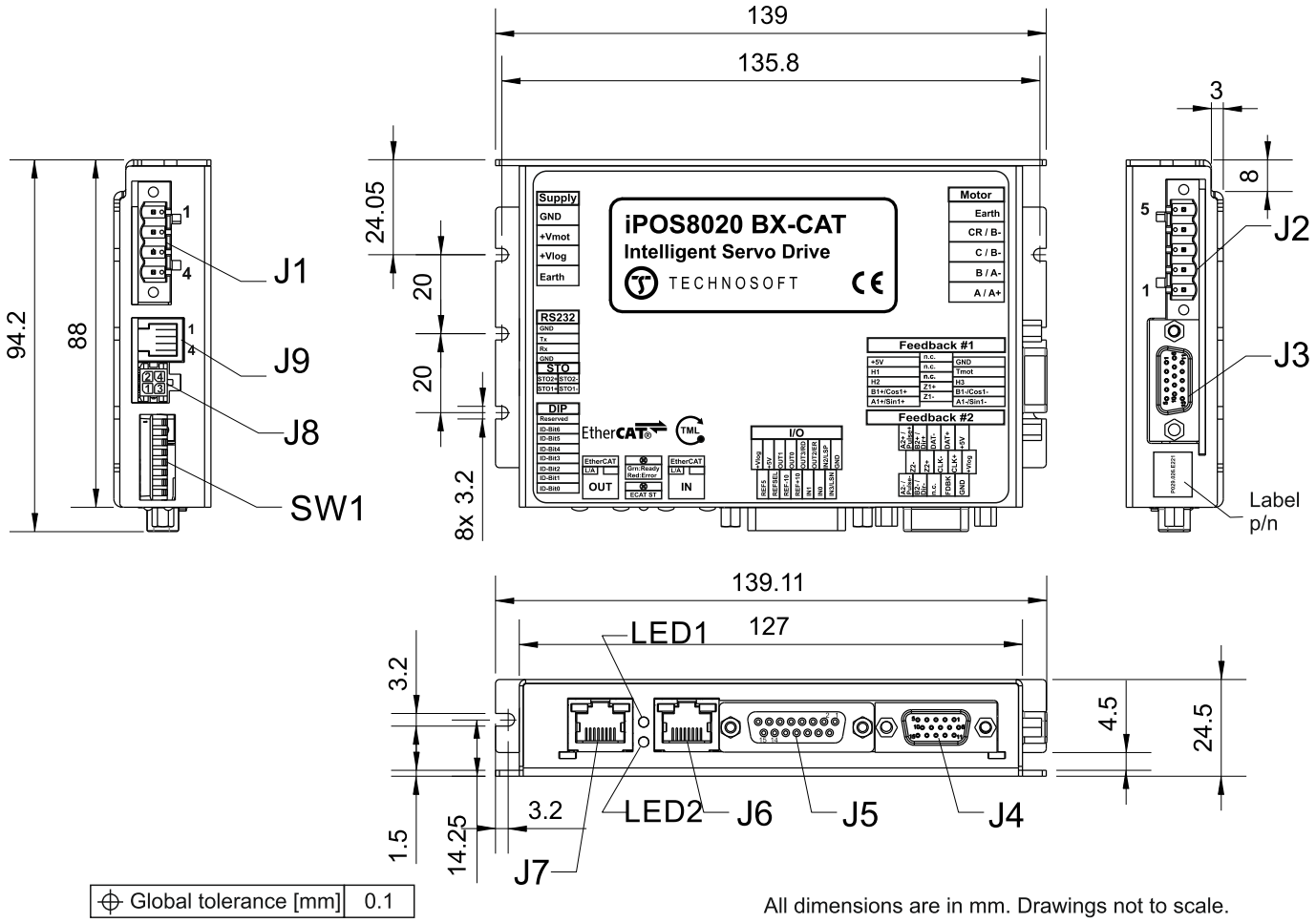


Global tolerance [mm] 0.1

All dimensions are in mm. Drawings not to scale.

Motor – sensor configurations					
Sensor \ Motor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP[2] (3-ph)
Incr. Encoder	✓		✓	✓	✓
Incr. Encoder + Hall	✓	✓			
Analog Sin/Cos encoder	✓	✓	✓	✓	✓
SSI	✓	✓	✓	✓	✓
BiSS-C	✓	✓	✓	✓	✓
EnDAT[1]	✓	✓	✓	✓	✓
Tacho			✓		
Open-loop (no sensor)				✓	✓

[1] *Available starting with F514K firmware version*
[2] *Sensor used only for step loss detection*

Features

- Motion controller and drive in a single compact unit based on MotionChip™ technology
- Universal solution for control of rotary and linear brushless, brushed and 2 or 3-phase step motors
- Advanced motion control capabilities (PVT, S-curve, electronic cam)
- Motor supply: 11-80V; Logic SELV/ PELV supply: 9-36V; STO SELV/ PELV supply: 18-40V
- Output current: 20A cont. (BLDC mode); $40A_{PEAK}$, up to 60kHz PWM
- Feedback Devices (dual-loop support)

1st feedback devices supported:

- Incremental encoder interface (differential)
- Analogue sin/cos encoder interface (differential $1V_{pp}$)
- Digital Hall sensor interface (single-ended and open collector)

2nd feedback devices supported:

- Incremental encoder interface (differential)
- BISS / SSI / EnDAT[1] encoder interface
- pulse & direction interface (differential) for external (master) digital reference

- STO: 2 safe torque-off inputs, safety integrity level (SIL3/Cat3/PLe) acc. to EN61800-5-1; -2/ EN61508-3; -4/ EN ISO 13849-1.
- 4 digital inputs, 12-36V, PNP/NPN programmable: 2 for limit switches, 2 general-purpose
- 4 digital outputs, 5-36V, NPN open-collector: Ready, Error, OUT1 0.5A and OUT0 2A
- 2 analogue inputs: 12 bit, +/-10V and 0-5V: Reference and Feedback (for Tacho) or general purpose
- RS-232 serial & dual 100Mbps RJ45 EtherCAT® interfaces
- EtherCAT® with CAN application protocol over EtherCAT (CoE)
- 127 h/w addresses selectable by DIN switch
- 16k x 16 SRAM memory for data acquisition
- 16k x16 E^2ROM memory to store setup data, TML motion programs, cam tables and other user data
- Operating ambient temperature: 0-40°C (over 40°C with derating)
- NTC/PTC analogue Motor Temperature sensor input
- Protections: short-circuit between motor phases and from motor phases to GND, over/under-voltage, over-current, I^2t, control error, over temperature, communication error

Mating Connectors			
Ref	**Producer**	**Part No.**	**Description**
J1	Camden	CTBA9208/4FL	Supply input, 4x5.08 female counter part for cable
J2	Camden	CTBA9208/5FL	Motor power, 5x5.08 female counter part for cable
J3, J4	generic 15-pin High Density D-Sub male		Feedback #1 +Hall & #2
J9	generic RJ10-4/4 phone plug		RS232
J5	generic 15-pin D-Sub male, DB15		I/O; Analog
J8	MOLEX	43025-0400	MICROFIT RECEPTACLE HOUSING, 2x2 WAY
J8	MOLEX	43030-0007	CRIMP PIN, MICROFIT, 5A
J6, J7	-		Standard 8P8C modular jack (RJ-45) male

Connector Description

	Pin	Name	Type	Description
J1	1	GND	-	Negative return (ground) of the power supply
	2	+V_{MOT}	I	Positive terminal of the motor supply: 12 to 80V_{DC} .
	3	+V_{LOG}	I	Positive terminal of the logic supply input: 12 to 36V_{DC}
	4	Earth	-	Earth connection

	Pin	Name	Type	Description
J2	1	A/A+	O	**Phase A** for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
	2	B/A-	O	**Phase B** for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
	3	C/B+	O	**Phase C** for 3-ph motors, B+ for 2-ph steppers
	4	CR / B-	O	**Chopping Resistor output/ Phase B**- for step motors
	5	Earth	-	Earth connection

	Pin	Name	Type	Description	
J8	1	STO1+	I	Safe Torque Off input 1, positive input (opto-isolated, 18÷40V)	Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation
	2	STO2+	I	Safe Torque Off input 2, positive input (opto-isolated, 18÷40V)	
	3	STO1-	I	Safe Torque Off input 1, negative return (opto-isolated, 0V)	
	4	STO2-	I	Safe Torque Off input 2, negative return (opto-isolated, 0V)	

	Pin	Name	Type	Description
J3	1	+$5V_{OUT}$	O	5V output supply for I/O usage
	2	Hall 1	I	Digital input Hall 1 sensor
	3	Hall 2	I	Digital input Hall 2 sensor
	4	B1+/Cos+	I	Incr. encoder1 B+ diff. input, or analogue encoder Cos+ diff. input
	5	A1+/Sin+	I	Incr. encoder1 A+ diff. input, or analogue encoder Sin+ diff. input
	6...8	n.c.		Not connected
	9	Z1+	I	Incr. encoder1 Z+ diff. input
	10	Z1-	I	Incr. encoder1 Z- diff. input
	11	GND	-	Return ground for sensors supply
	12	Temp Mot	I	Analogue input, 12-bit, 0-3.3V. Used to read an analog temperature value
	13	Hall 3	I	Digital input Hall 3 sensor
	14	B1-/Cos-	I	Incr. encoder1 B- diff. input, or analogue encoder Cos- diff. input
	15	A1- /Sin-	I	Incr. encoder1 A- diff. input, or analogue encoder Sin- diff. input

	Pin	Name	Type	Description
J4	1	+$5V_{OUT}$	O	5V output supply for I/O usage
	2	Data+/SL+	I	Data+ for SSI & EnDAT, or Slave+ for BiSS C; has 120Ω resistor between pins 2 and 3
	3	Data-/SL-	I	Data- for SSI & EnDAT, or Slave- for BiSS C; has 120Ω resistor between pins 2 and 3
	4	B2+/Dir+	I	Incr. encoder2 B+ diff. input, or Dir+; has 120Ω resistor between pins 4 and 14
	5	A2+/Pulse+	I	Incr. encoder2 A+ diff. input, or Pulse+; has 120Ω resistor between pins 5 and 15
	6	+V_{LOG}	I	Positive terminal of the logic supply input: 9 to 36V_{DC}
	7	CLK+/MA+	O	Clock+ for SSI & EnDAT, or Master+ for BiSS C
	8	CLK-/MA-	O	Clock- for SSI & EnDAT, or Master- for BiSS C
	9	Z2+	I	Incr. encoder2 Z+ diff. input
	10	Z2-	I	Incr. encoder2 Z- diff. input
	11	GND	-	Return ground for sensors supply
	12	FDBK	I	Analog input, 12-bit, 0-5V. Used to read an analog position or speed feedback (as tacho), or used as general-purpose analog input
	13	n.c.	-	
	14	B2-/Dir-	I	Incr. encoder2 B- diff. input, or Dir-; has 120Ω resistor between pins 4 and 14
	15	A2- /Pulse-	I	Incr. encoder2 A- diff. input, or Pulse-; has 120Ω resistor between pins 5 and 15

	Port	Name	Type	Description
	J6	ECAT IN	I	EtherCAT standard RJ45 Ethernet IN port
	J7	ECAT OUT	O	EtherCAT standard RJ45 Ethernet OUT port

	Pin	Name	Type	Description
J9	1	GND	-	Return ground for RS-232 pins
	2	232TX	O	RS-232 Data Transmission
	3	232RX	I	RS-232 Data Reception
	4	GND	-	Return ground for RS-232 pins

	Pin	Name	Type	Description
J5	1	GND	-	Return ground for I/O pins
	2	IN2/LSP	I	12-36V digital PNP/NPN input. Positive limit switch input
	3	OUT2/Error	O	5-36V 0.5A, drive Error output, active low, NPN open-collector/TTL pull-up. Also drives the red LED
	4	OUT3/Ready	O	5-36V 0.5A, drive Ready output, active low, NPN open-collector/TTL pull-up. Also drives the green LED.
	5	OUT0	O	5-36V 2A, general-purpose digital output, NPN open-collector/TTL pull-up
	6	OUT1	O	5-36V 0.5A, general-purpose digital output, NPN open-collector/TTL pull-up
	7	+$5V_{OUT}$	O	5V output supply for I/O usage
	8	+V_{LOG}	I	Positive terminal of the logic supply input: 12 to 36V_{DC}
	9	IN3/LSN	I	12-36V digital PNP/NPN input. Negative limit switch input
	10	IN0	I	12-36V general-purpose digital PNP/NPN input
	11	IN1	I	12-36V general-purpose digital PNP/NPN input
	12	REF10+	I	Analogue input, 11-bit, positive +/-10V input. Used to read an analog position, speed or torque reference.
	13	REF10-	I	Analogue input, 11-bit, negative +/-10V input. Used to read an analog position, speed or torque reference. Connected to GND when REF5 is used.
	14	REFSEL	I	Analogue selection, floating for +/-10V input, GND connected when REF5+ is used.
	15	REF5	I	Analogue input, 12-bit, 0-5V input. Used to read an analog position, speed or torque reference.

	Pin	Name	Type	Description
SW1	1	**Reserved**	-	Leave switch off (UP position)
	2	**ID-Bit6**	-	Hardware AxisID selection switches They represent the first 7 LSB bits of an 8 bit Axis ID number.
	3	**ID-Bit5**	-	
	4	**ID-Bit4**	-	
	5	**ID-Bit3**	-	
	6	**ID-Bit2**	-	
	7	**ID-Bit1**	-	
	8	**ID-Bit0**	-	

Electrical characteristics

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

- Tamb = 24ºC, VLOG = 24 VDC; VMOT = 80VDC
- Supplies start-up / shutdown sequence: any
- Load current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 20A

Operating Conditions		**Min.**	**Typ.**	**Max.**	**Units**
Ambient temperature[1]		0		+40	ºC
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure[2]	Altitude (vs. sea level)	-0.1	0 ÷ 2	2	km
	Ambient Pressure	0 [2]	0.75 ÷ 1	10.0	atm
Storage Conditions		**Min.**	**Typ.**	**Max.**	**Units**
Ambient temperature		-40		+85	ºC
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
Mechanical Mounting		**Min.**	**Typ.**	**Max.**	**Units**
Airflow		natural convection[3], closed box			
Environmental Characteristics		**Min.**	**Typ.**	**Max.**	**Units**
Size (Length x Width x Height)	Without mating connectors	139 x 94.2 x 24.5			mm
		~5.47 x 3.7 x 0.97			inch
Weight	Without mating connectors	240			g
Power dissipation	Idle (no load)		3.6		W
	Operating		11		
Efficiency			98		%
Cleaning agents	Dry cleaning is recommended	Only Water- or Alcohol- based			
Protection degree	According to IEC60529, UL508	IP20			-

Logic Supply Input (+V_{LOG})			**Min.**	**Typ.**	**Max.**	**Units**
Supply voltage	Nominal values		12	24	36	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters		8	24	40	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms) †		-1		+45	V
Supply current	No Load on Digital Outputs	+V_{LOG} = 12V		250		mA
		+V_{LOG} = 24V		150		
		+V_{LOG} = 36V		100		
Motor Supply Input (+V_{MOT})			**Min.**	**Typ.**	**Max.**	**Units**
Supply voltage	Nominal values		12	80	90	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters		11		94	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms) [4]		-1		95	V
Supply current	Idle			1	5	mA
	Operating		-40	±20	+40	A
	Absolute maximum value, short-circuit condition (duration ≤ 10ms) [1]				45	A

Motor Outputs (A/A+, B/A-, C/B+, BR/B-)			**Min.**	**Typ.**	**Max.**	**Units**
Nominal output current, continuous	for DC brushed, steppers and BLDC motors with Hall-based trapezoidal control				20	A
	for PMSM motors with FOC sinusoidal control (sinusoidal amplitude value)				20	
	for PMSM motors with FOC sinusoidal control (sinusoidal effective value)				14.2	
Motor output current, peak	maximum 10s		-40		+40	A
Short-circuit protection threshold					±45	A
Short-circuit protection delay			5	10		µs
On-state voltage drop	Nominal output current; including typical mating connector contact resistance			±0.3	±0.5	V
Off-state leakage current				±0.5	±1	mA
Motor inductance (phase-to-phase)	Recommended value, for current ripple max. ±5% of full range; +V_{MOT} = 80 V	F_{PWM}				µH
		20 kHz	330			
		40 kHz	150			
		60 kHz	120			
	Minimum value, limited by short-circuit protection; +V_{MOT} = 80 V	20 kHz	120			µH
		40 kHz	40			
		60 kHz	30			
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	20 kHz	250			µs
		40 kHz	125			
		60 kHz	100			
Current measurement	FS = Full Scale accuracy			±5	±8	%FS

Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN)[5]		**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance		PNP			
Default state	Input floating (wiring disconnected)	Logic LOW			
Input voltage	Logic “LOW”	-36	0	2.4	V
	Logic “HIGH”	7.5	24	36	
	Hysteresis	1.2	2.4	2.8	
	Floating voltage (not connected)		0		
	Absolute maximum, continuous	-36		+39	
	Absolute maximum, surge (duration ≤ 1s)†	-50		+50	
Input current	Logic “LOW”; pulled to GND		0		mA
	Logic “HIGH”; pulled to +24V		9	10	

Mode compliance		NPN			
Default state	Input floating (wiring disconnected)	Logic HIGH			
Input voltage	Logic “LOW”	-36	0	2.2	V
	Logic “HIGH”	7.5		36	
	Hysteresis	1.2	2.4	2.8	
	Floating voltage (not connected)		23		
	Absolute maximum, continuous	-36		+39	
	Absolute maximum, surge (duration ≤ 1s)†	-50		+50	
Input current	Logic “LOW”; Pulled to GND		9	10	mA
	Logic “HIGH”; Pulled to +24V			0.4	

Input frequency		0		150	kHz
Minimum pulse		3.3			µs
ESD protection	Human body model	±2			kV

[1] Operating temperature can be extended up to **+65ºC** with reduced current and power ratings.
[2] iPOS8020 BX-CAT 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.
[3] It is recommended to mount the iPOS8020 BX-CAN on a metallic support using the provided mounting holes, for better reliability and reduced de-rating due to heat dissipation
[4] 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.
[5] The digital inputs are software selectable as PNP or NPN

Digital Outputs (OUT0, OUT1, OUT2/Error, OUT3/ Ready)			**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance	All outputs (OUT0, OUT1, OUT2/Error, OUT3/Ready)		NPN 24V			
Default state	Not supplied (+V_{LOG} floating)		High-Z (floating)			
	Immediately after power-up	OUT0, OUT1 OUT2/Error, OUT3/ Ready	Logic “HIGH”			
	Normal operation	OUT0, OUT1, OUT2/Error	Logic “HIGH”			
		OUT3/Ready	Logic “LOW”			
Output voltage	Logic “LOW”; output current = 2A for OUT0/ 0.5A for the other digital outputs				0.8	V
	Logic “HIGH”; output current = 0, no load	OUT2/Error, OUT3/ Ready	2.9	3	3.3	V
		OUT0, OUT1	4	4.5	5	V
	Logic “HIGH”, external load to +V_{LOG}			V_{LOG}		
	Absolute maximum, continuous		-0.5		V_{LOG}+0.5	
	Absolute maximum, surge (duration ≤ 1s) †		-1		V_{LOG}+1	
Output current	Logic “LOW”, sink current, continuous	OUT2/Error, OUT3/ Ready, OUT1			0.5	A
		OUT0			2	A
	Logic “HIGH”, source current; external load to GND; V_{OUT} >= 2.0V	OUT2/Error, OUT3/ Ready			2.5	mA
		OUT0, OUT1			7	mA
	Logic “HIGH”, leakage current; external load to +V_{LOG}; V_{OUT} = V_{LOG} max = 40V			0.05	0.7	mA
Minimum pulse width			0.5			µs
ESD protection	Human body model		±15			kV
Digital Hall Inputs (Hall1, Hall2, Hall3)			**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance			TTL / CMOS / Open-collector			
Default state	Input floating (wiring disconnected)		Logic HIGH			
Input voltage	Logic “LOW”			0	0.8	V
	Logic “HIGH”		1.8			V
	Floating voltage (not connected)			4.5		V
	Absolute maximum, surge (duration ≤ 1s) [1]		-10		+15	V
Input current	Logic “LOW”; Pull to GND			5	3	mA
	Logic “HIGH”; Internal 1KΩ pull-up to +5		0	0	0	mA
Minimum pulse width			2			µs
ESD protection	Human body model		±5			kV
Encoder Inputs (A+, A-, B+, B-, Z+, Z-, A2+, A2-, B2+, B2-, Z2+, Z2-)[2]			**Min.**	**Typ.**	**Max.**	**Units**
Differential mode compliance	For full RS422 compliance, see [2]		TIA/EIA-422-A			
Input voltage	Hysteresis		±0.06	±0.1	±0.2	V
	Differential mode		-14		+14	V
	Common-mode range (A+ to GND, etc.)		-11		+14	V
Input impedance, differential	A+, A2+, B+, B2+, Z+, Z2+			2.2		kΩ
	A-, A2-, B-, B2-, Z-, Z2-			1.6		kΩ
Input frequency	Differential mode		0		10	MHz
Minimum pulse width	Differential mode		50			ns

Sin-Cos Encoder Inputs (Sin+, Sin-, Cos+, Cos-)[2]		**Min.**	**Typ.**	**Max.**	**Units**
Input voltage, differential	Sin+ to Sin-, Cos+ to Cos-		1	1.25	V_{PP}
Input voltage, any pin to GND	Operational range	-1	2.5	4	V
	Absolute maximum values, continuous	-7		+7	V
	Absolute maximum, surge (duration ≤ 1s) [1]	-11		+14	V
Input impedance	Differential, Sin+ to Sin-, Cos+ to Cos-	4.2	4.7		kΩ
	Common-mode, to GND		2.2		kΩ
Resolution with interpolation	Software selectable, for one sine/cosine period	2		10	bits
Frequency	Sin-Cos interpolation	0		450	kHz
	Quadrature, no interpolation	0		10	MHz
ESD protection	Human body model	±2			kV
Analog 0…5V Inputs (REF, FDBK)		**Min.**	**Typ.**	**Max.**	**Units**
Input voltage	Operational range	0		4.95	V
	Absolute maximum values, continuous	-12		+18	V
	Absolute maximum, surge (duration ≤ 1s) [1]			±36	V
Input impedance	To GND		8		kΩ
Resolution			12		bits
Integral linearity				±2	bits
Offset error			±2	±10	bits
Gain error			±1%	±3%	% FS [3]
Bandwidth (-3dB)	Software selectable	0		1	kHz
ESD protection	Human body model	±2			kV
Analog ±10V Input (Ref)		**Min.**	**Typ.**	**Max.**	**Units**
Differential voltage range			±10		V
Common-mode voltage range	Referenced to GND	-12	0…10	+50	V
Input impedance	Differential		40		kΩ
Common-mode impedance	Referenced to GND		20		kΩ
Resolution			12		bits
Integral linearity				0.036	%FS[2]
Offset error	Common-mode voltage = 0…10 V		±0.2	±0.5	%FS[2]
Gain error	Common-mode voltage = 0…10 V		±10	±12	%FS[2]
Bandwidth (-3dB)	Depending on software settings		1.5		kHz
RS-232		**Min.**	**Typ.**	**Max.**	**Units**
Compliance		TIA/EIA-232-C			
Bit rate	Software selectable	9600		115200	Baud
Short-circuit	232TX short to GND	Guaranteed			
ESD protection	Human body model	±2			kV
EtherCAT®		**Min.**	**Typ.**	**Max.**	**Units**
Compliance		IEEE802.3, IEC61158			
Transmission line specification	According to TIA/EIA-568-5-A	Cat. 5e.UTP			
J5, J6 pinout	EtherCAT® supports MDI/MDI-X auto-crossover	TIA/EIA-568-A or TIA/EIA-568-B			
Software protocols compatibility		CoE, CiA402, IEC61800-7-301			
Node addressing	By hardware DIP switch	1 ÷ 127			-
	By software	1 ÷ 255			-
MAC addressing		none			-
ESD protection	Human body model	±15			kV

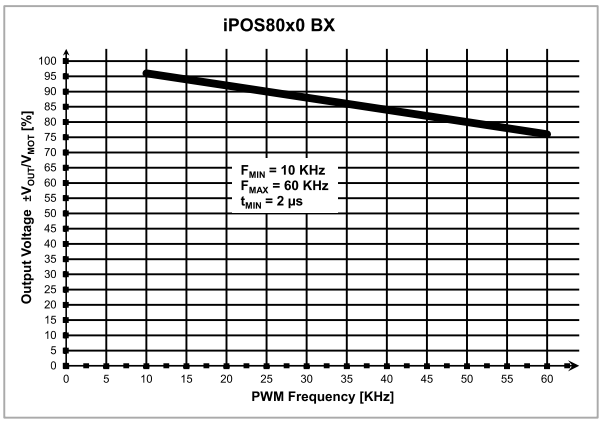
[1] Stresses beyond values listed under “absolute maximum ratings” may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

[2] All differential input pins have internal 120Ω termination resistors connected across

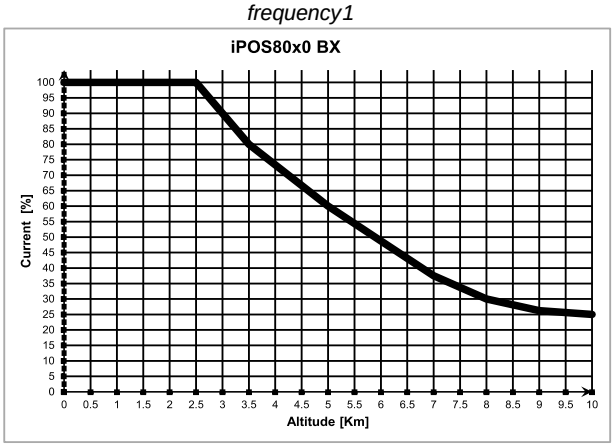
[3] “FS” stands for “Full Scale”

		IEC61800-5-1 / UL 61800-5-1	⚠	**This drive is UL compliant only if the applied voltage does not exceed 60V**	

Safe torque OFF (STO1+, STO1-; STO2+, STO2+)		**Min.**	**Typ.**	**Max.**	**Units**
Safety function	According to EN61800-5-2	STO (Safe Torque OFF)			
EN 61800-5-1/ -2 and EN 61508-5-3/ -4 Classification	Safety Integrity Level	safety integrity level 3 (SIL3)			
	PFHd (Probability of Failures per Hour - dangerous)	$8*10^{-10}$	hour^{-1} (0.8 FIT)		
EN13849-1 Classification	Performance Level	Cat3/PLe			
	MTTFd (meantime to dangerous failure)	377			years
Mode compliance		PNP			
Default state	Input floating (wiring disconnected)	Logic LOW			
Input voltage	Logic "LOW" (PWM operation disabled)	-20		5.6	V
	Logic "HIGH" (PWM operation enabled)	18		36	
	Absolute maximum, continuous	-20		+40	
Input current	Logic "LOW"; pulled to GND		0		mA
	Logic "HIGH", pulled to +Vlog		5	13	
Repetitive test pulses (high-low-high)	Ignored high-low-high			5	ms
				20	Hz
Fault reaction time	From internal fault detection to register DER bit 14 =1 and OUT2/Error high-to-low			30	ms
PWM operation delay	From external STO low-high transition to PWM operation enabled			30	ms
ESD protection	Human body model	±2			kV
BiSS/SSI Encoder Interface		**Min.**	**Typ.**	**Max.**	**Units**
Differential mode (CLOCK, DATA) [1]	For full RS422 compliance, see [1]	TIA/EIA-422			
CLOCK Output voltage	Differential; 50Ω differential load	2.0	2.5	5.0	V
	Common-mode, referenced to GND	2.3	2.5	2.7	
CLOCK frequency	Software selectable	1000, 2000, 3000			kHz
DATA Input hysteresis	Differential mode	±0.1	±0.2	±0.5	V
Data input impedance	Termination resistor on-board		120		Ω
DATA Input common mode range	Referenced to GND	-7		+12	
	Absolute maximum, surge (duration≤1s) †	-25		+25	
DATA format	Software selectable	Binary / Gray			
		Single-turn / Multi-turn			
		Counting direction			
DATA resolution	Single-turn			56	Bits
	Multi-turn and single-turn			56	
	If total resolution >31 bits, some bits must be ignored by software setting to achieve a max 31 bits resolution				
Supply Output (+5V)		**Min.**	**Typ.**	**Max.**	**Units**
Output voltage	Current sourced = 250mA	4.8	5	5.2	V
Output current		350	400		mA
Short-circuit		NOT protected			
Over-voltage		NOT protected			
ESD protection	Human body model	±2			kV
Conformity		**Min.**	**Typ.**	**Max.**	**Units**
EU Declaration	2014/30/EU (EMC), 2014/35/EU (LVD), 2011/65/EU (RoHS), 1907/2006/EC (REACH), 93/68/EEC (CE Marking Directive), EC 428/2009 (non dual-use item, output frequency limited to 590Hz)				
	CAUTION!				



iPOS8020 BX-CAT Output Voltage De-rating with PWM frequency1



iPOS8020 BX-CAT De-rating with altitude

CAUTION!

⚠ **FOR PWM FREQUENCIES LESS THAN 20 KHZ, CORRELATE THE PWM FREQUENCY WITH THE MOTOR PARAMETERS IN ORDER TO AVOID POSSIBLE MOTOR DAMAGE.**

[1] V_{OUT} – the output voltage, V_{MOT} – the motor supply voltage