

ENGINEERING RESOURCES



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Glossary

A

ACCELERATION

The change in velocity as a function of time. Acceleration usually refers to increasing velocity, and deceleration to decreasing velocity.

ACCURACY

A measure of the difference between expected position and actual position.

ACTUATOR

A mechanism for moving or controlling something indirectly instead of by hand.

ADJUSTABLE SHOCK ABSORBERS

Used on BC2 and BC3 band cylinders to decelerate heavy loads at high velocities. Tolomatic offers light and heavy duty shock absorbers. The sizing and selection software will automatically choose the correct either light duty or heavy duty as required. When shock absorbers are used on the cylinder internal cushions are not operational. Note: Shock absorber is most effective when stopping load at its center of gravity.

AMBIENT TEMPERATURE

The temperature of the cooling medium, usually air, immediately surrounding the motor or another device.

ANODIZING

Protective treatment for aluminum that involves subjecting the metal to electrolytic action in a chemical bath, to create a protective film of aluminum oxide with a very smooth finish. The process is similar to that of hardcoating, but the latter involves

the use of a different, more complex chemical bath and results in a thicker, rougher, extremely brittle coating of aluminum oxide.

AUXILIARY CARRIER

An option for band cylinders or linear slides that increases the load capacity of the cylinder as well as increasing the capacity of bending moment about the Y axis. Note: internal cushion will not work when auxiliary carrier ordered without piston, it will be necessary to add external shock absorbers.

AVERAGE VELOCITY

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Cycling a 100 inch BC3 model in one direction in one second yields an average velocity of 100 inches per second. To properly determine the inertia forces for cushioning, it is important to know the final (or impact) velocity. Rodless cylinders accelerate and decelerate at each end of the stroke. Therefore this acceleration must be considered. If final velocity cannot be calculated directly, a reasonable guideline is to use 2X average velocity.

AXIAL LOADING

A load with a force directed along an axis, such as a shaft.

B

BALL BEARING

A bearing where the journal turns upon loose, hardened

steel balls that roll easily in a race.

BAND CYLINDER

The name for a rodless cylinder using Tolomatic's unique band retention system. Band cylinders feature a central slot. A band-type cylinder uses a bracket directly mounted to the cylinder piston to transmit force. The bracket passes between two bands which then seal the cylinder. The inner sealing band creates a tight metal to metal seal with the internal diameter of the cylinder bore. An outer dust band keeps dust and grit away from the sealing band. Elastomer strips provide a positive, non-magnetic lock. Tolomatic models include: BC2, BC3, BC4

BAR

The SI Metric unit of pressure equal to one million Dynes per square centimeter. The bar is used to measure both pneumatic and hydraulic pressure. One Bar is equal to 14.5038 pounds per square inch. It is also nearly equivalent to one atmosphere of pressure.

BASE MOUNT

Base mounting linear slides may be accomplished by fastening directly to "T" slot nuts provided in the base of the slide or by using the base mounting.

BC2 BAND CYLINDER

The second generation of the original band cylinder, introduced in 1986.

BC3 BAND CYLINDER

This band cylinder, intro-

duced in 1995, incorporates a ball bearing system in the carrier for high performance.

BC4 BAND CYLINDER

Introduced in 1996, the BC4 is an economical choice for supported loads.

BENDING MOMENT

Equivalent torque produced by a force displaced by a known distance from the carriage.

BREAKAWAY

The minimum amount of force or pressure required to cause the initial movement of a given device such as a cable cylinder piston, a brake piston, or a rotary actuator through a full stroke.

BRITISH THERMAL UNIT (BTU)

The amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

BUNA-N

A widely used copolymer (artificial rubber) used for making seals. Buna-N seals should never be used with automotive brake fluid.

C

CABLE

A wire rope made of twisted strands of material. In the case of cable cylinders, cables are made of strands of galvanized steel which are twisted together in bundles of seven strands each. These bundles, in turn, are twisted around each other. The resulting cable is coated with an extruded nylon covering.

ABT

MXR

BC2

BC3

BC4

LS

MG

CC

PB

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Glossary

CABLE ASSEMBLY

A sub-assembly consisting of the cable ferrules, terminals and gland seals.

CABLE CYLINDER

A rodless cylinder using cables to transmit force from a piston.

CABLE CYLINDER REPAIR KIT

A sub-assembly consisting of two cable assemblies and the internal seals (two piston seals, two cushion seals and two tube-sealing O-rings) required to keep a cable cylinder operational.

CALIPER DISC BRAKE

A form of brake, used to retard, stop or hold action. The brake is called a “caliper” because it is mounted over a rotating disc to which it applies a friction member (puck) to slow, stop or hold the disc.

CARRIER

Attached to band cylinder or linear slide with bearing system the carrier supports and moves the load. Tolomatic options include: Auxiliary carrier, Dual 180 carrier (BC3 only), Long Carrier (BC4 only).

CENTER OF GRAVITY

(Center of Mass) The point at which the entire weight of a body may be considered as concentrated so that if supported at this point the body would remain in equilibrium in any position.

CLEVIS

The name given to the U-shaped cable connecting bracket on a Tolomatic cable cylinder.

COEFFICIENT OF FRICTION

The measurement of friction of one object sliding across another. Symbolized by the Greek letter Mu (μ) it is defined as the tangent of the angle of repose of a static body. The coefficient is expressed in decimal values (clean iron on clean iron is 1.0, while metal on solid rubber may range from 1.0 up to 4.0). When objects are wet, the coefficient of friction decreases.

CONFIGURATOR

Name given to the software that uses the configuration string to give instructions to the factory with correct specifications to create your built-to-order actuator.

CONFIGURATOR STRING

A series of code letters and numbers that Tolomatic uses to create built-to-order actuators.

CONSTRAINT

Guided and supported in a particular direction, through the use of an external guidance and bearing system.

CUSHION

A means of slowing down a cylinder piston at the end of its stroke by using an exhaust port with an orifice small enough to restrict the velocity at which the pressure fluid is exhausted.

CUSTOM PRODUCTS

These products don't resemble any of the products seen in the Tolomatic catalogs. Tell us your performance requirements, we can build a custom product for you.

CYCLE

- 1) A sequence of operations that is repeated regularly.
- 2) The time it takes for one such sequence to occur.

CYCLE RATE

The total number of times a complete motion is made from start and return to start in a specific period of time.

D

DEAD LENGTH

Dead length is the part of the band cylinder or linear slide required for mounting and mechanisms. The overall length of a band cylinder or linear slide is the stroke length plus the dead length.

DECELERATION

The opposite of acceleration. Deceleration means diminished velocity or slowing down.

DEFLECTION

A measurement of the amount of bend under the weight of a load, such as that to which a load-supporting rod or cable is subject.

DIE-CAST

A metal-forming process similar to injection-molding for plastic. In Die-Casting, molten metal (usually aluminum) is injected into a mold under pressure.

DOUBLE-ACTING CABLE CYLINDER

Cable cylinder that applies equal force in two directions.

DOUBLE-PURCHASE CABLE CYLINDER

Cable cylinder that uses additional cable and pulleys to double the velocity and

stroke of cable cylinders.

DUAL 180 CARRIER

Option for the BC3 that gives greater bending moments without using a larger actuator.

DUAL MAGNET

Option for BC2 with two magnets, one on each side of the carrier.

DUST BAND

Part of Tolomatic's unique band retention system, the external band.

E

EXTERNAL CUSHIONS

Shock absorbers of some sort used to decelerate the load on a rodless cylinder in cases where the load is too heavy to make use of the cylinder's internal cushions.

EXTERNAL STOPS

Stops used on the outside of a vane-type rotary actuator to limit the rotation of the unit short of the unit's full cycle.

F

FINAL VELOCITY

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Cycling a 100 inch BC3 model in one direction in one second yields an average velocity of 100 inches per second. To properly determine the inertia forces for cushioning, it is important to know the final (or impact) velocity. Rodless cylinders accelerate and decelerate at each

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end of the stroke. Therefore this acceleration must be considered. If final velocity cannot be calculated directly, a reasonable guideline is to use 2X average velocity.

FLOATING MOUNT (BAND CYLINDERS, MAGNETICALLY COUPLED CYLINDERS)

An option for use in applications where the load is not guided and supported by the Tolomatic actuator, or when compensating for nonparallelism.

FOOT MOUNT

A mounting plate that attaches a cylinder head to mount the cylinder to a flat surface at a 90° angle.

FORCE

An agency or influence that if applied to a free body results chiefly in an acceleration of the body and sometimes in elastic deformation and other effects.

4 PORTED HEAD

The BC2 features standard 3 ported heads but can be ordered with an additional 4th port in the underside of the head for additional mounting flexibility.

FRICITION

Resistance to relative motion between two bodies in contact, such as steel sliding on steel.

H

HALL-EFFECT D.C. SWITCH

A magnetically-controlled transistor switch controlling DC power. It has no moving parts and theoretically unlimited contact life.

HEAD

A metal component mounted at each end of a rodless pneumatic cylinder. With a cable cylinder, the head has a pulley, ports, mounting holes and provides sealing. On a Band Cylinder, the head provides tube sealing, fluid ports and mounting holes.

HUB

A means of attaching a sprocket, pulley or disc to a shaft.

I

INCH-POUND

A unit of measure of torque. It is derived from a given force in pounds acting at a given radius in inches (pounds multiplied by inches = inch-pounds). An inch-pound is 1/12th of a foot-pound. Inch-pounds may be converted to the SI Metric equivalent of Newton-meters by multiplying them by 0.1129848. Newton-meters may be converted to inch-pounds by multiplying them by 8.850748.

INERTIA

A measure of an object's resistance to a change in velocity. The larger an object's inertia, the larger the torque required to accelerate or decelerate it. Inertia is a function of an object's mass and shape.

K

KEY

A demountable machine part, which, when assembled into a keyseat, provides a positive means for transmitting

torque between two other machine parts.

KEYWAY

An axially-located groove in the length of a shaft along which a key may be located.

KINETIC ENERGY

The ability to do work based on motion. It is found by multiplying half the mass by the square of the velocity.

L

LIMIT SWITCH

A switch that is actuated by some part or motion of a machine or equipment to alter the electrical circuit associated with it.

LINEAR SLIDE

A rodless cylinder using the same unique band retention system as the band cylinder. The Linear Slide uses a wider extrusion with steel shafts and bearings for additional load support. Tolomatic model: LS

LOAD

A mass or weight supported by the carrier (rodless cylinders) or tooling plate (rod cylinder slides).

LONG CARRIER

An option available for the BC4 the long carrier increases the My and Mz moment load capacity. It also gives a larger mounting surface and virtually eliminates chatter for vertical cantilever loads.

M

MAGNETICALLY COUPLED ACTUATOR

Rodless cylinder and slides featuring a magnetic couple

between the piston and moving carrier.

MAGNETIC COUPLING FORCE

The force created between the piston magnets and the moving carrier (measured in pounds).

MODIFIED STANDARD PRODUCTS

Tolomatic can easily accommodate your special needs. Our standard products are often customized with extra mounting holes, different materials and other requests. This can often be done within our normal 5 day production time. We welcome modifications as well as completely new custom products.

N

NEEDLE BEARING

A type of roller bearing where the journal turns on small-diameter, hardened needle-like rollers which roll easily in a metal race.

O

O-RING

A ring of synthetic rubber with a circular cross-section, used as a gasket or seal.

P

PARALLEL PORT

Metric versions of the BC2, BC3, BC4 and LS have the choice of parallel port and taper port.

PISTON

A sliding component moved by fluid pressure. It usually consists of a short, solid metal cylinder within a cylindrical vessel in which it moves back and forth.

ABT

MXP

BC2

BC3

BC4

LS

MG

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PORT

In pneumatic units, the area to make connection to air lines that supply power to the actuator. In electrical units: a connecting unit between a data link and a device.

POUNDS PER SQUARE INCH OR PSI

A measurement of pressure in the U.S. customary system. By way of comparison, the weight of the atmosphere (one atmosphere) is 14.7 pounds per square inch, at sea level. It is used to express pressure in both pneumatic and hydraulic-powered systems. In the SI Metric system, pressure is measured in Bars. To convert PSI to Bars, take the PSI figure and multiply it by 0.0689476.

PRESSURE

The force or thrust exerted over a surface divided by its area. In the U.S. customary system, pressure is expressed as Pounds per Square Inch (PSI). In the SI Metric system, it is expressed in Bars.

PROXIMITY SENSOR

An LED-equipped device for sensing end-of-stroke on cylinder slides. Proximity sensors supply either a sourcing signal or a sinking signal to a device such as a programmable logic controller.

PULLEY

A sheave or small wheel with a grooved rim used with a cable cylinder to change the direction and point of application of the pulling force generated by

the cylinder's piston.

Q

QUAD RING

A sealing ring of synthetic rubber which has 4 sealing lobes and is capable of sealing in two directions.

R

REED SWITCH

Tolomatic's Form A Reed Switch is an LED-equipped 0.5 ampere switch consisting of ferromagnetic blades brought into contact when a magnet passes nearby. Reed switches are used for signaling position only.

RELATIVE HUMIDITY

A ratio that indicates the amount of water vapor in the air. It is usually expressed as a percentage. At any temperature, it is the amount of water vapor in the air, divided by the amount that would be present at saturation.

RMS (ROOT MEAN SQUARE)

An industry-accepted standard for measuring the smoothness of a surface finish. Under a microscope, all surface finishes have peaks and valleys. The more peaks and valleys, the rougher the finish and the higher the RMS value. The smaller the RMS number, the smoother the finish.

ROCKWELL

Industry-accepted standard for definition of hardness.

ROD CYLINDER

A cylinder using a rod attached to its piston to trans-

mit force. Tolomatic models include: RCS and PB2.

RODLESS CYLINDER

An actuator that contains the stroke within the cylinder itself. Tolomatic models include: BC2, BC3, BC4, LS, MG, MGS, CC, SA, DP, and TC.

ROLLER BEARING

An anti-friction device consisting of a journal which rests on free-rolling, hardened cylinders in a race.

S

SCHEMATIC

A diagram of a circuit in which symbols illustrate circuit components.

SEAL

An object used to retain air pressure, water, hydraulic fluid or oil in a vessel. In the Tolomatic product line, seals are made of an elastomer, which is any of a variety of synthetic rubber compounds.

SEALING BAND

The stainless steel strap which is part of Tolomatic's unique band retention system, the internal band.

SHIELDING

The practice of confining the electrical field around a conductor to the primary insulation of the cable by putting a conducting layer over and/or under the cable insulation. (External shielding is a conducting layer on the outside of the cable insulation. Strand or internal shielding is a conducting layer over the wire insulation.)

SHOCK ABSORBERS

A self contained hydraulic device commonly used on rodless cylinders, rodless slides and rod cylinder slides to decelerate heavy loads at high velocities.

SIGNAL

The event, phenomenon, or electrical quantity that conveys information from one point to another.

SINGLE-ACTING CABLE CYLINDER

Cable cylinder that applies force in one direction and uses gravity (generally) to return to home position.

SINGLE END PORTING

Single end porting simplifies air hook up, allows running air lines to just one end of the actuator. Unless otherwise specified single end porting is factory installed on the right side of the actuator. Available for the BC3 and BC4.

SNAP-IN SEAL®

A unique method of installing seals in cable cylinder heads without using tools. It includes a plastic washer, which, when pulled into a cable cylinder head cable port, snaps into a groove and holds the seal arrangement in place.

SOLID STATE DEVICES

Electronic components that control electron flow through solid materials (e.g., transistors, diodes, or integrated circuits).

STROKE LENGTH

Stroke length is the distance

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that the carrier and its load will move on the band cylinder or linear slide.

SURGE

A transient variation in the current or potential at a point in the circuit.

SWITCH MAGNETS

Located on the carrier or piston magnets are needed for switches to sense position of carrier. On the BC3 and BC4 the switch magnet is a standard feature, attached to the piston. On the BC2 and LS the switch magnet is only included if switch is ordered. Magnets are easily inserted into carrier for field retrofitting.

SWITCH MAGNETS (DUAL)

The BC2 optionally can have dual switch magnets, one on each side of the carrier.

SWITCHES

For signaling position Tolomatic has 5 different switches available. These switches are available with a 5 meter lead, or with a quick-disconnect connector and 5 meter lead.

SYSTEM

A collection of units combined to work as a larger integrated unit having the capabilities of all of the separate units.

T

T-NUTS

For intermediate support, tube support brackets can be mounted to the BC2, BC3, and BC4 models. For the

BC3 and BC4 the T-Nuts, that are needed for the brackets, must also be ordered.

TAPER PORT

Metric versions of the BC2, BC3, BC4 and LS have the choice of parallel port and taper port.

TENSILE STRENGTH

The greatest longitudinal stress a substance can bear without permanent deformation.

TERMINAL

A threaded device attached to the end of a cable cylinder assembly for convenience in making connections and adjustments. One terminal is attached to the piston, while the other is attached to the bracket (clevis).

TOLERANCE

A specified allowance for error from a desired or measured quantity.

TORQUE

A force that produces rotation. A turning or twisting force. (From the Latin torquere - to twist. Also the root word for torture.)

TRACK CABLE CYLINDER

A cable cylinder with hardened ground shafts and a guided carrier within linear bearings, giving the cylinder the ability to guide and support moderate work loads.

TRIAC AC REED SWITCH

These switches are designed for signaling end-of-stroke position to devices such as programmable controllers. They can be used to operate

ac relays and solenoids if a protection circuit is used and if current and voltage limits are observed.

TUBE DEFLECTION

Due to the nature of loads and aluminum extrusions tube deflection will occur if cylinder (linear slide) is supported only on the ends without tube supports at recommended intervals along length of cylinder.

TUBE SUPPORTS

Optional accessory for band cylinders and linear slides (base mount) to prevent tube deflection.

U

U-CUP

A synthetic rubber component with lips along its inner and outer circumferences giving a cross-section the appearance of the letter "U". When under pressure, the lips flare out, providing a tight seal in one direction and minimal drag from the non-pressurized side.

UNITS

U.S. customary: A system of weights and measures based on the pound and inches. Metric: A decimal system of weights and measures based on the kilogram and meter.

V

VALUE

A number that represents a computed or assigned quantity; or, a number contained in a data table or data file word.

VITON®

A DuPont Chemical Co. trademark for a fluorocarbon rubber used in high temperature applications. At Tolomatic, Viton® is used for seals in high temperature situations and for brakes designed to be operated with non-flammable hydraulic fluids such as phosphate-ester.

VOLT

Unit of electromotive force. It is the difference of potential required to make a current of one ampere flow through a resistance of one ohm.

VOLTAGE

The term most often used in place of electromotive force, potential, potential difference, or voltage drop. It describes the electric pressure that exists between two points and is capable of producing a flow or current when a closed circuit is connected between the two points.

VOLTAGE RATING

The maximum voltage at which a given device may be safely maintained during continuous use in a normal manner. It is also called working voltage.

W

WATT

A unit of power or a rate of doing work. The power dissipated by a one ohm resistor with one ampere of current is one watt.

ABT

MXP

BC2

BC3

BC4

LS

MG

CC

PB

ENGR

Conversion Tables

To convert from A to B, multiply by entry in table

LENGTH	B						
	in	ft	yd	mm	cm	m	
A	in	1	0.0833	0.028	25.4	2.54	0.0254
	ft	12	1	0.333	304.8	30.48	0.3048
	yd	36	3	1	914.4	91.44	0.914
	mm	0.03937	0.00328	0.00109	1	0.1	0.001
	cm	0.3937	0.03281	0.0109	10	1	0.01
	m	39.37	3.281	1.09	1000	100	1

MASS	B					
	gm	kg	slug	lb(m)	oz(m)	
A	gm	1	0.001	6.852×10^{-5}	2.205×10^{-3}	0.03527
	kg	1000	1	6.852×10^{-2}	2.205	35.274
	slug	14590	14.59	1	32.2	514.72
	lb(m)	453.6	0.45359	0.0311	1	16
	oz(m)	28.35	0.02835	1.94×10^{-3}	0.0625	1

PRESSURE	B							
	atm	bar	millibar	lbs/sqr ft (PSF)	lbs/sqr in (PSI)	N/sqr m (NSM)	N/sqr mm (NSMM)	
A	atm	1	1.01325	1013.25	2,116.22	14.6454	101,325	0.101325
	bar	0.986923	1	1000	2088.54	14.5037	100,000	0.1
	millibar	0.000987	0.001	1	2.08854	0.014504	100	0.0001
	PSF	0.000473	0.000479	0.478803	1	0.006944	47.88	0.000048
	PSI	0.068046	0.068948	68.94757	144	1	6,894.757	0.006895
	NSM	0.00001	0.00001	0.01	0.020885	0.000145	1	0.000001
NSMM	98,692	10	10,000	20885.43	145.0377	1,000,000	1	

FORCE	B						
	lb(f)	N	dyne	oz(f)	kg(f)	gm(f)	
A	lb(f)	1	4.4482	4.448×10^5	16	0.45359	453.6
	N	0.22481	1	100,000	3.5967	0.10197	101.97
	dyne	2.248×10^{-6}	0.00001	1	3.59×10^{-5}	1.02×10^{-6}	0.00102
	oz(f)	0.0625	0.27801	2.78×10^4	1	0.02835	28.35
	kg(f)	2.205	9.80665	980,665	35.274	1	1000
	gm(f)	2.205×10^{-3}	0.0098	980.665	0.03527	0.001	1

POWER	B						
	Watts	KW	hp (US customary)	hp (Metric)	ft-lb/s	in-lb/s	
A	Watts	1	1×10^{-3}	1.34×10^{-3}	1.36×10^{-3}	0.74	8.88
	kw	1000	1	1.34	1.36	738	8880
	hp (US customary)	746	0.746	1	1.01	550	6600
	hp (Metric)	736	0.736	0.986	1	543	6516
	ft-lb/s	1.36	1.36×10^{-3}	1.82×10^{-3}	1.84×10^{-3}	1	12
	in-lb/s	0.113	1.13×10^{-4}	1.52×10^{-4}	1.53×10^{-4}	8.3×10^{-2}	1

ABBREVIATED TERMS
atm = atmosphere (STD)
C = Celsius
cm = centimeter
F = Fahrenheit
ft = foot
g = gravity
gm = gram
gm(f) = gram force
hp = horse power
in = inch
kg = kilogram
kg(f) = kilogram force
kw = Kilowatt
lb(f) = pound force
lb(m) = pound mass
min = minute
mm = millimeter
m = meter
N = Newton
oz(f) = ounce force
oz(m) = ounce mass
rad = radians
rpm = revs per minute
rps = revs per second
s = seconds
sqr = square

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TORQUE	B							
	dyne-cm	gm-cm	oz-in	kg-cm	lb-in	N-m	lb/ft	kg/m
A dyne-cm	1	1.019×10^{-2}	1.416×10^{-5}	1.0197×10^{-6}	8.850×10^{-7}	10^{-7}	7.375×10^{-6}	1.019×10^{-6}
gm-cm	980.665	1	1.388×10^{-2}	.001	8.679×10^{-4}	9.806×10^{-5}	7.233×10^{-5}	10 ⁻⁵
oz-in	7.061×10^4	72.007	1	7.200×10^{-2}	6.25×10^{-2}	7.061×10^{-3}	5.208×10^{-3}	7.200×10^{-4}
kg-cm	9.806×10^5	1000	13.877	1	0.8679	9.806×10^{-2}	7.233×10^{-2}	0.001
lb-in	1.129×10^6	1.152×10^3	16	1.152	1	0.112	8.333×10^{-2}	1.152×10^{-2}
N-m	10^7	1.019×10^4	141.612	10.197	8.85	1	0.737	0.102
lb-ft	1.355×10^7	1.382×10^4	192	13.825	12	1.355	1	0.138
kg-m	9.806×10^7	105	1.388×10^3	100	86.796	9.806	7.233	1

INERTIA (ROTARY)	B									
	gm-cm ²	oz-in ²	gm-cm-s ²	kg-cm ²	lb-in ²	oz-in-s ²	lb-ft ²	kg-cm-s ²	lb-in-s ²	lb-ft-s ² or slug-ft-s ²
A gm-cm ²	1	5.46×10^{-2}	1.01×10^{-3}	38,992	3.417×10^{-4}	1.41×10^{-5}	2.37×10^{-6}	1.01×10^{-4}	8.85×10^{-7}	7.37×10^{-4}
oz-in ²	182.9	1	0.186	0.182	0.0625	2.59×10^{-2}	4.34×10^{-4}	1.86×10^{-4}	1.61×10^{-4}	1.34×10^{-5}
gm-cm-s ²	980.6	5.36	1	0.9806	0.335	1.38×10^{-2}	2.32×10^{-3}	38,992	8.67×10^{-4}	7.23×10^{-5}
kg-cm ²	1,000	5.46	1.019	1	0.3417	1.41×10^{-2}	2.37×10^{-3}	1.019×10^{-3}	8.85×10^{-4}	7.37×10^{-5}
lb-in ²	2.92×10^3	16	2.984	2.925	1	4.14×10^{-2}	6.94×10^{-3}	2.96×10^{-3}	2.59×10^{-3}	2.15×10^{-4}
oz-in-s ²	7.06×10^4	386.08	72	70.615	24.13	1	0.1675	7.20×10^{-2}	6.25×10^{-2}	5.20×10^{-3}
lb-ft ²	4.21×10^5	2,304	429.71	421.4	144	5.967	1	0.4297	0.3729	3.10×10^{-2}
kg-cm-s ²	9.8×10^5	5.36×10^3	1,000	980.66	335.1	13.887	2.327	1	0.8679	7.23×10^{-2}
lb-in-s ²	1.129×10^4	6.177×10^3	1.152×10^3	1.129×10^3	386.08	16	2.681	1.152	1	8.33×10^{-2}
lb-ft-s ²	1.355×10^7	7.41×10^4	1.38×10^4	1.35×10^4	4.63×10^3	192	32.17	13.825	12	1

NOTE: Mass inertia = $\frac{\text{wt. inertia}}{g}$

ANGULAR VELOCITY	B			
	deg/s	rad/s	rpm	rps
A deg/s	1	1.75×10^{-2}	0.167	2.78×10^{-3}
rad/s	57.3	1	9.55	0.159
rpm	6	0.105	1	1.67×10^{-2}
rps	360	6.28	60	1

TEMPERATURE
$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32$
$^{\circ}\text{C} = .555 \times (^{\circ}\text{F} - 32)$

LINEAR VELOCITY	B					
	in/min	ft/min	in/sec	ft/sec	mm/sec	m/sec
A in/min	1	0.0833	0.0167	1.39×10^{-3}	0.42	4.2×10^{-4}
ft/min	12	1	0.2	0.0167	5.08	5.08×10^{-3}
in/sec	60	5	1	0.083	25.4	0.0254
ft/sec	720	60	12	1	304.8	0.3048
cm/sec	23.62	1.97	0.3937	0.0328	10	0.01
m/sec	2362.2	196.9	39.37	3.281	1000	1

GRAVITY
(Acceleration Constant)
$g = 386 \text{ in/sec}^2 = 32.2 \text{ ft/sec}^2 = 9.8 \text{ m/sec}^2$

Terms and Conditions of Sale

1. GENERAL:

Tolomatic Inc. is the seller and is referred to herein as "Tolomatic". Any person buying or offering to buy Products from Tolomatic is the "Buyer." The products, including replacement products, sold by Tolomatic are the "Products."

2. ACCEPTANCE APPLICATION OF THESE TERMS AND CONDITIONS

a. The placing by a Buyer of a purchase order with Tolomatic shall be deemed an offer made to Tolomatic to purchase Products. Where Tolomatic accepts a purchase order, it shall be subject to these terms and conditions.

b. No order placed by the Buyer shall be deemed to be accepted by Tolomatic until a written acknowledgment of order, which may include email or facsimile, is issued by Tolomatic or, if earlier, Tolomatic delivers the Products to the Buyer.

c. Where Tolomatic proposes to sell Products to Buyer quoting prices, delivery dates or specifications different than those set out in Buyer's purchase order, or where Tolomatic otherwise provides a price quotation at Buyer's request, Tolomatic may invite Buyer to place a new purchase order the acceptance of which by Tolomatic will form a contract for the sale of the Product to Buyer, subject to these terms and conditions. Tolomatic may also provide a quotation or offer to sell Products to Buyer which Buyer may accept. In that case, Buyer's acceptance of the offer or quotation will form a contract for the sale of the Product to Buyer, subject to these terms and conditions.

d. The placing of a purchase order by the Buyer, the confirmation by the Buyer of Tolomatic's acceptance of a purchase order, the acceptance of the delivery of Products and payment by the Buyer of the price or any down payment or any security for payment and any other confirmation of the purchase order on the part of the Buyer (including any agreed variations of the purchase order) shall be deemed to be an acceptance and/or confirmation by the Buyer of these terms and conditions. Tolomatic hereby rejects any additional or different terms contained in any purchase order or other communication previously or hereafter presented by Buyer to Tolomatic. No additional or different terms or conditions other than the terms and conditions set out herein (together with the content of the purchase order accepted by Tolomatic) will have any force or effect, except where

specifically agreed by Tolomatic in writing.

e. These terms and conditions together with the details of any accepted purchase order form the entire agreement between Tolomatic and Buyer in relation to the sale and supply of Products by Tolomatic to Buyer, and there are no conditions to that agreement that are not expressly contained in these terms and conditions.

f. Any variation, cancellation or waiver of these terms and conditions shall only be effective if made in writing and signed by a duly authorized representative of Tolomatic.

3. CHANGES AND CANCELLATION

Once Tolomatic has accepted Buyer's order, Buyer cannot modify or cancel the order, in whole or in part, without Tolomatic's written consent.

4. MATERIALS FURNISHED BY TOLOMATIC

Catalogs and other materials furnished by Tolomatic and other information provided in connection with Products, including price lists, are subject to modification by Tolomatic and are provided for information only. Prices are binding only on acceptance of purchase orders (or if Tolomatic provided Buyer a full quotation which was accepted by Buyer).

5. PRICES, TAXES, FREIGHT AND HANDLING

a. The prices for Products will be those set out in an accepted purchase order or (if relevant) in Tolomatic's quotation/proposal accepted by Buyer.

b. If Buyer orders any installation or similar services, unless a fixed price or rates are specifically agreed, Buyer shall pay for such services on a labor plus materials basis at the standard rates charged by Tolomatic from time to time.

c. Unless Tolomatic specifies in writing that any quotation is binding for a specified period of time, quoted prices are subject to change at any time prior to acceptance of a purchase order. Price quotations shall expire automatically without notice thirty (30) days from the date thereof (unless otherwise specified in the quotation/proposal).

d. Prices quoted by Tolomatic assume that the entire quantity of Products ordered will be shipped at completion of manufacture in

accordance with the purchase order or in accordance with a delivery schedule accepted by Tolomatic. If the Buyer requests partial shipment or requests variations in quantities, the original price quotation will no longer apply.

e. Unless otherwise agreed in writing by the parties, shipping, custom shipping containers, freight and insurance costs are not included in the price, nor are any customs, duties, sales, use, value added or similar taxes which shall be payable by the Buyer at its sole responsibility. If notwithstanding the above, Buyer and Tolomatic agree that Tolomatic should bear any such costs or pay such taxes, they shall be added to the price payable by the Buyer.

f. If prices are quoted including any taxes, duties, third party fees, freight or insurance costs, Tolomatic may adjust the price if such costs or rates of tax or fees increase after acceptance of the purchase order.

g. If Tolomatic is required by law to charge Buyer any sales tax, value added tax or other taxes, charges or levies, such amounts shall be in addition to quoted prices and shall be added to invoices payable by Buyer.

6. MINIMUM BILLING

Orders amounting to less than \$35.00 net will be billed at \$35.00.

7. DELIVERY, SCHEDULE AND INSPECTION

a. Unless agreed otherwise in writing by Tolomatic, Products shall be delivered to Buyer Ex Works (Incoterms 2010), Tolomatic's facilities at 3800 County Road 116, Hamel, Minnesota 55340. Title and all risk or loss or damage in transit shall pass to Buyer at that time.

b. Any delivery dates furnished by Tolomatic are estimates only and do not bind Tolomatic to deliver the Products on the dates indicated. Tolomatic reserves the right to make partial shipments and to submit separate invoices to Buyer for each such shipment.

c. Where Products are delivered Ex Works, Buyer may specify the carrier or indicate its preferred transportation method (which shall be at Buyer's costs) by giving written notice to Tolomatic which must be received at least 5 working days prior to the expected date of shipment by Tolomatic to the Ex Works delivery point. In the absence of a

notice requesting a particular carrier or method of delivery, transportation shall be by any method of transport and any carrier chosen by Tolomatic and shall in any event be at the sole risk and expense of Buyer.

d. If the quantity of products received by Buyer is less than the quantity shown in the purchase order or invoice or if the products received by Buyer are damaged in transit or missing, Buyer will be responsible to notify the carrier and insurer and to file any necessary claims.

e. If Buyer requires Products to be inspected by Buyer's representative or nominee before shipment, such inspection shall be performed with reasonable advance notice, during normal working hours on working days and be limited to plant areas designated by Tolomatic.

f. If a purchase order accepted by Tolomatic does not contain a firm shipment schedule for all the Products ordered, and Tolomatic has not received a substantial shipping order (as determined by Tolomatic in its sole discretion) within 30 days of the date the purchase order is placed, then Tolomatic has the right to give written notice to Buyer that Buyer must send Tolomatic, within such date as may reasonably be indicated in the notice, a shipping order for at least the quantity of Products specified in the notice. Unless Tolomatic receives a shipping order as specified in the notice within the specified period, Tolomatic may terminate the purchase order without liability.

8. PAYMENT

a. Unless orders are accepted on a prepayment basis, in which case payment for the Products shall be due in advance of delivery, payment for Products shall be due and payable within thirty (30) days from the date of invoice to the Ex Works delivery point. Tolomatic reserves the right to withdraw or change any credit terms at any time for purchase orders that have not yet been accepted by Tolomatic.

b. Prices shall be quoted and payable in U.S. dollars (unless agreed otherwise). All bank charges for wire transfers, letters of credits or other methods of payment shall be paid by Buyer.

c. Buyer shall pay invoices in full and shall have no right to assert any credit, set-off or counterclaim against any amount invoiced for

Terms and Conditions of Sale (cont.)

the sale or supply of Products.

d. All amounts payable to Tolomatic shall be paid in full without any withholding or deduction on account of any taxes, duties, levies or charges, unless Buyer is required by law to make such deduction or withholding. If it is so required it shall duly deduct or withhold the amount as required by law and shall, when making the payment to which the withholding or deduction relates, pay Tolomatic such additional amount as will ensure that (after the deduction or withholding) Tolomatic receives the same total amount that it would have received if no such withholding or deduction had been required.

e. Buyer shall notify Tolomatic of any invoice discrepancy within fourteen (14) days of receipt of the invoice after which time the invoice shall be deemed accepted by Buyer.

f. Tolomatic reserves the right to charge interest at the rate of 2% per month (or at the maximum rate permitted by law, if lower) on amounts not paid within 30 days of the due date of payment. Interest shall accrue from the due date for payment.

g. Tolomatic reserves the right at any time at its discretion to demand security for payment before continuing with or delivering any order. In such event, Buyer will grant a security interest in all Products to be delivered by Tolomatic to Buyer and will take all additional steps requested by Tolomatic and as otherwise necessary to enable Tolomatic to create and perfect a security interest, including if so designated by Tolomatic a purchase money security interest, in all Products delivered by Tolomatic to Buyer, including obtaining necessary consents from creditors of Buyer and executing and delivering to Tolomatic all documents related thereto.

h. If Buyer defaults in its payment obligations in regard to any shipment of Products, Tolomatic may suspend any additional shipments until Buyer cures such default and may terminate the purchase order in relation to any remaining shipments.

9. LIMITED WARRANTY

a. Tolomatic warrants that at the time of delivery, Products shall be in good condition, free from defects in material and workmanship and that Products made to order shall conform to applicable drawings or specifications as referenced in the

quotation or accepted purchase order ("Product Warranty"). The Product Warranty shall expire one year from date of shipment (the "Warranty Period"). Tolomatic warrants that Buyer shall acquire good title to the Products free from third party rights. These warranties are given only to Buyer and not to any third party.

b. The Product Warranty excludes any defects or non-conformance resulting (wholly or in part) from: (i) accidental damage, mishandling, incorrect installation, negligence or other circumstances arising after delivery; (ii) the repair or alteration of the Product by any party other than Tolomatic or its authorized representative; (iii) the failure by Buyer to provide a suitable storage, use, or operating environment for the Products; (iv) Buyer's use of the Products for a purpose or in a manner other than that for which they were designed; and (v) other abuse, misuse or neglect of the Products by Buyer or any third party.

c. The Product Warranty excludes any Products not manufactured by Tolomatic. Insofar as any Products are manufactured by third parties, Tolomatic shall, insofar as it can, pass to the Buyer the benefit of all warranties given by the supplier of such Products.

d. The Product Warranty shall be limited to defects of which Tolomatic is notified within twenty-one (21) days from the date of shipment to Buyer or, in the event of latent defects, within twenty-one (21) days of the defect being discovered and provided that such notice is received within the Warranty Period. As sole remedy for the breach of the warranty in paragraph (a) above, provided that (if required by Tolomatic) all non-conforming Products are returned to Tolomatic at Buyer's cost, and provided that Tolomatic confirms the defect or non-conformance, Tolomatic shall at its option (i) replace or repair the defective or non-conforming items, or correct any defective work or non-conformance, or (ii) refund to Buyer the original purchase price of the defective or non-conforming item and reimburse to Buyer any transportation and insurance charges incurred by Buyer.

e. Any claim by Buyer against Tolomatic alleging the breach of the Product Warranty must be commenced within twelve (12) months following the date of the alleged breach.

f. In the event the parties disagree whether or not a breach of the Product Warranty has occurred, Tolomatic may (but shall not be obliged to) undertake any repairs or replacement requested by Buyer pending final settlement of the matter. If it is determined that no such breach has occurred, Buyer shall pay Tolomatic upon demand the reasonable price of the repairs, corrections, or replacements made by Tolomatic including allowances for overheads and a reasonable profit margin.

g. THE WARRANTIES EXPRESSLY MADE UNDER THESE TERMS ARE EXCLUSIVE AND GIVEN IN LIEU OF ALL OTHER REPRESENTATIONS, WARRANTIES AND COVENANTS THAT MAY BE IMPLIED BY LAW, BY CUSTOM OF TRADE, BY THESE TERMS, BY THE PURCHASE ORDER OR OTHERWISE WITH RESPECT TO THE PRODUCTS. TO THE FULL EXTENT PERMITTED BY LAW, TOLOMATIC DISCLAIMS AND BUYER WAIVES ALL SUCH REPRESENTATIONS, WARRANTIES AND COVENANTS INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS. BUYER'S SOLE REMEDY FOR BREACH OF WARRANTY IS STATED IN PARAGRAPH (d) ABOVE.

h. No Products shall be returned without Tolomatic's prior written consent. Products which Tolomatic consents to have returned shall be shipped by Buyer at Buyer's risk and expense, freight prepaid, to such location as Tolomatic designates.

10. LIMITATION OF LIABILITY

a. Tolomatic shall in no event be liable to Buyer or any third party, whether in contract, tort (including negligence), misrepresentation, strict liability or otherwise, for any incidental, punitive, consequential, indirect or special damages, including any loss of profits or savings or anticipated profits or savings, loss of data, loss of opportunity, loss of reputation, loss of goodwill or business or potential business, however caused, even if Tolomatic has been advised of the possibility of such damages in advance.

b. Under no circumstances shall Tolomatic's liability to Buyer in connection with any purchase order or Products supplied to Buyer exceed

an amount equal to the amount paid by Buyer for such Products.

c. Buyer agrees and understands that it is solely Buyer's responsibility to ensure that Products are suitable for Buyer's requirements and for the environment, facilities or machinery for which they are intended by Buyer or by its end-customer to be fitted or used. Even if Tolomatic is advised of Buyer's intended use, Tolomatic makes no representation or warranty that the Product will be suitable for that purpose. Any technical advice furnished by Tolomatic relating to the intended use of the Products is given for information only and Tolomatic assumes no obligation or liability for the advice given or the results obtained. Except insofar as specifications or drawings form part of a purchase order and the Product Warranty, to the full extent permitted by law, Tolomatic disclaims and Buyer waives all representations, warranties and covenants that may be implied from the provision by Tolomatic of technical advice or information about Product. All such advice and information are accepted by Buyer at its risk.

d. Insofar as any liability or warranty of Tolomatic cannot be limited or excluded under applicable law, including any laws that do not permit limitations on liability relating to death or personal injury, the provisions of these terms and conditions shall be construed as being subject to such legal limitations, but only if those legal provisions have effect in relation to Tolomatic's liability notwithstanding the governing law provision in Section 18 below.

11. BUYER'S RESPONSIBILITIES

a. Buyer shall be responsible for complying with any laws relating to the exportation of the Products from the United States of America and their importation into any other country and shall be solely responsible for all import duties or other relevant charges and for all costs of shipment, freight (whether by air, sea or otherwise) and insurance from the point of delivery.

b. Without limitation to paragraph (a) above, Buyer shall be responsible to ensure that the exportation of any Products to any country outside the United States of America complies with all relevant export control laws, orders, regulations and restrictions applicable to the Products, including all applicable statutory and regulatory requirements under the Arms Export Control Act (22 U.S.C. 1778), the

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Terms and Conditions of Sale (cont.)

International Traffic in Arms Regulations, the Export Administration Regulations and associated executive orders, the Laws implemented by the Office of Foreign Assets Control, U.S. Department of the Treasury, U.S. Customs Regulations, and equivalent laws in any jurisdiction to which the Products are imported (collectively, "Export and Import Laws"). Upon the request of Tolomatic, Buyer will provide certificates signed by an authorized representative certifying compliance with applicable Export and Import Laws, as indicated by Tolomatic.

c. Buyer shall be responsible for the collection, remittance and payment of any or all taxes, duties, charges, levies, assessments and other fees of any kind imposed by any authority in the country of import or use of the Products in respect of the purchase, importation, sale or other use of the Products.

d. Buyer shall be responsible at its cost and expense for obtaining any import licenses or permits necessary for the entry of the Products into any territory outside the United States of America and for any import procedures. If Buyer requires Tolomatic to produce any documentation in relation to Products for any administrative or regulatory purposes, Buyer shall inform Tolomatic of the requirement as early as possible and shall provide all necessary details to Tolomatic. Tolomatic cannot guarantee that all required documentation or certifications can be provided. Tolomatic may charge Buyer for the costs of producing such documentation.

e. Paragraphs (a) to (d) above shall apply notwithstanding any agreement by Tolomatic to deliver Products to Buyer under terms other than Ex Works (except in relation to the payment of importation duties, freight and insurance if Tolomatic expressly agrees to the alteration of such terms).

f. If Buyer believes or becomes aware that a recall or other corrective action relating to Products purchased by Buyer is desirable or required by law, it shall immediately notify Tolomatic. Buyer shall cooperate with Tolomatic in carrying out any recall of Products required by law or by any regulatory authority or deemed necessary by Tolomatic, including by communicating with end-users of the Products. Tolomatic shall have sole control over the implementa-

tion of any recall or other corrective action.

g. Buyer shall maintain appropriate records to enable the tracking of Products purchased by Buyer, where required for the purpose of any testing, recall or corrective action.

12. INTELLECTUAL PROPERTY RIGHTS AND USE OF PRODUCTS

a. Buyer acknowledges that the Products, including but not limited to designs and drawings created by Tolomatic, embody valuable intellectual property rights. As between Buyer and Tolomatic, all such intellectual property rights, including all trademarks displayed on Products or their packaging or on any documentation, are solely and exclusively owned by Tolomatic.

b. Buyer acknowledges and agrees that the purchase of the Products by Buyer shall not give effect to the transfer of any title, right or interest over any such intellectual property rights or the grant of any rights in and to such intellectual property rights.

c. No license is granted or shall be implied for the use of any such intellectual property rights, and no warranty is made that use of the Products or of such intellectual property will not infringe the intellectual property rights of third parties.

13. DEFAULT

Tolomatic may, without prejudice to any other rights it may have, by notice in writing to Buyer, terminate any contract or purchase order immediately if: (a) Buyer breaches any of these terms and conditions (including any payment default), provided that if the breach can be remedied in Tolomatic's reasonable judgment, Tolomatic shall allow Buyer seven (7) days from the date of the notice to cure the breach; (b) Buyer becomes unable to pay its debts as they become due or if any bankruptcy, receivership, administration, liquidation or similar proceedings are issued or commenced against Buyer, or if Buyer makes an assignment for the benefit of creditors or has a receiver appointed for any of its assets, or permits judgment against it to remain unsatisfied for seven (7) days, or if the business or assets of Buyer are confiscated, expropriated, seized or taken over by any government agency.

14. RETURNS

No Products may be returned

without first obtaining prior authorization from Tolomatic and according to Tolomatic's instructions. If accepted, all Product returns shall be subject to a minimum service charge of 35% of the invoice price and all transportation charges shall be prepaid by Buyer. Without derogation from the above, assembled Products which have been modified beyond what is offered as a standard product or built as a "Customer Special" (product that currently does not reside in Tolomatic's list of available standard products), shall in no event be returnable to Tolomatic.

15. INDEMNITY

Buyer shall defend, indemnify, and hold Tolomatic harmless from any and all liabilities, penalties, losses, damages, costs and expenses, including attorney fees, resulting from any acts or omissions of Buyer in connection with the use, installation or onward sale of Products sold by Tolomatic to Buyer, except where the claim, loss or liability arises predominantly out of a breach of the Product Warranty.

16. FORCE MAJEURE

a. Tolomatic shall not be liable to Buyer in respect of any delay or failure in the delivery of Products where such delay or failure is due to circumstances beyond its reasonable control, including but not limited to shortages of supplies, actions of government agencies, acts of nature, acts of Buyer (including any failure by Buyer to discharge its responsibilities under these terms and conditions), fire, strike, or labor dispute, war, hostilities or terrorist acts, embargoes, equipment breakdown, power failure, failures in telecommunications systems, or the inability to obtain necessary labor, material or manufacturing facilities. If any such circumstances prevent a purchase order from being performed for more than forty-five (45) days from the anticipated date of delivery, either party may terminate the purchase order by written notice to the other (provided that such notice is not received after Tolomatic confirms that it is ready to make delivery).

b. In the event of such delay, and assuming that Buyer chooses not to cancel due to such cause, the date of delivery shall be extended for a period equal to the time lost by reason of the delay.

17. SEVERABILITY

If any of these terms and conditions are held by a court or tribunal

of competent jurisdiction to be illegal or unenforceable, this shall not affect the validity or enforceability of any other term, and Tolomatic and Buyer shall use all reasonable efforts to agree to modify the relevant term insofar as necessary to render it lawful and enforceable and shall replace the unlawful or unenforceable term with such modified term.

18. MISCELLANEOUS

a. Buyer acknowledges that it has not been induced to purchase the Products from Tolomatic by any representation or warranty not expressly set forth herein. These terms and conditions may not be modified except by a written document signed by an authorized representative of Tolomatic and Buyer. The paragraph headings are intended for convenience of reference only and shall not affect the interpretation of any provision.

b. These terms and conditions and the rights of the parties hereunder shall be governed by and construed in accordance with the laws of the state of Minnesota, USA, without reference to its conflict of laws rules. The parties disclaim the application of the United Nations Convention on Contracts for the International Sale of Goods to these terms and conditions.

c. Buyer shall not have the right to assign or otherwise transfer its rights or obligations under these terms and conditions except with the prior written consent of Tolomatic. These terms and conditions shall be binding on the parties and their respective successors and permitted assigns. Any prohibited assignment shall be null and void.

d. No failure by either Party to take any action or assert any right hereunder shall be deemed to be a waiver of such right. The parties are independent contractors and not agents of each other. If a copy of these terms and conditions is translated into another language, the official and binding version shall be the English language version, which shall prevail in all instances.

e. Notices shall be deemed given on the third day following domestic mailing or the seventh day following international mailing, if mailed registered or certified mail, postage prepaid, return receipt requested, or on receipt if delivered by private courier service, or by facsimile, addressed to the respective addresses of the receiving party.

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The Tolomatic Difference Expect More From the Industry Leader:



INNOVATIVE PRODUCTS

Unique linear actuator solutions with Endurance TechnologySM to solve your challenging application requirements.



FAST DELIVERY

The fastest delivery of catalog products... Built-to-order with configurable stroke lengths and flexible mounting options.



ACTUATOR SIZING

Online sizing that is easy to use, accurate and always up-to-date. Find a Tolomatic electric actuator to meet your requirements.



YOUR MOTOR HERE

Match your motor with compatible mounting plates that ship with any Tolomatic electric actuator.



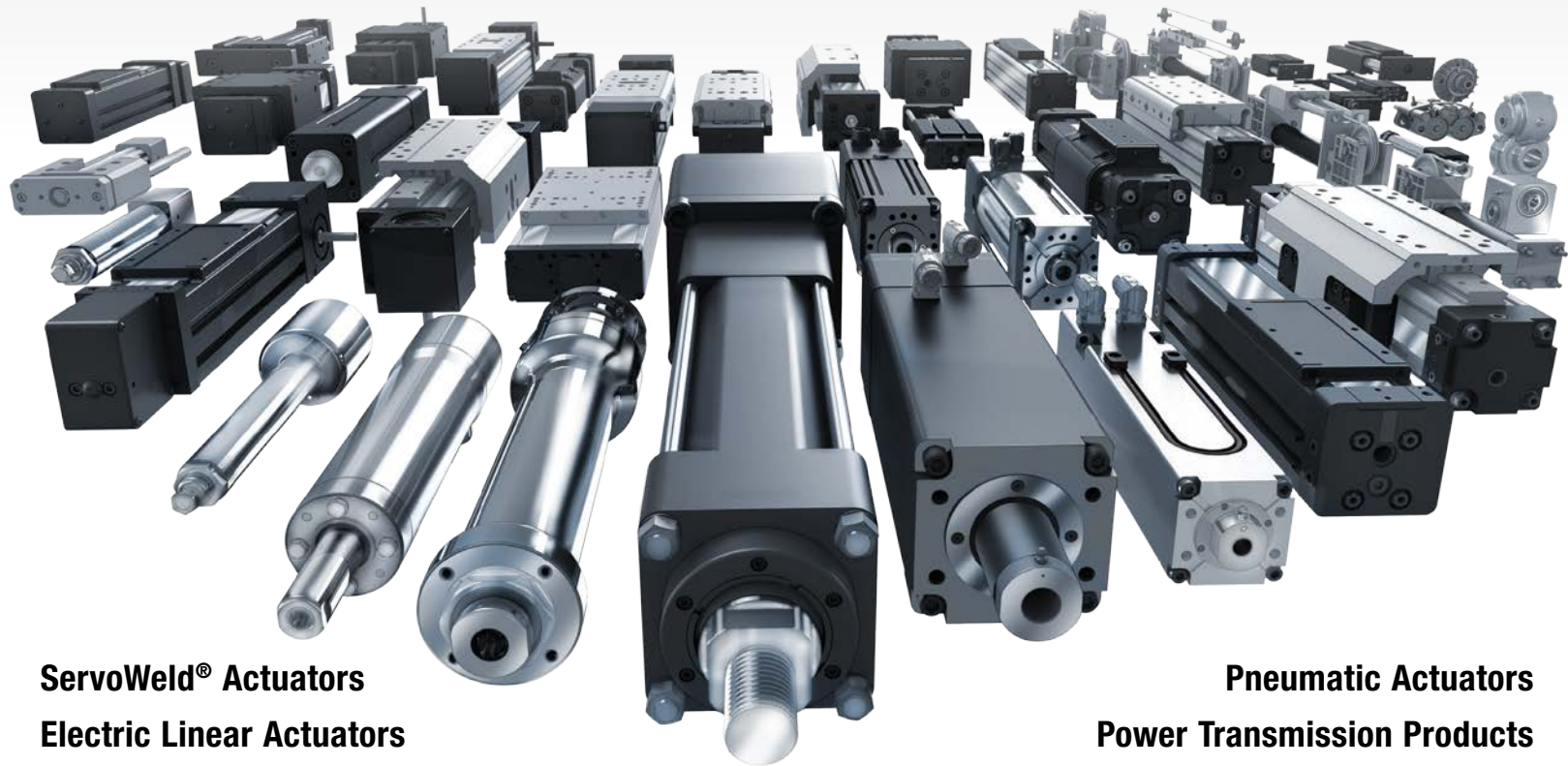
LIBRARY

Easy to access CAD files available in the most popular formats to place directly into your assembly.



TECHNICAL SUPPORT

Extensive motion control knowledge: Expect prompt, courteous replies to any application and product questions from Tolomatic's industry experts.



ServoWeld® Actuators
Electric Linear Actuators

Pneumatic Actuators
Power Transmission Products

TolomaticTM
EXCELLENCE *IN* MOTION

COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV GL
= ISO 9001 =
Certified site: Hamel, MN

USA - Headquarters

Tolomatic Inc.
3800 County Road 116
Hamel, MN 55340, USA
Phone: (763) 478-8000
Toll-Free: **1-800-328-2174**
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