



The KSC-10 is a 1 Quadrant digital servo amplifier for direct current motor with permanent magnets of up to 600 Watts. It permits speed regulation in Rxl mode controlled by a microcontroller. The digital setting of motor control parameters associated with multiple protections guarantees the reliability and robustness necessary for motorised applications.

The KSC-10 is protected against:

- current overloads
- motor short-circuits
- Power supply over- and undervoltages
- Power supply polarity inversions

The PWM frequency is 20 kHz. It permits the control of low inductivity motors. An external induction coil can thus be avoided in most applications.

The voltage range is between 10 and 60 VDC. The KSC-10 range supports non-stabilised power supplies. The aluminium case facilitates installation and entry into service is fast thanks to the screw connections, which are practical, sturdy and disconnectable. Its format also allows integration into a 3U frame.

Contents

1	Safety instructions.....	4
2	Technical data	5
2.1	Electrical characteristics	5
2.2	Inputs.....	5
2.3	Outputs	5
2.4	Output voltage.....	5
2.5	Setting Pushbuttons.....	5
2.6	LED indicator.....	5
2.7	Temperature / Humidity.....	5
2.8	Mechanical characteristics	5
2.9	Connections.....	5
3	Minimal external wiring.....	6
4	Instructions for use.....	7
4.1	Pushbutton functions and LED meanings	7
4.2	Limit of travel function	7
4.3	Servo amplifier setting procedure	8
4.3.1	Basic setting	8
4.3.2	Settings	8
5	Using the RS232 serial link	9
5.1	Format of frames	9
5.2	Commands	9
6	Error processing	10
7	Dimensions (mm).....	11
8	Notes:	11

1 Safety instructions

Qualified personnel

Installation and putting into service should only be performed by qualified and adequately trained personnel.

Legal regulations

The user must ensure that the servo amplifier and the other components comply with local wiring and connection regulations.

Load decoupling

At the time of entry into service, the motor must operate at no-load with the load decoupled.

Additional safety devices

In principle, no electronic device is free from the risk of sudden failure. Machines and installations that depend on these devices must be equipped with independent safety devices. These must be capable of intervening in the event of control failure or an erroneous command transmitted by the control electronics, if a wire breakage occurs or if there is any other technical incident, establishing well-defined operating conditions.

Repairs

Repairs must only be carried out by qualified, duly authorised personnel or by the manufacturer himself. Dismantling and inappropriate interventions may create considerable risks to the user and may lead to cancellation of the warranty.

Warranty and limit of responsibility

In the event of direct or indirect damage caused by negligence, misuse, incorrect application and/or service, inappropriate use or insufficient maintenance of the product, MDP disclaims all responsibility.

Danger

All parts of the installation must be powered-off during installation of the KSC-10 servo amplifier. After interlocking, do not touch powered-on conductors!

EMC Standard

This device complies with NF-EN 55014 (Limits and methods of measurement of radio disturbance) and NF-EN 55104 (electromagnetic compatibility)

The device contains sensitive to electrostatic discharges (ESD) components.

2 Technical data

2.1 Electrical characteristics

Power supply voltage V_{cc} (tolerated ripple < 5%)	10 to 60 VDC
Permanent output current I_{nom}	10 A
The motor current is limited to $I_{nom} + I_{boost}$ for 500ms then to I_{nom} for 10s (motor overload) before being cut (motor locks up). Any current return under the limitation resets the detection time.	
Commutation frequency.....	20 kHz

2.2 Inputs

SET VALUE: Setpoint value (terminals 1, 2 and 3)	0/+10 VDC ($R_L > 10\text{ k}\Omega$)
ENABLE: active when the contact is closed (terminals 4 and 8).....	Dry contact
CW/CCW: open contact: clockwise (terminals 5 and 8) contact closed: Counterclockwise direction.....	Dry contact
In the event of an inversion of the rotation direction with a non-zero speed, the servo amplifier waits until the current is cancelled in the motor before reversing the rotation direction.	

2.3 Outputs

I MOT: Image with I_{nom} current voltage during nominal operation. (terminals 9 & 12)	
This output is protected against short-circuits	0/+10 VDC ($R_o = 100\Omega$)
Proportionality factor	1V / 2A
MONITOR: Image with I_{nom} and I_{boost} current voltages during settings. (terminals 10 & 12)	
This output is protected against short-circuits	0/+5 VDC ($R_o = 100\Omega$)
Proportionality factor	1V / 2A
READY: Message for monitoring the state of card (terminals 11 and 12)	
Open collector not protected from the short-circuits	max. 30 VDC ($I_L < 20\text{ mA}$)

2.4 Output voltage

+10V: Auxiliary voltage (terminals 1 & 3)	+10 VDC, max. 20 mA
protected against short-circuits and overloads	

2.5 Setting Pushbuttons

OK: Validation or setting mode input/output	
+ :	Increase of parameterisable values
+ :	Reduction of parameterisable values

2.6 LED indicator

Green LED	Presence of voltage
Orange LED Steady	Clockwise rotation direction
Orange flashing LED.....	Counterclockwise rotation direction
Red LED.....	Fault

2.7 Temperature / Humidity

Operation.....	0 to +45°C
Storage	-40 to +85°C
Relative humidity.....	20 to 80% non-condensed

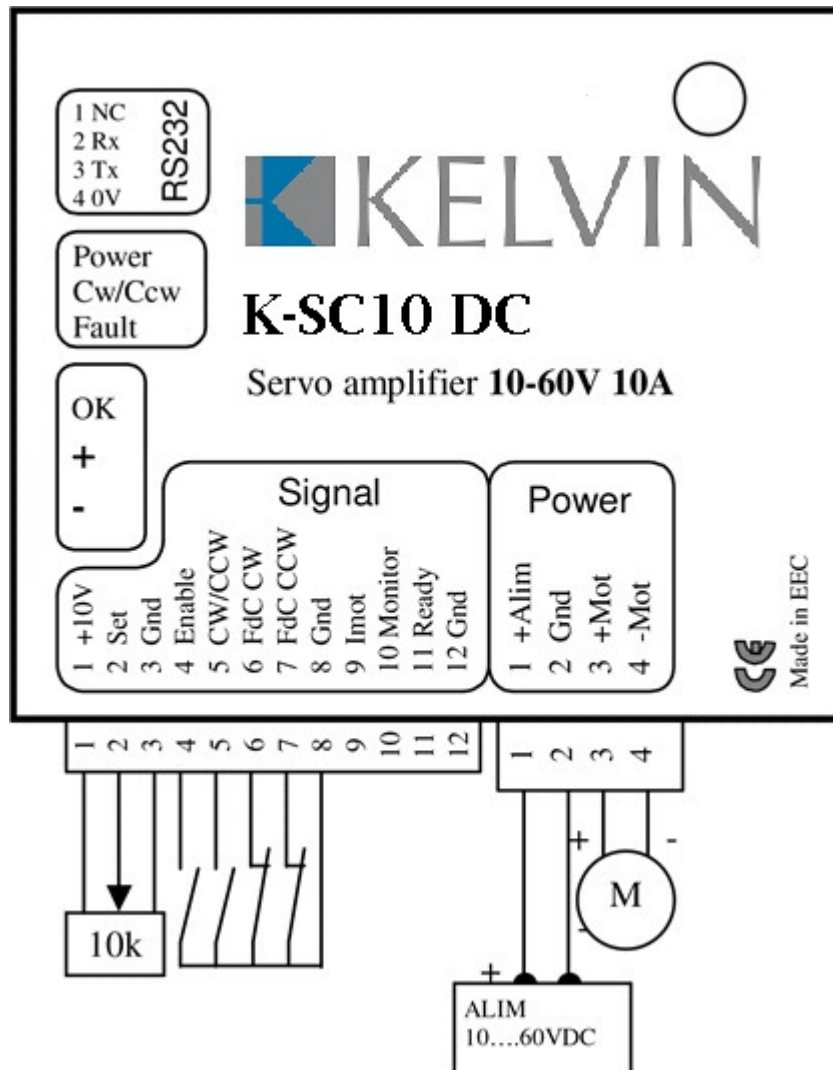
2.8 Mechanical characteristics

Weight.....	approximately 220 g
Dimensions	102 X 100 X 32 (or 3U frame)
Mounting plate	for M4 screw

2.9 Connections

Terminals with screws.....	"Power" (4 poles), "Signal" (12 poles)
'Power' step	5.08 mm
Suitable for sections of wire	0.5 to 2.5 mm ²
'Signal' step.....	3.81 mm
Suitable for sections of wire	0.14 to 1.5 mm ²

3 Minimal external wiring



CAUTION: if no limit of travel is used in the application, the limit of travel inputs must be connected to GND.

4 Instructions for use

4.1 Pushbutton functions and LED meanings

Pushbuttons	Brief press	Sustained press (>5s)
OK	Validation	Setting mode input or output
+	Increments slowly to the value to be set	Increments rapidly to the value to be set
-	Decrements slowly to the value to be set	Decrements rapidly to the value to be set

Green	Orange	Red	State of the card
Off	Off	Off	No power supply or fuse open
Normal operation			
Steady	Off	Off	Presence of voltage, motor not powered
Steady	Steady	Off	Motor controlled in clockwise direction
Steady	Flashing	Off	Motor controlled in counterclockwise direction
Faults			
Steady	X	Steady	Presence of voltage, motor in overload
Steady	X	Flashing	Rapid flashing, motor in short-circuit
Flashing	Off	Off	Detection of under- or overvoltage
Settings			
Off	Off	Flashing	Slow flashing, current setting
Flashing	Off	Off	Low speed setting
Off	Flashing	Off	High speed setting
Flashing	Flashing	Off	Alternate LEDs, wait before Rxl mode setting, motor not powered
Flashing	Flashing	Off	Synchronised LEDs, Rxl mode setting, motor powered at halfspeed (high speed/2)

4.2 Limit of travel function

In the event of one of the limit of travel contacts opening, the motor can no longer be controlled in the direction concerned.

For example, if a clockwise (CW) limit of travel contact is opened, the motor can no longer rotate in the clockwise direction. If it is already running it is stopped; if it is not running, any clockwise direction instructions are ignored.

CAUTION: if this function is not used in the application, the limit of travel inputs must be connected to ground (GND).

4.3 Servo amplifier setting procedure

4.3.1 Basic setting

The servo amplifier is factory preset according to the following values:

Parameters	Values
I_{nom}	5 A
N_{min}	0 rpm
N_{max}	Maximum
Comp. IxR	Minimum

4.3.2 Settings

To enter the setting mode, the Enable contact must be open.

Phases from 1 to 6 are performed with the motor decoupled from the mechanics. To guarantee optimum operation, the power supply voltage value must be identical to that of the application.

Ph	PB	LED(s) active			LED states		Operation
		G	O	R	Flashing	Steady	
1	OK sustained			X	X		Enter the setting mode to set the motor nominal current configuration I_{nom}
2	+ or -			X	X		Connect a voltmeter to the Volt DC position between terminals 10 and 12; the read value corresponds to the current I_{nom} . Act on the pushbuttons (PBs) such that the read value is equal to the current registered on the data plate or the motor technical data sheet.
3	OK brief	X			X		Minimum speed setting N_{min}
4	+ or -	X			X		Act on the pushbuttons such that the value of N_{min} corresponds to the desired and obtained speed for a nil setpoint voltage (SET VALUE = 0V)
5	OK brief		X		X		Maximum speed setting N_{max}
6	+ or -		X		X		Act on the pushbuttons such that the value of N_{max} corresponds to the desired and obtained speed for a maximum setpoint voltage (SET VALUE = +10V)
7	OK brief	X	X		X		The card re-enters a wait phase, the operator must compulsorily connect the mechanics to the motor or geared motor (the green and orange LEDs flash alternately)
8	OK brief	X	X		X		Act on the pushbuttons + or - such that the IxR compensation value does not cause vibration or jerking on the motor. (The green and orange LEDs flash together)
9	OK brief			X	X		Return of the setting to phase 1
10	OK sustained	X				X	The operator exits the setting mode.

Note:

A sustained press (5s) on pushbutton OK allows the setting mode to be exited at any time

A parameter is saved after each press on the OK button.

5 Using the RS232 serial link

The serial link can only be used when the jumper is positioned on the card (JP1), which makes the direction input and analogue setpoint inactive.

5.1 Format of frames

- 9600Bds;
- 8 bits;
- 1 Start bit;
- 1 Stop bit;
- Parity step;
- A frame is made up of ASCII coded characters;
- A read command is made up only of the letter without argument;
- Lower case commands generate a response supplemented with 'return'
- Upper case commands generate a response supplemented with 'return' 'OK' 'prompt';

5.2 Commands

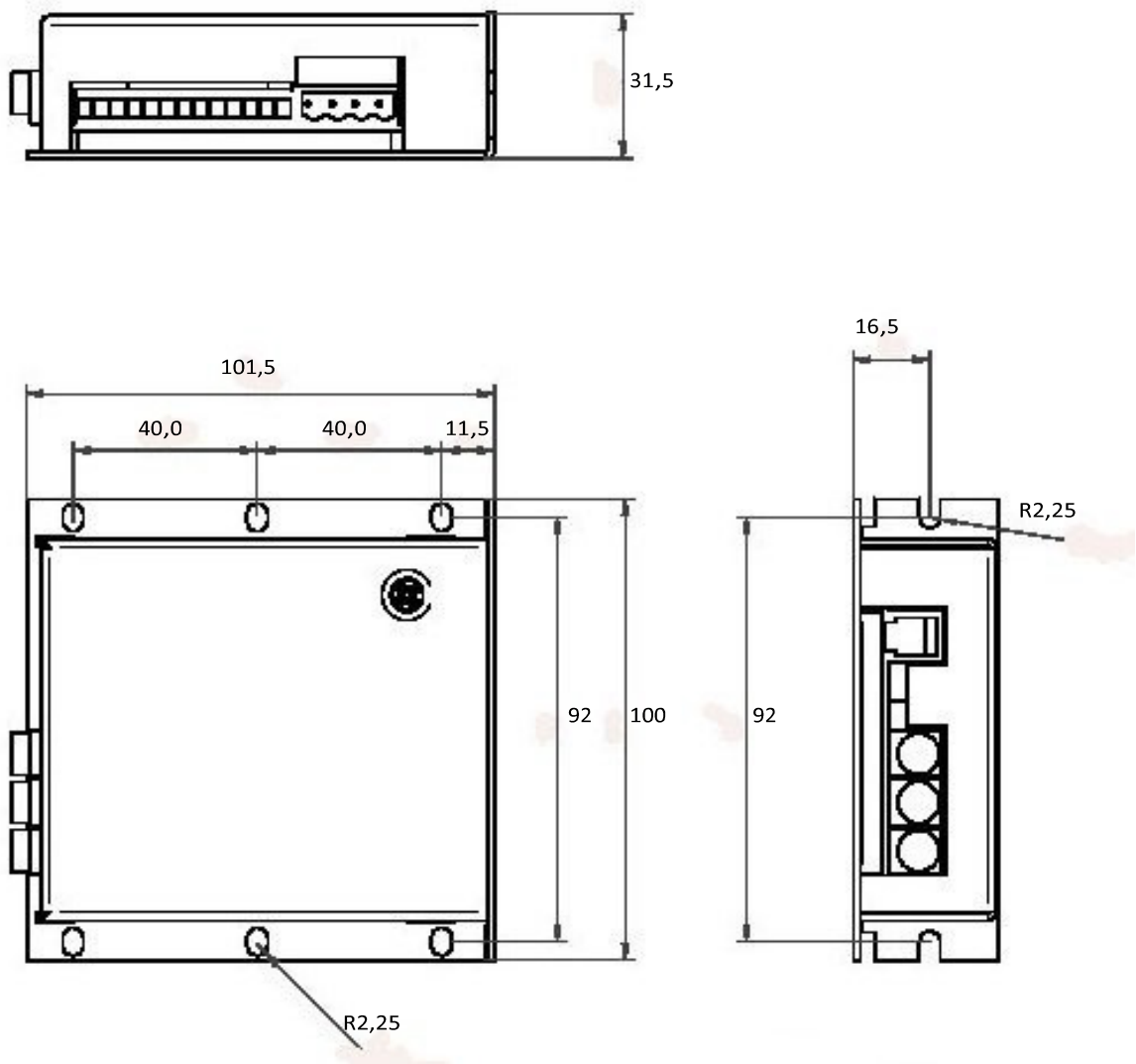
Command	Response	Effect	Min. value	Max. value
A	Axxx	Supply voltage read	000 (0V)	255 (60V)
Axxx		Nominal supply voltage write	000 (0V)	255 (60V)
B	Bxxx	Current of boost read (motor current limited to $I_{nom} + I_{boost}$ for 500ms)	000 (0A)	255 (10A)
Bxxx		Current of boost write (limited to I_{nom} within the limit of $I_{nom} + I_{boost} = 15A$)	000 (0A)	255 (10A)
D	Dx	Card state read (bit0: Low Power; bit1: Short-circuit; bit2: overload; bit3: motor locked up; bit4: reserve; bit5: Limit of travel CW reached; bit6: Limit of travel - CCW reached; bit7: Enable)		
H	Hxxx	Max. speed read	000	248
Hxxx		Max. speed write, the value must be > at the min. set speed Motor voltage = supply voltage x set value/255	000	248
I	Ixxx	Instantaneous current read	000 (-20A)	255 (20A)
L	Lxxx	Min. read speed	000	248
Lxxx		Min. write speed (the value must be < the maximum speed set) Motor voltage = supply voltage x set value/255	000	248
M		If the set parameters are memorised without this command being sent, the current settings will not be memorised following a power cut.		
N	Nxxx	Nominal current read	000 (0A)	255 (10A)
Nxxx		Nominal current write	000 (0A)	255 (10A)

R	Rxxx	RI regulation coefficient read	000	255
Rxxx		RI regulation coefficient write	000	255
S	Sxxx	Direction of rotation read: 0 for CW direction; other for CCW direction (according to the written value)	000	255
Sxxx		Direction of rotation write: 0 for CW direction; other for CCW direction (according to the written value)	000	255
T	Txxx	Read of the Inom max. limitation time before the motor power supply is disconnected	000 (00.0s)	255 (25.5s)
Txxx		Write of the Inom max. limitation time before the motor power supply is disconnected	000 (00.0s)	255 (25.5s)
V	Vxxx	Speed setpoint read	000	248
Vxxx		Speed setpoint write	000	248

6 Error processing

Fault	Visualisation	Problem source	Measures
No motor rotation	All LEDs are off	Unserviceable fuse or power supply insufficient	Check the polarity and the voltage supply
	Green LED flashing	U _{pow} <10V or U _{pow} >60V	Check the supply voltage between terminals 1 and 2 of POWER
	READY output in the low state	ENABLE INACTIVE	Check the state of the ENABLE input
	X	Setpoint value = 0V	Check the signal on terminals 2 and 3 of SIGNAL
	Red LED steady	Current limit too low	Increase current I _{nom}
	X	Poor contact	Check the electrical installation
Speed not controlled	Flashing LED	Setting mode	Exit the setting mode with a sustained press on OK
	X	IxR compensation too high	Decrease the IxR configuration in the setting mode

7 Dimensions (mm)



8 Notes: