READ BEFORE USE!

The 5 minutes it takes you to read this now, can save you hours later

The Piezo LEGS® motor you have purchased is a high-resolution motor capable of providing very high accuracy movements over its lifetime. To fully utilize the performance of the motor and to achieve the best life time a few simple instructions must be adhered to.

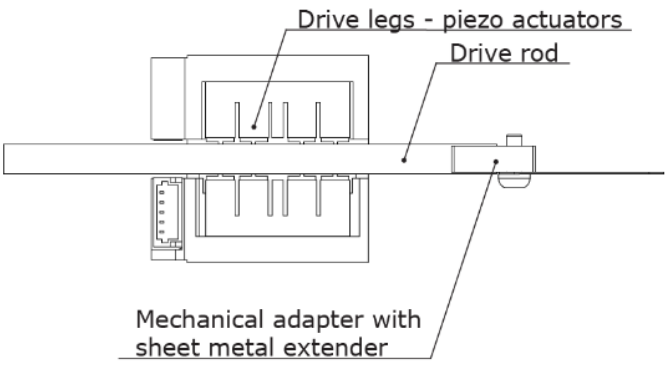
CAUTIONS

- **The maximum voltage of +50V relative to GND must never be exceeded. Over voltage or reversed polarity can damage the motor.**
- **Always handle the motor with caution and use gloves. Contamination of the drive rod may severely reduce motor function.**
- **Do not exceed the rated max frequency. Be careful not to overheat motor. Continuous operation at high drive frequencies may damage the motor. In non-continuous applications higher drive frequencies might be accepted, but please consult PiezoMotor in these cases**
- **The motor housing must not be distorted by uneven mounting surfaces in the customer's application. Warped mounting, even down in the sub micro meter range, might impair motor performance.**
- **The motor should not be operated without preload. This means that the motor should not be run without applied drive rod. If this happens damage can occur to the drive legs.**
- **A drive rod must never be removed while any of the legs are energized, even if they are stationary. In applications where disassembly is required, the voltage of all motor phases must be set to 0V before removing the preload. Contact PiezoMotor for instructions for instructions.**
- **High G-force / impact can damage the motor. Drive rod and piezo legs are both ceramic components.**
- **When using PiezoMotor drivers, be sure to check driver data sheet or manual for notes on maximum drive frequency for different motor model (capacitive loads).**
- **Motors designed for vacuum environment typically have cables that are soldered on the PCB. The cable strain relief has limited strength.**
- **Do not exceed the rated stall force/holding force of the motor.**
  In vacuum applications this can occur if the preload is not reduced to consider the change in friction due to the vacuum conditions. An increased friction coefficient in vacuum can give very high forces on the drive legs, especially in the case of high loads and large accelerations.

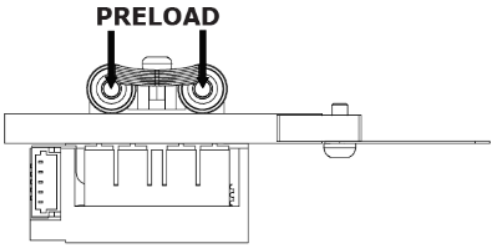
General

The Piezo LEGS is a direct drive motor. Proper friction coupling between drive legs and drive rod is essential for optimum performance. When properly installed the motor can position down to the nanometer range without backlash.

Piezo LEGS® Linear Twin 20N

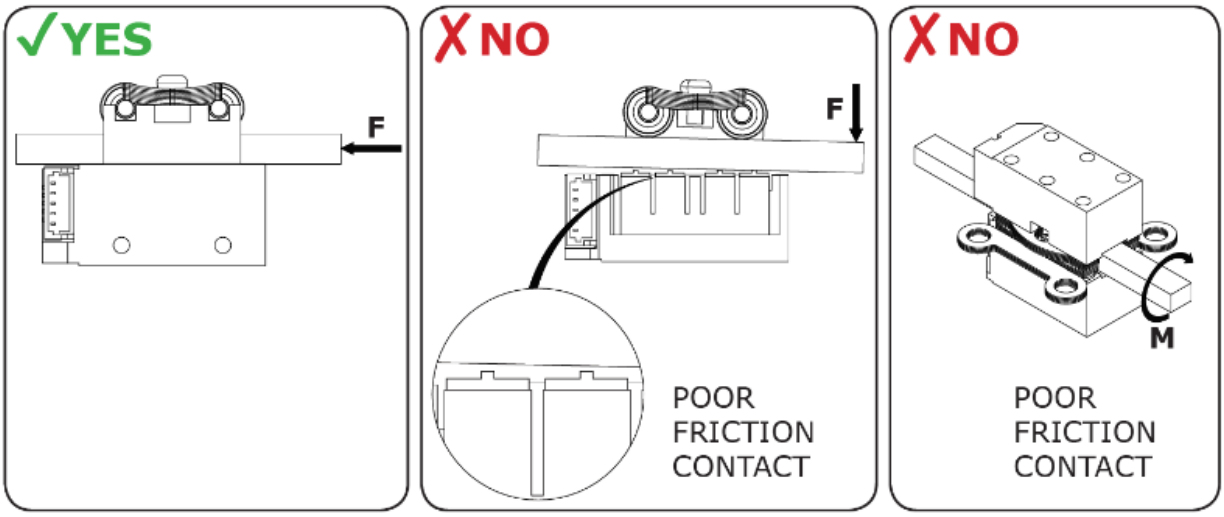


Piezo LEGS® Linear 6N

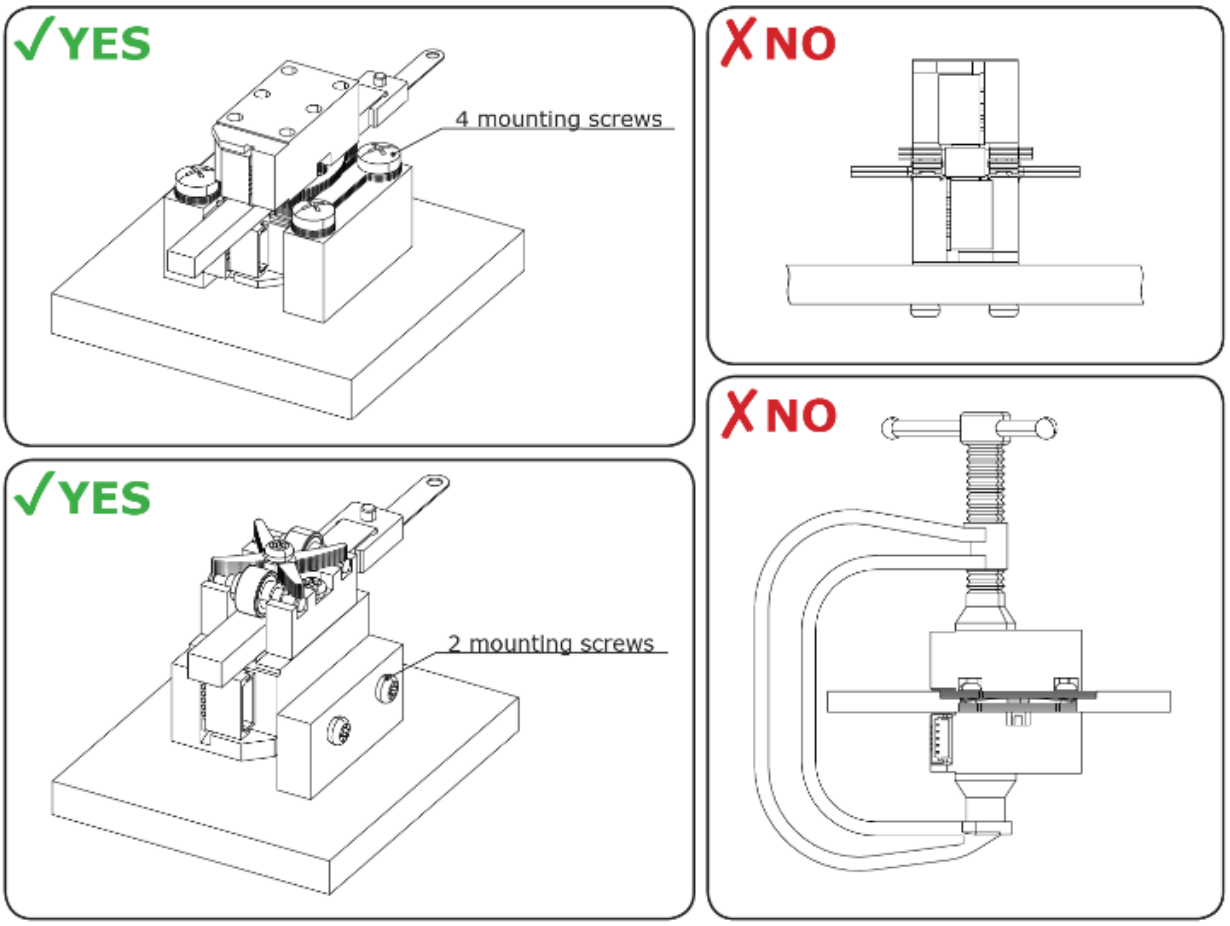


Mechanical notes

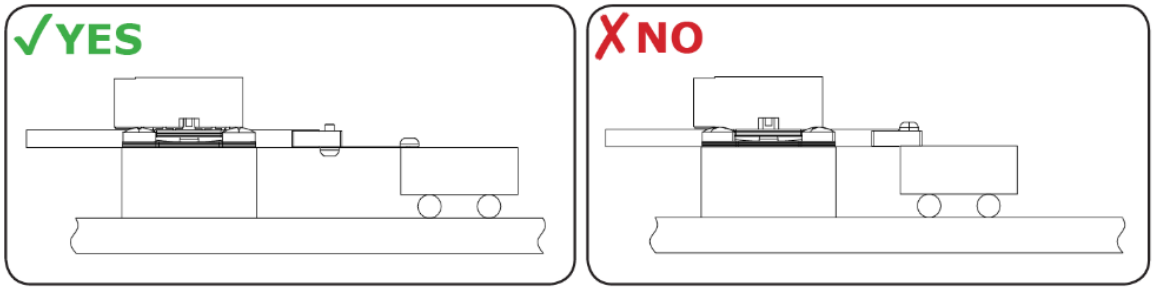
The drive rod must not be subjected to non-axial force – even small loads or torques at the end of the drive rod may cause loss of proper contact between drive legs and drive rod.
The motor function can be impaired, and the motor can be damaged.



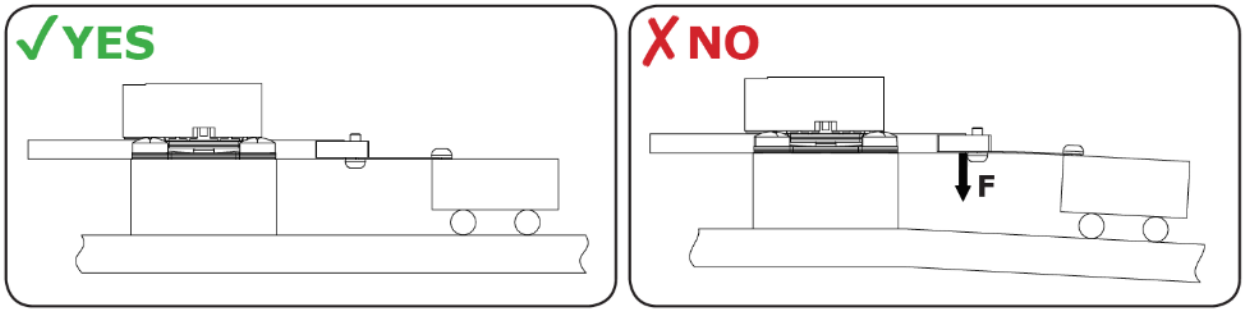
Always mount using the intended mounting holes. Do not use the non-threaded holes in motor housing for fastening the motor. Warped mounting, even down in the sub micrometer range, might impair motor performance. Do not clamp the motor.



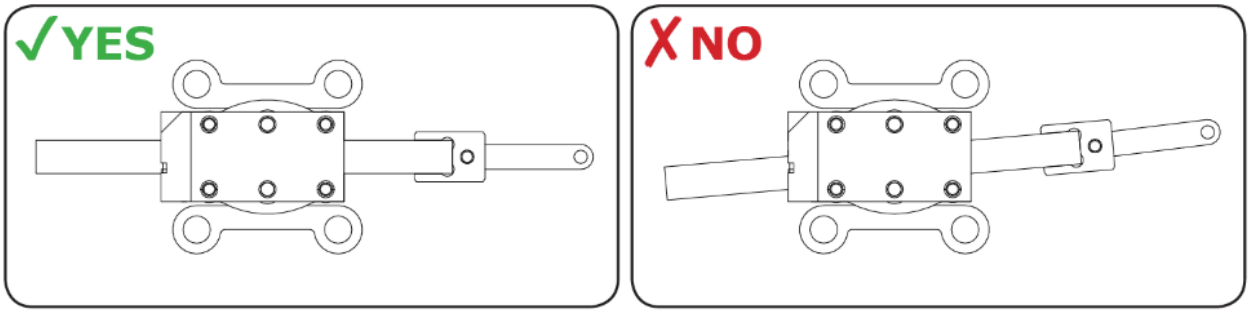
Always mount the drive rod using a mechanical adapter with flexible sheet metal extender so that transverse loads and torques on the drive rod are minimized. Never directly connect the drive rod and moving part in your application (for example when connecting the motor to a linear bearing). Mounting directly will introduce loads large enough for the drive rod to lose friction contact.



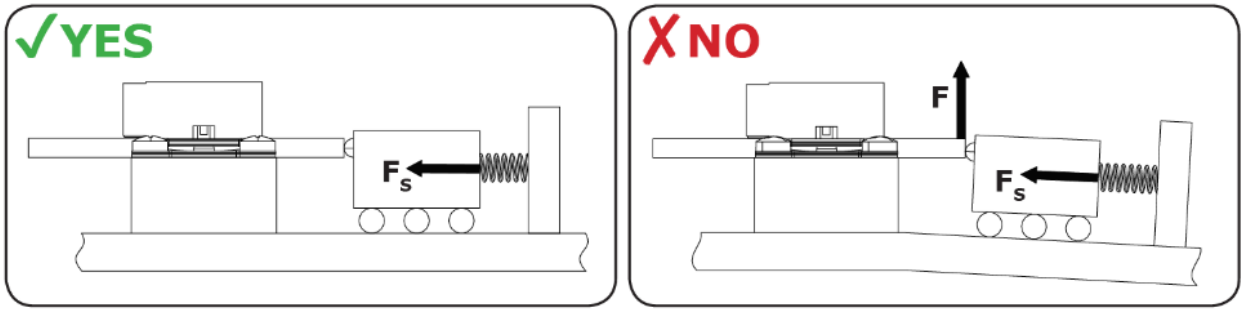
Always align the drive rod so that there are no loads transverse the motion direction. Even small angular misalignment may impair motor function.



Misalignments in the drive plane are less critical but should be avoided. If the drive rod is aligned poorly there is risk for contact between drive rod and motor housing. Contact may impair function.

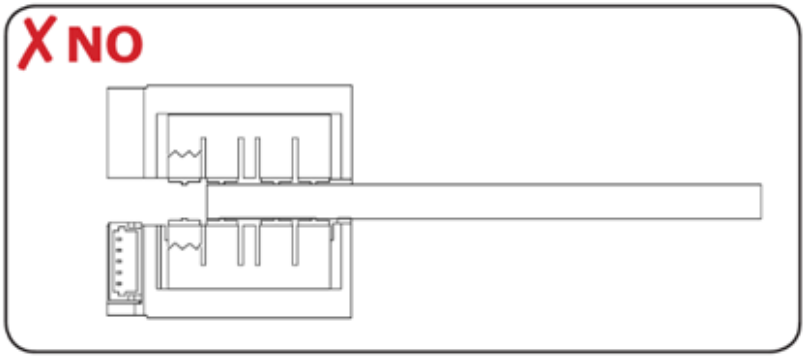


If a mechanical adapter with metal sheet extender cannot be used because of space limitations, we suggest that the motor works against a spring-loaded linear bearing. Small non-axial loads can be reduced by pressing against a spherical surface.



If acceptable, insert a thin piece of hard rubber between drive rod and stage block to minimize vibrations.

The drive rod must not be removed from the motor, and it must not be run or moved to a position where friction contact with *any* drive leg is lost. The drive legs can be severely damaged if they are not preloaded while motor is running.
Efforts to reposition a drive rod that has come out of place may crack the ceramic drive legs and is not a procedure to do yourself. Please consult PiezoMotor.



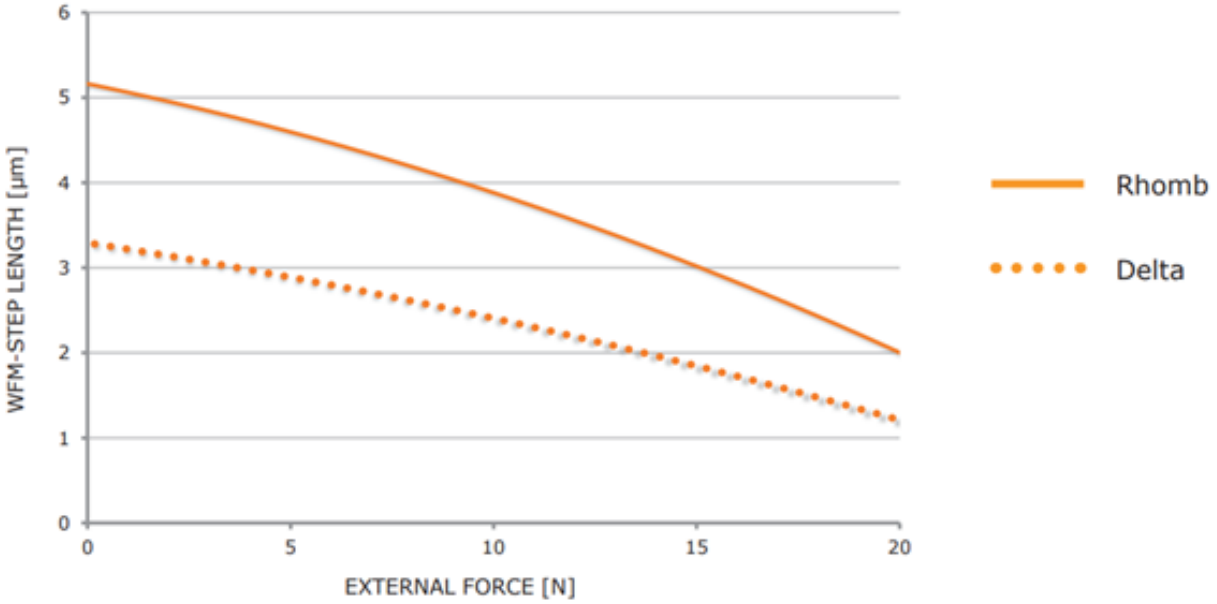


Figure 1 *Motor performance with waveform Rhomb (filled) and waveform Delta (dotted). Wfm-step length is the average distance the drive rod moves when the legs take one wfm-step (i.e. for one waveform cycle). Note: Standard deviation σ of 0.5 µm should be taken into account. Typical values are given for 20ºC.*

The motion speed depends on the driver frequency. The type of waveform influences the speed and force (Figure 1) Recommended working force in the system is 50% of the stall force of the motor.

Frequency (Hz)			
	Approximate speed		
1	5µm/s	3µm/s	7µm/s
10	50µm/s	30µm/s	70µm/s
100	0,5mm/s	0,3mm/s	0,7mm/s
1000	5mm/s	3mm/s	7mm/s

Note: Approximations since the speed is based on the force applied on the motor.

Estimated speed based on waveform cycles (general concept). Speed is reduced when working against load and increase when working with load.
Internal or external encoder is required for accurate positioning.

Contact information

Email (general questions): info@piezomotor.se

Email (support questions): support@piezomotor.se

Phone: +46 (18) 489 5000

Adress: PiezoMotor
Stålgatan 14
754 50 Uppsala
Sweden

www.piezomotor.se