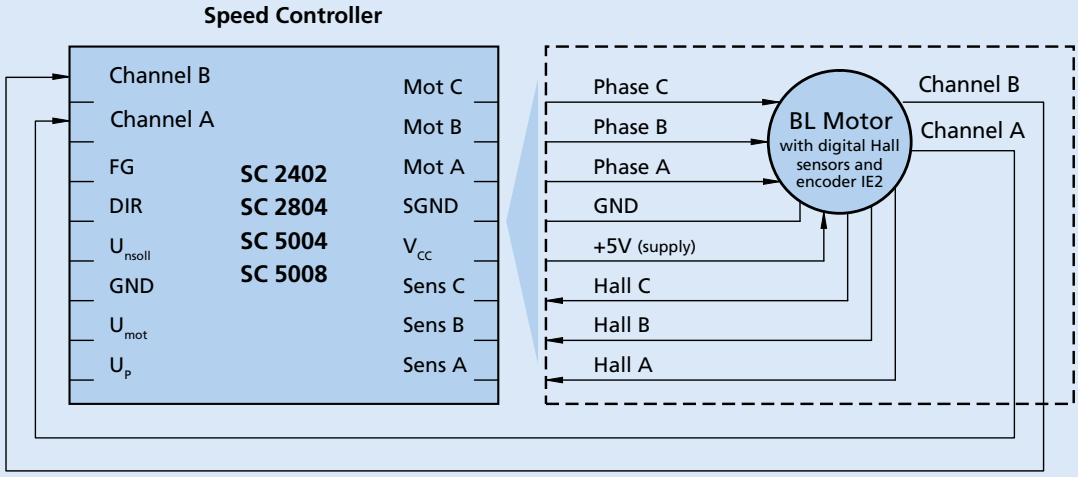
Connection diagram operation mode DC-Micromotor with encoder



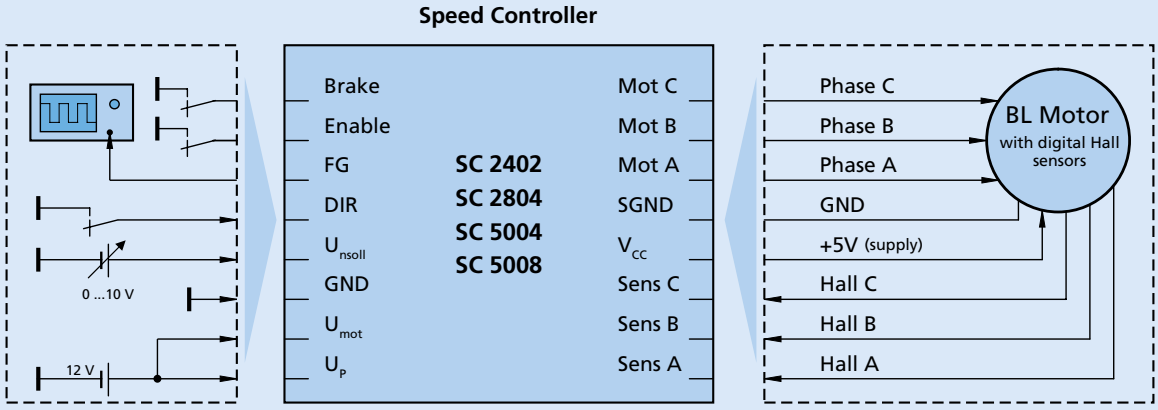
Connection diagram operation mode BL motor with Hall Sensors



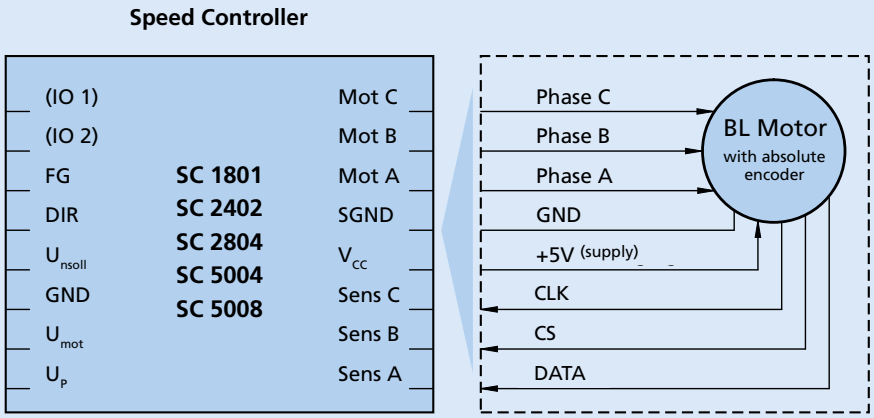
Connection diagram operation mode BL motor with digital Hall Sensors and Encoder



Connection diagram operation mode BL motor with digital Hall Sensors and Brake / Enable



Connection diagram operation mode BL motor with AES



Connection diagram operation mode DC and BL motor sensorless