Integrated Servo Drive IEL-060-15

GENERAL SPECIFICATIONS

Control Modes
- Cyclic Synchronous Position-Velocity-Torque (CSP, CSV, CST)
- Cyclic Synchronous Torque with Commutation Angle (CSTCA)
- Profile Position-Velocity-Torque, Interpolated Position (PVT), Homing
- CVM: Indexer GUI, Programming Language CPL
- Camming, Gearing

Command Interface
- CANopen application protocol over EtherCAT (CoE)
- ASCII and Serial Binary
- ±10 V Position/Velocity/Torque command
- Master encoder (Gearing/Camming)

Communications
- EtherCAT
- Serial

Feedback
Primary: Differential
- Incremental
- Biss-C unidirectional, Absolute clock and data
- SSI

Secondary: Single-ended or Differential
- Incremental

Halls:
- Digital U,V,W

I/O
- 2 Digital high-speed input
- 1 Analog motor overtemp input
- 1 Analog differential input
- 1 Digital PWM brake output
- 1 Digital general purpose output

Dimensions: mm [in]
- 60 x 62 x 22.78 [2.36 x 2.44 x 0.90] mm [in]
  Center cutout diameter 20 [0.79] mm [in]
  Outer diameter 64 [2.52] mm [in]

Actual Size

Model	Ic	Ip	Unit	Vdc
IEL-060-15	7.5	15	Adc	14~60 Vdc

DESCRIPTION

IEL-060-15 is a miniature dual-board servo drive designed for mounting on motors or in robotic joints. A large cutout in the center allows power, network, and other device cables to pass through.

GENERAL SPECIFICATIONS

Test conditions: Load = Wye connected load: 1 mH + 1Ω line-line. Ambient temperature = 25 °C. +HV = HVmax

MODEL	IEL-060-15	
OUTPUT POWER		
Peak Current	15 (10.6)	Adc (Arms, sinusoidal)
Peak time	1	Sec
Continuous current	7.5 (5.3)	Adc (Arms, sinusoidal)
INPUT POWER		
HVmin to HVmax	+14 to +60	Vdc, transformer-isolated
Ipeak	15 (10.6)	Adc (1 sec) peak (Arms)
Icont	7.5 (5.3)	Adc continuous (Arms)
HV input power	2 W with no encoder and disabled, 6 W with no encoder and max continuous output current	
PWM OUTPUTS		
Type	MOSFET 3-phase inverter, 16 kHz center-weighted PWM carrier, space-vector modulation	
PWM ripple frequency	32 kHz	
BANDWIDTH		
Current loop, small signal	2.5 kHz typical, bandwidth will vary with tuning & load inductance	
Current loop update rate	16 kHz (62.5 µs)	
Current sense resolution	12 bits	
Position & Velocity loop update rate	4 kHz (250 µs)	
HV Compensation	Changes in HV do not affect bandwidth	
Minimum load inductance	100 µH line-line	
COMMAND INPUTS		
EtherCAT:	CANopen application protocol over EtherCAT (CoE): Cyclic Synchronous Position/Velocity/Torque Profile Position/Velocity/Torque, Interpolated Position (PVT), Homing	
Indexing	Up to 32 sequences can be launched from inputs or ASCII commands	
Camming	Up to 10 CAM tables can be stored in flash memory	
ASCII	LVTTL, 9600~115200 Baud, 3-wire, RxD, TxD, GND	
DIGITAL INPUTS		
Number	2	
IN1, IN2	High-speed Schmitt trigger with 100 ns RC filter, 10 kΩ pull-up to +5 Vdc, maximum input voltage = +12 Vdc RC time-constants assume active drive on inputs and do not include 10 kΩ pull-ups.	
ANALOG INPUTS		
Number	2	
AIN1	Motor temperature	4.99 kΩ pull-up to +5V, overtemp threshold programmable from CME
AIN2	General purpose	Differential, ±5 Vdc, 5.05 k input impedance, ±10 Vdc range Sample-rate 4 kHz, 12 bits
DIGITAL OUTPUTS		
Number	2	
OUT1	MOSFET open drain, 1 kΩ pullup to +5V, functions programmable	
OUT2	Brake, MOSFET open-drain with flyback diode to +HV, programmable for other functions Rated voltage, holding voltage, delay to holding voltage, and PWM frequency programmable	
SERIAL COMMUNICATION PORT		
Signals	RxD, TxD, GND, TTL levels	
Mode	Full-duplex, DTE serial communication port for drive setup and control, 9,600 to 115,200 Baud	
Protocol	ASCII or Binary format	
Isolation	Non-isolated. Referenced to Signal Ground	
ETHERCAT PORT		
Format	100BASE-TX	
Signals	RX1+, RX1-, TX1+, TX1-, RX2+, RX2-, TX2+, TX2-, non-isolated, referenced to signal ground	
Protocol	EtherCAT, CANopen Application Protocol over EtherCAT (CoE)	
Isolation	Internal magnetics. Max voltage with respect to grounds: 32 Vdc	
DC POWER OUTPUT		
+5 Vdc	250 mA maximum, shared by dual encoders. Protected for overload or shorts	
MOTOR CONNECTIONS		
Motor U,V,W	Drive outputs to 3-phase brushless motor, Wye or delta connected For DC brush motor use outputs U & V Minimum inductance: 100 µH line-line	
Encoders	2 inputs. See FEEDBACK on p. 3	
Halls	U,V,W. See FEEDBACK on p. 3	
Motemp	AIN1 analog input is programmable to disable the drive if motor sensor voltage is greater or less than a programmed value	
INDICATORS		
EtherCAT	RUN: Green, shows the state of the EtherCAT State Machine ERR: Red, shows that an error condition exists L/A: Green, shows the state of the network on each port	
AMP	Status: Green shows the drive status, Red shows fault condition. Bicolor LEDs operate independently	

GENERAL SPECIFICATIONS

FEEDBACK		
Absolute encoder:		
BiSS (B&C) Unidirectional	MA+, MA- (X, /X), SL+, SL- (A, /A) signals, clock output from drive, data returned from encoder.	
SSI	Clk, /Clk, (X, /X), Data, /Data (A, /A) signals, clock output from drive, data returned from encoder	
	Encoder data inputs and clock outputs are differential with internal 121 Ω terminators	
Incremental encoder:		
Quadrature A/B/X	A, B, X: single-ended (X Index signal not required)	
	Schmitt trigger, 100 ns RC filter, 5 Vdc compatible, 10 kΩ pull-up to +5 Vdc	
	5 MHz maximum line frequency (20 M counts/sec)	
Digital Halls:		
	U, V, W: Single-ended, 120° electrical phase difference between U-V-W signals	
	Schmitt trigger, 1 µs RC filter from active HI/LO sources, 24 Vdc compatible, 1.5 kΩ pull-up to +5 Vdc	
	Vt+ = 2.5~3.5 Vdc, VT- = 1.3~2.2 Vdc, VH = 0.7~1.5 Vdc	
Encoder power	+5 Vdc ±2% @ 250 mAdc max, shared by dual encoders	
PROTECTIONS		
HV Overvoltage	+HV > +62 ±1 Vdc	Drive outputs turn off until +HV is < +62 ±1 Vdc
HV Undervoltage	+HV < +14 ±1 Vdc	Drive outputs turn off until +HV > +14 Vdc ±0.5 Vdc
Drive over temperature	PC Board > 95 ±3 ºC	Programmable as latching or temporary fault
Short circuits	Output to output, output to ground, output to +HV, internal PWM bridge faults	
	Regen+ to GND, or regen- to +HV	
I^2T Current limiting	Programmable: continuous current, peak current, peak time for drive and motor	
Latching / Non-Latching	Programmable response to errors	
Motor Overtemperature	AIN1 has two programmable thresholds. The first one triggers an overtemp warning	
	and the second one disables the drive. Expected thresholds are 100~200 ºC	
Loss of Feedback (BiSS encoders)	The PWM outputs are disabled until the feedback is restored.	
	Selectable as either latching or non-latching	
MECHANICAL & ENVIRONMENTAL		
Size	Shape is round with flats	
	Length & width: 60 x 62 mm (2.36 x 2.44 in)	
	Center hole diameter: 20 mm (0.79 in), outer diameter 64 mm (2.52 in)	
Weight	45g	
Ambient temperature	0 to +70 ºC operating, -40 to +85 ºC storage in occordance to IEC 60068-2-1 and IEC 60068-2-2	
Humidity	0 to 95% RH, non-condensing per IEC 60068-2-78	
Altitude	≤ 2000 m (6,500 ft) per IEC 60068-2-13	
Vibration	2 *g* peak, 10~500 Hz (sine) per IEC 60068-2-6	
Shock	10 *g*, 10 ms, half-sine pulse per IEC 60068-2-27	
Contaminants	Pollution degree 2 per IEC 60664-1	

AGENCY STANDARDS CONFORMANCE

Standards and Directives

In accordance with EC Directive 2014/30/EU (EMC Directive)
IEC 61800-3

Product Safety
Directive 2014/35/EU (Low Voltage)
IEC 61800-5-1

Restriction of the Use of Certain Hazardous Substances (RoHS)
Directive 2011/65/EU (RoHS II)

Approvals
UL 61800-5-1

All of the agency approvals are pending at this time.

ORDERING GUIDE

INTEGRATED SERVO DRIVE

IEL-060-15	Integrated EtherCAT Servo Drive, 7.5/15 A Peak, 14~60 V

EtherCAT®

ACCESSORIES

IEL-CK	Connector Kit

ORDERING GUIDE: CONNECTOR KIT WITH SHELLS, CRIMP CONTACTS, & FLYING LEADS

CONNECTOR KIT: IEL-CK

	QTY	REF	NAME	DESCRIPTION	MDFGR: PART NUMBER
IEL-CK Connector Kit	1	J1,J2	Motor, Power	Tool	Wago: 106388
	3	J5, J6, J7	I/O,Encoder 1 Abs, Encoder 2 Inc	Connector, socket, single row, 1.25 mm, 8 pos	Hirose: DF13-8S-1.25C
	1	J8	Halls	Connector, socket, single row, 1.25 mm, 5 pos	Hirose: DF13-5S-1.25C
	3	J3, J4, J13	Motor Temp, PT1000, Brake	Connector, socket, single row, 1.25 mm, 2 pos	Hirose: DF13-2S-1.25C
	2	J11,J12	EtherCAT IN,OUT	Connector, socket, single row, 1.25 mm, 4 pos	Hirose: DF13-4S-1.25C
	43	J3, J4, J5, J6 J7, J8, J11, J12, J13	Crimp socket, 26~30 AWG, gold		Hirose: DF13-2630SCFA
	16		White Flying Lead with socket at both ends, 26 AWG, gold, 12”		Hirose: H4BBG-10112-W6
	3		Red Flying Lead with socket at both ends, 26 AWG, gold, 12”		Hirose: H4BBG-10112-R6
	4		Black Flying Lead with socket at both ends, 26 AWG, gold, 12”		Hirose: H4BBG-10112-B6
	1		Blue Flying Lead with socket at both ends, 26 AWG, gold 12”		Hirose: H4BBG-10112-L6
	1	P1	Serial Port	Connector, 3 pin	J.S.T: PAP-03V-S
	3			CONTC SKT CRMP 26-22GA SN	J.S.T: SPHD-001T-P0.5
	2	P3,P4	EtherCAT Shield	Faston, 22~26 AWG	TE: 7-520366-2

16-127915 Document Revision History

Revision	Date	Remarks
00	July, 2 2020	Initial release
01	March, 19 2021	Changed all references from IES to IEL. Changed document name from IES-60-15 to IEL-60-15.

Note: Specifications subject to change without notice