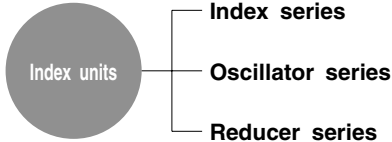


# Index unit basic operation

- Index/single-dwell cam index and multi-dwell cam index

Index units are classified in three types, including indexer, oscillator, and reducer, based on its operation. CKD provides all three types of index units with a wide variety.



## Indexing

The index unit issues constant speed rotation to the input shaft to repeat a series of operations, such as turning and stopping the output shaft at a set angle. The cam installed on the input shaft has a geometrically analyzed motion curve. It follows the cam follower in the output shaft to convert rotation into optimal movement.

This features the following:

### 1. Synchronous properties

Operation time is determined by functionally converting input shaft rotation to that of the output shaft to synchronize with other operations.

### 2. Operation properties

The smooth motion curve attained from the cam enables the output shaft to be turned and stopped at high speed and high frequency. Speed and acceleration are controlled with the appropriate motion curve.

### 3 Repeatability

Issuing constant speed rotation to the input shaft enables a series of operations that repeatedly turn and stop the shaft within a set angle at a set time. This also enables outstanding accuracy.

Common index units that use a cam include the roller gear cam, parallel cam, and barrel cam.

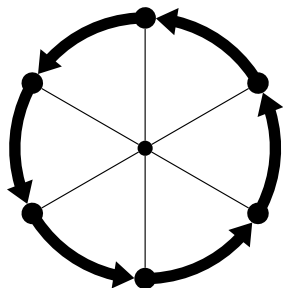
The mechanism differs with the method, but different operations are possible by combining different index numbers, index angles, and cam curves.

\* Note: The term "index" is often used to translate the terms index (such as in a book), exponential, and indicator. In this catalog, index indicates the index operation or index unit following the cam drive's operation and type.

## Single-dwell and multi-dwell cam index units

The general index unit has one dwell angle that corresponds to the index angle dwell of the output shaft movement within  $360^\circ$  input shaft rotation. This is called a single-dwell (single-dwell) cam.

Where many index numbers are required,

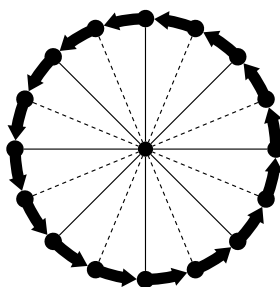


### ● 6-division single-dwell cam index unit

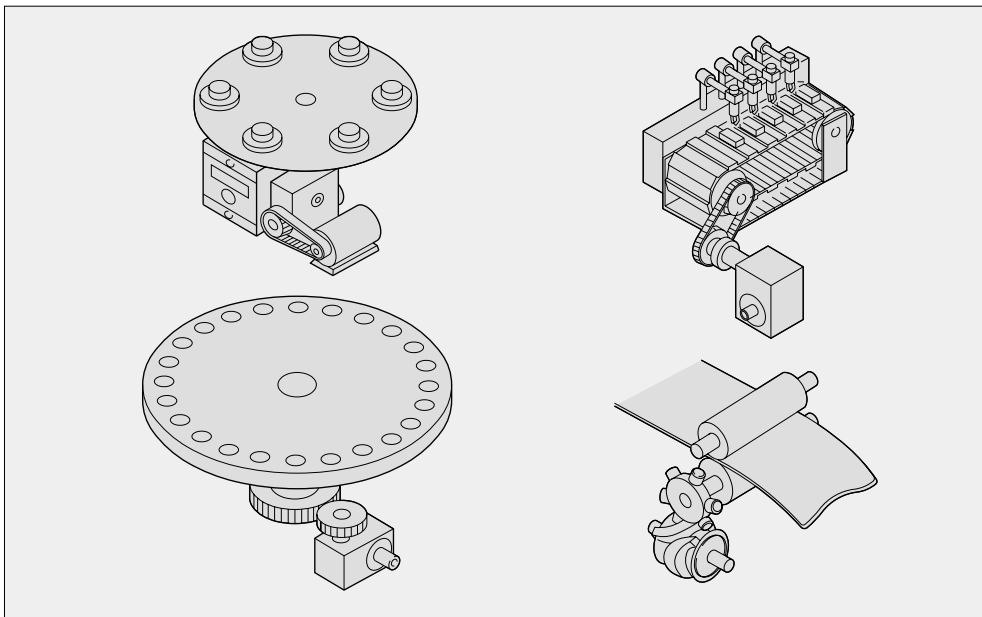
The index unit is commonly used as the drive source for intermittent tables, intermittent conveyors, and roller feeds used for unidirectional indexing.

multiple sets of index angles and dwell angles are set. This is called a multi-dwell cam.

The multi-dwell cam index unit is less accurate than that of the single-dwell cam, but it is more rigid. Compare and consider the type, size, accuracy, and compatibility with the application when selecting the application.



### ● 16-division 2-dwell cam index unit



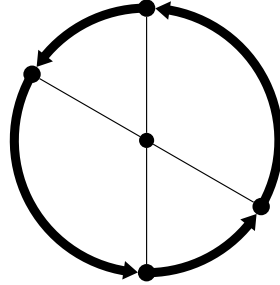
# Index unit basic operation

## ● Special index/Oscillation

### Special index unit

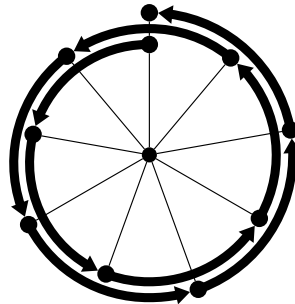
#### (1) Unequal division index unit

With the normal index unit, the output shaft's index angle is equally divided. An unequal divided index unit is manufactured based on design conditions.



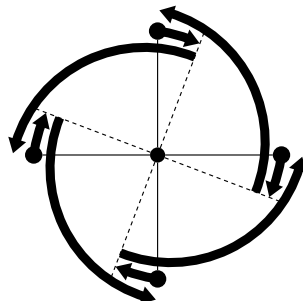
#### (2) Irregularly divided index unit

With the normal index unit, the output shaft's stop position is repeated at the same position each rotation. However, with an index unit that turns every  $80^\circ$  (4.5 division), the stop position is repeated each time the output shaft rotates twice. Possible applications include a drive source for a reduction gear.



#### (3) Return motion index

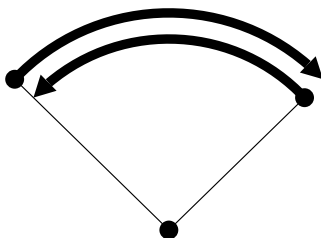
In some cases, once the intermittent conveyor transfers the workpiece to a set position, the workpiece is moved in another direction by another device. The workpiece must be released from the conveyor's jig pressure in this case. Operation that retracts slightly after positioning at a set position -- a cam that combines an index unit and oscillator, explained later -- is manufactured as needed.



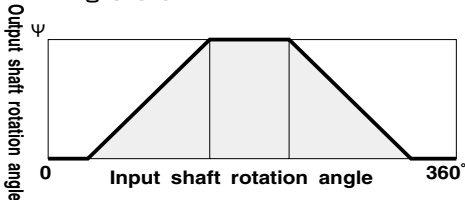
## Oscillation

When the index unit indexes only in one direction and constant speed rotation is issued to the input shaft, the oscillator turns the output shaft by the set angle, stops it, reverses it, and returns to the original position.

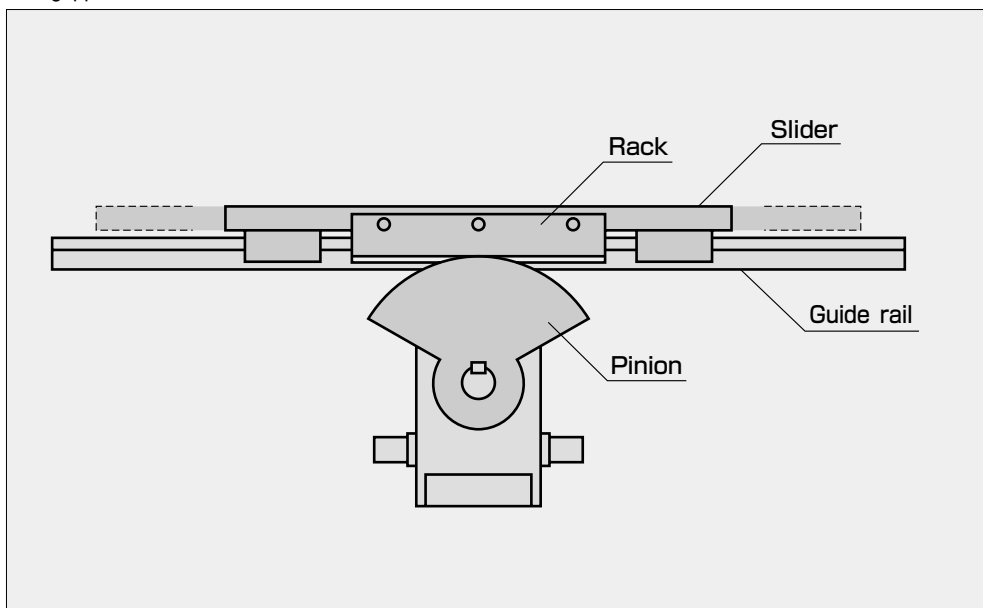
The dwell angle - index angle (forward) - dwell angle - index angle (return) is set within the input shaft's  $360^\circ$  rotation. Compared to the same sized index unit turning the output shaft in one direction, the output shaft's swing angle and the input shaft's index angle may be restricted, requiring that timing be considered.



● Timing chart



The oscillator is used as a drive source for straight slider reciprocation, turning arms, pick and place, and gripper feed.



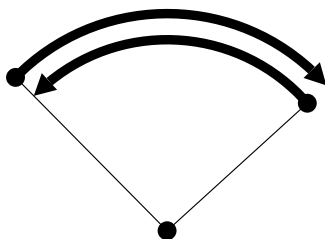
# Index unit basic operation

- Special oscillator, reducer, special reducer

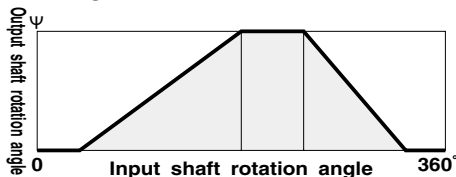
## Special oscillator

### (1) Oscillator with differing reciprocating times

The standard oscillator series uses the same index angle and dwell angles when reciprocating. If the input shaft rotates at constant speed, dwell time may be changed at the oscillating end and reciprocation movement time changed. This means that the index angle and dwell angle ratio within the input shaft's 360° range can be set freely.

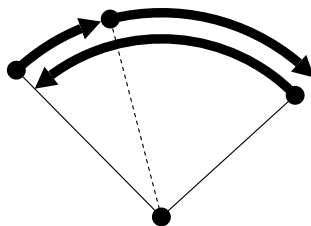


#### ● Timing chart

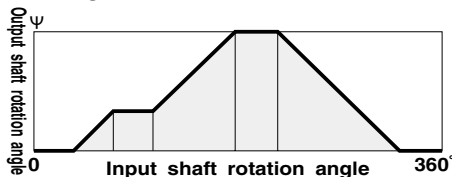


### (2) Oscillator with three or more stop positions

When working at the oscillating end, the arm, jig, etc., at the end of the output shaft may interfere with other equipment at the oscillating end. The wait point must be set at other than the oscillating end to ensure a dwell angle of several minutes at the input shaft. The drive is stopped within this angle to stop movement until work is completed. This is used for cycle stops and waiting points when the system runs out of workpieces (supplied parts), or as a set stop position when stopping operation. Depending on the equipment structure, this may not be changeable.



#### ● Timing chart



The positional relationship of input and output shaft rotation direction, output shaft keyway, and tap hole and specifications such as the timing chart must be set to manufacture this special oscillator.

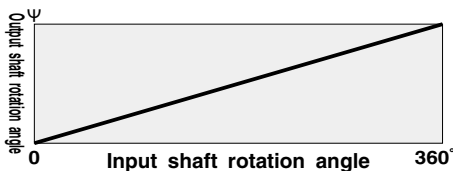
## Reducer

When the index unit has a dwell angle and stops at a set position, a reducer with a reduction rate that corresponds to the index unit index number is realized by setting the dwell angle to  $0^\circ$  and using a constant speed curve with no acceleration or deceleration for the cam curve.

This reducer cam features the following:

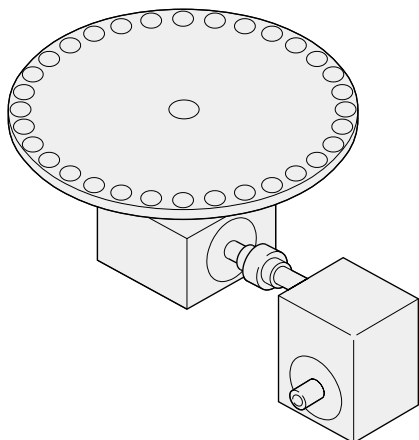
- (1) Backlash caused by the pre-load mechanism is extremely small, and
- (2) A rolling contact makes age deterioration low and speed reduction high.

### ● Timing chart



### • Applications

- Servomotor reduction gears
- Multidivision indexing when combined with an index unit.
- Transferring precision between two shafts instead of gears.



## Special reducer (Surf motion)

The general reducer operates as a constant speed reducer. In special cases, the input shaft's constant speed rotation is fluctuated cyclically at the output shaft.

With the 1:1 reducer, for example, when the input shaft is rotated once at a constant speed, the output shaft rotates with it. When a special reducer with surf motion is used, the acceleration, deceleration, and constant speed ranges are randomly set within one rotation.

With the 1:1 reducer, for example, when the input shaft is rotated once at a constant speed, the output shaft rotates with it. When a special reducer with surf motion is used, the acceleration, deceleration, and constant speed ranges are randomly set within one rotation.

This is also called as a nonvibrating speed converter having outstanding operation attained with the cam curve.

