Glossary

A – Ce

Acceleration
Acceleration is a measure of the rate of speed change going from standstill (or a lower speed) to a higher speed. The calculations, which are used to develop the Load versus Speed diagrams for each actuator, are based on an acceleration rate that is limited by the maximum speed of the unit. Therefore, this value will be different for all actuators. Please contact customer service if your application is critical to which acceleration rate is acceptable or needed. Also see “Deceleration”.

Accuracy
There are several types of accuracy and many different factors that will affect the overall accuracy of a system. Also see “Repeatability”, “Positioning Accuracy”, “Resolution”, “Lead Accuracy” and “Backlash”.

AC Motor
There are several types of AC motors; all of which run on an applied alternating current. Also see “Three-Phase AC Motor”.

AC Servo Motor
AC servo motor is an abbreviation for a brushless, synchronous AC motor design. This type of design requires little mechanical maintenance since no physical contact (no brushes and bars) is used to commutate the motor. This extends the life of the motor and reduces down time. Also see “Brushless AC Servo Motor”.

Adapter
The adapter on T and ECT actuators is the connection point for the load and is situated at the end of the extension tube. There are several types of adapters: 1) tapped hole, 2) threaded rod and 3) spherical joint. Also see “Mounting”.

Anti-rotation Mechanism
An actuator with anti-rotation mechanism has a built-in feature that prevents the extension tube from rotating if the tube is not attached to any load. All T and ECT actuators have this feature.

Backlash
Backlash is the stack up of tolerances (play) within the leadscrew assembly and gearing, which creates a dead band when changing directions. The result is that the motor can rotate some before any motion can be seen on the extension tube when reversing the direction of the motor rotation. The backlash varies depending of the actuator model, and the amount of backlash for each can be found in the performance specifications. The backlash for ball screw models will remain the same during its life time, while it will increase slightly for acme screws. Direct-driven models normally have less backlash because they do not incorporate any gearing.

Ball Screw
Ball screws (fig. a) are used on all T and ECT actuators. They are highly efficient and can run up at 100% duty cycle. Also see “Duty Cycle”.

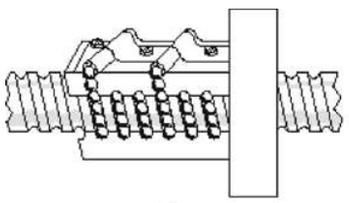


Fig. a

Belt Gear
A belt gear consists of a timing belt that runs between two pulley wheels of different diameter. The difference between the diameters determines the gear ratio. Belt gears are quiet, have medium accuracy, and require no maintenance. However, the belt is susceptible to breakage under overload conditions.

Brake
Acme screws are inherently self-locking, while ball screws are not. To prevent ball screw actuators from backdriving, the actuator may need some type of motor brake depending on the application. A brake can also be used to stop the actuator quickly and safely in emergency situations. Precision linear actuators with DC motors do not have optional brakes, so an alternative solution must be sought. All asynchronous, three-phase AC motors come equipped with an electrically released, fail-safe brake (optional for brushless AC servo motors).

Brushless AC Servo Motor
A brushless AC servo motor has many advantages over DC and asynchronous, three-phase AC motors. For a given power rating, they are smaller and can typically travel at higher speeds and acceleration rates (due to a lower rotor inertia). Unlike DC motors, AC servo motors have no brushes for commutation; therefore, they are almost maintenance free. Instead, they incorporate a resolver feedback device that feeds a shaft-position signal to the drive control for commutation. The drive control also converts the resolver signal into a simulated encoder pulse train that can be used to feed a positioning controller. Also see “ Three-Phase AC Motor”,“Servo Motor” and “Servo Drive”.

Certificates
All T and ECT actuators sold in the EU are CE certified. Please contact customer service if you need any other type of certificate.

Glossary

Co – Du

Column Load Limit

The column load limit is the maximum compression force that the lead screw can handle before it becomes damaged (Fig. b). The limit is a function of the screw diameter and the unsupported length of the screw, which means that the limit will drop as the extension tube extends. For some actuators this means that the allowed maximum dynamic load found in the performance specifications can be higher than the column load limit when the extension tube travel is beyond a certain distance. In this case, either the load must be reduced to the column load limit, the amount of used stroke must be reduced, or you must select another actuator model that can manage the column load at that stroke. The column load force limits can be found in the "Column Load vs. Stroke" diagram on the product pages for each actuator. Also see "Dynamic Load Rating".

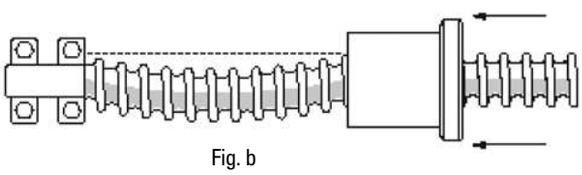


Fig. b

Controls

There are many types of programmable controls that can be used to control the motion of the actuator. PLC, motion controls, robot controls, CNC controls and industrial computers are just some of them. Many types of servo drives have built-in (or as an expansion card option) programmable motion control features. Thomson offers a variety of combinations to serve your motion control needs.

Cover Tube

The cover tube provides protection for the ball or acme screw and provides protection and support for the extension tube. The cover tube on T and ECT actuators are designed so that magnetic sensors easily can be mounted to the outside of the tube. Also see "Extension Tube" and "Magnetic Sensors".

Critical Speed

All ball screws have a critical speed where the screw starts to vibrate and eventually bend or warp the screw (Fig. c). The exact limit is a function of how far out the extension tube is run and speed. For some actuators this means that the allowed maximum speed found in the performance specifications can be higher than the critical speed when the extension tube travel is beyond a certain distance. In this case, either the speed must be reduced to the critical speed, the amount of stroke must be reduced, or you must select another actuator model that can manage the speed at that stroke. The critical speed limits can be found in the "Critical Speed vs. Stroke" diagram on the product pages for each actuator. Also see "Speed Rating".

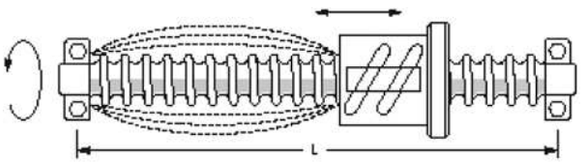


Fig. c

Customization

Even the most versatile standard actuator may not always suit all applications. But whatever your need is, our engineers are ready to help you to customize the actuators according to your requirements. We build more exclusive actuators than anyone in the business and have decades of experience in customizing actuators to meet special needs.

Cycle

One cycle is one complete extension and retraction of the extension tube.

Deceleration

Deceleration is a measure of the rate of speed change going from a higher speed to a lower speed (or standstill). The calculations, which are used to develop the Load versus Speed diagrams for each actuator, are based on a deceleration rate that is limited by the maximum speed of the unit. Therefore, this value will be different for all actuators. Please contact customer service if your application is critical to which deceleration rate is acceptable or needed. Also see "Acceleration".

Direct Drive

Direct drive means that there is no gearing between the motor and the lead screw. Instead, the motor is connected to the lead screw directly via a coupling.

Duty Cycle

$$\text{Duty cycle} = \frac{\text{on time}}{(\text{on time} + \text{off time})}$$

Example: 2,5 minutes on, 7,5 minutes off

$$\frac{2{,}5 \text{ min}}{(2{,}5 \text{ min} + 7{,}5 \text{ min})} = 25\% \text{ duty cycle}$$

The duty cycle is a function of the load and the ambient temperature. A higher ambient temperature and/or load will affect the duty cycle negatively, while a lower temperature and/or lower load will affect it positively. The duty cycles stated in this catalog are all valid for a 10-minute period.

Glossary

Dy – Lif

Dynamic Load Rating

The dynamic load rating (Fx) is the maximum load the actuator can move at a given speed. The relation between the dynamic load and the speed can be studied in the Load versus Speed diagrams. For some actuators, however, the column load limit will be exceeded if the extension tube extends beyond a certain point. Also see “Load Rating” “Forces” and “Column Load Limit”.

Encoder

Encoders provide a digital output signal in the form of a square-shaped pulse train that can be used to determine the position of the extension tube. The encoder signal in a servo motor system is connected to the motion control so that it can control the servo drive and hence close the position feedback loop. The servo motors used on the precision linear actuators do not have an encoder. Instead, they incorporate a resolver feedback device that feeds a shaft-position signal to the drive control. The drive control also converts the resolver signal into a simulated encoder pulse train that can be used to feed a positioning controller. Also see “Resolver”, Servo Motor” and Servo Drive”.

End-of-Stroke Switches

We strongly recommend the use of switches at the ends of the actuator stroke to prevent the unit from running in to the mechanical end stops. Keep in mind that the extension tube will travel some distance (dependent of speed, load and actuator type) before it comes to a complete stop. This means the end-of-stroke switches must be placed before the mechanical end of stroke and will reduce the available stroke length.

Extension Tube

The extension tube slides in and out of the actuator’s cover tube and is connected via the front adaptor to the load being moved or positioned. Also see “Cover Tube”.

Extension Tube Side Load

The extension tube side loads (Fy and Fz) are the forces applied to the sides of the extension tube. The maximum allowed side loads can be found in the performance specifications for each actuator. The stated side loads are only valid for a completely retracted extension tube and will decrease as the extension tube extends. Also see “Forces”.

Forces

The below figure (Fig. d) shows the definitions for the forces and moments used in this catalog. Always use these definitions in any communication with Thomson.

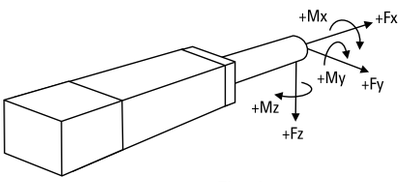


Fig. d

Frequency Inverter

A frequency inverter (also called frequency converter) is a type of motor drive that is used to control the speed, acceleration and deceleration of three-phase AC motors. A frequency inverter does that by changing the input frequency to the motor windings as the rotational speed of a three-phase AC motor is dependent on the frequency. Also see “Three-Phase AC Motor”.

Inertia

Inertia is the property of an object to resist speed changes and is dependent on the shape and mass of the object. The inertia is important when sizing and selecting and also when tuning a servo system to optimum performance. Consult customer service for more information.

Inline Motor

An inline motor is mounted in line with the cover tube.

Installation Instructions

Each actuator has an installation manual to answer typical questions about mounting and wiring the actuators.

Lead Accuracy

Lead accuracy is a measure of how accurate the lead of a lead screw is. For a lead screw with a lead of 25 mm, the screw should, in theory, move the nut 25 mm per each revolution. In reality, there will be a deviation between the expected traveling distance and what is actually achieved. The deviation for a ball screw is typically 0,05 mm per 300 mm of stroke. Contact customer service for more information. Also see “Accuracy”.

Lifetime Expectancy

The life-time expectancy is a function of many important factors, including load, speed, duty cycle, ambient temperature and screw type. To be able to accurately estimate the life-time expectancy, applications must be evaluated on a case-by-case basis. However, for most actuators, a travel life of at least 25 km under the maximum dynamic load can be used as a general approximation. Contact customer service for more information.

Glossary

Lin – Po

Linear Actuators
Actuators providing a linear thrust via an extension tube to lift, lower, push, pull or position a load.

Load Rating
There are many types of load ratings that need to be considered. Normally when you speak about the load, you refer to the load that the extension tube will pull or push, which is the dynamic load. But there may also be static, side, moment and column loads and forces from acceleration, deceleration, gravity and friction that are all equally important. Also see “Dynamic Load Rating”, “Static Load Rating”, “Side Loads”,“Column Load Limit”, “Tension and Compression Load”, “Acceleration” and “Deceleration”.

Magnetic Sensors
The magnetic sensors used in the precision linear actuators consist of a reed switch that are molded into a plastic housing. In the actuator, a magnet is mounted that travels back and forth with the extension tube. The magnet triggers the magnetic sensors, which are mounted on the outside of the cover tube. The sensors come in both normally open and normally closed versions.

Motion Control
A motion control is a control that is dedicated to control the motion of a servo motor. To be able to do this, the control must have inputs that can receive the feedback signal, which typically is an encoder signal (even if other devices such as potentiometers and resolvers, can be used) and an output which gives the motion commands to the servo drive. Motion controls can be stand-alone units or integrated in to other control systems. Also see “Control”, “Servo Motors and “Servo Drive”.

Motor Type
There are two types of electrical motors in different sizes used on the precision linear actuators; three phase AC motors and brushless AC servo motors. Also see Brushless AC Servo Motor” and “Three-Phase AC motor”.

Mounting
The precision linear actuators can quickly and easily be mounted using any of the available mounting and adapter options. However, there are some things to consider when mounting the actuator. When using the clevis type of mounting, solid mounting pins should be used (avoid using roll- or spring-type mounting pins). The mounting pins (or trunnions) should be parallel to each other as shown below (Fig. e). It is also recommended to attach the load so that the force acts along the axis of the actuator (Fig. f). Any actuator using side-angel brackets, tapped holes or mounting feet should be mounted so that the cover tube or the extension tube does not bend or is subjected to bending forces during standstill or operation.

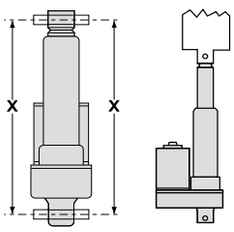


Fig. e

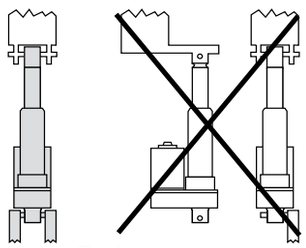


Fig. f

Mounting Options
To be able to mount a precision linear actuator, you must select the appropriate mounting and adapter options for your application. There are several different options to choose from and you can define your choice by using the ordering keys or part numbers. However, T and ECT actuators come with mounting holes and T-slots that can be used.

Operating and Storage Temperatures
The operating temperature is the range in which the actuator may be safely operated. All actuators can be stored or transported at the same temperature as the operating temperature. Contact customer support if the operating temperature will be exceeded during storage or transportation.

Parallel Motor
A parallel motor is mounted parallel to the cover tube.

Planetary Gear
A planetary gear is a gear system that consists of one or more outer gears (planet gears) rotating about a central (sun) gear. Typically, the planet gears are mounted on a movable arm or carrier, which itself may rotate relative to the sun gear. As a result, planetary gears have the input and output shafts in line with each other with rotation in the same direction. Planetary gears are robust, accurate and comparably small but are more expensive than belt or helical gears.

Positioning Accuracy
Positioning accuracy is the error between the expected and actual position and is the sum of all factors that will reduce the accuracy (i.e. repeatability, backlash, resolution, lead accuracy, and the accuracy of the motor, drive and motion control system). Some of these factors, such as backlash and lead accuracy, can sometimes be compensated for in the software of the motion control system being used. Also see “Accuracy”.

Glossary

Pr – Sta

Protection Class
The protection class refers to the environmental rating of the enclosure. The first digit applies to airborne contaminants, and the second digit to water/moisture.

IP65: dust tight and protected against low-pressure water jets from any direction.

Repeatability
Repeatability is the ability for a positioning system to return to a location when approaching from the same distance, at the same speed and deceleration rate. Some of the factors that affect the repeatability are the angular repeatability of the motor, drive and motion control system, system friction and changes in load, speed and deceleration.

Resolution
Resolution is the smallest move increment that the system can perform. Some of the factors that affect the resolution are the angular repeatability of the motor, drive and motion control system, system friction, the drive train reduction, the type and lead of the lead screw and changes in load, speed and deceleration.

Resolver
A resolver is basically a type of rotary electrical transformer used for measuring degrees of rotation and is commonly used on AC servo motors as a feedback device to control the commutation of the motor windings. The resolver is mounted to the end of a motor shaft and when the motor rotates, the resolver will transmit the position and direction of the rotor to the servo drive, which then can control the motor. Most servo drives for AC servo motors on the market today can convert the resolver signal in to a pulse train (encoder signal simulation), which can be used by a motion control to determine and control the position of the motor. Also see “Encoder”, “Servo Drive”, “Servo Motor” and “Motion Control”.

RoHS Compliance
The RoHS directive stands for “the restriction of the use of certain hazardous substances in electrical and electronic equipment”. This directive bans the placing on the EU market of new electrical and electronic equipment containing more than agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants. All precision linear actuators, controls and accessories sold in the EU are RoHS compliant.

Service and Maintenance
Precision liner actuators only need to be lubricated. The interval between the lubrications depends on how frequent and hard the actuator works. The lubrication of the entire actuator is done at one single point. No other service or maintenance is required.

Servo Drive
A servo drive is an electrical device that controls the commutation of a servo motor. Different types of servo motors require different types of drives. To be able to run the system as a servo system, there must also be a motion control that gives the commands to the servo drive and some kind of feedback (encoder, potentiometer, etc) to the control so that it can determine and adjust the speed and the position of the motor (closed loop feedback). Some servo drives have built-in motion controls. Also see “Servo Motor”, Brushless AC Servo Motor” and “Controls”.

Servo Motor
A servo motor is a motor that works with a feedback device in a closed loop configuration controlled by a motion control. Any type of motor, can in principal work as a servo motor, but normally when speaking about servo motors you refer to motors that are specially designed to work in servo systems. Also see “Servo Drive”, Brushless AC Servo Motor” and “Controls”.

Side Loads
See “Extension Tube Side Loads”.

Sizing and Selection
This catalog gives you an overview of what Thomson can offer you and an indication of which products may suit your applications. But in order to get the best solution, it is necessary to know your specific application requirements and to carry out detailed sizing and selection calculations. Please contact customer service for further help.

Speed Rating
The Speed versus Load diagrams on each product page show the maximum allowed speed at any given dynamic load, ranging from no load to maximum allowed dynamic load. For some actuators, however, the critical speed limit can be a limiting factor for the maximum allowed speed if the extension tube extends beyond a certain point. Also see “Load Rating” “Forces” and “Critical Speed Limit”.

Static Load Rating
The static load rating is how much load the actuator will hold at standstill. This value can be higher than the dynamic load rating and depends on factors such as stroke length, column load rating, gear type, and maximum holding force of the motor brake. Consult customer service for more information. Also see “Load Rating”.

Glossary

Str – Th

Stroke Length

The maximum stroke length for each actuator type can be found in the performance specifications. The stroke length is the available distance the extension tube can move from one mechanical end to the other. Keep in mind that extra stroke length above the application requirements will be needed to avoid hitting the mechanical end stops. We also recommend the use of end of stroke limit switches (both extension and retraction) to avoiding running in to the mechanical ends by accident. Using end-of-stroke limit switches requires some deceleration distance to be added to the stroke so that the extension tube has time to stop before running in to the ends. Exactly how much extra stroke you need depends on many factors and needs to be determined for each application. Also see “End-of-Stroke Limit Switches”.

Tension and Compression Load

A tension load tries to stretch the actuator, and a compression load tries to compress the actuator (Fig. g). All precision linear actuators can manage the same tension and compression loads. Also see “Dynamic Load Rating”.

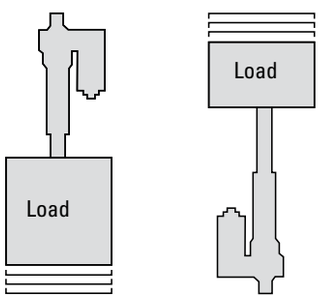


Fig. g

Three-Phase AC Motor

The three-phase AC motor is known under many names; squirrel cage motor, induction motor, asynchronous motor and asynchronous induction motor are a few. The three-phase AC motor can be run directly from a three-phase source, in which case its speed will be determined by the frequency and number of poles. The typical nominal speed of a 2-pole motor is around 2850 rpm, a 4-pole has half that speed and a 8-pole half of the 4-pole, etc. However, when running the motor directly from a three-phase source, there is no control of the speed, acceleration or deceleration. Instead, the motor accelerates as fast as it can, depending of the load, to its nominal speed. This puts stress on the mechanical components, if they can manage it at all. A precision linear unit with a three-phase AC motor is not designed to run directly from a three-phase source. Instead, a frequency inverter must be used that can control speed, acceleration and deceleration to keep these within the acceptable limits. A three-phase motor is relatively cheap, very robust and needs no maintenance. The downside is that even though it can be controlled from a frequency inverter, it will never be as accurate as a servo motor system. Especially at low speeds (below approximately 10 Hz), the motor will start to lose torque and may also become overheated with time, as the internal fan mounted on the rotor will rotate too slow to be able to cool the motor sufficiently for operation. Using an external fan mounted to the back of the motor may solve this problem but is an added cost and will also make the installation larger. The speed at which overheating caution should be taken is marked in the “Speed vs. Load” diagrams with a dashed line instead of a continuous line (Fig. h). Also see “Frequency Inverter” and “Motor Type”.

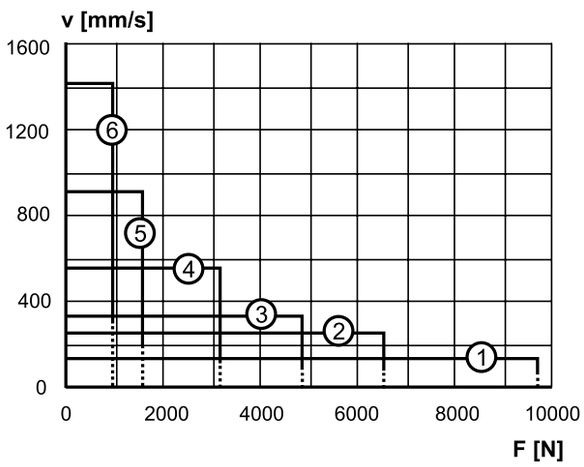


Fig. h

THOMSON
Linear Motion. Optimized.™

Application Data Form

Worksheet

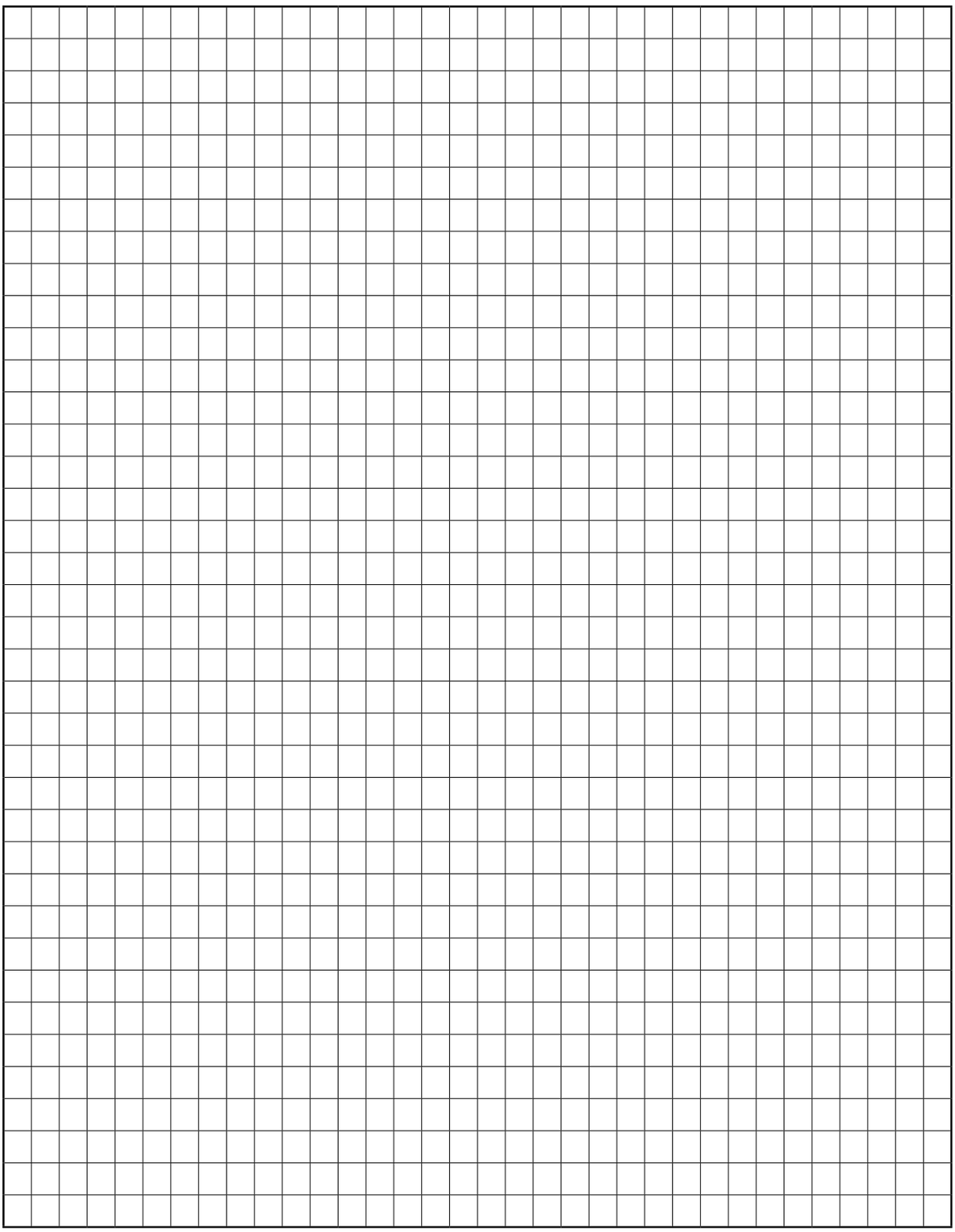
Application Data Form*

Submitted by:	Phone:	Date:
1. Company name	20. Do you need any special retracted length (cross hole c/c in mm)?	
2. Street address	21. What kind of motor would you prefer?	
3. City-state, zip	22. Is a holding brake required?	
4. Contact name	23. Do you need any of the optional features of the actuator?	
5. Phone	24. Do you need a matching drive to the actuator?	
6. Fax	25. What are the accuracy requirements of the application?	
7. E-mail	26. What are the environmental conditions (dusty, outdoors, wash down)?	
8. What is the estimated annual volume?	27. What is the operation temperature range in Celsius?	
9. What is the target price?	28. What is the duty cycle (on-time / on-time + off-time) in seconds?	
10. What is the current or alternative solution?	29. Do you need any certificates (UL, CE, etc.)?	
11. How much load is moved in Newton?	30. Do you require any print (dwg, dxf, faxed)?	
12. How much load do you need to hold in Newton?	31. Describe any additional requirements (packaging, labeling, etc.)	
13. How will the actuator be mounted (horizontal/vertical)?		
14. Is the load trying to stretch or/and compress the actuator?		
15. What speed do you want the actuator to move in mm/s?		
16. What is the life of the unit in cycles (one cycle = extend and retract)?		
17. What is the stroke length?		
18. How will the actuator be mounted to the extension tube?		
19. How will the actuator be mounted to the foundation?		

* Please enter all fields in the form and send it and any drawings to customer service by mail or fax. See the back of the catalog for the nearest location.

Application Data Form

Drawing/Notes



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