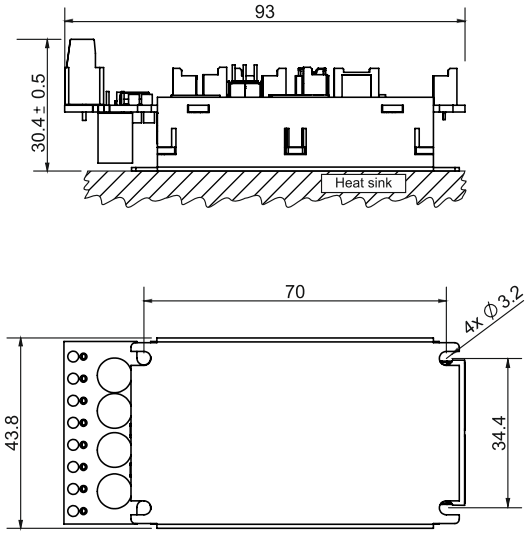
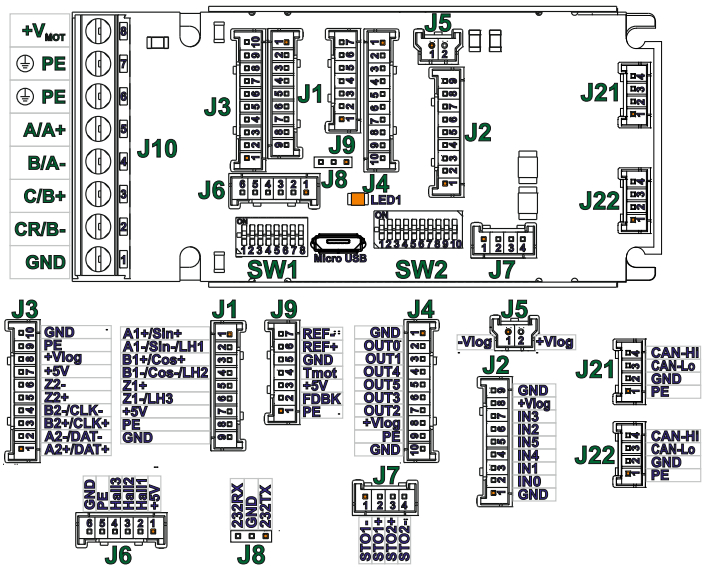
iPOS8015 XZ-CAN DATASHEET

P/N: P022.836.E102

-Preliminary-





All dimensions are in mm; Drawing not to scale.

Motor – sensor configurations					
Sensor \ Motor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)
Incr. Encoder	✓		✓	✓	
Incr. Encoder + Dig. Hall	✓	✓			
Linear Halls	✓				
Digital Hall control only	✓				
Analog Sin/Cos encoder	✓	✓	✓	✓	
SSI / BiSS-C/ EnDAT/ TAMAGAWA/ Panasonic/ Nikon / Sanyo Denki	✓	✓	✓	✓	
Tacho			✓		
Open-loop (no sensor)				✓	✓

Mating Connectors			
Producer	**Part No.**	**Connector**	**Description**
Molex	355070900	J1, J2	2.00mm Pitch Sherlock Wire-to-Board Housing, Natural, 9 Circuits
Molex	355071000	J3, J4	2.00mm Pitch Sherlock Wire-to-Board Housing, Natural, 10 Circuits
Molex	355070200	J5	2.00mm Pitch Sherlock Wire-to-Board Housing, Natural, 2 Circuits
Molex	355070600	J6	2.00mm Pitch Sherlock Wire-to-Board Housing, Natural, 6 Circuits
Molex	355070400	J7, J21, J22	2.00mm Pitch Sherlock Wire-to-Board Housing, Natural, 4 Circuits
Molex	355070700	J9	2.00mm Pitch Sherlock Wire-to-Board Housing, Natural, 7 Circuits
Molex	797581021	J1, J2, J3, J4, J5, J6, J7, J9, J21, J22	Pre-Crimped Lead Sherlock Female-to-Sherlock Female, Tin (Sn) Plating, 300.00mm Length, 26 AWG, Black
	638190500		Hand Crimp Tool for 2.00mm Pitch Terminal 24-30 AWG
	502128100		2.00mm Pitch, Micro-Latch Female Crimp Terminal, Tin (Sn) Plating, 24-30 AWG, Bag
J10	M3 screws fixed with 0.5...1Nm using a 2.5mm x 0.3mm tip screwdriver. Wire AWG 12…30 (0.5mm² … 3.3mm²), strip length 6.5mm.		

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: 12-80V; Logic SELV/ PELV supply: 9-36V; STO SELV/ PELV supply: 18-40V
- Motor output current:
  - Nominal*: 15A$_{RMS}$ / 21.2A amplitude;
  - Peak: 28.3A$_{RMS}$ / 40A amplitude.
- Operating ambient temperature: 0-40°C (over 40°C with derating)
- NTC/PTC analogue Motor Temperature sensor input
- Communication interfaces: USB; TMLCAN and CANopen (CiA 301 v4.2, CiA 305 v.2.2.13 and CiA 402 v4.1.1) protocols
- 128 h/w addresses selectable by h/w sliding switches
- 16k x 16 SRAM memory for data acquisition
- 24k x16 E2ROM to store setup data, TML motion programs, cam tables and other user data
- Feedback Devices (dual-loop support)
  - 1st feedback devices supported:
    - Incremental encoder interface (single ended or differential)
    - Analogue sin/cos encoder interface (differential 1V$_{pp}$)
    - Digital Hall sensor interface (single-ended / open collector)
    - Linear Hall sensors interface
  - 2nd feedback devices supported:
    - Incremental encoder interface (differential)
    - BISS / SSI / EnDAT / TAMAGAWA / Panasonic / Nikon / Sanyo Denki encoder interface
- Pulse & direction reference (single-ended or differential) capability
- Integrated termination resistors for differential Feedback#1 pairs, selectable through sliding switches.
- 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.
- 6 digital inputs, 12-36V, PNP/NPN programmable: 2 for limit switches, 4 general-purpose
- 5 x digital outputs, 5-36V: 0.4A NPN / 0.3A PNP, polarity software selectable: Ready, Error or general-purpose
- 1 x dedicated motor brake or general-purpose output (OUT0): 2A NPN / 1.5A PNP, polarity software selectable
- 2 x analogue inputs, 12-bit: ±10V Reference (via REF+ and REF- pins), 0-5V Feedback or general-purpose

** It is mandatory to mount the iPOS8015 XZ on a metallic support using the provided mounting holes. To achieve the rated current capability, the heat sink temperature must not exceed **75°C**.*

Connectors description

J1 Feedback #1		
Pin	**Name**	**Description**
1	**A1+/Sin+**	Incr. encoder1 A single-ended, or A+ diff. input, or analogue encoder Sin+ diff. input
2	**A1-/Sin-/LH1**	Incr. encoder1 A- diff. input, or analogue encoder Sin- diff. input if SW2 pin2=ON and pin3=OFF
		Linear Hall 1 input if SW2 pin2=OFF and pin3=ON
3	**B1+/Cos+**	Incr. encoder1 B single-ended, or B+ diff. input, or analogue encoder Cos+ diff. input
4	**B1-/Cos-/LH2**	Incr. encoder1 B- diff. input, or analogue encoder Cos- diff. input if SW2 pin5= ON and pin6=OFF
		Linear Hall 2 input if SW2 pin5=OFF and pin6=ON
5	**Z1+**	Incr. encoder1 Z single-ended, or Z+ diff. input
6	**Z1-/LH3**	Incr. encoder1 Z- diff. input if SW2 pin8=ON and pin9=OFF
		Linear Hall 3 input if SW2 pin8=OFF and pin9=ON
7	**+5V$_{OUT}$**	5V output supply
8	**PE**	Protection Earth
9	**GND**	Return ground. Internally connected to all GND signals except STO GND.

J2 Digital Inputs		
Pin	**Name**	**Description**
1	**GND**	Return ground. Internally connected to all GND signals except STO GND.
2	**IN0**	12-36V general-purpose digital PNP/NPN input
3	**IN1**	12-36V general-purpose digital PNP/NPN input
4	**IN4**	12-36V general-purpose digital PNP/NPN input
5	**IN5**	12-36V general-purpose digital PNP/NPN input
6	**IN2/LSP**	12-36V digital PNP/NPN input. Positive limit switch input
7	**IN3/LSN**	12-36V digital PNP/NPN input. Negative limit switch input
8	**+V$_{LOG}$**	Positive terminal of the logic supply input: 9 to 36V$_{DC}$. Internally connected to other +V$_{LOG}$ pins
9	**GND**	Return ground. Internally connected to all GND signals except STO GND.

J3 Feedback #2		
Pin	**Name**	**Description**
1	**A2+/Pulse+/ Data+/SL+**	Incr. encoder2 A+ diff. input, or Pulse+, or Data+ for SSI, or Slave+ for BiSS; has internal 120Ω resistor between pins 1 and 2
2	**A2- /Pulse-/ Data-/SL-**	Incr. encoder2 A- diff. input, or Pulse-, or Data- for SSI, or Slave- for BiSS; has internal 120Ω resistor between pins 1 and 2
3	**B2+/Dir+/ CLK+/MA+**	Incr. encoder2 B+ diff. input, or Dir+, or Clock+ for SSI, or Master+ for BiSS; has internal 120Ω resistor between pins 3 and 4
4	**B2-/Dir-/CLK-/MA-**	Incr. encoder2 B- diff. input, or Dir-, or Clock- for SSI, or Master- for BiSS; has internal 120Ω resistor between pins 3 and 4
5	**Z2+**	Incr. encoder2 Z+ diff. input; has internal 120Ω resistor between pins 5 and 6
6	**Z2-**	Incr. encoder2 Z- diff. input; has internal 120Ω resistor between pins 5 and 6
7	**+5V$_{OUT}$**	5V output supply
8	**+V$_{LOG}$**	Positive terminal of the logic supply input: 9 to 36V$_{DC}$. Internally connected to other +V$_{LOG}$ pins
9	**PE**	Protection Earth
10	**GND**	Return ground. Internally connected to all GND signals except STO GND.

J8 Serial communication		
Pin	**Name**	**Description**
1	**232TX**	RS-232 Data Transmission.
2	**GND**	Return ground. Internally connected to all GND signals except STO GND.
3	**232RX**	RS-232 Data Reception.

J4 Digital Outputs		
Pin	**Name**	**Description**
1	**GND**	Return ground. Internally connected to all GND signals except STO GND.
2	**OUT0**	12-36V general-purpose digital output, 1.5A PNP/ 2A NPN, software selectable
3	**OUT1**	12-36V general-purpose digital output, 0.3A PNP/ 0.4A NPN, software selectable
4	**OUT4**	12-36V general-purpose digital output, 0.3A PNP/ 0.4A NPN, software selectable
5	**OUT5**	12-36V general-purpose digital output, 0.3A PNP/ 0.4A NPN, software selectable
6	**OUT3/ Ready**	12-36V Ready signal digital output, 0.3A PNP/ 0.4A NPN, software selectable
7	**OUT2/ Error**	12-36V Error signal digital output, 0.3A PNP/ 0.4A NPN, software selectable
8	**+V$_{LOG}$**	Positive terminal of the logic supply input: 9 to 36V$_{DC}$. Internally connected to other +V$_{LOG}$ pins
9	**PE**	Protection Earth
10	**GND**	Return ground. Internally connected to all GND signals except STO GND.

J5 Logic supply input		
Pin	**Name**	**Description**
1	**-V$_{LOG}$**	Negative terminal of the logic supply input: 9 to 36V$_{DC}$ from SELV/ PELV type power supply.
2	**+V$_{LOG}$**	Positive terminal of the logic supply input: 9 to 36V$_{DC}$ from SELV/ PELV type power supply.

J6 Digital Hall		
Pin	**Name**	**Description**
1	**+5V$_{OUT}$**	5V output supply
2	**Hall 1**	Digital input Hall 1 sensor
3	**Hall 2**	Digital input Hall 2 sensor
4	**Hall 3**	Digital input Hall 3 sensor
5	**PE**	Protection Earth
6	**GND**	Return ground. Internally connected to all GND signals except STO GND.

J7 STO (Safe Torque Off)			
Pin	**Name**	**Description**	
1	**STO1-**	Safe Torque Off input 1, negative return (opto-isolated, 0V)	Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation
2	**STO1+**	Safe Torque Off input 1, positive input (opto-isolated, 18÷40V)	
3	**STO2+**	Safe Torque Off input 2, positive input (opto-isolated, 18÷40V)	
4	**STO2-**	Safe Torque Off input 2, negative return (opto-isolated, 0V)	

J9 Analogue inputs			
Pin	**Name**	**Description**	
1	**PE**	Protection Earth	
2	**FDBK**	Analogue input, 12-bit, 0-5V. Reads analogue feedback (tacho), or general purpose	
3	**+5V$_{OUT}$**	5V output supply	
4	**Temp Mot**	NTC/PTC 3.3V input. Used to read an analog temperature value	
5	**GND**	Return ground. Internally connected to all GND signals except STO GND.	
6	**REF+**	Analogue Input+, 11-bit for 0...10V	Found as variable **REF**
7	**REF-**	Analogue Input-, 11-bit for -10...0V	

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J10 Power input and Motor outputs		
Pin	**Name**	**Description**
1	**GND**	Negative return (ground) of the power supply
2	**CR/B-**	**Chopping Resistor output/ Phase B**- for step motors
3	**C/B+**	**Phase C** for 3-ph motors, B+ for 2-ph steppers
4	**B/A-**	**Phase B** for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
5	**A/A+**	**Phase A** for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
6	**PE**	Earth connection
7	**PE**	Earth connection
8	**+Vmot**	Positive terminal of the motor supply: 12 to 80V_{DC}.

J21 & J22 CAN		
Pin	**Name**	**Description**
1	**PE**	Earth connection
2	**GND**	Return ground. Internally connected to all GND signals except STO GND.
3	**Can Lo**	CAN-Bus negative line (dominant low)
4	**Can Hi**	CAN-Bus positive line (dominant high)

SW1 – Axis ID settings	
Position	**Description**
1..7	7-bit H/W Axis ID register Switch 1 is Bit 0... Switch 7 is Bit 6 of the Axis value. Switch ON -> Bit = 0 Switch OFF -> Bit = 1 AxisID values: from 1 to 127 and 255 when all switches are ON. In CANopen, when Axis ID is 255 the drive will be in LSS inactive state.
8	Switch ON = CANopen mode; Switch OFF = TMLCAN mode.

SW2 – Feedback #1 Signal routing and termination resistors	
Position	**Description**
1	Internally connect 120Ω termination resistor between J1 pin 1 and 2.
2	Internally connect A1-/Sin- signal to J1 pin2; **Remark**: If this pin is ON, SW2 pin 3 must be OFF.
3	Internally connect Linear Hall 1 (LH1) signal to J1 pin2; **Remark**: If this pin is ON, SW2 pin 2 must be OFF.
4	Internally connect 120Ω termination resistor between J1 pin 3 and 4.
5	Internally connect B1-/Cos- signal to J1 pin4; **Remark**: If this pin is ON, SW2 pin 6 must be OFF.
6	Internally connect Linear Hall 2 (LH2) signal to J1 pin4; **Remark**: If this pin is ON, SW2 pin 5 must be OFF.
7	Internally connect 120Ω termination resistor between J1 pin 5 and 6.
8	Internally connect Z1- signal to J1 pin6; **Remark**: If this pin is ON, SW2 pin 9 must be OFF.
9	Internally connect Linear Hall 3 (LH3) signal to J1 pin6; **Remark**: If this pin is ON, SW2 pin 8 must be OFF.
10	Internally connect 120Ω termination resistor between CAN-Hi and CAN-Lo signals (pins 3 and 4 of J21 & J22 connectors are internally connected)

LEDs	
LED1 - yellow	Indicates that logic supply is present.

Electrical characteristics

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

- V_{LOG} = 24 VDC; V_{MOT} = 80VDC; F_{PWM} = 20kHZ
- Supplies start-up / shutdown sequence: -any-
- Load current (sinusoidal amplitude) = 21.2 A

Operating Conditions		**Min.**	**Typ.**	**Max.**	**Units**
Ambient temperature		0		40[1]	ºC
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure[2]	Altitude (vs. sea level)	-0.1	0 ÷ 2.5	[2]	Km
	Ambient Pressure	0 [2]	0.75 ÷ 1	10.0	atm
Storage Conditions		**Min.**	**Typ.**	**Max.**	**Units**
Ambient temperature		-40		100	ºC
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
	Original packaging			±15	kV

Mechanical Mounting		**Min.**	**Typ.**	**Max.**	**Units**
Airflow		natural convection[3], closed box			
Spacing required for vertical mounting	Between adjacent drives	30			mm
	Between drives and nearby walls	30			mm
	Between drives and roof-top	20			mm
Spacing required for horizontal mounting	Between adjacent drives	4			mm
	Between drives and nearby walls	5			mm
	Space needed for drive removal	10			mm
	Between drives and roof-top	15			mm
Insertion force	Using recommended mating connectors		12	18	N
Extraction force		8	10		N
Heat sink	mounted	Full current capability			
	not mounted	max 12A output current			

Environmental Characteristics		**Min.**	**Typ.**	**Max.**	**Units**
Size (Length x Width x Height)	Global size	93 x 43.8 x 30.4(±0.5)			mm
		~3.66 x 1.72 x 1.2(±0.01)			inch
Weight		~92			g
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	9		36	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	8		40	V_{DC}
	Absolute maximum values, continuous	-0.6		42	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms) †	-1		+45	V
Supply current	+V_{LOG} = 12V		150		mA
	+V_{LOG} = 24V		100		
	+V_{LOG} = 40V		80		
Utilization Category	Acc. to 60947-4-1 (IPEAK<=1.05*INOM)	DC-1			

Motor Supply Input (+V_{MOT})		**Min.**	**Typ.**	**Max.**	**Units**
Supply voltage	Nominal values	12	80	82	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	11		94	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms) †	-1		95	V
Supply current	Idle		1	5	mA
	Operating	-40	±20	+40	A
	Absolute maximum value, short-circuit condition (duration ≤ 10ms) †			45	A
Utilization Category	Acc. to 60947-4-1 (IPEAK<=4.0*INOM)	DC-3			

Supply Output (+5V)		**Min.**	**Typ.**	**Max.**	**Units**
Output voltage	Current sourced = 250mA	4.95	5.11	5.25	V
Output current		360	450		mA
Short-circuit		NOT protected			
Over-voltage		NOT protected			
ESD protection	Human body model	±1			kV
Isolation PE (earth) – GND				±250	V

[1]Operating temperature at higher temperatures is possible with reduced current and power ratings
[2] iPOS8015 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] In case of forced cooling (conduction or ventilation) the spacing requirements may drop substantially down to zero as long as the ambient temperature is kept below the maximum operating limit

Motor Outputs (A/A+, B/A-, C/B+, CR/B-)			**Min.**	**Typ.**	**Max.**	**Units**
Nominal current with heat sink[1]	PMSM motors sinusoidal amplitude				21.2	A
	PMSM motors sinusoidal RMS				15	
	DC/BLDC motors continuous				18.3	
Nominal current without heat sink	PMSM motors sinusoidal amplitude				12	
	PMSM motors sinusoidal RMS				8.5	
	DC/BLDC motors continuous				10.4	
Peak current	maximum 12.5 s		-40		+40	A
Short-circuit protection threshold				70		A
Short-circuit protection delay			1.5		3.3	µs
On-state voltage drop	Nominal output current; including typical mating connector contact resistance			0.15		V
Voltage efficiency				100		%
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	400			
		40 kHz	200			
		60 kHz	150			
		80 kHz	100			
		100 kHz	80			
	Minimum value, limited by short-circuit protection; $+V_{MOT}$ = 80 V	20 kHz	150			µH
		60 kHz	50			
		40 kHz	40			
		80 kHz	20			
		100 kHz	10			
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	20 kHz	330			µs
		40 kHz	170			
		60 kHz	140			
		80 kHz	80			
		100 kHz	66			
Current measurement	FS = Full Scale accuracy		-9.3	+/- 3.4	+9.3	%FS

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"	2	5		
	Floating voltage (not connected)		4.4		
	Absolute maximum, surge (duration ≤ 1s)[†]	-10		+15	
Input current	Logic "LOW"; Pull to GND			1.2	mA
	Logic "HIGH"; Internal 4.7KΩ pull-up to +5	0	0	0	
Minimum pulse width		2			µs
ESD protection	Human body model	±5			kV

Linear Hall Inputs (LH1, LH2, LH3)		**Min.**	**Typ.**	**Max.**	**Units**
Input voltage	Operational range	0	0.5÷4.5	4.9	V
Input voltage	Absolute maximum values, continuous	-7		+7	V
	Absolute maximum, surge (duration ≤ 1s)[†]	-11		+14	
Input current	Input voltage 0…+5V	0		0.2	mA
Interpolation Resolution	Depending on software settings			11	bits
Frequency		0		1	kHz
ESD protection	Human body model	±1			kV

Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4, IN5)[2]		**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance		PNP			
Default state	Input floating (wiring disconnected)	Logic LOW			
Input voltage	Logic "LOW"	-10	0	2.2	V
	Logic "HIGH"	6.3	24	36	
	Hysteresis	1.2	2.4	2.8	
	Floating voltage (not connected)		0		
	Absolute maximum, continuous	-10		+39	
	Absolute maximum, surge (duration ≤ 1s)[†]	-20		+40	
Input current	Logic "LOW"; pulled to GND		0		mA
	Logic "HIGH"		8	10	

Mode compliance		NPN			
Default state	Input floating (wiring disconnected)	Logic HIGH			
Input voltage	Logic "LOW"		0	2.2	V
	Logic "HIGH"	6.3	24	36	
	Hysteresis	1.2	2.4	2.8	
	Floating voltage (not connected)		15		
	Absolute maximum, continuous	-10		+39	
	Absolute maximum, surge (duration ≤ 1s)[†]	-20		+40	
Input current	Logic "LOW"; Pulled to GND		8	10	mA
	Logic "HIGH"; Pulled to +24V	0	0	0	
Input frequency		0		10	kHz
Minimum pulse		6			µs
ESD protection	Human body model	±5			kV

Encoder1 Inputs (A1/A1+, A1-, B1/B1+, B1-, Z1/Z1+, Z1-)		**Min.**	**Typ.**	**Max.**	**Units**
Single-ended mode compliance	Leave negative inputs disconnected	TTL / CMOS / Open-collector			
Input voltage, single-ended mode A/A+, B/B+	Logic "LOW"			1.6	V
	Logic "HIGH"	1.8			
	Floating voltage (not connected)		3.3		
Input voltage, single-ended mode Z/Z+	Logic "LOW"			1.2	V
	Logic "HIGH"	1.4			
	Floating voltage (not connected)		4.7		
Input current, single-ended mode A/A+, B/B+, Z/Z+	Logic "LOW"; Pull to GND		5.5	6	mA
	Logic "HIGH"; Internal 2.2KΩ pull-up to +5	0	0	0	
Differential mode compliance	For full RS422 compliance, see [3]	TIA/EIA-422-A			
Input voltage, differential mode	Hysteresis	±0.06	±0.1	±0.2	V
	Common-mode range (A+ to GND, etc.)	-7		+7	
Input impedance, differential	A1+ to A1-, B1+ to B1-		1		kΩ
	Z1+ to Z1-		1		
Input frequency	Single-ended mode, Open-collector / NPN	0		5	MHz
	Differential mode, or Single-ended driven by push-pull (TTL / CMOS)	0		10	MHz
Minimum pulse width	Single-ended mode, Open-collector / NPN	1			µs
	Differential mode, or Single-ended driven by push-pull (TTL / CMOS)	50			ns
Input voltage, any pin to GND	Absolute maximum values, continuous	-7		+7	V
	Absolute maximum, surge (duration ≤ 1s)[†]	-11		+14	
ESD protection	Human body model	±1			kV

Digital Outputs (OUT1, OUT2/Error, OUT3/Ready, OUT4, OUT5)[4]		**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance		PNP 24V			
Default state	Not supplied (+VLOG floating or to GND)	High-Z (floating)			
	Normal operation	Logic "High"			
Output voltage	Logic "HIGH"; output current = 0.3A		V_{LOG}-1.0	V_{LOG}-2.0	V
	Logic "LOW"; output current = 0, no load	open-collector			
	Logic "HIGH", external load to GND		0		
	Absolute maximum, continuous	-0.3		V_{LOG}+0.3	
	Absolute maximum, surge (duration ≤ 1s)[†]	-0.5		V_{LOG}+0.5	
Output current	Logic "HIGH", source current, continuous			0.3	A
	Logic "HIGH", source current, pulse ≤ 5 s			0.4	A
	Logic "LOW", means High-Z			20	µA
Minimum pulse width		3	1.5		µs
ESD protection	Human body model	±15			kV

[1] It is mandatory to mount the iPOS8015 XZ on a metallic support using the provided mounting holes. To achieve the rated current capability, the heat sink temperature must not exceed **75°C**.
[2] The digital inputs and outputs are software selectable as PNP or NPN
[3] For full RS-422 compliance, 120Ω termination resistors must be connected across the differential pairs, as close as possible to the drive input pins.
[4] The digital inputs and outputs are software selectable as PNP or NPN

Mode compliance		NPN 24V			
Default state	Not supplied (+V_{LOG} floating or to GND)	High-Z (floating)			
	Normal operation	High-Z			
Output voltage	Logic “LOW”; output current = 0.4A		0.6	1.3	V
	Logic “HIGH”; output current = 0, no load	open-collector			
	Logic “HIGH”, external load to +V_{LOG}		V_{LOG}		
	Absolute maximum, continuous	-0.3		V_{LOG}+0.3	
	Absolute maximum, surge (duration ≤ 1s)[†]	-0.5		V_{LOG}+0.5	
Output current	Logic “LOW”, sink current, continuous			0.4	A
	Logic “LOW”, sink current, pulse ≤ 5 s			0.5	A
	Logic “HIGH”, means High-Z			20	µA
Minimum pulse width		5	1.8		µs
ESD protection	Human body model	±15			kV

OUT0 – Brake or general-purpose digital output[1]	**Min.**	**Typ.**	**Max.**	**Units**

Mode compliance		PNP 24V			
Default state	Not supplied (+V_{LOG} floating or to GND)	High-Z (floating)			
	Normal operation	Logic “High”			
Output voltage	Logic “HIGH”; output current = 1.5A		V_{LOG}-0.4	V_{LOG}-0.7	V
	Logic “LOW”; output current = 0, no load	open-collector			
	Logic “HIGH”, external load to GND		0		
	Absolute maximum, continuous	-0.3		V_{LOG}+0.3	
	Absolute maximum, surge (duration ≤ 1s)[†]	-0.5		V_{LOG}+0.5	
Output current	Logic “HIGH”, source current, continuous			1.5	A
	Logic “HIGH”, source current, pulse ≤ 5 s			2.0	A
	Logic “LOW”, means High-Z			50	µA
Minimum pulse width		30	15		µs
ESD protection	Human body model	±15			kV

Mode compliance		NPN 24V			
Default state	Not supplied (+V_{LOG} floating or to GND)	High-Z (floating)			
	Normal operation	High-Z			
Output voltage	Logic “LOW”; output current = 2.0A		0.2	0.3	V
	Logic “HIGH”; output current = 0, no load	open-collector			
	Logic “HIGH”, external load to +V_{LOG}		V_{LOG}		
	Absolute maximum, continuous	-0.3		V_{LOG}+0.3	
	Absolute maximum, surge (duration ≤ 1s)[†]	-0.5		V_{LOG}+0.5	
Output current	Logic “LOW”, sink current, continuous			2.0	A
	Logic “LOW”, sink current, pulse ≤ 5 s			2.5	A
	Logic “HIGH”, means High-Z			50	µA
Minimum pulse width		30	10		µs
ESD protection	Human body model	±15			kV

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

Encoder2 Inputs (A2+/Data+, A2-/Data-, B2+/Clk+, B2-/Clk-, Z2+, Z2-)2		**Min.**	**Typ.**	**Max.**	**Units**
Differential mode compliance		TIA/EIA-422-A			
Input voltage	Hysteresis	±0.06	±0.1	±0.2	V
	Differential mode	-14		+14	
	Common-mode range (A+ to GND, etc.)	-11		+14	
Input impedance, differential	A2+, B2+, Z2+ A2-, B2-, Z2-		120		Ω
Input frequency	Differential mode	0		10	MHz
Minimum pulse width	Differential mode	50			ns

BISS / SSI / EnDAT / TAMAGAWA / Panasonic/ Nikon / Sanyo Denki Encoder Interface from J3		**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				

Sin-Cos Encoder Inputs (Sin+, Sin-, Cos+, Cos-)		**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	
	Absolute maximum, surge (duration ≤ 1s)[†]	-11		+14	
Input impedance	Differential, Sin+ to Sin-, Cos+ to Cos- [3]	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	±1			kV

Analog 0…5V Inputs (REF, FDBK)		**Min.**	**Typ.**	**Max.**	**Units**
Input voltage	Operational range	0		5	V
	Absolute maximum values, continuous	-12		+18	
	Absolute maximum, surge (duration ≤ 1s)[†]			±36	
Input impedance	To GND		28		kΩ
Resolution			12		bits
Integral linearity				±2	bits
Offset error			±2	±10	bits
Gain error			±1%	±3%	% FS[4]
Bandwidth (-3db)	Software selectable	0		1	kHz
ESD protection	Human body model	±5			kV

[1] The digital inputs and outputs are software selectable as PNP or NPN
[2] Feedback#2 differential input pins have internal 120Ω termination resistors connected across
[3] For many applications, a 120Ω termination resistor should be connected across SIN+ to SIN-, and across COS+ to COS-. Please consult the feedback device datasheet for confirmation.
[4] “FS” stands for “Full Scale”

Analog +/-10V Input (REF)		**Min.**	**Typ.**	**Max.**	**Units**
Input voltage	Operational range	-10		+10	V
	Absolute maximum values, continuous	-15		+15	
	Absolute maximum, surge (duration ≤ 1s) †			±20	
Input impedance	To GND		50		kΩ
	Differential		80		
Resolution			12		bits
Integral linearity				±2	bits
Offset error			±10	±35	bits
Gain error			±2%	±5%	% FS[1]
Bandwidth (-3db)	Software selectable	0		1	kHz
ESD protection	Human body model	±15			kV

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 dangerous failures per hour)	$8*10^{-10}$	hour^{-1} (0.8 FIT)		
EN13849-1 Classification	Performance Level	Cat3/PLe			
	MTTFM (meantime to dangerous failure)	377			years
Mode compliance		PNP			
Default state	Input floating (wiring disconnected)	Logic LOW			
Input voltage	Logic “LOW”	-20		5.6	V
	Logic “HIGH”	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

CAN-Bus		**Min**	**Typ**	**Max**	**Units**
Compliance		ISO11898, CiA-301v4.2, CiA 305 v2.2.13, 402v3.0			
Bit rate	Software selectable	125		1000	Kbps
Bus length	1Mbps			25	m
	500Kbps			100	
	≤ 250Kbps			250	
Resistor	Between CAN-Hi, CAN-Lo	SW2 pin 10			
Node addressing	Hardware: by SW1	1 ÷ 127 & 255 LSS non-configured (CANopen); 1 ÷ 127 & 255 (TMLCAN)			
	Software	1 ÷ 127 (CANopen); 1- 255 (TMLCAN)			
Voltage, CAN-Hi or CAN-Lo to GND	Absolute maximum, continuous	-36		36	V
ESD protection	Human body model	±15			kV

Conformity	
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)

† 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.

[1] “FS” stands for “Full Scale”