MAHI Pendulum v2.0 Datasheet

Prepared by: Evan Pezent

Date: 2/8/2019

DC Motor

Make:	Maxon Motor
Model:	DCX35L 24V
PN:	B78BD16BA583
Nominal Voltage:	24 V
Torque Constant:	0.0293 Nm/A
Nominal (Max Cont.) Current:	4.26 A
Nominal (Max Cont.) Torque:	0.121 Nm

Amplifier

Make:	Advanced Motion Control (AMC)
Model:	12A8
Supply Voltage:	24 VDC*
Nominal (Max Cont.) Current:	6 A
Peak Current:	12 A:
Command Source:	± 10 V operational (± 15 V max)
Current Command Gain:	0.6 A/V
Current Sense Gain:	2.2 A/V
Enable Source:	5 V TTL***

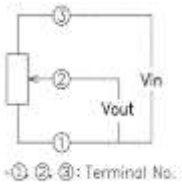
*As dictated by motor nominal voltage, actual range 20 – 80 VDC
**Pull to GND to disable, float or supply 5V to enable

Optical Encoder

Make:	Avago/Broadcom
Model:	ENC 30 HEDL 5540
Supply Voltage:	5 V
Counts Per Revolution:	500

Absolute Angle Sensor / Potentiometer

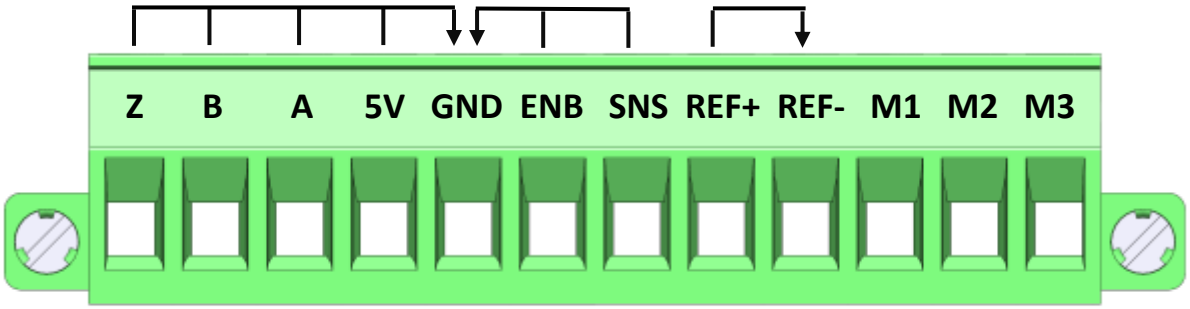
Make:	Midori America Corporation
Model:	CPP-45B
Total Resistance:	5 kΩ (± 0.75 kΩ)
Max Current:	1 mA
Terminals:	3



Pin Out

+Power Supply (24V)

-Power Supply (DC GND)



Pin	Name	Description	Input / Output	Range
0	Z	Optical Encoder Z Channel	Output	0V or 5V
1	B	Optical Encoder B Channel	Output	0V or 5V
2	A	Optical Encoder A Channel	Output	0V or 5V
3	5V	Optical Encoder Supply Voltage	Input	5V
4	GND	Signal Ground	GND	N/A
5	ENB	Amplifier Enable (5V) / Disable (0V)	Input	0V or 5V
6	SNS	Amplifier Current Sense (2.2 A/V)	Output	-10V to 10V
7	REF+	Amplifier Current Command (0.6 A/V)*	Input	-10V to 10V Differential
8	REF-			
9	M1	Midori Terminal 1	Input	< 1 mA
10	M2	Midori Terminal 2	Output	< 1 mA
11	M3	Midori Terminal 3	Input	< 1 mA

*Your REF- will likely be the same reference as your GND

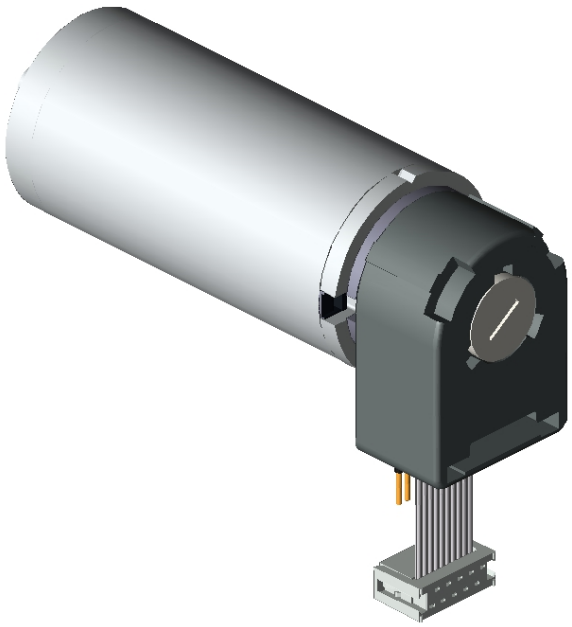
maxon motor
driven by precision

Configured drive

Motor - DCX35L GB KL 24V
Sensor - ENC 30 HEDL 5540 500IMP

Part number: B78BD16BA583 Revision number 1

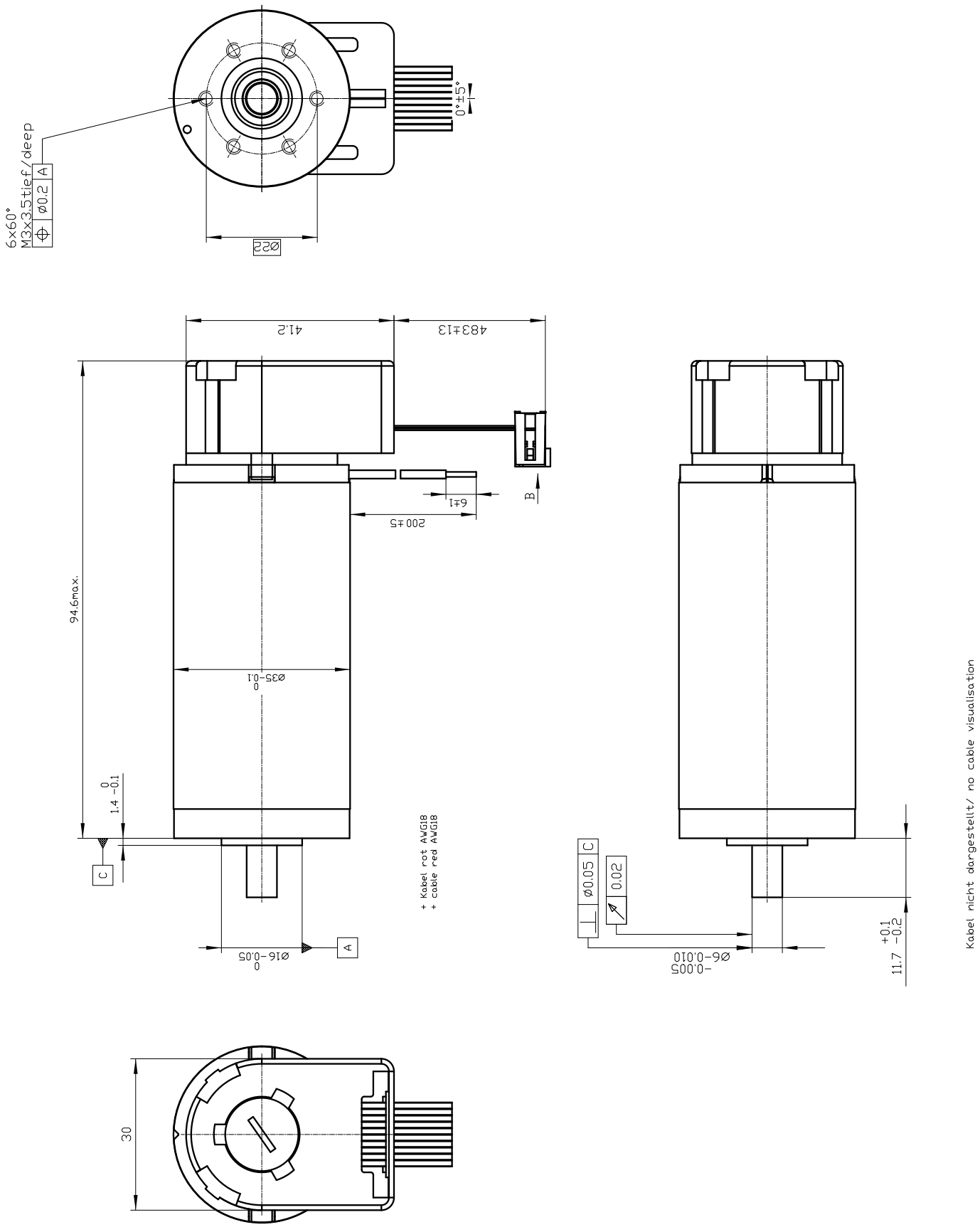
Orders are processed and shipped from Switzerland within 11 working days.
General Terms and Conditions: https://www.maxonmotor.ch/maxon/view/content/terms_and_conditions_page

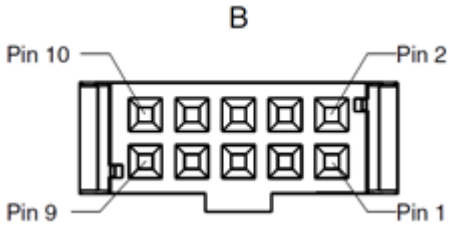


To open the integrated CAD file, please save this document and open it in Acrobat Reader. The STEP file is available after a double-click on the pin icon.

B78BD16BA583.stp (STP AP 214)

Open configuration: http://www.maxonmotorusa.com/maxon/view/configurator/?ConfigID=B78BD16BA583


6x60°
M3x3.5tief/deep
⌖ ø0.2 A
Ø22
0°±5°
41.2
48.3±1.3
6±1
B
200±5
94.6max.
Ø35 0 -0.1
1.4 0 -0.1
C
A
Ø16 0 -0.05
+ Kabel rot AWG18
+ cable red AWG18
⊥ ø0.05 C
0.02
Ø6 -0.005 -0.010
11.7 +0.1 -0.2
Kabel nicht dargestellt/ no cable visualisation
30



Connector type, encoder	
2.54mm 10-pol	
Pin 1	No connection
Pin 2	VCC
Pin 3	GND
Pin 4	No connection
Pin 5	Channel A \
Pin 6	Channel A
Pin 7	Channel B \
Pin 8	Channel B
Pin 9	Channel I \ (Index)
Pin 10	Channel I (Index)

Summary of your selected configuration

Total weight of the drive: 447 g

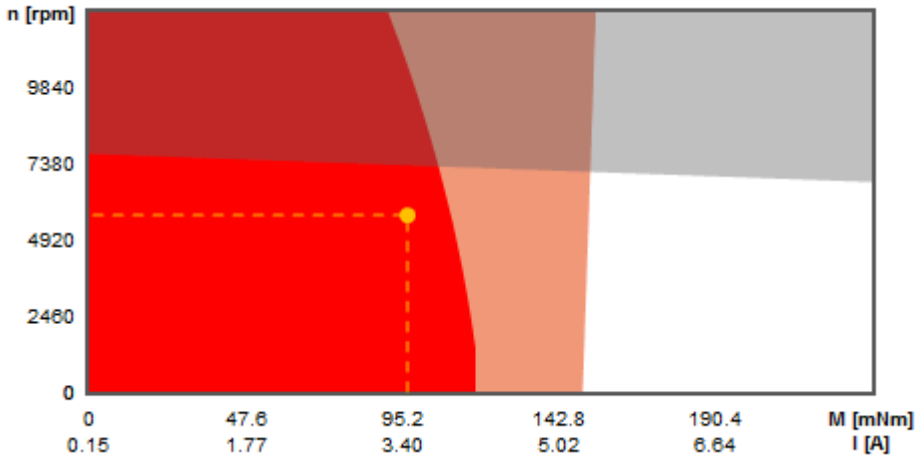
	DCX35L GB KL 24V	
Product detail		
	Commutation	Graphite brushes
	Nominal voltage	24 V
	Motor bearings	Preloaded ball bearing
Electrical connection, motor		
	Electrical connection, motor	Cable
	Cable length	200 mm

	ENC 30 HEDL 5540 500IMP	
Product detail		
	Counts per turn	500
	Cable type	Flachband TPE

Legend for part designation

EB	Precious metal brushes	GB	Graphite brushes	CLL	Spark suppression	BL	Brushless
A	Hall sensors	B	Sensorless	KL	Ball bearings	SL	Sintered bearings
GPX	Planetary gearhead	ENX	Encoder	ENC	Encoder	IMP	Pulses
ST	Number of stages	HP	High Power	S/M/L	Short/medium/long	HS	High Speed
STE	Sterilizable	INT	Integrated	STD	Standard	SP	Speed
ABS	Absolute	LN	Reduced noise level	A	Standard	LZ	Reduced backlash
C	Ceramic bearing			STEC	Sterilizable, Ceramic bearing		

Drive disposition



Continuous operation range
Short-term operating range
Selected operating point
Out of voltage range
Not recommended range
Continuous operation range at reduced thermal resistance Rth2 50%

Combination details	
Your entries	
Available voltage	24 V
Speed	5728 min^{-1}
Torque	96.8 mNm
Values of the drive at available voltage	
Available voltage	24 V
Max. speed at given load	7272 min^{-1}
Max. continuous torque	121.0096.8 mNm
Max. continuous current	4.26 A
Required electrical data for your operating point	
Speed	5728 min^{-1}
Torque	96.8 mNm
Required voltage	19.01 V
Required current	3.44 A

DCX35L GB KL 24V

	Product specification	
Values at nominal voltage		
	Nominal voltage	24 V
	No load speed	7720 min^{-1}
	No load current	146mA
	Nominal speed	7160 min^{-1}
	Nominal torque (max. continuous torque)	121 mNm
	Nominal current (max. continuous current)	4.26 A
	Stall torque	2030 mNm
	Stall current	69.3 A
	Max. efficiency	88.9 %
Characteristics		
	Max. output power continuous	117 W
	Terminal resistance	0.346 Ω
	Terminal inductance	0.121 mH
	Torque constant	29.3 mNm A^{-1}
	Speed constant	326 min^{-1} V^{-1}
	Speed/torque gradient	3.86 min^{-1} mNm^{-1}
	Mechanical time constant	3.91ms
	Rotor inertia	96.6 gcm^2
Thermal data		
	Thermal resistance housing-ambient	6.98 KW^{-1}
	Thermal resistance winding-housing	2.1 KW^{-1}
	Thermal time constant of the winding	43 s
	Thermal time constant of the motor	1030 s
	Ambient temperature	-40…100 °C
	Max. winding temperature	155 °C
Mechanical data		
	Max. permissible speed	12300 min^{-1}
	Axial play	0…0.1 mm
	Preload	7 N
	Radial backlash	0.02 mm
	Max. axial load (dynamic)	7 N
	Max. force for press fits (static)	22.6 N

	Static, supported shaft	2510 N
	Max. radial load 5 mm from flange	65.3 N
	Measurement from the flange	5 mm

Further specifications		
	Number of pole pairs	1
	Number of commutator segments	11
	Motor weight	411.5 g
	Motor length	74 mm
	Typical noise level	48 dBA (min^{-1})

Information about motor data: http://www.maxonmotor.com/medias/CMS_Downloads/DIVERSES/12_049_EN.pdf

ENC 30 HEDL 5540 500IMP

	Product specification	
Sensor data		
	Counts per turn	500
	Number of channels	3
	Line Driver	AM26C31QD
	Max. electrical speed	12000 min^{-1}
	Max. mechanical speed	30000 min^{-1}
Technical data		
	Supply voltage Vcc	5 V ±10 %
	Output signal	INC
	Output signal driver	Differential / EIA RS 422
	Output current per channel	-20...20 mA
	State length	45…135 °el
	Signal rise time/Signal fall time	180/40 ns
	Min. state duration	ns
	Direction of rotation	A before B CW
	Index position	A low & B low
	Index synchronously to AB	Yes
	Index pulse width	90 °el
	Typical current draw at standstill	60 mA
	Max. moment of inertia of code wheel	0.6 gcm^2
	Operating temperature range	-40…100 C°
	Number of autoclave cycles	0

Description

The 12A8 PWM servo drive is designed to drive brush type DC motors at a high switching frequency. A single red/green LED indicates operating status. The drive is fully protected against over-voltage, under voltage, over-current, over-heating and short-circuits across motor, ground and power leads. Furthermore, the drive can interface with digital controllers or be used stand-alone and requires only a single unregulated DC power supply. Loop gain, current limit, input gain and offset can be adjusted using 14-turn potentiometers. The offset adjusting potentiometer can also be used as an on-board input signal for testing purposes.

See Part Numbering Information on last page of datasheet for additional ordering options.

Power Range

Peak Current	12 A
Continuous Current	6 A
Supply Voltage	20 - 80 VDC

Features

- Four Quadrant Regenerative Operation
- DIP Switch Selectable Modes
- Adjustable Current Limits
- High Switching Frequency
- Differential Input Command
- Digital Fault Output Monitor
- On-Board Test Potentiometer
- Offset Adjustment Potentiometer
- Adjustable Input Gain
- Drive Status LED
- Current Monitor Output
- Directional Inhibit Inputs for Limit Switches

MODES OF OPERATION

- Current
- Voltage
- IR Compensation
- Velocity

COMMAND SOURCE

- ±10 V Analog

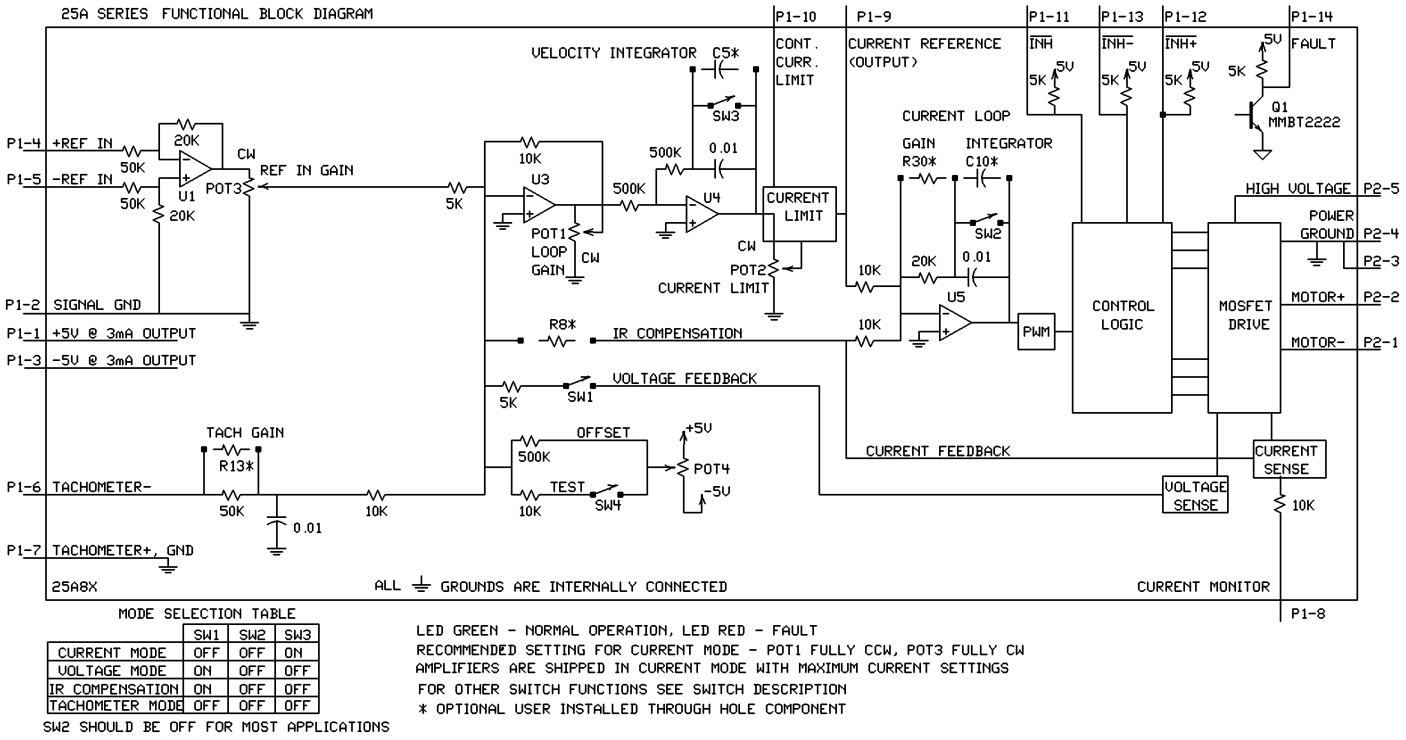
FEEDBACK SUPPORTED

- Tachometer (±60 VDC)
- ±10 VDC Position

COMPLIANCES & AGENCY APPROVALS

- UL
- cUL
- CE Class A (LVD)
- CE Class A (EMC)
- RoHS

BLOCK DIAGRAM



MODE SELECTION TABLE

	SW1	SW2	SW3
CURRENT MODE	OFF	OFF	ON
VOLTAGE MODE	ON	OFF	OFF
IR COMPENSATION	ON	OFF	OFF
TACHOMETER MODE	OFF	OFF	OFF

SW2 SHOULD BE OFF FOR MOST APPLICATIONS

LED GREEN - NORMAL OPERATION, LED RED - FAULT
RECOMMENDED SETTING FOR CURRENT MODE - POT1 FULLY CCW, POT3 FULLY CW
AMPLIFIERS ARE SHIPPED IN CURRENT MODE WITH MAXIMUM CURRENT SETTINGS
FOR OTHER SWITCH FUNCTIONS SEE SWITCH DESCRIPTION
* OPTIONAL USER INSTALLED THROUGH HOLE COMPONENT

Information on Approvals and Compliances	
cULus	US and Canadian safety compliance with UL 508c, the industrial standard for power conversion electronics. UL registered under file number E140173. Note that machine components compliant with UL are considered UL registered as opposed to UL listed as would be the case for commercial products.
CE	Compliant with European CE for both the Class A EMC Directive 2004/108/EC on Electromagnetic Compatibility (specifically EN 61000-6-4:2007 and EN 61000-6-2:2005) and LVD requirements of directive 2006/95/EC (specifically EN 60204-1:2006), a low voltage directive to protect users from electrical shock.
RoHS COMPLIANCE	RoHS (Reduction of Hazardous Substances) is intended to prevent hazardous substances such as lead from being manufactured in electrical and electronic equipment.

SPECIFICATIONS

Power Specifications		
Description	Units	Value
DC Supply Voltage Range	VDC	20 - 80
DC Bus Over Voltage Limit	VDC	86
Maximum Peak Output Current[1]	A	12
Maximum Continuous Output Current	A	6
Maximum Continuous Output Power	W	456
Maximum Power Dissipation at Continuous Current	W	24
Minimum Load Inductance (Line-To-Line)[2]	µH	200
Low Voltage Supply Outputs	-	±5 VDC (3 mA)
Switching Frequency	kHz	36
Control Specifications		
Description	Units	Value
Command Sources	-	±10 V Analog
Feedback Supported	-	±10 VDC Position, Tachometer (±60 VDC)
Commutation Methods	-	Brush Type
Modes of Operation	-	Current, IR Compensation, Velocity, Voltage
Motors Supported	-	Single Phase (Brushed, Voice Coil, Inductive Load)
Hardware Protection	-	Over Current, Over Temperature, Over Voltage, Short Circuit (Phase-Phase & Phase-Ground)
Primary I/O Logic Level	-	5V TTL
Mechanical Specifications		
Description	Units	Value
Agency Approvals	-	CE Class A (EMC), CE Class A (LVD), cUL, RoHS, UL
Size (H x W x D)	mm (in)	129.3 x 75.8 x 25.1 (5.1 x 3 x 1)
Weight	g (oz)	280 (9.9)
Heatsink (Base) Temperature Range[3]	°C (°F)	0 - 65 (32 - 149)
Storage Temperature Range	°C (°F)	-40 - 85 (-40 - 185)
Form Factor	-	Panel Mount
P1 Connector	-	16-pin, 2.54 mm spaced, friction lock header
P2 Connector	-	5-port, 5.08 mm spaced, screw terminal

Notes

1. Maximum duration of peak current is ~2 seconds. Peak RMS value must not exceed continuous current rating of the drive.
2. Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
3. Additional cooling and/or heatsink may be required to achieve rated performance.

PIN FUNCTIONS

P1 - Signal Connector			
Pin	Name	Description / Notes	I/O
1	+5V 3mA OUT	±5 V @ 3 mA low power supply for customer use. Short circuit protected. Reference ground common with signal ground.	O
2	SIGNAL GND		GND
3	-5V 3mA OUT		O
4	+REF IN	Differential Reference Input (±10 V Operating Range, ±15 V Maximum Input)	I
5	-REF IN		I
6	-TACH IN	Negative Tachometer Input (Maximum ±60 V). Use signal ground for positive input.	I
7	+TACH / GND	Positive Tachometer Input and Signal Ground	GND
8	CURRENT MONITOR	Current Monitor. Analog output signal proportional to the actual current output. Scaling is 2.2 A/V. Measure relative to signal ground.	O
9	CURR REF OUT	Measures the command signal to the internal current-loop. This pin has a maximum output of ±7.25 V when the drive outputs maximum peak current. Measure relative to signal ground.	O
10	CONT CURRENT LIMIT	Can be used to reduce the factory-preset maximum continuous current limit without affecting the peak current limit by attaching an external current limiting resistor between this pin and signal ground. See pin details for resistor values.	I
11	$\overline{\text{INHIBIT IN}}$	TTL level (+5 V) inhibit/enable input. Leave open to enable drive. Pull to ground to inhibit drive. Inhibit turns off all power devices.	I
12	$\overline{\text{+INHIBIT IN}}$	Positive Direction Inhibit (Does Not Cause A Fault Condition)	I
13	$\overline{\text{-INHIBIT IN}}$	Negative Direction Inhibit (Does Not Cause A Fault Condition)	I
14	FAULT OUT	TTL level (+5 V) output becomes high when power devices are disabled due to at least one of the following conditions: inhibit, output short circuit, over voltage, over temperature, power-up reset.	O
15	NC	Not Connected (Reserved)	-
16	NC	Not Connected (Reserved)	-

P2 - Power Connector			
Pin	Name	Description / Notes	I/O
1	-MOT	Negative Motor Output	O
2	+MOT	Positive Motor Output	O
3	POWER GND	Power Ground (Common With Signal Ground)	PGND
4	POWER GND		PGND
5	HIGH VOLTAGE	DC Power Input	I

Pin Details

CONT CURRENT LIMIT (P1-10)

This pin can be used to reduce the continuous current limit without affecting the peak current limit by connecting an external current limiting resistor between this pin and signal ground. See table below.

Current Limit Resistor	15 kΩ	6.6 kΩ	3.4 kΩ	2.1 kΩ	1.2 kΩ	810Ω	500 Ω	250 Ω	0 kΩ
Continuous Current Limit	90%	80%	70%	60%	50%	40%	30%	20%	10%

Note: These values are secondary to the continuous/peak ratio set by the DIP switches.

HARDWARE SETTINGS

Switch Functions

Switch	Description	Setting	
		On	Off
1	Voltage feedback. Mode dependent (see mode selection table below).	On	Off
2	Current loop integral gain. Activates or deactivates integration. OFF by default.	Inactive	Active
3	Outer loop integration. Activates or deactivates integration. ON, by default, for current mode and OFF for other modes.	Inactive	Active
4	Test/Offset. Switches the function of the Test/Offset pot between an on-board command input for testing or a command offset adjustment. OFF by default.	Test	Offset

Mode Selection Table

	SW1	SW3
CURRENT	OFF	ON
VOLTAGE	ON	OFF
IR COMPENSATION	ON	OFF
TACHOMETER VELOCITY	OFF	OFF

Potentiometer Functions

Potentiometer	Description	Turning CW
1	Loop gain adjustment for voltage/velocity modes. Turn this pot fully CCW in current mode.	Increases gain
2	Current limit. It adjusts both continuous and peak current limit while maintaining their ratio.	Increases limit
3	Reference gain. Adjusts the ratio between input signal and output variables (voltage, current, or velocity).	Increases gain
4	Offset / Test. Used to adjust any imbalance in the input signal or in the amplifier. Can also be used as an on-board signal source for testing purposes.	Adjusts offset in negative direction
Note: Potentiometers are approximately linear and have 12 active turns with 1 inactive turn on each end.		

Through-hole Components†

Location	Description
C10*	Current Loop Integrator. Through-hole capacitor that can be added for more precise current loop tuning. See section below on Tuning with Through-hole components for more details.
C5*	Velocity Loop Integrator. Through-hole capacitor that can be added for more precise velocity loop tuning. See section below on Tuning with Through-hole components for more details.
R13*	Tachometer Input Scaling. Through-hole resistor that can be added to change the gain of the tachometer input. See section below on Tachometer Gain for more details.
R30*	Current Loop Proportional Gain. Through-hole resistor that can be added for more precise current loop tuning. See section below on Tuning with Through-hole components for more details.
R8*	IR Compensation Scaling. Through-hole resistor that can be added to configure the amplifier for IR Compensation mode. See section below on IR Compensation Notes for more details.

Tachometer Gain

Some applications may require an increase in the gain of the tachometer input signal. This occurrence will be most common in designs where the tachometer input has a low voltage to RPM scaling ratio. The drive offers a through-hole location listed in the above table where a resistor can be added to increase the tachometer gain. Use the drive's block diagram to determine an appropriate resistor value.

Tuning With Through-hole Components

In general, the drive will not need to be further tuned with through-hole components. However, for applications requiring more precise tuning than what is offered by the potentiometers and dipswitches, the drive can be manually modified with through-hole resistors and capacitors as denoted in the above table. By default, the through-hole locations are not populated when the drive is shipped. Before attempting to add through-hole components to the board, consult the section on loop tuning in the installation notes on the manufacturer's website. Some general rules of thumb to follow when adding through-hole components are:

- A larger resistor value will increase the proportional gain, and therefore create a faster response time.
- A larger capacitor value will increase the integration time, and therefore create a slower response time.

Proper tuning using the through-hole components will require careful observation of the loop response on a digital oscilloscope to find the optimal through-hole component values for the specific application.

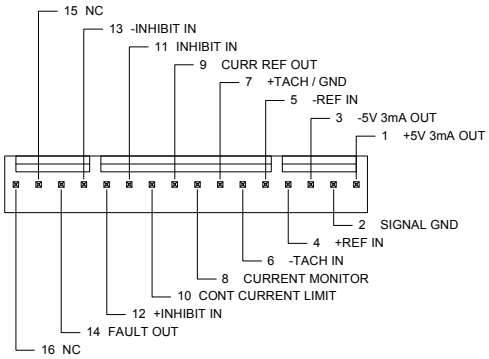
IR Compensation Notes

For applications that will use IR Compensation mode, a resistor can be added to the location named in the table above. The combination of the added resistor and correct dipswitch settings will configure the amplifier for IR Compensation mode. While in IR Compensation mode, the amplifier will adjust the duty cycle to compensate for changes in the output current. Consult the amplifier's functional block diagram and the manufacturer's website for more information.

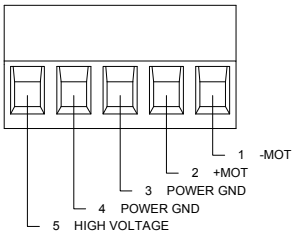
†Note: Damage done to the drive while performing these modifications will void the warranty.

MECHANICAL INFORMATION

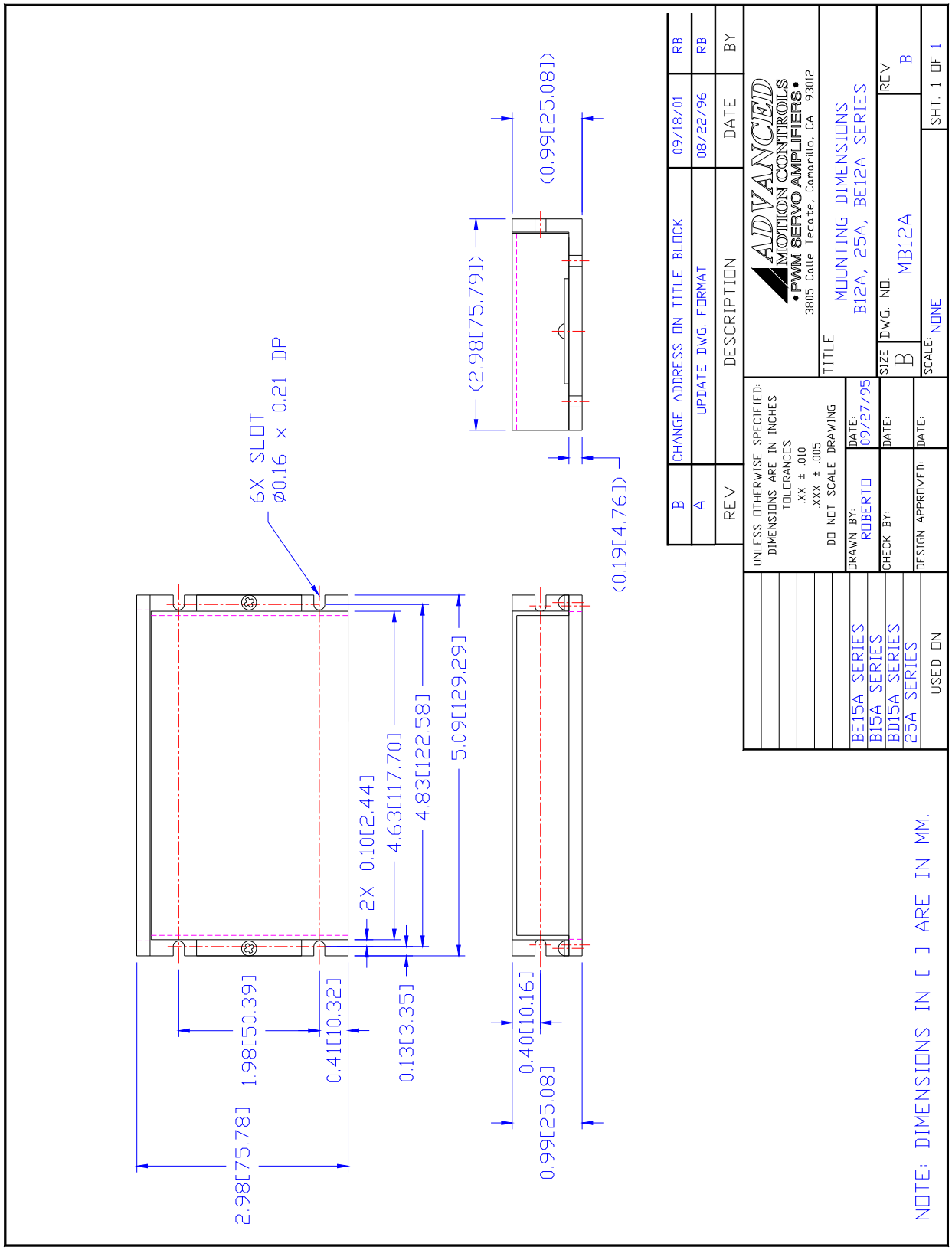
P1 - Signal Connector		
Connector Information		16-pin, 2.54 mm spaced, friction lock header
Mating Connector	Details	Molex: P/N 22-01-3167 (connector) and P/N 08-50-0114 (insert terminals)
	Included with Drive	Yes



P2 - Power Connector		
Connector Information		5-port, 5.08 mm spaced, screw terminal
Mating Connector	Details	Not applicable
	Included with Drive	Not applicable



MOUNTING DIMENSIONS



PART NUMBERING INFORMATION

12 A 8 -

Peak Current
Maximum peak current rating in Amps.

Peak Voltage
Peak voltage rating scaled 1:10 in Volts.

Isolation Option**
I: Optical Isolation

Command
: Analog Command
DD: PWM Command

Additional Options*
-ANP: Analog Position Loop
-INV: Inverted Inhibit
-QD: Quick Disconnect
-QDI: Quick Disconnect w/ Inverted Inhibit

Revision
Assigned a letter (A through Z) by manufacturer.

Power Supply
: DC Power Supply
AC: AC Power Supply

* Options available for orders with sufficient volume. Contact *ADVANCED* Motion Controls for more information.
** Isolation comes standard on all AC supply drives and most DC supply drives 200V and above. Consult selection tables of the website or the drive datasheet block diagram to see if isolation is included.

ADVANCED Motion Controls analog series of servo drives are available in many configurations. Note that not all possible part number combinations are offered as standard drives. All models listed in the selection tables of the website are readily available, standard product offerings.

ADVANCED Motion Controls also has the capability to promptly develop and deliver specified products for OEMs with volume requests. Our Applications and Engineering Departments will work closely with your design team through all stages of development in order to provide the best servo drive solution for your system. Equipped with on-site manufacturing for quick-turn customs capabilities, *ADVANCED* Motion Controls utilizes our years of engineering and manufacturing expertise to decrease your costs and time-to-market while increasing system quality and reliability.

Examples of Modifications and Customized Products

- Integration of Drive into Motor Housing
- Mount OEM PCB onto Drive Without Cables
- Multi-axis Configuration for Compact System
- Custom PCB and Baseplate for Optimized Footprint
- RTV/Epoxy Components for High Vibration
- OEM Specified Connectors for Instant Compatibility
- OEM Specified Silkscreen for Custom Appearance
- Increased Thermal Limits for High Temp. Operation
- Integrate OEM Circuitry onto Drive PCB
- Custom Control Loop Tuned to Motor Characteristics
- Custom I/O Interface for System Compatibility
- Preset Switches and Pots to Reduce User Setup
- Optimized Switching Frequency
- Ramped Velocity Command for Smooth Acceleration
- Remove Unused Features to Reduce OEM Cost
- Application Specific Current and Voltage Limits

Feel free to contact Applications Engineering for further information and details.

Available Accessories

ADVANCED Motion Controls offers a variety of accessories designed to facilitate drive integration into a servo system. Visit www.a-m-c.com to see which accessories will assist with your application design and implementation.


Power Supplies


Shunt Regulators


Drive(s)


Filter Cards

To Motor

All specifications in this document are subject to change without written notice. Actual product may differ from pictures provided in this document.

Conductive Plastic Angle Sensor

CPP-45 Series

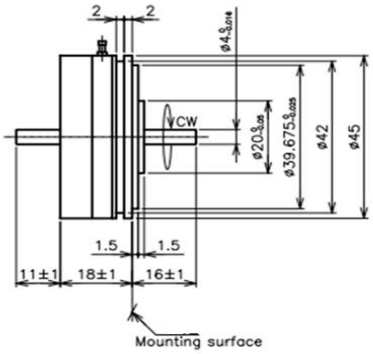
- Conductive Plastic Angle Sensor
- Effective Electrical Travel : 350°
- Independent Linearity : ±0.3% (Special Linearity : ±0.1%)
- Servo Mount & Screw Mount

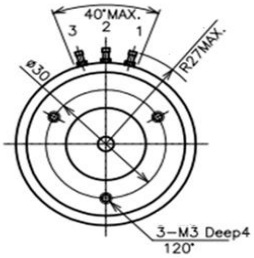
・CPP-45 : Φ4mm Shaft
・CPP-45B : Φ6mm Shaft

【Material】
- Housing : Aluminum
- Shaft : Stainless Steel
- Ball Bearing : Stainless Steel

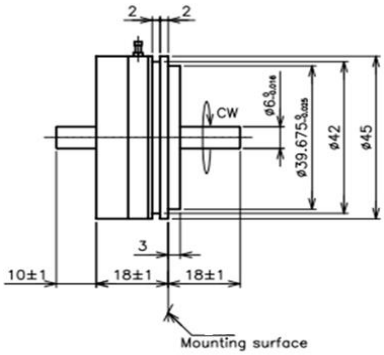
■ Dimension (mm)

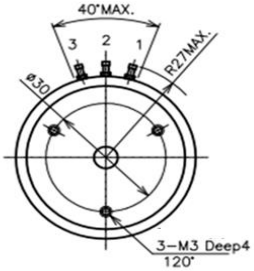
CPP−45



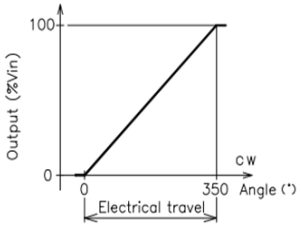


CPP−45B

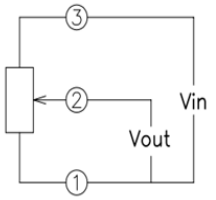




■ Output Characteristics

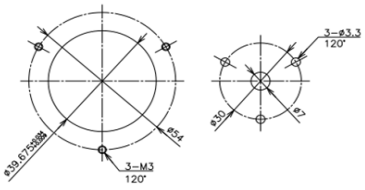


■ Schematic



・①, ②, ③: Terminal No.

■ Mounting



【Model No.】	CPP-45	CPP-45B
	<Φ4mm Shaft>	<Φ6mm Shaft>
Electrical Specifications		
Effective Electrical Travel	350° + 2°、−3°	
Total Resistance	0.5, 1K, 2K, 5K, 10K Ω	
Total Resistance Tolerance	±15%	
Independent Linearity	±0.3% (Special Linearity ±0.1%)	
Rated Dissipation	3 W/70 ℃	
Output Smoothness	MAX. 0.1%	
Insulation Resistance	MIN. 100MΩ/DC1000V	
Dielectric Strength	AC1000V/ 1 Minute	
TC of Resistance	±400 ppm/K	
Mechanical Specifications		
Total Mechanical Travel	360° endless	
Torque	1.8 mN・m MAX. (Additional 1.2mN・m/add one gang)	
Thrust Load Tolerance	1N	2N
Radial Load Tolerance	5N	6N
Mass	Approx. 60g (Additional 10g/add one gang)	
Environmental Specifications		
Life Cycles	10 Million Cycle	
Category Temperature Range	-40 ~ +120 ℃	
Storage Temperature Range	-40 ~ +120 ℃	
Vibration	150m/S^2 2000Hz 3axis 2hours each	
Shock	500m/S^2 11ms 6directions 3times	

■ Options

・Multi Ganging : More than 4 sections, please contact us

・Additional Taps : Up to 8 taps

For Output : Type (A) … No shorted angle

For Input : Type (B) … 1~5° shorted on tap

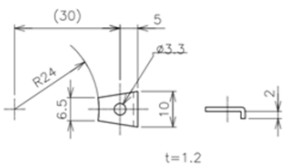
・Additional Center Tap

C.T(A) … No shorted angle

C.T(B) … Shorted on tap (Shorted angle 1~5°)

■ Accessories

Mounting Cleats : 2 pieces



■ Handling Instruction

・To avoid burnout of resistive element, do not supply more than 1mA current to terminal 2.

・Miswiring might cause burnout of resistive element.

・To reduce sliding noise, add load resistance should be more than 100times and less than 1000times of total resistance.

・Slight continuous vibration such as dither might cause short lifetime of the sensor.