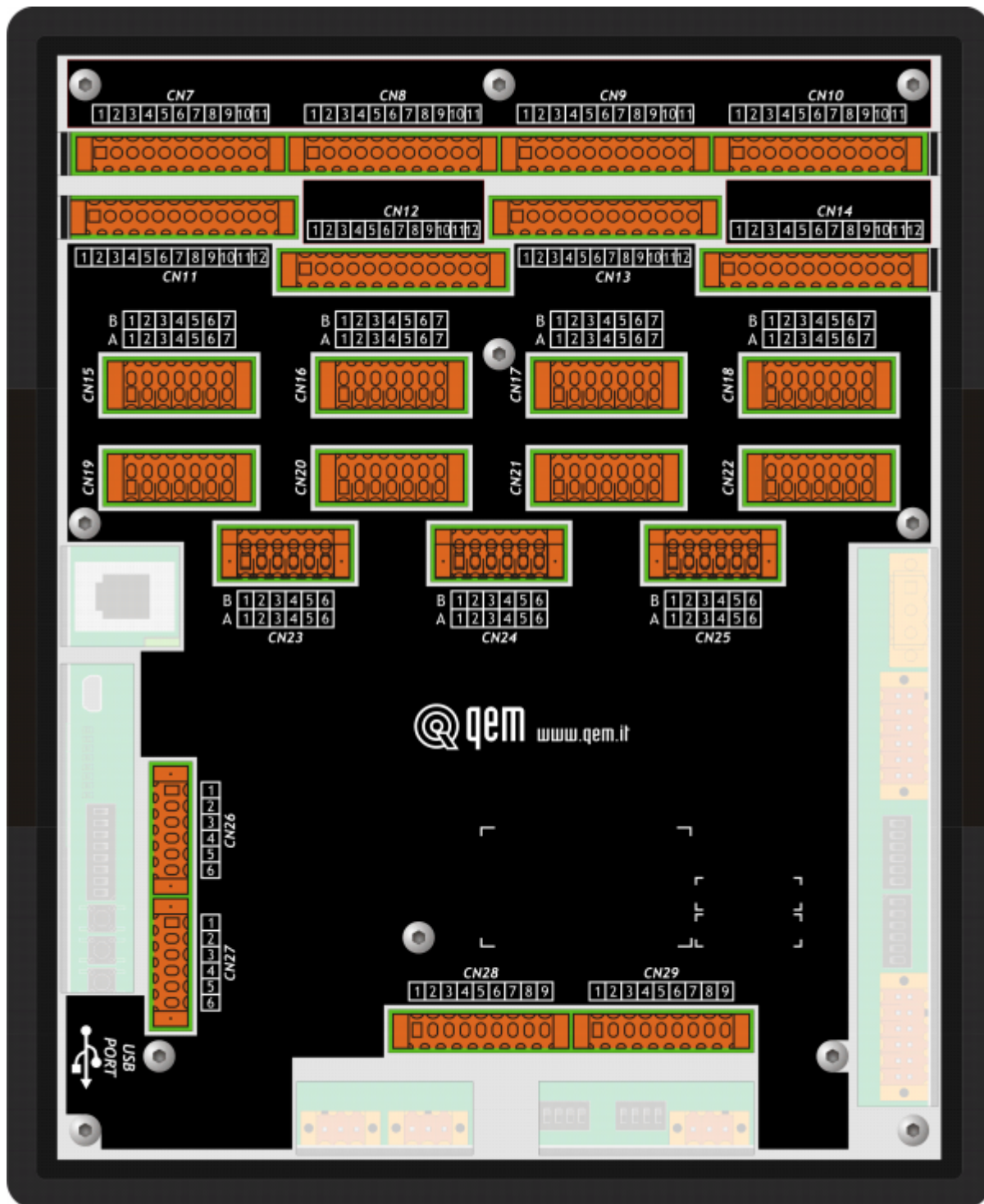


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Specialization card 1MG6F



Informations



Quality in Electronic
Manufacturing

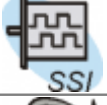
Docuption:	Installation and maintenance manual			
Editor:	Riccardo Furlato			
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Link:	http://www.qem.eu/doku/doku.php/en/strumenti/qmoveplus/mim1mg6f01			
Language:	English			
Document release	Hardware release	Description	Note	Date
01	01	New manual		05/02/2015

02	01	Fixed connectors for protected digital outputs	Will be fixed in the hardware release 02	24/03/2015
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1. Description

The **1MG6F** card for the Qmove+ series.

1.1 Equipment

	32 standard digital inputs (+12 alternative inputs to 6 counters)
	4 analog inputs
	4 rapid digital inputs
	6 bidirectional counters
	2 SSI absolute counters
	32 digital outputs
	8 analog outputs
	4 step-direction outputs

2. Connectors

2.1 Digital inputs

2.1.1 32 standard digital inputs + 4 rapid inputs



The electrical features are given in paragraph [Electrical Features](#).
The wiring examples are given in paragraph [Connection examples](#)

CN11	Terminal	Symbol	Description	Address	
	1	I01(PNP)	PNP type fast input I01	External terminal configuration ¹⁾ FREQ1 ²⁾	
	2	I01(NPN)	PNP type fast input I01		
	3	0V	Common for digital inputs		
	4	I1	Input I1		3.INP01
	5	I2	Input I2		3.INP02
	6	I3	Input I3		3.INP03
	7	I4	Input I4		3.INP04
	8	I5	Input I5		3.INP05
	9	I6	Input I6		3.INP06
	10	I7	Input I7		3.INP07
	11	I8	Input I8		3.INP08
	12	0V	Common for digital inputs		

¹⁾ **NPN type fast input configuration:**

Terminal 1: connect to 12-24Vdc of the power unit

Terminal 2: input

PNP type fast input configuration:

Terminal 1: input

Terminal 2: connect to 0V (terminal 3)

²⁾ can be used as frequency input for a FREQ device, indicating 1 in the device declaration

can be used as frequency input for a Freq device, indicating 1 in the device declaration

CN12	Terminal	Symbol	Description		Address
	1	I02(PNP)	PNP type fast input I02	External terminal configuration ¹⁾	FREQ2 ²⁾
	2	I02(NPN)	NPN type fast input I02		
	3	0V	Common for digital inputs		
	4	I9	Input I9		3.INP09
	5	I10	Input I10		3.INP10
	6	I11	Input I11		3.INP11
	7	I12	Input I12		3.INP12
	8	I13	Input I13		3.INP13
	9	I14	Input I14		3.INP14
	10	I15	Input I15		3.INP15
	11	I16	Input I16		3.INP16
	12	0V	Common for digital inputs		

¹⁾ **NPN type fast input configuration:**

Terminal 1: connect to 12-24Vdc of the power unit

Terminal 2: input

PNP type fast input configuration:

Terminal 1: input

Terminal 2: connect to 0V (terminal 3)

²⁾ can be used as frequency input for a FREQ device, indicating 2 in the device declaration

CN13	Terminal	Symbol	Description		Address	
	1	I03(PNP)	PNP type fast input I03	External terminal configuration ¹⁾	1.INT09	
	2	I03(NPN)	NPN type fast input I03			
	3	0V	Common for digital inputs			
	4	I17	Input I17			3.INP17
	5	I18	Input I18			3.INP18
	6	I19	Input I19			3.INP19
	7	I20	Input I20			3.INP20
	8	I21	Input I21			3.INP21
	9	I22	Input I22			3.INP22
	10	I23	Input I23			3.INP23
	11	I24	Input I24			3.INP24
	12	0V	Common for digital inputs			

¹⁾ NPN type fast input configuration:

Terminal 1: connect to 12-24Vdc of the power unit

Terminal 2: input

PNP type fast input configuration:

Terminal 1: input

Terminal 2: connect to 0V (terminal 3)

CN14	Terminal	Symbol	Description		Address	
	1	I04(PNP)	PNP type fast input I04	External terminal configuration ¹⁾	1.INT10	
	2	I04(NPN)	NPN type fast input I04			
	3	0V	Common for digital inputs			
	4	I25	Input I25			3.INP25
	5	I26	Input I26			3.INP26
	6	I27	Input I27			3.INP27
	7	I28	Input I28			3.INP28
	8	I29	Input I29			3.INP29
	9	I30	Input I30			3.INP30
	10	I31	Input I31			3.INP31
	11	I32	Input I32			3.INP32
	12	0V	Common for digital inputs			

¹⁾ NPN type fast input configuration:

Terminal 1: connect to 12-24Vdc of the power unit

Terminal 2: input

PNP type fast input configuration:

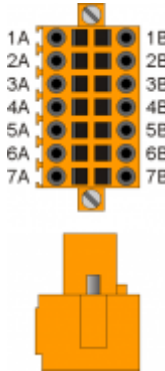
Terminal 1: input

Terminal 2: connect to 0V (terminal 3)

2.1.2 6 bidirectional counter inputs 200KHz



The electrical features are given in paragraph [Electrical features](#).
The wiring examples are given in paragraph [Connection examples](#)

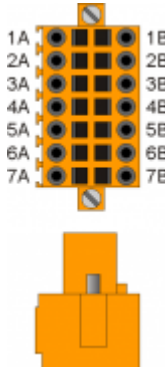
CN15	Terminal	Symbol	Description	Address		
	1A		Internal bridge 1A -1B			
	2A	PHA1	Phase A count 1	PNP Push-Pull ¹⁾	3.INP33	3.CNT01
	3A	PHB1	Phase B count 1		3.INP34	
	4A	Z1	Z count 1		1.INT01	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA1+	+ PHA count 1	Line Driver	3.INP33	3.CNT01
	3B	PHB1+	+ PHB count 1		3.INP34	
	4B	Z1+	+ Z count 1		1.INT01	
	5B	PHA1-	- PHA count 1			
	6B	PHB1-	- PHB count 1			
	7B	Z1-	- Z count 1			

¹⁾ PNP/Push-Pull type count input configuration:

Terminal 5B: connect to terminal 5A

Terminal 6B: connect to terminal 6A

Terminal 7B: connect to terminal 7A

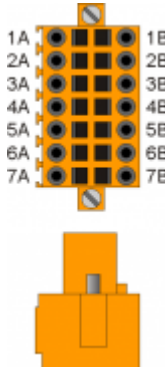
CN16	Terminal	Symbol	Description		Address		
	1A		Internal bridge 1A -1B				
	2A	PHA2	Phase A count 2	PNP Push-Pull ¹⁾	3.INP35	3.CNT02	
	3A	PHB2	Phase B count 2		3.INP36		
	4A	Z2	Z count 2		1.INT02		
	5A	0V	Common for count inputs				
	6A	0V					
	7A	0V					
	1B		Internal bridge 1A -1B				
	2B	PHA2+	+ PHA count 2	Line Driver	3.INP35	3.CNT02	
	3B	PHB2+	+ PHB count 2		3.INP36		
	4B	Z2+	+ Z count 2		1.INT02		
	5B	PHA2-	- PHA count 2				
	6B	PHB2-	- PHB count 2				
	7B	Z2-	- Z count 2				

¹⁾ PNP/Push-Pull type count input configuration:

Terminal 5B: connect to terminal 5A

Terminal 6B: connect to terminal 6A

Terminal 7B: connect to terminal 7A

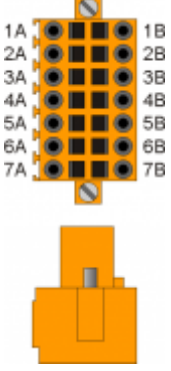
CN17	Terminal	Symbol	Description	Address			
	1A		Internal bridge 1A -1B				
	2A	PHA3	Phase A count 3	PNP Push-Pull ¹⁾	3.INP37	3.CNT03	
	3A	PHB3	Phase B count 3		3.INP38		
	4A	Z3	Z count 3		1.INT03		
	5A	0V	Common for count inputs				
	6A	0V					
	7A	0V					
	1B		Internal bridge 1A -1B				
	2B	PHA3+	+ PHA count 3	Line Driver	3.INP37	3.CNT03	
	3B	PHB3+	+ PHB count 3		3.INP38		
	4B	Z3+	+ Z count 3		1.INT03		
	5B	PHA3-	- PHA count 3				
	6B	PHB3-	- PHB count 3				
	7B	Z3-	- Z count 3				

¹⁾ PNP/Push-Pull type count input configuration:

Terminal 5B: connect to terminal 5A

Terminal 6B: connect to terminal 6A

Terminal 7B: connect to terminal 7A

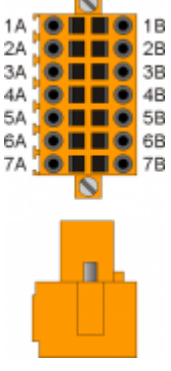
CN18	Terminal	Symbol	Description	Address		
	1A		Internal bridge 1A -1B			
	2A	PHA4	Phase A count 4	PNP Push-Pull ¹⁾	3.INP39	3.CNT04
	3A	PHB4	Phase B count 4		3.INP40	
	4A	Z4	Z count 4		1.INT04	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA4+	+ PHA count 4	Line Driver	3.INP39	3.CNT04
	3B	PHB4+	+ PHB count 4		3.INP40	
	4B	Z4+	+ Z count 4		1.INT04	
	5B	PHA4-	- PHA count 4			
	6B	PHB4-	- PHB count 4			
	7B	Z4-	- Z count 4			

¹⁾ PNP/Push-Pull type count input configuration:

Terminal 5B: connect to terminal 5A

Terminal 6B: connect to terminal 6A

Terminal 7B: connect to terminal 7A

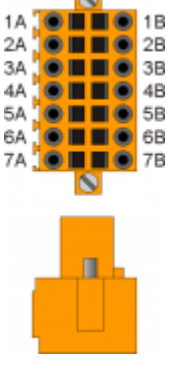
CN19	Terminal	Symbol	Description	Address				
	1A		Internal bridge 1A -1B					
	2A	PHA5	Phase A count 5	PNP Push-Pull ¹⁾	3.INP41	3.CNT05		
	3A	PHB5	Phase B count 5		3.INP42			
	4A	Z5	Z count 5		1.INT05			
	5A	0V	Common for count inputs					
	6A	0V						
	7A	0V						
	1B		Internal bridge 1A -1B					
	2B	PHA5+	+ PHA count 5	Line Driver	3.INP41	3.CNT05		
	3B	PHB5+	+ PHB count 5		3.INP42			
	4B	Z5+	+ Z count 5		1.INT05			
	5B	PHA5-	- PHA count 5					
	6B	PHB5-	- PHB count 5					
	7B	Z5-	- Z count 5					

¹⁾ PNP/Push-Pull type count input configuration:

Terminal 5B: connect to terminal 5A

Terminal 6B: connect to terminal 6A

Terminal 7B: connect to terminal 7A

CN20	Terminal	Symbol	Description		Address		
	1A		Internal bridge 1A -1B				
	2A	PHA6	Phase A count 6	PNP Push-Pull ¹⁾	3.INP43	3.CNT06	
	3A	PHB6	Phase B count 6		3.INP44		
	4A	Z6	Z count 6		1.INT06		
	5A	0V	Common for count inputs				
	6A	0V					
	7A	0V					
	1B		Internal bridge 1A -1B				
	2B	PHA6+	+ PHA count 6	Line Driver	3.INP43	3.CNT06	
	3B	PHB6+	+ PHB count 6		3.INP44		
	4B	Z6+	+ Z count 6		1.INT06		
	5B	PHA6-	- PHA count 6				
	6B	PHB6-	- PHB count 6				
	7B	Z6-	- Z count 6				

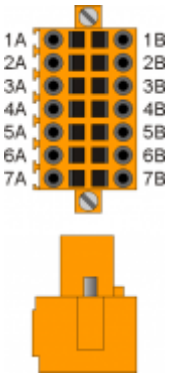
¹⁾ PNP/Push-Pull type count input configuration:

Terminal 5B: connect to terminal 5A

Terminal 6B: connect to terminal 6A

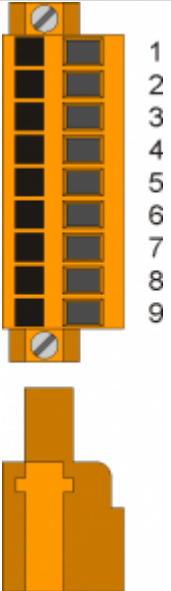
Terminal 7B: connect to terminal 7A

2.1.3 2 SSI absolute counter

CN22	Terminal	Symbol	Description	Address
	1A		Internal bridge 1A-2A-1B-2B	
	2A			
	3A	DATA1+	DATA in SSI1	1
	4A	DATA1-		
	5A	CLOCK1+	CLOCK out SSI1	
	6A	CLOCK1-		
	7A	0V	Common for count inputs	
	1B		Internal bridge 1A-2A-1B-2B	
	2B			
	3B	DATA2+	DATA in SSI2	2
	4B	DATA2-		
	5B	CLOCK2+	CLOCK out SSI1	
	6B	CLOCK2-		
	7B	0V	Common for count inputs	

2.2 Analog inputs

2.2.1 4 potentiometric, voltmetric and amperometric inputs 12bit

 The electrical features are given in paragraph Electrical features. The wiring examples are given in paragraph Connection examples				
CN28	Terminal	Symbol	Description	Address
	1	GAI	Common for analog inputs	
	2	IA1	analog input 1	3.AI01
	3	SEL1V	Analog input selector 1 voltmetric 0-10V ¹⁾	
	4	SEL1C	Analog input selector 1 amperometric 0-20mA ²⁾	
	5	GAI	Common for analog inputs	
	6	IA2	analog input 2	3.AI02
	7	SEL2V	Analog input selector 2 voltmetric 0-10V ³⁾	
	8	SEL2C	Analog input selector 2 amperometric 0-20mA ⁴⁾	
	9	VREF	Reference voltage	

^{1), 3)} Connecting this terminal to GAI, the input functions as voltmetric 0-10V

^{2), 4)} Connecting this terminal to GAI, the input functions as amperometric 0-20mA

CN29	Terminal	Symbol	Description	Address
	3	GAI	Common for analog inputs	
	2	IA3	analog input 3	3.AI03
	3	SEL3V	Analog input selector 3 voltmetric 0-10V ¹⁾	
	4	SEL3C	Analog input selector 3 amperometric 0-20mA ²⁾	
	5	GAI	Common for analog inputs	
	6	IA4	analog input 4	3.AI04
	7	SEL4V	Analog input selector 4 voltmetric 0-10V ³⁾	
	8	SEL4C	Analog input selector 4 amperometric 0-20mA ⁴⁾	
	9	VREF	Reference voltage	

^{1), 3)} Connecting this terminal to GAI, the input functions as voltmetric 0-10V

^{2), 4)} Connecting this terminal to GAI, the input functions as amperometric 0-20mA

2.3 Digital outputs

2.3.1 32 protected digital outputs

 The electrical features are given in section Electrical features. The connection examples are provided in section Connection examples				
CN7	Terminal	Simbol	Description	Address
	1	V1+	Outputs power input O1÷O8 (12÷28V dc)	
	2	O1	Output digital 1	3.OUT01
	3	O2	Output digital 2	3.OUT02
	4	V1-	Outputs power input O1÷O8 (0V dc)	
	5	O3	Output digital 3	3.OUT03
	6	O4	Output digital 4	3.OUT04
	7	V1-	Outputs power input O1÷O8 (0V dc)	
	8	O5	Output digital 5	3.OUT05
	9	O6	Output digital 6	3.OUT06
	10	O7	Output digital 7	3.OUT07
	11	O8	Output digital 8	3.OUT08

CN8	Terminal	Simbol	Description	Address
	1	V2+	Outputs power input O9÷O16 (12÷28V dc)	
	2	O9	Output digital 9	3.OUT09
	3	O10	Output digital 10	3.OUT10
	4	V2-	Outputs power input O9÷O16 (0V dc)	
	5	O11	Output digital 11	3.OUT11
	6	O12	Output digital 12	3.OUT12
	7	V2-	Outputs power input O9÷O16 (0V dc)	
	8	O13	Output digital 13	3.OUT13
	9	O14	Output digital 14	3.OUT14
	10	O15	Output digital 15	3.OUT15
	11	O16	Output digital 16	3.OUT16

CN9	Terminal	Simbol	Description	Address
	1	V3+	Outputs power input O17÷O32 (12÷28V dc)	
	2	O17	Output digital 17	3.OUT17
	3	O18	Output digital 18	3.OUT18
	4	V3-	Outputs power input O17÷O32 (0V dc)	
	5	O19	Output digital 19	3.OUT19
	6	O20	Output digital 20	3.OUT20
	7	V3-	Outputs power input O17÷O32 (0V dc)	
	8	O21	Output digital 21	3.OUT21
	9	O22	Output digital 22	3.OUT22
	10	O23	Output digital 23	3.OUT23
	11	O24	Output digital 24	3.OUT24

CN10	Terminal	Simbol	Description	Address
	1		N.C.	
	2	O25	Output digital 25	3.OUT25
	3	O26	Output digital 26	3.OUT26
	4	V3-	Outputs power input O17÷O32 (0V dc)	
	5	O27	Output digital 27	3.OUT27
	6	O28	Output digital 28	3.OUT28
	7	V3-	Outputs power input O17÷O32 (0V dc)	
	8	O29	Output digital 29	3.OUT29
	9	O30	Output digital 30	3.OUT30
	10	O31	Output digital 31	3.OUT31
	11	O32	Output digital 32	3.OUT32

2.3.2 5 STEP-DIRECTION outputs



The electrical features are given in paragraph [Electrical features](#).
The wiring examples are given in paragraph [Connection examples](#)

CN23	Terminal	Symbol	Description	Address
	1A	-	n.c.	
	2A	DIR1+	DIRECTION output 1	3.PULSE01
	3A	STEP1+	STEP output 1	
	4A	DIR2+	DIRECTION output 2	3.PULSE02
	5A	STEP2+	STEP output 2	
	6A	0V	Common for stepper outputs	
	1B	-	n.c.	
	2B	DIR1-	Complementary output DIRECTION 1	Complementary outputs for use in drivers with Line-Driver inputs
	3B	STEP1-	Complementary output STEP 1	
	4B	DIR2-	Complementary output DIRECTION 2	
	5B	STEP2-	Complementary output STEP 2	
	6B	0V	Common for stepper outputs	
CN24	Terminal	Symbol	Description	Address
	1A	-	n.c.	
	2A	DIR1+	DIRECTION output 3	3.PULSE03
	3A	STEP1+	STEP output 3	
	4A	DIR2+	DIRECTION output 4	3.PULSE04
	5A	STEP2+	STEP output 4	
	6A	0V	Common for stepper outputs	
	1B	-	n.c.	
	2B	DIR1-	Complementary output DIRECTION 3	Complementary outputs for use in drivers with Line-Driver inputs
	3B	STEP1-	Complementary output STEP 3	
	4B	DIR2-	Complementary output DIRECTION 4	
	5B	STEP2-	Complementary output STEP 4	
	6B	0V	Common for stepper outputs	
CN25	Terminal	Symbol	Description	Address
	1A	-	n.c.	
	2A	DIR5+	DIRECTION output 5	3.PULSE05
	3A	STEP5+	STEP output 5	
	4A	-	n.c.	3.PULSE05
	5A	-	n.c.	
	6A	0V	Common for stepper outputs	
	1B	-	n.c.	
	2B	DIR5-	Complementary output DIRECTION 5	Complementary outputs for use in drivers with Line-Driver inputs
	3B	STEP5-	Complementary output STEP 5	
	4B	-	n.c.	
	5B	-	n.c.	
	6B	0V	Common for stepper outputs	

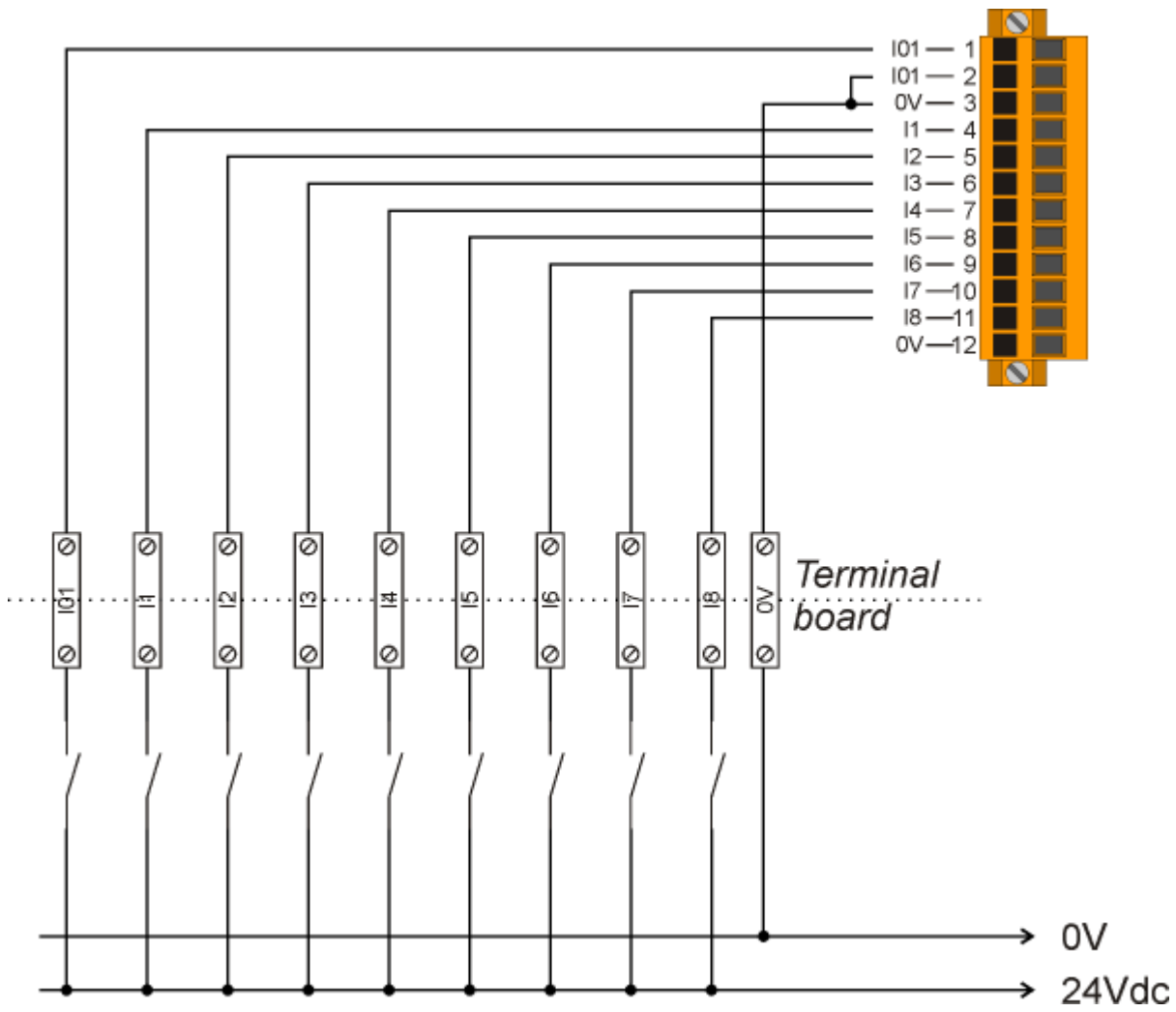
2.4 Analog outputs

2.4.1 8 analog outputs +/-10V, 16bit

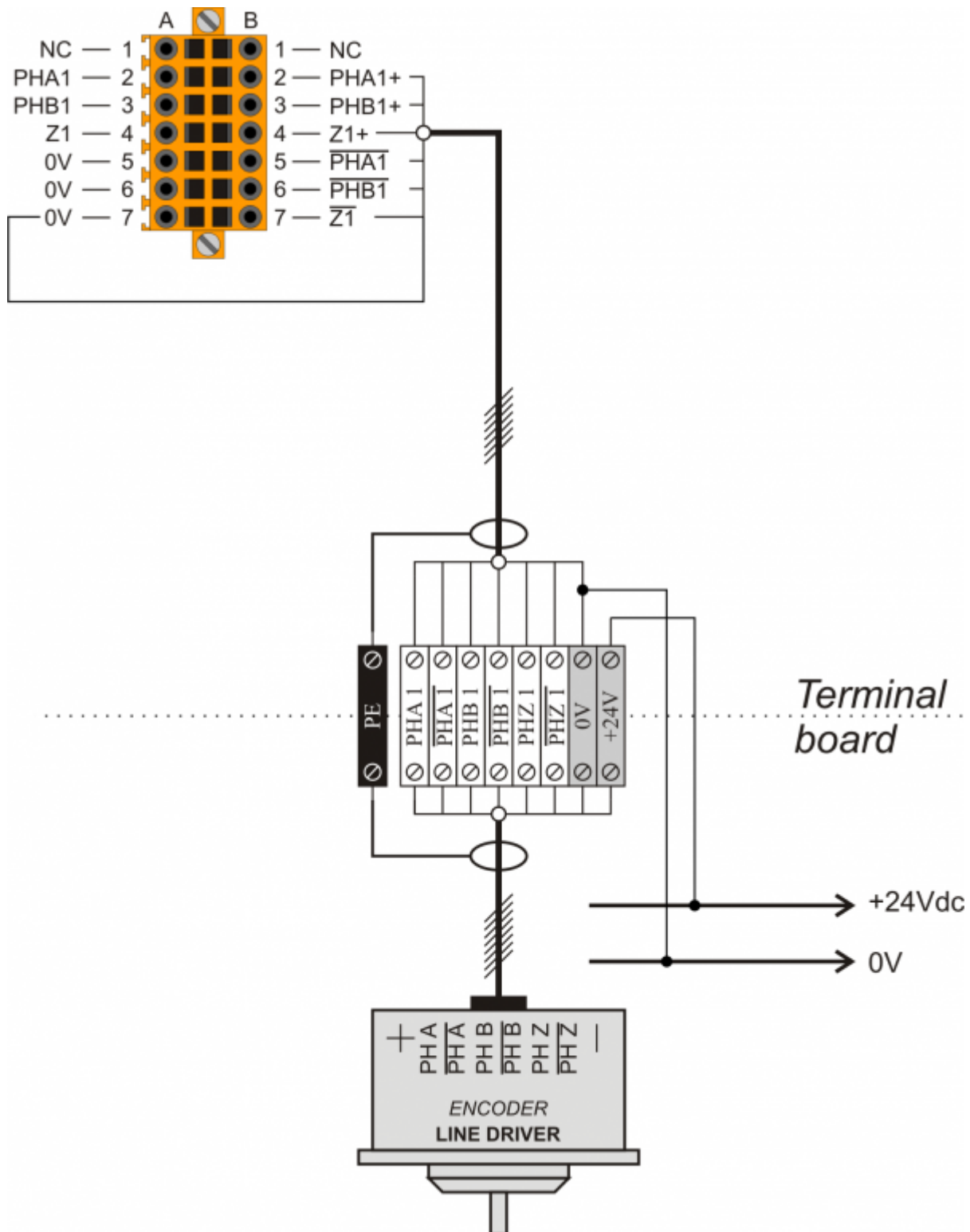
 The electrical features are given in paragraph Electrical features. The wiring examples are given in paragraph Connection examples				
CN26	Terminal	Symbol	Description	Address
	1	GAO	Common for analog outputs	
	2	A01	Analog output 1	3.AN01
	3	A02	Analog output 2	3.AN02
	4	GAO	Common for analog outputs	
	5	A03	Analog output 3	3.AN03
	6	A04	Analog output 4	3.AN04
CN27	Terminal	Symbol	Description	Address
	1	GAO	Common for analog outputs	
	2	A05	Analog output 5	3.AN05
	3	A06	Analog output 6	3.AN06
	4	GAO	Common for analog outputs	
	5	A07	Analog output 7	3.AN07
	6	A08	Analog output 8	3.AN08

3. Connection examples

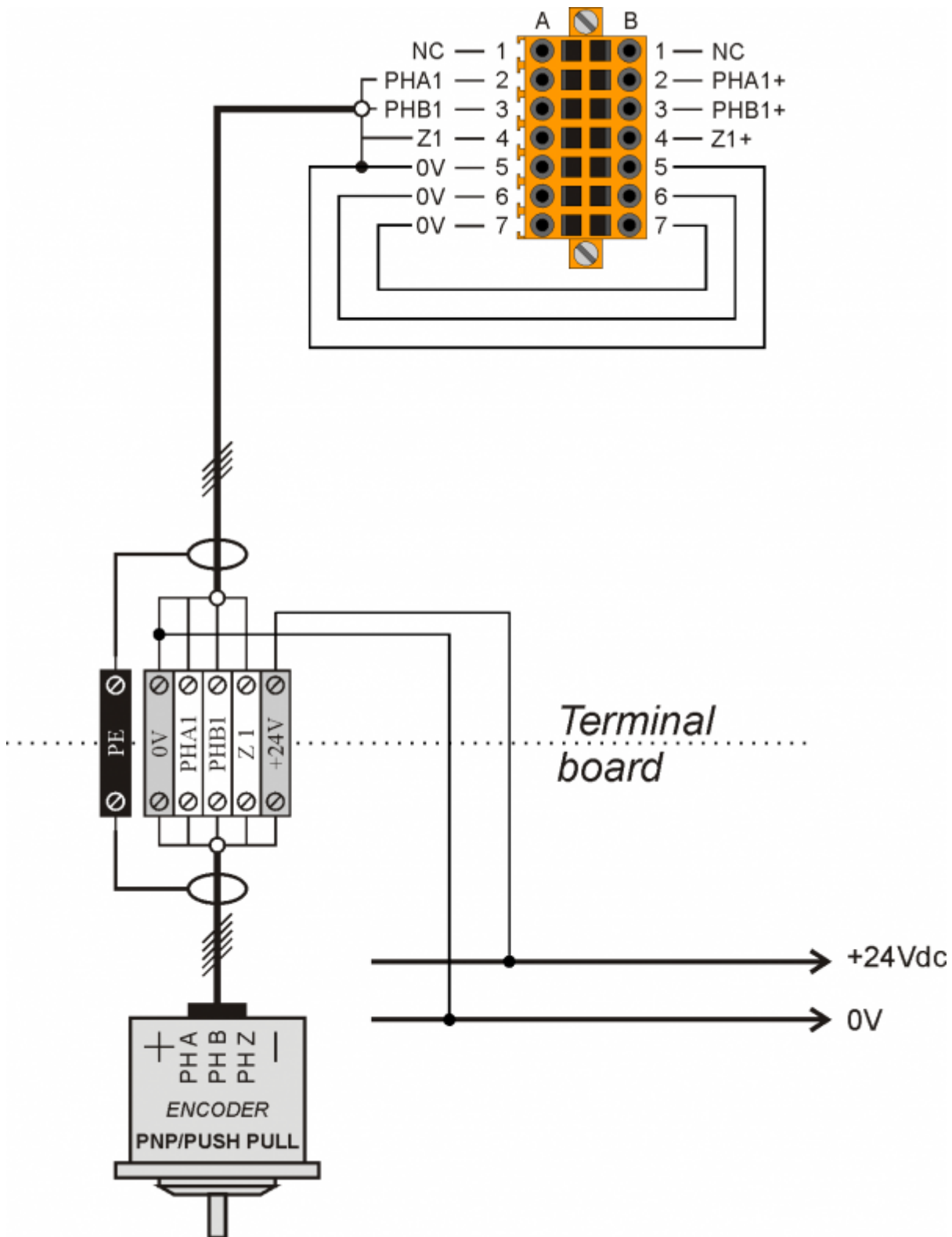
3.1 Digital inputs



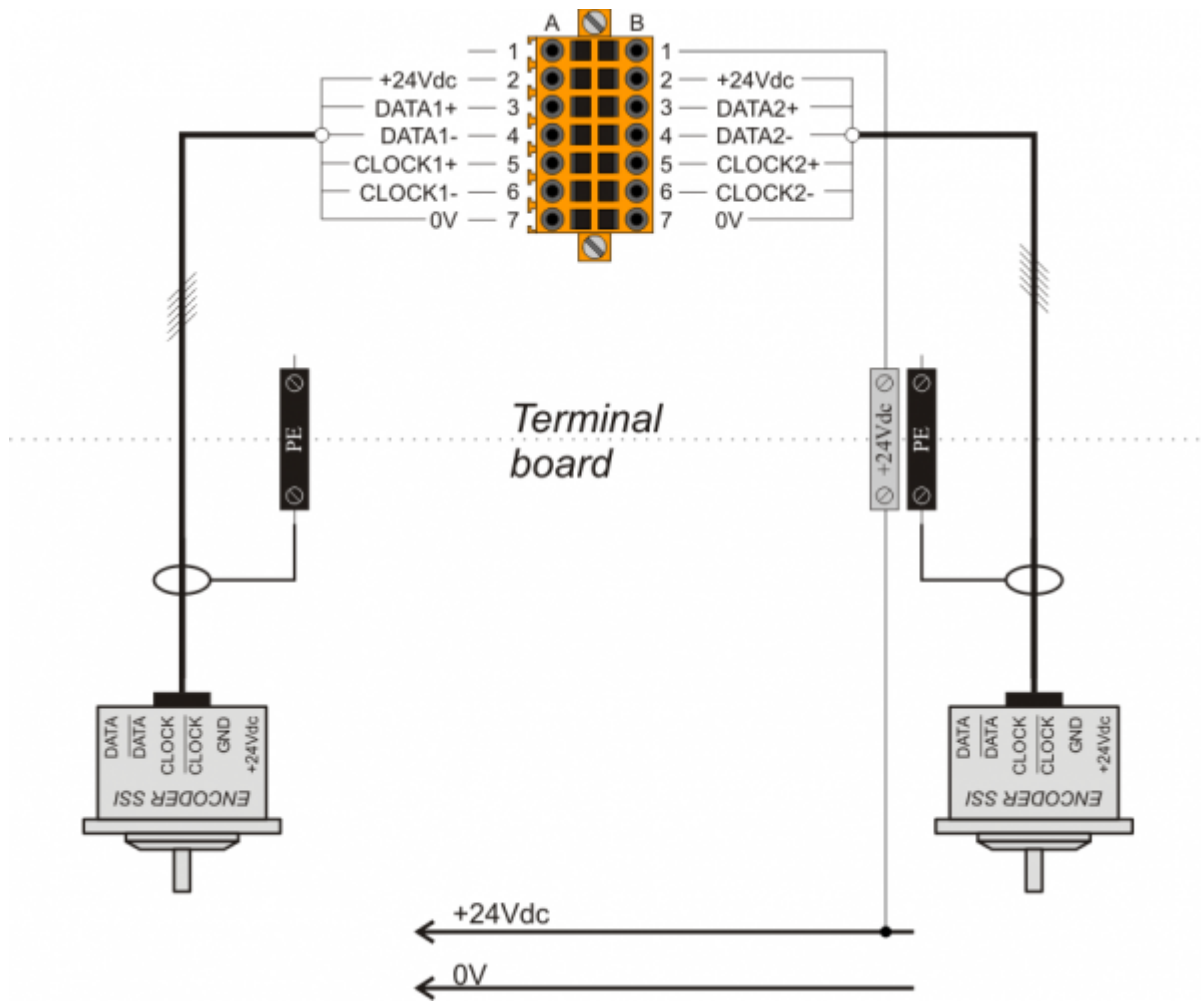
3.2 Line Driver digital counters



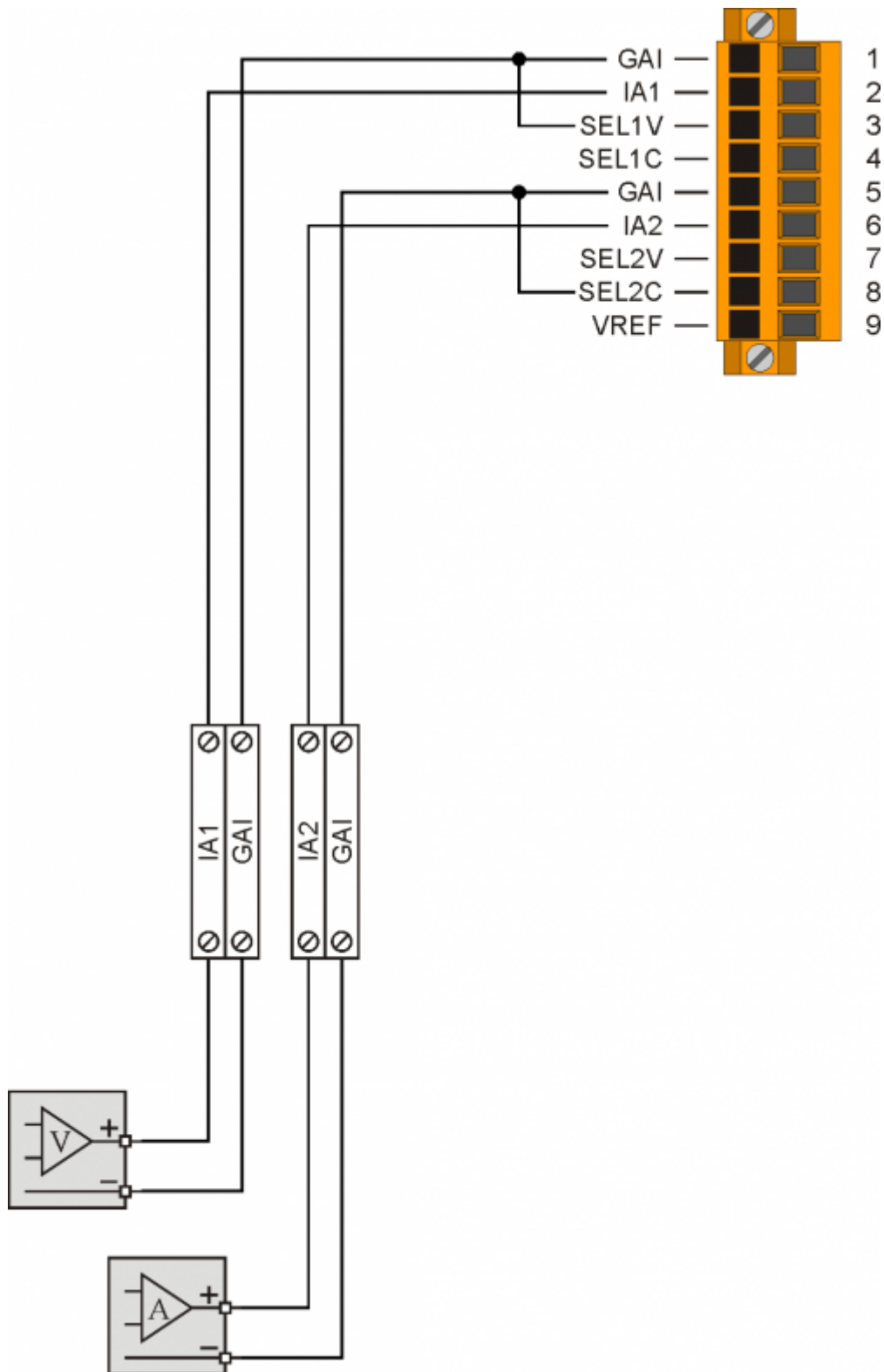
3.3 PNP / Push Pull counter inputs



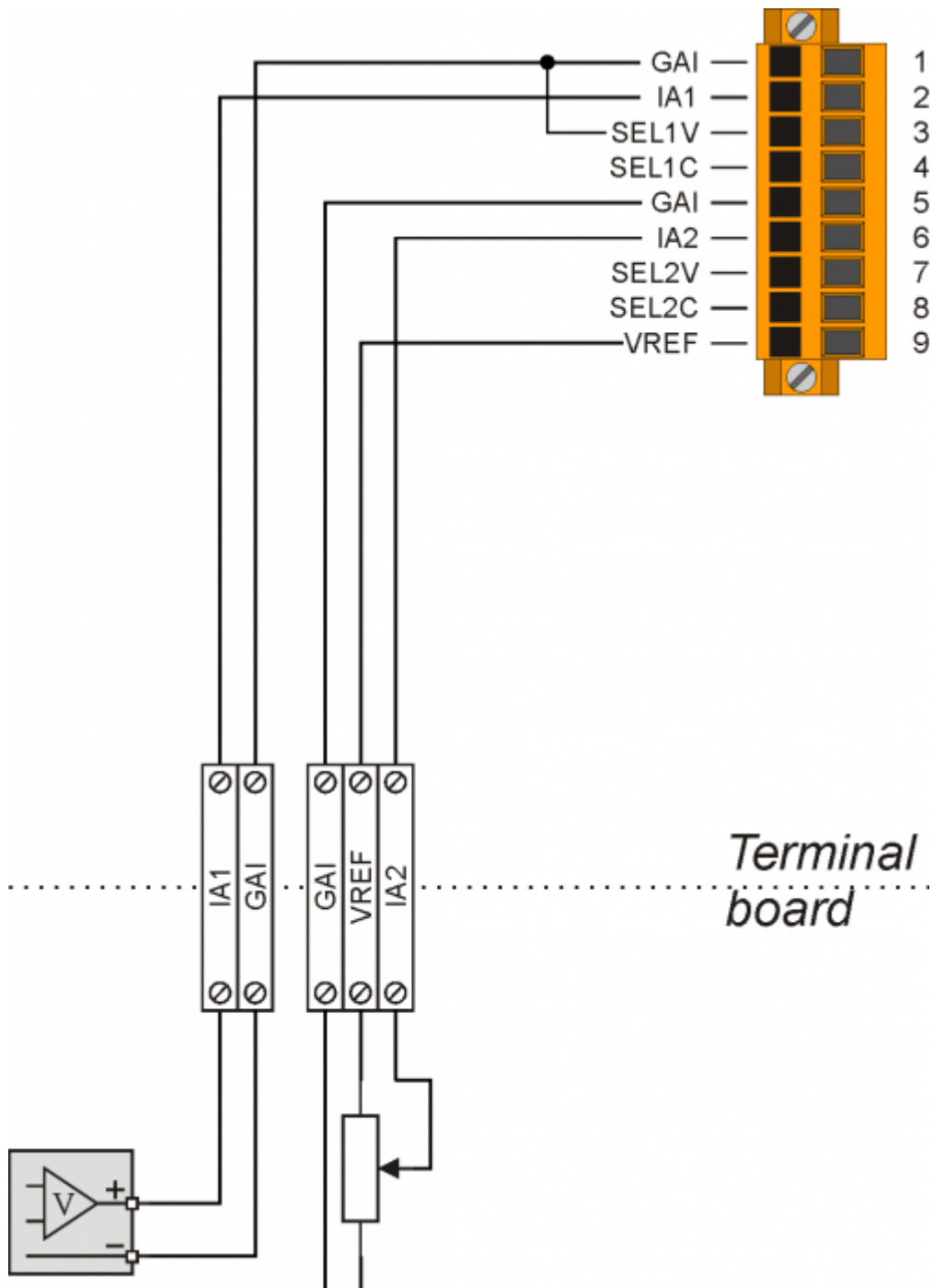
3.4 SSI absolute counters



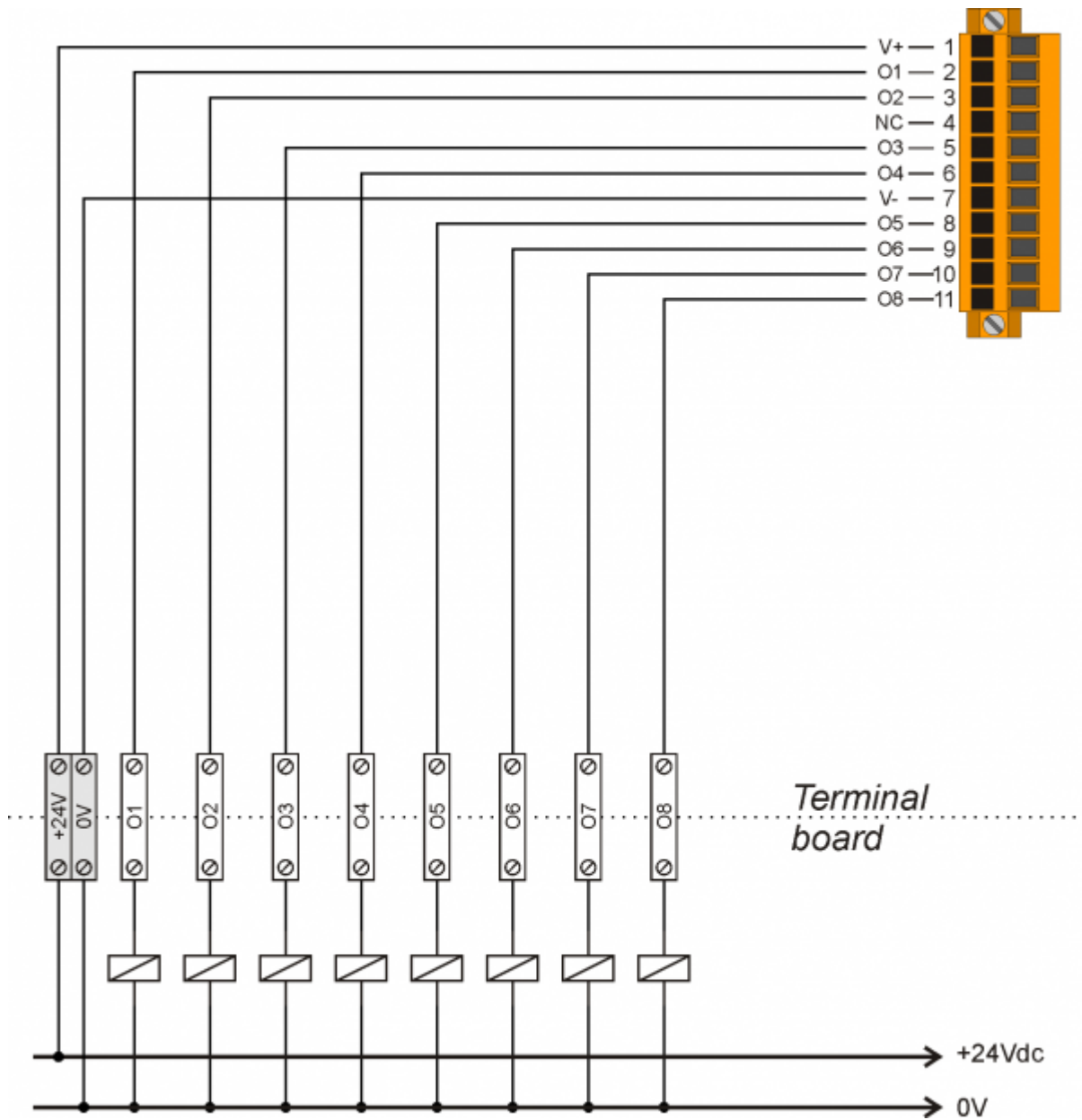
3.5 Voltmetric and amperometric analog inputs



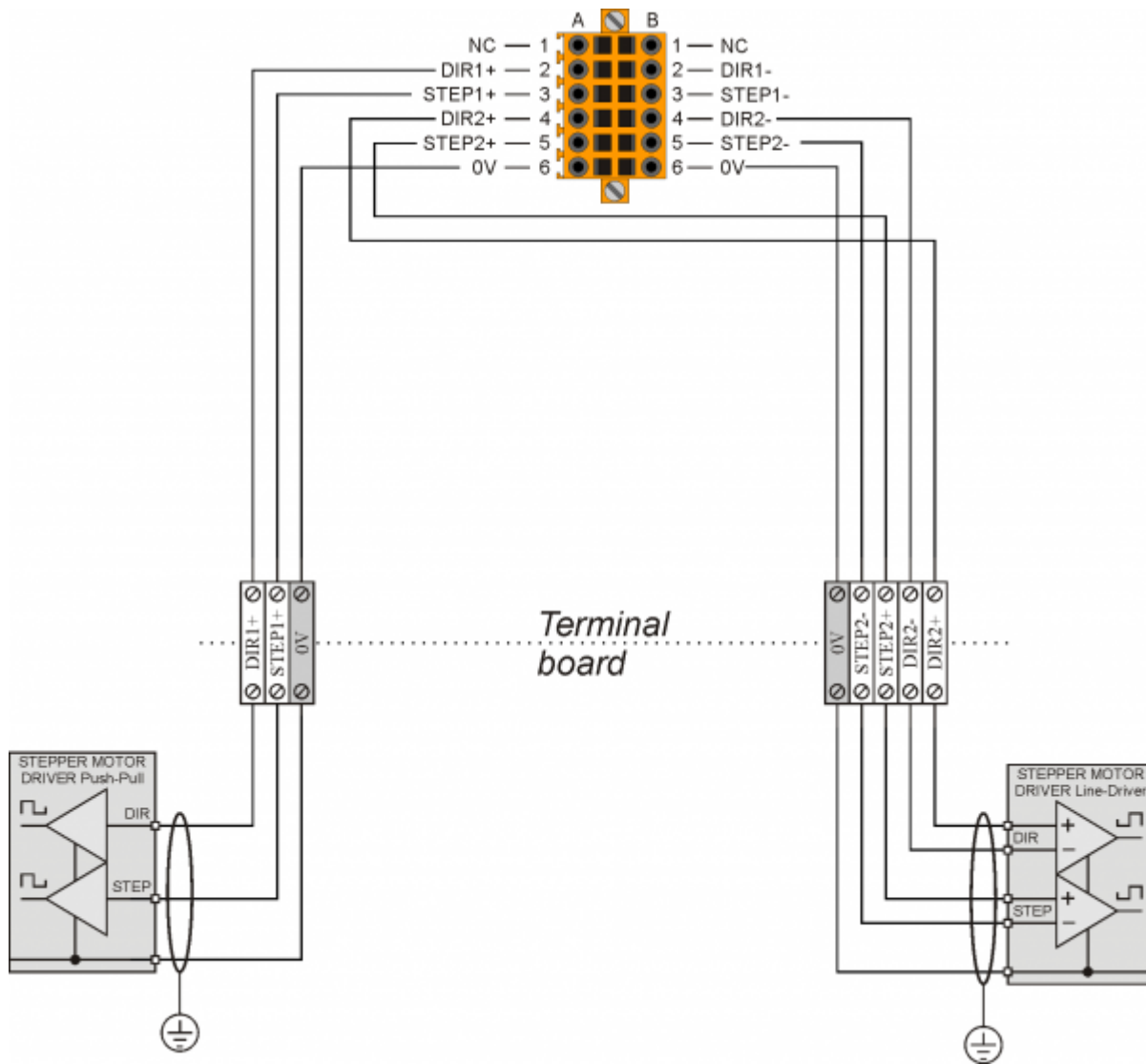
3.6 Voltmetric and potentiometric analog inputs



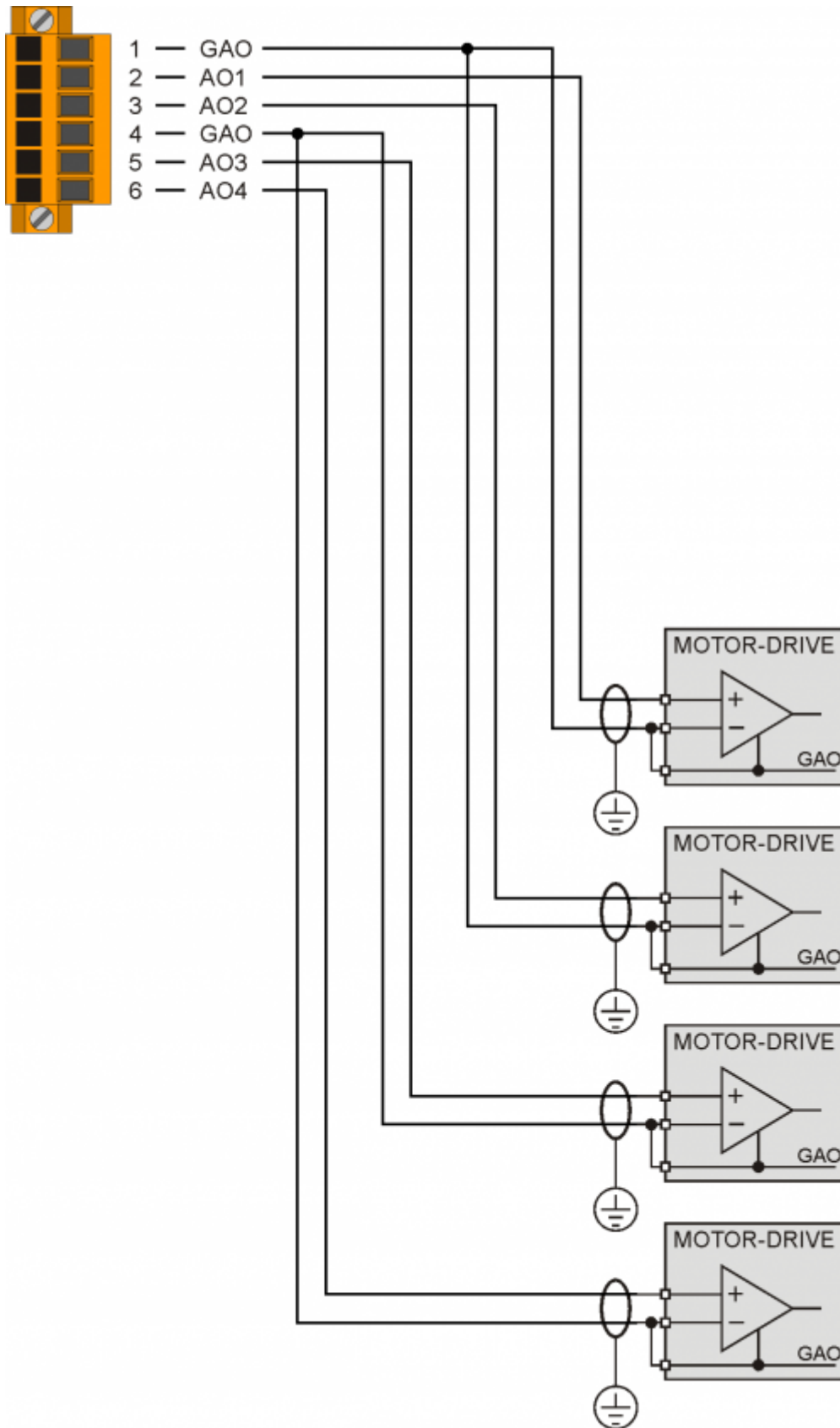
3.7 Protected digital outputs



3.8 STEP - DIRECTION outputs



3.9 Analog outputs



4. Electrical features

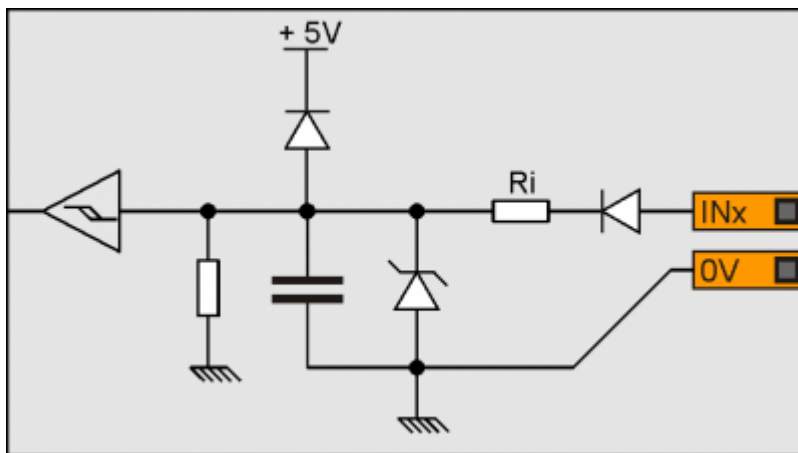
The following are the electrical hardware features.

The maximum and minimum frequency values and actual acquisition times, can still depend on any additional software filters, see the system variable "QMOVE:sys004".

4.0.1 Standard digital inputs

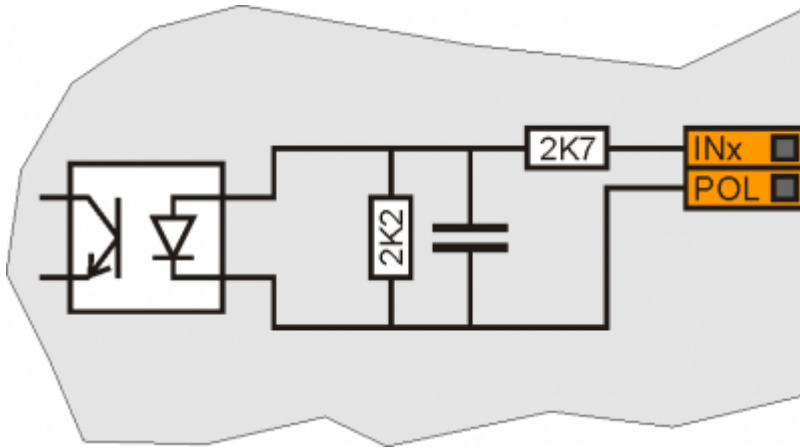
Type of polarisation	PNP
Min. acquisition time (hardware)	3ms
Isolation	1000Vrms
Rated operating voltage	24Vdc
Voltage of logic state 0	0-2 V
Voltage of logic state 1	10.5 - 26.5 V
Internal voltage drop	5V
Input resistance (Ri)	2700Ω
Sink current	2mA ÷ 8mA ¹⁾

¹⁾ CAUTION: If the device connected to the inputs needs a higher minimum current, inputs may not work properly.



4.0.2 Rapid digital inputs

Type of polarisation	NPN / PNP
Max. frequency	200KHz
Min. acquisition time (hardware)	5 μ s
Insulation	1000Vrms
Rated operating voltage	24Vdc
Voltage of logic status 0	0-2 V
Voltage of logic status 1	10.5 - 26.5 V
Internal voltage drop	1.2 V
Input resistance	2700 Ω



4.0.3 Bidirectional counters inputs 200KHz

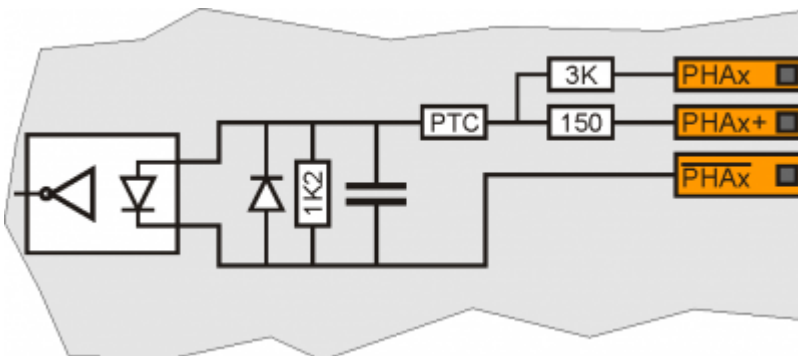


The values given in the table refer to input signals A, B and Z.
The max. frequency given in the table refers to A and B phase signals with a DutyCycle = 50%
With count frequencies over 50KHz the use of Line-Driver type encoders is recommended.

Type of polarisation	PNP/PP
Max frequency	200KHz
Min. acquisition time	5 μ s
Insulation	1000Vrms
Rated operating voltage	24Vdc
Voltage of logic status 0	0 - 2 V
Voltage of logic status 1	10.5 - 26.5 V
Internal voltage drop	1.2V
Input resistance	3100 Ω

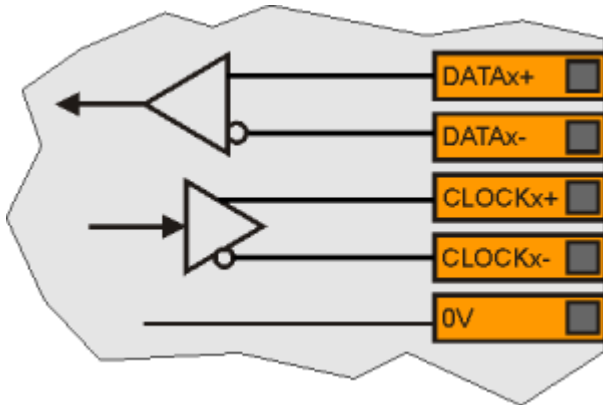
Line-Driver

Type of polarisation	Line-Driver
Max. frequency	200KHz
Min. acquisition time	5 μ s
Insulation	1000Vrms
Rated operating voltage (PHx+ ? PHx-)	5Vdc
Voltage of logic status 0 (PHx+ ? PHx-)	0-1.5 V
Voltage of logic status 1 (PHx+ ? PHx-)	2-5 V
Internal voltage drop	1.2V
Input resistance	150 Ω



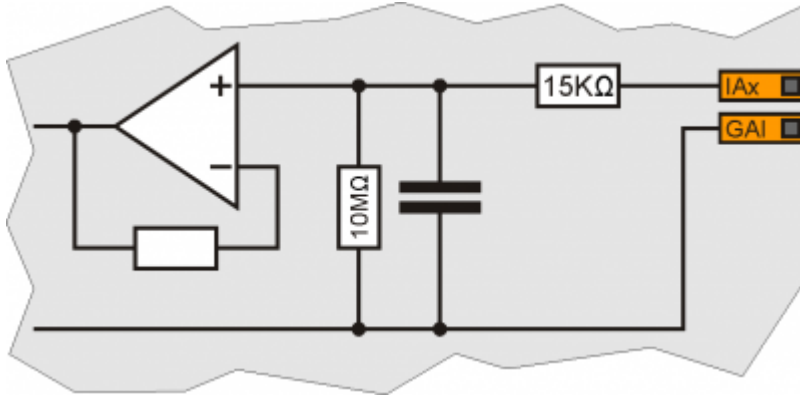
4.0.4 SSI absolute counters

Frequency	320KHz
Operation mode	Differential
Input impedance	$\geq 12\text{KO}$
Short circuit current limit	$\geq 35\text{mA}$



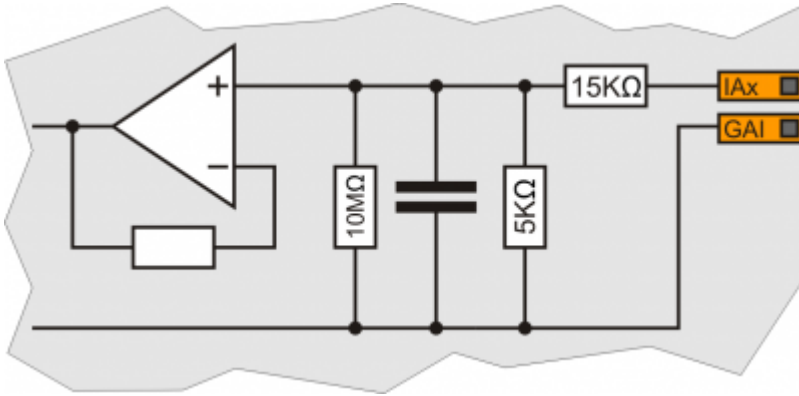
4.0.5 Potentiometric analog inputs

Type of connection	Potentiometric 1K Ω -20K Ω
Resolution	12bit/16bit
Reference voltage output	2.5Vdc
Max output current from reference	10mA
Input resistance	10M Ω
Max. linearity error	$\pm 0,1\%$ Vfs
Max. offset error	$\pm 0,1\%$ Vfs
S.n.	71 dB
Update speed	1ms
Insulation	1000 Vrms



4.0.6 Voltmetric analog inputs

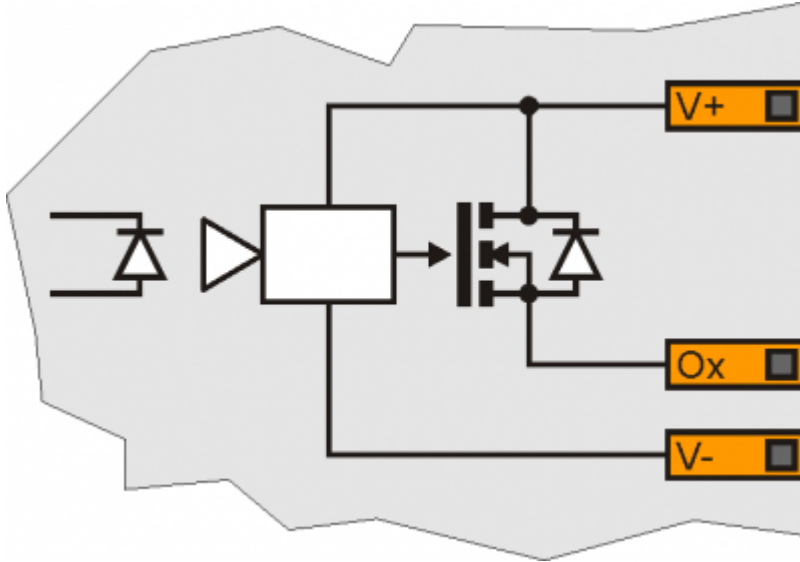
Type of connection	Voltmetric 0-10V
Resolution	12bit/16bit
Input resistance (Rin)	20K Ω
Damage value	20V
Max. linearity error	$\pm 0.1\%$ Vfs
Max. offset error	$\pm 0.1\%$ Vfs
S.n.	71 dB
Update speed	1ms
Insulation	1000 Vrms



The diagram shows an op-amp configured as a voltage follower. The non-inverting input (+) is connected to the input signal. The inverting input (-) is connected to the output through a feedback resistor labeled $10\text{M}\Omega$. The output is also connected to a load resistor labeled 125Ω and a load capacitor labeled $15\text{K}\Omega$. The output is labeled IAx and GAI .

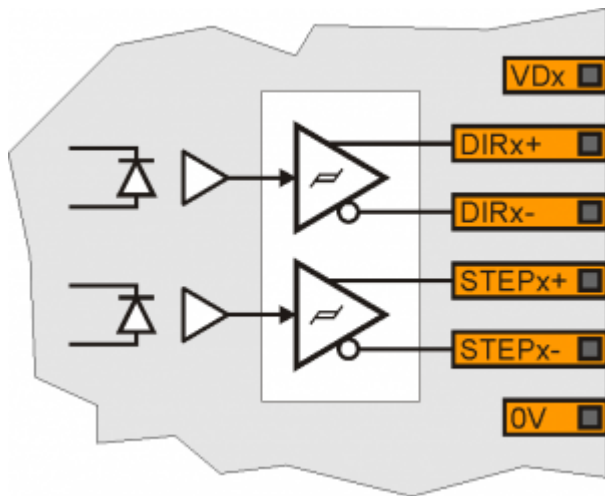
4.0.8 Protected digital outputs

Switchable load	Dc (PNP)
Max. operating voltage	28V
Insulation	1000Vpp
Max. internal voltage drop	600mV
Max internal resistance @ON	90mΩ
Max. protection current	12A
Max. operating current	2A
Max. current @OFF	5μA
Max switching time from ON to OFF	270μs
Max switching time from OFF to ON	250μs



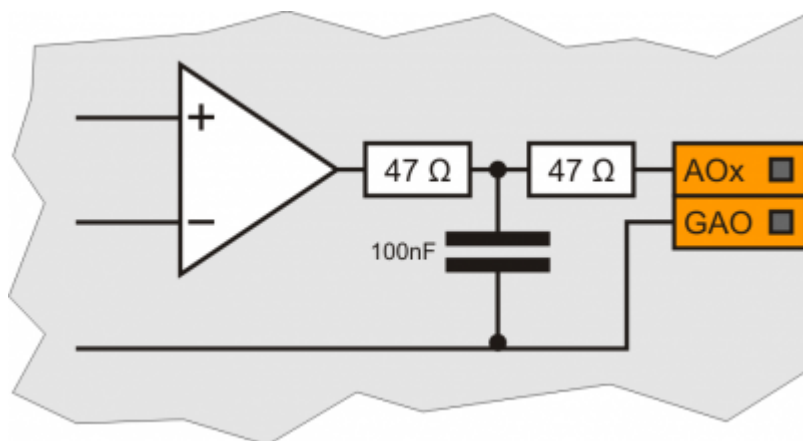
4.0.9 Stepper motor outputs

Type of polarisation	Push-Pull / Line-Driver
Max output frequency	50KHz
Insulation	1000Vpp
Max. operating current	20mA



4.0.10 Analog outputs

Type of connection	Common mode
Insulation	1000Vrms
Voltage range (minimum no load)	-9.8V - +9.8V
Max. offset variation depending on temperature*	+/- 5mV
Resolution	16bit
Max. current	1mA
Output variation depending on load	100 μ V/mA
Output resistance	249 Ω



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