Electronics
DC Motor with Shaft Encoder

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Shaft encoders

As long as you know the initial position, you can update if you can sense changes.
Shaft encoders

- *Incremental rotary* encoding
Shaft encoders

- *Incremental rotary* encoding
  - two channels
Shaft encoders

- *Incremental rotary* encoding
  - two channels

As long as you know the initial position, you can update if you can sense changes.
There are 30 teeth, so the encoder has $12^\circ$ resolution.
Here’s how it fits in the case.
There’s no electrical connection between motor and shaft encoder.
Here are the two parts identified.
Here are the motor connections.
Here are the shaft encoder connections.
There is not even a common ground.
DC Motor with Shaft Encoder

Two sensors will allow determination of rotation speed and angle.

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Electronics DC Motor with Shaft Encoder
Shaft encoder wheel
• Shaft encoder wheel
• Two sensors will allow determination of rotation *speed* and *angle*
Clockwise
Clockwise
Clockwise
DC Motor with Shaft Encoder

Shaft encoders

Clockwise
Counter-clockwise
Counter-clockwise
Counter-clockwise
Counter-clockwise
Shaft encoder timing

1

1
- Shaft encoder timing
  - 0
  - 1
Shaft encoder timing

0

1
Shaft encoder timing

0

1
Shaft encoder timing
0
0
- Shaft encoder timing
- 0
- 0
Shaft encoder timing

1

0
Shaft encoder timing

1

0
- Shaft encoder timing
- 1
- 0
Shaft encoder timing

1

1
- Speed of rotation from frequency of either channel
- *Speed* of rotation from frequency of either channel
- *Angle* of rotation from combination
- **Speed** of rotation from frequency of either channel
- **Angle** of rotation from combination

Here’s an example from an actual motor.
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Electronics DC Motor with Shaft Encoder
One direction
Other direction
Period is 5 divisions
Period is 5 divisions
Time scale is 500 µS per division
Period is 5 divisions $\rightarrow 2500\mu S = 2.5\text{mS}$
Time scale is $500\mu S$ per division
Period is 5 divisions → $2500\mu S = 2.5\text{mS}$
30 slots per revolution $\times 2.5\text{mS}$
Period is 2.5mS
30 slots per revolution × 2.5mS → 75ms per revolution
Period is 2.5mS × 30 → 75ms per revolution
75/1000 seconds per revolution → 13.33 rev./second
Period is $2.5\text{mS} \times 30 \rightarrow 75\text{ms per revolution}$
$75/1000 \text{ seconds per revolution} \rightarrow 13.33 \text{ rev./second}$
$\times 60 \rightarrow 800 \text{ RPM}$