

## CA20 Size 2" Absolute Encoder

Featuring  
**CoreTech™**  
by **STEGMANN**

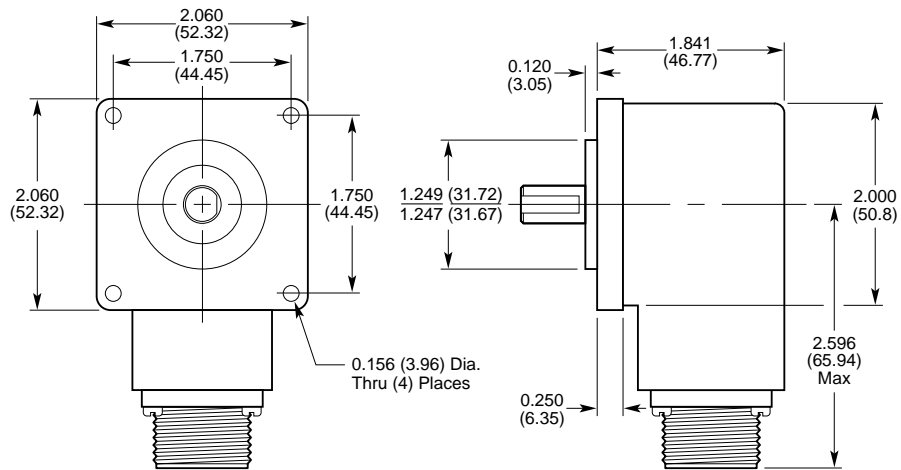


**Features**  
Any resolution  
from 2 to 32,768 ppr  
Parallel or **SSI** absolute output  
Electronic zero position set  
2 to 3 day shipment

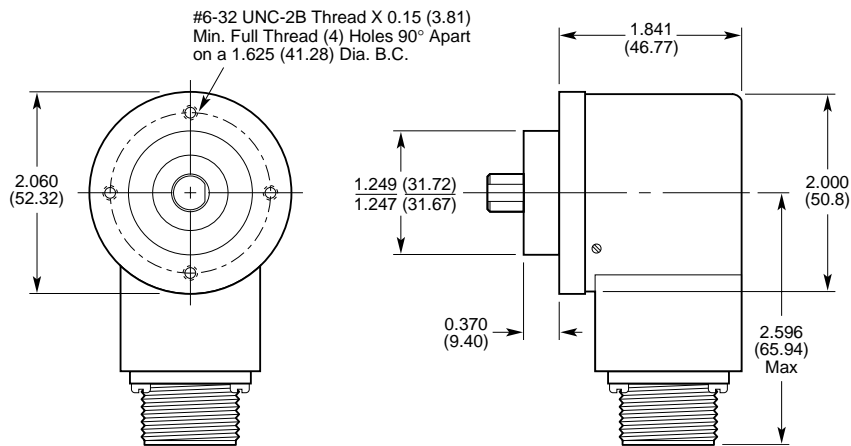


## Dimensions in. (mm)

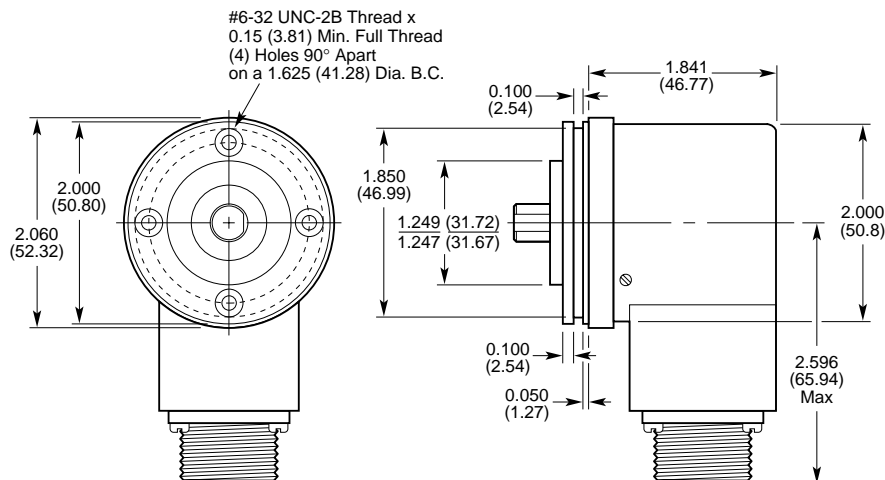
### 2.0" Square Flange Mount



### 2.0" Face Mount with Pilot

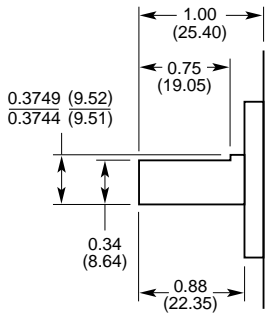


### 2.0" Servo Flange Mount

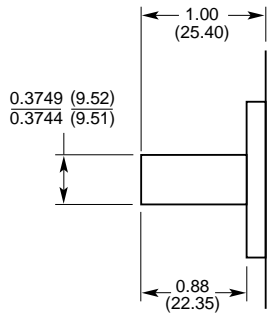


Dimensions in. (mm)

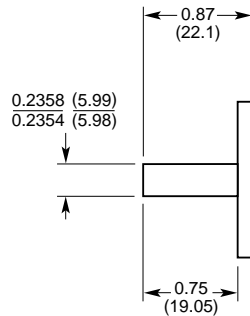
## Shaft Options



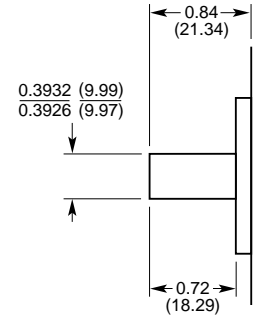
**Square Flange  
3/8" w/Flat**



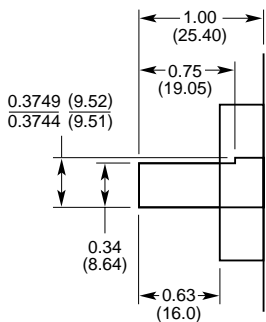
**Square Flange  
3/8"**



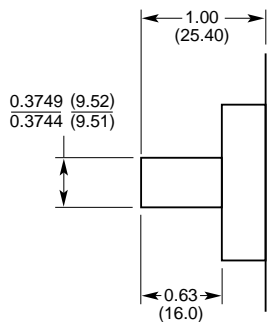
**Square Flange  
6mm**



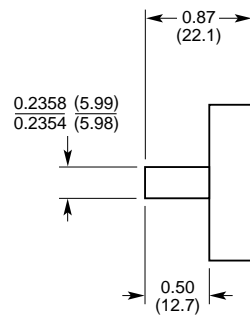
**Square Flange  
10mm**



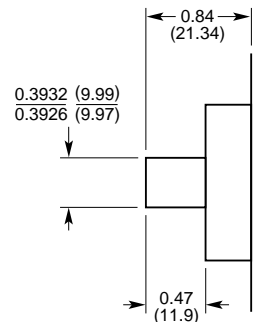
**Face Mount  
3/8" w/Flat**



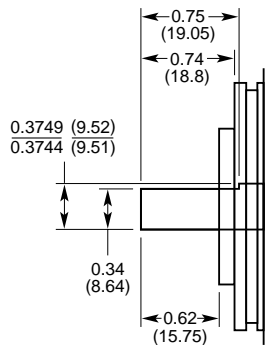
**Face Mount  
3/8"**



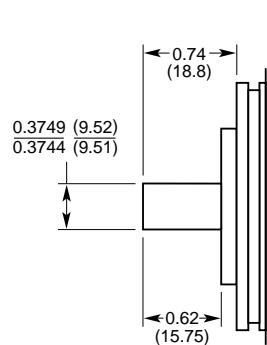
**Face Mount  
6mm**



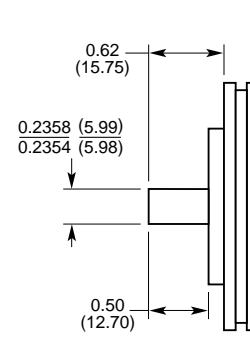
**Face Mount  
10mm**



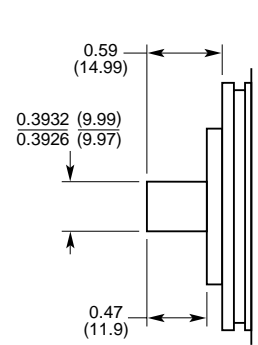
**Servo Mount  
3/8" w/Flat**



**Servo Mount  
3/8"**



**Servo Mount  
6mm**



**Servo Mount  
10mm**

## CA20 Technical Data and Features

Resolutions (Z) per revolution		2–32,768 steps
Interfaces		SSI +5 V Open Collector (7407) +5 V TTL (7407) +10-30 V Push-Pull (7272)
Dimensions		see drawings
Mass		Approx . 0.50 lb. (0.22 kg)
Moment of inertia of the rotor	6 mm shaft 10 mm shaft 3/8" shaft 3/8" shaft with flat	0.0164 lb-in <sup>2</sup> (48 g-cm <sup>2</sup> ) 0.0184 lb-in <sup>2</sup> (54 g-cm <sup>2</sup> ) 0.0181 lb-in <sup>2</sup> (53 g-cm <sup>2</sup> ) 0.0164 lb-in <sup>2</sup> (48 g-cm <sup>2</sup> )
Code direction when viewing the clockwise rotating shaft		CW increasing
Measurement range		1 Revolution
Measuring step		360/ Z degrees
Repeatability		0.005 degrees
Error Limits	binary number of lines non-binary number of lines	0.035 degrees 0.046 degrees
Measuring step deviation	binary number of lines non-binary number of lines	0.005 degrees 0.016 degrees
Measured value backlash		0.005 degrees
Response threshold		0.003 degrees
Max. angular acceleration		5 x 10 <sup>5</sup> rad/ sec <sup>2</sup>
Max. operating speed	With shaft seal Without shaft seal	6,000 rpm 10,000 rpm
Operating torque	6mm shaft 10mm shaft 3/8" shaft 3/8" shaft with flat	typ. 0.0177 in-lb (0.2 N-cm) typ. 0.0266 in-lb (0.3 N-cm) typ. 0.0221 in-lb (0.25 N-cm) typ. 0.0177 in-lb (0.2 N-cm)
Start-up torque	6mm shaft 10mm shaft 3/8" shaft 3/8" shaft with flat	typ. 0.0221 in-lb (0.25 N-cm) typ. 0.0354 in-lb (0.4 N-cm) typ. 0.0266 in-lb (0.3 N-cm) typ. 0.0221 in-lb (0.25 N-cm)
Permissible shaft loading	Radial/ Axial	40 lb. (90 N)/ 40 lb. (90 N)
Bearing Lifetime <sup>1</sup>		3.6 x 10 <sup>9</sup> Revolutions
Working temperature range		32-185°F (0-85°C)
Operating temperature range		-4-185°F (-20-85°C)
Storage temperature range		-40-212°F (-40-100°C)
Permissible relative humidity (condensation not permitted)		90%
EMC to EN 50082-2 and EN 50081-2		

Continued on next page

## CA20 Technical Data and Features (continued)

Resistance to shocks (DIN IEC 68 Parts 2-27)		50/ 11 g/ ms
Resistance to vibration (DIN IEC 68 Parts 2-6)		20/ 10 - 150 g/ Hz
Protection class <sup>2</sup>	Connector with mating connector fitted Cable outlet	IP65 IP66
Operating voltage range(Vs)	SSI +10-30 V Push-Pull (7272) +5 V Open Collector (7407) +5 V TTL (7407)	10-30 VDC 10-30 VDC 5 VDC 5 VDC
Operating current	SSI/ parallel	typ. 60/ 90 mA
Switching level of the control inputs		Logic H=0.7 x Vs Logic L=0v-0.3 x Vs
Operation of zero-set (only with shaft stationary)		100 ms
Initialization time after power on		40 ms

- Notes: 1. Bearing lifetime is at typical loads of 2.25 lb. axial and 4.5 lb. radial. Bearing lifetime at maximum loads is  $2.0 \times 10^8$  cycles.  
2. Protection class is with shaft seal.

## SSI Interface

Line driver and receiver to EIA RS-422 (see also Technical Information 910 940 001 557 synchronous serial interfaces for absolute encoders)

### Data Format

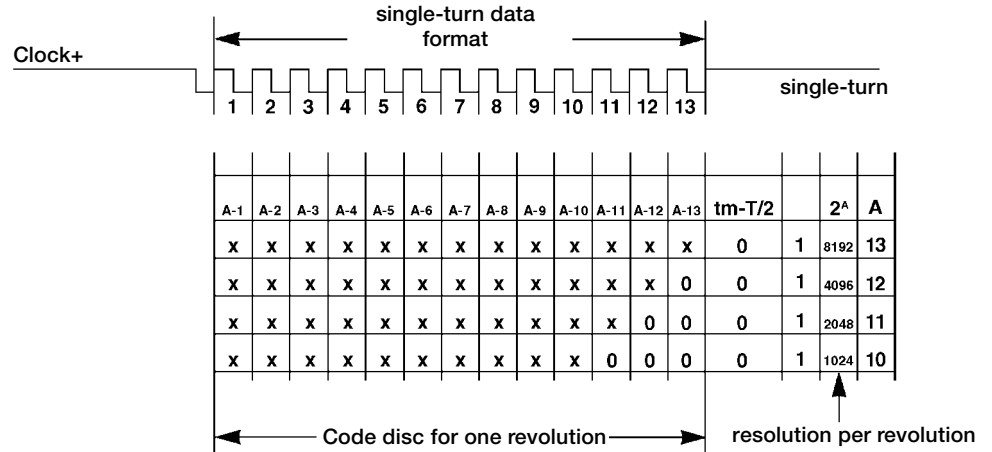
In order to be compatible with the data formats on the market, a distinction is made in the CA6S between two data formats:

The first data format applies to the encoder designs with resolutions up to 13 bits.

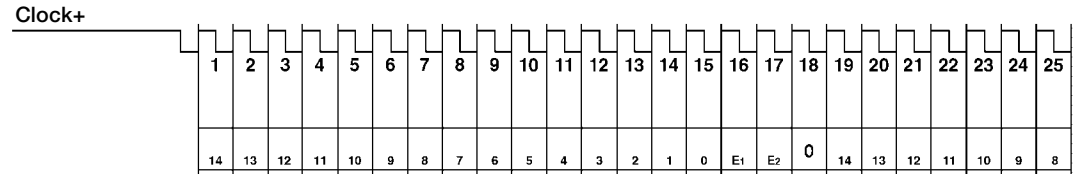
This is the standard data format for the single turn absolute encoder.

The second data format applies to the encoder with a resolution of 14 and 15 bits.

### SSI data format for resolutions 8192 (1-13 bits)



### SSI data format for resolutions > 8192 (14 and 15 bits)



The data transmitted is left justified. The 14/15 data bits are followed by two error bits.

Error 1 (E<sub>1</sub>)  
= position error

During the determination of the position, an error has occurred since the last SSI transmission. This error bit will be deleted during the next SSI transmission

Error 2 (E<sub>2</sub>)  
= light source monitoring

## CA20 Signal Functions

Signal	Description
CW/CCW	Clockwise/counterclockwise: this input programs the counting direction of the encoder. If not connected, the input floats high. When the encoder shaft, as viewed from the shaft end, rotates in the clockwise direction, the encoder counts in an increasing direction. If customer requires opposite count direction, the CW/CCW line must be connected to GND (zero volts).
Store*	This input floats high, and stores the current encoder data in Gray Code when a low level is applied. This insures that all bits of the stored data are correct. The stored data can be read in any code format. While this input is at a low level, the output data is stable whether the encoder shaft rotates or not.
Parity*	This output supplies a high level when the Binary checksum of the data bits is even.
Set Zero	This input serves to set the zero position electronically. If this line is connected to +Vs for more than 100ms, the mechanical position becomes the zero position.

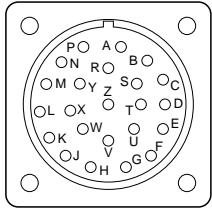
\*Available with parallel outputs only

## Code Types and Resolutions

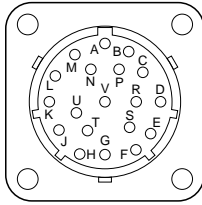
# of Bits	Resolutions	
	Gray, Excess Gray, and Binary Codes**	Binary Coded Decimal**
1	2	2
2	3-4	3-4
3	5-8	5-8
4	9-16	9-10
5	17-32	11-20
6	33-64	21-40
7	65-128	41-80
8	129-256	81-100
9	257-512	101-200
10	513-1,024	201-400
11	1,025-2,048	401-800
12	2,049-4,096	801-1,000
13	4,097-8,192	1,001-2,000
14	8,193-16,384	2,001-4,000
15	16,385-32,768	4,001-8,000

\*\*Binary and binary coded decimal are available with parallel outputs only.

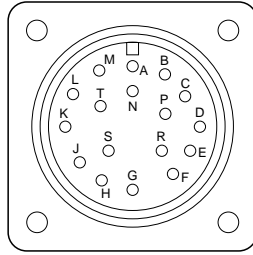
## CA20 Connector Drawings



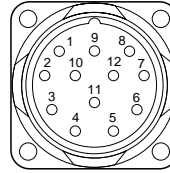
23 Pin KPT02E20-23P



19 Pin KPT02E14-19P



17 Pin MS3102R



12 Pin SSI

## CA20 Pin and Cable Allocation

### 23 Pin Connector (Parallel Output)

Pin	32768 (15 bit)	16384 (14 bit)	8192 (13 bit)	4096 (12 bit)	2048 (11 bit)	1024 (10 bit)	512 (9 bit)	360 (9 bit)	256 (8 bit)
A	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0
B	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1
C	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2
D	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3
E	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4
F	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5
G	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6
H	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7
J	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	-
K	Bit 9	Bit 9	Bit 9	Bit 9	Bit 9	Bit 9	-	-	-
L	Bit 10	Bit 10	Bit 10	Bit 10	Bit 10	-	-	-	-
M	Bit 11	Bit 11	Bit 11	Bit 11	-	-	-	-	-
N	Bit 12	Bit 12	Bit 12	-	-	-	-	-	-
P	Bit 13	Bit 13	-	-	-	-	-	-	-
R	Bit 14	-	-	-	-	-	-	-	-
S	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw
T	GND	GND	GND	GND	GND	GND	GND	GND	GND
U	Store	Store	Store	Store	Store	Store	Store	Store	Store
V	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs
W	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero
X	-	-	-	-	-	-	-	-	-
Y	Parity	Parity	Parity	Parity	Parity	Parity	Parity	Parity	Parity
Z	Case	Case	Case	Case	Case	Case	Case	Case	Case

## CA20 Pin and Cable Allocation

### 19 Pin Connector (Parallel Output)

Pin	32768 (15 bit)	16384 (14 bit)	8192 (13 bit)	4096 (12 bit)	2048 (11 bit)	1024 (10 bit)	512 (9 bit)	360 (9 bit)	256 (8 bit)
A	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0
B	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1
C	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2
D	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3
E	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4
F	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5
G	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6
H	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7
J	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	-
K	Bit 9	Bit 9	Bit 9	Bit 9	Bit 9	Bit 9	-	-	-
L	Bit 10	Bit 10	Bit 10	Bit 10	Bit 10	-	-	-	-
M	Bit 11	Bit 11	Bit 11	Bit 11	-	-	-	-	-
N	Bit 12	Bit 12	Bit 12	-	-	-	-	-	-
P	Bit 13	Bit 13	-	-	-	-	-	-	-
R	Bit 14	Store	Store	Store	Store	Store	Store	Store	Store
S	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw
T	GND	GND	GND	GND	GND	GND	GND	GND	GND
U	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero
V	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs

## Watertight Cable for Parallel Output

Wire Color	32768 (15 bits)	16384 (14 bits)	8192 (13 bits)	4096 (12 bits)	2048 (11 bits)	1024 (10 bits)	512 (9 bits)	360 (9 bits)	256 (8 bits)
Violet	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0	Bit 0
White/ brown	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1	Bit 1
White/ green	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2	Bit 2
White/ yellow	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3	Bit 3
White/ grey	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4	Bit 4
White/ pink	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5	Bit 5
White/ blue	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6	Bit 6
White/ red	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7	Bit 7
White/ black	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	Bit 8	-
Brown/ green	Bit 9	Bit 9	Bit 9	Bit 9	Bit 9	Bit 9	-	-	-
Brown/ yellow	Bit 10	Bit 10	Bit 10	Bit 10	Bit 10	-	-	-	-
Brown/ grey	Bit 11	Bit 11	Bit 11	Bit 11	-	-	-	-	-
Brown/ pink	Bit 12	Bit 12	Bit 12	-	-	-	-	-	-
Brown/ blue	Bit 13	Bit 13	-	-	-	-	-	-	-
Brown/ red	Bit 14	-	-	-	-	-	-	-	-
Green	Parity	Parity	Parity	Parity	Parity	Parity	Parity	Parity	Parity
Pink	Store	Store	Store	Store	Store	Store	Store	Store	Store
Yellow	-	-	-	-	-	-	-	-	-
Brown	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw	cw/ccw
Grey	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero	Set Zero
Blue	GND	GND	GND	GND	GND	GND	GND	GND	GND
Red	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs	+Vs
Shield	Case	Case	Case	Case	Case	Case	Case	Case	Case

## 12 Pin Connector and Watertight Cable for SSI

Signal	12 pin Connector	Wire Color	Signal	12 pin Connector	Wire Color
GND	1	Blue	-	7	-
Data +	2	White	+Vs	8	Red
Clock +	3	Yellow	Set Zero	9	Orange
-	4	-	Data -	10	Brown
cw/ccw_	5	Pink	Clock -	11	Violet
-	6	-	-	12	-

## How To Order

Use the numbered chart below to construct your ordering code as shown below.

TW 2 - 2 - 32768 - 1 - 2 1 1

### ① Encoder Type

TW Absolute CoreTech

### ② Interface

- 1 SSI
- 2 10-30 V Push-Pull (7272)
- 3 5 VDC Open Collector (7407)
- 4 5 VDC TTL (7407)

### ③ Code Type

- 1 Gray Code
- 2 Gray Excess
- 3 Natural Binary<sup>1</sup>
- 4 BCD<sup>1,2</sup>

### ④ Positions per 360°

Maximum 32,768  
(Final part number will have a base 32 coded resolution)

### ⑤ Size and Mounting Arrangement

- 0 2" face mount
- 1 2" square flange
- 2 2" face/servo mount

### ⑥ Shaft Size

- 1 3/8"
- 2 3/8" with flat
- 3 1/4"
- 4 6 mm
- 5 10 mm

### ⑦ Electrical Connection

- 1 SSI: 12 pin radial
- 3 SSI: 18 in. radial
- 4 SSI: 3 ft. radial
- 1 Parallel: 23 pin radial
- 3 Parallel: 19 pin radial
- 6 Parallel: 18 in. radial cable
- 7 Parallel: 3 ft. radial cable
- 8 Parallel: 10 ft. radial cable
- B Parallel: 10 ft. axial cable

#### Notes:

- 1 Not available on SSI units.
- 2 Maximum resolution with BCD output is 8000.