Avago
TECHNOLOGIES

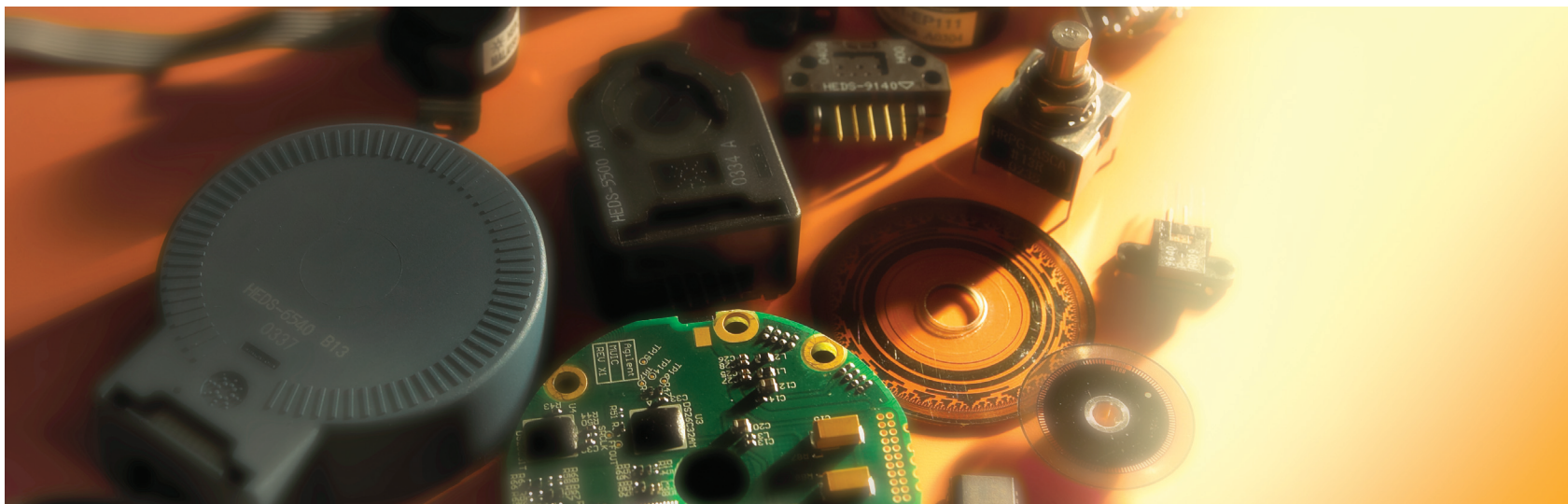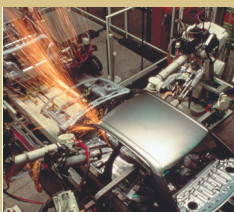# Motion Sensing and Control Products

Selection Guide

Incremental Optical Encoders
Absolute Optical Encoders
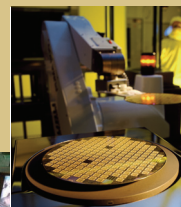Integrated Circuits
Codewheels

Robotics

Medical

Industrial

Consumer

Printers

2

Performance in Motion

Avago Technologies motion sensing and control solutions cover a wide span of application requirements, ranging from the most cost-effective price performance encoders to cost-competitive, very high end, high-resolution industrial encoders.
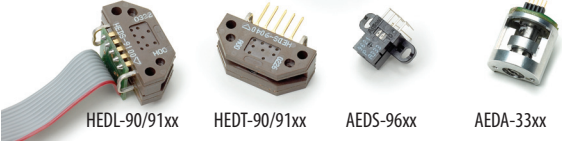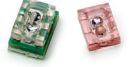
We are committed to providing our customers solutions which are:
• Reliable
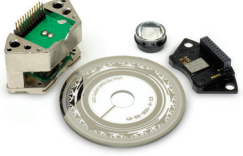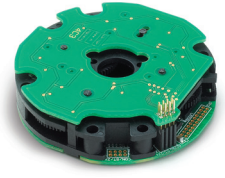
• Cost competitive

• Easy to assemble

• Feature a wide range products and options

• Use innovative technology

• Guarantee performance

Our worldwide support team will work with you to meet your requirements and put your designs in motion.

Human Interface Devices

Controller

Controller
Uses current load spread to compute signal for amplifier (HCTL-1100 Series)

Optocoupler

Amplifies signal

Host
Decides appropriate motor function

Amp

Motor

Turns load

Decoder
Changes encoder output to a number (HCTL-2022/2032)

Encoder
Measures position change and direction (Wide variation of encoder options available)

Input
Rotary Pulse Generator (HRPG Series)

Feedback

Motion Control Products Overview

Optical Encoder							
Module				**Housed**			
Transmissive							

Incremental

HEDS-90/91/92x HEDS-97xx AEDB-9140 AEDA-32xx

HEDx-65xx

HEDx-55/56xx

HEDS-57xx
(Rotary Pulse Generator)

HEDL-90/91xx HEDT-90/91xx AEDS-96xx AEDA-33xx

HEDL-55/65xx

HEDL-64xx

Reflective

AEDR-80xx AEDR-83xx

HEDR-54xx HRPG-Axxx
(Rotary Pulse Generator)

Optical Encoder		Codewheel/Codestrip	Integrated Circuit	
Module		**Metal/Mylar/Glass**	**Controller**	**Decoder/Counter**
Transmissive				

Absolute

AEAS-7000/7500

AEAT-84/86AD

HEDx-51/61xx

HCTL-1100

HCTL-20xx

Customer Benefits

	Features	Benefits
Reliability	Longer lifespan for optical encoders due to elimination of mechanical parts.	Low maintenance cost.
Size	Integrated encoder solution comes in different packages (e.g. chip-size and SOIC packages versus industrial-grade robust housing) and mountings that can be catered to customer's specific needs.	Small form factor. High performance in small package. Well suited for space-constrained applications.
Reduced Switching Glitch	Optical technology promotes quiet switching as no switching transients are generated without electrical contacts.	Accurate and precise motion sensing.
High Resolution	Avago Technologies encoders offer a wide range of resolutions: • Up to 80,000 counts per revolution (incremental) • Up to 65,536 positional data per revolution (absolute) • Up to 1 million or more positional data per revolution for customized solutions. Technology is not limited to quasi absolute/absolute.	Accurate and precise motion sensing.
Surface Mount	Smaller package delivers the same functionality as standard DIP.	Lower assembly cost. Easier, faster handling, as well as improved solderability.
Cost-Effective, High Performance	Newest encoder module features reduced component and package sizes. Delivers higher performance, easier installation through patented alignment plug and play tool.	Reduced design cycles. Small form factor. Reduced cost.
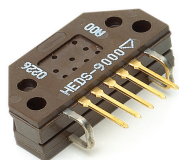
HEDS-90xx/91xx/9200, HEDL-90xx/91xx Series, HEDT-90xx/91xx Series

Description

HEDS-9000/9040/ 9100/9140 Series

- High-performance two/ three channel rotary encoder

- Consists of a lensed (LED) source and a detector IC enclosed in a small C-shaped plastic package

- Extremely tolerant to mounting misalignment due to a highly collimated light source and unique photodetector array

- The two channel digital outputs and the single 5-V supply input are accessed through five 0.025 inch square pins located on 0.1 inch centers

- HEDS-9000 resolution: from 500 to 2048 CPR when used with appropriate codewheel

- HEDS-9040 is designed for use with a HEDX-614X codewheel which has an optical radius of 23.36 mm (0.920 inch)

- HEDS-9100 resolution: from 96 to 512 CPR when used with appropriate codewheel

- HEDS-9140 is designed for use with the HEDS-5140 codewheel which has an optical radius of 11.00 mm (0.433 inch)

HEDS-9200 Series

- Same features as listed above

- Detects linear position when operated in conjunction with a codestrip

HEDL-90XX/91XX Series

- Differential outputs

- Utilizes an industry-standard line driver IC, 26C31, which provides complementary outputs for each encoder channel

- Offers enhanced performance when the encoders are used in noisy environments, or when required to drive long distances

- Suggested line receivers are 26C32 and 26C33

- Quadrature signals are accessed through a cable and 10-pin female connector, which is manufactured by FCI, part number: 66900-310

- Mating connectors manufactured by FCI; straight type part number: 71912-010, right angle type part number: 71913-010

HEDT-90XX/91XX Series

- High performance

- Low cost

- Operates to 125°C

- Ideal for high volume automotive applications

HEDT-9040/9140 Series

- High temperature

- Three channels (two channel quadrature output plus a third channel index output)

- Operates up to 140°C

Features

- High performance

- High resolution

- Low cost

- Easy to mount

- No signal adjustment required

- Small size

- -40°C to 100°C operating temperature (up to 140°C for high temperature version)

- Two and three channel quadrature output

- TTL compatible

- Single 5-V supply

Applications

Ideal for high-volume applications, like:
- Printers

- Plotters

- Tape drives

- Factory automation equipment

* Refer to product datasheet for package dimensions

Incremental Optical Encoders
Transmissive Module

Ordering Information

Two Channel Linear Encoders Module – HEDS-9200 Series

HEDS-9200 Option			

Resolution (Cycles/Rev)
300 – 300 LPI
360 – 360 LPI
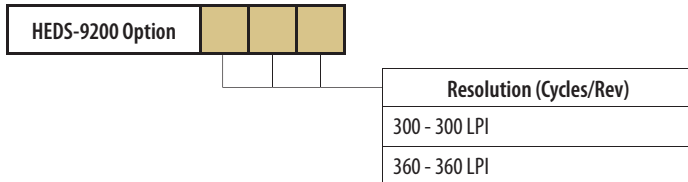
Two Channel Incremental Encoders – HEDS-910X series

HEDS-910	0

Option		0	0

Lead
0 - Straight Leads
1 - Bent Leads

Resolution (Cycles/Rev)	
S - 50 CPR	H - 400 CPR
K - 96 CPR	A - 500 CPR
C - 100 CPR	I - 512 CPR
E - 200 CPR	B - 1000 CPR
F - 256 CPR	J - 1024 CPR
G - 360 CPR	
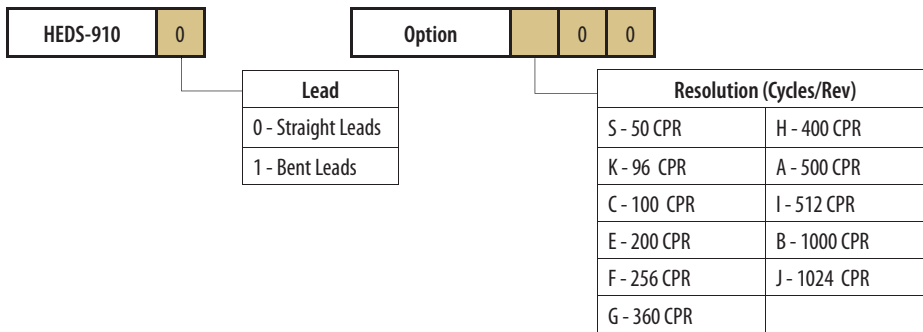
Available Options														
Part Number	Options													
	A	B	C	D	E	F	G	H	I	J	K	S	T	U
HEDS-9100	●	●	●		●	●	●	●	●	●	●	●		
HEDS-9101	●		●		●		●							
Please refer to codewheel ordering information for recommended usage														

Three Channel Incremental Encoders – HEDS-914X series

HEDT -914	0

Option		0	0

Assembly tool: HEDS-8905

Lead
0 - Straight Leads
1 - Bent Leads

Resolution (Cycles/Rev)	
S - 50 CPR	G - 360 CPR
C - 100 CPR	H - 400 CPR
E - 200 CPR	A - 500 CPR
F - 256 CPR	I - 512 CPR
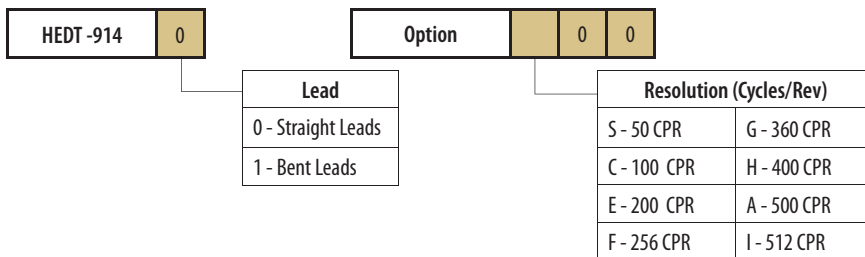
Available Options														
Part Number	Options													
	A	B	C	D	E	F	G	H	I	J	K	S	T	U
HEDS-9140	●		●		●	●	●	●	●		●			
HEDS-9141	●				●	●	●							
Please refer to codewheel ordering information for recommended usage														

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Two Channel Incremental Encoders – HEDS-900X series

| HEDS-9000 Option | | 0 | 0 |

Resolution (Cycles/Rev)	
A - 500 CPR	B - 1000 CPR
J - 1024 CPR	T - 2000 CPR
U - 2048 CPR*	

Available Options														
Part Number	Options													
	A	B	C	D	E	F	G	H	I	J	K	S	T	U
HEDS-9000	●	●								●			●	●
Please refer to codewheel ordering information for recommended usage														

Three Channel Incremental Encoders – HEDS-904X series

| HEDS-904 | 0 |

Lead
0 - Straight Leads
1 - Bent Leads

| Option | | 0 | 0 |

Resolution (Cycles/Rev)
A - 500 CPR
T - 2000 CPR*
J - 1024 CPR

Available Options														
Part Number	Options													
	A	B	C	D	E	F	G	H	I	J	K	S	T	U
HEDS-9040	●									●			●	
HEDS-9041	●													
Please refer to codewheel ordering information for recommended usage														

High Temp 125°C Two Channel Optical Incremental Encoder Modules – HEDT-9000/9100 series

| HEDT -910 | 0 |

Lead
0 - Straight Leads
1 - Bent Leads

| Option | | 0 | 0 |

Resolution (Cycles/Rev)	
C - 100 CPR	G - 360 CPR
D - 192 CPR	A - 500 CPR
E - 200 CPR	I - 512 CPR

Available Options					
Part Number	Options				
	A	C	D	E	G	I
HEDT-9001	●					
HEDT-9100	●	●		●	●	●
HEDT-9101	●	●	●	●	●	●
Please refer to codewheel ordering information for recommended usage						

Incremental Optical Encoders
Transmissive Module

High Temp 140°C Three Channel Optical Incremental Encoder Modules – HEDT-9040/9140 series

HEDT-914	0

Lead

0 - Straight Leads
1 - Bent Leads

Option	0	0

Resolution (Cycles/Rev)

I - 512 CPR

Available Options									
Part Number	**Options**								
	A	B	C	D	E	F	G	H	I
HEDT-9140									●
HEDT-9141									●
Please refer to codewheel ordering information for recommended usage									

HEDL-900xx/91xx Series

HEDL-90		0

Outputs

0 - 2 Channel
4 - 3 Channel

Option	0	0

Resolution (Cycles/Rev)

B - 1000 CPR
U - 2048 CPR

HEDL-91		0

Outputs

0 - 2 Channel
4 - 3 Channel

Option	0	0

Resolution (Cycles/Rev)

A - 500 CPR
I - 512 CPR

Available Options				
Part Number	**Options**			
	A00	B00	I00	U00
HEDL-9000				●
HEDT-9040		●		
HEDL-9100	●			
HEDL-9140	●		●	
Please refer to codewheel ordering information of HEDS-5120, HEDS-5140, HEDM- 6120 and HEDS-6140 series for recommended codewheel usage				

Incremental Optical Encoders
Transmissive Module

HEDS-9700/973x Series

Description

- High performance
- HEDS-973x is a high-resolution version of HEDS-9700
- Detects rotary or linear position when operated in conjunction with either a codewheel or codestrip
- Consists of a lensed LED source and a detector IC enclosed in a small C-shaped plastic package
- Extremely tolerant to mounting misalignments due to a highly collimated light source and unique photodetector array
- Two channel digital output
- 5-V supply input
- Four solder-plated leads located on 2.54 mm (0.1 inch) centers
- Standard HEDS-9700 is designed for use with 11-mm optical radius codewheel or linear codestrip. (Other options are available - refer to factory for further details)

Features

- Small size
- Wide resolution range
- No signal adjustment required
- Two channel quadrature output
- Single 5-V supply
- -40°C to +85°C operating temperature
- Multiple mounting options
- Linear and rotary options available
- Wave solderable
- Lead-free package

Applications

- Printers
- Plotters
- Copiers
- Office automation equipment

* Refer to product datasheet for package dimensions

Incremental Optical Encoders
Transmissive Module

Ordering Information

HEDS-97		

Lead Bend
0 - Straight Leads
1 - Bent Leads

0 - Rotary
2 - Linear

Option			

Mounting Options
50 - Standard
51 - Rounded Outline
52 - Backplane
53 - Standard w/Posts
54 - Tabless
55 - Backplane w/Posts

Resolution Options (11 mm optical radius,Rop)
K - 96 CPR
C - 100 CPR
D - 192 CPR
E - 200 CPR
F - 256 CPR
G - 360 CPR
H - 400 CPR
(Linear)
L - 120 LPI
M - 127 LPI
P - 150 LPI
Contact Factory for Other Resolution Options

HEDS-973	

Lead Bend
0 - Straight Leads
1 - Bent Leads
2 - Straight Leads
3 - Bent Leads

Option			

Mounting Options
50 - Standard
51 - Screwmount
52 - Backplane
53 - Standard w/Posts
54 - Tabless
55 - Backplane w/Posts

Resolution Options
A - 500 CPR, 11 mm Rop
B - 1000 CPR, 11 mm Rop
J - 1024 CPR, 11 mm Rop
Q - 180 LPI, Linear
2 - 300 LPI, Linear
1 - 360 LPI, Linear
3 - 480 LPI, Linear
T - 2000 CPR, 23.36 mm Rop
U - 2048 CPR, 23.36 mm Rop

Note: Please contact factory for codewheel and codestrip information.

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Incremental Optical Encoders
Transmissive Module

HEDS-971x Series

Description

- High performance
- Detects rotary position when operates in conjunction with a codewheel
- Consists of a lensed LED source and a detector IC enclosed in a small C-shaped plastic package
- Extremely tolerant to mounting misalignment due to a highly collimated light source and unique photodetector array
- Two channel analog output
- 5-V supply input
- Four solder plated leads located on 2.54 mm (0.1 inch) centers
- Designed for use with an appropriate optical radius codewheel. (Refer to factory for further details)

Features

- Small size
- Wide resolution range
- No signal adjustment required
- Single 5-V supply
- Two channel analog output
- 15°C to 45°C operating temperature
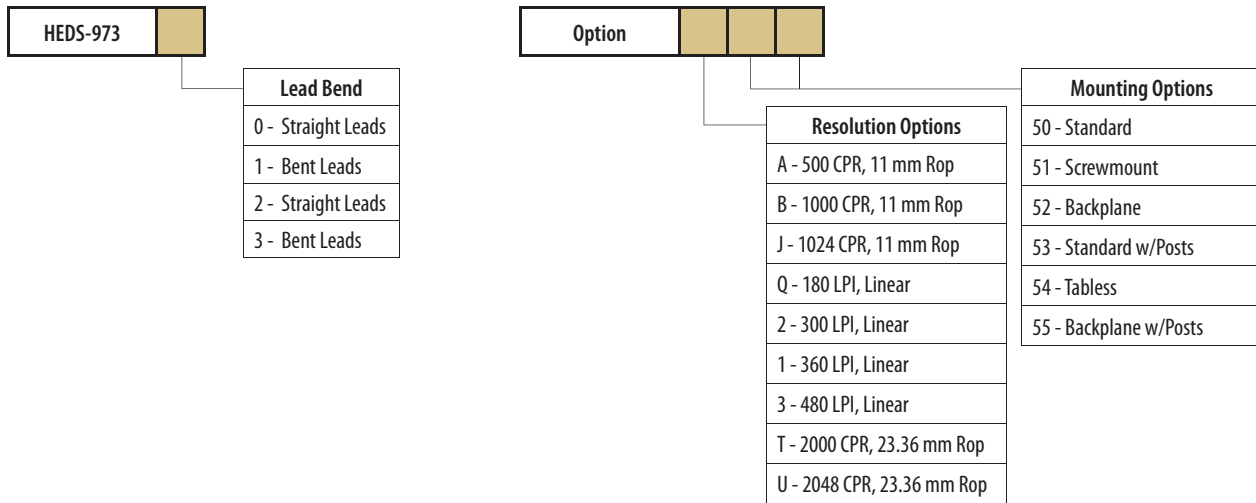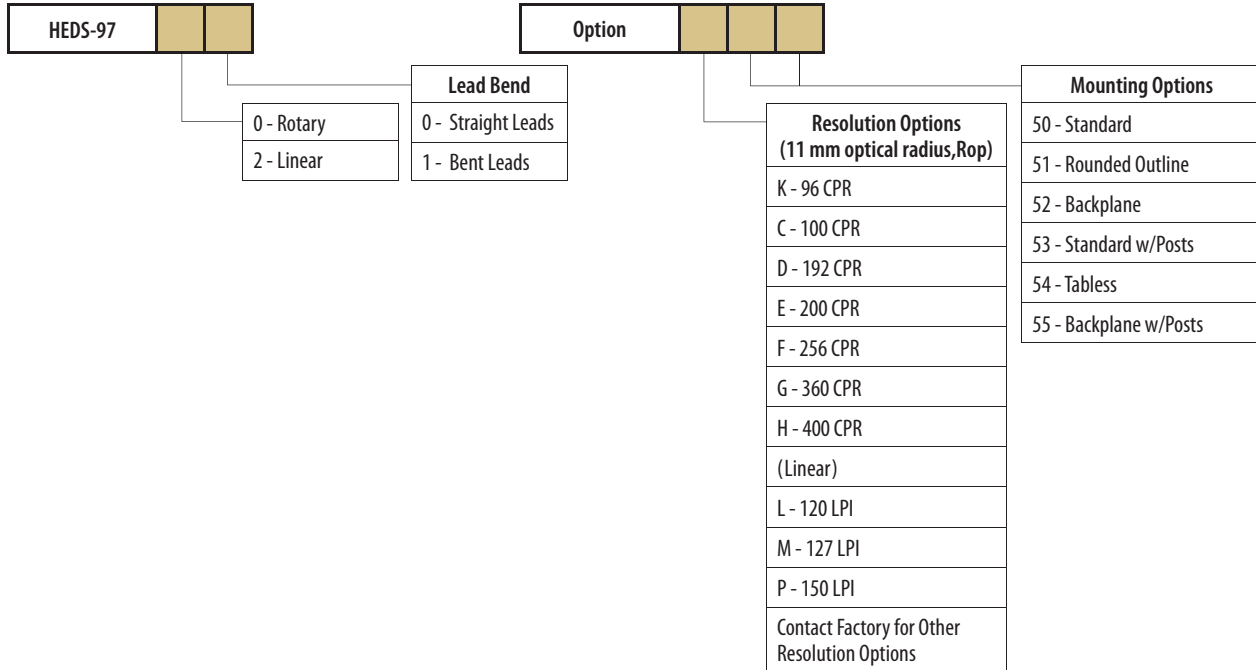- Multiple mounting options
- Wave solderable
- Lead-free package

Applications

- Printers
- Plotters
- Copiers
- Office automation equipment

* Refer to product datasheet for package dimensions

Ordering Information

HEDS-971			Option			

Lead Configurations
0 - Straight Leads
1 - Bent Leads

Resolution
1 - 360 LPI
R - 200 LPI

Mounting Option
50
54
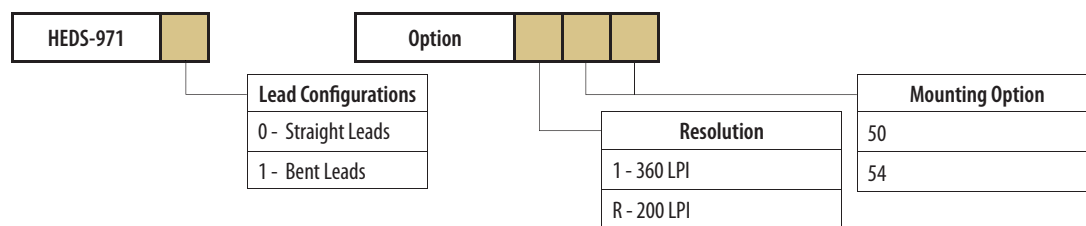
Note: Please contact factory for codewheel and codestrip information.

Incremental Optical Encoders
Transmissive Module

AEDS-964x Series

Description

- High performance
- Ultra-miniature package
- Detects rotary or linear position when operated in conjunction with either a codewheel or codestrip
- Consists of lensed LED source and a detector IC enclosed in a small C-shaped plastic package
- Extremely tolerant to mounting misalignment due to a highly collimated light source and unique photodetector array
- Two channel digital output
- 3.3/5.0-V supply input
- Four solder plated leads located on 2.00 mm (0.1 inch) centers
- Supply input of LED rated at 16 mA, accessed through two leads located at 2.54 mm
- Designed for use with an 11.00 mm optical radius codewheel or linear codestrip. (Other options are available – refer to factory for further details)

Features

- Low package height, small size
- Built-in codewheel and codestrip guide bumps
- Wide resolution range
- For linear and rotary applications
- No signal adjustment required
- Insensitive to radial and axial play
- 0°C to + 70°C operating temperature
- Two channel quadrature output
- TTL, 3.3/5.0-V CMOS compatible
- Wave solderable
- Lead-free package

Applications

- Printers
- Plotters
- Copiers
- Office automation equipment
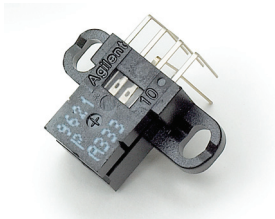
* Refer to product datasheet for package dimensions

Ordering Information

AEDS-964		Option		1	0

Lead Configurations
0 - Straight Leads
1 - Bent Leads

Resolution
P - 150 LPI
2 - 300 LPI
1 - 360 LPI

Mounting Options

Other mounting options are available. Please refer to factory for further details.

Note: Please contact factory for codewheel and codestrip information.

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Incremental Optical Encoders
Transmissive Module

AEDA-3200/3300 Series

Description

- Ultra-miniature package with wide resolution ranges
- "One size fits all resolutions" concept makes it ideal for space-constrained applications
- Uses transmissive technology
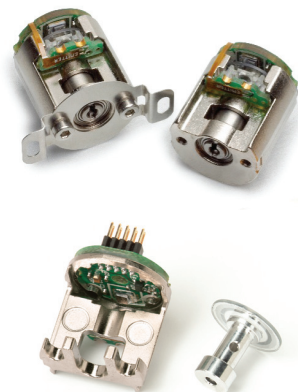- Consists of a lensed LED source, an integrated circuit with detectors and output circuitry, and an incremental track-glass codewheel that rotates between the emitter and detector IC
- Emitter and detector IC are housed in a C-shape module with the codewheel attached to a specially designed hub
- Eliminates customer need to design different platforms for different resolutions
- Extremely cost effective
- Specifically designed to serve industrial market where applications require wide temperature ranges and high accuracy
- High operating frequencies
- Fits standard 2 mm customer solid shaft (Contact factory for other shaft sizes)
- AEDA-3200 Series modular unit offers a patented alignment tool which makes installation and assembly virtually plug & play. Eliminates the need for costly assembly machines and provides faster turn around time to manufacture. Encoder module comes in a C-shape module with a codewheel attached to a special hub
- AEDA-3300 series unit offers a pre-aligned and integrated bearing kit housing
- Assembled unit, offered at a slight cost increase, saves production cycle time. Encoder module comes in a pre-aligned and integrated bearing kit housing

Features

- AEDA-3200 - 17 mm diameter x 23.2 mm height (module size)
- AEDA-3300 - Bxx - 17 mm diameter x 24.0 mm height (module size)
- AEDA-3300 - Txx size - 28 mm diameter x 26.7 mm height (module size)
- Resolution ranges from 600 to 20,000 CPR (up to 80,000 after 4x decode)
- Wide operating temperature range from -40°C through 125°C
- Integrated line driver for long cable connection
- Easy assemble process with integrated bearing options
- Single 5-V supply
- 1 MHz, maximum frequency
- 12,000 RPM, maximum speed
- AEDA-3200 series offers plug and play capability

Applications

- Servo motors
- Stepper motors
- Pick and place machines
- Die bonders
- Robotics
- Machine tools
- Textiles
- Factory automation

* Refer to product datasheet for package dimensions

Incremental Optical Encoders
Transmissive Module

Ordering Information

AEDA-3		0	0		Option			

Housing Type

2	Modular
3	Pre-aligned Kit

Mounting Options

T	Top-down
B	Bottom-up
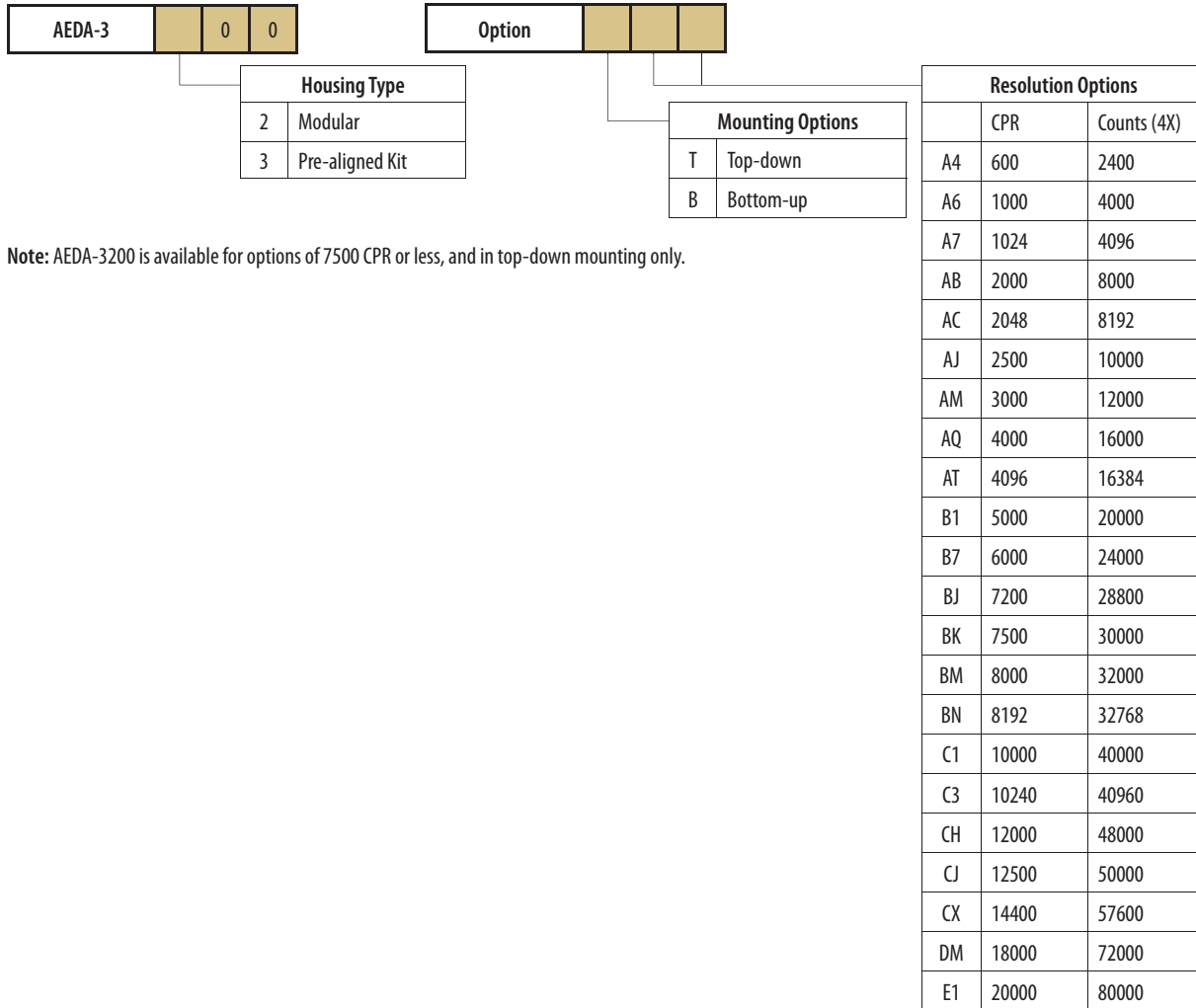
Note: AEDA-3200 is available for options of 7500 CPR or less, and in top-down mounting only.

Resolution Options

	CPR	Counts (4X)
A4	600	2400
A6	1000	4000
A7	1024	4096
AB	2000	8000
AC	2048	8192
AJ	2500	10000
AM	3000	12000
AQ	4000	16000
AT	4096	16384
B1	5000	20000
B7	6000	24000
BJ	7200	28800
BK	7500	30000
BM	8000	32000
BN	8192	32768
C1	10000	40000
C3	10240	40960
CH	12000	48000
CJ	12500	50000
CX	14400	57600
DM	18000	72000
E1	20000	80000

Incremental Optical Encoders
Transmissive Module
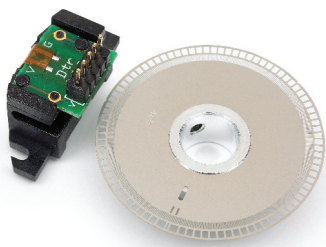
AEDB-9140 Series

Description

Description
- Three channels
- Low cost
- Detects rotary position when used with a codewheel
- Consists of a lensed LED source and detector IC enclosed in a small plastic package
- Extremely tolerant to mounting misalignment due to a highly collimated light source and unique photodetector array
- AEDB-9140 has a two channel quadrature output, plus a third channel index output. (The index output is a 90 electrical degree high, true index pulse, which is generated once for each full rotation of the codewheel)
- AEDB-9140 is designed for use with a codewheel with an optical radius of 11.00 mm (0.433 inch)
- Quadrature signals and index pulse are accessed through five 0.46-mm square pins located on 1.2- mm (pitch) centers

* Refer to product datasheet for package dimensions

Features

- Two channel quadrature output with index pulse
- Resolution from 100 CPR up to 500 CPR
- Low cost
- Easy to mount
- No signal adjustment required
- Small size
- -10oC to 85oC operating temperature
- TTL compatible
- Single 5-V supply

Applications

Ideal for high-volume applications, like:
- Printers
- Plotters
- Tape drives
- Industrial equipment
- Factory automation equipment

Incremental Optical Encoders
Transmissive Module

Ordering Information

Three Channel Encoder Modules with Codewheel, 11 mm Optical Radius

AEDB-9140 Option			

Resolutions (Cycle/Rev)
C - 100 CPR
E - 200 CPR
F - 256 CPR
G - 360 CPR
H - 400 CPR
A - 500 CPR

Shaft Diameter*
02 - 3 mm
04 - 5/32 in
05 - 3/16 in
06 - 1/4 in
11 - 4 mm
12 - 6 mm
13 - 8 mm
14 - 5 mm
* Please contact factory for other shaft diameters

Available Options									
Part Number	CPR	Shaft Diameter Options							
		02	04	05	06	11	12	13	14
AEDB-9140	C		●		●		●	●	●
	E				●	●	●		●
	F		●				●		●
	G				●		●		●
	H				●				●
	A	●	●	●	●	●	●	●	●

Incremental Optical Encoders
Transmissive Housed

HEDS-65xx, HEDM-65xx, HEDL-65xx Series

Description

HEDS-65XX Series

- High performance two and three channel optical encoders
- High reliability, high resolution and easy assembly
- Contains a lensed LED source or emitter, integrated circuitry and a codewheel which rotates between the emitter and detector IC
- HEDS-6500 series output features two single-ended square waves in quadrature
- HEDS-6540 series output has a third channel index output in addition to the two quadrature outputs. This index is an active high pulse that occurs once every full rotation of the codewheel
- Resolutions up to 8,192 CPR available in two and three channel versions

HEDM-65XX Series

- Same features as listed above
- Comes with film codewheels
- Resolutions available from 1,024 to 2,048 CPR in two and three channel versions

HEDL-65XX Series

- Comes with differential outputs
- Utilizes an industry standard line driver IC (an integrated RS-422 differential line driver), which provides complementary output for each encoder channel and enables enhanced performance when the encoders are used in noisy environments or when they are required to drive long distances
- Suggested line receivers: 26C32 and 26C33
- Quadrature signals are accessed through a cable and 10-pin female connector, which is manufactured by FCI, part number: 66900-310. The mating connectors are also manufactured by FCI; straight type part number: 71912-010, right angle type part number: 71913-010

Features

- Two channel quadrature output with optional index pulse
- HEDS series features TTL-compatible, single-ended outputs
- Up to 100°C operating temperature
- HEDL series features industry-standard 26C31 CMOS line driver IC
- Easy assembly, no signal adjustment necessary
- Up to 8,192 CPR
- Maximum shaft diameter of 5/8 inches
- Single 5-V supply

Applications

- Machine tools
- Textiles
- Photocopiers and printing machinery
- Pulp and paper
- Chemical and pharmaceutical
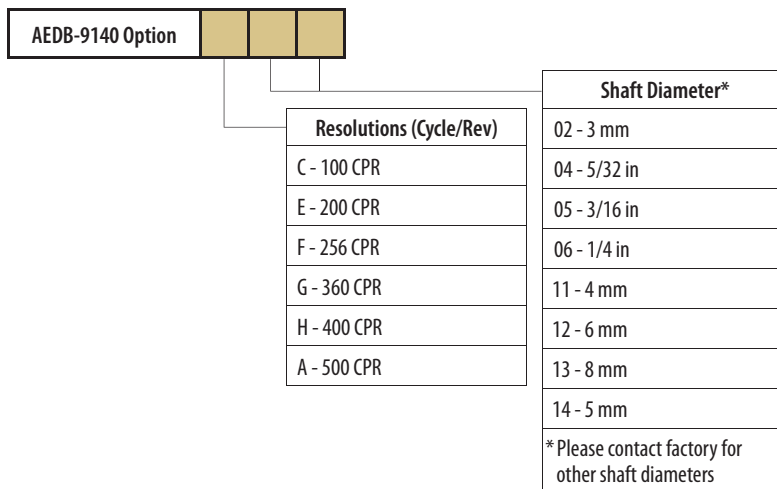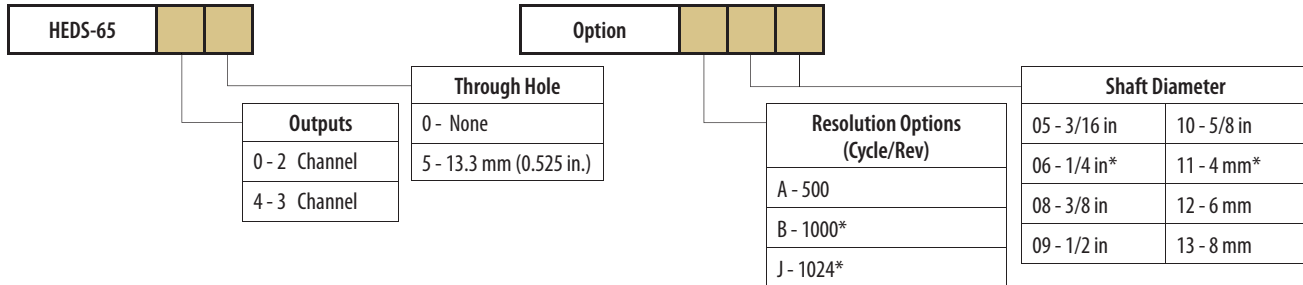- Factory automation assembly
- Automatic handlers

* Refer to product datasheet for package dimensions

Incremental Optical Encoders
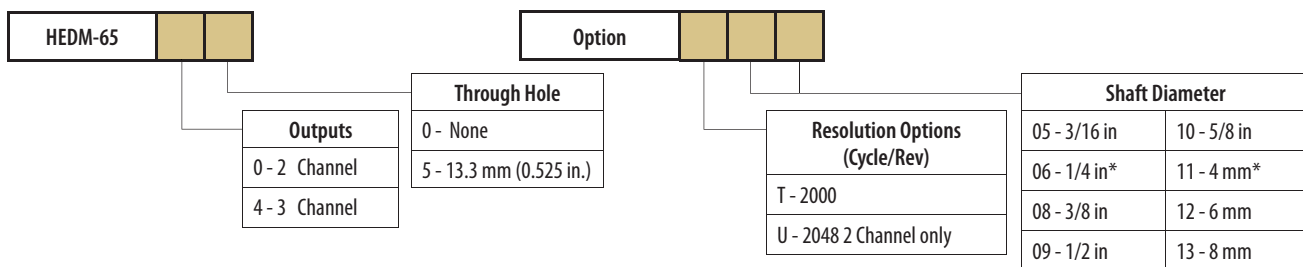## Transmissive Housed

Ordering Information

Large Diameter Housed, 2 and 3 Channel Encoders with Metal Codewheels (up to 100°C) – HEDS-65xx Series

HEDS-65		

Outputs
0 - 2 Channel
4 - 3 Channel

Through Hole
0 - None
5 - 13.3 mm (0.525 in.)

Option			

Resolution Options (Cycle/Rev)
A - 500
B - 1000*
J - 1024*

Shaft Diameter	
05 - 3/16 in	10 - 5/8 in
06 - 1/4 in*	11 - 4 mm*
08 - 3/8 in	12 - 6 mm
09 - 1/2 in	13 - 8 mm

* This is a popular option with short lead time

Available Options									
Part Number		**Options**							
		05	06	08	09	10	11	12	13
HEDS-6500#	A	●	●	●	●	●	●	●	●
	B	●	●	●	●	●	●	●	●
	J	●	●	●	●	●	●	●	●
HEDS-6505#	A								
	B				●	●			
	J				●				
HEDS-6540#	A	●	●	●	●	●	●	●	●
	B	●	●	●	●	●	●	●	●
	J	●	●	●	●	●	●	●	●
HEDS-6545#	A			●		●			
	B			●					
	J		●		●				

Large Diameter Housed, 2 and 3 Channel Encoders with Film Codewheel (up to 70°C) – HEDM-65xx Series

HEDM-65		

Outputs
0 - 2 Channel
4 - 3 Channel

Through Hole
0 - None
5 - 13.3 mm (0.525 in.)

Option			

Resolution Options (Cycle/Rev)
T - 2000
U - 2048 2 Channel only

Shaft Diameter	
05 - 3/16 in	10 - 5/8 in
06 - 1/4 in*	11 - 4 mm*
08 - 3/8 in	12 - 6 mm
09 - 1/2 in	13 - 8 mm

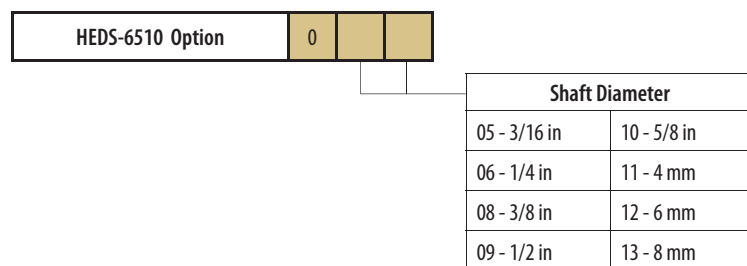| Available Options									
Part Number		**Options**							
		05	06	08	09	10	11	12	13
HEDM-6500#	T		●	●					
	U		●						●
HEDM-6505#	T		●	●					
	U								●
HEDM-6540#	T						●		●
HEDM-6545#	T								

Incremental Optical Encoders
Transmissive Housed

Ordering Information

Large Diameter Housed, 2 and 3 Channel Encoders with Metal Codewheel and Line Driver (up to 70°C) – HEDL-65xx Series

HEDL-65			

Through Hole

Outputs
0 - 2 Channel
4 - 3 Channel

Through Hole
0 - None
5 - 13.3 mm (0.525 in.)

Option			

Resolution Options (Cycle/Rev)
A - 500
B - 1000
J - 1024

Shaft Diameter	
08 - 3/8 in	11 - 4 mm
09 - 1/2 in	12 - 6 mm
10 - 5/8 in	13 - 8 mm
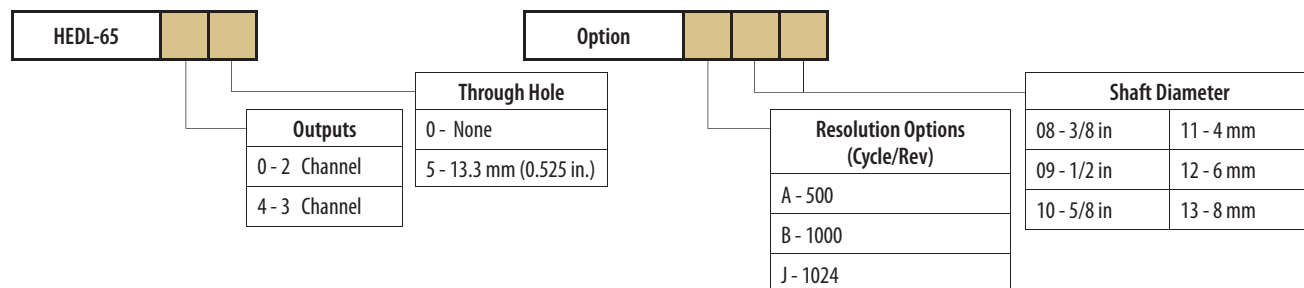
Available Options									
Part Number		Options							
		05	06	08	09	10	11	12	13
HEDL-6540#	B						●		●
HEDS-6545#	B				●				
	J		●	●	●				

Ordering Information for HEDS-6510 Centering Tools

HEDS-6510 Option	0		

Shaft Diameter	
05 - 3/16 in	10 - 5/8 in
06 - 1/4 in	11 - 4 mm
08 - 3/8 in	12 - 6 mm
09 - 1/2 in	13 - 8 mm

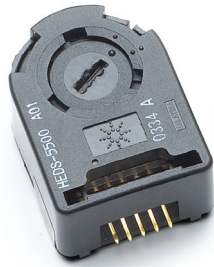| Available Options									
Part Number		Options							
		05	06	08	09	10	11	12	13
HEDS-6510	0	●	●	●	●	●	●	●	●

Ordering Information for HEDS-65xx Codewheel

Gapping Tool

HEDS-6511

Incremental Optical Encoders

Transmissive Housed

HEDL-5xxx, HEDS-550x/554x, HEDS-560x/564x, HEDM-550x/560x Series

Description

HEDS-550X/HEDM-550X/HEDS-560X and HEDS-554X/HEDS-564X Series

- High-performance, two and three channel incremental optical encoders

- High reliability, high resolution, easy assembly

- Contains a lensed LED source or emitter, an integrated circuit with detectors and output circuitry, and a codewheel which rotates between the emitter and detector IC

- HEDS-550X/HEDM-550X/HEDS-560X output is two square waves in quadrature

- HEDS-554X/HEDS-564X output has a third channel index output in addition to the two channel quadrature

- The index output is a 90 electrical degree, high true index pulse which is generated once for each full rotation of the codewheel

- Features quick and easy to motor mounting

HEDM-55XX/56XX Series

- Features same as listed above

- Comes with film codewheels

HEDS-56XX and HEDM-56XX Series

- Features same as listed above

- Features mounting ears

HEDL-55XX Series

- Features differential output

- Utilizes an industry-standard line driver IC (26C31), which provides complementary output for each encoder channel, offering enhanced performance when the encoders are used in noisy environments, or when required to drive long distances.

- Suggested line receivers: 26C32 and 26C33

- Quadrature signals are accessed through a cable and 10-pin female connector, manufactured by FCI, part number: 66900-310. The mating connectors are also made by FCI; for straight type part number: 71912-010, right angle type part number: 71913-010

Features

- Two channel quadrature output with optional index pulse

- Quick and easy assembly

- No signal adjustment required

- External mounting ears available

- Low cost

- Resolutions up to 1,024 CPR

- Small size

- -40°C to 100°C operating temperature

- TTL compatible

- Single 5-V supply

Applications

Ideal for high-volume applications, including:
- Printers

- Plotters

- Tape drives
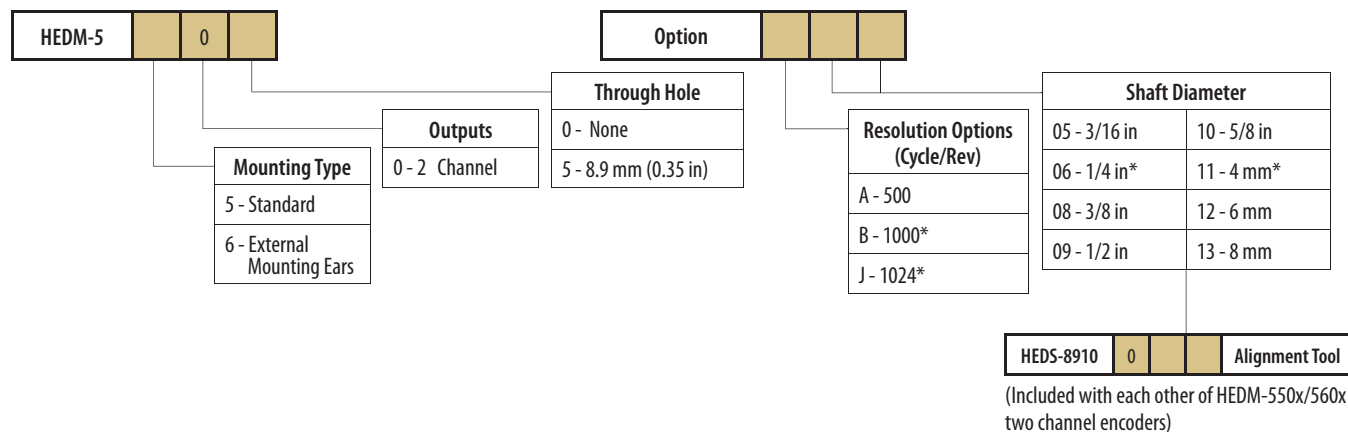
- Positioning tables and automatic handlers

* Refer to product datasheet for package dimensions
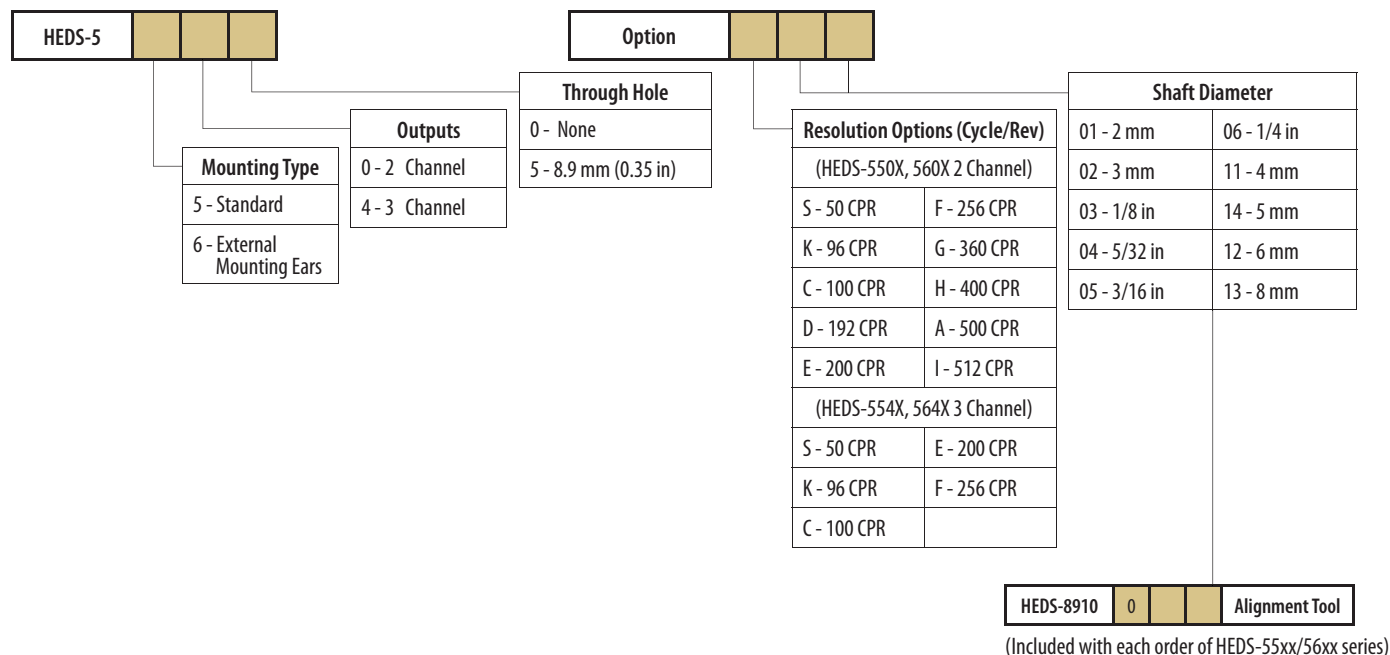
Incremental Optical Encoders
Transmissive Housed

Ordering Information

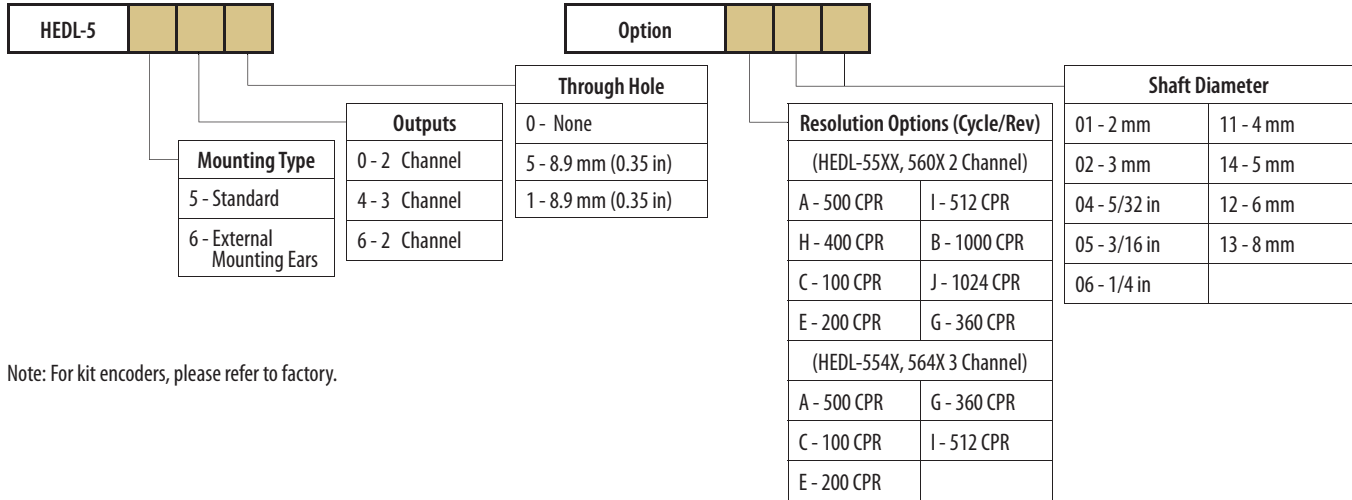**Mid-Sized Housed Encoders with Film Codewheels – HEDM-550x/560x series**

HEDM-5		0		

Mounting Type

5 - Standard
6 - External Mounting Ears

Outputs

0 - 2 Channel

Through Hole

0 - None
5 - 8.9 mm (0.35 in)

Option			

Resolution Options (Cycle/Rev)

A - 500
B - 1000*
J - 1024*

Shaft Diameter

05 - 3/16 in	10 - 5/8 in
06 - 1/4 in*	11 - 4 mm*
08 - 3/8 in	12 - 6 mm
09 - 1/2 in	13 - 8 mm

HEDS-8910	0			Alignment Tool

(Included with each other of HEDM-550x/560x two channel encoders)

Mid-Sized Housed Encoders with Metal Codewheels – HEDS-550x/554x/564x Series

HEDS-5			

Mounting Type

5 - Standard
6 - External Mounting Ears

Outputs

0 - 2 Channel
4 - 3 Channel

Through Hole

0 - None
5 - 8.9 mm (0.35 in)

Option			

Resolution Options (Cycle/Rev)

(HEDS-550X, 560X 2 Channel)	
S - 50 CPR	F - 256 CPR
K - 96 CPR	G - 360 CPR
C - 100 CPR	H - 400 CPR
D - 192 CPR	A - 500 CPR
E - 200 CPR	I - 512 CPR
(HEDS-554X, 564X 3 Channel)	
S - 50 CPR	E - 200 CPR
K - 96 CPR	F - 256 CPR
C - 100 CPR	

Shaft Diameter

01 - 2 mm	06 - 1/4 in
02 - 3 mm	11 - 4 mm
03 - 1/8 in	14 - 5 mm
04 - 5/32 in	12 - 6 mm
05 - 3/16 in	13 - 8 mm

HEDS-8910	0			Alignment Tool

(Included with each order of HEDS-55xx/56xx series)

Incremental Optical Encoders
Transmissive Housed

Mid-Sized Housed Encoders with Line Drivers – HEDL-5xxx series

HEDL-5			

Mounting Type
5 - Standard
6 - External Mounting Ears

Outputs
0 - 2 Channel
4 - 3 Channel
6 - 2 Channel

Through Hole
0 - None
5 - 8.9 mm (0.35 in)
1 - 8.9 mm (0.35 in)

Option			

Resolution Options (Cycle/Rev)	
(HEDL-55XX, 560X 2 Channel)	
A - 500 CPR	I - 512 CPR
H - 400 CPR	B - 1000 CPR
C - 100 CPR	J - 1024 CPR
E - 200 CPR	G - 360 CPR
(HEDL-554X, 564X 3 Channel)	
A - 500 CPR	G - 360 CPR
C - 100 CPR	I - 512 CPR
E - 200 CPR	

Shaft Diameter	
01 - 2 mm	11 - 4 mm
02 - 3 mm	14 - 5 mm
04 - 5/32 in	12 - 6 mm
05 - 3/16 in	13 - 8 mm
06 - 1/4 in	

Note: For kit encoders, please refer to factory.

HEDS-8910	0			Alignment Tool

(Included with each order of HEDL-5xxx series)

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Incremental Optical Encoders
Transmissive Housed

Available Options

Available Options											
Part Number		**Options**									
		01	02	03	04	05	06	11	12	13	14
HEDL-5540	A	•	•			•	•	•	•	•	•
	C		•			•			•		
	E						•	•			
	G							•			
	I	•					•	•		•	
HEDL-5640	A						•			•	•
HEDL-5645	A						•			•	
	G						•				
HEDL-5500	A		•				•				
	E						•				
	G					•			•		
	H						•				
	I				•						
HEDL-5505	A						•				
	I									•	
HEDL-5560	B		•					•		•	
HEDL-5561	J						•				
HEDL-5600	A						•				
	H						•				
HEDL-5605	A						•				
	C										•
HEDM-5500	B	•	•				•	•	•	•	•
	J		•				•		•	•	•
HEDM-5505	B				•						
	J			•			•			•	
HEDM-5600	B						•			•	
	J						•				
HEDM-5605	B						•			•	
	J						•				
HEDS-5500	A	•	•	•	•	•	•	•	•	•	•
	C	•	•	•	•	•	•	•	•	•	•
	E		•		•	•	•	•	•		•
	F	•	•		•	•	•	•	•		•
	G		•			•	•	•	•		•
	H					•	•		•		•
	I	•	•	•	•	•	•	•	•	•	•
	K				•	•	•	•			
	S									•	

Incremental Optical Encoders
Transmissive Housed

Available Options

Part Number		01	02	03	04	05	06	11	12	13	14
HEDS-5505	A				•		•			•	•
	C				•		•		•		•
	E				•		•				•
	F				•		•				•
	G				•		•				
	H						•				•
	I				•		•			•	
	K				•						
HEDS-5540	A	•	•	•	•	•	•	•	•	•	•
	C	•	•				•	•	•	•	•
	E						•	•	•		
	F	•						•			•
	G						•				
	H						•				•
	I	•	•				•	•	•	•	•
HEDS-5545	A						•		•		•
	C								•		
	H						•				•
	I						•				
HEDS-5600	A						•		•	•	•
	C						•		•		•
	E						•				
	G						•			•	
	H						•		•		
	I	•						•			
HEDS-5605	A						•			•	
	C						•				
	E						•				
	F									•	
	G						•				
	H						•				•
	I						•				
HEDS-5640	A						•		•	•	
	E						•		•		
	F						•				
	H						•				
HEDS-5645	A						•		•	•	
	C									•	
	E									•	
	F									•	
	G									•	
	H						•		•		•
	I									•	

Incremental Optical Encoders
Transmissive Housed

HEDL-64xx Series

Description

- Highly robust design
- Ultra-miniature small form factor, ideal for space-constrained applications
- Fits onto almost any servo motor without taking up excessive space
- Features an ingress-protected package of IP50 (dust-protected)
- Utilizes transmissive technology
- Consists of a lensed LED source or emitter, an integrated circuit with detectors and output circuitry, and an incremental track glass codewheel that rotates between the emitter and detector IC
- Components are contained within a zinc alloy metal housing that is fitted with bearings to produce an IP-rated encoder capable of working in harsh and dusty environmental conditions

Features

- 20 mm diameter x 15.9 mm height, housing
- Resolutions of 500 or 512 CPR
- 2 or 3 channel output signal
- 100 kHz, maximum operating frequency
- Ingress Protection (IP50) rated shell allows operation where dust-tight products are required
- -25°C through 90°C operating temperature
- Line driver of over 100 feet
- Shaft options of 2 mm, 3 mm or 4 mm
- Mounting options for coupling plate or tab hole

Applications

- Machine tools
- Textiles
- Photocopiers and printing machinery
- Servo motor applications
- Pulp and paper
- Chemical and pharmaceutical

* Refer to product datasheet for package dimensions

Incremental Optical Encoders
## Transmissive Housed

Ordering Information

Miniature Housed Encoders with Metal Codewheels – HEDL-64xx Series

HEDL-64		

Option				

Channel
0 - 2 Channel
4 - 3 Channel

Ribbon Cable Connection
2 - Pigtail
3 - Connector

Resolution
A - 500 CPR
I - 512 CPR

Mounting
P - Coupling Plate
T - Tab Hole

Shaft Size
01 - 2 mm
02 - 3 mm
11 - 4 mm
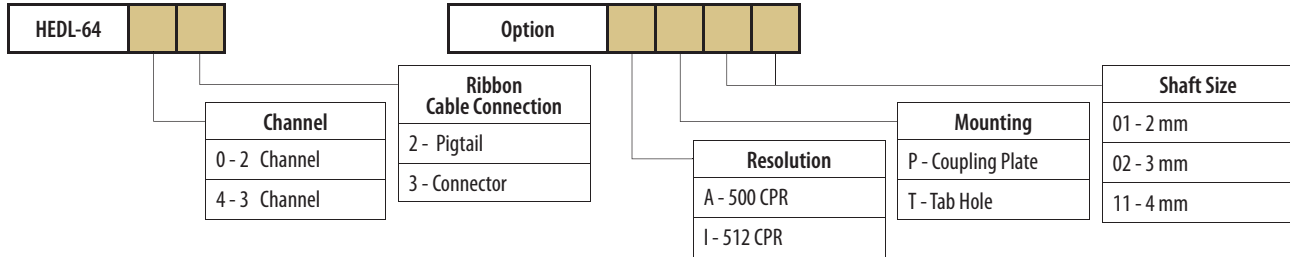
Note:

1. The 4mm shaft option is not available with a 3-channel output combination.
2. Non-IP rated options available upon request.
3. For kit encoders, please refer to factory.
4. For other options or requests, please contact Avago Technologies, Inc.

Incremental Optical Encoders
Transmissive Housed
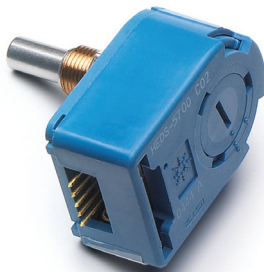
HEDS-57xx Series (Rotary Pulse Generators)

Description

- Low cost
- High performance
- Comes with mounted shafts and bushings
- Available with tactile feedback for hand-operated panel mount applications, or with a free spinning shaft for applications requiring a pre-assembled encoder for position sensing
- Contains a collimated LED light source and special detector circuit which allows for high resolution, excellent encoding performance, long rotational life, and increased reliability
- Two digital output waveforms which are 90 degrees out of phase to provide position and direction information
- HEDS-5740 series provides a third index channel
- HEDS-5700 is quickly and easily mounted to a front panel using the threaded bushing. It can also be directly coupled to a motor shaft (or gear train) for position sensing applications

Features

- Two-channel quadrature
- Output with optional index pulse
- Available with or without static drag for manual or mechanized operation
- Resolution up to 512 CPR
- Long rotational life >1 million revolutions
- -20˚C to 85˚C operating temperature
- TTL quadrature output
- Single 5-V supply
- Available with color-coded leads

Applications

**HEDS-5700
(with static drag option)**

Ideal for applications requiring digital information from a manually operated knob. Front panel applications include:
- Instruments
- CAD/CAM systems
- audio/video control boards

**HEDS-5700
(free spinning option)**

Ideal for low speed, mechanized operations, like:
- Copiers
- X-Y tables
- Assembly line equipment

Note: Avago Technologies encoders are not recommended for use in safety critical applications such as ABS braking systems, power steering, life support systems and critical care medical equipment. Please contact our sales representative for further clarification.

* Refer to product datasheet for package dimensions

Incremental Optical Encoders
Transmissive Housed

Ordering Information

| HEDS-57 | | | Option | | | |

	Outputs	
0 - 2	Channel	
4 - 3	Channel	

Mechanical Configuration	
0 -	Pins
1 - 6"	Coded Leads

Resolution (Cycles/Revolution)
HEDS-570X 2 Channel
K - 96 CPR
C - 100 CPR
F - 256 CPR
G - 360 CPR
A - 500 CPR
I - 512 CPR
HEDS-574X Three Channel*
A - 500 CPR
* Please contact factory for other resolutions

Drag Option	
0 - Free Spinning	
1 - Static Drag	

Shaft Configuration	
0 - 1/4" dia. with no flat	
1 - 6 mm dia. with no flat	
2 - 1/4" dia. with flat	
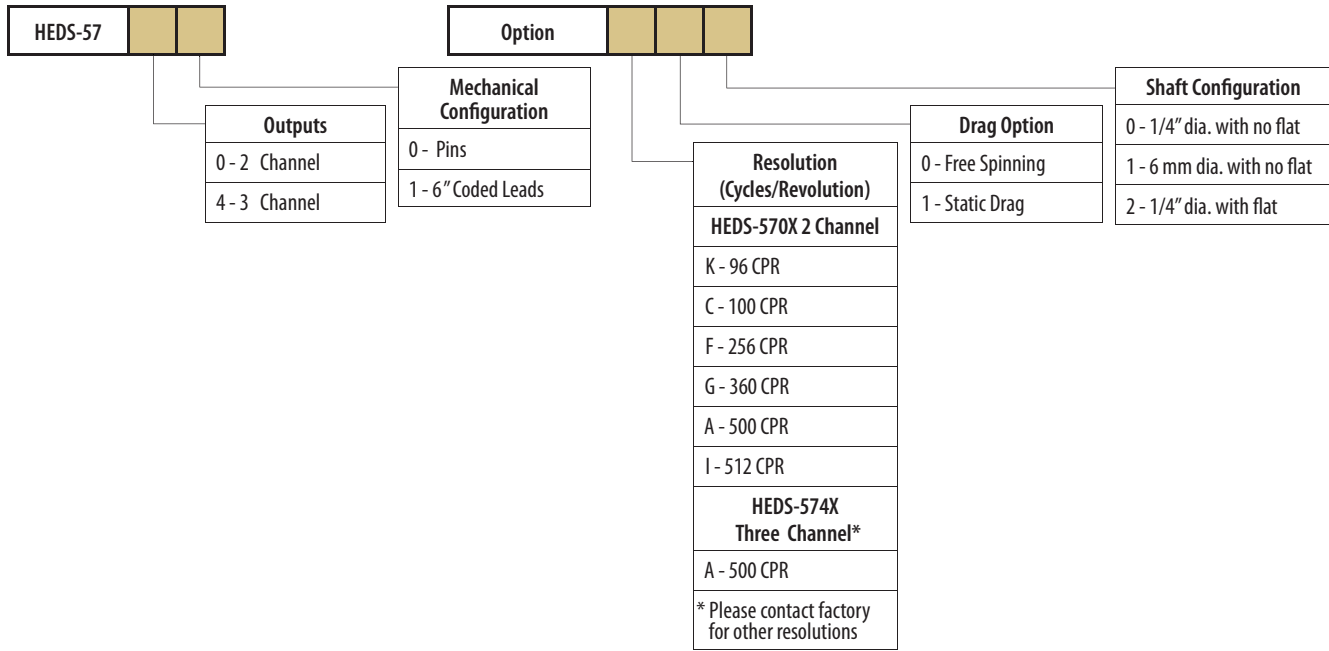
Available Options

		00	01	02	10	11	12
HEDS-5700#	A		●	●	●		
	C		●	●	●	●	
	F	●				●	●
	G	●					
	I	●	●	●	●		●
	K		●		●		
HEDS-5701#	A	●		●			●
	C				●		
	F	●	●		●	●	
	G	●					
	H		●				
	I			●			
HEDS-5740#	A			●			

Incremental Optical Encoders
Reflective Module
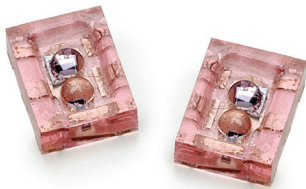
AEDR-83xx Series

Description

- New generation encoder
- SMT and leadless package, ideal for applications with critical space constraints
- More accurate real-time position indicator
- Single-channel and two-channel motion sensing at a very low cost
- Uses reflective technology to sense rotary or linear position
- Consists of an LED light source and a photodetector IC in a single package
- Provides either one (single channel) or two (two channel) square wave outputs in quadrature for count and direction information
- TTL-compatible outputs correspond to the alternating reflective/non-reflective patterns of the codewheel or codestrip
- Can be used over a range of codewheel and codestrip resolutions
- Environmentally friendly lead-free package compliant with current world standards

* Refer to product datasheet for package dimensions

Features

- 5.12 mm (L) x 3.96 mm (W) x 1.63 mm (H)
- Resolutions of 36, 75, 150 & 180 LPI
- 30 kHz, maximum operating frequency
- Rotary and linear motion sensing
- -20°C through 85°C absolute operating temperature
- One or two channel quadrature output for positioning and homing capabilities

Applications

Ideal for high-volume applications, like:
- Printers
- Copiers
- Card readers
- Scanners
- Cameras
- Motor solutions
- Electronic wheelchairs
- Automobile power steering
- Automotive applications
- Medical equipment such as automated wheelchair
- Wafer handling machines
- Vending machines
- Low servo systems
- ATM machines
- Textile machines
- Industrial sewing machines
- Consumer product applications

Incremental Optical Encoders
Reflective Module

Ordering Information

Pure Optical Leadless Array Optical Reflective Encoders – AEDR-8300

AEDR-83		0		Option			

Channels

1 - One Channel
2 - Two Channels

Packaging Options

1 - Tape & Reel

Resolution

K - 75 LPI
P - 150 LPI
Q - 180 LPI
V - 36 LPI

Shipping Units

0 - 1000 pcs
1 - 500 pcs
2- 100 pcs
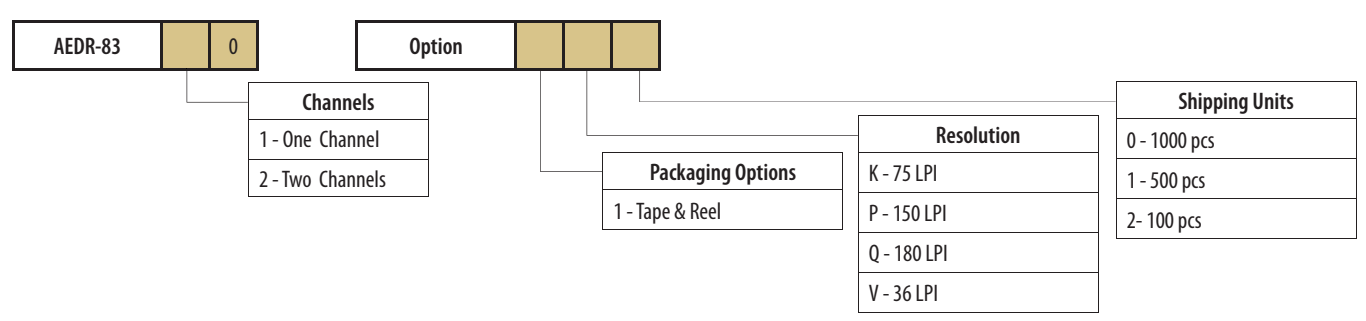
Note: Encoders are packed in tape of quantity 1000pcs or 500pcs or 100pcs.

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Incremental Optical Encoders
Reflective Housed

HEDR-542x Series

Description

- High performance
- Cost-effective
- Two channels
- High reliability, high resolution and easy assembly
- Uses reflective technology to sense rotary position
- Consists of an LED light source and photodetector IC in a single SO-8 surface mount package
- HEDR-542X output - two square waves in quadrature
- Quick and easy motor mounting

Features

- Two channel quadrature output
- Quick and easy assembly
- Cost-effective
- Ideal for small motor systems
- Resolutions at 200 CPR
- 0°C to 85°C operating temperature
- Right angle connector available
- Hub available in either a set screw configuration or a press-fit/adhesive mount configuration
- External mounting ears available

Applications

- Wafer handling machines
- Vending machines
- Motor manufacturing applications

* Refer to product datasheet for package dimensions

Ordering Information

Mid-Sized Housed Encoders – HEDR-54XX Series

| HEDR-54 | | | – | | | | | | |

Output	
2 - 2 Channel	

Connector	
0 - Standard/Axial	
1 - Right Angle/Radial	
Q - 180 LPI	

Resolution	
E - 200 CPR	

Hub	
S2 - Set screw with mounting ears baseplate	
P1 - Pressfit without mounting ears baseplate	

Shaft	
01 - 2 mm	
02 - 3 mm	
03 - 1/8 in	
11 - 4 mm	
14 - 5 mm	
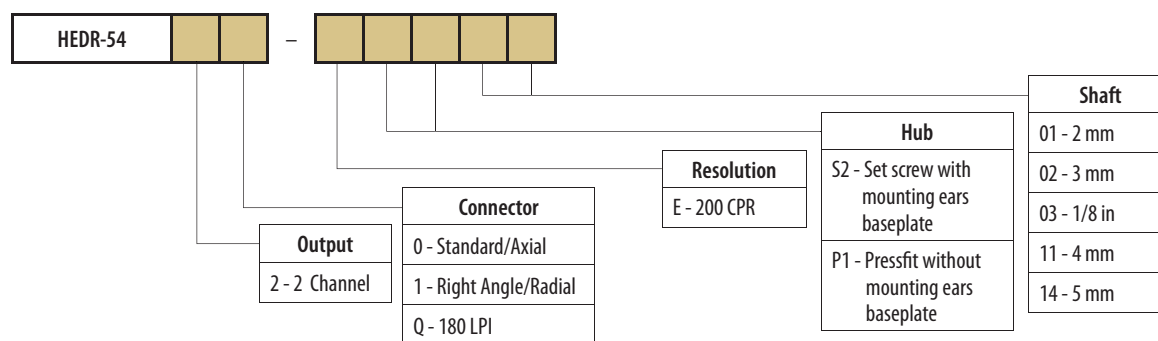
* Note: Pressfit options will only have 2 mm, 3 mm and 4 mm shaft available

Available Options					
Part Number	**Options**				
	01	02	03	11	14
HEDR-5420ES2	●	●	●	●	●
HEDS-5421EP1				●	

Note: For kit encoders, please refer to factory

Incremental Optical Encoders
Reflective Housed

HRPG Series (Rotary Pulse Generators)

Description

- Family of miniature panel-mount optical encoders and digital potentiometers
- Can be mounted on a front panel and used as a rotary, data-entry device
- Multiple configuration options accommodate a variety of different applications
- Available options include: detents or smooth, multiple terminations, versatile mounting capabilities, and different shaft configurations
- Uses optical reflective technology
- Single IC detector circuit makes the part less sensitive to temperature and other environmental variations

* Refer to product datasheet for package dimensions

Features

- Miniature size
- Smooth turning and detented options
- Multiple mounting bracket options
- Uses optical reflective technology
- Quadrature digital output
- Small footprint for versatile mounting
- TTL compatible

Applications

- Front panel instruments
- Audio/visual boards
- Other devices requiring digital output from a turning knob

Note: For applications requiring component reliability estimation, Avago Technologies can provide reliability data for all its families of devices.

Data is compiled from reliability tests run prior to market introduction to demonstrate that a product meets design criteria. This data represents the latest review of accumulated test results.

Incremental Optical Encoders
Reflective Housed

Ordering Information

Miniature Panel Mount Optical Encoders – HRPG Series

| HRPG-A | ☐ ☐ ☐ | # | ☐ ☐ ☐ |

Termination

Termination
F - Pins Front with Bracket
R - Pins Rear with Bracket
C - Cable Connector with Strain Relief

Mechanical Configuration

Mechanical Configuration
11 - 0.3 in. long, 0.25 in. dia.
13 - 0.3 in. long, 0.25 in. dia. D-cut
14 - 0.5 in. long, 0.25 in. dia.
15 - 0.5 in. long, 0.25 in. dia. D-cut
17 - 0.8 in. long, 0.25 in. dia.
19 - 0.8 in. long, 0.25 in. dia. D-cut
51 - 7.6 mm long, 6 mm dia.
53 - 7.6 mm long, 6 mm dia. D-cut
54 - 12.7 mm long, 6 mm dia.
56 - 12.7 mm long, 6 mm dia. D-cut
57 - 20.3 mm long, 6 mm dia.
59 - 20.3 mm long, 6 mm dia. D-cut

Shaft Feel/Resolution

Shaft Feel/Resolution
S16 - Smooth 16 CPR
D16 - Detented 16 CPR*
S32 - Smooth 32 CPR
D32 - Detented 32 CPR*
SCA - Smooth 120 CPR

Available Options

Part Number		Options 01	Options 02	Options 03
HRPG-AD32	11	●		●
	13	●	●	●
	14	●	●	●
	16	●	●	●
	17	●		
	19		●	●
	51	●	●	
	53	●	●	●
	54	●		●
	56	●		●
	57		●	
	59	●	●	●
HRPG-AS16	11			●
	14	●		
	17		●	
	51	●		
	53			●
	54		●	
HRPG-AS32	11			●
	13		●	●
	14	●		●
	53			●
	56		●	
	59	●		
HRPG-ASCA	11	●	●	●
	13	●		●
	14	●	●	●
	16	●	●	●
	17	●	●	●
	19	●	●	●
	51			●
	53	●	●	
	54	●	●	●
	56	●	●	●
	57		●	
	59	●	●	
HRPG-AD16	16	●	●	●
	51			●
	54		●	●
	56	●	●	
	59		●	

Note: For kit encoders, please refer to factory

Absolute Optical Encoders
Transmissive Module
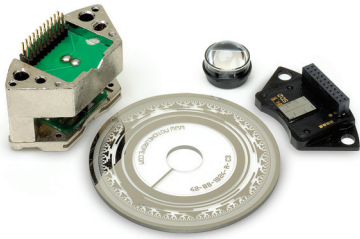
AEAS-7x00 Series (Single-Turn Module)

Description

- 16-bit absolute encoder module
- Feedback device which generates a unique binary 'word' for each encoder shaft position
- Encoder design provides positional information instantly upon power up, unlike incremental encoders that require codewheel movement to obtain such information
- Ideal for space-constrained applications
- Plug and play feature eliminates the need for multiple alignment adjustments, making installation very simple
- Contains 13 signal photodiode channels and 1 monitor photodiode channel - each accompanied by precision amplifiers and additional circuitry
- The integrated chip, together with a highly collimated light source and precision codewheel, outputs up to 16 bits of positional information to the user via a serial synchronous interface

* Refer to product datasheet for package dimensions

Features

- Miniature size, consists of 2 components only
- -25°C to 85°C standard operating temperature
- Quick and easy assembly using plug and play tool
- Cost-effective
- 11 digital tracks plus 2 sin/cos tracks to generate precise 16-bit gray code
- Ultra-fast, 1-μs cycle for serial data output word equals 16 MHz
- On-chip interpolation and code correction to compensate for mounting tolerance
- Internally built-in monitor track for tracking the light level

Applications

- Semiconductor automation machines
- Industrial sewing machine
- Robotics
- Automotive (body plant robot cells for assembly and welding)
- Machine tools

Ordering Information

1. AEAS-7000-1GSDO (13bit resolution)
2. AEAS-7000-1GSGO (16bit resolution)
3. AEAS-7500-1GSGO (16bit resolution)
4. HEDS-8933 AEAS-7000 alignment tool

Absolute Optical Encoders
Transmissive Module
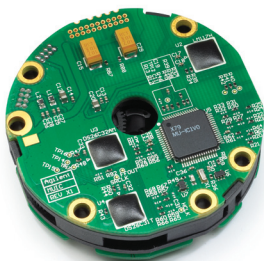
AEAS-84AD/AEAT-84AD/AEAT-86AD Series (Multi-Turn Module)

Description

- Optoelectronic-mechanical unit
- Provides multiturn capabilities when used with the AEAS-7000 single-turn absolute encoder
- When used together with AEAS-7000, the designer gains a complete multiturn absolute encoder with a total resolution of 30 bits (16-bit single turn, 14-bit multiturn)
- Enables the designer to count the number of rotations that the motor shaft has gone through

* Refer to product datasheet for package dimensions

- Ideal for space-constrained applications
- Its plug and play feature eliminates the need for multiple alignment adjustments, making installation very simple
- Consists of an IR-LED circuit board, a phototransistor (PT) circuit board, and either 6 (12 bits) or 7 (14 bits) code wheels, arranged in between the PCBs. This construction enables AEAx-8xAD to provide absolute multiturn positioning information without battery backup

Features

- 12-bit and 14-bit resolution within small form factor
- -25°C to 85°C nominal operating temperature
- -40°C to 125°C maximum operating temperature
- Gearing system can tolerate up to 12,000 rpm of speed, making it ideal for fast spinning applications like servo motors
- Integrator chip (built-in option available – AEAT-86AD)

Applications

- Robotics
- Machine tools
- Industrial sewing machines
- Semiconductor automation machines
- Packaging machines

Ordering Information

Standard Multiturn Encoder Module
1. AEAS-84AD-LBSC0 (12 bit, normal temp)
2. AEAS-84AD-LBSF0 (14 bit , normal temp)
3. AEAT-84AD-LBSC0 (12 bit, high temp)
4. AEAT-84AD-LBSF0 (14 bit , high temp)

Integrated Multiturn Encoder Module
1. AEAT-86AD-LASC0 (12 bit, high temp, binary code)
2. AEAT-86AD-LASF0 (14 bit, high temp, binary code)
3. AEAT-86AD-LCSC0 (12 bit, high temp, Gray code)
4. AEAT-86AD-LCSF0 (14 bit, high temp, Gray code

Integrated Circuits
Decoder
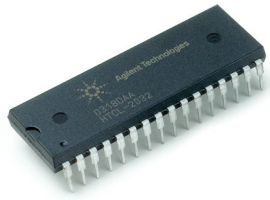
HCTL-2022/2032 Series

Description

- CMOS ICs that perform quadrature decoding, bus interfacing and counter functions

- Designed to improve system performance in digital, closed-loop motion control systems and digital data input systems. ICs interface the encoder to the microprocessor

- HCTL-2022 comes in a 20-pin PDIP (Plastic Dual In-Line Package)

- HCTL-2032 comes in a 32-pin PDIP

- HCTL-2032-SC comes in a 32-pin SOIC

- HCTL-2032/2032-SC are not pin-to-pin compatible with the HCTL-2000 series, but it is backward compatible in terms of functionality with some added enhancements

- HCTL-2032 IC supports single or dual-axis support. Cost savings realized due to decrease in on-board components

- HCTL-2022 is similar to the HCTL-2032 except that it only has single-axis control

- Large counter allows the IC to operate without the support of extra memory, further reducing the number of supporting components needed on board and decreasing cost

- Features allow deeper penetration into the

Industrial Automation market, such as servo motor market

- Key advantages over competitors:

- HCTL-2022/2032 operates at a wider range of temperatures, making it suitable for deeper penetration into the Industrial Automation Market

- Cascaded output signals allow design flexibility

- A 32-bit counter size allows the product to operate without the need of external counters, reducing the component count on the PCB and therefore cost

- Higher frequencies let the HCTL-2022/2032 to operate with a wider range of encoders

Features

- Operates up to 33 MHz

- 32-bit binary up/down counter

- -40°C to 100°C operating temperature

- Programmable count modes (1x, 2x or 4x)

- Index channel support provides the ability to reset latched output when necessary

- High noise immunity. The Schmitt Trigger Input and Digital Noise Filter rejects noise on incoming quadrature signals

- Latched output, allowing stable output to microcontroller

- 8, 16, 24, or 32-bit operating modes

- Cascade-able output signals, up/down and count triggers an external decoder or counter in case of an underflow/overflow situation

- Substantially reduced system software

- Comes with hardware built-in counters. Generally no external counters are required

Applications

- Machine tools
- Servo motors
- Sewing machines
- Robotics
- Measurement equipment
- Printers and printing machines
- Automobile service equipment

Absolute Optical Encoders

Integrated Circuits

* Refer to product datasheet for package dimensions

Integrated Circuits
Decoder

Key Advantages Over Competitors

	LSI Computer Systems	Aligent Technologies	
Part Number	LS7266	HCTL – 2022	HTCL – 2032/2032-SC
Operating Temperature (°C)	–25 to 80	–40 to 100	–40 to 100
Cascade Output Signals	No	Yes	Yes
Max Counter Size	24 bit	32 bit	32 bit
Max Frequency	30 MHz	33 MHz	33 MHz

Ordering Information

HCTL-20 | XX | – | XX

32	Blank	32-PDIP Package
32	SC	32-SOIC Package
22	Blank	20-PDIP Package
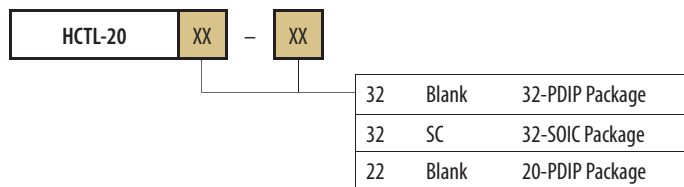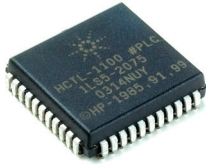
HCTL-1100 Series

Description

- High-performance general purpose motion control IC

- Fabricated in CMOS technology

- IC offloads the host processor by performing the time-intensive functions of digital motion control

- Programmability of all control parameters provides maximum flexibility and quick design of control systems with a minimum number of components

- Complete control system

- Consists of a host processor to specify commands, an amplifier, and a motor with an incremental encoder (such as the HEDS-5XXX, HEDS-6XXX or HEDS-9XXX series)

- No analog compensation or velocity feedback is necessary

- Accepts TTL-compatible outputs from 2- or 3-channel incremental encoders. Channels A and B are internally decoded into quadrature counts, which increment or decrement the 24-bit position counter

- The index channel is used only for the commutator and has a 3-bit filter on its input

- The output port drives a brushless motor or step motor. Its four pins can be programmed to energize each winding on a multiphase motor

Features

- Low-power CMOS

- PDIP and PLCC versions available

- DC, DC brushless and stepper motor control

- Position and velocity control

- Programmable digital filter and commutator

- 8-bit parallel and PWM motor command ports

- TTL compatible

- SYNC pin for coordinating multiple HCTL-1100 ICs

- 100 kHz to 2 MHz operation

- Encoder input port

- Encoder input pins

- PWM output port consists of the Pulse and Sign pins. The PWM port outputs the motor command as a pulse width modulated signal with the correct polarity

- Commutator output (PHA – PHD)

- Motor command port operates in two modes - bipolar and unipolar - when under control of internal software

- Trapezoid Profile Control performing point-to-point position moves and profiles the velocity trajectory to a trapezoid or triangle

Applications

- Printers
- Medical instruments
- Material handling machines
- Industrial automation
- Measurement equipment
- Sewing machine

Ordering Information

HCTL-1100: 40 Pin DIP Package
HCTL-1100#PLC: 44 Pin PLCC Package

* Refer to product datasheet for package dimensions

Codewheels

Transmissive

HEDS-51x0/61x0, HEDG-512x/612x, HEDM-512x/61xx Series

Description

- Wide range of codewheels for use with HEDS-90XX/91XX series encoder modules
- Designed for many environments, applications and budget
- Available in glass, film and metal
- Resolutions from 96 to 1024 CPR on an 11-mm optical radius, and 500 to 2048 CPR on a 23.36-mm optical radius
- Each of the three codewheel materials offers certain advantages

HEDS-51X0/61X0 Series

- Metal codewheels are the most versatile
- Temperature rating up to 100°C
- HEDS-51X0 offers resolution up to 512 CPR
- HEDS-61X0 offers resolution from 500 to 1024 CPR
- 2 and 3 channels output

HEDM-512X/61XX Series

- Film codewheels offer higher resolution
- HEDM-512X offers resolutions of 1000 and 1024 CPR
- HEDM-61XX offers 2000 and 2048 CPR
- 70°C operating temperature
- 2 and 3 channels output

HEDG-512X/612X Series

- Glass codewheels combine the best of film and metal
- Offers temperature rating of 100°C
- HEDG-512X offers resolution of 1000 and 1024 CPR
- HEDG-612X offers resolution of 2000 and 2048 CPR

Features

- Codewheels available in glass, film and metal
- Available in two standard diameters (11 mm and 23.36 mm optical radius)
- Cost effective
- Resolutions from 96 to 2048 CPR
- For use with HEDS-90XX/91XX series two and three channel encoders

Applications

- Printers
- Plotters
- Tape drivers
- Industry automation equipment
- Factory automation equipment

Reflective

Customized. Please consult factory for these special parts

Product Family Matrix

	Incremental Optical Encoders								
	Transmissive Modules					Transmissive Housed			Rotary Pulse Generators
Products	HEDS-9xxx	HEDS-97xx	AEDS-964x	AEDA-3xxx	AEDB-9140	HEDS-65xx	HEDx -5xxx	HEDL-64xx	HEDS-57xx
Office Automation									
Printers	•	•	•		•				
Copiers	•	•	•		•		•	•	•
Tape Drives	•	•	•		•				
Plotters	•	•	•		•		•		
Scanners			•						
All in One		•	•						
Industrial Automation									
Wafer Handling Machines	•			•	•	•	•	•	
Industrial Sewing Machines	•			•	•	•	•	•	
Robotics	•			•	•	•	•		
CAD/CAM Dial Boxes							•	•	
Wire Bonders				•			•	•	
Vending Machines							•	•	
Seat Control and Alignment	•				•		•	•	
Industrial Fans						•	•	•	
A/C Ventilation Blades									
Tool Changer (Machine Tools)				•					
Robotics (Automotive)									
Medical									
Blood Analyzers	•			•			•	•	
Lab Sample Handling Equip.				•					
Surgical Robotics				•			•		
CAT Scan Machines				•					
Motor Manufacturers	•		•			•	•	•	
Consumer									
Card Readers									
Appliance Front Panels									•
Instrumentation									
Audio Video									•
Front Panel Combo Knobs									•

Codewheels

Appendix

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
Product Family Matrix

	Incremental Optical Encoder			Absolute Optical Encoders		Integrated Circuit	
	Reflective Module	Reflective Housed		Transmissive Module		Decoder	Controller
			Rotary Pulse Generators				
Products	AEDR-83xx	HEDR-542x	HRPG-Axxx	AEAS-7x00	AEAx-8x	HTCL-2022/2032	HCTL-1100
Office Automation							
Printers	•					•	
Copiers	•		•			•	
Tape Drives	•					•	
Plotters	•	•	•			•	
Scanners						•	
All in One	•					•	
Industrial Automation							
Wafer Handling Machines				•	•	•	•
Industrial Sewing Machines				•	•		•
Robotics		•		•	•		
CAD/CAM Dial Boxes							
Wire Bonders				•	•	•	
Vending Machines		•					
Seat Control and Alignment				•	•		
Industrial Fans		•					
A/C Ventilation Blades		•					
Tool Changer (Machine Tools)				•	•	•	•
Robotics (Automotive)				•	•		
Medical							
Blood Analyzers			•	•			
Lab Sample Handling Equip.				•			
Surgical Robotics				•	•		
CAT Scan Machines				•	•		
Motor Manufacturers	•	•	•	•	•	•	•
Consumer							
Card Readers	•		•				
Appliance Front Panels			•				
Instrumentation							
Audio Video			•				
Front Panel Combo Knobs			•				

Definition of Product Technologies

Product Technology	Description
Absolute Encoder	A type of encoder which generates a unique code for each position, unlike an incremental encoder, which only generate pulses proportional to position. An absolute encoder has the distinctive feature of being able to provide positional information instantly upon power up.
Absolute Multi-Turn Encoder	In addition to the Absolute Single-Turn Encoder, this type of Absolute Multi-Turn Encoder provides shaft revolution detection, usually through means of integrated gear, in which the code representation for each revolution is unique. Combined with Absolute Single-Turn Encoder, it provides unique positional information beyond one revolution.
Absolute Single-Turn Encoder	A type of absolute encoder whereby each measurable angular position provides unique positional information, within one revolution, without the need of counter and homing operation, upon power up
Codewheel and Codestrip	Codewheel and codestrip are patterned discs or strips that translate a mechanical position into a representative electrical signal when used with an optical encoder. A codewheel is used for rotary motion while a codestrip is used for side-to-side motion. In a transmissive encoder, the bars block light and the windows allow light to pass through. In a reflective encoder, the bars absorb light while the windows reflect light.
Controller IC	A PID Motor Controller IC commands the motor operation by taking the feedback signal from the encoder output. It frees the host processor for other tasks by performing all the time intensive functions of digital motion control.
Decoder / Counter IC	Interfaces the encoder to the microprocessor. A decoder and counter IC converts the incremental signal from the encoder to a binary number.
Housed Encoder	An enclosed encoder with protective housing that normally has a defined IP rating.
Incremental Encoder	A type of encoder that provides relative position, whereby the feedback signal is always referenced to a start or home position. On an incremental encoder, each mechanical position is not uniquely defined. The current position sensed is only incremental from the last position sensed.
Linear Encoder	A type of incremental encoder that provides high resolution linear incremental positioning information. The linear encoder is a good alternative to designers who need to measure linear movement in high resolution.
Module Encoder	A basic encoder unit that integrates the detector and emitter in a single unit.
Optical Encoder	Sensors that use light to sense the speed, angle and direction of a rotary shaft
Reflective Encoder	Consists of an emitter and detector, each positioned on the same side of the codewheel/codestrip.
Rotary Encoder	Also known as a shaft encoder. A type of incremental encoder that converts angular position of a shaft or axle to a digital code. Rotary encoders can also be used to measure linear motion, with the use of ballscrew systems, to translate linear motion into rotary motion.
Transmissive Encoder	Consists of an emitter and detector, each positioned at opposite sides of the codewheel/codestrip.