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# Miniature Panel Mount Optical Encoders

## Technical Data

### 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**

### Description

The HRPG series is a family of miniature panel mount optical encoders, also known as Rotary Pulse Generators (RPG) and digital potentiometers. The HRPG is designed to be mounted on a front panel and used as a rotary, data-entry device. The HRPG is very flexible for numerous applications due to the many configuration options available. These options include detents or smooth, multiple terminations, versatile mounting capabilities, and different shaft configurations.

The HRPG uses optical reflective technology providing accuracy and reliability to the encoder. An LED emits a beam of light onto the specular codewheel surface. When the light strikes the surface, it projects the image of the code-wheel back on the photodetector, causing the output to change. The entire detector circuit is on one IC, thus the part is less sensitive to temperature and other environmental variations.

### Applications

Typical applications for the Rotary Pulse Generator include front panel instruments, audio/visual boards, and other devices requiring digital output from a turning knob.

**Note:** Agilent Technologies encoders are not recommended for use in safety critical applications. Eg. ABS braking systems, power steering, life support systems and critical care medical equipment. Please contact sales representative if more clarification is needed.

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## HRPG Series



## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units	Notes
Storage Temperature	$T_S$	-40	+85	°C	
Operating Temperature	$T_A$	0	+70	°C	
Vibration			20	g	20 Hz to 2 kHz
Supply Voltage	$V_{CC}$	-0.5	7	V	
Output Voltage	$V_O$	-0.5	$V_{CC}$	V	
Output Current Per Channel	$I_O$	-1	5	mA	
Shaft Load – Axial			4.0	N	$10^6$ Revolutions
Shaft Load – Radial			0.1	Nm	$10^6$ Revolutions
Revolution Life		$10^6$		Rev	At Maximum Loads

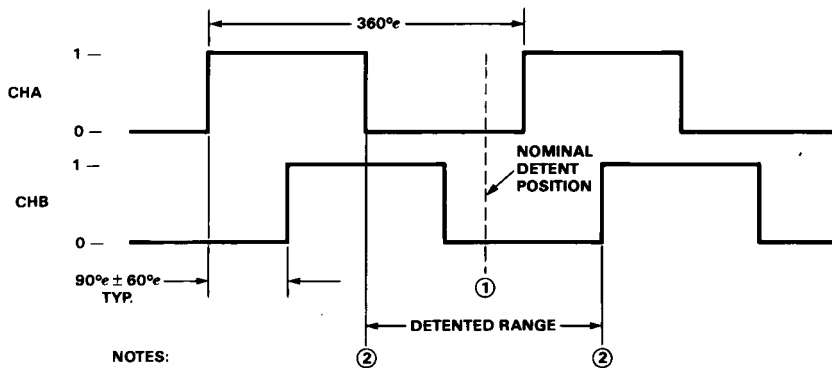
## Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units	Notes
Temperature	T	0	+70	°C	Noncondensing Atmosphere
Supply Voltage	$V_{CC}$	4.5	5.5	V	Ripple < 100 mV <sub>P-P</sub>
Rotation Speed – Detented			200	RPM	
– Smooth			300	RPM	

## Electrical Characteristics Over Recommended Operating Range

Parameter	Symbol	Min.	Max.	Units	Notes
Supply Current	$I_{CC}$		40	mA	
High Level Output Voltage	$V_{OH}$	2.4		V	$I_{OH} = -40 \mu\text{A Max.}$
Low Level Output Voltage	$V_{OL}$		0.4	V	$I_{OL} = 3.2 \text{ mA}$

## Output Waveforms



NOTES:  
360° = 360° MECH.  
CPR

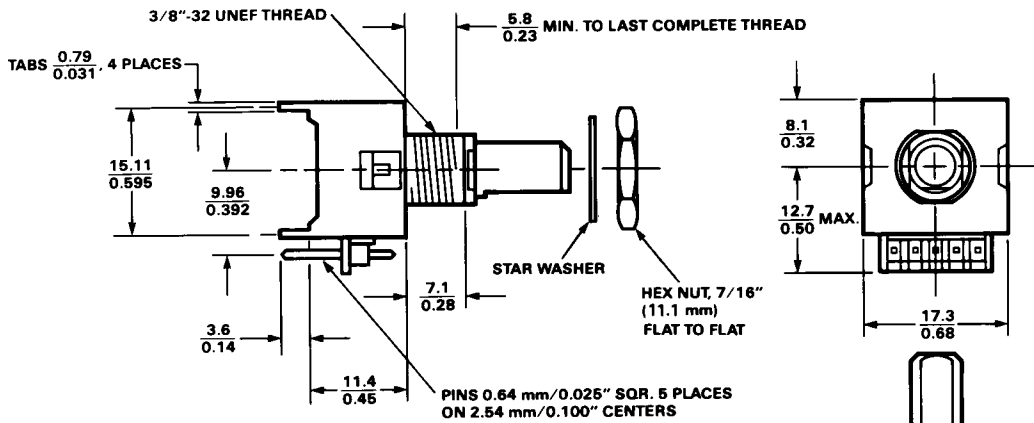
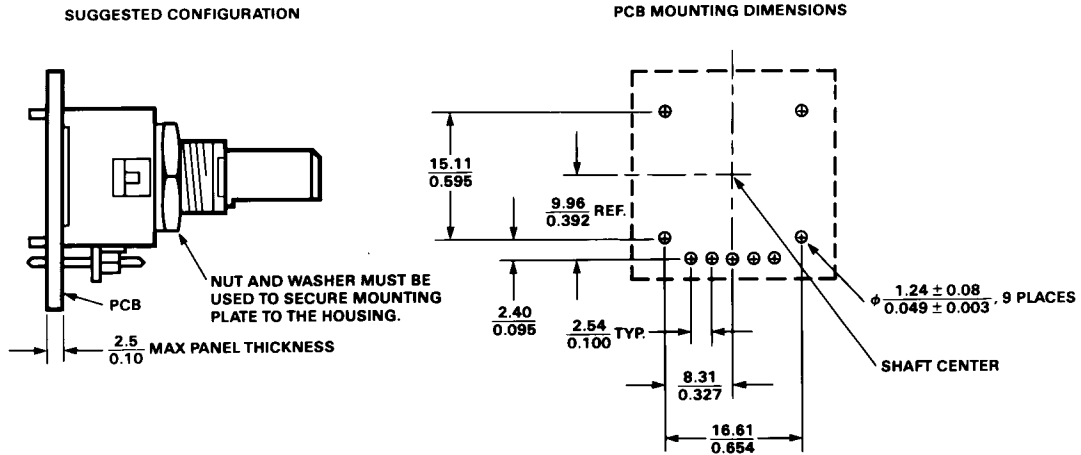
CHANNEL A LEADS CHANNEL B FOR CLOCKWISE ROTATION  
CHANNEL B LEADS CHANNEL A FOR COUNTERCLOCKWISE ROTATION  
1. FOR HRPG-ADXX #XXX THE NOMINAL DETENT POSITION IS CENTERED AROUND LOW-LOW STATE  
(CHA = 0, CHB = 0).  
2. DETENT POSITION WILL LIE WITHIN THESE BOUNDARIES, NEVER IN HIGH-HIGH STATE  
(CHA = 1, CHB = 1).

# Mechanical Configurations

## Termination Options

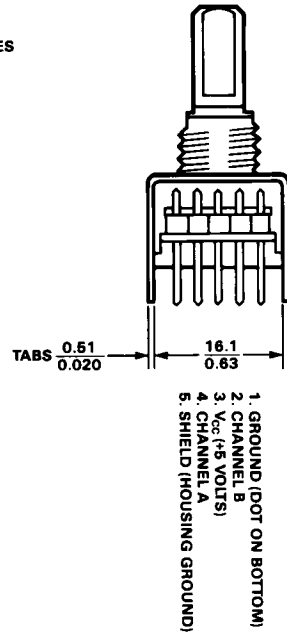
Option R - Pins Rear with Bracket

HRPG-AXXX#XXR



NOTES:  
 DIMENSIONS ARE:  $\frac{\text{mm}}{\text{INCHES}}$   
 TOLERANCES ARE:  $X \pm 0.25 \text{ mm}$   
                            $.XX \pm 0.01''$   
                            $.XX \pm 0.13 \text{ mm}$   
                            $.XXX \pm 0.005''$

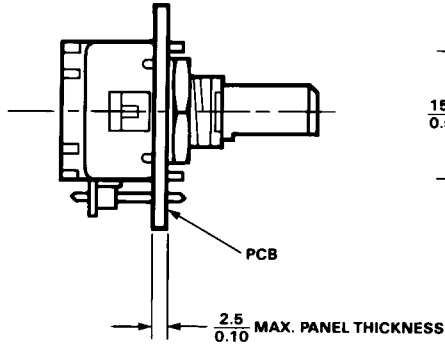
SHIELD IS FOR HOUSING ESD PATH ONLY



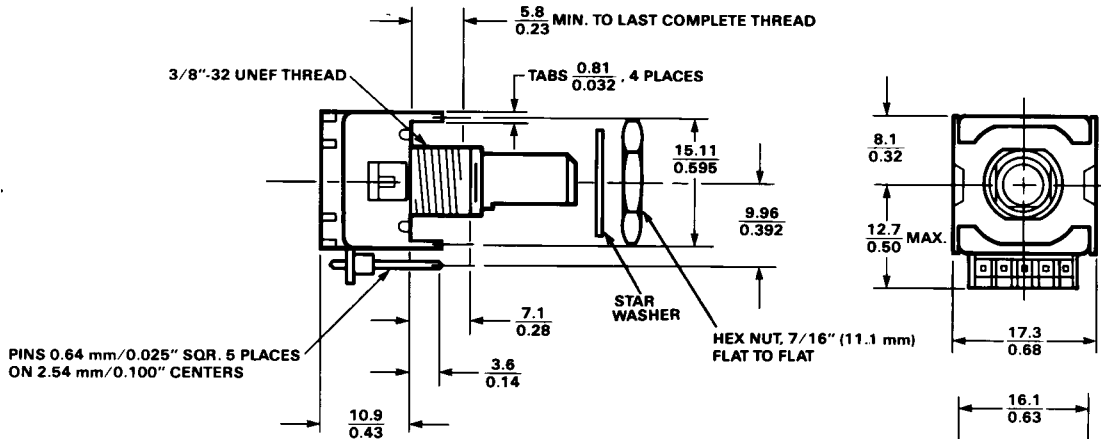
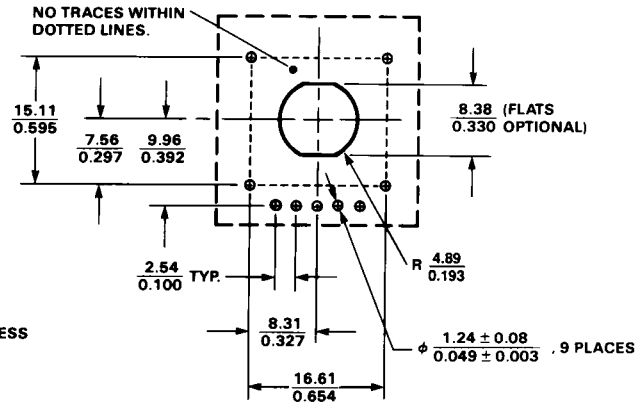
- 1. GROUND (DOT ON BOTTOM)
- 2. CHANNEL B
- 3. V<sub>CC</sub> (+5 VOLTS)
- 4. CHANNEL A
- 5. SHIELD (HOUSING GROUND)

Option F - Pins Front with Bracket  
HRPG-AXXX#XXF

SUGGESTED CONFIGURATION

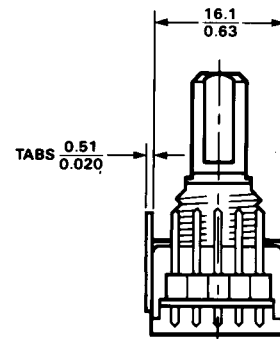


PCB MOUNTING DIMENSIONS



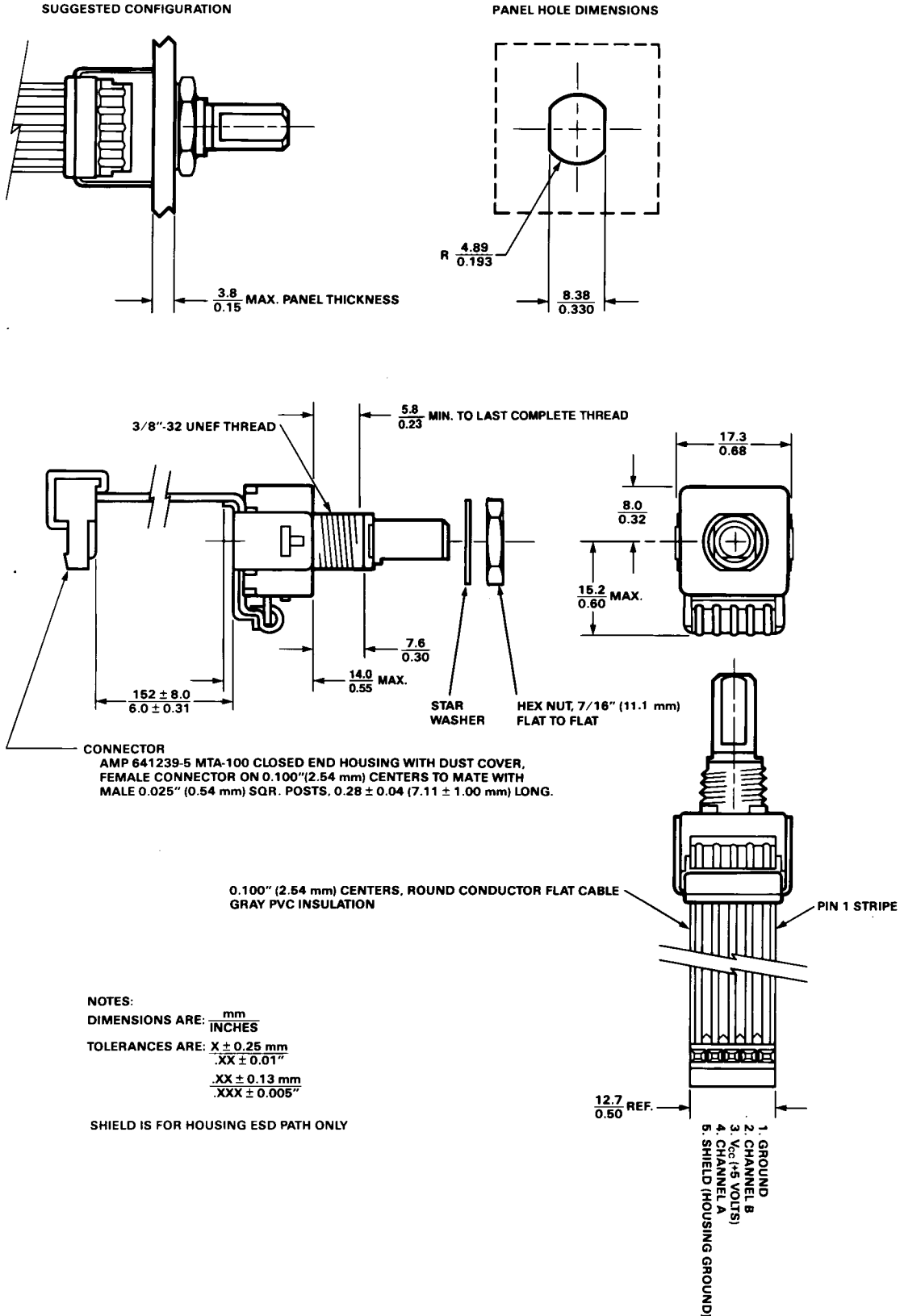
NOTES:  
 DIMENSIONS ARE:  $\frac{\text{mm}}{\text{INCHES}}$   
 TOLERANCES ARE:  $X \pm 0.25 \text{ mm}$   
 $.XX \pm 0.01''$   
 $.XX \pm 0.13 \text{ mm}$   
 $.XXX \pm 0.005''$

SHIELD IS FOR HOUSING ESD PATH ONLY



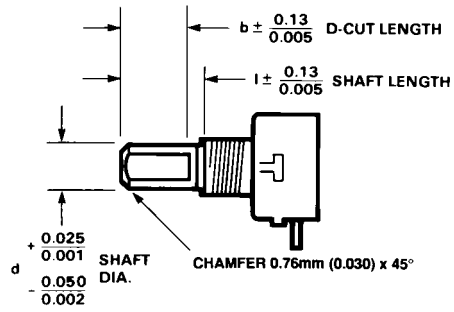
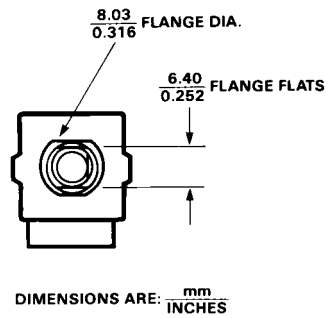
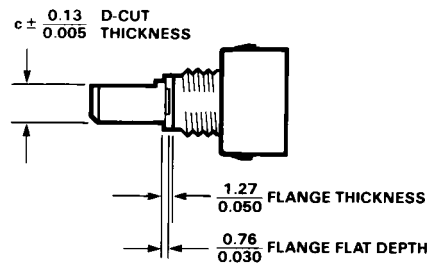
1. GROUND (DOT ON BOTTOM)
2. CHANNEL B
3. V<sub>CC</sub> (+5 VOLTS)
4. CHANNEL A
5. SHIELD (HOUSING GROUND)

**Option C – Cable Connector with Strain Relief  
HRPG-AXXX#XXC**



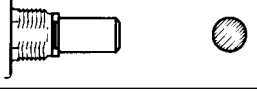
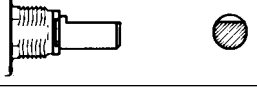
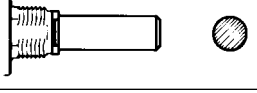
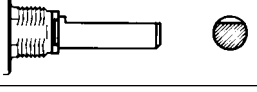


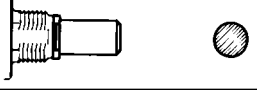
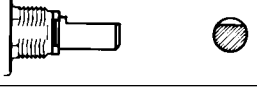
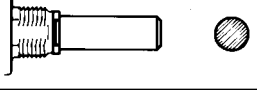



## Shaft Configurations

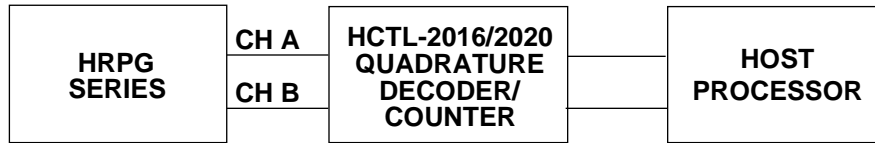
Shaft Dimensions (D-cut shown also)



### Shaft Options Available

Option #	Shaft Length (l)	Shaft Diameter (d)	D-Cut Thickness (c)	D-Cut Length (b)	Sketch (not to scale)
11	0.30"	0.251"	-	-	
13	0.30"	0.250"	0.225"	0.230"	
14	0.50"	0.251"	-	-	
16	0.50"	0.250"	0.225"	0.400"	
17	0.80"	0.251"	-	-	
19	0.80"	0.250"	0.225"	0.700"	
51	7.6 mm	6.02 mm	-	-	
53	7.6 mm	6.00 mm	5.33 mm	5.84 mm	
54	12.7 mm	6.02 mm	-	-	
56	12.7 mm	6.00 mm	5.33 mm	10.16 mm	
57	20.32 mm	6.02 mm	-	-	
59	20.32 mm	6.00 mm	5.33 mm	17.78 mm	

## Typical Interface



## Ordering Information

HRPG - A    #

**Shaft / Resolution**

S16 – Smooth 16CPR  
 D16 – Detented 16CPR\*  
 S32 – Smooth 32CPR  
 D32 – Detented 32CPR\*  
 SCA – Smooth 120CPR

**Mechanical Configuration**

11 – 0.3" long, 0.25" dia.  
 13 – 0.3" long, 0.25" dia. D-cut  
 14 – 0.5" long, 0.25" dia.  
 16 – 0.5" long, 0.25" dia. D-cut  
 17 – 0.8" long, 0.25" dia.  
 19 – 0.8" long, 0.25" 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

**Termination**

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

**\*Note:** When ordering detented versions, a D-cut shaft is recommended.

HRPG Series		11	13	14	16	17	19	51	53	54	56	57	59
AD16	F				*					*	*		*
	R				*			*		*			
	C				*						*		
	L												
AD32	F		*	*	*		*	*	*			*	*
	R	*	*	*	*		*		*	*	*		*
	C	*	*	*	*	*		*	*	*	*		*
	L												
AS16	F					*				*			
	R	*							*				
	C			*				*					
	L												
AS32	F	*	*								*		
	R		*	*					*				
	C			*									*
	L												
ASCA	F	*		*	*	*	*		*	*	*	*	*
	R	*	*	*	*	*	*	*		*	*		
	C	*	*	*	*	*	*	*	*	*	*		*
	L												

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Data subject to change.

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