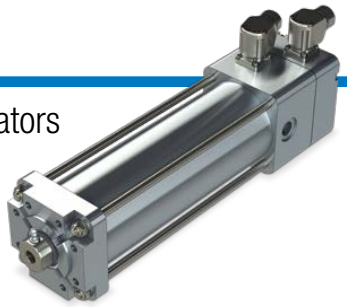
Tolomatic
EXCELLENCE *IN MOTION*®

ServoWeld® Actuators

SWA & SWB MODELS

INTEGRAL MOTOR HIGH THRUST ACTUATOR

ServoWeld SWA & SWB



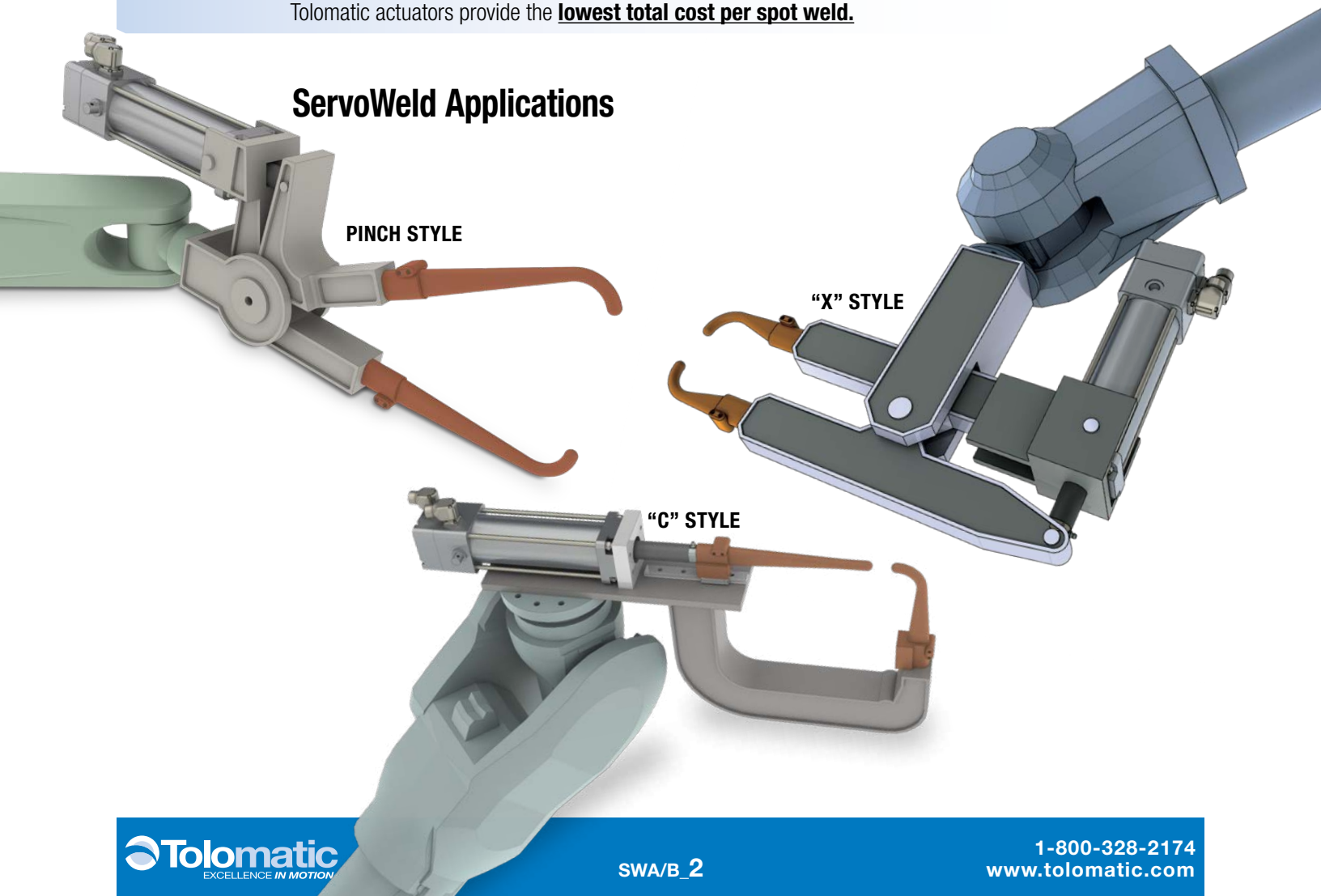
Tolomatic is the world's leading manufacturer of integrated servo actuators for resistance spot welding, used by the world's top weld gun OEM's and numerous global vehicle manufacturers.

Superior Integrated Servo Motor Actuators

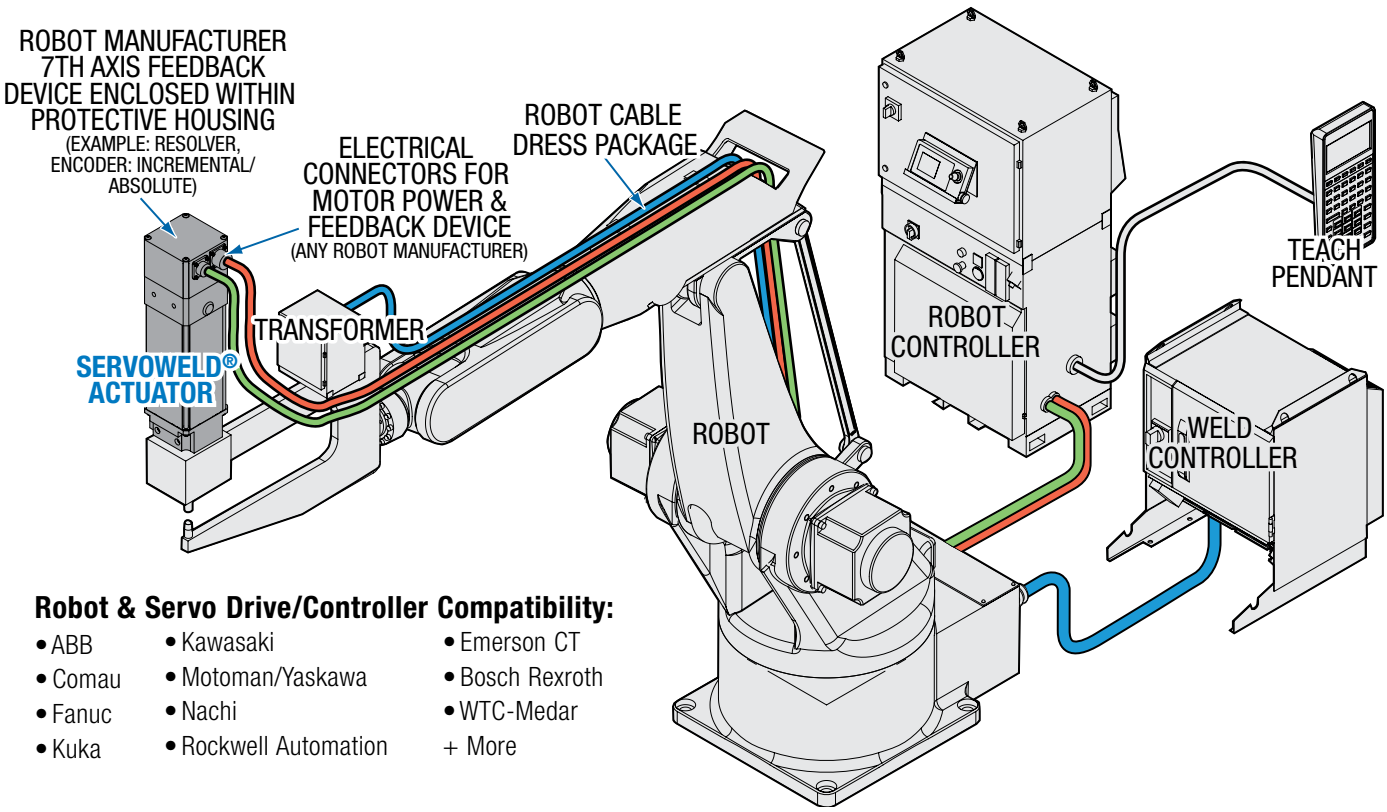
Tolomatic's ServoWeld family of integrated servo actuators are designed for best-in-class performance with the factors that are most important for resistance spot welding gun applications.

NUMBER OF WELDS/ PRODUCT LIFE	Tolomatic's superior roller screw design has the **highest dynamic load rating for more welds** than any competitive technology (other roller screws, ball screw, pneumatic).
FORCE REPEATABILITY	Skewed winding designed for welding minimizes motor cogging and **provides industry best actuator force repeatability:** • ±3 % Over the Lifetime of the Actuator
EFFICIENCY	All elements of actuator (winding, screw, rod scraper, bearings) are designed to optimize the efficiency of the actuator system and provide the **most energy efficient solution on the market.**
WELDS/ MINUTE	All elements of the actuator (winding, screw, rod scraper, bearings) are designed to last and run as cool as possible in welding applications, with the ability to add water cooling as an option. This means **more welds per minute than any competitive technology** (other roller screws, ball screw, pneumatic).
WEIGHT	Tolomatic integrated servo actuators minimize weight when designed into the weldgun. Additionally, Tolomatic can customize actuators for a specific weldgun applications to provide **industry leading light weight designs.**
LIFETIME COST	By building the longest lasting, most efficient and highest weld per minute actuators on the market, Tolomatic actuators provide the **lowest total cost per spot weld.**

ServoWeld Applications



Typical Robotic ServoWeld Installation



Robot & Servo Drive/Controller Compatibility:

- ABB
- Comau
- Fanuc
- Kuka
- Kawasaki
- Motoman/Yaskawa
- Nachi
- Rockwell Automation
- Emerson CT
- Bosch Rexroth
- WTC-Medar

+ More

Tolomatic Offers the Broadest, Most Capable Family of Integrated Servo Actuators for Resistance Spot Welding

Model:	*GSWA*	*SWA*	*SWB*
			
Number of Welds[1] (millions):	20+	20+	10+
Re-lubrication without Disassembly:	Yes[4]	Yes	Yes
Peak Force:	24.5 kN *[5,500 lbf]*	17.8 kN *[4,000 lbf]*	17.8 kN *[4,000 lbf]*
Actuator Output Force[2] **(Lifetime)** Repeatability**:**	±3%	±3%	±5%
Weight (size 33, 3 / 44, 4)[3]:	8.3 kg / 13.8 kg *[18.3 lb / 30.4 lb]*	7.2 kg / 12.6 kg *[15.9 lb / 27.8 lb]*	7.2 kg / 12.6 kg *[15.9 lb / 27.8 lb]*
Water Cooling:	Optional	Optional	Optional
Manual Override:	Optional	No	No
Full Force Direction:	Push and Pull	Push	Push

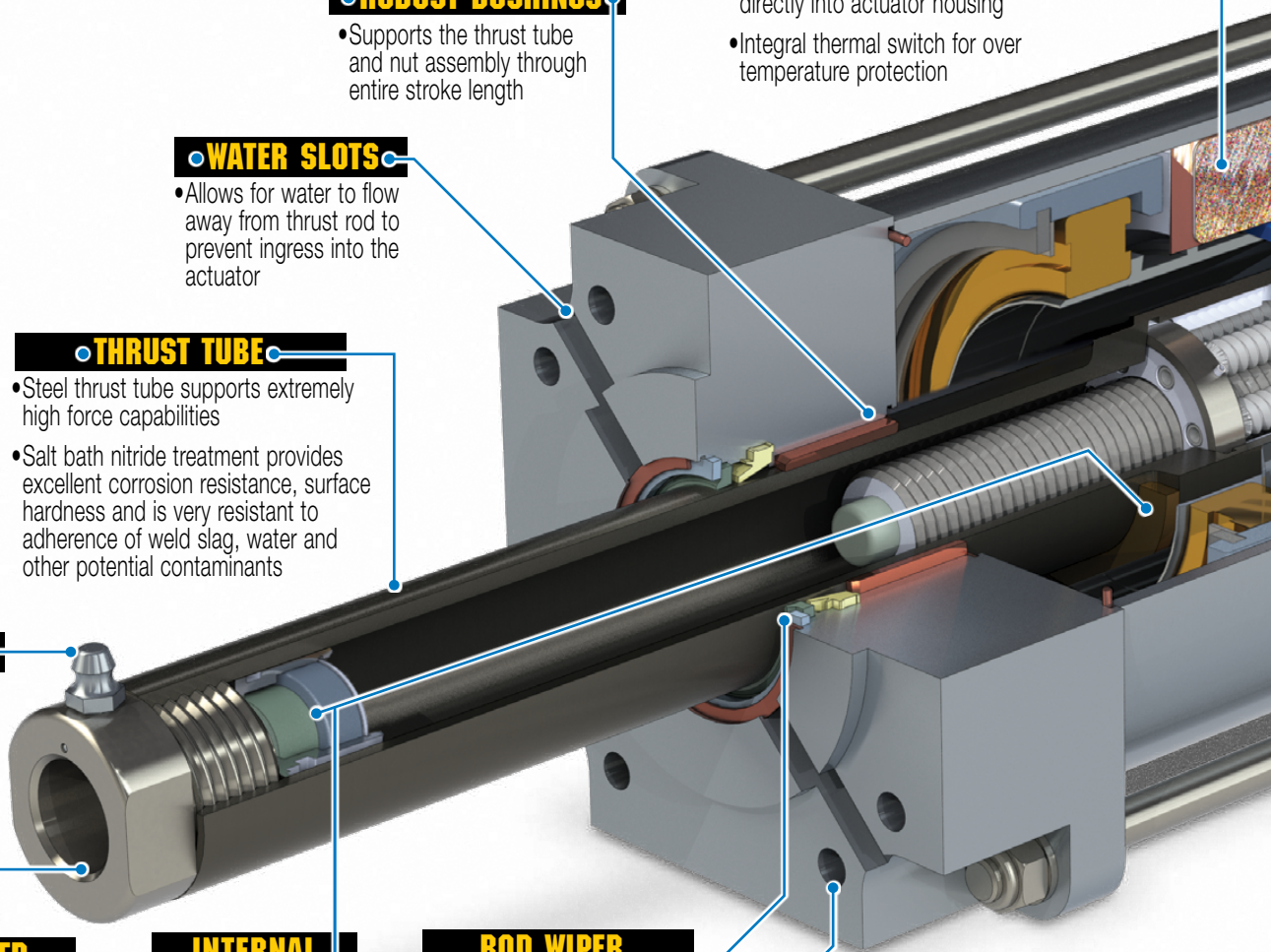
[1] Based on properly lubricated ServoWeld unit used as recommended in user manual. Weld schedule, tip force, environment and lubrication are factors in the total number of welds achievable with ServoWeld actuators.

[2] At weld force [3] Weight varies with choice of feedback device and mounting options [4] Some exceptions, see GSWA user manual

SWA & SWB INTEGRATED MOTOR ACTUATOR

ENDURANCE TECHNOLOGY℠

Endurance Technology features are designed for maximum durability to provide extended service life.



MULTIPLE MOTOR WINDINGS

YOU CAN CHOOSE:

- 460VAC or 230VAC rated windings potted directly into actuator housing
- Integral thermal switch for over temperature protection

ROBUST BUSHINGS

- Supports the thrust tube and nut assembly through entire stroke length

WATER SLOTS

- Allows for water to flow away from thrust rod to prevent ingress into the actuator

THRUST TUBE

- Steel thrust tube supports extremely high force capabilities
- Salt bath nitride treatment provides excellent corrosion resistance, surface hardness and is very resistant to adherence of weld slag, water and other potential contaminants

GREASE PORT

- Screw re-lubrication system provides extended screw life
- Convenient lubrication without disassembly

THREADED ROD END

- Zinc plated steel construction for corrosion resistance
- Provides a common interface to multiple rod end options

INTERNAL BUMPERS

- Bumpers protect the screw and nut assembly from damage at end of stroke

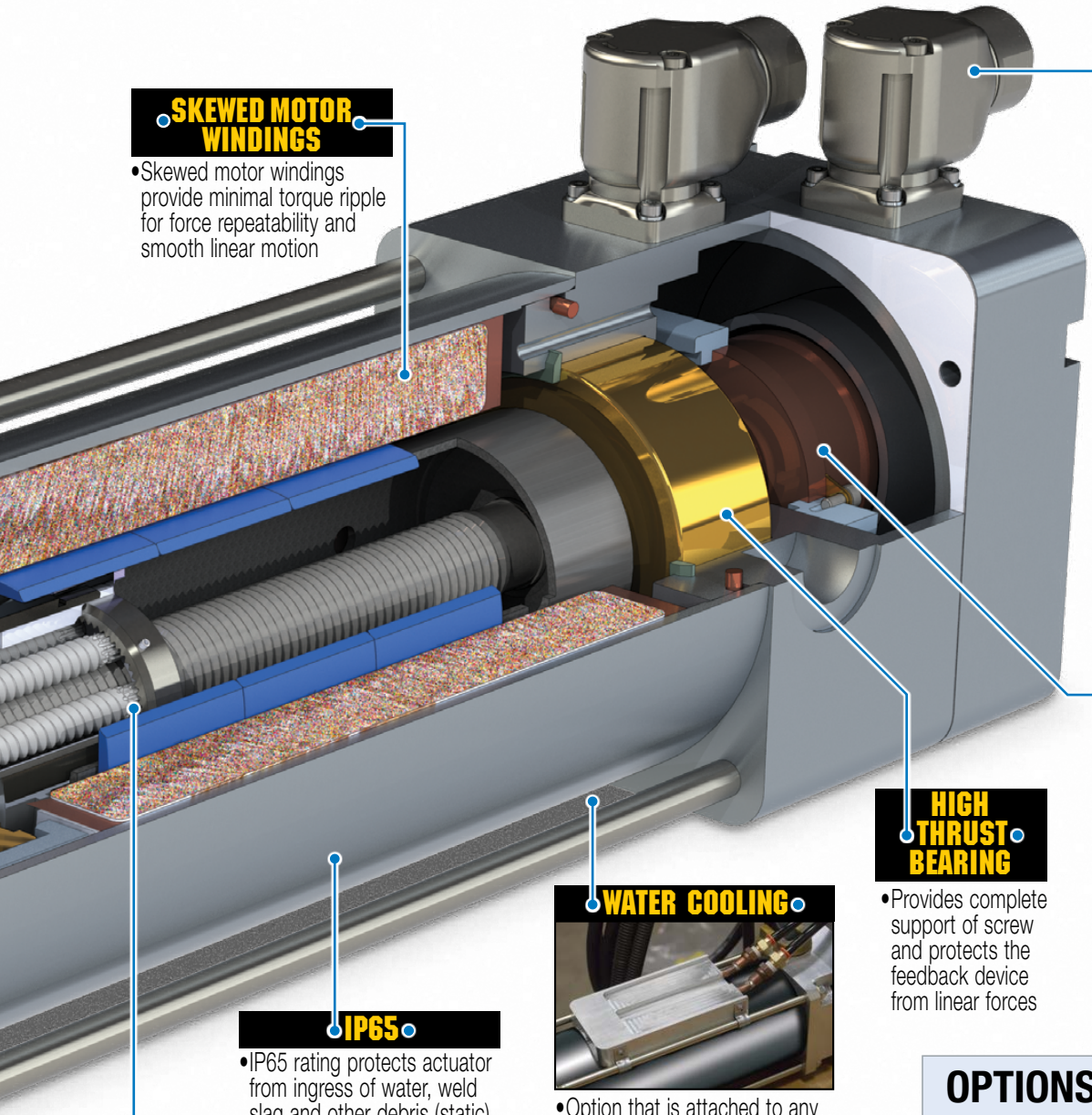
ROD WIPER WITH SCRAPER

- Prevents contaminants from entering the actuator for extended life

UNIVERSAL MOUNTING

- Tapped holes in front face allow for mounting in any orientation... 0°, 90°, 180° or 270°

...MAXIMUM DURABILITY



SKEWED MOTOR WINDINGS

- Skewed motor windings provide minimal torque ripple for force repeatability and smooth linear motion

ROBOT & DRIVE/CONTROLLER COMPATIBILITY

- Compatible feedback, connector(s) and wiring to match the following robot & drive/controller manufacturers' cable dress packages

YOUR CHOICE:

+ ABB
+ Comau
+ Fanuc
+ Kawasaki
+ Kuka
+ Motoman/Yaskawa
+ Nachi
+ Rockwell Automation
+ Bosch-Rexroth
+ Emerson CT
+ WTC-Medar

& more

FEEDBACK CHOICES

- Customer specified to robot manufacturer
- Multi-turn absolute encoder
- Resolver
- Digital encoder

HIGH THRUST BEARING

- Provides complete support of screw and protects the feedback device from linear forces

WATER COOLING

- Option that is attached to any side of the actuator
- Allows increased duty cycle and increased jobs/hour

IP65

- IP65 rating protects actuator from ingress of water, weld slag and other debris (static)

ADVANCED SCREW TECHNOLOGY

- Roller screws provide the highest thrust and life ratings available
- SWA: Highest DLR roller screw provides longest life
- SWB: Lower DLR roller screw, provides longer life than ball screws or inverted roller screws

OPTIONS

BRAKE
WATER COOLING
REAR TRUNNION MOUNTING

Table 1: Performance & Mechanical Specifications:

SERIES		SWA3 or SWB3			SWA4 or SWB4				
FRAME SIZE	mm	90.0			110.0				
	in	*3.54*			*4.33*				
MOTOR WINDING		A3 / B3			A2 / B2		A3 / B3		
NUT/SCREW		RN04	RN05	RN10	RN05	RN10	RN04	RN05	RN10
§SCREW LEAD	mm	4.0	5.0	10.0	5.0	10.0	4.0	5.0	10.0
PEAK FORCE	kN	9.35	7.56	3.78	11.12	5.56	17.80	14.68	7.34
	lbf	*2,100*	*1,700*	*850*	*2,500*	*1,250*	*4,000*	*3,300*	*1,650*
MAX. VELOCITY	mm/sec	234	292	584	292	584	234	292	584
	in/sec	9.2	11.5	23.0	11.5	23.0	9.2	11.5	23.0
SWA SCREW DLR (DYNAMIC LOAD RATING)	kN	41.42	54.01	47.56	73.87	76.99	67.72	73.87	76.99
	lbf	*9,240*	*12,050*	*10,611*	*16,479*	*17,175*	*15,107*	*16,479*	*17,175*
SWB SCREW DLR (DYNAMIC LOAD RATING)	kN	24.44	31.87	28.06	43.58	45.42	39.95	43.58	45.42
	lbf	*5,452*	*7,110*	*6,260*	*9,723*	*10,133*	*8,913*	*9,723*	*10,133*
BACK DRIVE FORCE	N	436	347	173	405	205	507	405	205
	lbf	*98*	*78*	*39*	*91*	*46*	*114*	*91*	*46*
WEIGHT*	kg	7.80	7.80	7.80	11.25	11.25	12.29	12.29	12.29
	lbf	*17.2*	*17.2*	*17.2*	*24.8*	*24.8*	*27.1*	*27.1*	*27.1*
STROKE	mm	150	150	150	150	150	150	150	150
	in	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
BASE INERTIA	kg-cm^2	4.8997	4.8997	4.8997	9.7864	9.7864	9.7864	9.7864	9.7864
	lb-in	*1.6723*	*1.6723*	*1.6723*	*3.3442*	*3.3442*	*3.3442*	*3.3442*	*3.3442*
AMBIENT TEMP ** RANGE	°C	0 to 50							
	°F	*32 to 122*							
IP RATING	Standard IP65 (static)								
AGENCY LISTINGS	CE								

*Weight varies per feedback device or mounting option. See table below for details.
**From 0-10°C (32-50°F), additional startup procedure may be required for optimal performance. See user manual for details.
§NOTE: Screw/Lead Accuracy: 0.023 mm/300 mm; 0.0009 in/ft

Table 2:

		Weight Adder						
		Water Cooling	Rear Trunnion	FEEDBACK OPTION				
				F1	F2	A1	K1***	W1
SW_3	kg	0.36	0.10	-	0.77	0.59	1.27	1.03
	lb	*0.80*	*0.22*	-	*1.70*	*1.30*	*2.80*	*2.26*
SW_4	kg	0.52	0.24	-	0.48	0.64	1.34	0.72
	lb	*1.15*	*0.52*	-	*1.05*	*1.41*	*2.96*	*1.59*

***Weight adder for K1 option includes weight of brake

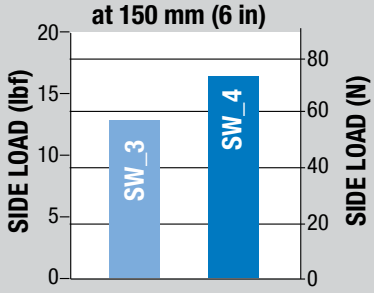
Table 3:
Motor Specifications:

SERIES			SW_3		SW_4			
MOTOR WINDING			A3	B3	A2	B2	A3	B3
TORQUE CONSTANT (K_t)		N-m/A Peak	0.62	1.21	0.52	0.90	0.61	1.20
		in-lb/A Peak	*5.5*	*10.7*	*4.6*	*8.0*	*5.4*	*10.6*
VOLTAGE CONSTANT (K_e)		V/Krpm Peak	79.8	154	66.1	107.2	78.1	153.1
CONTINUOUS STALL TORQUE	No Water Cooling	N-m	4.4	4.3	5.5	4.9	8.4	8.5
		in-lb	*39*	*38*	*48.8*	*43.0*	*74*	*75*
	With Water Cooling	N-m	8.8	8.6	11.0	9.8	16.8	17.0
		in-lb	*78*	*76*	*97.6*	*86*	*148*	*150*
CONTINUOUS STALL CURRENT	No Water Cooling	A_{RMS}	5	2.5	7.5	3.8	9.7	5.0
	With Water Cooling	A_{RMS}	10.0	5.0	15.0	7.6	19.4	10.0
PEAK TORQUE		N-m	13.2	12.9	16.5	14.6	25.1	25.4
		in-lb	*117*	*114*	*146*	*129*	*222*	*225*
PEAK CURRENT		A_{RMS}	15	7.5	22.4	11.9	29.1	15.0
RESISTANCE		Ohms	2.07	8.3	0.9	4.2	0.58	2.32
INDUCTANCE		mH	3.8	15	3.65	15.7	2.75	11.5
NO. OF POLES			8					
BUS VOLTAGE		V_{RMS}	230	460	230	460	230	460
SPEED @ RATED V		RPM	3,500					

SIDE LOADING

Some weld gun designs may subject the actuator to excessive side loading reducing overall service life. Measures are required, especially in "C" style designs, to limit side loading. For life optimization Tolomatic recommends side loads of less than 5% of axial load (thrust rod output force) for all roller screw configurations.

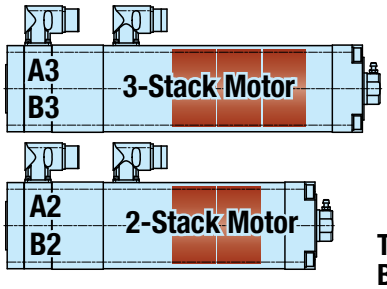
SW_ SIDE LOAD SPECIFICATIONS
at 150 mm (6 in)



MOTOR WINDING

A3 B3 = 3 Stack Motor

A2 B2 = 2 Stack Motor

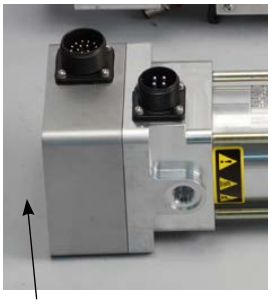


BRAKE CONSIDERATIONS

An un-powered SW will require a brake to maintain its position if the force on the actuator exceeds Back Drive Force listed in Table 1.

A brake can be used with the actuator to keep it from backdriving, typically in vertical applications. A brake may be used for safety reasons or for energy savings allowing the actuator to hold position when un-powered.

NOTE: The optional Spring-Applied / Electronically-Released Brake requires 24V power.



Brake will increase actuator length and weight, see Table 2 (K1).

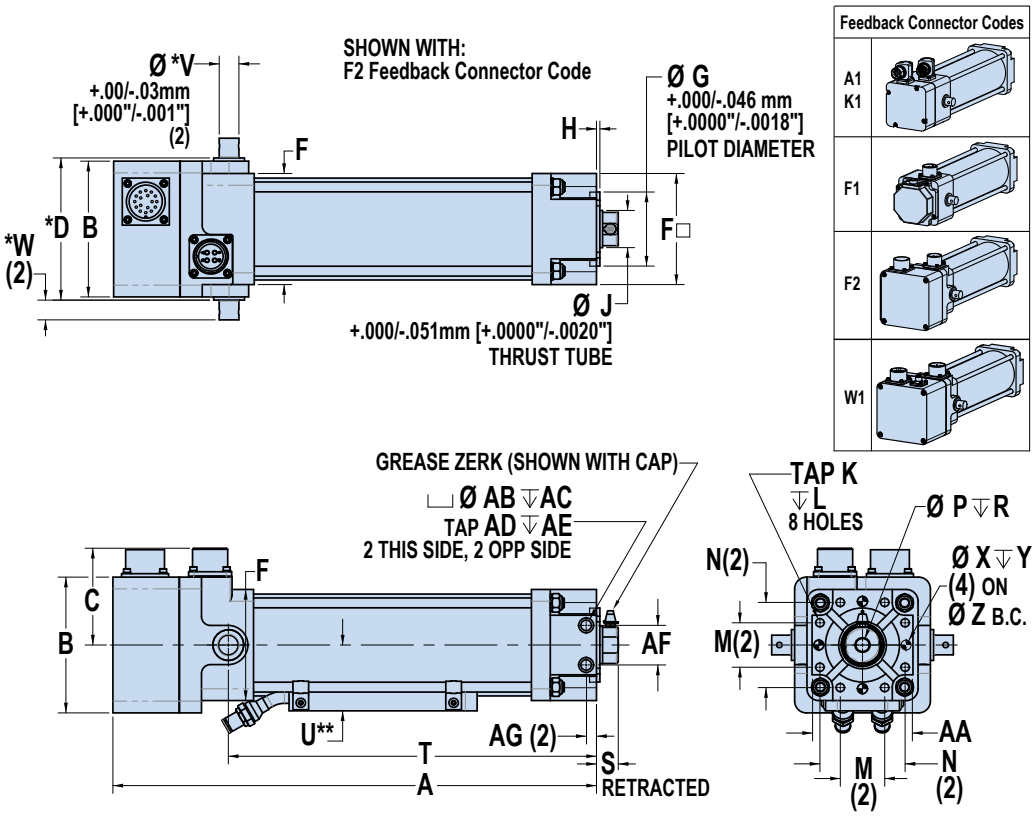
Table 4:
Brake Specifications:

	SERIES	SW_3	SW_4
ROTOR INERTIA	gm-cm²	73	239
	oz-in²	*0.112*	*0.656*
CURRENT	Amp	0.43	0.67
HOLDING TORQUE	N-m	4.0	9.0
	in-lb	*35*	*89*
ENGAGE TIME	mSec	40	25
DISENGAGE TIME	mSec	50	35
VOLTAGE	Vdc	24	24

SWA & SWB Dimensions

3D CAD available from Tolomatic
Always use configurated CAD solid model to determine critical dimensions

Table 5: Dimensions



Feedback		SW_3 A1	SW_3 F1	SW_3 F2	SW_3 K1	SW_3 W1	SW_4 A1	SW_4 F1	SW_4 F2	SW_4 K1	SW_4 W1
A	mm	350.5	343.9	366.5	377.7	366.5	402.9	395.4	418.0	422.2	366.5
	in	*13.80*	*13.54*	*14.43*	*14.87*	*14.43*	*15.86*	*15.57*	*16.46*	*16.62*	*14.43*
B	mm	90.0	90.0	110.0	90.0	110.0	110.0	90.0	110.0	110.0	110.0
	in	*3.54*	*3.54*	*4.33*	*3.54*	*4.33*	*4.33*	*3.54*	*4.33*	*4.33*	*4.33*
C	mm	84.1	68.4	78.4	86.4	78.4	94.1	78.4	78.4	96.4	78.4
	in	*3.31*	*2.69*	*3.09*	*3.40*	*3.09*	*3.71*	*3.09*	*3.09*	*3.80*	*3.09*
D*	mm	95.2	95.2	115.2	95.2	115.2	123.0	123.0	123.0	123.0	115.2
	in	*3.75*	*3.75*	*4.54*	*3.75*	*4.54*	*4.84*	*4.84*	*4.84*	*4.84*	*4.54*
Feedback Connector Code/Type		A1 SWIVEL	F1 BOX	F2 BOX	K1 SWIVEL	W1 BOX	A1 SWIVEL	F1 BOX	F2 BOX	K1 SWIVEL	W1 BOX

**for Trunnion Option*

		SW_3	SW_4
F	mm	90.0	110.0
	in	*3.54*	*4.33*
G	mm	60.000	64.500
	in	*2.3622*	*2.5394*
H	mm	*2.8*	*3.4*
	in	*0.11*	*0.13*
J	mm	*30.135*	*34.926*
	in	*1.1864*	*1.3750*
K		M8 x 1.25	M8 x 1.25
L	mm	16.0	16.0
	in	*0.63*	*0.63*
M	mm	36.0	55.0
	in	*1.42*	*2.17*
N	N	69.0	85.0
	in	*2.72*	*3.35*
P		M12 x 1.25	M20 x 1.5
R	mm	22.2	25.9
	in	*0.88*	*1.02*
S	mm	17.6	19.1
	in	*0.69*	*0.75*
T	mm	273.0	321.0
	in	*10.75*	*12.64*
U**	mm	53.3	66.7
	in	*2.10*	*2.63*
V*	mm	15.98	20.0
	in	*0.629*	*0.787*
W*	mm	16.0	20.1
	in	*0.63*	*0.79*
X	mm	–	8.052/8.026
	in	–	*0.3170/0.3160*
Y	mm	–	12.7
	in	–	*0.50*
Z	mm	–	85.00
	in	–	*3.346*
AA	mm	–	94.01/93.95
	in	–	*3.701/3.699*
AB	mm	–	12.09/12.04
	in	–	*0.476/0.474*
AC	mm	–	6.00
	in	–	*0.236*
AD		–	M10 x 1.5
AE	mm	–	16.00
	in	–	*0.630*
AF	mm	–	50.00
	in	–	*1.969*
AG	mm	–	15.00
	in	–	*0.591*

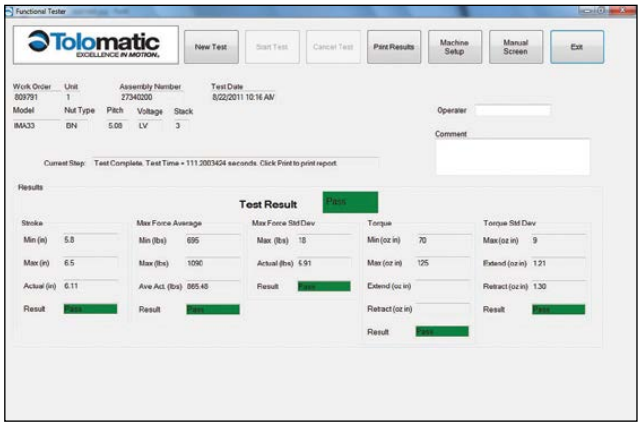
**for Trunnion Option*
***for Water Cooling Option*

Complete Verification Testing is Performed on Every Actuator

Properly applied, every ServoWeld actuator shipped is guaranteed for millions of cycles of maintenance free or minimal maintenance performance.

We verify the performance of each individual unit before delivery to ensure they conform to Tolomatic's high standard of performance.

Functional unit testing for hundreds of cycles quantifies stroke, length, torque under no load, input current vs force standard deviation.



Testing parameter results in progress for the Functional Test procedure.

Final system test ensures the feedback device is properly aligned with the ServoWeld motor poles.

1. High POT (High Potential/High Voltage Test)
This standard electric motor test procedure is a 3-part test that checks the insulation system of the assembly to verify proper armature and thermal wire insulation.

2. Electronic phasing of ServoWeld® and feedback device (Encoder, Resolver, Feedback Device)
Using a fixed current and a specially designed fixture the feedback device is physically and electronically aligned relative to the phasing of the ServoWeld motor.

3. Functional Testing
Performed with Tolomatic motion control components and dedicated data acquisition equipment. Operated for hundred of cycles, this test quantifies these parameters - stroke length, torque under no load, input current vs force average, input current vs force standard deviation - using an electronic load cell in conjunction with data acquisition equipment.

4. Tolomatic System Test
Using a single-axis control unit the test ensures that the feedback device is properly aligned with the poles of the ServoWeld motor.

ServoWeld Application Guidelines

SIDE LOADING: Some weld gun designs may subject the actuator to excessive side loading, reducing overall service life. The GSWA33, GUIDED actuator will accommodate side loading. For other ServoWeld configurations, measures are required, especially in "C" style designs, to limit side loading. For life optimization Tolomatic recommends side loads of less than 5% of axial load (thrust rod output force) for all roller screw configurations and less than 1% of axial load for all ball screw configurations.

For maximum service life, external guiding is recommended to minimize side loading to the thrust rod and provide consist weld gun movable tip/fixed tip alignment throughout service life.

THRUST ROD WIPER/SCRAPER: The thrust rod wiper/scraper assembly is field replaceable. For maximum service life, measures should be taken to reduce/eliminate contamination, weld slag, and water in the thrust rod wiper/scraper interface area. Implementation of industrial thrust rod boot and/or deflective device can be effectively utilized in this area.

CABLES: Shielded power & feedback cables are recommended to minimize electrical noise/grounding issues. Electrical noise or inadequate grounding can corrupt the feedback device signal.

RSW SERVO SYSTEM CALIBRATION: RSW weld gun servo system consists of robot 7th axis amplifier, robot feedback device, robot RSW software, weld gun chassis, & ServoWeld.

For optimal RSW weld gun servo system performance the calibration process should include maximum weld tip force from the production weld schedule, tip dress force, and multiple weld tip forces in-between. Utilizing all the available robot manufacturer force table inputs will provide best RSW weld gun servo system performance. The same weld tip part contact speed should be used for both RSW weld gun servo system calibration and production weld schedule.

WELD TIP/PART CONTACT SPEED: Tolomatic testing confirms the highest ServoWeld repeatability (**INPUT CURRENT** verses **OUTPUT FORCE**) at a weld tip part contact speed of 25mm/second or less. Speeds greater than 25mm/second can create "impact contribution" to the weld force. This impact contribution to the weld force deteriorates prior to completion of the weld cycle.

ROBOT CARRIED APPLICATIONS: Robot carried RSW gun applications have reduced exposure to water pooling/water ingression by virtue of the continuous robot movement and various RSW gun positions. In addition, in robot carried applications positioning of the RSW gun can be programmed as part of the weld cap change program/routine to eliminate ServoWeld exposure to water. (ServoWeld above weld caps)

ROBOT MANUFACTURER SERVO FILE: Robot manufacturer servo parameter files for operation of ServoWeld are available only from the robot manufacturer. Each robot manufacturer creates 3rd party motor servo parameter files, validates operation of ServoWeld via their 7th axis, and maintains servo motor parameter file for operation of ServoWeld.

TOOL CHANGER APPLICATIONS: Weld gun storage fixture in cell should position weld gun so movable electrode is not loading ServoWeld thrust rod - back driving the ServoWeld. Weld gun tips should be positioned to weld gun closed at low force prior to disconnect from robot/tool changer. Consider ServoWeld configured with integral brake option.

FIXED/PEDESTAL APPLICATIONS: One of the more challenging RSW applications is a pedestal RSW gun, ServoWeld mounted vertical – thrust rod up. Measures should be taken to reduce and/or eliminate the ServoWeld to water exposure, water pooling/spray in the access areas of the ServoWeld unit to maximize overall service life.

- Pedestal RSW guns that can be mounted with the ServoWeld vertical – thrust rod down should be considered.
- Pedestal RSW guns that must be mounted with the ServoWeld vertical – thrust rod up should be mounted at an angle of a least 10 – 15° to minimize water pooling.
- Water channels on interfacing mounting components of the ServoWeld/RSW Gun to minimize water pooling
- Any RSW gun applications that are suspect for water exposure should utilize an external deflector (bib) or a thrust rod boot to keep the water away from the thrust rod wiper/scraper interface area.
- Any RSW gun application that is suspect for water exposure should consider utilizing a manual shut-off valve in the water saver circuit at the RSW gun. Shutting off the water prior to weld cap change can significantly reduce water exposure issues in the RSW gun environment.
- Pedestal RSW gun applications should have the mating electrical connectors (90 degree) on the cable dress package facing down with the cable dress cables looped to reduce water ingression via the electrical connectors (power/feedback).
- Allow adequate cable length so the cables are not in tension.
- Molded mating electrical connectors on the cable dress package for pedestal RSW gun applications
- Confirming full engagement of the cable dress connector to the appropriate mating receptacle on ServoWeld.

ServoWeld SWA & SWB Integrated Motor Actutors

Ordering

MODEL SELECTION (MUST BE IN THIS ORDER)

SWA	4	A	1	A3	R1	B	1	A1	X	2	A

MODEL

SWA	ServoWeld Advanced
SWB	ServoWeld Base

SIZE

3	3 Series Actuator
4	4 Series Actuator

STROKE LENGTH

A	150mm (6") Stroke
X	Special

SCREW LEAD

Screw/Nut combinations available

Code	Screw	Description
1	**RN05**	Roller Nut, 5 mm lead
2	**RN10**	Roller Nut, 10 mm lead
3	**RN04**	Roller Nut, 4 mm lead

MOTOR VOLTAGE

A2	230 Vac, Motor Voltage, 2 Stack Winding
B2	460 Vac, Motor Voltage, 2 Stack Winding
A3	230 Vac, Motor Voltage, 3 Stack Winding
B3	460 Vac, Motor Voltage, 3 Stack Winding

FEEDBACK, CONNECTOR, WIRING

A1	ABB Resolver
C1	Comau Resolver
E1	Emerson CT Hiperface
F1	Fanuc a128
F2	Fanuc a64
K1	Kuka Resolver
M1	Motoman Absolute
N1	Nachi Absolute FD11 Series
R1	Rockwell Automation Hiperface
R2	Rockwell Automation Hiperface DSL
W1	Kawasaki Absolute E Series
XX	Special

FEEDBACK SUPPLIED BY:

A	Customer
B	Tolomatic

BRAKE OPTION

1	NO Brake
2	Brake

MOUNTING OPTIONS

A1	Front Face
T1	Rear Trunnion
XX	Special

ROD END OPTIONS

A	**Standard**, Metric female, threaded rod end
X	Special

WATER COOLING

1	NO Water Cooling
2	Water Cooling, Bottom, 8mm tube fitting
X	Special

SPECIAL OPTIONS

A	No Special Options
X	Special

Not all codes listed are compatible with all options.

Call Tolomatic 1-800-328-2174 to determine available options and accessories based on your application requirements.

CONSIDER TOLOMATIC FOR ALL YOUR MOTION CONTROL NEEDS

The Tolomatic Difference Expect More From the Industry Leader:

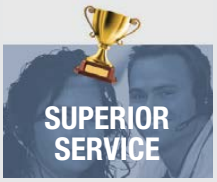
Tolomatic designs and builds the best standard products, modified products & unique custom products for your challenging applications.

The fastest delivery of catalog products... Electric products are built-to-order in 15 days; Pneumatic & Power Transmission products in 5 days.

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

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

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



Our people make the difference! Expect prompt, courteous replies to all of your application and product questions.

Other Tolomatic Products:

Electric Products

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"Foldout" Brochure #9900-9074

Pneumatic Products

Rodless Cylinders: Band Cylinders, Cable Cylinders, Magnetically Coupled Cylinders/Slides; Guided Rod Cylinder Slides

"Foldout" Brochure #9900-9075

Power Transmission Products

Gearboxes: Float-A-Shaft®, Slide-Rite®; Disc Cone Clutch; Caliper Disc Brakes

"Foldout" Brochure #9900-9076

Tolomatic
EXCELLENCE IN MOTION®

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV GL = ISO 9001 =

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