

Motor – sensor configurations							
Motor Sensor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)		
Incr. Encoder	T		T	T			
Incr. Encoder + Dig. Hall	7	•					
Digital halls only	T						
Tacho			T				
Open-loop (no sensor)				3	3		
Open-loop (with step loss detection using incr. enc.)				3	•		
Open-loop (with enc. on load)				7	•		

Features

¹Mini USB cable not provided

- Motion controller and drive in a single compact unit
- Universal solution for control of rotary and linear brushless, brushed and 2 or 3-phase step motors
- CANopen communication protocol (CiA 301v4.2, CiA 305v2.213 and 402v3.0)
- Various modes of operating supported: Position or Speed Profile, interpolated Cyclic Synchronous Position (CSP) mode, external reference mode (Position, Speed, Torque), 35 homing modes
- Motor supply: 11-50V. Logic supply: 9-36V
- Output current: 4A cont. (BLDC mode); 10A_{PEAK}, up to 100KHz PWM
- 5 opto-isolated digital inputs, 12-36V, PNP/NPN compatible: 2 for limit switches, 3 general-purpose
- 5 digital outputs, 5-36V, 0.5A, NPN open-collector: Error, 1 Motor brake [2A], 3 general-purpose [0.5A]
- Mini USB¹ & CAN-bus 2.0B interfaces
- 127 h/w addresses selectable by h/w DIP switch
- NTC/PTC analogue Motor Temperature sensor input

- Protections: short-circuit between motor phases and from motor phases to GND, over/under-voltage, over-current, I²t, control error, over temperature, communication error
- Feedback Devices :
 - 1st feedback devices supported:
 - Incremental encoder interface (differential)
 - Digital Hall sensor interface (single-ended and open collector)
 - 2nd feedback devices supported:
 - pulse & direction interface (differential) for external (master) digital reference
- 1 analogue input: 12-bit, 0-5V: Feedback
- 1 rotating potentiometer used as Reference
- 16k x16 SRAM memory for data acquisition
- 16k x16 E²ROM to store setup and other user data
- Operating ambient temperature: 0-40°C (over 40°C with derating)

Mating Connectors							
Producer	Part No.	Connector	Description	Image			
WAGO	734-104	J1	Pluggable terminal block 4- pole Pin spacing 3.5 mm	AWG 14-28			
WAGO	733-108	J2	Pluggable terminal block 8- pole Pin spacing 2.5 mm	AWG 20-28			
WAGO	733-112	J3 & J5	Pluggable terminal block 12-pole Pin spacing 2.5 mm	AWG 20-28			
WAGO	733-106	J4	Pluggable terminal block 6-pole Pin spacing 2.5 mm	AWG 20-28			
WAGO	734-105	J6	Pluggable terminal block 5-pole Pin spacing 3.5 mm	AWG 14-28			

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Name	First edition	Document template: P099.TQT.564.0001	Last edition	Visa:
EP	January 16, 2018		January 16, 2018	
		Title of document	N° document	
(3) LE	CHNOSOFT	Udrive200	P030.400.E101.DSH.10A	
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Co	onnect	ors Description	on	
	Pin		Туре	Description
	1	GND	-	Negative return (ground) of the power supply
5	2	+V _{LOG}	ı	Positive terminal of the logic supply input: 12 to $36V_{DC}$
7	3	+V _{MOT}	I	Positive terminal of the motor supply: 12 to $50V_{DC.}$
	4	Earth	-	Earth connection
	Pin	Name	Туре	Description
	1	OUT0/M.BRK	0	5-36V 2A, digital output used for an electro- mechanical brake, NPN open-collector/TTL pull-up
	2	OUT5	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	3	OUT4	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
75	4	OUT1	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	5	OUT2/Error	0	12-36V 0.5A, drive Error output, active low, NPN open-collector/TTL pull-up. Also drives the red Error LED.
	6	CAN Hi	I/O	CAN-Bus positive line(dominant high)
	7	CAN Lo	I/O	CAN-Bus negative line (dominant low)
	8	GND	-	Return ground for I/O and CAN pins
	Pin	Name	Туре	Description
	1	IN2+/LSP+	ı	12-36V digital PNP/NPN opto-isolated input. Positive limit switch function, positive input
-	2	IN2-/LSP-	ı	12-36V digital PNP/NPN opto-isolated input. Positive limit switch function, negative input
	3	IN3+/LSN+	1	12-36V digital PNP/NPN opto-isolated input. Negative limit switch function, positive input
•	4	IN3-/LSN-	ı	12-36V digital PNP/NPN opto-isolated input. Negative limit switch function, negative input
	5	IN0+	ı	12-36V general-purpose digital PNP/NPN opto-isolated positive input.
•	6	INO-	ı	12-36V general-purpose digital PNP/NPN opto-isolated negative input.
J3	7	IN1+	ı	12-36V general-purpose digital PNP/NPN opto-isolated positive input.
'-	8	IN1-	1	12-36V general-purpose digital PNP/NPN opto-isolated negative input.
	9	Ena+/IN4+	I	12-36V digital PNP/NPN opto-isolated input. Drive enable function, positive input
-	10	Ena-/ IN4-	ı	12-36V digital PNP/NPN opto-isolated input. Drive enable function, negative input
	11	FDBK	ı	Analogue input, 12-bit, 0-5V. Used to read an analogue position or speed feedback (as tacho), or used as general purpose analogue input.
	12	GND	-	Negative return (ground) of the motor supply
	Pin	Name	Туре	Description
	1	GND	-	Return ground
	2	Pulse+	ı	Pulse+ differential input; has 120Ω resistor between pins 2 and 3
_	3	Pulse-	ı	Pulse- differential input; has 120Ω resistor between pins 2 and 3
₹	4	Dir+	ı	Direction+ differential input; has 120 $\!\Omega$ resistor between pins 4 and 5
	5	Dir-	ı	Direction- differential input; has 120Ω resistor between pins 4 and 5
	6	Temp Mot	ı	NTC/PTC input. Used to read an analog temperature value

	Pin	Name	Туре	Description
	1	GND	-	Return ground for sensors supply
	2	A1+	I	Incr. encoder1 A+ diff. input; has 120Ω resistor between pins 2 and 3
	3	A1-	I	Incr. encoder1 A- diff. input; has 120Ω resistor between pins 2 and 3
	4	B1+	ı	Incr. encoder1 B+ diff. input; has 120Ω resistor between pins 4 and 5
	5	B1-	ı	Incr. encoder1 B- diff. input; has 120Ω resistor between pins 4 and 5
JS	6	Z1+	I	Incr. encoder1 Z+ diff. input; has 120Ω resistor between pins 6 and 7
	7	Z1-	ı	Incr. encoder1 Z- diff. input; has 120Ω resistor between pins 6 and 7
	8	+5V _{OUT}	0	5V output supply for I/O usage
	9 Hall 1 I		ı	Digital input Hall 1 sensor
	10	Hall 2	ı	Digital input Hall 2 sensor
	11	Hall 3	ı	Digital input Hall 3 sensor
	12	GND	-	Return ground for sensors supply
	Pin	Name	Type	Description
		Hame	i ype	Description
	1	A/A+	0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
6				Phase A for 3-ph motors, A+ for 2-ph steppers,
96	1	A/A+	0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers,
96	1 2	A/A+ B/A-	0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
90	1 2 3	A/A+ B/A- C/B+	0 0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step
96	1 2 3 4	A/A+ B/A- C/B+ CR/B-	0 0 0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors
95	1 2 3 4 5	A/A+ B/A- C/B+ CR/B- Earth	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection
96	1 2 3 4 5 Pin	A/A+ B/A- C/B+ CR/B- Earth Name	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection
90	1 2 3 4 5 Pin 1	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit
	1 2 3 4 5 Pin 1 2 3 4	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number.
SW1 J6	1 2 3 4 5 Pin 1 2 3 4 5 5	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4	0 0 0 0 - Type	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1
	1 2 3 4 5 Pin 1 2 3 4	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3	0 0 0 0 - Type	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number.
	1 2 3 4 5 Pin 1 2 3 4 5 5	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4	0 0 0 0 - Type	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph stepmotors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1
	1 2 3 4 5 Pin 1 2 3 4 5 6	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4 ID-Bit5	0 0 0 0 - Type - - -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph stepmotors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1

Electrical characteristics

All parameters measured under the following conditions (unless otherwise specified):

• VLOG = 24 VDC; VMOT = 48VDC

- Supplies start-up / shutdown sequence: -any-Load current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 4A

Operating Conditions			Тур.	Max.	Units
Ambient temperature		0		40 ^{1, 3}	°C
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure ²	Altitude (vs. sea level)	-0.1	0 ÷ 2.5	2	Km
Allitude / pressure	Ambient Pressure	0 ²	$0.75 \div 1$	10.0	atm
Storage Conditions	Storage Conditions			Max.	Units
Ambient temperature		-40		105	°C
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
ESD capability (Human body model)	Not powered; applies to any accessible part			±0.5	kV
(Human body model)	Original packaging			±15	kV
Mechanical Mounting	Mechanical Mounting			Max.	Units
Airflow		natura	al convecti	on³, close	ed box
-					

 $^{^{\}rm 3}$ In case of forced cooling (conduction or ventilation) the maximum ambient temperature can be increased substantially.

Name	First edition	Document template: P099.TQT.564.0001	Last edition	Visa:
EP	January 16, 2018		January 16, 2018	
		Title of document	N° document	
TECHNOSOFT		Udrive200	P030.400.E101.DSH.10A	
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¹Operating temperature at higher temperatures is possible with reduced current and power ratings ² Udrive can be operated in vacuum (no altitude restriction), but at altitudes over 2,500m, current and power rating are reduced due to thermal dissipation efficiency.

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	aracteristics		Min.	Тур.	Max.	Units
Size (Length x	Without mating cor	nnectors		0 x 90 x 1		mm
Width x Height)				3 x 3.54 x		inch
	With recommende	d mating	110 x 110 x 19.1			mm
	connectors.		~4.3	3 x 4.33 x	0.75	inch
Weight	Without mating cor	nnectors		130		g
Efficiency	<u> </u>			98		%
Cleaning agents	Dry cleaning is recommended		Only	Water- or	Alcohol- b	ased
Protection degree	According to IEC60 UL508	0529,		IP20	ı	_
Logic Supply Inpo	ut (+V _{LOG})		Min.	Тур.	Max.	Units
	Nominal values		9		36	V _{DC}
	Absolute maximum drive operating but guaranteed param	outside	8		40	V _{DC}
Supply voltage	Absolute maximum continuous	n values,	-0.6		42	V _{DC}
	Absolute maximum surge (duration ≤ 1		-1		+45	V
	+V _{LOG} = 12V	Ums)		120		
Supply current	$+V_{LOG} = 24V$ $+V_{LOG} = 40V$			70 50		mA
Motor Supply Inp	ut (+V _{MOT})		Min.	Тур.	Max.	Units
	Nominal values		11	48	52	V _{DC}
Supply voltage	Absolute maximum drive operating but guaranteed param	outside eters	9	.0	55	V _{DC}
	Absolute maximum values, surge (duration ≤ 10ms) [†]		-1		63	V
	Idle			1	5	mA
	Operating		-10	±4	+10	Α
Supply current	Absolute maximum value, short-circuit condition (duration ≤ 10ms)				18	А
Motor Outputs (A	/A+, B/A-, C/B+, BR	/B-)	Min.	Тур.	Max.	Units
Nominal output current, continuous 1 for DC brushed, and BLDC moto based trapezoic for PMSM moto sinusoidal contramplitude value		with Hall- control			4	
	sinusoidal control (amplitude value) for PMSM motors	(sinusoidal			4	A
continuous1	amplitude value)	sinusoidal with FOC			2.83	A
current, continuous 1 Motor output current, peak	amplitude value) for PMSM motors sinusoidal control	sinusoidal with FOC	-10.2			A
Motor output current, peak Short-circuit protection threshold	amplitude value) for PMSM motors sinusoidal control (effective value)	sinusoidal with FOC	-10.2 ±22	±26	2.83	
Motor output current, peak Short-circuit protection threshold Short-circuit	amplitude value) for PMSM motors sinusoidal control effective value) maximum 2.5s	(sinusoidal with FOC (sinusoidal		±26	2.83	A
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop	amplitude value) for PMSM motors sinusoidal control (effective value)	(sinusoidal with FOC (sinusoidal	±22		2.83	A
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output cuincluding typical m	with FOC sinusoidal	±22	10	2.83 +10.2 ±30	A A μs
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage	amplitude value) for PMSM motors of sinusoidal control of effective value) maximum 2.5s Nominal output cui including typical monnector contact	with FOC sinusoidal with FOC sinusoidal	±22	10 ±0.3	2.83 +10.2 ±30	A A μs V
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage	amplitude value) for PMSM motors of sinusoidal control of effective value) maximum 2.5s Nominal output cur including typical monnector contact Recommended	(sinusoidal with FOC (sinusoidal rrent; ating resistance FPWM 20 kHz	±22 5 330	10 ±0.3	2.83 +10.2 ±30	A A μs V
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output cui including typical m connector contact Recommended value, for current	with FOC (sinusoidal with FOC	±22 5 330 150	10 ±0.3	2.83 +10.2 ±30	A A μs V
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage	amplitude value) for PMSM motors of sinusoidal control of effective value) maximum 2.5s Nominal output cur including typical monnector contact Recommended	with FOC sinusoidal with FOC sinusoidal with FOC sinusoidal rrent; ating resistance	±22 5 5 330 150 120	10 ±0.3	2.83 +10.2 ±30	A A μs V
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output cui including typical m connector contact Recommended value, for current ripple max. ±5% of	rrent; ating resistance FPWM 20 kHz 40 kHz 60 kHz 80 kHz 80 kHz	±22 5 330 150 120 80	10 ±0.3	2.83 +10.2 ±30	A A μs V
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance	amplitude value) for PMSM motors of sinusoidal control of effective value) maximum 2.5s Nominal output curincluding typical maximum connector contact Recommended value, for current ripple max. ±5% of full range;	rrent; ating resistance FPWM 20 kHz 40 kHz 80 kHz 100 kHz 100 kHz 100 kHz 100 kHz	±22 5 330 150 120 80 60	10 ±0.3	2.83 +10.2 ±30	A A μs V
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance	amplitude value) for PMSM motors of sinusoidal control of effective value) maximum 2.5s Nominal output curincluding typical maximum connector contact Recommended value, for current ripple max. ±5% of full range;	rrent; ating resistance FPWM 20 kHz 40 kHz 60 kHz 80 kHz 80 kHz	±22 5 330 150 120 80	10 ±0.3	2.83 +10.2 ±30	A A μs V
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance	amplitude value) for PMSM motors of sinusoidal control (effective value) maximum 2.5s Nominal output cur including typical m connector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V	rrent; ating resistance FPWM 20 kHz 40 kHz 80 kHz 100 kHz 100 kHz 100 kHz 100 kHz	±22 5 330 150 120 80 60	10 ±0.3	2.83 +10.2 ±30	A A μs V
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output curincluding typical monnector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value,	rrent; ating resistance FPWM 20 kHz 40 kHz 80 kHz 100 kHz 100 kHz 20 kHz 20 kHz 40 kHz 20 kHz 40 kHz 20 kHz 40 kH	±22 5 330 150 120 80 60 120	10 ±0.3	2.83 +10.2 ±30	A A μs. V mA
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance	amplitude value) for PMSM motors of sinusoidal control of effective value) maximum 2.5s Nominal output cui including typical monnector contact Recommended value, for current ripple max. ±5% of full range; +VMOT = 36 V Minimum value, limited by short-	rrent; ating resistance FPWM 20 kHz 40 kHz 80 kHz 100 kHz 20 kHz 40 kHz	±22 5 5 330 150 120 80 60 120 40 30	10 ±0.3	2.83 +10.2 ±30	A A μs. V mA
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output cui including typical m connector contact Recommended value, for current ripple max ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit	rrent; ating resistance FPWM 20 kHz 40 kHz 80 kHz 100 kHz 60 kHz 60 kHz 40 kHz 80 kHz	±22 5 5 330 150 120 80 60 120 40 30 15	10 ±0.3	2.83 +10.2 ±30	A A μs V mA
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output curincluding typical m connector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection;	rrent; ating resistance FPWM 20 kHz 40 kHz 80 kHz 100 kHz 40 kHz 40 kHz 80 kHz 100 kHz	±22 5 330 150 120 80 60 120 40 30 15 8	10 ±0.3	2.83 +10.2 ±30	A A μs V mA
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output curincluding typical m connector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection;	rrent; ating resistance FPWM 20 kHz 40 kHz 100 kHz 20 kHz 40 kHz 40 kHz 40 kHz 40 kHz 20 kHz 40 kHz 20 kHz 40 kHz 20 kHz 40 kHz 20 kHz 80 kHz 20 kHz 80 kHz 40 kHz 80 kHz 20 kHz	±22 5 5 330 150 120 80 60 120 40 30 15	10 ±0.3	2.83 +10.2 ±30	A A μs V mA
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance	amplitude value) for PMSM motors is sinusoidal control of effective value) maximum 2.5s Nominal output cui including typical miconnector contact Recommended value, for current ripple max. ±5% of full range; +VMOT = 36 V Minimum value, limited by short-circuit protection; +VMOT = 36 V	rrent; ating resistance FPWM 20 kHz 40 kHz 80 kHz 100 kHz 40 kHz 40 kHz 80 kHz 100 kHz	±22 5 330 150 120 80 60 120 40 30 15 8	10 ±0.3	2.83 +10.2 ±30	A A μs V mA
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance (phase-to-phase)	amplitude value) for PMSM motors of sinusoidal control of effective value) maximum 2.5s Nominal output cur including typical monnector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V Recommended	rrent; ating resistance FPWM 20 kHz 40 kHz 100 kHz 20 kHz 40 kHz 40 kHz 40 kHz 40 kHz 20 kHz 40 kHz 20 kHz 40 kHz 20 kHz 40 kHz 20 kHz 80 kHz 20 kHz 80 kHz 40 kHz 80 kHz 20 kHz	±22 5 330 150 120 80 60 120 40 30 15 8 250	10 ±0.3	2.83 +10.2 ±30	A A µs V mAA µH
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance (phase-to-phase)	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output cui including typical m connector contact Recommended value, for current ripple max ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V Recommended value for ±5% current measure-ment	rrent; ating resistance FPWM 20 kHz 40 kHz 60 kHz 80 kHz 100 kHz 80 kHz 100 kHz 20 kHz 80 kHz 100 kHz 80 kHz 80 kHz 100 kHz 80 kHz 100 kHz 80 kHz 100 kHz 80 kHz 100	±22 5 330 150 120 80 60 120 40 30 15 8 250 125	10 ±0.3	2.83 +10.2 ±30	A A µs V mAA µH
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance (phase-to-phase)	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output curincluding typical micronnector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V Recommended value for ±5% current	rrent; ating resistance FPWM 20 kHz 40 kHz 20 kHz 40 kHz 40 kHz 100 kHz 20 kHz 40 kHz 40 kHz 40 kHz 40 kHz 40 kHz 60 kHz 60 kHz	\$22 \$5 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	10 ±0.3	2.83 +10.2 ±30	A A µs V mAA µH
Motor output current, peak Short-circuit protection threshold Short-circuit protection delay On-state voltage drop Off-state leakage current Motor inductance (phase-to-phase)	amplitude value) for PMSM motors is sinusoidal control (effective value) maximum 2.5s Nominal output cui including typical m connector contact Recommended value, for current ripple max ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V Recommended value for ±5% current measure-ment	rrent; ating resistance FPWM 20 kHz 40 kHz 80 kHz 100 kHz 80 kHz 100 kHz 20 kHz 40 kHz 80 kHz 100 kHz 80 kHz	±22 5 330 150 80 60 120 40 30 15 8 250 125 100	10 ±0.3	2.83 +10.2 ±30	A A μs V

Digital Inputs – o (IN0, IN1, IN2/LSI		2	Min.	Тур.	Max.	Units		
Mode	PNP		positive	pin to si				
compliance	NPN	NPN			Connect positive pin to supply and connect negative pin to signal			
Default state	Input floating (v disconnected)	viring		Logi	c LOW			
	Logic LOW		0		36	V		
Input voltage	Logic HIGH		5		36			
	Absolute maxi	mum	-7		50	mA		
Innut ourrant	Logic LICH		0 8	10	50 12	mA		
Input current	Logic HIGH Absolute maxi	mum	-20	10	20			
Input frequency	Absolute maxi	IIIuIII	-20	2	20	kHz		
Minimum pulse				500		μs		
ESD protection	Human body m	odel	±15			kV		
Digital Outputs	IT2/F==== OUT4	OUTE)	Min.	Тур.	Max.	Units		
(OUT0, OUT1, OL Mode	All outputs (OU							
compliance	OUT2/Error)	10, 1, 1, 0		NP	N 24V			
	Not supplied (+ to GND)	V _{LOG} floating or		High-Z	(floating)			
	Immediately	OUT0, OUT1		Logic	"HIGH"			
Default state	after power-	OUT2/Error		Logic	: "LOW"			
		OUT0, OUT1, OUT2/Error		Logic	"HIGH"			
	Logic "LOW"; o			0.3	0.65			
	Logic "HIGH";		3.6					
Output voltage	output current = 0, no load		V_{LOG}		5	V		
	Logic "HIGH", 6	external load to	-0.5		V _{LOG} +0.5			
		Absolute maximum, continuous			V _{LOG} +1			
	Absolute maxin							
	(duration ≤ 1s) [†]		-1		V _{LOG} +1			
	Logic "LOW",	OUT2/Error, OUT1,4,5			0.5	Α		
	continuous	OUT0			2	Α		
Output current	Logic "HIGH", source current; external load to GND; Vout >= 2.0V				3	mA		
	Logic "HIGH", current; extern +V _{LOG} ; V _{OUT} = 40V	nal load to		0.1		mA		
Minimum pulse width			2					
ESD protection	Human body m		±15			kV		
Digital Hall Input	s (Hall1, Hall2, F	lall3)	Min.	Тур.	Max.	Units		
Mode compliance			TTL	/ CMOS	/ Open-coll	ector		
Default state	Input floating (wiring disconn	ected)		Logic	HIGH			
	Logic "LOW"			0	0.8			
	Logic "HIGH" Floating voltage	<u>a</u>	2	5	-			
Input voltage	(not connected) Absolute maxin)		4.4		V		
	(duration ≤ 1s)		-10		+15			
	Logic "LOW"; P	ull to GND			1.2			
	Logic "HIGH"; I	nternal 4.7KΩ	0	0	0	mA		
Input current					1			
Input current Minimum pulse width	pull-up to +5		2			μs		

1 @20Khz F _{PWI}	² The digital inputs are software selectable as PNP or NPN					
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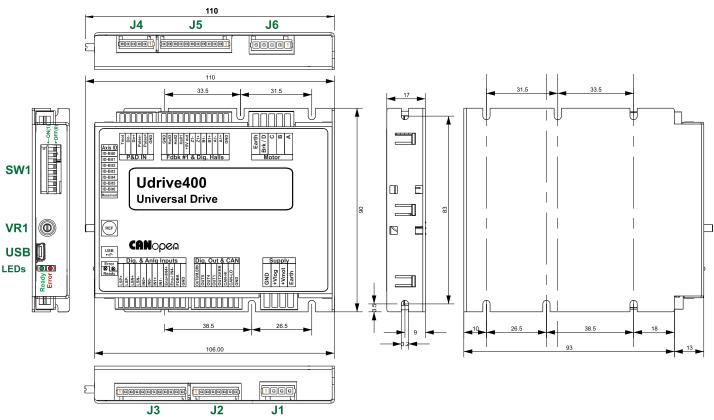
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Feedback 1 &2 inputs (A1+, A1-, B1+, B1-, Z1+, Z1-, P+, P-, D+, D-) ¹			Тур.	Max.	Units	
Differential mode compliance	For full RS422 compliance, see ²	TIA/EIA-422-A				
	Hysteresis	±0.06	±0.1	±0.2		
Input voltage	Differential mode	-14		+14	V	
	Common-mode range (A+ to GND, etc.)	-11		+14		
Input impedance, differential			120		Ω	
Input frequency	Differential mode	0		10	MHz	
Minimum pulse width	Differential mode	50			ns	
Analog 05V Inp	uts (REF, FDBK)	Min.	Тур.	Max.	Units	
	Operational range	0		5		
Input voltage	Absolute maximum values, continuous	-16		+23	V	
1	Absolute maximum, surge (duration ≤ 1s) [†]			±36		
Input impedance	To GND		15		kΩ	
Resolution			12		bits	
Integral linearity				±2	bits	
Offset error			±2	±10	bits	
Gain error			±1%	±3%	% FS ²	
Bandwidth (-3Db)	Software selectable	0		1	kHz	
ESD protection	Human body model	±2			kV	

CAN-Bus			Тур.	Max.	Units	
Compliance	Compliance ISO11898, CiA-301v4.2 & 402					
Bit rate	Software selectable	125		1000	Kbps	
	1Mbps			25		
Bus length	500Kbps			100	m	
	≤ 250Kbps			250		
Resistor	Between CAN-Hi, CAN-Lo		none or	n-board		
	by hardware through SW1	1 ÷ 127 ; 255 (all bits 0)				
Nodo oddroosina		1- 255 (numbers above 127 will				
Node addressing	by software using EasySetup	be co configu		as LSS	non-	
ESD protection	Human body model	±15			kV	
Supply Output (+	5V)	Min.	Тур.	Max.	Units	
Output voltage	Current sourced = 250mA	4.8	5	5.2	V	
Output current				500	mΑ	
Short-circuit			Prote	ected		
Over-voltage			Prote	ected		
ESD protection	Human body model	±15			kV	

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 $^{^{1}}$ All differential input pins have internal 120 $\!\Omega$ termination resistors connected across



Motor – sensor configurations							
Motor Sensor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)		
Incr. Encoder	5		7	(7)			
Incr. Encoder + Dig. Hall	•	9					
Digital halls only	7						
Tacho			T				
Open-loop (no sensor)				7	(7)		
Open-loop (with step loss detection using incr. enc.)				•	•		
Open-loop (with enc. on load)				7	7		

- Features
- Motion controller and drive in a single compact unit
- Universal solution for control of rotary and linear brushless, brushed and 2 or 3-phase step motors
- CANopen communication protocol (CiA 301v4.2, CiA 305v2.213 and 402v3.0)
- Various modes of operating supported: Position or Speed Profile, interpolated Cyclic Synchronous Position (CSP) mode, external reference mode (Position, Speed, Torque), 35 homing modes
- Motor supply: 11-50V. Logic supply: 9-36V
- Output current: 8A cont. (BLDC mode); 21A_{PEAK}, up to 100KHz PWM
- 5 opto-isolated digital inputs, 12-36V, PNP/NPN compatible: 2 for limit switches, 3 general-purpose
- 5 digital outputs, 5-36V, 0.5A, NPN open-collector: Error, 1 Motor brake [2A], 3 general-purpose [0.5A]
- Mini USB¹ & CAN-bus 2.0B interfaces
- 127 h/w addresses selectable by h/w DIP switch
- NTC/PTC analogue Motor Temperature sensor input

- Protections: short-circuit between motor phases and from motor phases to GND, over/under-voltage, over-current, I²t, control error, over temperature, communication error
- Feedback Devices :
 - 1st feedback devices supported:
 - Incremental encoder interface (differential)
 - Digital Hall sensor interface (single-ended and open collector)
 - 2nd feedback devices supported:
 - pulse & direction interface (differential) for external (master) digital reference
- 1 analogue input: 12-bit, 0-5V: Feedback
- 1 rotating potentiometer used as Reference
- 16k x16 SRAM memory for data acquisition
- 16k x16 E²ROM to store setup and other user data
- Operating ambient temperature: 0-40°C (over 40°C with derating)

Mating Connectors							
Producer	Part No.	Connector	Description	Image			
WAGO	734-104	J1	Pluggable terminal block 4- pole Pin spacing 3.5 mm	AWG 14-28			
WAGO	733-108	J2	Pluggable terminal block 8- pole Pin spacing 2.5 mm	AWG 20-28			
WAGO	733-112	J3 & J5	Pluggable terminal block 12-pole Pin spacing 2.5 mm	AWG 20-28			
WAGO	733-106	J4	Pluggable terminal block 6-pole Pin spacing 2.5 mm	AWG 20-28			
WAGO	734-105	J6	Pluggable terminal block 5-pole Pin spacing 3.5 mm	AWG 14-28			

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C	onnect	ors Description	on	
	Pin	Name	Туре	Description
	1	GND	-	Negative return (ground) of the power supply
5	2	+V _{LOG}	ı	Positive terminal of the logic supply input: 11 to $36\ensuremath{V_{DC}}$
7	3	+V _{MOT}	ı	Positive terminal of the motor supply: 11 to $50V_{\text{DC.}}$
	4	Earth	-	Earth connection
	Pin	Name	Туре	Description
	1	OUT0/M.BRK	0	5-36V 2A, digital output used for an electro- mechanical brake, NPN open-collector/TTL pull-up
	2	OUT5	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
_	3	OUT4	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
7	4	OUT1	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	5	OUT2/Error	0	12-36V 0.5A, drive Error output, active low, NPN open-collector/TTL pull-up. Also drives the red Error LED.
	6	CAN Hi	I/O	CAN-Bus positive line(dominant high)
	7	CAN Lo	I/O	CAN-Bus negative line (dominant low)
	8	GND	-	Return ground for I/O and CAN pins
	Pin	Name	Туре	Description
	1	IN2+/LSP+	ı	12-36V digital PNP/NPN opto-isolated input. Positive limit switch function, positive input
-	2	IN2-/LSP-	ı	12-36V digital PNP/NPN opto-isolated input. Positive limit switch function, negative input
	3	IN3+/LSN+	ı	12-36V digital PNP/NPN opto-isolated input. Negative limit switch function, positive input
	4	IN3-/LSN-	1	12-36V digital PNP/NPN opto-isolated input. Negative limit switch function, negative input
	5	INO+	ı	12-36V general-purpose digital PNP/NPN opto-isolated positive input.
•	6	INO-	ı	12-36V general-purpose digital PNP/NPN opto-isolated negative input.
ಬ	7	IN1+	1	12-36V general-purpose digital PNP/NPN opto-isolated positive input.
	8	IN1-	ı	12-36V general-purpose digital PNP/NPN opto-isolated negative input.
	9	Ena+/IN4+	1	12-36V digital PNP/NPN opto-isolated input. Drive enable function, positive input
•	10	Ena-/ IN4-	ı	12-36V digital PNP/NPN opto-isolated input. Drive enable function, negative input
•	11	FDBK	ı	Analogue input, 12-bit, 0-5V. Used to read an analogue position or speed feedback (as tacho), or used as general purpose analogue input.
	12	GND	-	Negative return (ground) of the motor supply
	Pin	Name	Туре	Description
	1	GND	-	Return ground
	2	Pulse+	1	Pulse+ differential input; has 120 $\!\Omega$ resistor between pins 2 and 3
	3	Pulse-	ı	Pulse- differential input; has 120Ω resistor between pins 2 and 3
4	4	Dir+	ı	Direction+ differential input; has 120 $\!\Omega$ resistor between pins 4 and 5
	5	Dir-	1	Direction- differential input; has 120Ω resistor between pins 4 and 5
				NTC/PTC input. Used to read an analog
	6	Temp Mot	ı	temperature value

	Pin	Name	Туре	Description			
	1	GND	-	Return ground for sensors supply			
-	2	A1+	ı	Incr. encoder1 A+ diff. input; has 120Ω resistor between pins 2 and 3			
	3	A1-	ı	Incr. encoder1 A- diff. input; has 120Ω resistor between pins 2 and 3			
_	4	B1+	ı	Incr. encoder1 B+ diff. input; has 120 $\!\Omega$ resistor between pins 4 and 5			
	5	В1-	ı	Incr. encoder1 B- diff. input; has 120Ω resistor between pins 4 and 5			
J5	6	Z1+	ı	Incr. encoder1 Z+ diff. input; has 120 $\!\Omega$ resistor between pins 6 and 7			
	7	Z 1-	ı	Incr. encoder1 Z- diff. input; has 120Ω resistor between pins 6 and 7			
-	8	+5V _{OUT}	0	5V output supply for I/O usage			
	9	Hall 1	ı	Digital input Hall 1 sensor			
	10	Hall 2	ı	Digital input Hall 2 sensor			
	11	Hall 3	ı	Digital input Hall 3 sensor			
	12	GND	-	Return ground for sensors supply			
	Pin	Name	Type	Description			
	1	A/A+	О	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors			
				Phase A for 3-ph motors, A+ for 2-ph steppers,			
96	1	A/A+	0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers,			
96	1 2	A/A+ B/A-	0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors			
96	1 2 3	A/A+ B/A- C/B+	0 0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step			
9° -	1 2 3 4	A/A+ B/A- C/B+ CR/B-	0 0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors			
90	1 2 3 4 5	A/A+ B/A- C/B+ CR/B- Earth	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection			
97	1 2 3 4 5 Pin	A/A+ B/A- C/B+ CR/B- Earth Name	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection			
97	1 2 3 4 5 Pin 1 2 3	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit			
W1	1 2 3 4 5 Pin 1 2 3 4	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number.			
SW1	1 2 3 4 5 Pin 1 2 3 4 5 5	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4	0 0 0 0 - Type	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1			
SW1 J6	1 2 3 4 5 Pin 1 2 3 4 5 6	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4 ID-Bit5	0 0 0 0 - Type - -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number.			
SW1	1 2 3 4 5 Pin 1 2 3 4 5 6 6 7	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4 ID-Bit5 ID-Bit6	0 0 0 0 - Type - -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1 Switch = OFF(up) -> ID bit = 0			
SW1	1 2 3 4 5 Pin 1 2 3 4 5 6	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4 ID-Bit5	0 0 0 0 - Type - -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1			

Electrical characteristics

All parameters measured under the following conditions (unless otherwise specified):

VLOG = 24 VDC; VMOT = 48VDC

Supplies start-up / shutdown sequence: -any-

- - Load current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 4A

Operating Conditions			Тур.	Max.	Units
Ambient temperature		0		40 ^{1, 3}	°C
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure ²	Altitude (vs. sea level)	-0.1	0 ÷ 2.5	2	Km
Allitude / pressure	Ambient Pressure	0 ²	$0.75 \div 1$	10.0	atm
Storage Conditions		Min.	Тур.	Max.	Units
Ambient temperature		-40		105	°C
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
ESD capability (Human body model)	Not powered; applies to any accessible part			±0.5	kV
(Hullian body model)	Original packaging			±15	kV
Mechanical Mounting	I	Min.	Тур.	Max.	Units
Airflow		natura	al convecti	on³, close	d box

 $^{^{\}rm 3}$ In case of forced cooling (conduction or ventilation) the maximum ambient temperature can be increased substantially.

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¹Operating temperature at higher temperatures is possible with reduced current and power ratings ² Udrive can be operated in vacuum (no altitude restriction), but at altitudes over 2,500m, current and power rating are reduced due to thermal dissipation efficiency.

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	naracteristics		Min.	Тур.	Max.	Units
Size (Length x	Without mating cor	nnectors		10 x 90 x 1		mm
Width x Height)				3 x 3.54 x		inch
3 ,	With recommended	d mating	110 x 110 x 19.1 ~4.33 x 4.33 x 0.75			mm
Weight	Without mating cor	anactora	~4.3		0.75	inch
Efficiency	Without mating cor		130 98		g %	
•	Dry cleaning is					
Cleaning agents	recommended	2520	Only \	Water- or	Alcohol- b	ased
Protection degree	According to IEC60 UL508	J529,		IP20		-
Logic Supply Inpu			Min.	Тур.	Max.	Units
	Nominal values		9		36	V _{DC}
	Absolute maximum drive operating but guaranteed parame	outside	8		40	V _{DC}
Supply voltage	Absolute maximum continuous		-0.6		42	V _{DC}
	Absolute maximum		-1		. 45	V
	surge (duration ≤ 1	0ms) [†]	-1	120	+45	V
Supply current	$+V_{LOG} = 12V$ $+V_{LOG} = 24V$			70		mA
Matan Committee	+V _{LOG} = 40V		M	50 T	M	He't
Motor Supply Inpu			Min.	Typ.	Max.	Units
	Nominal values Absolute maximum	n values	11	48	52	V _{DC}
Supply voltage	drive operating but guaranteed parame	outside eters	9		55	V _{DC}
	Absolute maximum surge (duration ≤ 1	-1		63	٧	
	Idle	0.110)		1	5	mA
	Operating		-22	±8	+22	Α
Supply current	short-circuit condition				37	А
Motor Outputs (A	(duration ≤ 10ms) ['] /A+, B/A-, C/B+, BR	/B-)	Min.	Тур.	Max.	Units
motor outputs (70	for DC brushed, sto	•		136.	IVIUX.	Omico
New Year or tour	and BLDC motors with Hall- based trapezoidal control for PMSM motors with FOC sinusoidal control (sinusoidal amplitude value) for PMSM motors with FOC				8	
Nominal output current,					8	A
continuous ¹						_
	sinusoidal control (effective value)				5.67	
Motor output current, peak	maximum 2.5s		-21.4		+21.4	Α
Short-circuit protection threshold			±22	±26	±30	А
Short-circuit			5	10		μS
protootice dil-	Nominal output current;				1	1
On-state voltage drop	including typical ma	ating	-	±0.3	±0.5	V
On-state voltage drop Off-state leakage		ating		±0.3	±0.5	V mA
On-state voltage drop	including typical ma	ating resistance				ļ
On-state voltage drop Off-state leakage	including typical ma	ating resistance				ļ
On-state voltage drop Off-state leakage	including typical m connector contact	ating resistance F _{PWM} 20 kHz	330			ļ
On-state voltage drop Off-state leakage	Recommended value, for current ripple max. ±5% of	F _{PWM} 20 kHz 40 kHz	330 150			ļ
On-state voltage drop Off-state leakage	including typical monnector contact Recommended value, for current ripple max. ±5% of full range;	F _{PWM} 20 kHz 40 kHz 60 kHz	330 150 120			mA
On-state voltage drop Off-state leakage	Recommended value, for current ripple max. ±5% of	F _{PWM} 20 kHz 40 kHz 60 kHz 80 kHz	330 150 120 80			mA
On-state voltage drop Off-state leakage current Motor inductance	Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V	F _{PWM} 20 kHz 40 kHz 60 kHz 80 kHz 100 kHz	330 150 120 80 60			mA
On-state voltage drop Off-state leakage current	including typical monnector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value,	resistance F _{PWM} 20 kHz 40 kHz 60 kHz 80 kHz 100 kHz 20 kHz	330 150 120 80 60 120			mA
On-state voltage drop Off-state leakage current Motor inductance	Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-	FPWM 20 kHz 40 kHz 60 kHz 80 kHz 100 kHz 20 kHz	330 150 120 80 60 120 40			mA μH
On-state voltage drop Off-state leakage current Motor inductance	Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit	FPWM 20 kHz 40 kHz 60 kHz 100 kHz 20 kHz 40 kHz	330 150 120 80 60 120 40 30			mA
On-state voltage drop Off-state leakage current Motor inductance	including typical monnector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection;	FPWM 20 kHz 40 kHz 40 kHz 80 kHz 100 kHz 20 kHz 20 kHz 40 kHz 80 kHz 40 kHz 80 kHz 80 kHz	330 150 120 80 60 120 40 30			mA μH
On-state voltage drop Off-state leakage current Motor inductance	Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit	F _{PWM} 20 kHz 40 kHz 60 kHz 80 kHz 100 kHz 20 kHz 40 kHz 100 kHz 20 kHz 40 kHz 40 kHz 40 kHz	330 150 120 80 60 120 40 30			mA μH
On-state voltage drop Off-state leakage current Motor inductance	Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V	FPWM 20 kHz 40 kHz 40 kHz 80 kHz 100 kHz 20 kHz 20 kHz 40 kHz 80 kHz 40 kHz 80 kHz 80 kHz	330 150 120 80 60 120 40 30			mA μH
On-state voltage drop Off-state leakage current Motor inductance (phase-to-phase)	Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V Recommended	F _{PWM} 20 kHz 40 kHz 60 kHz 80 kHz 100 kHz 20 kHz 40 kHz 100 kHz 20 kHz 40 kHz 40 kHz 40 kHz	330 150 120 80 60 120 40 30 15 8			mA μH
On-state voltage drop Off-state leakage current Motor inductance	Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V	FPWM 20 kHz 40 kHz 60 kHz 100 kHz 20 kHz 60 kHz 100 kHz 20 kHz 60 kHz 40 kHz 100 kHz 20 kHz 40 kHz 20 kHz	330 150 120 80 60 120 40 30 15 8 250			mA μH
On-state voltage drop Off-state leakage current Motor inductance (phase-to-phase)	including typical monnector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V Recommended value for ±5%	FPWM 20 kHz 40 kHz 60 kHz 100 kHz 20 kHz 40 kHz 100 kHz 20 kHz 40 kHz 20 kHz 40 kHz 100 kHz 20 kHz 40 kHz 40 kHz	330 150 120 80 60 120 40 30 15 8 250			mA μH
On-state voltage drop Off-state leakage current Motor inductance (phase-to-phase) Motor electrical time-constant	including typical monnector contact Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 36 V Minimum value, limited by short-circuit protection; +V _{MOT} = 36 V Recommended value for ±5% current	FPWM 20 kHz 40 kHz 60 kHz 100 kHz 20 kHz 40 kHz 100 kHz 20 kHz 40 kHz 20 kHz 40 kHz 40 kHz 40 kHz 40 kHz 60 kHz	330 150 120 80 60 120 40 30 15 8 250 125			mA μH

Digital Inputs – c (IN0, IN1, IN2/LSI		2	Min.	Тур.	Max.	Units		
Mode	PNP	PNP			Connect negative pin to GND and positive pin to signal			
compliance	NPN		Connect positive pin to supply and connect negative pin to signal					
Default state	Input floating (v disconnected)	viring		Logi	c LOW			
	Logic LOW		0		36	V		
Input voltage	Logic HIGH		5		36			
	Absolute maxi	mum	-7		50	^		
Lance Community	Logic LOW		0	40	50	mA		
Input current	Logic HIGH	ina i ina	8	10	12			
Input frequency	Absolute maxi	mum	-20	2	20	kHz		
Minimum pulse				500		μs		
ESD protection	Human body m	odel	±15			kV		
Digital Outputs			Min.	Тур.	Max.	Units		
Mode		T2/Error, OUT4, OUT5) All outputs (OUT0, 1, 4, 5			·····	•		
compliance	OUT2/Error)	10, 1, 4, 5		NP	N 24V			
		·V _{LOG} floating or		High-Z	(floating)			
	Immediately	OUT0, OUT1		Logic	"HIGH"			
Default state	after power-	OUT2/Error		Logic	"LOW"			
	Normal operation	OUT0, OUT1, OUT2/Error		Logic	"HIGH"			
	Logic "LOW"; o			0.3	0.65			
Output voltage	Logic "HIGH";		3.6					
	output current = 0, no load		V _{LOG}		5	V		
	Logic "HIGH", 6	external load to	-0.5		V _{LOG} +0.5			
		Absolute maximum, continuous			V _{LOG} +1			
	Absolute maximum, surge							
	(duration ≤ 1s)	t	-1		V _{LOG} +1			
	Logic "LOW", sink current, continuous	OUT2/Error, OUT1,4,5			0.5	Α		
		OUT0			2	Α		
Output current	Logic "HIGH", source current; external load to GND; Vout >= 2.0V				3	mA		
	Logic "HIGH", leakage current; external load to +V _{LOG} ; V _{OUT} = V _{LOG} max = 40V			0.1		mA		
Minimum pulse width			2					
ESD protection	Human body m		±15			kV		
Digital Hall Input	s (Hall1, Hall2, F	łali3)	Min.	Тур.	Max.	Units		
Mode compliance			TTL	/ CMOS	/ Open-coll	ector		
Default state	Input floating (wiring disconn	ected)			HIGH			
	Logic "LOW"		_	0	8.0			
	Logic "HIGH" Floating voltage	9	2	5	 			
Input voltage	(not connected)		4.4		V		
	Absolute maxin		-10		+15			
	(duration ≤ 1s)	1	-10					
Input current	Logic "LOW"; F	full to GND			1.2	m ^		
Minimum pulse	Logic "HIGH"; I pull-up to +5	nternal 4./KΩ	0	0	0	mA		
withinfillin Duise	pull-up to +5		2		1	μs		
width ESD protection						p. v		

1 @20Khz Fpwm		² The digital inputs are software selectable as PNP or NPN			
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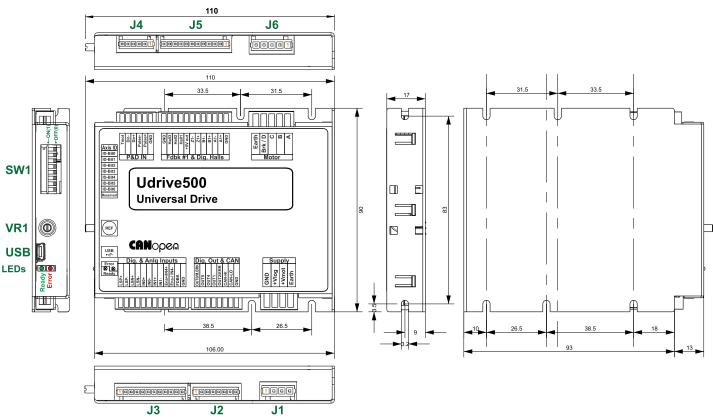
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Feedback 1 &2 in	puts (A1+, A1-, B1+, B1-, Z1+,	Min.	_			
Z1-, P+, P-, D+, D-) ¹			Тур.	Max.	Units	
Differential mode	Differential mode For full RS422 compliance,		TIA/FIA	-422-Δ		
compliance	see ²		11// 1/	1 722 /1		
	Hysteresis	±0.06	±0.1	±0.2		
Input voltage	Differential mode	-14		+14	V	
	Common-mode range (A+ to GND, etc.)	-11		+14		
Input impedance, differential			120		Ω	
Input frequency	Differential mode	0		10	MHz	
Minimum pulse width	Differential mode	50			ns	
Analog 05V Inp	uts (REF, FDBK)	Min.	Тур.	Max.	Units	
	Operational range	0		5		
Input voltage	Absolute maximum values, continuous	-16		+23	V	
1	Absolute maximum, surge (duration ≤ 1s) ^t			±36	1	
Input impedance	To GND		15		kΩ	
Resolution	·		12		bits	
Integral linearity				±2	bits	
Offset error			±2	±10	bits	
Gain error			±1%	±3%	% FS ²	
Bandwidth (-3Db)	Software selectable	0		1	kHz	
ESD protection	Human body model	±2			kV	

CAN-Bus		Min.	Тур.	Max.	Units	
Compliance	ISO118	398, CiA-30	01v4.2 & 4	02v3.0		
Bit rate	Software selectable	125		1000	Kbps	
	1Mbps			25		
Bus length	500Kbps			100	m	
	≤ 250Kbps			250		
Resistor	Between CAN-Hi, CAN-Lo	none on-board				
by hardware through SW1 1 ÷ 127 ; 255 (all bit				5 (all bits 0	0)	
Nodo oddroosina		1- 255 (numbers above 127 wil				
Node addressing	by software using EasySetup	be considered as LSS non-				
		configu	red)			
ESD protection	Human body model	±15			kV	
Supply Output (+	5V)	Min.	Тур.	Max.	Units	
Output voltage	Current sourced = 250mA	4.8	5	5.2	V	
Output current				500	mA	
Short-circuit			Prote	ected		
Over-voltage			Prote	ected		
ESD protection	Human body model	±15			kV	

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 $^{^{1}}$ All differential input pins have internal 120 $\!\Omega$ termination resistors connected across



Motor – sensor configurations						
Motor Sensor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)	
Incr. Encoder	5		7	(7)		
Incr. Encoder + Dig. Hall	•	•				
Digital halls only	T					
Tacho			T			
Open-loop (no sensor)				7	(7)	
Open-loop (with step loss detection using incr. enc.)				•	3	
Open-loop (with enc. on load)				T	•	

- Features
- Motion controller and drive in a single compact unit
- Universal solution for control of rotary and linear brushless, brushed and 2 or 3-phase step motors
- CANopen communication protocol (CiA 301v4.2, CiA 305v2.213 and 402v3.0)
- Various modes of operating supported: Position or Speed Profile, interpolated Cyclic Synchronous Position (CSP) mode, external reference mode (Position, Speed, Torque), 35 homing modes
- Motor supply: 11-90V. Logic supply: 9-36V
- Output current: 6A cont. (BLDC mode); 21A_{PEAK}, up to 100KHz PWM
- 5 opto-isolated digital inputs, 12-36V, PNP/NPN compatible: 2 for limit switches, 3 general-purpose
- 5 digital outputs, 5-36V, 0.5A, NPN open-collector: Error, 1 Motor brake [2A], 3 general-purpose [0.5A]
- Mini USB¹ & CAN-bus 2.0B interfaces
- 127 h/w addresses selectable by h/w DIP switch
- NTC/PTC analogue Motor Temperature sensor input

- Protections: short-circuit between motor phases and from motor phases to GND, over/under-voltage, over-current, I²t, control error, over temperature, communication error
- Feedback Devices :
 - 1st feedback devices supported:
 - Incremental encoder interface (differential)
 - Digital Hall sensor interface (single-ended and open collector)
 - 2nd feedback devices supported:
 - pulse & direction interface (differential) for external (master) digital reference
- 1 analogue input: 12-bit, 0-5V: Feedback
- 1 rotating potentiometer used as Reference
- 16k x16 SRAM memory for data acquisition
- 16k x16 E²ROM to store setup and other user data
- Operating ambient temperature: 0-40°C (over 40°C with derating)

Mating Connectors						
Producer	Part No.	Connector	Description	Image		
WAGO	734-104	J1	Pluggable terminal block 4- pole Pin spacing 3.5 mm	AWG 14-28		
WAGO	733-108	J2	Pluggable terminal block 8- pole Pin spacing 2.5 mm	AWG 20-28		
WAGO	733-112	J3 & J5	Pluggable terminal block 12-pole Pin spacing 2.5 mm	AWG 20-28		
WAGO	733-106	J4	Pluggable terminal block 6-pole Pin spacing 2.5 mm	AWG 20-28		
WAGO	734-105	J6	Pluggable terminal block 5-pole Pin spacing 3.5 mm	AWG 14-28		

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Co	onnect	ors Description	on	
	Pin	Name	Туре	Description
	1	GND	-	Negative return (ground) of the power supply
5	2	+V _{LOG}	ı	Positive terminal of the logic supply input: 11 to $36\ensuremath{V_{DC}}$
7	3	+V _{MOT}	ı	Positive terminal of the motor supply: 11 to 90V _{DC} .
	4	Earth	-	Earth connection
	Pin	Name	Туре	Description
	1	OUT0/M.BRK	0	5-36V 2A, digital output used for an electro- mechanical brake, NPN open-collector/TTL pull-up
	2	OUT5	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	3	OUT4	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
72	4	OUT1	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	5	OUT2/Error	0	12-36V 0.5A, drive Error output, active low, NPN open-collector/TTL pull-up. Also drives the red Error LED.
	6	CAN Hi	I/O	CAN-Bus positive line(dominant high)
	7	CAN Lo	I/O	CAN-Bus negative line (dominant low)
	8	GND	-	Return ground for I/O and CAN pins
	Pin	Name	Туре	Description
	1	IN2+/LSP+	ı	12-36V digital PNP/NPN opto-isolated input. Positive limit switch function, positive input
-	2	IN2-/LSP-	ı	12-36V digital PNP/NPN opto-isolated input. Positive limit switch function, negative input
	3	IN3+/LSN+	1	12-36V digital PNP/NPN opto-isolated input. Negative limit switch function, positive input
•	4	IN3-/LSN-	ı	12-36V digital PNP/NPN opto-isolated input. Negative limit switch function, negative input
•	5	INO+	ı	12-36V general-purpose digital PNP/NPN opto-isolated positive input.
•	6	INO-	ı	12-36V general-purpose digital PNP/NPN opto-isolated negative input.
5	7	IN1+	ı	12-36V general-purpose digital PNP/NPN opto-isolated positive input.
•	8	IN1-	ı	12-36V general-purpose digital PNP/NPN opto-isolated negative input.
•	9	Ena+/IN4+	ı	12-36V digital PNP/NPN opto-isolated input. Drive enable function, positive input
	10	Ena-/ IN4-	ı	12-36V digital PNP/NPN opto-isolated input. Drive enable function, negative input
•	11	FDBK	ı	Analogue input, 12-bit, 0-5V. Used to read an analogue position or speed feedback (as tacho), or used as general purpose analogue input.
	12	GND	-	Negative return (ground) of the motor supply
	Pin	Name	Туре	Description
	1	GND	-	Return ground
•	2	Pulse+	ı	Pulse+ differential input; has 120Ω resistor between pins 2 and 3
	3	Pulse-	ı	Pulse- differential input; has 120Ω resistor between pins 2 and 3
₹	4	Dir+	ı	Direction+ differential input; has 120Ω resistor between pins 4 and 5
•	5	Dir-	ı	Direction- differential input; has 120Ω resistor between pins 4 and 5
•	6	Temp Mot	ı	NTC/PTC input. Used to read an analog temperature value

	Pin	Name	Туре	Description		
	1	GND	-	Return ground for sensors supply		
	2	A1+	ļ	Incr. encoder1 A+ diff. input; has 120Ω resistor between pins 2 and 3		
	3	A1-	ı	Incr. encoder1 A- diff. input; has 120Ω resistor between pins 2 and 3		
-	4	B1+	I	Incr. encoder1 B+ diff. input; has 120Ω resistor between pins 4 and 5		
	5	B1-	I	Incr. encoder1 B- diff. input; has 120Ω resiste between pins 4 and 5		
J5	6	Z1+	ļ	Incr. encoder1 Z+ diff. input; has 120Ω resistor between pins 6 and 7		
	7	Z1-	I	Incr. encoder1 Z- diff. input; has 120Ω resistor between pins 6 and 7		
_	8	+5V _{out}	0	5V output supply for I/O usage		
	9	Hall 1	ı	Digital input Hall 1 sensor		
_	10	Hall 2	I	Digital input Hall 2 sensor		
	11	Hall 3	- 1	Digital input Hall 3 sensor		
	12	GND	-	Return ground for sensors supply		
	Pin	Name	Туре	Description		
	FIII	Name	туре	•		
_	1	A/A+	0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors		
9 -	2	B/A-	0	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors		
٦.	3	C/B+	0	Phase C for 3-ph motors, B+ for 2-ph steppers		
_	4	CR/B-	0	Chopping resistor / Phase B- for 2-ph step motors		
	4 5	CR/B- Earth		Chopping resistor / Phase B- for 2-ph step		
				Chopping resistor / Phase B- for 2-ph step motors		
	5	Earth	0	Chopping resistor / Phase B- for 2-ph step motors Earth connection		
	5 Pin	Earth Name	0	Chopping resistor / Phase B- for 2-ph step motors Earth connection Description		
	5 Pin	Earth Name ID-Bit0	0	Chopping resistor / Phase B- for 2-ph step motors Earth connection		
٧١	5 Pin 1 2	Earth Name ID-Bit0 ID-Bit1	O - Type	Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number.		
SW1	5 Pin 1 2 3	Earth Name ID-Bit0 ID-Bit1 ID-Bit2	O - Type	Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1		
SW1	5 Pin 1 2 3 4	Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3	O - Type	Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number.		
SW1	5 Pin 1 2 3 4 5	Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4	O - Type	Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1		
SW1	5 Pin 1 2 3 4 5 6	Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4 ID-Bit5	O - Type	Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1		

Electrical characteristics

All parameters measured under the following conditions (unless otherwise specified):

• VLOG = 24 VDC; VMOT = 48VDC

- Supplies start-up / shutdown sequence: -any-Load current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 4A

Operating Conditions	Min.	Тур.	Max.	Units	
Ambient temperature		0		40 ^{1, 3}	°C
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure ²	Altitude (vs. sea level)	-0.1	0 ÷ 2.5	2	Km
Ailliude / pressure	Ambient Pressure	0 ²	$0.75 \div 1$	10.0	atm
Storage Conditions	Min.	Тур.	Max.	Units	
Ambient temperature		-40		105	°C
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
ESD capability (Human body model)	Not powered; applies to any accessible part			±0.5	kV
(Human body model)	Original packaging			±15	kV
Mechanical Mounting	Mechanical Mounting			Max.	Units
Airflow		natura	al convecti	on³, close	d box

 $^{^{\}rm 3}$ In case of forced cooling (conduction or ventilation) the maximum ambient temperature can be increased substantially.

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¹Operating temperature at higher temperatures is possible with reduced current and power ratings ² Udrive can be operated in vacuum (no altitude restriction), but at altitudes over 2,500m, current and power rating are reduced due to thermal dissipation efficiency.

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aracteristics		Min.	Тур.	Max.	Units
Without mating cou	nnectors				mm
TTILLIOUS MIAILING COL		~4.33 x 3.54 x 0.67			inch
	d mating				mm
connectors.		~4.3		0.75	inch
Without mating cor	nnectors		130		g
			98		%
recommended		Only	Water- or	Alcohol- b	ased
According to IEC60 UL508		IP20		-	
ıt (+V _{LOG})		Min.	Тур.	Max.	Units
Nominal values		9		36	V _{DC}
drive operating but	outside	8		40	V _D
Absolute maximum		-0.6		42	V _{DC}
Absolute maximum		-1		+45	V
+V _{LOG} = 12V	ions)		120		
			70		mA
•			50		
ut (+V _{MOT})		Min.	Тур.	Max.	Units
Nominal values		11	90	92	V _{DC}
Absolute maximum drive operating but	outside	9		95	V _{DC}
	4	-1		102	٧
Idle	-,		1	5	mA
		-22	±10		Α
Absolute maximum va short-circuit condition				37	А
	/R_\	Min	Typ	May	Units
	-	Will.	τyp.	wax.	Units
and BLDC motors with Hall- based trapezoidal control				6	
sinusoidal control (6	А
for PMSM motors				4.26	
maximum 2.5s		-21.4		+21.4	Α
		±22	±26	±30	А
		5	10		μS
including typical m	ating		±0.3	±0.5	٧
			±0.5	±1	mA
Recommended	F _{PWM}				4
value, for current					4
ripple max. ±5% of	40 kHz	150			μН
	60 KHZ	120			٠
				1	1
full range; +V _{MOT} = 36 V	80 kHz	80			
full range;	100 kHz	60			
full range; +V _{MOT} = 36 V					
full range; +V _{MOT} = 36 V Minimum value,	100 kHz	60			
full range; +V _{MOT} = 36 V	100 kHz 20 kHz	60 120			- - - - -
full range; +V _{MOT} = 36 V Minimum value, limited by short- circuit	100 kHz 20 kHz 60 kHz 40 kHz	60 120 40 30			μΗ
full range; +V _{MOT} = 36 V Minimum value, limited by short- circuit protection;	100 kHz 20 kHz 60 kHz 40 kHz 80 kHz	60 120 40 30 15			<u>μ</u> Η
full range; +V _{MOT} = 36 V Minimum value, limited by short- circuit	100 kHz 20 kHz 60 kHz 40 kHz 80 kHz 100 kHz	60 120 40 30 15 8			μΗ
full range; +V _{MOT} = 36 V Minimum value, limited by short- circuit protection;	100 kHz 20 kHz 60 kHz 40 kHz 80 kHz	60 120 40 30 15			μН
full range; +V _{MOT} = 36 V Minimum value, limited by short- circuit protection; +V _{MOT} = 36 V	100 kHz 20 kHz 60 kHz 40 kHz 80 kHz 100 kHz	60 120 40 30 15 8			μН
full range; +V _{MOT} = 36 V Minimum value, limited by short- circuit protection; +V _{MOT} = 36 V Recommended	100 kHz 20 kHz 60 kHz 40 kHz 80 kHz 100 kHz 20 kHz	60 120 40 30 15 8 250			
full range; +V _{MOT} = 36 V Minimum value, limited by short- circuit protection; +V _{MOT} = 36 V Recommended value for ±5%	100 kHz 20 kHz 60 kHz 40 kHz 80 kHz 100 kHz 20 kHz 40 kHz	60 120 40 30 15 8 250 125 100			
full range; +V _{MOT} = 36 V Minimum value, limited by short- circuit protection; +V _{MOT} = 36 V Recommended value for ±5% current	100 kHz 20 kHz 60 kHz 40 kHz 80 kHz 100 kHz 20 kHz 40 kHz 60 kHz	60 120 40 30 15 8 250 125			μH
	Without mating core With recommende connectors. Without mating core with recommended According to IEC6 UL508 It (+VLos) Nominal values Absolute maximun drive operating but guaranteed param Absolute maximun continuous Absolute maximun surge (duration ≤ 1 +VLos = 12V +VLos = 24V +VLos = 40V ut (+VMor) Nominal values Absolute maximun drive operating but guaranteed param Absolute maximun surge (duration ≤ 1 ldle Operating Absolute maximun surge (duration ≤ 1 lons) A+, B/A-, C/B+, BR for DC brushed, st and BLDC motors based trapezoidal for PMSM motors sinusoidal control amplitude value) for PMSM motors sinusoidal control amplitude value) maximum 2.5s Nominal output cu including typical m connector contact	Without mating connectors With recommended mating connectors. Without mating connectors Dry cleaning is recommended According to IEC60529, UL508 It (+Vuo) Nominal values Absolute maximum values, drive operating but outside guaranteed parameters Absolute maximum values, continuous Absolute maximum values, surge (duration ≤ 10ms) +VLog = 12V +VLog = 24V +VLog = 40V It (+Vwor) Nominal values Absolute maximum values, drive operating but outside guaranteed parameters Absolute maximum values, surge (duration ≤ 10ms) Nominal values Absolute maximum values, drive operating but outside guaranteed parameters Absolute maximum values, surge (duration ≤ 10ms) Idle Operating Absolute maximum value, short-circuit condition (duration ≤ 10ms) for DC brushed, steppers and BLDC motors with Hall-based trapezoidal control (sinusoidal amplitude value) for PMSM motors with FOC sinusoidal control (sinusoidal amplitude value) for PMSM motors with FOC sinusoidal control (sinusoidal effective value) maximum 2.5s	Without mating connectors With recommended mating connectors. Without mating connectors Dry cleaning is recommended According to IEC60529, UL508 It (+V Los) Nominal values Absolute maximum values, drive operating but outside guaranteed parameters Absolute maximum values, surge (duration ≤ 10ms) +V Los = 12V +V Los = 24V +V Los = 24V +V Los = 40V It (+V wort) Nominal values Absolute maximum values, surge (duration ≤ 10ms) Nominal values Absolute maximum values, surge (duration ≤ 10ms) I Nominal values Absolute maximum values, drive operating but outside guaranteed parameters Absolute maximum values, drive operating but outside guaranteed parameters Absolute maximum values, surge (duration ≤ 10ms) Idle Operating Absolute maximum value, surge (duration ≤ 10ms) Idle Operating Absolute maximum value, surge (duration ≤ 10ms) Idle Operating Absolute maximum value, surge (duration ≤ 10ms) Idle Operating Absolute maximum value, surge (duration ≤ 10ms) Idle Operating Absolute maximum value, surge (duration ≤ 10ms) Idle Operating Absolute maximum value, surge (duration ≤ 10ms) Idle Operating Absolute maximum value, surge (duration ≤ 10ms) Idle Operating Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute maximum value, surge (duration ≤ 10ms) Idle Operating -22 Absolute for current transition on the form of the	Without mating connectors 110 x 90 x -4.33 x 3.54 x With recommended mating connectors. 110 x 110 x 1 0	Without mating connectors 110 x 90 x 17 -4.33 x 3.54 x 0.67 With recommended mating connectors. 110 x 110 x 19.1 connectors. -4.33 x 4.33 x 0.75 Without mating connectors 130 Dry cleaning is recommended 98 According to IEC60529, UL.508 IP20 It (+VLoc) Min. Typ. Nominal values 9 36 Absolute maximum values, continuous 9 36 Absolute maximum values, continuous -0.6 42 Absolute maximum values, continuous -0.6 42 Absolute maximum values, surge (duration ≤ 10ms) † -1 +45 +VLos = 12V 120 +45 +VLos = 24V 70 70 +VLos = 24V 70 92 Absolute maximum values, drive operating but outside guaranteed parameters 9 95 Absolute maximum values, surge (duration ≤ 10ms) † -1 102 Idle 1 5 Operating -22 ±10 +22 Absolute maximum value, short-circuit condition

Digital Inputs - o (IN0, IN1, IN2/LSI	pto-isolated- P, IN3/LSN, IN4)	2	Min.	Тур.	Max.	Units	
Mode	PNP		positive	Connect negative pin to GND and positive pin to signal			
compliance	NPN		Connect positive pin to supply and connect negative pin to signal				
Default state	Input floating (v disconnected)	viring		Logic LOW			
	Logic LOW		0		36	V	
Input voltage	Logic HIGH		-7		36		
		Absolute maximum			50	-m A	
Innut ourrant	Logic LOW Logic HIGH	ŭ		10	50 12	mA	
Input current	Absolute maximum		-20	10	20		
Input frequency	Absolute maximum		-20	2	20	kHz	
Minimum pulse				500		μs	
ESD protection	Human body m	odel	±15			kV	
Digital Outputs		•			Max.	Units	
(OUT0, OUT1, OU	All outputs (OU	Min.	Тур.	·····	•		
compliance	OUT2/Error)	10, 1, 4, 5		NP	N 24V		
		V _{LOG} floating or		High-Z	(floating)		
	Immediately	OUT0, OUT1		Logic	"HIGH"		
Default state	after power-	OUT2/Error		Logic	: "LOW"		
	Normal operation	OUT0, OUT1, OUT2/Error		Logic	"HIGH"		
	Logic "LOW"; o			0.3	0.65		
	Logic "HIGH";		3.6				
Output voltage	output current = 0, no load		V_{LOG}		5	V	
, ,	Logic "HIGH", 6	external load to	-0.5		V _{LOG} +0.5		
	Absolute maximum, continuous		-1		V _{LOG} +1		
	Absolute maximum, surge		4				
	(duration ≤ 1s)	t	-1		V _{LOG} +1		
	Logic "LOW", sink current,	OUT2/Error, OUT1,4,5			0.5	Α	
	continuous	OUT0			2	Α	
Output current	Logic "HIGH", source current; external load to GND; Vout >= 2.0V				3	mA	
	Logic "HIGH", leakage current; external load to +V _{LOG} ; V _{OUT} = V _{LOG} max = 40V			0.1		mA	
Minimum pulse width			2				
ESD protection	Human body m		±15			kV	
Digital Hall Input	s (Hall1, Hall2, F	lali3)	Min.	Тур.	Max.	Units	
Mode compliance			TTL	/ CMOS	/ Open-coll	ector	
Default state	Input floating (wiring disconn	ected)			HIGH	ı	
	Logic "LOW" Logic "HIGH"		2	0	0.8		
	Floating voltage	e		5	 		
Input voltage	(not connected)		4.4		V	
	Absolute maxin		-10		+15		
	(duration ≤ 1s)		10				
Input current	Logic "LOW"; F	Pull to GND			1.2	mA	
input curterit	Logic "HIGH"; I pull-up to +5	memai 4./K\\2	0	0	0	IIIA	
Minimum 1							
Minimum pulse width ESD protection	Human body m		2 ±5			μs kV	

1 @20Khz F _{PWN}	1	² The digital inputs are software selectable as PNP or NPN				
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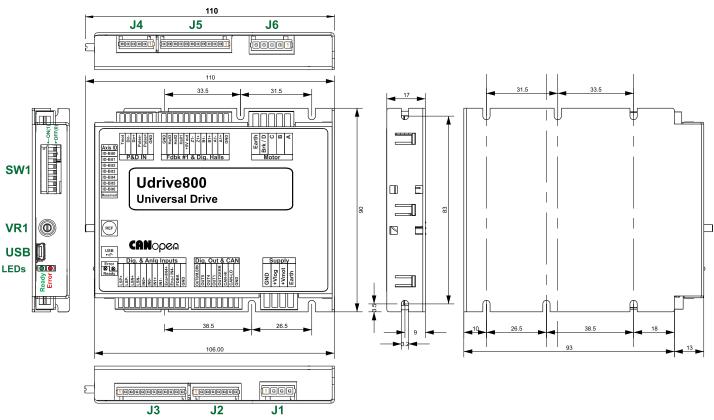
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Feedback 1 &2 in	puts (A1+, A1-, B1+, B1-, Z1+,	Min.	_				
Z1-, P+, P-, D+, D-)¹			Тур.	Max.	Units		
Differential mode	For full RS422 compliance,		TIA/FIA-422-A				
compliance	see ²		11// 1/	1 722 /1			
	Hysteresis	±0.06	±0.1	±0.2			
Input voltage	Differential mode	-14		+14	V		
	Common-mode range (A+ to GND, etc.)	-11		+14			
Input impedance, differential			120		Ω		
Input frequency	Differential mode	0		10	MHz		
Minimum pulse width	Differential mode	50			ns		
Analog 05V Inp	uts (REF, FDBK)	Min.	Тур.	Max.	Units		
	Operational range	0		5			
Input voltage	Absolute maximum values, continuous	-16		+23	V		
1	Absolute maximum, surge (duration ≤ 1s) ^t			±36			
Input impedance	To GND		15		kΩ		
Resolution	·		12		bits		
Integral linearity				±2	bits		
Offset error			±2	±10	bits		
Gain error			±1%	±3%	% FS ²		
Bandwidth (-3Db)	Software selectable	0		1	kHz		
ESD protection	Human body model	±2			kV		

CAN-Bus			Тур.	Max.	Units	
Compliance			398, CiA-30	01v4.2 & 4	02v3.0	
Bit rate	Software selectable	125		1000	Kbps	
	1Mbps			25		
Bus length	500Kbps			100	m	
	≤ 250Kbps			250		
Resistor Between CAN-Hi, CAN-Lo			none or	n-board		
	by hardware through SW1	1 ÷ 127 ; 255 (all bits 0)				
Nodo oddroosina		1- 255 (numbers above 127 will				
Node addressing	by software using EasySetup	be considered as LSS		non-		
		configu	red)			
ESD protection	Human body model	±15			kV	
Supply Output (+	5V)	Min.	Тур.	Max.	Units	
Output voltage	Current sourced = 250mA	4.8	5	5.2	V	
Output current				500	mA	
Short-circuit		Protected				
Over-voltage			Prote	ected		
ESD protection	Human body model	±15			kV	

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 $^{^{1}}$ All differential input pins have internal 120 $\!\Omega$ termination resistors connected across



Motor – sensor configurations								
Motor Sensor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)			
Incr. Encoder	T		T	T				
Incr. Encoder + Dig. Hall	7	•						
Digital halls only	T							
Tacho			T					
Open-loop (no sensor)				3	3			
Open-loop (with step loss detection using incr. enc.)				3	•			
Open-loop (with enc. on load)				7	•			

- Features
- Motion controller and drive in a single compact unit
- Universal solution for control of rotary and linear brushless, brushed and 2 or 3-phase step motors
- CANopen communication protocol (CiA 301v4.2, CiA 305v2.213 and 402v3.0)
- Various modes of operating supported: Position or Speed Profile, interpolated Cyclic Synchronous Position (CSP) mode, external reference mode (Position, Speed, Torque), 35 homing modes
- Motor supply: 11-90V. Logic supply: 9-36V
- Output current: 10A cont. (BLDC mode); 21A_{PEAK}, up to 100KHz PWM
- 5 opto-isolated digital inputs, 12-36V, PNP/NPN compatible: 2 for limit switches, 3 general-purpose
- 5 digital outputs, 5-36V, 0.5A, NPN open-collector: Error, 1 Motor brake [2A], 3 general-purpose [0.5A]
- Mini USB¹ & CAN-bus 2.0B interfaces
- 127 h/w addresses selectable by h/w DIP switch
- NTC/PTC analogue Motor Temperature sensor input

- Protections: short-circuit between motor phases and from motor phases to GND, over/under-voltage, over-current, I²t, control error, over temperature, communication error
- Feedback Devices :
 - 1st feedback devices supported:
 - Incremental encoder interface (differential)
 - Digital Hall sensor interface (single-ended and open collector)
 - 2nd feedback devices supported:
 - pulse & direction interface (differential) for external (master) digital reference
- 1 analogue input: 12-bit, 0-5V: Feedback
- 1 rotating potentiometer used as Reference
- 16k x16 SRAM memory for data acquisition
- 16k x16 E²ROM to store setup and other user data
- Operating ambient temperature: 0-40°C (over 40°C with derating)

Mating Connectors							
Producer	Part No.	Connector	Description	Image			
WAGO	734-104	J1	Pluggable terminal block 4- pole Pin spacing 3.5 mm	AWG 14-28			
WAGO	733-108	J2	Pluggable terminal block 8- pole Pin spacing 2.5 mm	AWG 20-28			
WAGO	733-112	J3 & J5	Pluggable terminal block 12-pole Pin spacing 2.5 mm	AWG 20-28			
WAGO	733-106	J4	Pluggable terminal block 6-pole Pin spacing 2.5 mm	AWG 20-28			
WAGO	734-105	J6	Pluggable terminal block 5-pole Pin spacing 3.5 mm	AWG 14-28			

	able not provided		Tarana an	La
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Co	onnect	ors Description	on	
	Pin	Name	Туре	Description
	1	GND	-	Negative return (ground) of the power supply
5	2	+V _{LOG}	ı	Positive terminal of the logic supply input: 11 to $36\ensuremath{V_{DC}}$
7	3	+V _{MOT}	ı	Positive terminal of the motor supply: 11 to 90V _{DC} .
	4	Earth	-	Earth connection
	Pin	Name	Туре	Description
	1	OUT0/M.BRK	0	5-36V 2A, digital output used for an electro- mechanical brake, NPN open-collector/TTL pull-up
	2	OUT5	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	3	OUT4	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
72	4	OUT1	0	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	5	OUT2/Error	0	12-36V 0.5A, drive Error output, active low, NPN open-collector/TTL pull-up. Also drives the red Error LED.
	6	CAN Hi	I/O	CAN-Bus positive line(dominant high)
	7	CAN Lo	I/O	CAN-Bus negative line (dominant low)
	8	GND	-	Return ground for I/O and CAN pins
	Pin	Name	Туре	Description
	1	IN2+/LSP+	ı	12-36V digital PNP/NPN opto-isolated input. Positive limit switch function, positive input
_	2	IN2-/LSP-	ı	12-36V digital PNP/NPN opto-isolated input. Positive limit switch function, negative input
	3	IN3+/LSN+	1	12-36V digital PNP/NPN opto-isolated input. Negative limit switch function, positive input
•	4	IN3-/LSN-	ı	12-36V digital PNP/NPN opto-isolated input. Negative limit switch function, negative input
•	5	INO+	ı	12-36V general-purpose digital PNP/NPN opto-isolated positive input.
•	6	INO-	ı	12-36V general-purpose digital PNP/NPN opto-isolated negative input.
5	7	IN1+	ı	12-36V general-purpose digital PNP/NPN opto-isolated positive input.
•	8	IN1-	ı	12-36V general-purpose digital PNP/NPN opto-isolated negative input.
•	9	Ena+/IN4+	ı	12-36V digital PNP/NPN opto-isolated input. Drive enable function, positive input
	10	Ena-/ IN4-	ı	12-36V digital PNP/NPN opto-isolated input. Drive enable function, negative input
•	11	FDBK	ı	Analogue input, 12-bit, 0-5V. Used to read an analogue position or speed feedback (as tacho), or used as general purpose analogue input.
	12	GND	-	Negative return (ground) of the motor supply
	Pin	Name	Туре	Description
	1	GND	-	Return ground
•	2	Pulse+	ı	Pulse+ differential input; has 120Ω resistor between pins 2 and 3
	3	Pulse-	ı	Pulse- differential input; has 120Ω resistor between pins 2 and 3
₹	4	Dir+	ı	Direction+ differential input; has 120Ω resistor between pins 4 and 5
•	5	Dir-	ı	Direction- differential input; has 120Ω resistor between pins 4 and 5
•	6	Temp Mot	ı	NTC/PTC input. Used to read an analog temperature value

	Pin	Name	Туре	Description			
	1	GND	-	Return ground for sensors supply			
-	2	A1+	ı	Incr. encoder1 A+ diff. input; has 120Ω resistor between pins 2 and 3			
	3	A1-	ı	Incr. encoder1 A- diff. input; has 120Ω resistor between pins 2 and 3			
_	4	B1+	ı	Incr. encoder1 B+ diff. input; has 120 $\!\Omega$ resistor between pins 4 and 5			
	5	В1-	ı	Incr. encoder1 B- diff. input; has 120Ω resistor between pins 4 and 5			
J5	6	Z1+	I	Incr. encoder1 Z+ diff. input; has 120 $\!\Omega$ resistor between pins 6 and 7			
	7	Z 1-	ı	Incr. encoder1 Z- diff. input; has 120 $\!\Omega$ resis between pins 6 and 7			
-	8 +5V _{OUT} 9 Hall 1 10 Hall 2		0	5V output supply for I/O usage			
			ı	Digital input Hall 1 sensor			
			ı	Digital input Hall 2 sensor			
	11	Hall 3	ı	Digital input Hall 3 sensor			
	12	GND	-	Return ground for sensors supply			
	Pin	Name	Type	Description			
	1	A/A+	О	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors			
				Phase A for 3-ph motors, A+ for 2-ph steppers,			
96	1	A/A+	0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers,			
96	1 2	A/A+ B/A-	0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors			
96	1 2 3	A/A+ B/A- C/B+	0 0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step			
9° -	1 2 3 4	A/A+ B/A- C/B+ CR/B-	0 0	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors			
90	1 2 3 4 5	A/A+ B/A- C/B+ CR/B- Earth	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection			
97	1 2 3 4 5 Pin	A/A+ B/A- C/B+ CR/B- Earth Name	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection			
97	1 2 3 4 5 Pin 1 2 3	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit			
W1	1 2 3 4 5 Pin 1 2 3 4	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3	0 0 0 0 -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number.			
SW1	1 2 3 4 5 Pin 1 2 3 4 5 5	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4	0 0 0 0 - Type	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1			
SW1 J6	1 2 3 4 5 Pin 1 2 3 4 5 6	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4 ID-Bit5	0 0 0 0 - Type - -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number.			
SW1	1 2 3 4 5 Pin 1 2 3 4 5 6 6 7	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4 ID-Bit5 ID-Bit6	0 0 0 0 - Type - -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1 Switch = OFF(up) -> ID bit = 0			
SW1	1 2 3 4 5 Pin 1 2 3 4 5 6	A/A+ B/A- C/B+ CR/B- Earth Name ID-Bit0 ID-Bit1 ID-Bit2 ID-Bit3 ID-Bit4 ID-Bit5	0 0 0 0 - Type - -	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors Phase C for 3-ph motors, B+ for 2-ph steppers Chopping resistor / Phase B- for 2-ph step motors Earth connection Description Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit binary Axis ID number. Switch = ON(down) -> ID bit = 1			

Electrical characteristics

All parameters measured under the following conditions (unless otherwise specified):

VLOG = 24 VDC; VMOT = 48VDC

Supplies start-up / shutdown sequence: -anyLoad current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 4A

Operating Conditions			Тур.	Max.	Units
Ambient temperature		0		40 ^{1, 3}	°C
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure ²	Altitude (vs. sea level)	-0.1	0 ÷ 2.5	2	Km
Allitude / pressure	Ambient Pressure	0 ²	$0.75 \div 1$	10.0	atm
Storage Conditions	Min.	Тур.	Max.	Units	
Ambient temperature		-40		105	°C
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
ESD capability (Human body model)	Not powered; applies to any accessible part			±0.5	kV
(Human body model)	Original packaging			±15	kV
Mechanical Mounting	Mechanical Mounting			Max.	Units
Airflow		natura	al convecti	on³, close	ed box
-					

 $^{^{\}rm 3}$ In case of forced cooling (conduction or ventilation) the maximum ambient temperature can be increased substantially.

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¹Operating temperature at higher temperatures is possible with reduced current and power ratings ² Udrive can be operated in vacuum (no altitude restriction), but at altitudes over 2,500m, current and power rating are reduced due to thermal dissipation efficiency.

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Environmental Ch	aracteristics		Min.	Тур.	Max.	Units
Size (Length x	Without mating co	nnectors		0 x 90 x		mm
Width x Height)		~4.3		inch		
/	With recommende	d mating		9.1	mm	
\\/ = : = l= 4	connectors.		~4.3	3 x 4.33 x	U./5	inch
Weight Efficiency	Without mating cor		130 98	1	g %	
Efficiency	Dry cleaning is		98		%	
Cleaning agents	recommended		Only \	Water- or	Alcohol- b	ased
	According to IEC6	0529.				
Protection degree	UL508	,		IP20		-
Logic Supply Inpu			Min.	Тур.	Max.	Units
3	Nominal values		9	.,,,,	36	V _{DC}
	Absolute maximum	n values	9		30	V DC
	drive operating but		8		40	V _{DC}
	guaranteed param		Ŭ			• 50
Supply voltage	Absolute maximun		0.0		40	
	continuous		-0.6		42	V _{DC}
	Absolute maximun	n values,				.,
	surge (duration ≤ 1	(0ms) [†]	-1		+45	V
	+V _{LOG} = 12V	, , ,		120		
Supply current	+V _{LOG} = 24V			70	İ	mA
11 7	+V _{LOG} = 40V			50	1	1
Motor Supply Inp			Min.	Тур.	Max.	Units
and and and	Nominal values		11	90	92	V _{DC}
	Absolute maximun	n values	- ' '	90	32	V DC
	drive operating but		9		95	VDC
Supply voltage	guaranteed param					¥ DC
	Absolute maximun					
	surge (duration ≤ 1	+ '	-1		102	V
	Idle	01110)		1	5	mA
	Operating		-22	±10	+22	A
Supply current	Absolute maximun	n value		±10	122	
Supply current	short-circuit condit				37	Α
					31	_ ^
	(duration ≤ 10ms)			_		
Motor Outputs (A	/A+, B/A-, C/B+, BR		Min.	Тур.	Max.	Units
	for DC brushed, st					
	and BLDC motors with Hall-				10	
Nominal output	based trapezoidal control					
current,	for PMSM motors with FOC sinusoidal control (sinusoidal				40	
continuous1	amplitude value)	(sinusoidai			10	Α
	for PMSM motors	with FOC				-
	sinusoidal control				7.09	
	effective value)	(Sil lusoluai			7.00	
Motor output	1		a : :			Ι.
current, peak	maximum 2.5s		-21.4		+21.4	Α
Short-circuit						
protection			±22	±26	±30	Α
threshold						
Short-circuit			5	10		μS
protection delay	l		J	10		μο
On-state voltage	Nominal output cu					l
drop	including typical m			±0.3	±0.5	V
	connector contact	resistance				-
Off-state leakage current				±0.5	±1	mA
ouncil		F	-		1	1
	Recommended	F _{PWM}	330			1
	value, for current	20 kHz 40 kHz	330 150		1	1
	ripple max. ±5% of	60 kHz	120		1	μН
	full range;	80 kHz	80		 	1
Motor inductance	$+V_{MOT} = 36 \text{ V}$	100 kHz	60		1	1
(phase-to-phase)		20 kHz	120			+
. ,	Minimum value,				1	1
	limited by short-	60 kHz	40		-	┨
	circuit	40 kHz	30			μН
		80 kHz	15			1
	protection;				1	
	$+V_{MOT} = 36 \text{ V}$	100 kHz	8			
	+V _{MOT} = 36 V		8 250			
Motor electrical	+V _{MOT} = 36 V Recommended	100 kHz	250			
Motor electrical	+V _{MOT} = 36 V Recommended value for ±5%	100 kHz 20 kHz 40 kHz	250 125			118
time-constant	+V _{MOT} = 36 V Recommended	100 kHz 20 kHz 40 kHz 60 kHz	250 125 100			μs
	+V _{MOT} = 36 V Recommended value for ±5% current	100 kHz 20 kHz 40 kHz 60 kHz 80 kHz	250 125 100 63			μs
time-constant	+V _{MOT} = 36 V Recommended value for ±5% current measure-ment	100 kHz 20 kHz 40 kHz 60 kHz	250 125 100			μs

Digital Inputs – c (IN0, IN1, IN2/LSI		2	Min.	Тур.	Max.	Units	
Mode	PNP		positive	Connect negative pin to GND and positive pin to signal			
compliance	NPN	Connect positive pin to supply and connect negative pin to signal					
Default state	disconnected)	Input floating (wiring disconnected)			c LOW		
	Logic LOW		0		36	V	
Input voltage	Logic HIGH		5		36		
	Absolute maxi	mum	-7		50	^	
Lance Community	Logic LOW		0 8	40	50	mA	
Input current		Logic HIGH		10	12		
Input frequency	Absolute maximum		-20	2	20	kHz	
Minimum pulse				500		μs	
ESD protection	Human body m	odel	±15			kV	
Digital Outputs			Min.	Тур.	Max.	Units	
(OUT0, OUT1, OUT)	All outputs (OU			. , .	·····	•	
compliance	OUT2/Error)		NP	N 24V			
		·V _{LOG} floating or		High-Z	(floating)		
	Immediately	OUT0, OUT1		Logic	"HIGH"		
Default state	after power-	OUT2/Error		Logic	"LOW"		
	Normal operation	OUT0, OUT1, OUT2/Error		Logic	"HIGH"		
	Logic "LOW"; o			0.3	0.65		
	Logic "HIGH";		3.6				
Output voltage	output current = 0, no load		V _{LOG}		5	V	
	Logic "HIGH", 6	external load to	-0.5		V _{LOG} +0.5		
		num, continuous	-1		V _{LOG} +1		
	Absolute maxin						
	(duration ≤ 1s) †		-1		V _{LOG} +1		
	Logic "LOW", sink current, continuous	OUT2/Error, OUT1,4,5			0.5	Α	
		OUT0			2	Α	
Output current	Logic "HIGH", source current; external load to GND; Vout >= 2.0V				3	mA	
	Logic "HIGH", current; exterr +V _{LOG} ; V _{OUT} = 40V	nal load to		0.1		mA	
Minimum pulse width			2				
ESD protection	Human body m		±15			kV	
Digital Hall Input	s (Hall1, Hall2, F	łali3)	Min.	Тур.	Max.	Units	
Mode compliance			TTL	/ CMOS	/ Open-coll	ector	
Default state	Input floating (wiring disconn	ected)			HIGH		
	Logic "LOW"		_	0	8.0		
	Logic "HIGH" Floating voltage	9	2	5	 		
Input voltage	(not connected)		4.4		V	
	Absolute maxin		-10		+15		
	(duration ≤ 1s)	1	-10				
Input current	Logic "LOW"; F	full to GND			1.2	m ^	
Minimum pulse	Logic "HIGH"; I pull-up to +5	nternal 4./KΩ	0	0	0	mA	
withinfillin Duise	1		2		1	μs	
width ESD protection						p. v	

¹ @20Khz F _{PWM}		² The digital inputs are sof	² The digital inputs are software selectable as PNP or NPN			
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Feedback 1 &2 inputs (A1+, A1-, B1+, B1-, Z1+, Z1-, P+, P-, D+, D-) ¹			Тур.	Max.	Units	
Differential mode compliance	For full RS422 compliance, see ²	TIA/EIA-422-A				
	Hysteresis	±0.06	±0.1	±0.2		
Input voltage	Differential mode	-14		+14	V	
	Common-mode range (A+ to GND, etc.)	-11		+14	-14	
Input impedance, differential			120		Ω	
Input frequency	Differential mode	0		10	MHz	
Minimum pulse width	Differential mode	50			ns	
Analog 05V Inputs (REF, FDBK)		Min.	Тур.	Max.	Units	
	Operational range	0		5		
Input voltage	Absolute maximum values, continuous	-16		+23	V	
,	Absolute maximum, surge (duration ≤ 1s) [†]			±36		
Input impedance	To GND		15		kΩ	
Resolution		12			bits	
Integral linearity				±2	bits	
Offset error			±2	±10	bits	
Gain error			±1%	±3%	% FS ²	
Bandwidth (-3Db)	Software selectable	0		1	kHz	
ESD protection	Human body model	±2			kV	

CAN-Bus			Тур.	Max.	Units	
Compliance IS			ISO11898, CiA-301v4.2 & 402v3.0			
Bit rate	Software selectable	125		1000	Kbps	
	1Mbps			25		
Bus length	500Kbps			100	m	
	≤ 250Kbps			250		
Resistor	Between CAN-Hi, CAN-Lo	none on-board				
	by hardware through SW1	1 ÷ 127 ; 255 (all bits 0)				
Nodo oddroosina		1- 255 (numbers above 127 will				
Node addressing	by software using EasySetup	be considered as LSS not configured)			non-	
ESD protection	Human body model	±15	lcu)		kV	
Supply Output (+			Units			
Output voltage	Current sourced = 500mA	4.8	5	5.2	V	
Output current				500	mA	
Short-circuit		Protected				
Over-voltage		Protected				
ESD protection	Human body model	±15			kV	

[†] Stresses beyond values listed under "absolute maximum ratings" may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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 $^{^{1}}$ All differential input pins have internal 120 $\!\Omega$ termination resistors connected across