

# Actuators Miniature Plungers

Micro-current driven electromagnetic  
ON(Self-retracted) type

MA series

Issue date: February 2007

- All specifications are subject to change without notice.
  - Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.
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# Actuators Miniature Plungers

## MA Series

Conformity to RoHS Directive

TDK's plungers are small electromagnetic plunger solenoids that are used as mechanical drive components for applications such as portable audio equipment, cameras, CD-ROM, DVD-ROM drives, etc. Due to high pulling force and low power consumption, these plungers are widely used as mechanical drive components for portable precision equipment.

### FEATURES

- These plungers offer excellent dust protection due to location of the contact surfaces between the yoke (fixed core component) and the armature (movable core component) within the drive coil bobbins (ON type).
- Electric power consumption can be reduced due use of a current pulse (10ms) for the opening operation.
- High pulling force in excess of 3.5N is possible (ON type).
- Can be used as a mechanical component in small scale portable equipment due to small scale architecture.
- Rapid change of mechanical operation becomes possible by combination with motors, etc.

### CONSTRUCTIONS

#### ON TYPE (Self-retracted type)

This type comprises a yoke, movable armature, coils, and high performance rare earth magnet.

The movable armature is held against the magnet by magnetic force. A pulse voltage is applied to the coils to release the movable armature.

The movable armature is released from the yoke due to back tension exerted by a spring, etc. The force exerted during armature release can be utilized to control various types of mechanisms.

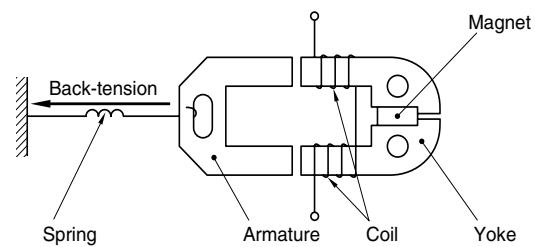
This voltage applied to the coil is called the "release voltage," which is normally a voltage pulse applied for 10 msec.

Since the released movable armature has no self-retracting force, another force must be provided to return the movable armature back to the position in which the movable armature is again held against the yoke by the magnet.

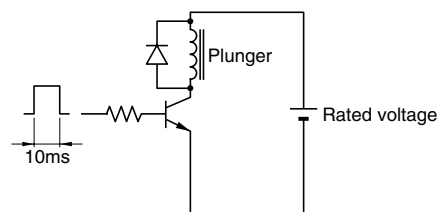
### APPLICATIONS

- Switching between operating modes for headphone stereos.
- Control of automatic focus, iris diaphragm, and shutter of cameras.
- Slim type CD-ROM, DVD-ROM drives.
- Card lock for magnetic card readers.
- Brake for prevention of tape wrap-up during power outages for DAT and DVC.
- Other small scale mechanical mechanisms with severe size and electric power consumption limitations.

### ON TYPE CONSTRUCTION



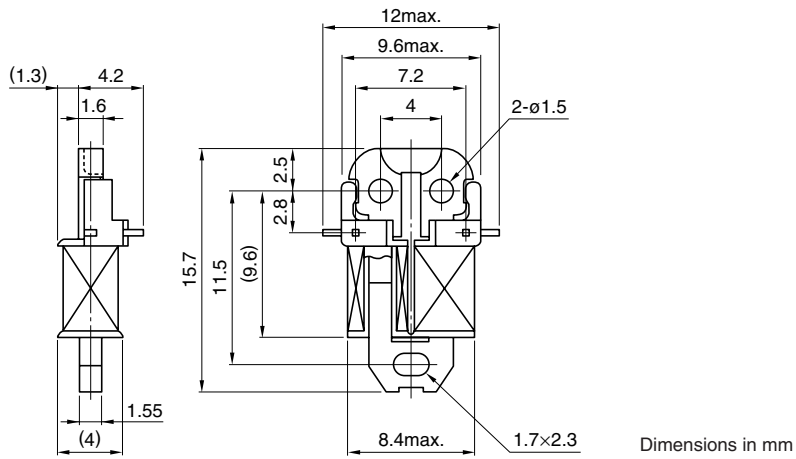
### DRIVING CIRCUIT



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**ON TYPE**  
**SHAPES AND DIMENSIONS**  
**MA-307**



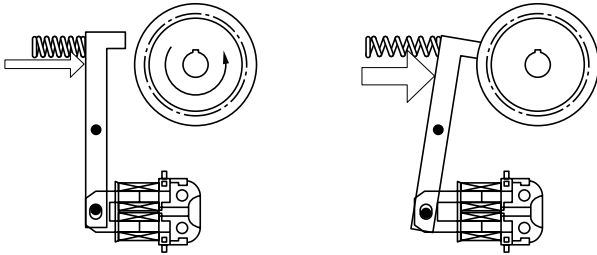
**CHARACTERISTICS**

Part No.	Rated voltage Edc(V)	Operating voltage range Edc(V)	Coil resistance ( $\Omega$ )	Attraction force (N)min.	Back tension (N)	Operating stroke (mm)	Weight (g)	Terminal construction
MA-307-2	1.5	0.8 to 2.5	5.5	1.7	0.85	2.5	1.4	L-type
MA-307-9	5	3 to 6	30	2.2	0.8	2.5	1.4	L-type
MA-307-26	5	3.7 to 6.5	30	3.5	1.0	2.5	1.4	L-type

**OPERATION EXAMPLES**

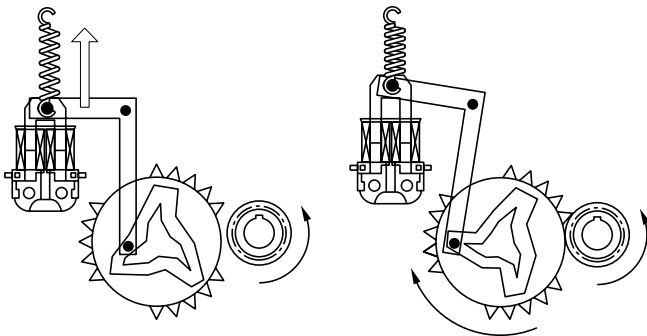
**1.STOP**

A rotating drum can be stopped by application of a brake.



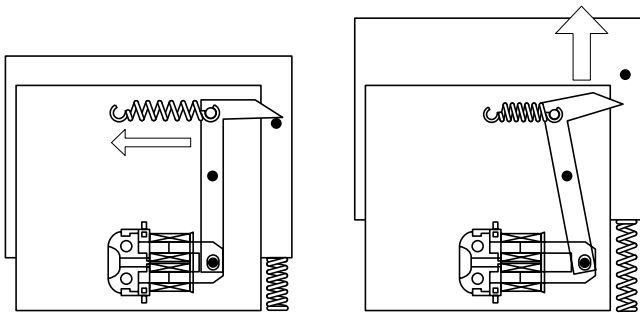
**2.ROTATE**

One third of a rotation can be carried out during each operation by use of a motor and a multiple-sector gear.



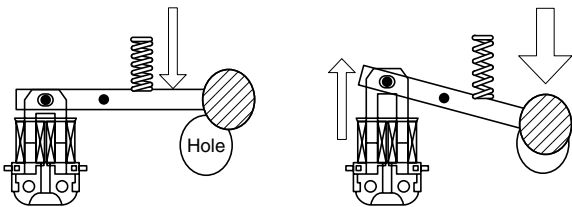
**3.RELEASE**

The lock of a tray, card, etc. can be released.



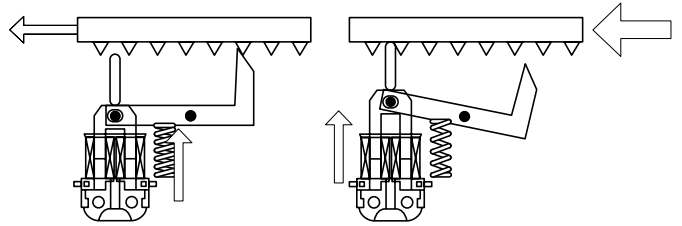
**4.CLOSE**

A shutter can be moved to close an aperture and control the amount of transmitted light.



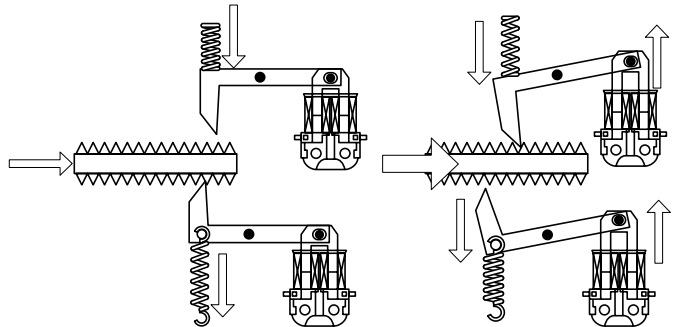
**5.MOVE**

A gear can be moved one tooth at a time by operation of a plunger.



**6.DETERMINE**

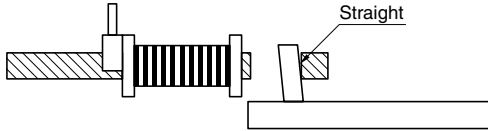
The distance of gear movement can be determined by differences in the operation time periods of two plungers.



### RECOMMENDATIONS CONCERNING USE OF PLUNGERS

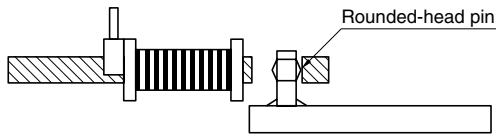
#### 1. PINS FOR APPLICATION OF BACK TENSION TO THE PLUNGER MOVABLE ARMATURE

When the pin or plunger is installed tilted and if the pin has a straight shape, problems can occur due to collision such as reduction of return force and weakening of the movable armature.

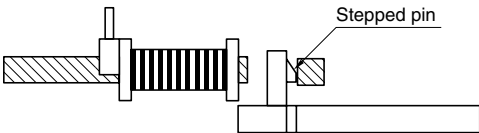


We recommend consideration and testing of the following shapes.

For metal pins: rounded-head pin

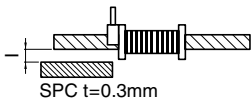
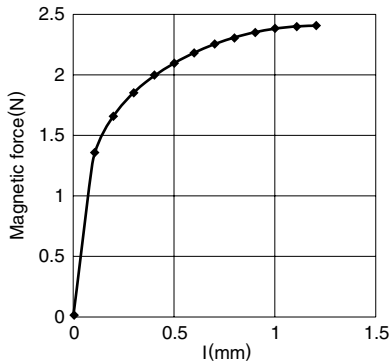


For lever-pin molded as a single unit from plastic: stepped pin



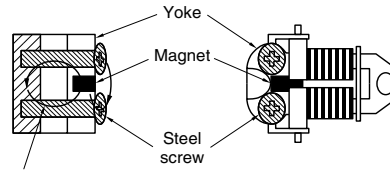
#### 2. EFFECT OF NEARBY MAGNETIC FIELDS

TDK plungers are magnetic actuators that utilize magnets and coils. Therefore retraction force can decrease when the plunger is approached by strongly magnetic materials such as iron, stainless, etc.



#### 3. MATERIAL OF CONSTRUCTION OF MOUNTING SCREWS

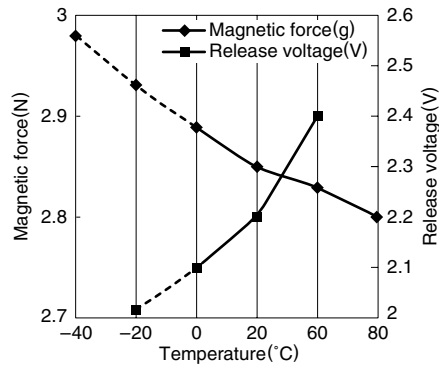
Due to redirection of the magnetic field, the retraction force and release voltage decrease when screws constructed from a magnetic material (steel, etc.) are used for mounting of the plunger.



The magnetic field is redirected along the screws and away from the movable armature.

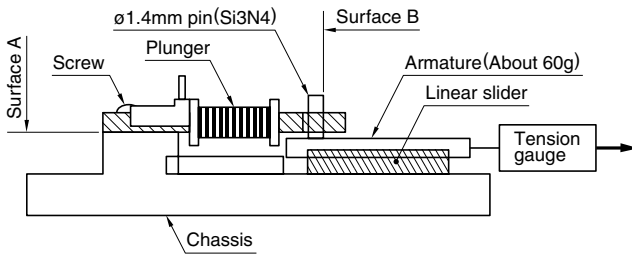
#### 4. TEMPERATURE DEPENDENCE OF RETRACTION FORCE AND RELEASE VOLTAGE

Due to a temperature increase of the surroundings, characteristics vary as the coil resistance increases and the magnetic field decreases.



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## SIMPLIFIED DRAWING OF TDK MEASUREMENT STAND



### 1. MEASUREMENT PROCEDURE

1-1. Use screws to mount the plunger on the measurement stand, and attach the plunger immediately behind a tension gauge.

Peak tension is the retention force(N) at the time of movable armature separation from the yoke.

1-2. In conditions applying prescript back tension, and a low voltage 10ms pulse is applied to the plunger terminal. The pulse voltage is gradually raised until a voltage (release voltage(V)) is reached that causes release of the movable armature.

### 2. PRECAUTIONS

- The chassis should have a polished surface.
- The chassis plunger mounting surface (surface A) and the pin (B surface) should be perpendicular to each other.
- The chassis, screws, test armature, and pin should be constructed from non-magnetic materials (stainless steel, ceramics).
- The pin should have a rounded head pin or a stepped pin in order to reduce the effect of pin tilt. Similar care should be paid to the pin selected for actual use.
- Release voltage tends to decrease as the test armature (mobile component that pulls the movable armature) mass is reduced.

