CTS Electrocomponents

Series 291 Data Sheet
Optical Encoder

Precision, Long-life Compact 12mm Size Optical Encoder

Features

- Package Size (12 X 14 X 7 mm)
- 3 Million life cycles (No detent)
- 1 Million life cycles (With detent)
- Durable Metal Shaft & Bushing
- Optional momentary switch
- Multiple options for terminations, resolution, cables, voltage
- RoHS Compliant

Electrical and Mechanical Specifications

Encoder:

Operating Voltage
5.0 ± 0.25 VDC
3.3 ± 0.125 VDC

Supply Current
5.0 VDC @ 30mA maximum
3.3 VDC @ 24mA maximum

Output Code
2-Bit Quadrature
Channel A leads channel B by 90° electrically during clockwise rotation of the shaft

Minimum Sink Current
2.0 mA for 5.0 VDC
1.0 mA for 3.3 VDC

Power Consumption
150 mW maximum for 5.0 VDC
80 mW maximum for 3.3 VDC

Rotational Torque
Running: 20 ± 10 gf-cm
Detent: 140 ± 50 gf-cm (24 Detents)
100 ± 50 gf-cm (16, 32 Detents)

Detent Options
0,16, 24, 32

Resolution
4, 6, 8, 24 Pulses per Revolution

Rotational Life (@30 RPM)
3 Million cycles (No detent)
1 Million cycles (With detent)

Temperature Range
Operating: - 40°C to 85°C
Storage: - 55°C to 100°C

Push-Pull Strength of Shaft
20 kg minimum for 10 seconds

Terminal Pull-out Strength
6 kg minimum for 10 seconds

Solder Heat Resistance
350°C for 5 seconds

Mechanical Vibration
15G, (MIL-STD-883F-2004)

Mechanical Shock
100G, (MIL-STD-883F-2004)

Note:
Consult CTS for other common standard features not listed.

Electrical and Mechanical Specifications (continued)

Optional Momentary Switch:

Switch Contact Resistance
10 Ω maximum

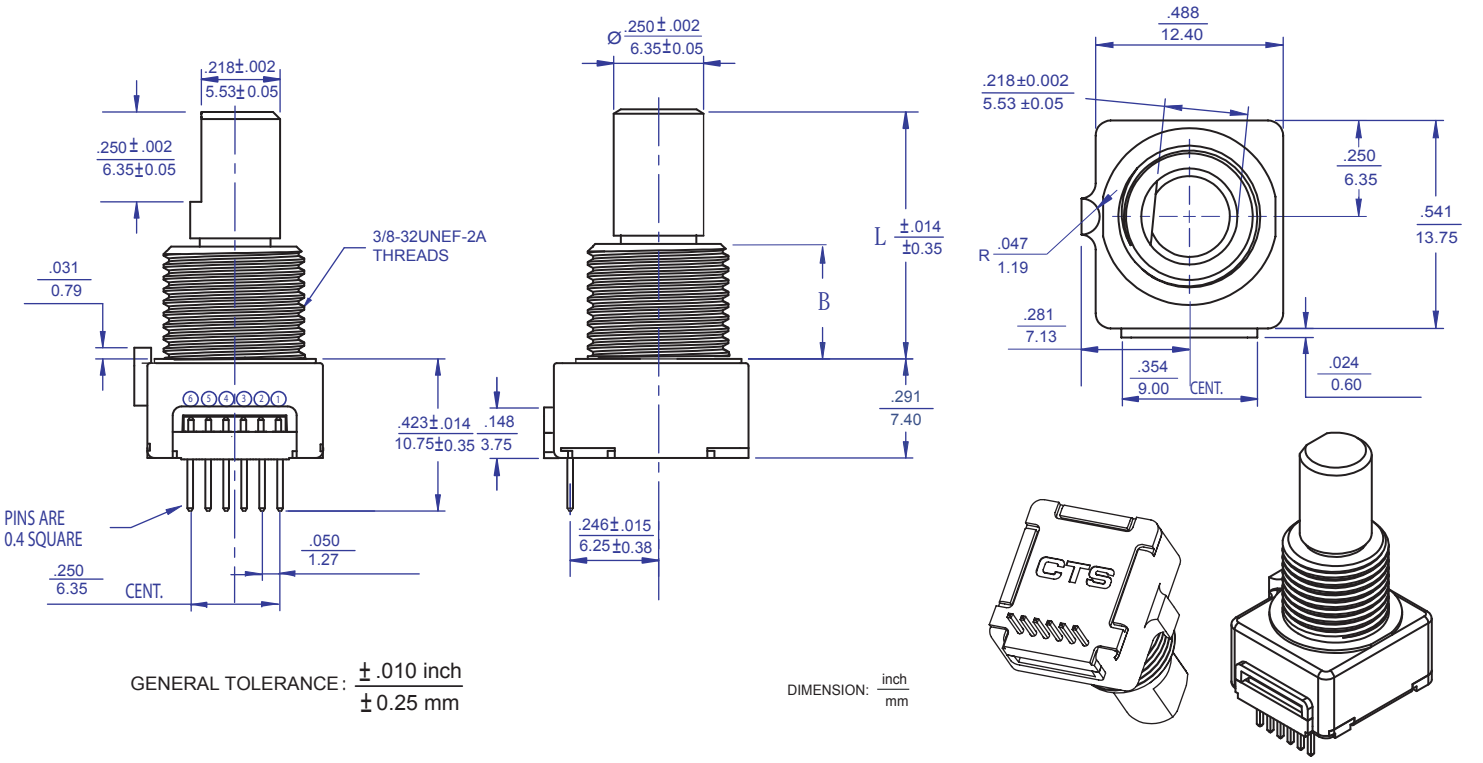
Switch Rating
5 VDC @ 10 mA

Switch Travel
0.5 ± 0.25 mm

Actuation Force
510 ± 110 grams

Switch Life
Standard: 1 Million actuations minimum
Special: Consult CTS for custom life requirements.

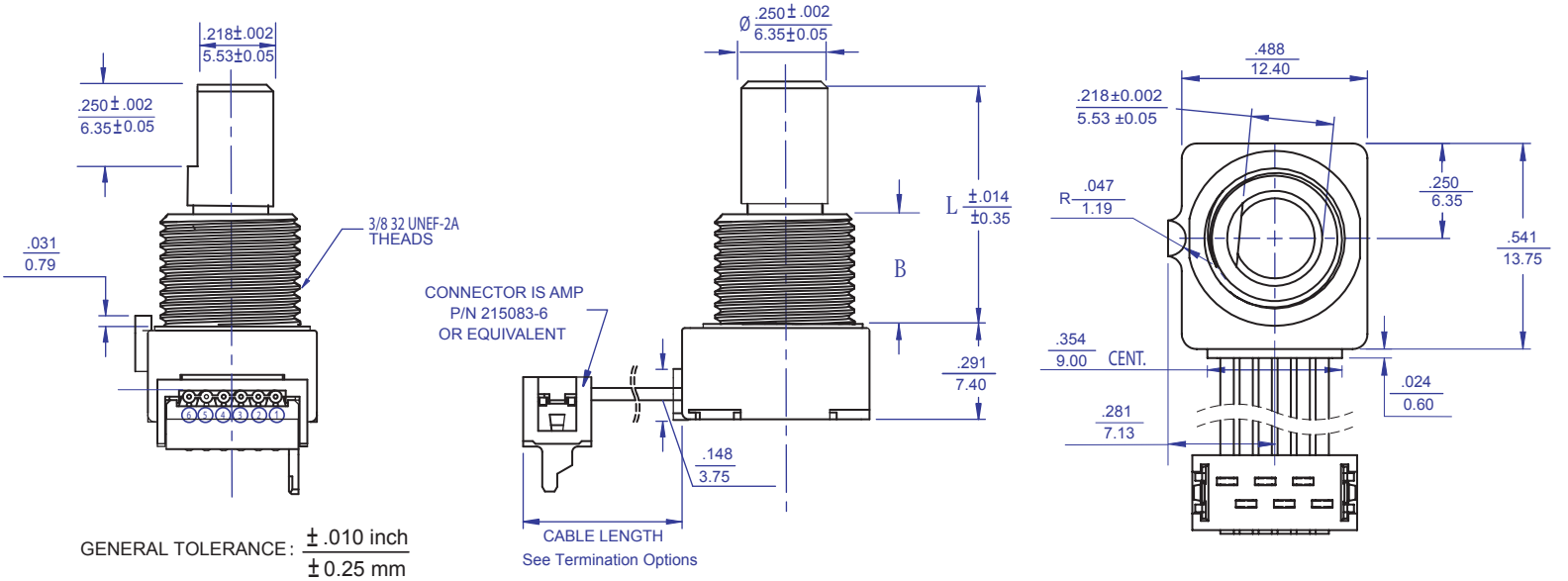
TYPE 291V1 2-Bit Encoder Without Schmitt Trigger, 0.05" Pitch Pins Formed to Rear



GENERAL TOLERANCE: ± .010 inch / ± 0.25 mm

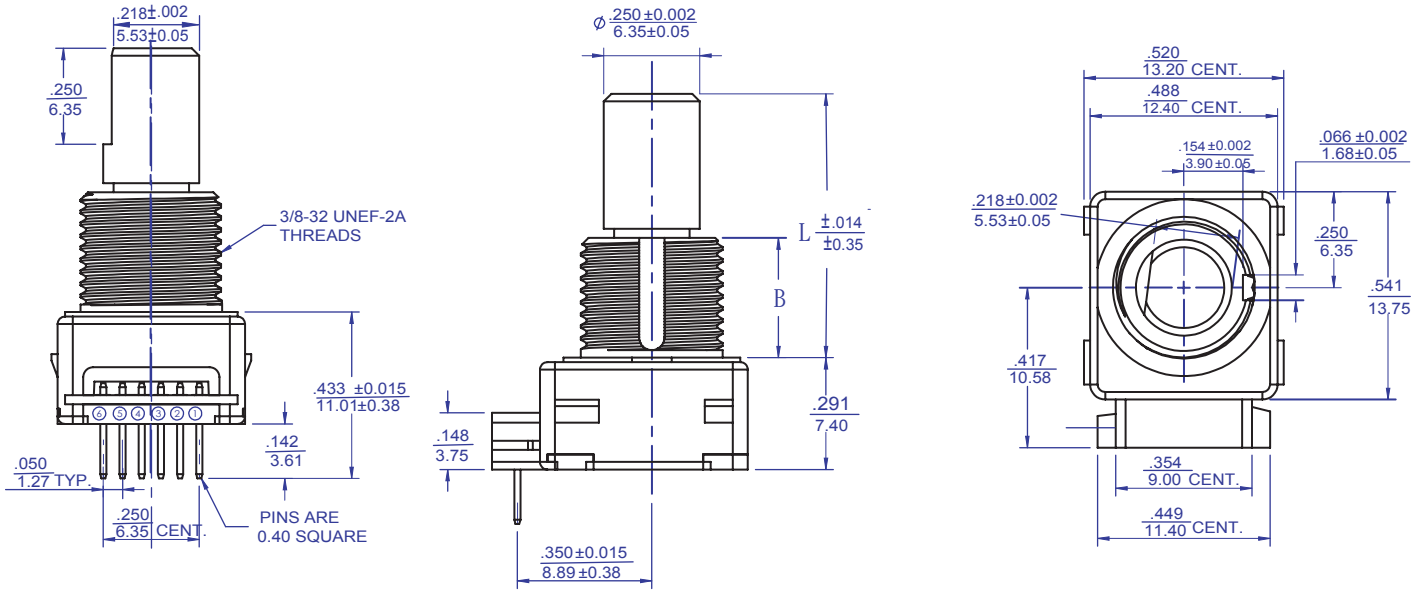
DIMENSION: inch / mm

TYPE 291C 2-Bit Encoder Without Schmitt Trigger, with Cable and Connector



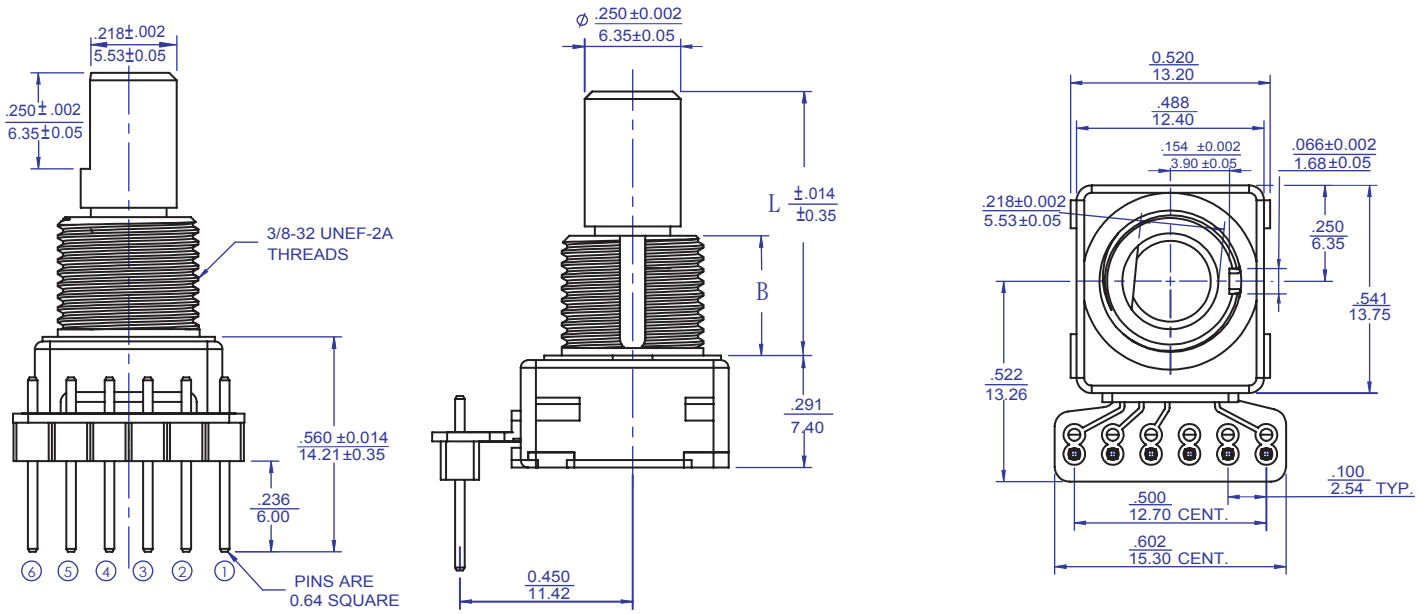
GENERAL TOLERANCE: ± .010 inch / ± 0.25 mm

TYPE 291V1-S 2-Bit Encoder With Schmitt Trigger, 0.05” Pitch Pins Formed to Rear



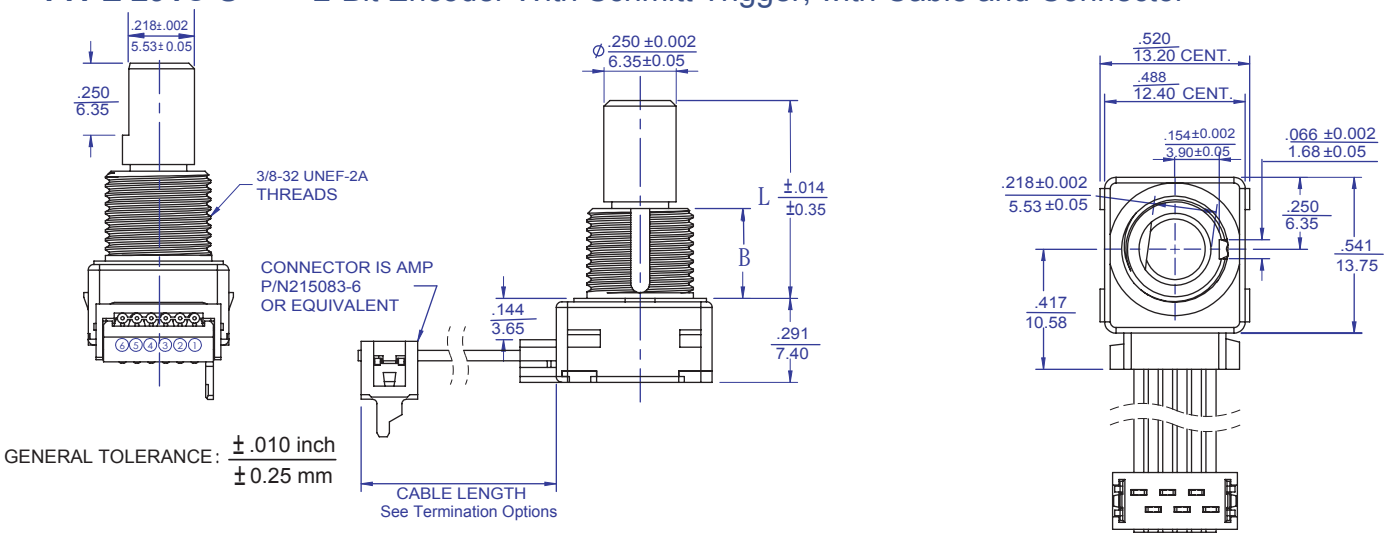
GENERAL TOLERANCE: ± .010 inch / ± 0.25 mm

TYPE 291P1 2-Bit Encoder With/Without Schmitt Trigger, 0.1” Pitch Pins Formed to Rear

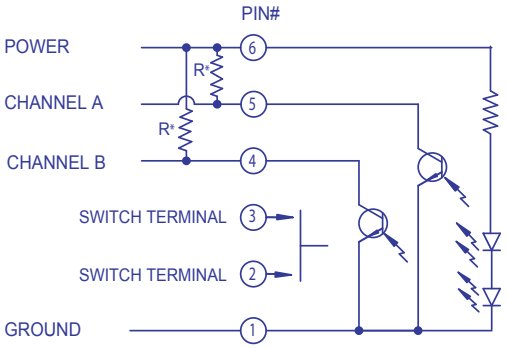


GENERAL TOLERANCE: ± .010 inch / ± 0.25 mm

TYPE 291C-S 2-Bit Encoder With Schmitt Trigger, with Cable and Connector



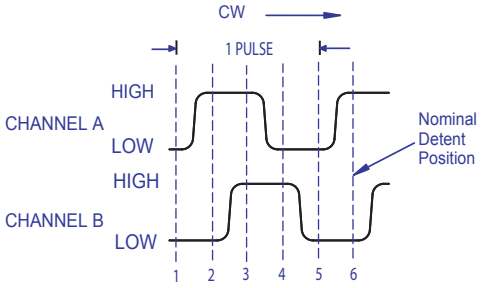
ELECTRIC CIRCUIT AND WAVEFORM (WITHOUT SCHMITT TRIGGER DESIGN)



* Require pull-up resistors (2.2K or 4.7K Ω) for application circuit

Standard Quadrature 2-Bit Code

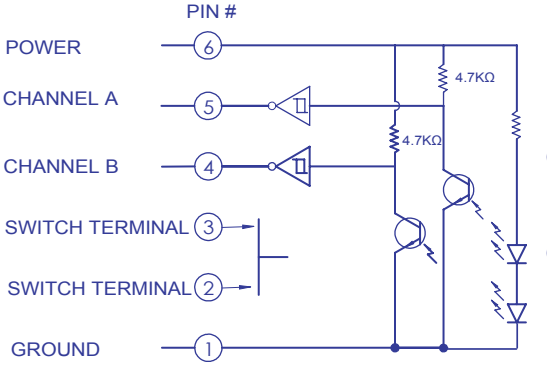
8 PPR/ 32 DETENTS



POSITION NUMBER

1. 8 PPR/32 detents is shown
2. Code repeats every 4 positions
3. Channel A Leads Channel B in CW direction and lags in CCW direction

ELECTRIC CIRCUIT AND WAVEFORM (WITH SCHMITT TRIGGER DESIGN)

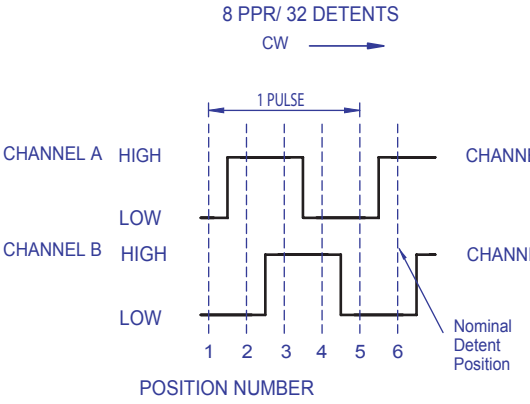


* Schmitt triggers and pull-up resistors (4.7KΩ) are integrated inside CTS optical encoder, so it's not necessary to have external pull-up resistors for application circuit.

* It can work well if application circuit still adopts external pull-up resistors (2.2KΩ).

Standard Quadrature 2-Bit Code

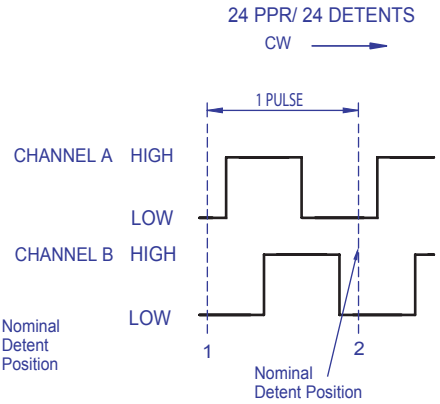
8 PPR/ 32 DETENTS



POSITION NUMBER

1. 8 PPR/32 detents is shown
2. Code repeats every 4 positions
3. Channel A Leads Channel B in CW direction and lags in CCW direction

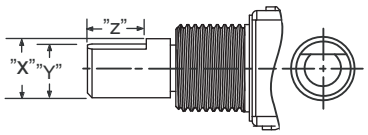
24 PPR/ 24 DETENTS



POSITION NUMBER

1. 24 PPR/24 detents is shown
2. The nominal detent position is located when both Channel A and B are low
3. Channel A Leads Channel B in CW direction and lags in CCW direction

Single Shaft Construction

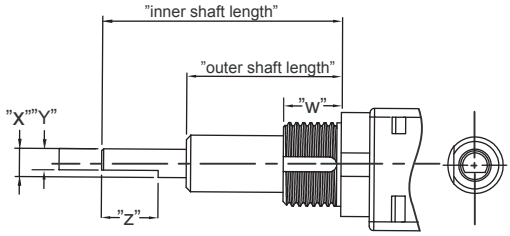


F - FLATTED

	X	Y	Z
Imperial Shaft	.250"	.218"	.250"
Metric Shaft	6.35	5.53	6.35

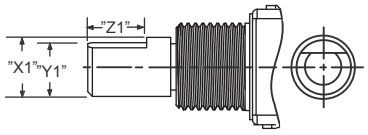
DIMENSION: inch / mm

Dual Shaft Construction



D - DUAL

	X	Y	Z	W
Imperial Shaft	.125"	.094"	.250"	.256"
Metric Shaft	3.18	2.40	6.35	6.50



OUTER FLATTED SHAFT DIMENSION

	X1	Y1	Z1
Imperial Shaft	.250"	.218"	.250"
Metric Shaft	6.35	5.53	6.35

DIMENSION: inch / mm

Ordering Information

291 V1 0 22 F 832 A B S

TERMINATION

V1 - .050" Pitch Center Pins Formed to Rear with .144 length
P1 - .10" Pitch Center Pins Formed to Rear with .236 length
C4 - .050" Pitch Center 4" Ribbon Cable with Connector
C5 - .050" Pitch Center 5" Ribbon Cable with Connector
C6 - .050" Pitch Center 6" Ribbon Cable with Connector

(Connector is AMP P/N 215083-6 or Equivalent)

BUSHING LENGTH

SINGLE SHAFT STRUCTURE
0 - .312"
DUAL SHAFT STRUCTURE
D - .256"
3/8-32NEF-2A Dia.

SHAFT LENGTH

SINGLE SHAFT STRUCTURE
22 - .250" Dia., .687" Length
DUAL SHAFT STRUCTURE
DD - Outer Shaft: .250" Dia., .685" Length
Inner Shaft: .125" Dia., 1.059" Length

SHAFT TRIM

F - FLATTED

OUTPUT COMBINATION

832 - 8PPR, 32-DETENTS
624 - 6PPR, 24-DETENTS
416 - 4PPR, 16-DETENTS
800 - 8PPR, NO DETENTS
600 - 6PPR, NO DETENTS
400 - 4PPR, NO DETENTS
***X00** - 24PPR, NO DETENTS
***X24** - 24PPR, 24-DETENTS
*24PPR is only available with schmitt trigger version

OPERATING VOLTAGE

A - 5.0V
B - 3.3V

SWITCH

A - NONE
B - MOMENTARY

SCHMITT TRIGGER

S - WITH SCHMITT TRIGGER
BLANK - WITHOUT

Note:

Consult CTS for other common features not listed.