ESCON 36/2 DC

Servo Controller
P/N 403112

Hardware Reference
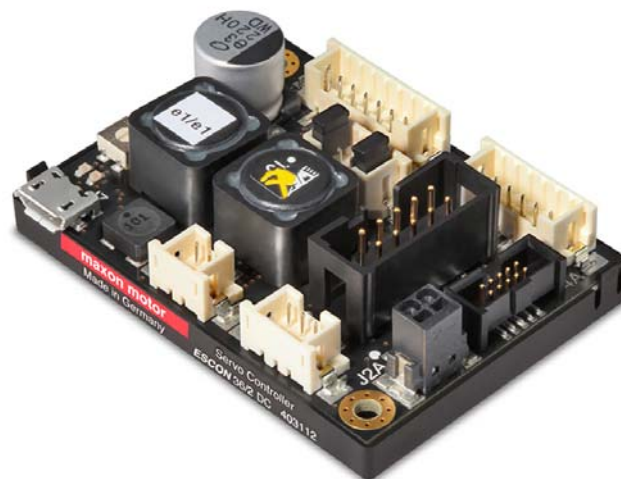
Document ID: rel4144

TABLE OF CONTENTS

READ THIS FIRST

These instructions are intended for qualified technical personnel. Prior commencing with any activities …
- *you must carefully read and understand this manual and*
- *you must follow the instructions given therein.*

The ESCON 36/2 DC is considered as partly completed machinery according to EU Directive 2006/42/EC, Article 2, Clause (g) and **is intended to be incorporated into or assembled with other machinery or other partly completed machinery or equipment**.

Therefore, you must not put the device into service, …
- *unless you have made completely sure that the other machinery fully complies with the EU directive's requirements!*
- *unless the other machinery fulfills all relevant health and safety aspects!*
- *unless all respective interfaces have been established and fulfill the herein stated requirements!*

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1 About

1.1 About this Document

1.1.1 Intended Purpose

The purpose of the present document is to familiarize you with the ESCON 36/2 DC Servo Controller. It will highlight the tasks for safe and adequate installation and/or commissioning. Follow the described instructions …

- to avoid dangerous situations,
- to keep installation and/or commissioning time at a minimum,
- to increase reliability and service life of the described equipment.

The document contains performance data and specifications, information on fulfilled standards, details on connections and pin assignment, and wiring examples.

1.1.2 Target Audience

The present document is intended for trained and skilled personnel. It conveys information on how to understand and fulfill the respective work and duties.

1.1.3 How to use

Take note of the following notations and codes which will be used throughout the document.

Notation	Meaning
(n)	refers to an item (such as order number, list item, etc.)
➔	denotes "see", "see also", "take note of" or "go to"

Table 1-1   Notation used

1.1.4 Symbols & Signs

In the course of the present document, the following symbols and sings will be used.

Type	Symbol	Meaning	
Safety Alert	(typical)	DANGER	Indicates an **imminent hazardous situation**. If not avoided, it **will result in death or serious injury**.
		WARNING	Indicates a **potential hazardous situation**. If not avoided, it **can result in death or serious injury**.
		CAUTION	Indicates a **probable hazardous situation** or calls the attention to unsafe practices. If not avoided, it **may result in injury**.
Prohibited Action	(typical)	Indicates a dangerous action. Hence, **you must not**!	
Mandatory Action	(typical)	Indicates a mandatory action. Hence, **you must**!	

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Type	Symbol	Meaning
Information		Requirement / Note / Remark	Indicates an activity you must perform prior continuing, or gives information on a particular item you need to observe.
		Best Practice	Indicates an advice or recommendation on the easiest and best way to further proceed.
		Material Damage	Indicates information particular to possible damage of the equipment.

Table 1-2   Symbols & Signs

1.1.5   Trademarks and Brand Names

For easier legibility, registered brand names are listed below and will not be further tagged with their respective trademark. It must be understood that the brands (the list below is not necessarily concluding) are protected by copyright and/or other intellectual property rights even if their legal trademarks are omitted in the later course of this document.

Brand Name	Trademark Owner
Windows®	© Microsoft Corporation, USA-Redmond, WA

Table 1-3   Brand Names and Trademark Owners

1.1.6   Copyright

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CH-6072 Sachseln   Web   www.maxonmotor.com

1.2   About the Device

The ESCON 36/2 DC is a small-sized, powerful 4-quadrant PWM servo controller for the highly efficient control of permanent magnet-activated DC motors up to approximately 72 Watts.

The featured operating modes – speed control (closed loop), speed control (open loop), and current control – meet the highest requirements. The ESCON 36/2 DC is designed being commanded by an analog set value and features extensive analog and digital I/O functionality.

The device is designed to be configured via USB interface using the graphical user interface «ESCON Studio» for Windows PCs.

You can download the latest ESCON software version (as well as the latest edition of the documentation) from the internet under ➜http://escon.maxonmotor.com.

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1.3 About the Safety Precautions

- Make sure that you have read and understood the note "READ THIS FIRST" on page A-2!
- Do not engage with any work unless you possess the stated skills (➔chapter "1.1.2 Target Audience" on page 1-3)!
- Refer to ➔chapter "1.1.4 Symbols & Signs" on page 1-3 to understand the subsequently used indicators!
- You must observe any regulation applicable in the country and/or at the site of implementation with regard to health and safety/accident prevention and/or environmental protection!

DANGER

High Voltage and/or Electrical Shock
Touching live wires causes death or serious injuries!
- *Consider any power cable as connected to life power, unless having proven the opposite!*
- *Make sure that neither end of cable is connected to life power!*
- *Make sure that power source cannot be engaged while work is in process!*
- *Obey lock-out/tag-out procedures!*
- *Make sure to securely lock any power engaging equipment against unintentional engagement and tag it with your name!*

Requirements
- *Make sure that all associated devices and components are installed according to local regulations.*
- *Be aware that, by principle, an electronic apparatus can not be considered fail-safe. Therefore, you must make sure that any machine/apparatus has been fitted with independent monitoring and safety equipment. If the machine/apparatus should break down, if it is operated incorrectly, if the control unit breaks down or if the cables break or get disconnected, etc., the complete drive system must return – and be kept – in a safe operating mode.*
- *Be aware that you are not entitled to perform any repair on components supplied by maxon motor.*

Electrostatic Sensitive Device (ESD)
- *Make sure to wear working cloth in compliance with ESD.*
- *Handle device with extra care.*

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2   Specifications

2.1   Technical Data

ESCON 36/2 DC (403112)		
Electrical Rating	Nominal operating voltage $+V_{CC}$	10…36 VDC
	Absolute operating voltage $+V_{CC\ min}$ / $+V_{CC\ max}$	8 VDC / 38 VDC
	Output voltage (max.)	0.98 x $+V_{CC}$
	Output current I_{cont} / I_{max} (<60 s)	2 A / 4 A
	Pulse Width Modulation frequency	53.6 kHz
	Sampling rate PI current controller	53.6 kHz
	Sampling rate PI speed controller	5.36 kHz
	Max. efficiency	95%
	Max. speed	limited by max. permissible speed (motor) and max. output voltage (controller)
	Built-in motor choke	300 µH; 2 A
Inputs & Outputs	Analog Input 1 Analog Input 2	resolution 12-bit; –10…+10 V; differential
	Analog Output 1 Analog Output 2	resolution 12-bit; –4…+4 V; referenced to GND
	Digital Input 1 Digital Input 2	+2.4…+36 VDC (R_i = 38.5 kΩ)
	Digital Input/Output 3 Digital Input/Output 4	+2.4…+36 VDC (R_i = 38.5 kΩ) / max. 36 VDC (I_L <500 mA)
	Encoder signals	A, A\, B, B\, (max. 1 MHz)
Voltage Outputs	Auxiliary output voltage	+5 VDC (I_L ≤40 mA)
	Encoder supply voltage	+5 VDC (I_L ≤70 mA)
Potentiometer	Potentiometer P1 (on board)	210°; linear
Motor Connections	+ Motor	
	– Motor	
Interface	USB 2.0	full speed (12 Mbit/s)
Status Indicators	Operation	green LED
	Error	red LED
Physical	Weight	approx. 30 g
	Dimensions (L x W x H)	55 x 40 x 16.1 mm
	Mounting holes	for M2.5 screws

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ESCON 36/2 DC (403112)			
Environmental Conditions	Temperature	Operation	−30…+45°C
		Extended range [1]	+45…+81°C Derating: −0.056 A/°C
		Storage	−40…+85°C
	Humidity	20…80% (condensation not permitted)	

Remark: *1) Operation within the extended temperature range is permitted. However, a respective derating (declination of max. output current) as to the stated value will apply.

Table 2-4   Technical Data

Figure 2-1   Dimensional Drawing [mm]

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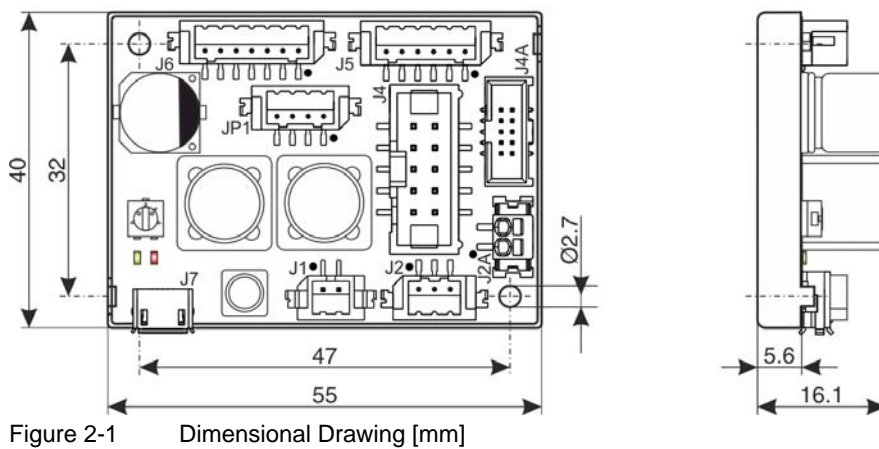
2.2   Standards

The described device has been successfully tested for compliance with the below listed standards. In practical terms, only the complete system (the fully operational equipment comprising all individual components, such as motor, servo controller, power supply unit, EMC filter, cabling etc.) can undergo an EMC test to ensure interference-free operation.

! ***Important Notice***
The device's compliance with the mentioned standards does not imply its compliance within the final, ready to operate setup. In order to achieve compliance of your operational system, you must perform EMC testing of the involved equipment as a whole.

Electromagnetic Compatibility		
Generic Standards	IEC/EN 61000-6-2	Immunity for industrial environments
	IEC/EN 61000-6-3	Emission standard for residential, commercial and light-industrial environments
Applied Standards	IEC/EN 61000-6-3 IEC/EN 55022 (CISPR22)	Radio disturbance characteristics / radio interference
	IEC/EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test >10 V/m
	IEC/EN 61000-4-4	Electrical fast transient/burst immunity test ±2 kV
	IEC/EN 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields 10 Vrms

Others		
Environmental Standards	IEC/EN 60068-2-6	Environmental testing – Test Fc: Vibration (sinusoidal)
	MIL-STD-810F	Random transport
Safety Standards	UL File Number E207844; unassembled printed circuit board	

Table 2-5   Standards

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3   Setup

IMPORTANT NOTICE: PREREQUISITES FOR PERMISSION TO COMMENCE INSTALLATION

The ESCON 36/2 DC is considered as partly completed machinery according to EU Directive 2006/42/EC, Article 2, Clause (g) and **is intended to be incorporated into or assembled with other machinery or other partly completed machinery or equipment**.

> **WARNING**
>
> *Risk of Injury*
> *Operating the device without the full compliance of the surrounding system with the EU Directive 2006/42/EC may cause serious injuries!*
> * *Do not operate the device, unless you have made completely sure that the other machinery fully complies with the EU directive's requirements!*
> * *Do not operate the device, unless the other machinery fulfills all relevant health and safety aspects!*
> * *Do not operate the device, unless all respective interfaces have been established and fulfill the requirements stated in this document!*

3.1   Generally applicable Rules

For each possible motor variant you will find information on the from/to connections and the cables you will require. If you should decide not to use the ready-made maxon cables, you must establish the respective connections as to ➔chapter "3.4.7 ESCON 36/2 DC Connector Set" on page 3-29 and ➔chapter "4 Wiring" on page 4-33.

Maximal permitted Supply Voltage
* *Make sure that supply power is between 10…36 VDC.*
* *Supply voltages above 38 VDC, or wrong polarity will destroy the unit.*
* *Note that the necessary output current is depending on the load torque. Yet, the output current limits of the ESCON 36/2 DC are as follows; continuous max. 2 A / short-time (acceleration) max. 4 A.*

How to read the Wiring Details

The subsequent description follows this scheme:
* *Column "J… & Head A": Pin number…*
  – of the socket,
  – of the corresponding plug, and
  – of Head A of the matching prefab maxon cable.
* *Column "Prefab Cable": Wire color of the prefab maxon cable.*
* *Column "Head B": Pin number of Head B of the matching prefab maxon cable.*

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3.2 Determination of Power Supply

Basically, any power supply may be used, provided it meets the minimal requirements stated below.

Power Supply Requirements	
Output voltage	+V_{CC} 10…36 VDC
Absolute output voltage	min. 8 VDC; max. 38 VDC
Output current	Depending on load (continuous max. 2 A; short-time (acceleration) max. 4 A (<60 s)

1) Use the formula below to calculate the required voltage under load.

2) Choose a power supply according to the calculated voltage. Thereby consider:

   a) During braking of the load, the power supply must be capable of buffering the recovered kinetic energy (for example, in a capacitor).

   b) If you are using an electronically stabilized power supply, make sure that the overcurrent protection circuit is configured inoperative within the operating range.

Note

The formula already takes the following into account:

- *Maximum PWM duty cycle of 98%*
- *Controller's max. voltage drop of 1 V @ 2 A*

KNOWN VALUES:

- Operating torque M [mNm]
- Operating speed n [rpm]
- Nominal motor voltage U_N [Volt]
- Motor no-load speed at U_N, n_0 [rpm]
- Speed/torque gradient of the motor $\Delta n/\Delta M$ [rpm/mNm]

SOUGHT VALUE:

- Supply voltage +V_{CC} [Volt]

SOLUTION:

$$V_{CC} \geq \left[\frac{U_N}{n_O} \cdot \left(n + \frac{\Delta n}{\Delta M} \cdot M \right) \cdot \frac{1}{0.98} \right] + 1\,[V]$$

3.3 Cabling

Here you can get the connection information required to commission your ESCON 36/2 DC. You will find all details for both approaches, Plug&Play and making your own cables.

PLUG&PLAY

Take advantage of maxon's prefab cable assemblies. They come as ready-to-use parts and will help you to reduce commissioning time to a minimum.

a) Check the «Cable Selector» (➔Table 3-6) to find the cable assemblies' order number matching the setup you will be using.

b) Follow the cross-reference to get the cable assemblies' pin assignment.

MAKE&BAKE YOUR OWN

a) Check the «Cable Selector» (➔Table 3-6) to find the required cables for the setup you will be using.

b) Follow the cross-reference to get the cable's specification and pin assignment.

c) Utilize the installation kit (➔page 3-29) containing plugs and terminals that will fit the controller's sockets.

Cable				DC Motor with…	
Designation	Order number	➔ page	Socket	Separated Motor/Encoder Cable	Integrated Motor/Encoder Ribbon Cable
Power Cable	403957	3-14	J1	X	X
DC Motor Cable	403962	3-15	J2	X	
Encoder Cable	275934	3-18	J4	O	O
I/O Cable 7core	403964	3-26	J6	O	O
I/O Cable 8core	403965	3-22	J5	X	X
USB Type A - micro B Cable	403968	3-28	J7	X	X
Legend: X = required / O = optional					

Table 3-6   Cable Selector

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3.4   Connections

The actual connection will depend on the overall configuration of your drive system and the type of motor you will be using. Some connections must be established in a given way, while for motor (J2/J2A and encoder (J4/J4A) alternative plug-in locations can be chosen from.

Follow the description in given order and choose the connection scheme that suits the respective components you are using. For corresponding wiring diagrams ➔chapter "4 Wiring" on page 4-33.

3.4.1   Power (J1)

Figure 3-2   Power Socket J1

J1 & Head A Pin	Prefab Cable Color	Head B Pin	Signal	Description
1	white	–	Power_GND	Ground of supply voltage
2	brown	+	$+V_{CC}$	Power supply voltage (+10…+36 VDC)

Table 3-7   Power Socket J1 – Pin Assignment & Cabling

Power Cable (403957)		
A		B
Cable cross-section	2 x 0.34 mm²	
Length	1.5 m	
Head A	Suitable plugs Suitable contacts	Hirose DF3-2S-2C Hirose DF3-22SC…
Head B	Cable end sleeves 0.34 mm²	

Table 3-8   Power Cable

3.4.2 Motor (J2 / J2A)

Potential Destruction
Use only one of the two sockets – either J2 or J2A!

SOCKET J2

Figure 3-3   Motor Socket J2

J2 & Head A Pin	Prefab Cable Color	Head B Pin	Signal	Description
1	white		Motor (+M)	Motor +
2	brown		Motor (–M)	Motor –
3	black		Motor shield	Cable shield

Table 3-9   Motor Socket J2 – Pin Assignment & Cabling

DC Motor Cable (403962)		
A 3 1		B
Cable cross-section	2 x 0.34 mm^2 shielded	
Length	1.5 m	
Head A	Suitable plugs Suitable contacts	Hirose DF3-3S-2C Hirose DF3-22SC…
Head B	Cable end sleeves 0.34 mm^2	

Table 3-10   DC Motor Cable

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SOCKET J2A

Figure 3-4   Motor Socket J2A

J2A & Head A Pin	Prefab Cable Color	Head B Pin	Signal	Description
1			Motor (+M)	Motor +
2			Motor (–M)	Motor –

Table 3-11   Motor Socket J2A – Pin Assignment

Specification / Accessories	
Type	2 poles, spring-loaded contacts, pitch 2.5 mm
Suitable cables	Rigid: 0.14…0.5 mm² / wire stripping length 6 mm
	Flexible: 0.2…0.5 mm² / wire stripping length 6 mm 0.25…0.5 mm² / wire stripping length 6 mm, cable end sleeves
Suitable tools	Miniature screwdriver, size "00"

Table 3-12   Motor Socket J2A – Specification & Accessories

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3.4.3 Encoder (J4 / J4A)

Potential Destruction
Use only one of the two sockets – either J4 or J4A!

SOCKET J4
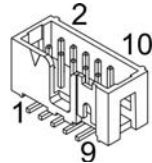
Figure 3-5   Encoder Socket J4

J4 & Head A Pin	Prefab Cable Color	Head B Pin	Signal	Description
1			Motor (+M)	Motor +M (➔note below)
2			+5 VDC	Encoder supply voltage (+5 VDC; ≤70 mA)
3			GND	Ground
4			Motor (–M)	Motor –M (➔note below)
5			Channel A\	Channel A complement
6			Channel A	Channel A
7			Channel B\	Channel B complement
8			Channel B	Channel B
9			not connected	–
10			not connected	–

Table 3-13   Encoder Socket J4 – Pin Assignment & Cabling

Note
*If you are using a **maxon DC motor with integrated Motor/Encoder Ribbon Cable**, make sure to close both JP1 jumpers (➔chapter "3.5 Jumpers" on page 3-30).*

Accessories		
Suitable strain relief	Lock	2 levers, Harting (09 18 000 9905)
	Retainer	For sockets with strain relief: 1 retainer clip, height 13.5 mm, 3M (3505-8110)
		For sockets without strain relief: 1 retainer clip, height 7.9 mm, 3M (3505-8010)
	Latch	For sockets with strain relief: 2 pieces, 3M (3505-33B)

Table 3-14   Encoder Socket J4 – Accessories
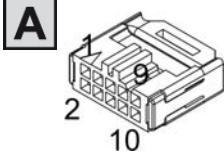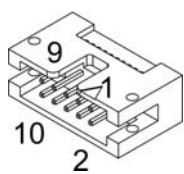
Encoder Cable (275934)	
Cable cross-section	10 x AWG28, round-jacket, twisted pair flat cable, pitch 1.27 mm
Length	3.20 m
Head A	DIN 41651 female, pitch 2.54 mm, 10 poles, with strain relief
Head B	DIN 41651 Plug, pitch 2.54 mm, 10 poles, with strain relief

Table 3-15   Encoder Cable

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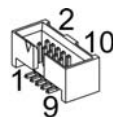
SOCKET J4A

Figure 3-6   Encoder Socket J4A

J4A & Head A Pin	Prefab Cable Color	Head B Pin	Signal	Description
1			not connected	–
2			+5 VDC	Encoder supply voltage (+5 VDC; ≤70 mA)
3			GND	Ground
4			not connected	–
5			Channel A\	Channel A complement
6			Channel A	Channel A
7			Channel B\	Channel B complement
8			Channel B	Channel B
9			not connected	–
10			not connected	–

Table 3-16   Encoder Socket J4A – Pin Assignment

Specification / Accessories	
Type	2 x 5 poles, half pitch box header, pitch 1.27/1.27 mm
Suitable plugs	Samtec: FFSD series W+P Products: 376 series Elcotron: IDC32 series
Suitable cables	Flat ribbon cable AWG 30

Table 3-17   Encoder Socket J4A – Specification & Accessories

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Best Practice
- *Because of its resistance against electrical interferences, **we recommend using differential scheme**. Nevertheless, the controller supports both schemes – differential and single-ended.*
- *The controller does not require an index impulse (Ch I, Ch I\).*
- *For best performance, **we strongly recommend using encoders with line driver**. Otherwise, speed limitations may apply due to slow switching edges.*

Differential	
Min. differential input voltage	±200 mV
Max. input voltage	+12 VDC / –12 VDC
Line receiver (internal)	EIA RS422 Standard
Max. input frequency	1 MHz
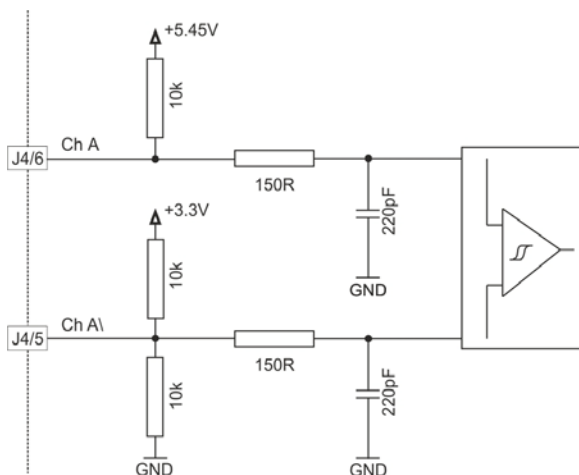
Figure 3-7   Encoder Input Circuit Ch A "Differential" (analogously valid also for Ch B)

Single-ended		3-21
Input voltage	0…5 VDC	
Max. input voltage	+12 VDC / −12 VDC	
Logic 0	<1.0 V	
Logic 1	>2.4 V	
Input high current	I_{IH} = typically −50 µA @ 5 V	
Input low current	I_{IL} = typically −550 µA @ 0 V	
Max. input frequency	100 kHz	
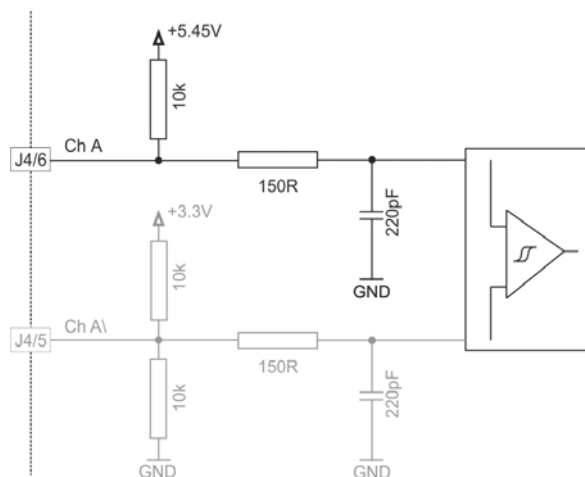
Figure 3-8   Encoder Input Circuit Ch A "Single-ended" (analogously valid also for Ch B)

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3.4.4   Digital I/Os (J5)
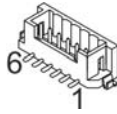
Figure 3-9   Digital I/Os Socket J5

J5 & Head A Pin	Prefab Cable Color	Head B Pin	Signal	Description
1	white		DigIN1	Digital input 1
2	brown		DigIN2	Digital input 2
3	green		DigIN/DigOUT3	Digital input/output 3
4	yellow		DigIN/DigOUT4	Digital input/output 4
5	grey		GND	Signal ground
6	pink		+5 VDC	Auxiliary output voltage (+5 VDC; ≤40 mA)

Table 3-18   Digital I/Os Socket J5 – Pin Assignment & Cabling

I/O Cable 8core (403965)		
A		**B**
Cable cross-section	6 x 0.14 mm^2	
Length	1.5 m	
Head A	Suitable plugs Suitable contacts	Hirose DF3-6S-2C Hirose DF3-2428SC…
Head B	Cable end sleeves 0.14 mm^2	

Table 3-19   I/O Cable 8core

3.4.4.1 Digital Input 1

Input voltage	0…36 VDC
Max. input voltage	+36 VDC / −36 VDC
Logic 0	typically <1.0 V
Logic 1	typically >2.4 V
Input resistance	typically 47 kΩ (<3.3 V) typically 38.5 kΩ (@ 5 V) typically 25.5 kΩ (@ 24 V)
Input current at logic 1	typically 130 µA @ 5 VDC
Switching delay	<8 ms

PWM frequency range	10 Hz…5 kHz
PWM duty cycle range	10...90%
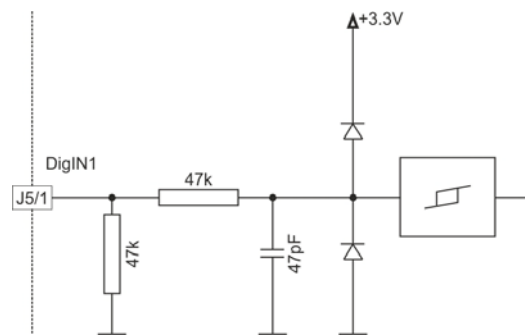
Figure 3-10   DigIN1 Circuit

3.4.4.2 Digital Input 2

Input voltage	0…36 VDC
Max. input voltage	+36 VDC / −36 VDC
Logic 0	typically <1.0 V
Logic 1	typically >2.4 V
Input resistance	typically 47 kΩ (<3.3 V) typically 38.5 kΩ (@ 5 V) typically 25.5 kΩ (@ 24 V)
Input current at logic 1	typically 130 µA @ 5 VDC
Switching delay	<8 ms

Figure 3-11   DigIN2 Circuit

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3.4.4.3   Digital Inputs/Outputs 3 and 4

DigIN	
Input voltage	0…36 VDC
Max. input voltage	+36 VDC
Logic 0	typically <1.0 V
Logic 1	typically >2.4 V
Input resistance	typically 47 kΩ (<3.3 V) typically 38.5 kΩ (@ 5 V) typically 25.5 kΩ (@ 24 V)
Input current at logic 1	typically 130 µA @ 5 VDC
Switching delay	<8 ms

Figure 3-12   DigIN3 Circuit (analogously valid also for DigIN4)

DigOUT	
Max. input voltage	+36 VDC
Max. load current	500 mA
Max. voltage drop	0.5 V @ 500 mA
Max. load inductance	100 mH @ 24 VDC; 500 mA
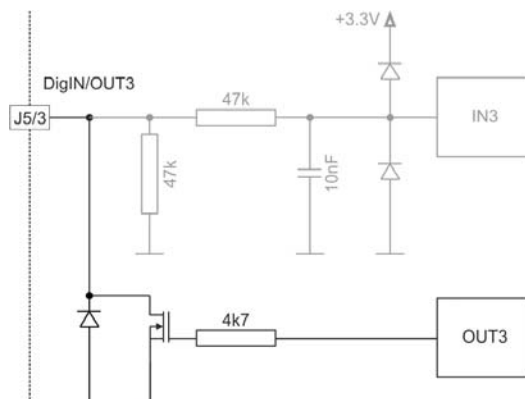
Figure 3-13   DigOUT3 Circuit (analogously valid also for DigOUT4)

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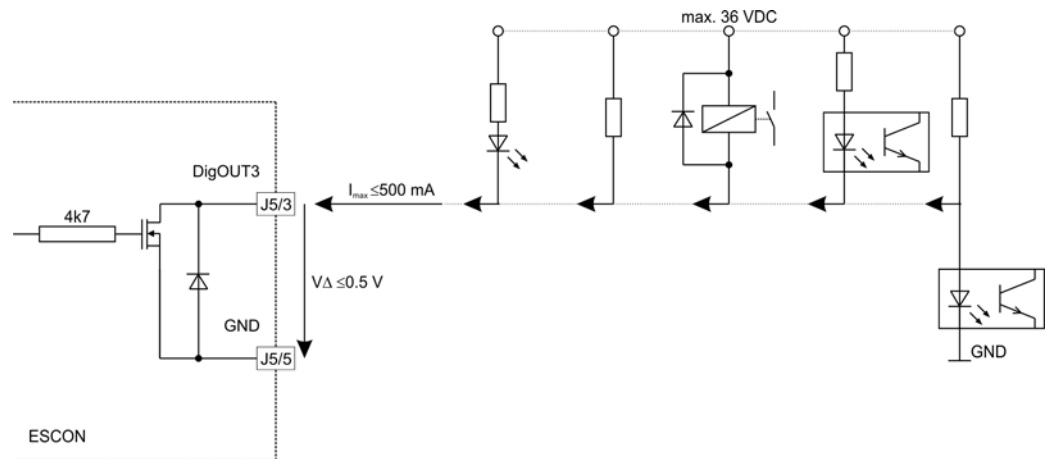
Figure 3-14   DigOUT3 Wiring Examples (analogously valid also for DigOUT4)

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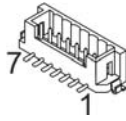
3.4.5 Analog I/Os (J6)

Figure 3-15   Analog I/Os Socket J6

J6 & Head A Pin	Prefab Cable Color	Head B Pin	Signal	Description
1	white		AnIN1+	Analog input 1, positive signal
2	brown		AnIN1–	Analog input 1, negative signal
3	green		AnIN2+	Analog input 2, positive signal
4	yellow		AnIN2–	Analog input 2, negative signal
5	grey		AnOUT1	Analog output 1
6	pink		AnOUT2	Analog output 2
7	blue		GND	Signal ground

Table 3-20   Analog I/Os Socket J6 – Pin Assignment & Cabling

I/O Cable 7core (403964)		
A		B
Cable cross-section	7 x 0.14 mm^2	
Length	1.5 m	
Head A	Suitable plugs Suitable contacts	Hirose DF3-7S-2C Hirose DF3-2428SC…
Head B	Cable end sleeves 0.14 mm^2	

Table 3-21   I/O Cable 7core

3.4.5.1 Analog Inputs 1 and 2

Input voltage	–10…+10 VDC (differential)
Max. input voltage	+24 VDC / –24 VDC
Common mode voltage	–5…+10 VDC (referenced to GND)
Input resistance	100 kΩ (differential) 50 kΩ (referenced to GND)
A/D converter	12-bit
Resolution	5.07 mV
Bandwidth	10 kHz
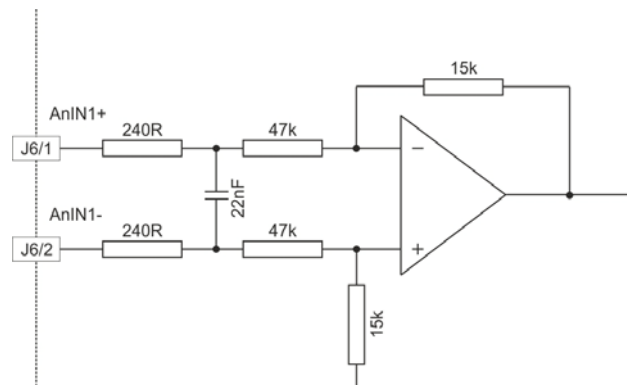
Figure 3-16   AnIN1 Circuit (analogously valid also for AnIN2)

3.4.5.2 Analog Outputs 1 and 2

Output voltage	–4…+4 VDC
D/A converter	12-bit
Resolution	2.30 mV
Refresh rate	AnOUT1: 26.8 kHz AnOUT2: 5.4 kHz
Analog bandwidth of output amplifier	20 kHz
Max. capacitive load	10 nF
Max. output current	1 mA
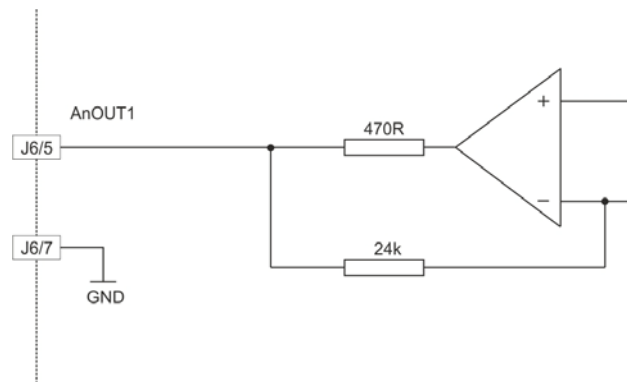
Figure 3-17   AnOUT1 Circuit (analogously valid also for AnOUT2)

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3.4.6   USB (J7)
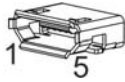
Figure 3-18   USB Socket J7

Note
Column "Head B" (➜Table 3-22) refers to USB terminals of your PC.

J7 & Head A Pin	Prefab Cable Color	Head B Pin	Signal	Description
1		1	V_{BUS}	USB BUS supply voltage input +5 VDC
2		2	D–	USB Data– (twisted pair with Data+)
3		3	D+	USB Data+ (twisted pair with Data–)
4		–	ID	not connected
5		4	GND	USB ground

Table 3-22   USB Socket J7 – Pin Assignment & Cabling

USB Type A - micro B Cable (403968)	
Cable cross-section	According to USB 2.0 specification
Length	1.5 m
Head A	USB Type "micro B", male
Head B	USB Type "A", male

Table 3-23   USB Type A - micro B Cable

USB Standard	2.0 (Full Speed)
Max. bit rate	12 Mbit/s
Max. bus supply voltage	+5.25 VDC
Typical input current	60 mA
Max. DC data input voltage	–0.5…+3.8 VDC

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3.4.7 ESCON 36/2 DC Connector Set

If you decide not to employ maxon motor's prefab cable assemblies, you might wish to use the prepackaged kit that contains all connectors required to make up your own cabling.

ESCON 36/2 DC Connector Set» (404404)		
For Socket	**Specification**	**Quantity**
J1	Hirose crimping socket, 2 poles (DF3-2S-2C)	1
J1, J2	Hirose crimping contact for Socket (DF3-22SC…)	6
J2	Hirose crimping socket, 3 poles (DF3-3S-2C)	1
J4	3M Retainer Clip with Strain Relief, H=13.5 mm (3505-8110)	1
J5	Hirose crimping socket, 6 poles (DF3-6S-2C)	1
J5, J6	Hirose crimping contact for Socket (DF3-2428SC…)	14
J6	Hirose crimping socket, 7 poles (DF3-7S-2C)	1

Table 3-24   ESCON 36/2 DC Connector Set – Content

Best Practice

If you should decide not to use the ready-made cable assemblies, we strongly suggest that you use the following hand tools:

- *Hirose hand crimper (DF3-TA22HC) for crimping contacts DF3-22SC…*
- *Hirose hand crimper (DF3-TA2428HC) for crimping contacts DF3-2428SC…*

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3.5　Jumpers

⚠️ **STOP**
Check on safety precautions before continuing (➜page 1-5).

JUMPER JP1

For maxon DC motor with integrated Motor/Encoder Ribbon Cable, activate the motor terminal by setting both jumpers to CLOSED (➜Figure 3-21, right).
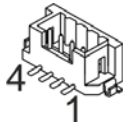
Figure 3-19　　Jumper JP1
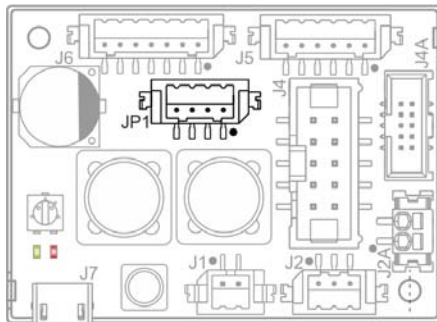
Figure 3-20　　Jumper JP1 – Location
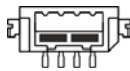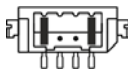
Figure 3-21　　Jumper JP1 – OPEN, Default Setting (left) / CLOSED (right)

3.6　Potentiometers

POTENTIOMETER P1

Adjustment angle	210°
Type	Linear
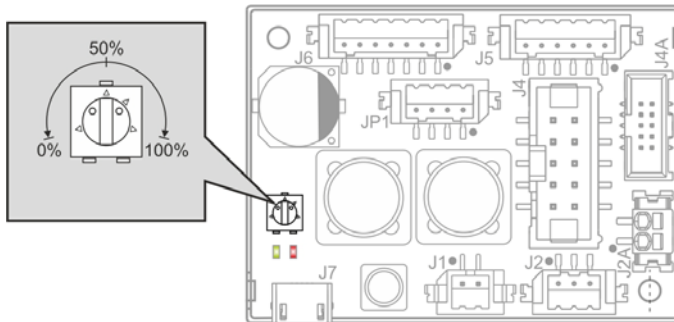
Figure 3-22　　Potentiometer P1 – Location & Adjustment Range

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3.7 Status Indicators

Light-emitting diodes (LEDs) indicate the actual operating status (green) and possible errors (red).
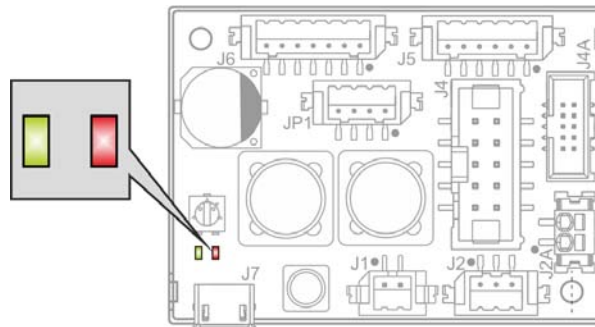
Figure 3-23   LEDs – Location

LED		Status / Error	
Green	**Red**		
off	off	INIT	
slow	off	DISABLE	
on	off	ENABLE	
2x	off	STOPPING; STOP STANDSTILL	
off	1x	ERROR	• +Vcc Overvoltage Error • +Vcc Undervoltage Error • +5 VDC Undervoltage Error
off	2x	ERROR	• Thermal Overload Error • Overcurrent Error • Power Stage Protection Error
off	3x	ERROR	• Encoder Cable Break Error • Encoder Polarity Error • DC Tacho Cable Break Error • DC Tacho Polarity Error
off	4x	ERROR	• PWM Set Value Input out of Range Error
off	on	ERROR	• Auto Tuning Identification Error • Internal Software Error

Table 3-25   LEDs – Interpretation of Condition

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4 Wiring
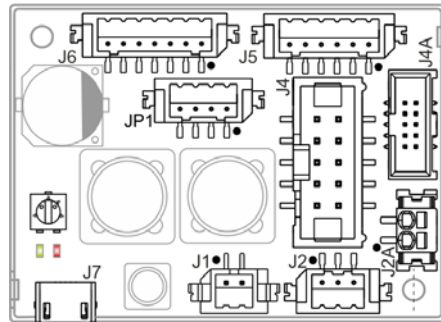
Figure 4-24   Interfaces – Designations and Location

> **Remark**
>
> The subsequent diagrams feature these signs:
>
> *   ⏚ *PCB mounting hole*
>
> *   ⏚ *Ground safety earth connection (optional)*

4.1 maxon DC motor
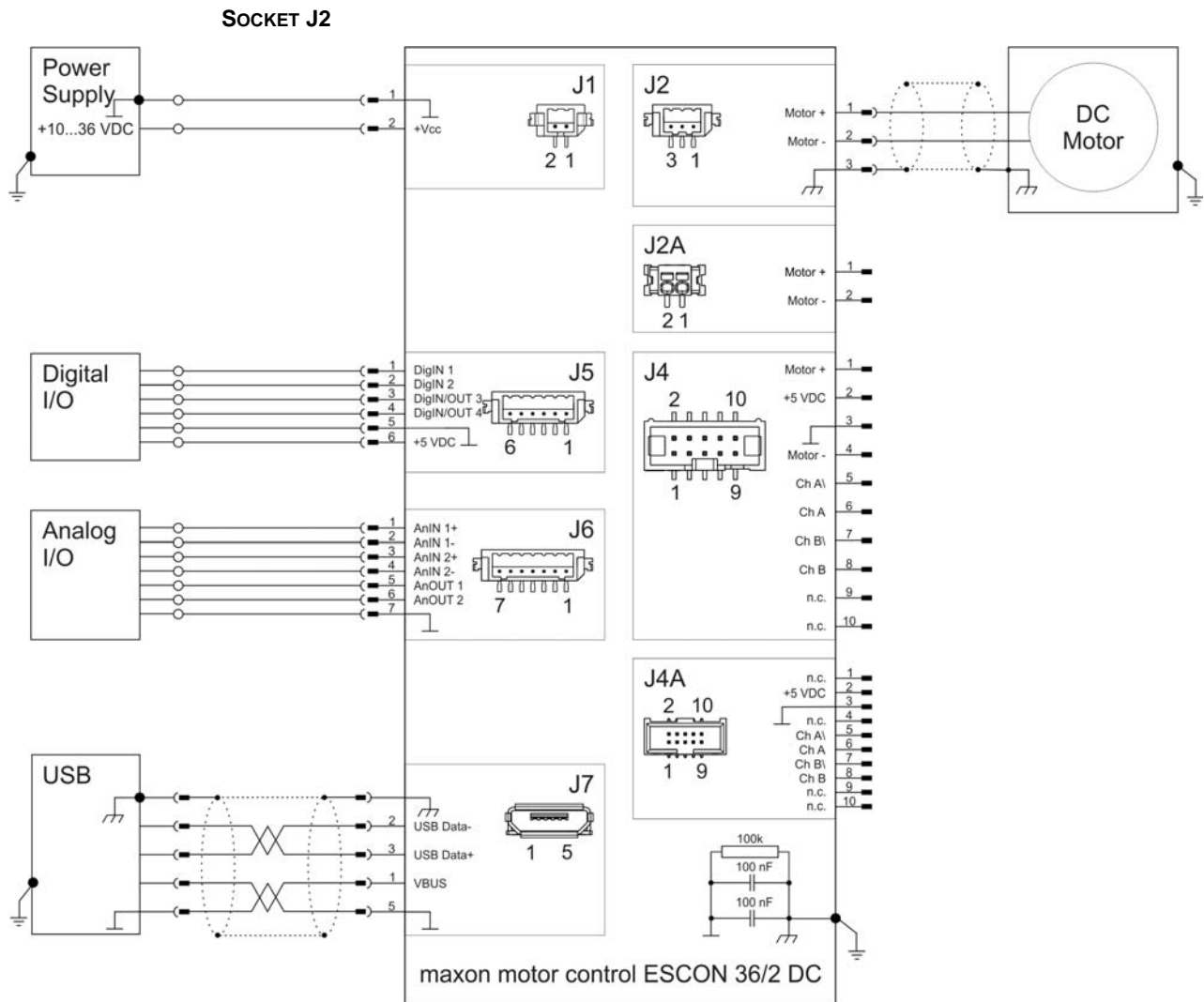
Socket J2

Figure 4-25   maxon DC motor (J2)

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4.2   maxon DC motor with DC Tacho

SOCKET J2
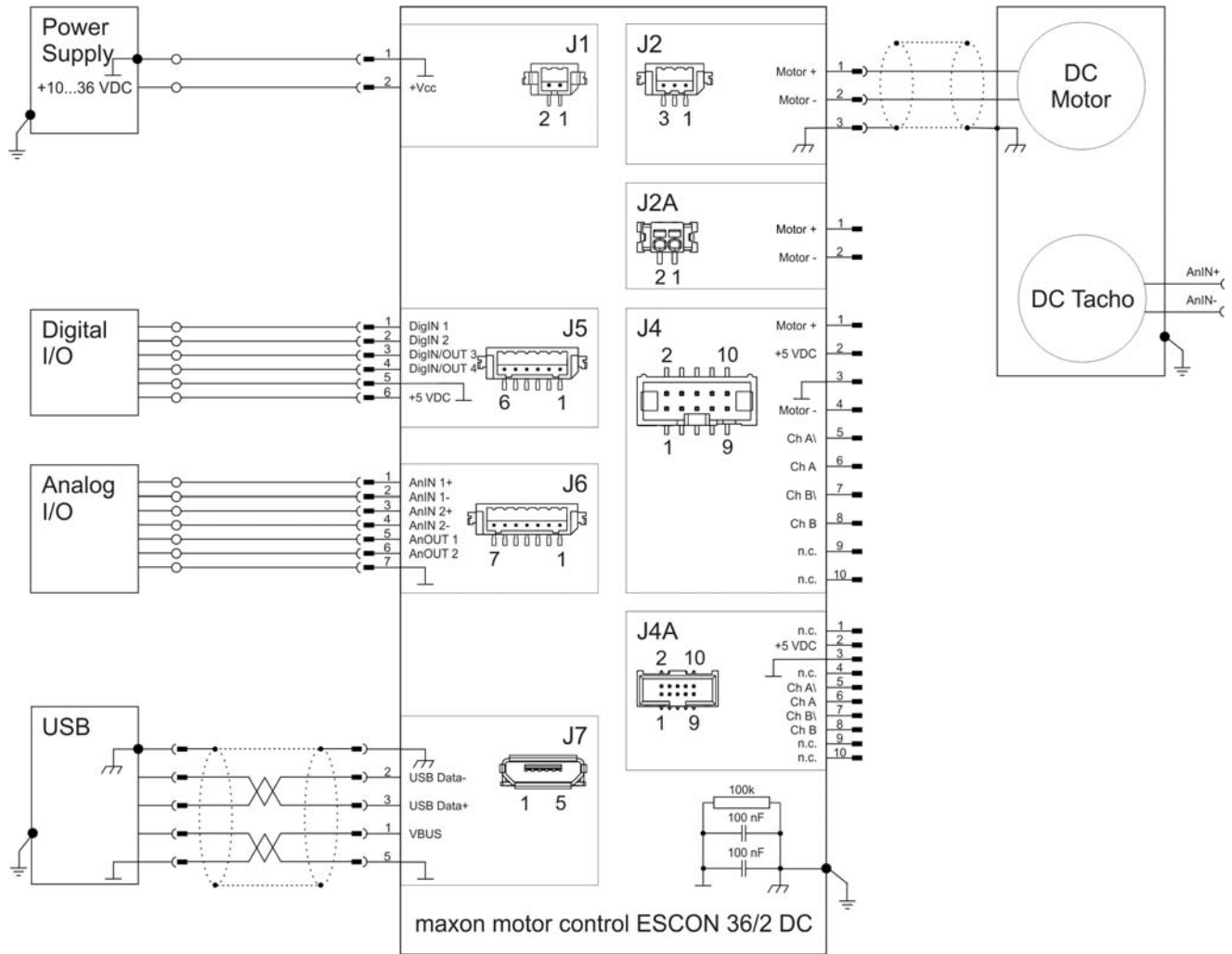
Figure 4-26   maxon DC motor with DC Tacho (J2)

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4.3 maxon DC motor with separated Motor/Encoder Cable

SOCKETS J2 / J4
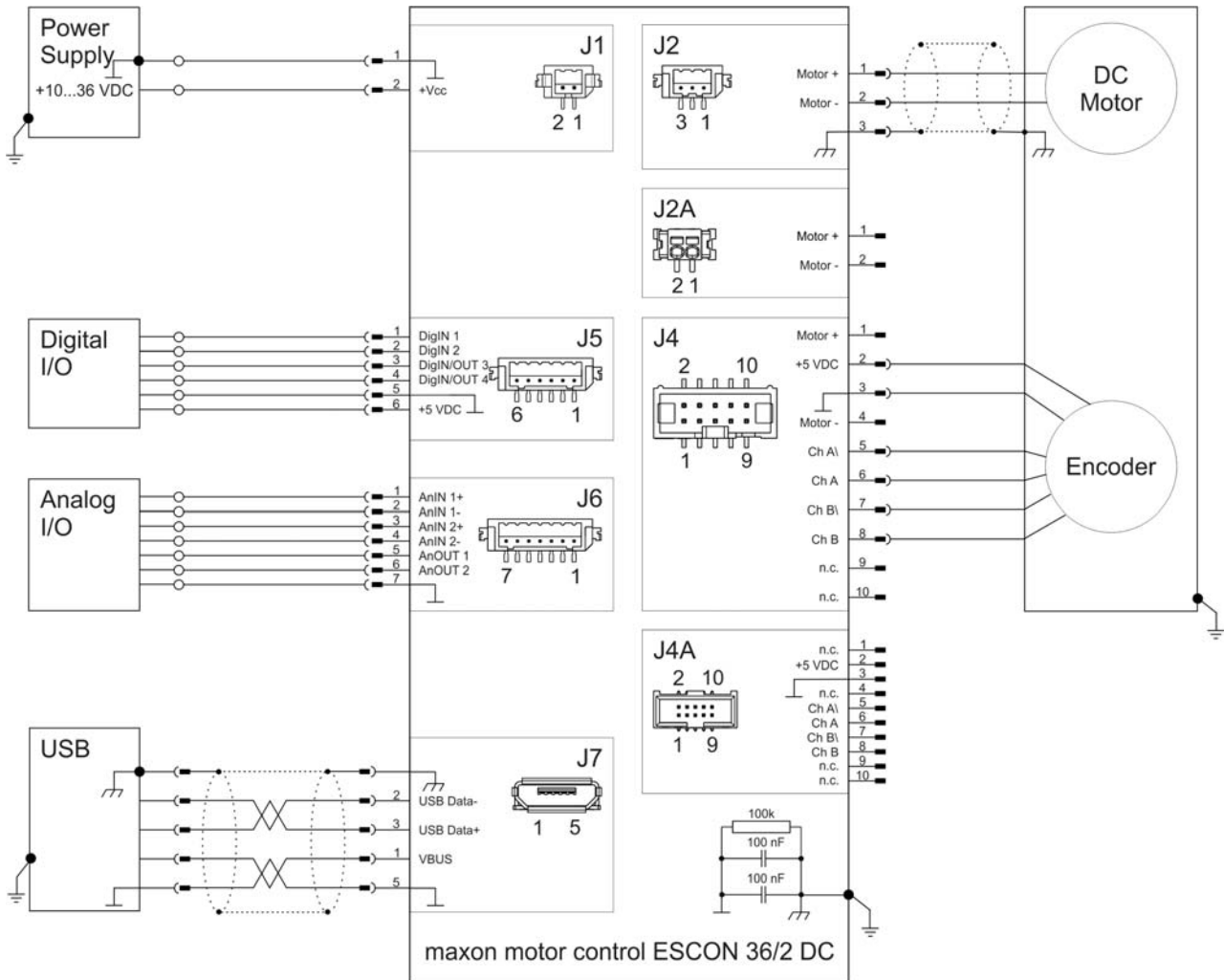
Figure 4-27   maxon DC motor with Encoder – separate Cables (J2 / J4)

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SOCKETS J2 / J4A
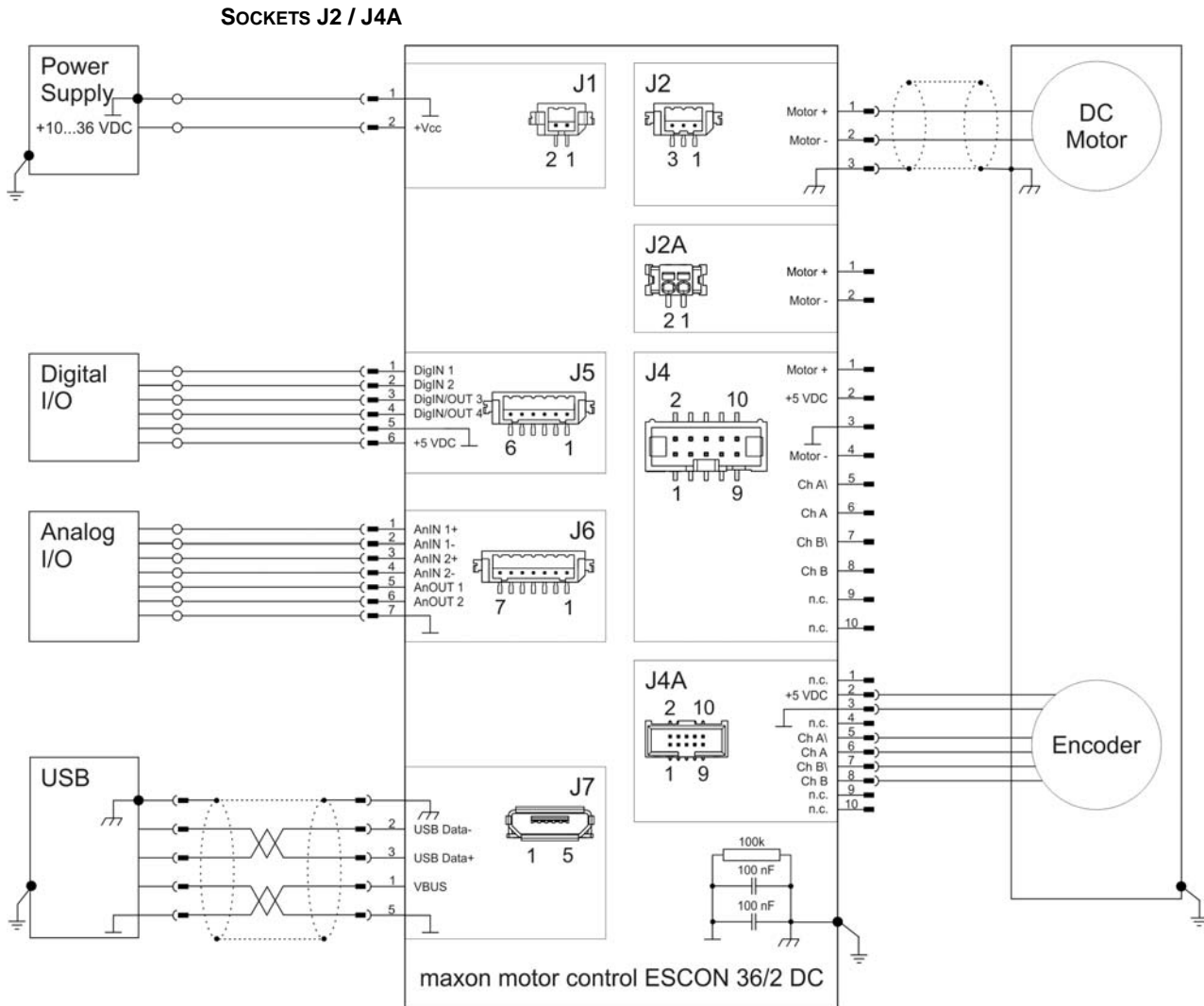
Figure 4-28   maxon DC motor with Encoder – separate Cables (J2 / J4A)

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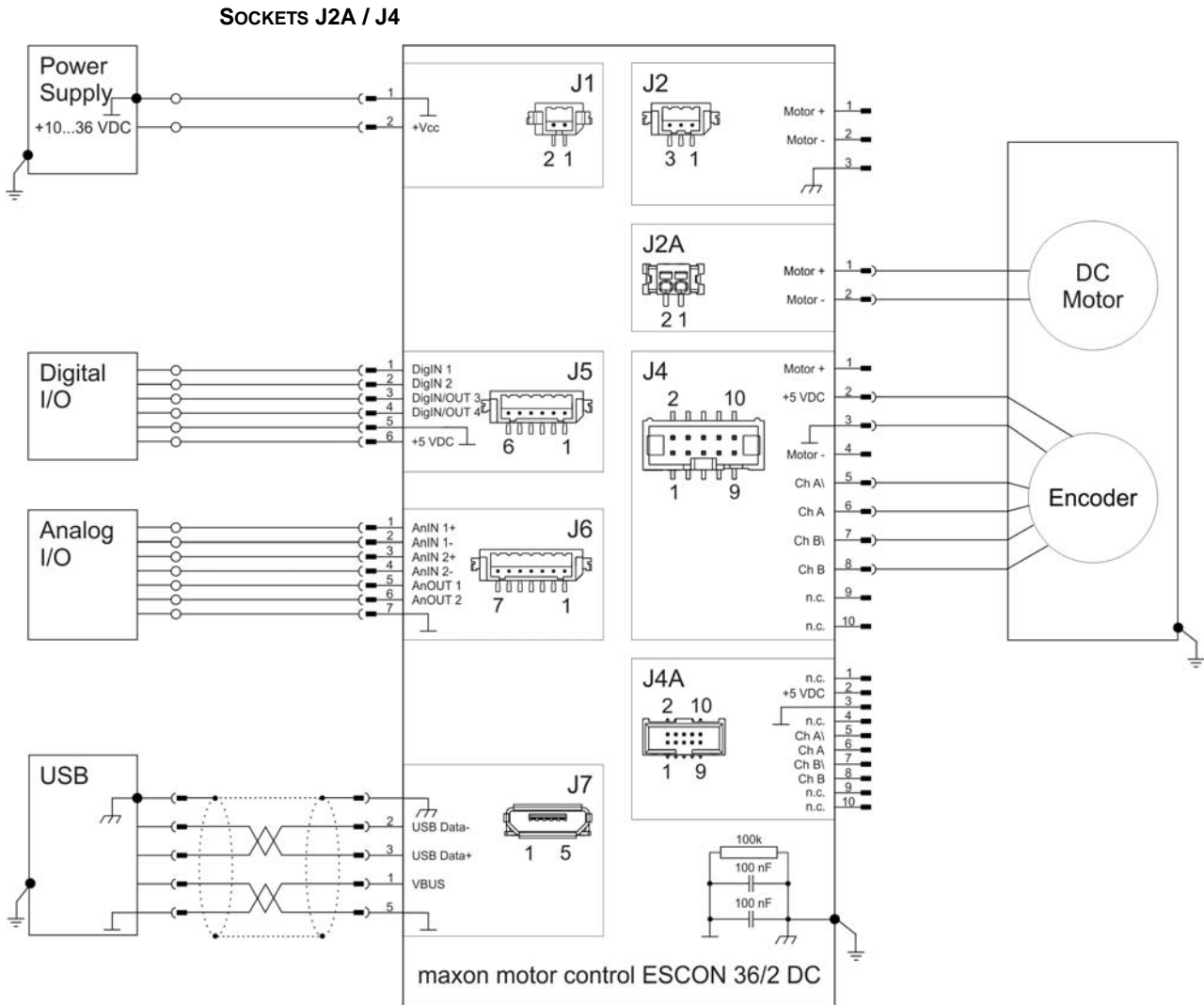
Figure 4-29   maxon DC motor with Encoder – separate Cables (J2A / J4)

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SOCKETS J2A / J4A
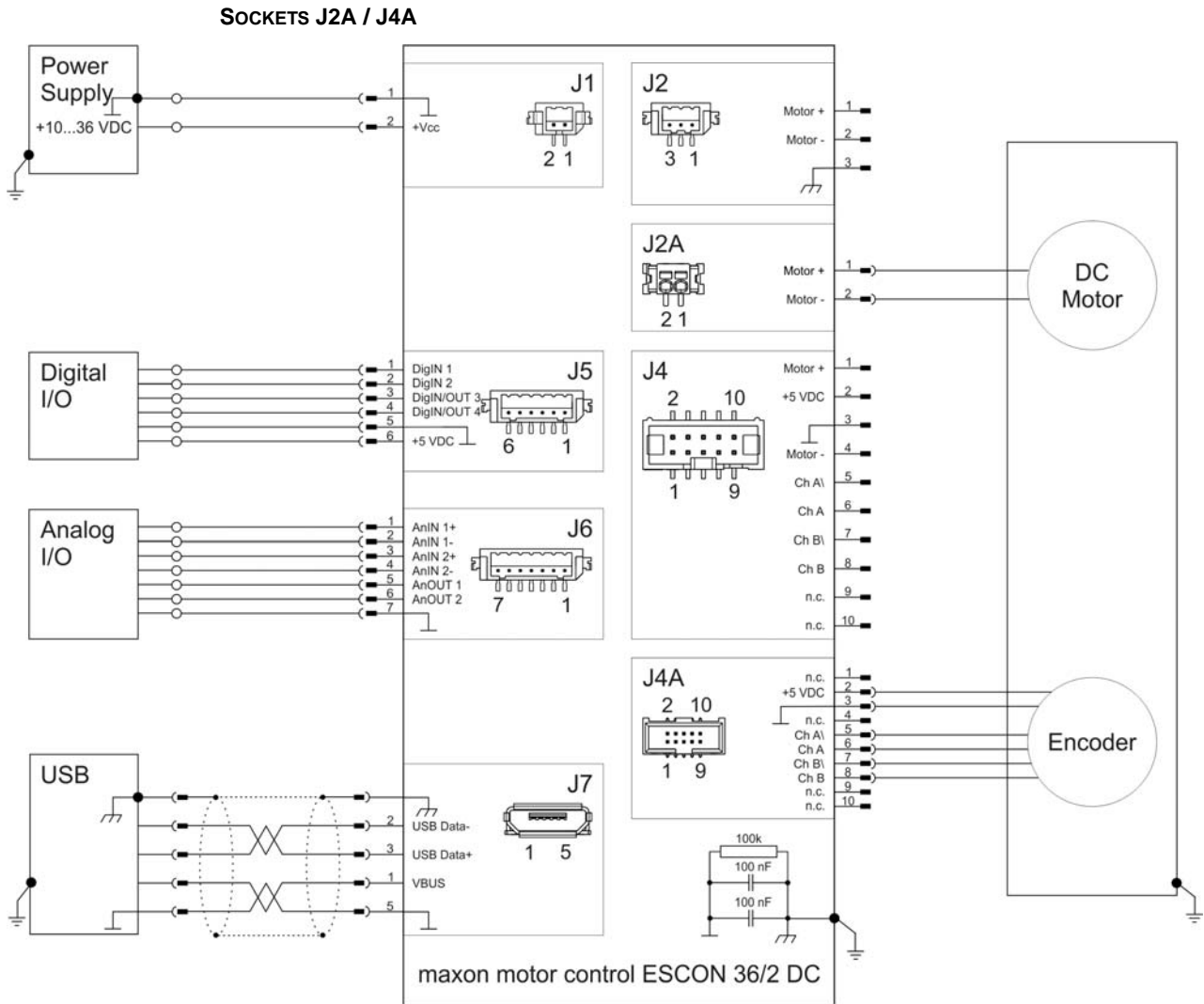
Figure 4-30   maxon DC motor with Encoder – separate Cables (J2A / J4A)

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4.4   maxon DC motor with integrated Motor/Encoder Ribbon Cable
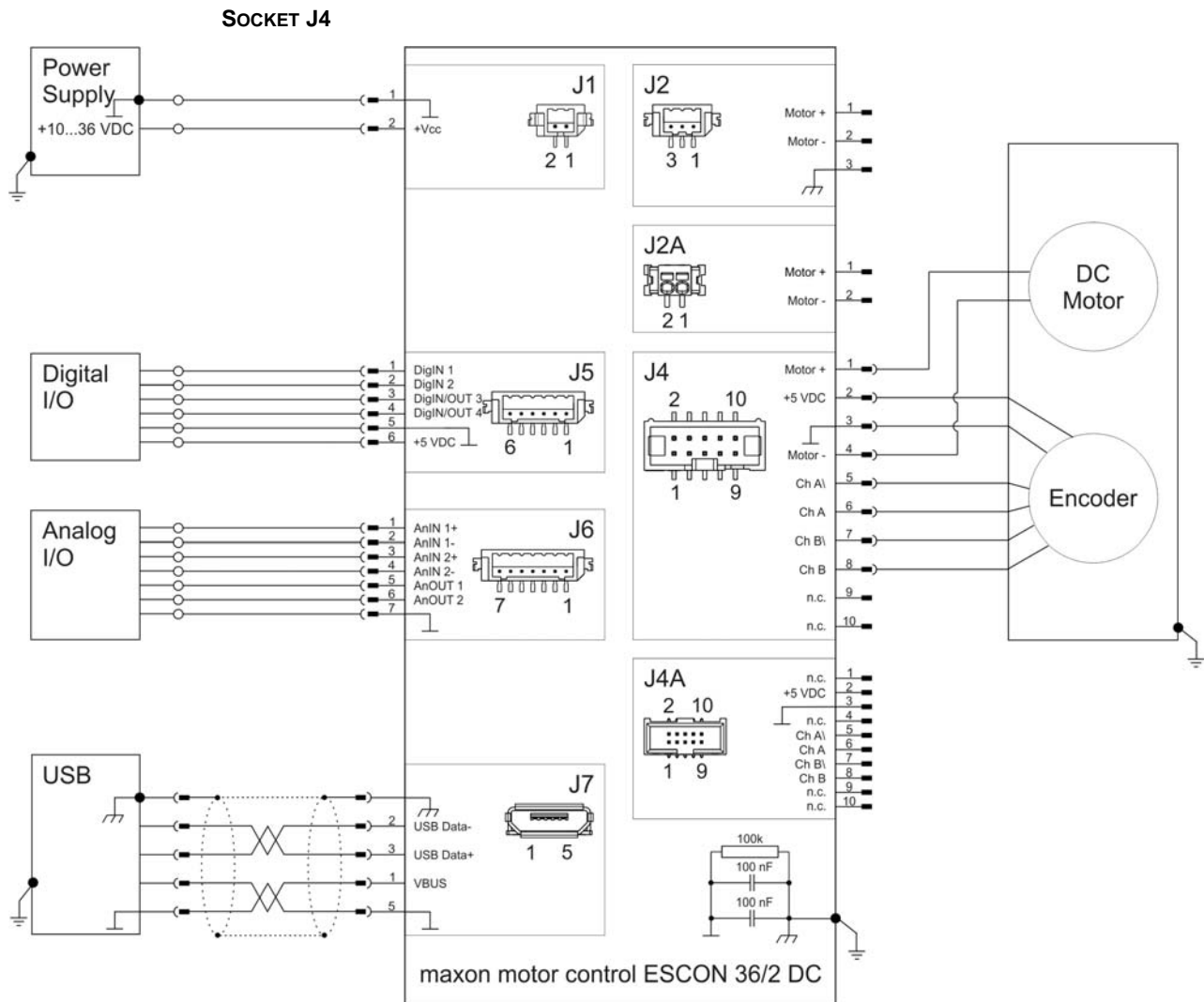
SOCKET J4

Figure 4-31   maxon DC motor with Encoder – integrated Ribbon Cable (J4)

> **Note**
> *For jumper settings ➔ chapter " Jumper JP1" on page 3-30.*

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