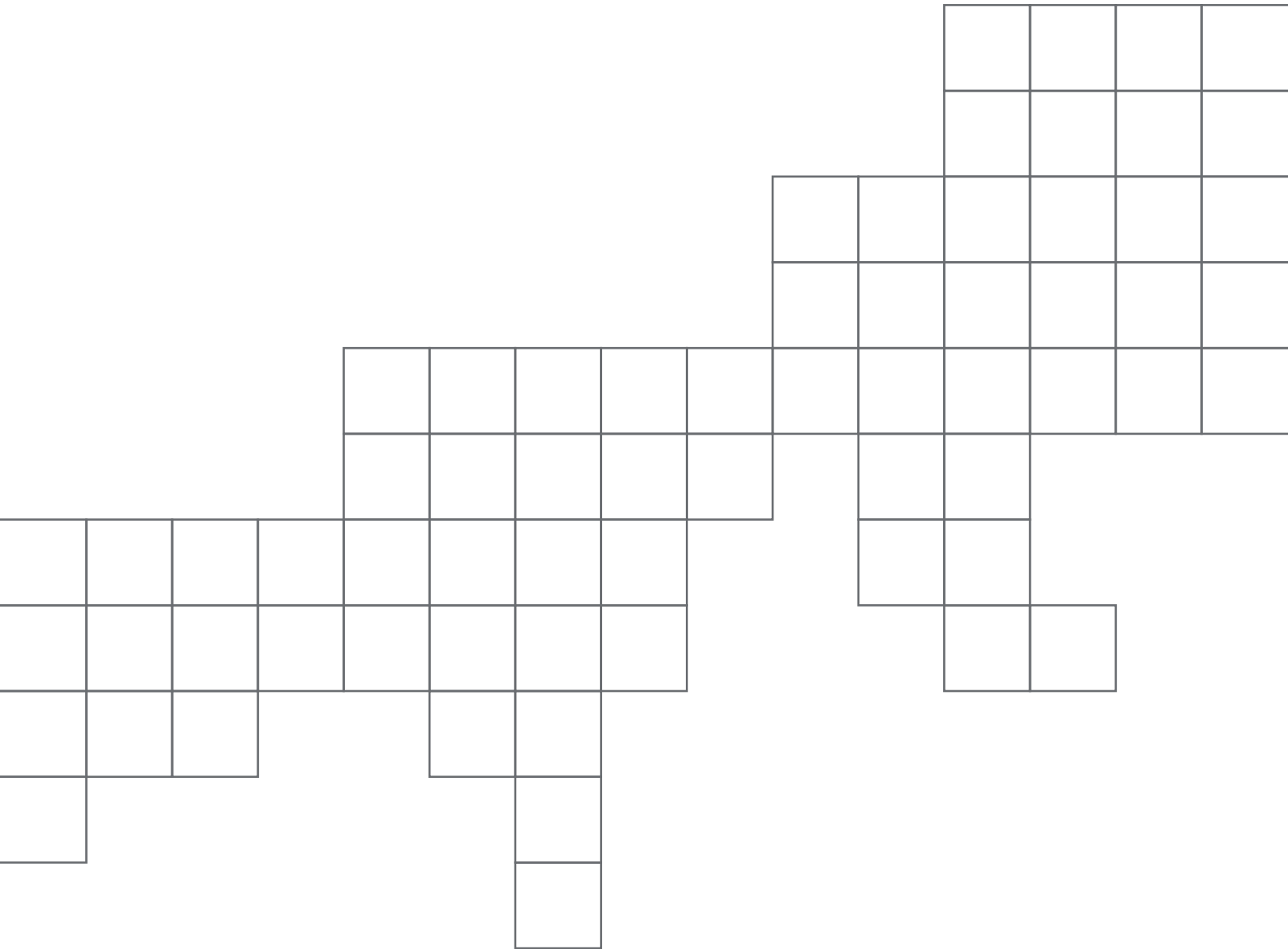


# Controls



# Controls

CTS offers an extensive line of reliable, high-performance electromechanical components, that includes encoders, potentiometers and mini-joysticks. These components are designed for a wide range of applications such as electronic circuit calibration, mechanical adjustments to equipment, and signal control. In addition to standard models, custom designs are available, tailored to the needs of specific applications.



# Encoders






## Typical Applications

Test Equipment, Medical (Patient Monitoring, CPAP, Ultrasound), Aerospace, Cooking Equipment, Professional Lighting, Industrial (Welding, Test Equipment), Audio/Video.

CTS offers a variety of encoder options for your application, such as incremental and absolute rotary encoders for applications that require high reliability and precise digital output. CTS encoders provide flexibility in design by providing choices in resolution and power consumption. Multiple shaft and bushing options provide adaptability for your design requirements. CTS mechanical encoders provide direct interface to your digital circuitry without signal conversion. The 16 mm 288 Series mechanical encoders are available with 2-bit binary, 4-bit Gray,

and 4-bit hexadecimal output. Options include detents to provide positive actuation feel for each position change and a push-to-actuate momentary switch. CTS optical encoders allow for versatility in design applications by providing highly reliable, precise digital output and long rotational life with our non-contacting design. Such options as Schmitt trigger, detents, momentary switch, shaft & bushing length, dual shaft, termination styles, torque, operating voltage, and IP ratings provide flexibility to meet your exacting design requirements.

## Optical and Mechanical Encoders

Series		Typical Applications	Rating	Code	Options	Rotation
291 12 mm Optical		Medical, Aerospace, Security, A/V Equipment	5V DC @ 30 mA, 3.3V DC @ 24 mA, IP 40, Up to 3 Million Cycles	2 Bit Quadrature, 4, 6, 8, 24, 32, or 64 PPR	0, 16, 24, or 32 Detents, Switch, Single or Dual Shaft, Harness	360° Continuous
290 9 mm Mechanical		Test Equipment, Medical, Industrial, Audio	2 Bit Quadrature	BCD and Hexadecimal	20 Detents, Switch	360° Continuous
288 16 mm Mechanical		Test Equipment, Medical, Industrial, Audio	20V DC @ 5 mA 50,000 Cycles*	2 Bit Binary 4 Bit Gray 4 Bit Hex	16 Detents, Switch	360° Continuous
292 20 mm Optical		Medical, Industrial Automation, Automotive HVAC, Pro Audio/Lighting	5V DC @ 30mA, 3.3V DC @ 24 mA, IP 50, 3 Million Cycles	2 Bit Quadrature, 24 PPR	24 Detents	360° Continuous
11CE 12 mm		Commercial Appliances, Instrument Amplifiers, Audio Mixers, Consumer Electronics	5V DC @ 0.5mA, IP 40, 30,000 Cycles	2 Bit Quadrature, 12 & 24 PPR	12 & 24 Detents	360° Continuous
12CE 12 mm		Commercial Appliances, Instrument Amplifiers, Audio Mixers, Consumer Electronics	5V DC @ 0.5mA, IP 40, 30,000 Cycles	2 Bit Quadrature, 12 & 24 PPR	12 & 24 Detents	360° Continuous

\*100K cycles available – consult factory. Consult CTS for PPR or detent options not listed.

# Rotary Position Sensors






## Typical Applications

Patient Care Equipment, Diagnostic Equipment, Medication Management, Robotic Surgical Equipment, Dental Chairs, Mobility Scooters, Wheel Balancing Equipment, Flow Valves, Pneumatic Control Valves, Draw Wire Position Sensors, Material Handling Equipment, Agriculture and Construction Heavy Equipment, Light Rail, Marine Equipment, Riding Mowers, HVAC Equipment.

CTS non-contacting Hall-Effect rotary position sensors are designed for the most demanding applications in the industrial, medical, and transportation markets. With over 20 years of experience in non-contacting solutions for automotive applications, CTS is now bringing this technology to industrial grade rotary position sensors. Hall-Effect technology eliminates internal wearing contacting parts and allows for extended field deployment. Both plastic bearing and ball bearing options provide different levels

of rotational life. The precision linearity and low hysteresis allow for consistent position and precise position sensing. The wide operating temperature range and seal options make this product suitable for applications in extreme hot or cold environments and suitable for use in dusty or wet environments. A broad range of standard configurations are available along with custom engineered solutions in order to accommodate specific applications.

## Rotary Position Sensors

Series	Typical Applications	Rotational Life	Linearity	IP Rating	Power Options	Machnical Angle	Effective Rotation Angle
285 24mm 	industrial Automation, Flow Valves, Draw Wire Sensors Position Sensing	10M cycles	± 0.5% ± 0.25%	IP50 IP54 IP67	3.3 VDC 5.0 VDC	270° 320° 360°	260° 310° 360°
285S 285N 24mm 	Throttle/Pedal Position, Flow Valves, Steering/Lift Controls	10M cycles	± 0.5% ± 0.25%	IP50 IP54 IP67	3.3 VDC 5.0 VDC	125° 270° 320° 360°	200° 260° 310° 360°
286 25mm 	Material Handling, Tire Balancing, Off-Road and Maritime Vehicles	10M Cycles	± 0.5%	IP67	5.0 VDC	Free Turning	360° to 3600°

# Potentiometers

## Typical Applications




Guitar Tone & Volume Controls, Foot Pedal Controls, Amplifiers, Commercial Cooking and Food Preparation Equipment, Oven Temperature Controls, Fan Speed Controls, Motor Speed Controls, Valve Controls, HVAC Controls, Lighting and Dimming Controls, Cleaning Equipment, Welding Equipment, Industrial Joystick Controls, In-cab Vehicle HVAC.

CTS is a leader in designing and manufacturing robust, reliable, and high-quality rotary and slide potentiometers, serving the global industry for more than 85 years. Our potentiometers are constructed with carbon composition, conductive plastic, or wire-wound elements, and they are capable of operating in rugged environments and wide temperature ranges. Some are

sealed up to an IP67 rating and with operational life up to 3 million cycles. With decades of experience in developing and manufacturing these reliable products, we offer a broad range of standard configurations as well as custom solutions to meet the demands of your application.

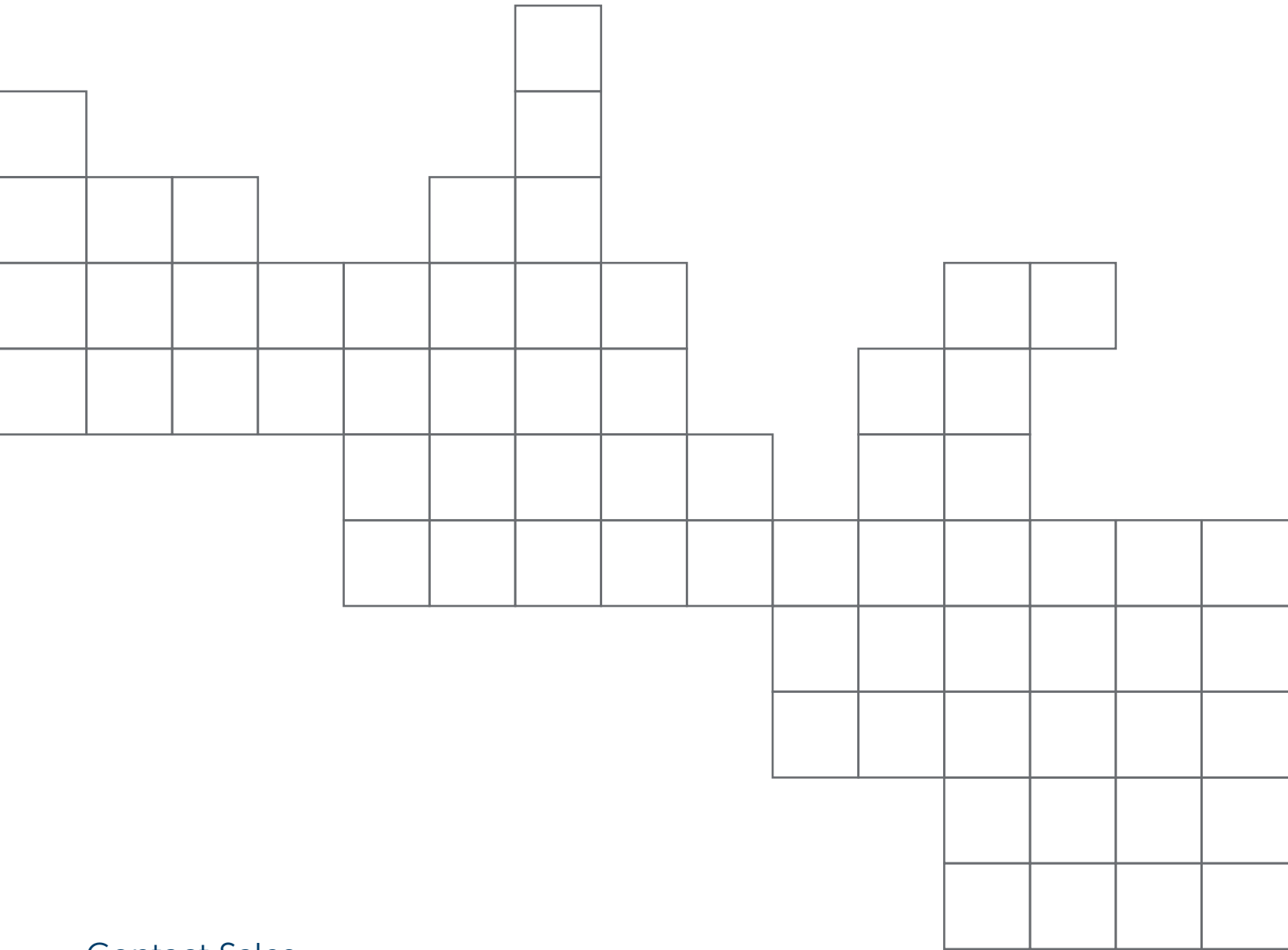
## Rotary Potentiometers/Variable Resistors

Series		Typical Applications	Rating	Resistance Range	Tolerance	Travel
450 24 mm		Dimmers, Musical Instruments, Industrial Controls	0.50 Watts thru 100K $\Omega$ , 0.33 Watts above 100K $\Omega$ @ 55°C, Optional Switches	100 $\Omega$ ~ 10M $\Omega$	$\pm$ 10% $\pm$ 20% $\pm$ 30%	300° Mechanical 320° with Switch
450G 24 mm		Guitars, Musical Instruments	0.25 Watts @ 55°C, Multiple Tapers Available	25K $\Omega$ ~ 1M $\Omega$	$\pm$ 10% $\pm$ 20%	300° Mechanical
295 24 mm		Joysticks, Gaming Controls, Musical Instruments	0.125 Watts @ 50°C, 1 Million Cycles	1 $\Omega$ ~ 25K $\Omega$	$\pm$ 5% $\pm$ 10% $\pm$ 20% Others Available	300° Mechanical
026 24 mm Wire wound		Industrial Controls	5 Watts @ 25°C, Optional Switches	1 $\Omega$ ~ 25K $\Omega$	$\pm$ 10% $\pm$ 20% $\pm$ 30%	300° Mechanical
280 16 mm		Audio / Video Amplifiers, Motor Speed Controls, Industrial Appliances	0.25 Watts @ 55°C, IP 54 Available	500 $\Omega$ ~ 5M $\Omega$	$\pm$ 10% $\pm$ 20% $\pm$ 30%	300° Mechanical

270 16 mm		Audio, Industrial Controls, Musical Instruments	0.25 Watts thru 100K $\Omega$ , 0.20 Watts Above 100K $\Omega$ @ 55°C, Optional Switches	500 $\Omega$ ~ 2M $\Omega$	$\pm 10\%$ $\pm 20\%$ $\pm 30\%$	300° Mechanical 315° with Switch
251 9 mm		Joystick Gaming Controls	0.01 Watts @ 50°C Up to 1 Million Cycles	10K $\Omega$ ~ 200K $\Omega$	$\pm 10\%$ $\pm 20\%$ $\pm 30\%$	Mech: 180° Eff: 40°, 60°, 110°
282 16 mm		Industrial Controls, HVAC, Position Sensor, Medical, Instrumentation	0.50 Watts thru 100K $\Omega$ , 0.33 Watts above 100K $\Omega$ @ 55°C; Optional Switches	100 $\Omega$ ~ 10M $\Omega$	$\pm 10\%$ $\pm 20\%$	250°, 300°, 360° Mechanical Rotation, 240°, 280°, 340° Effective
284 16 mm		Industrial Controls, HVAC, Position Sensor, Medical, Instrumentation	0.25 Watts @ 55°C IP 54, IP 67 3 Million Cycles	1K ~ 500K $\Omega$ Linear	$\pm 10\%$ $\pm 20\%$	250° Mechanical, Up to 220° Effective

## Slide Potentiometers/Variable Resistors

Series	Typical Applications	Rating	Resistance Range	Tolerance	Travel	
448 Slide Open Frame		Power Tools, E-Book Readers, Lighting/Fan Controls, Temperature Controls, Optional Switch	0.05 ~ 0.50 Watts, (Power is Travel and Taper Dependent), Up to 250,000 Cycles	500 $\Omega$ ~ 1M $\Omega$	$\pm 10\%$ $\pm 20\%$ $\pm 30\%$	10 mm, 15 mm 20 mm, 30 mm 45 mm, 60 mm
287 24 mm		Welders, Joystick Controllers, Portable Generators, Power Supplies	2 Watts thru 1M $\Omega$ , IP50, 100,000 Cycles	500 $\Omega$ ~ 1M $\Omega$	$\pm 10\%$ $\pm 20\%$	312° Mechanical 274° Electrical
09VR 9 mm		Portable Medical Equipment, Audio Amplifiers, Audio Mixers, Consumer Appliances	0.05 Watts thru 500k $\Omega$ IP40, 5,000 Cycles	5k $\Omega$ ~ 500k $\Omega$	$\pm 20\%$	280°, 300° Mechanical
11VR 11 mm		Portable Medical Equipment, Audio Amplifiers, Audio Mixers, Consumer Appliances	0.05 Watts thru 500k $\Omega$ IP40, 15,000 Cycles	5k $\Omega$ ~ 500k $\Omega$	$\pm 20\%$	300° Mechanical
12VR 12 mm		Portable Medical Equipment, Audio Amplifiers, Audio Mixers, Consumer Appliances	0.05 Watts thru 250k $\Omega$ IP40, 15,000 Cycles no Switch 30,000 Cycles w/Switch	5k $\Omega$ ~ 250k $\Omega$	$\pm 20\%$	300° Mechanical
14VR 14 mm		Portable Medical Equipment, Audio Amplifiers, Audio Mixers, Consumer Appliances	0.05 Watts thru 500k $\Omega$ IP40, 15,000 Cycles	5k $\Omega$ ~ 500k $\Omega$	$\pm 20\%$	300° Mechanical



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