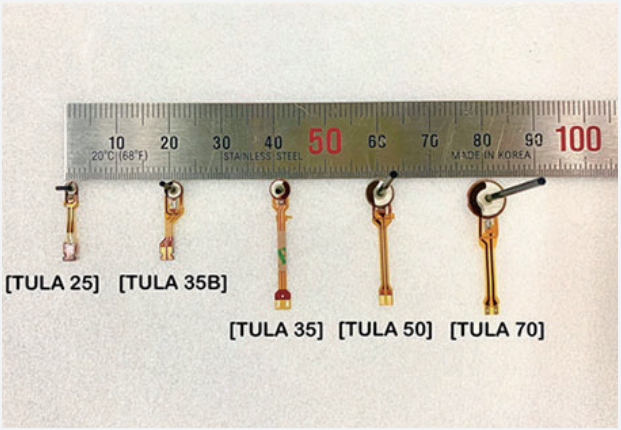
TULA

Tiny Ultrasonic Linear Actuators 微型直线电机

由单层或双层压电体的线性运动驱动的下一代促动器。

Next generation actuator driven by linear motion of unimorph or bimorph piezoelectric body.



Applications 应用领域

- 相机及手机的变焦 (ZOOM) 与自动对焦 (AF)
  ZOOM, AF of camera and mobile phone
- 数码相机 (DSC) 或智能手机的光学图像稳定 (OIS) 系统
  Optical Image Stabilizer (OIS) of DSC or Smartphone
- 位移平台模块
  Stage module
- 闭路电视 (CCTV) 系统的红外滤光片切换 (ICR) 装置
  ICR(infrared cut removal) of CCTV
- 医疗设备、MEMS、光学设备
  Medical equipment, MEMS, Optical equipment
- 微型夹持器 / 机械手
  Micro gripper / Manipulator
- 云台 (Pan/Tilt) 模块
  Pan/Tilt module

Features 特性

- 体积小、重量轻、结构简单
  Very small size, light weight and simple structure
- 行程可调
  Variable stroke
- 快速响应
  Quick response
- 自带锁止力
  Intrinsic holding force
- 卓越的控制性能
  Excellent controllability
- 精密定位 / 高分辨率
  Fine positioning / High resolution
- 运行安静
  Quiet operation
- 无电磁干扰 (EMI)
  No EMI

Product Line 产品系列

- TULA系列
  TULA Series
- 微型直线电机
  Tiny Ultrasonic Linear Actuators

TULA25 | TULA35B | TULA35

TULA50 | TULA70 | TULA75

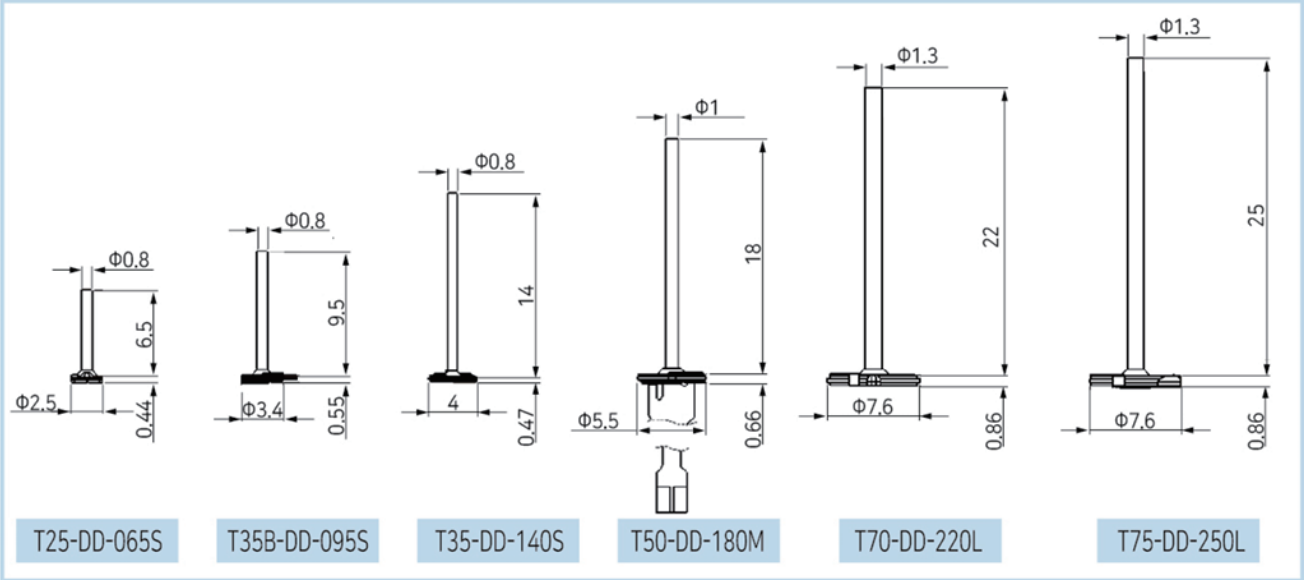
- 中空型压电电机
  Hollow type Piezo Motor
- 适用于智能设备的多层压电促动器
  Mutilayer Piezo Actuator for smart device

Specification 规格

Model 型号	TULA25	TULA35B	TULA35
Mechanical Characteristics 机械性能			
Speed (No load) (mm/s) 速度(无负载)(mm/s)	>3	>7	>10
Max-Thrust(gf) 最大推力(gf)	>3	>7	>10
Holding Force (gf) 锁止力(gf)	30~50	40~70	50~80
Stoke(mm) 行程(mm)	<3	<6	<8
Shaft Diameter(mm) 轴径(mm)	Φ0.8	Φ0.8	Φ0.8
Shaft length(mm) 轴长(mm)	<9	<14	<19
Reference mobile 推荐滑块	M308	M308	M308
Electrical Characteristics 电气性能			
Driving Frequency(kHz) 驱动频率(kHz)	170~250	110~140	80~100
Driving Voltage(V) 驱动电压(V)	12~16	12~18	14~20
Power Consumption(mW) 功耗(mW)	<150@12V	<180@12V	<250@14V
Environment Condition 环境要求			
Operation Temperature(°C) 工作温度(°C)	-10 ~ 60		
Storage Temperature(°C) 存储温度(°C)	-30 ~ 80		

Model 型号	TULA50	TULA50	TULA70	TULA70
Mechanical Characteristics 机械性能				
Speed (No load) (mm/s) 速度(无负载)(mm/s)	>10	>10	>15	>20
Max-Thrust(gf) 最大推力(gf)	>40	>20	>50	>70
Holding Force (gf) 锁止力(gf)	100~150	100~150	120~160	120~160
Stoke(mm) 行程(mm)	<8	<10	<15	<18
Shaft Diameter(mm) 轴径(mm)	Φ1.3	Φ1.0	Φ1.3	Φ1.3
Shaft length(mm) 轴长(mm)	<20	<22	<28	<30
Reference mobile 推荐滑块	M813	M510	M813	M813
Electrical Characteristics 电气性能				
Driving Frequency(kHz) 驱动频率(kHz)	60~80	60~80	40~55	35~55
Driving Voltage(V) 驱动电压(V)	20~35	20~35	20~35	20~35
Power Consumption(mW) 功耗(mW)	<350@20V	<350@20V	<500@20V	<500@20V
Environment Condition 环境要求				
Operation Temperature(°C) 工作温度(°C)	-10 ~ 60			
Storage Temperature(°C) 存储温度(°C)	-30 ~ 80			

Dimension drawing 尺寸图



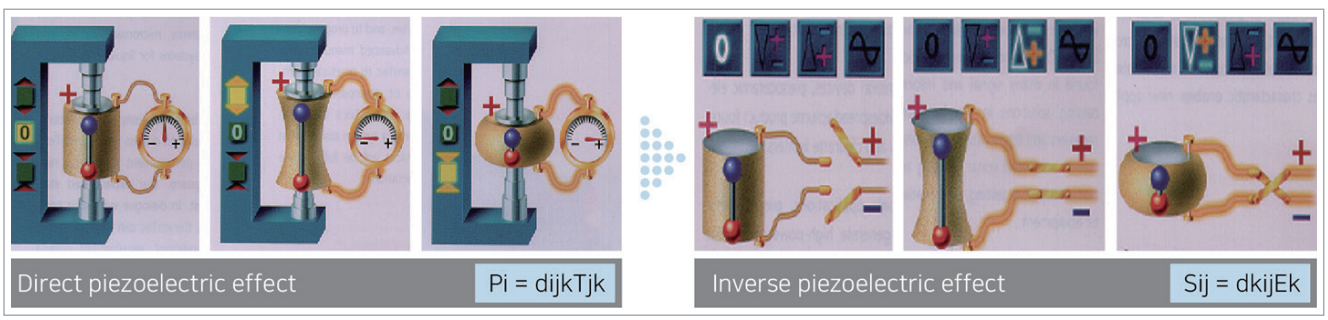
Piezoelectric Actuator Technology

压电驱动技术

Piezoelectric Effect 压电效应

压电效应是指压电陶瓷在受到机械压力时，其特定表面上产生电势的现象。该术语源自希腊语“piezein”，意为“挤压”。压电材料是指在施加机械应力（即受到挤压或拉伸）时能产生电荷的材料；反之，当施加电场时，该材料会发生机械形变（即收缩或膨胀）。

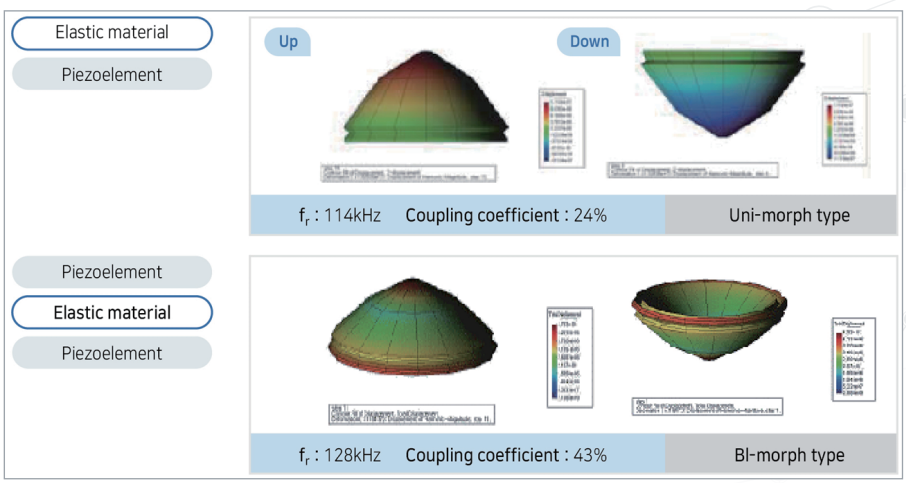
Piezoelectic effect is appearance of an electric potential across certain faces of piezoceramics when it is subjected to mechanical pressure. The word originates from the Greek word "piezein", which means Hto press". A piezoelectric substance is one that produces an electric charge when a mechanical stress is applied (the substance is squeezed or stretched). Conversely, a mechanical deformation (the substance shrinks or expands) is produced when an electric field is applied.

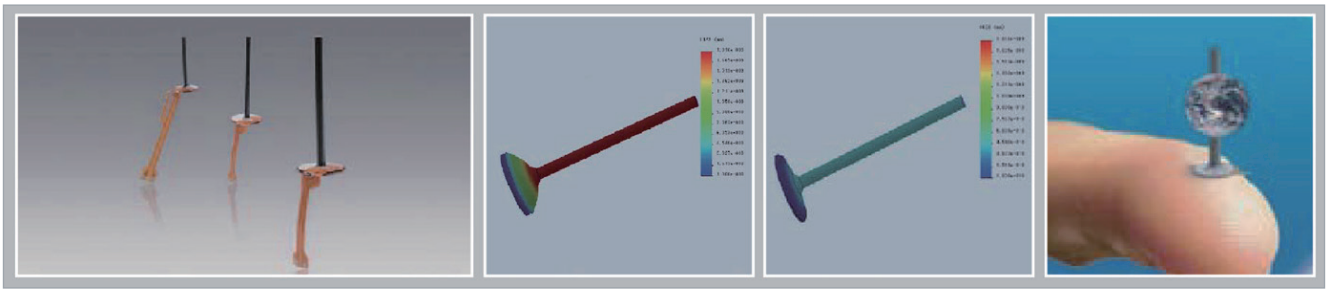


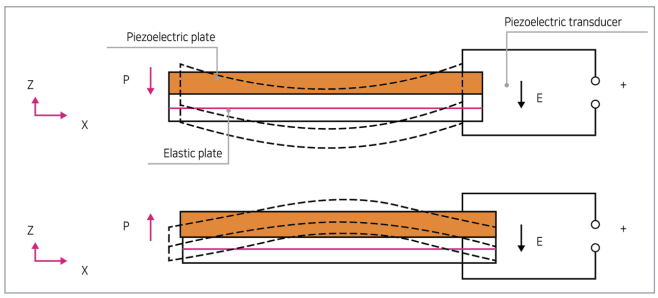
operating principle 工作原理

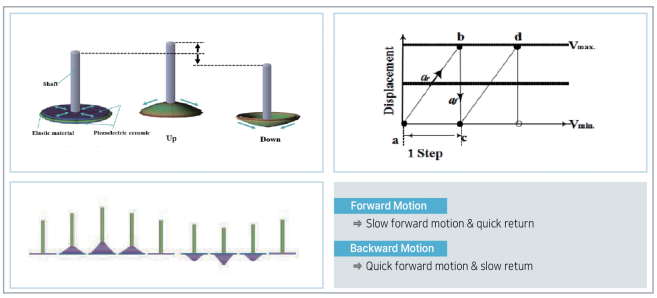
TULA的工作原理基于压电特性和牛顿第一定律。换言之，TULA利用了压电陶瓷的振动模态、惯性原理以及摩擦接触力。

The operating principle of the TULA is explained by the characteristics of the piezoelectricity and Newton's first law. In other words, the TULA exploits the vibration modes of the piezoelectric ceramics, the inertia principle and the contact force of the friction.

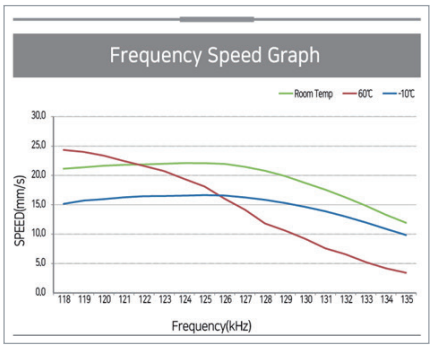


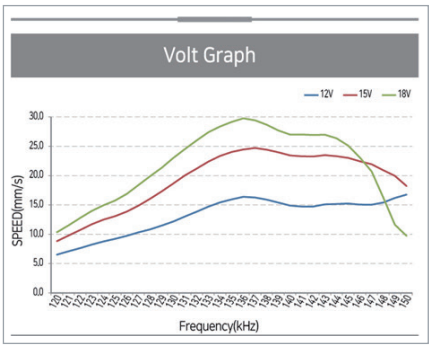


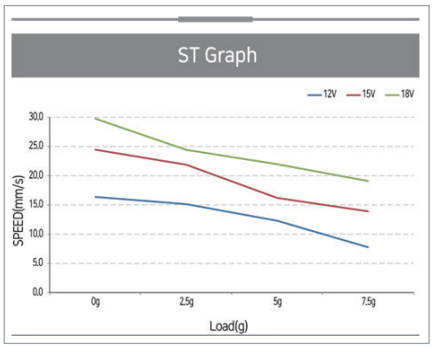




Typical Characteristics of TULA　TULA的典型特征







Multilayered TULA (TM-AA-BB)

多层 TULA (TM-AA-BB)

Features 特性

1. X : 陶瓷烧结温度
   X : sintering temperature of ceramics

   H: 高温
   H: high temperature

   L: 低温
   L: low temperature

2. AA: 陶瓷尺寸
   AA : size of ceramic

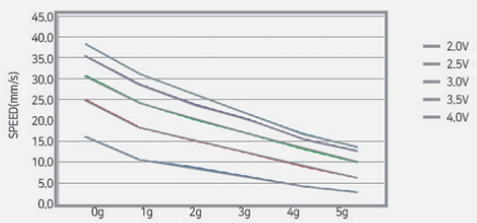
3. BB: 陶瓷层数
   BB: layer of ceramics

Specification 规格

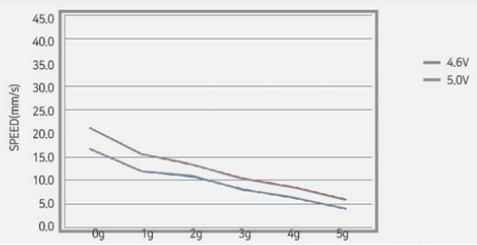
Model 型号	TM3507
Mechanical Characteristics 机械性能	
Speed (No load) (mm/s) 速度(无负载)(mm/s)	>10
Max-Thrust(gf) 最大推力(gf)	>7
Holding Force (gf) 锁止力(gf)	40~70
Stoke(mm) 行程(mm)	<8
Shaft length(mm) 轴长(mm)	<18
Electrical Characteristics 电气性能	
Driving Frequency(kHz) 驱动频率(kHz)	100~120
Driving Voltage(V) 驱动电压(V)	2~6
Power Consumption(mW) 功耗(mW)	<450@20V
Environment Condition 环境要求	
Operation Temperature(°C) 工作温度(°C)	-10 ~ 60
Storage Temperature(°C) 存储温度(°C)	-30 ~ 80

ST Graph

TML ST GRAPH



TMH ST GRAPH



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