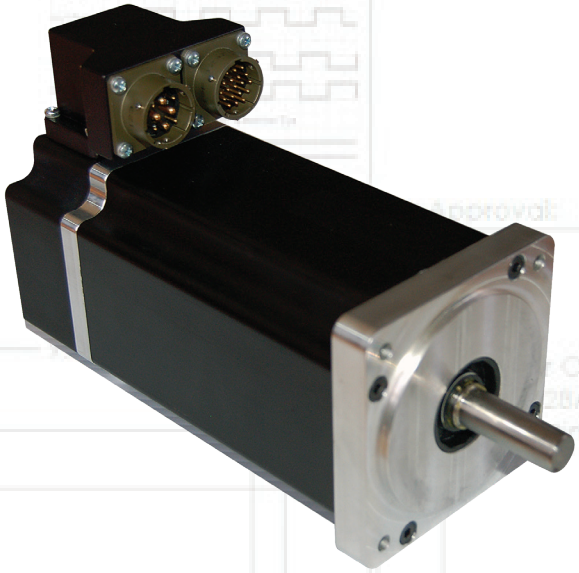
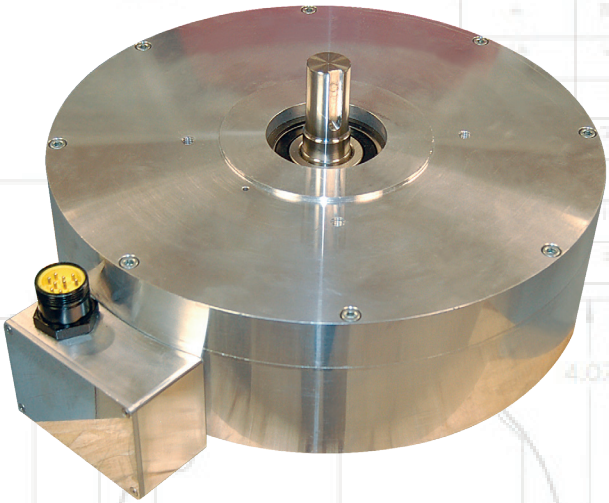
OPTIMIZING
Servo Motors & Systems





TruTech
Servo Motors & Systems

Our Background

TruTech Servo Motors & Systems was founded in 2010 by individuals with over 50 years of combined experience. Having seen many potential Permanent Magnet Servo Motor (PMSM) projects overlooked or unfulfilled, the foundation of our company was built upon delivering unique solutions for motors and motor systems with complex specifications fully implemented. Specialized constructions can include basic NEMA ICS 16 components, standard frame sizes with pre-specified shaft and mount dimensioning, delivered within one week to new/unique designs with prototypes tested within 6-8 weeks. With complete engineering, prototyping and manufacturing/production facilities, TruTech is ready to be *your* servo motor systems provider.

THE PROBLEM

Compromises – OEM's, integrators and builders of various machines often accept existing or cataloged servo motors. Being available, in reality, leads to solutions that are overpriced, oversized, under supported on equipment where the end design of the machine needed to adapt accordingly. A more-costly pursuit than you might normally realize.

THE SOLUTION

Results – TruTech's Optimization Process provides customers with what they need. As an extension of your engineering team, we look at the entire system. Whether using basic components with client specific windings or designing completely new motors, we strive to meet your specifications at a cost target that delivers best performance solutions.

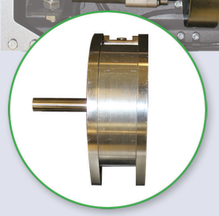
Our Optimization Process

From basic to complex, you will never be compromised.

Design implementation is a process by which TruTech delivers performance at a reasonable cost. When we understand your basic needs and system requirements, a baseline is established with the addition of only those needed end goal aspects. This process has proven time and again; mitigating any trade-offs of cost and performance plus includes best manufacturing processes.

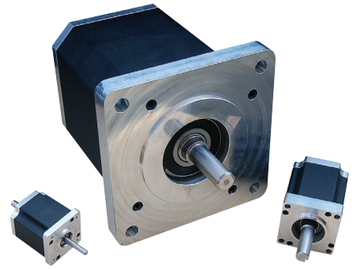
The evolution of an optimized servo motor design offers lowest cost regardless of whether it's all reliable NEMA ICS 16 stocked components or a completely customized design specifically made to your exacting requirements.

OEM design originally included catalog motor with adapted mounting and added flywheel.

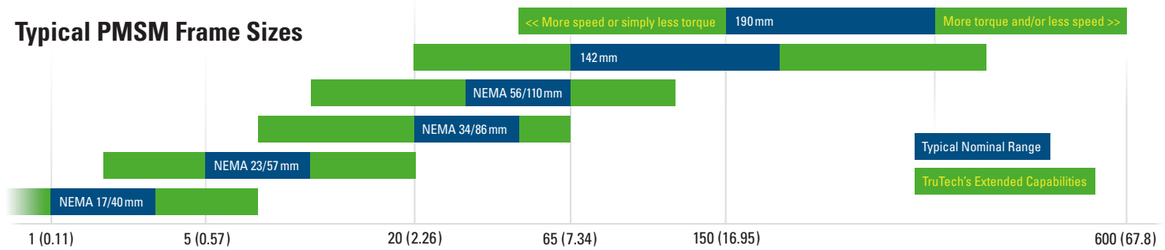


Replaced by completely new motor design with less components, made to be more compact and lighter weight overall, with better kinematic performance... at far less cost!

Our Permanent Magnet Servo Motor (PMSM) Solutions Meet or Exceed Catalog Products



- Wide voltage range including low voltage options (10-80+VDC) with high currents
- Stocked components to NEMA ICS 16 dimensions along with IEC 142mm and 190mm metric sizes
- Continuous torques from 1.2-600 lb-in available for rapid prototyping
- Standard 416sst shafts, sleeved rotors
- Client specified Kt and Ke to torque and speed specifications
- Performance optimized



Our Permanent Magnet Servo Motors (PMSM) start with motor components designed around popular NEMA ICS 16 standards coupled with windings to meet standard applications at low costs and short lead-times.

These motors are used for quick turnaround and rapid prototyping as components are available off-the-shelf.

CONTINOUS TORQUE AT RATED SPEED AND SUPPLY VOLTAGE, LB.-IN. (Nm)

Motor Model	Typ Voltage Range (VDC)	Max Mechanical Speed (RPM)	Stall Torque (lbf-in)	Peak Torque (lbf-in)	Max Continuous Power** (W)	Rotor Inertia (lbf-in-sec²)	Max Winding Temp (°C)	Weight (lbs)
MT040, 8 POLE								
MT040-1	12-170	6000	1.52	5.3	100	2.00E-05	145	0.75
MT040-2			2.12	7.4	141	5.00E-05		0.9
MT040-3			2.72	9.5	182	7.00E-05		1.05
MT040-4			3.15	11	211	9.00E-05		1.2
MT040-5			3.58	12.5	240	1.10E-04		1.35
MT057, 8 POLE								
MT057-1	12-325	6000	4.5	15	310	1.30E.04	145	2.2
MT057-2			9	30	625	2.50E.04		3.1
MT057-3			13	45	906	3.60E.04		4
MT057-4			17	60	1186	4.90E.04		5
MT086, 8 POLE								
MT086-1	12-325	6000	16	60	1079	8.60E.04	145	7
MT086-2			32	120	2191	1.71E.04		10
MT086-3			47	180	3232	2.57E.04		13
MT086-4			62	240	4272	3.43E.04		16
MT110, 8 POLE								
MT110-1	12-325	4000	32.5	120	1485	3.06E.04	145	14
MT110-2	24-325		65	240	3023	6.12E.04		18
MT110-3			97	360	4538	9.18E.04		22
MT110-4			128	480	6005	1.22E.04		26
MT142, 8 POLE								
MT142-1	12-325	4000	65	215	2941	5.11E.03	145	17
MT142-2			130	430	5985	9.77E.03		22.5
MT142-3	24*-325		195	645	9025	1.44E.02		28
MT142-4			260	860	12068	1.91E.02		33.5
MT142-5			325	1075	15112	2.37E.02		39
MT142-6			390	1290	18155	2.84E.02		44.5
MT190, 10 POLE								
MT190-1	24*-325	4000	150	375	6862	2.83E.02	145	32
MT190-2			300	750	13909	5.15E.02		42
MT190-3			450	1125	20957	7.46E.02		51.9
MT190-4			600	1500	28004	9.77E.02		61.9

*DUE TO LOW INDUCTANCE MAY BE DIFFICULT TO DRIVE **POWER CALCULATED AT MAX MECHANICAL SPEED **AND** RATED TORQUE

Our Custom-Driven Solutions Provide an Ultimate Level of Performance

During our more advanced design process, we optimize all aspects of motion to assure the machinery or equipment will operate at its maximum performance; allowing most, if not all, motor design parameters – performance, sizing, output mounting, functional components, environmental considerations – to be altered and tailored to the exact requirements of the machine.

Simply stated…

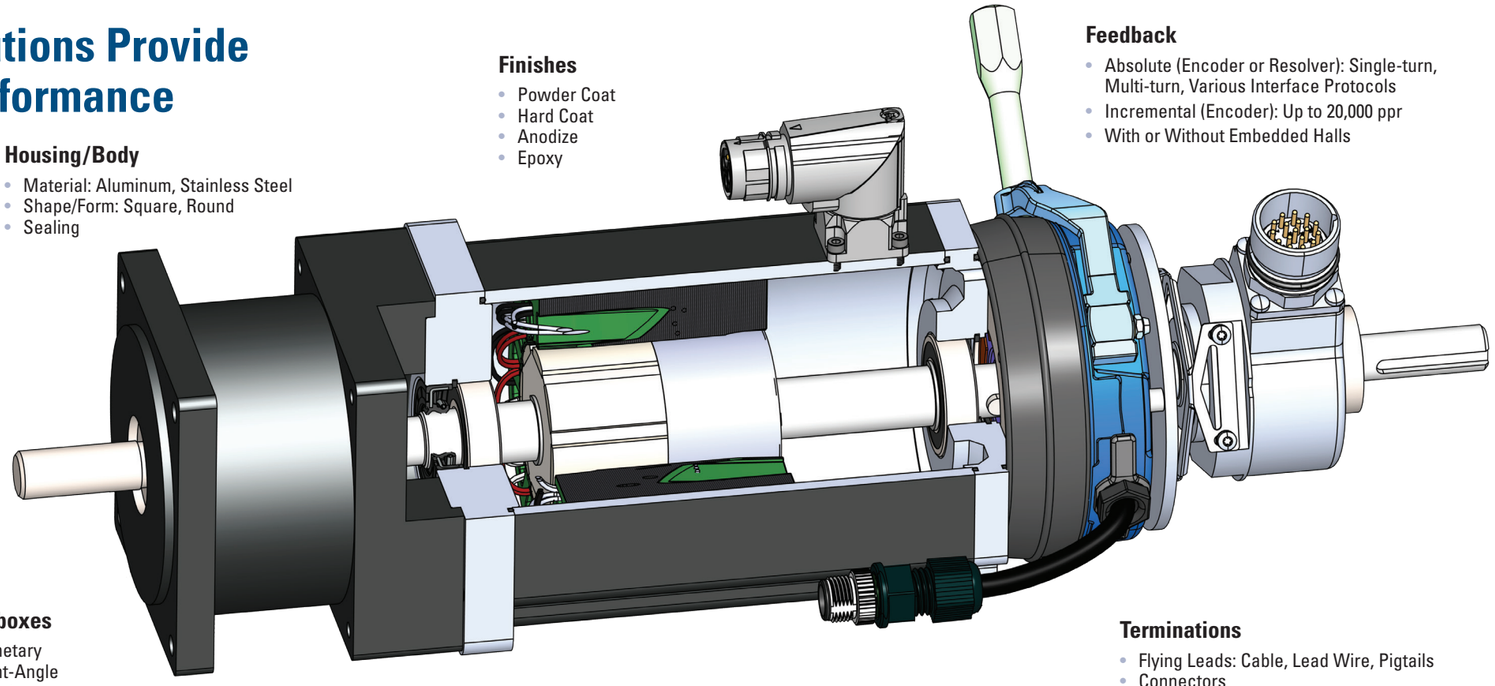
You need it.
We make it.

Housing/Body
- Material: Aluminum, Stainless Steel
- Shape/Form: Square, Round
- Sealing

Finishes
- Powder Coat
- Hard Coat
- Anodize
- Epoxy

Feedback
- Absolute (Encoder or Resolver): Single-turn, Multi-turn, Various Interface Protocols
- Incremental (Encoder): Up to 20,000 ppr
- With or Without Embedded Halls

Shafts
- Keyway
- Round
- Flats
- Spline

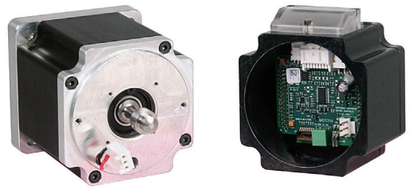


Gearboxes
- Planetary
- Right-Angle
- Offset

Motor Characteristics
- Operation Optimized: Pole Count, Skewed Alignment of Stator and/or Rotor (Windings and/or Magnets)
- Winding Optimized: Speed, Torque, Voltage, Current
- Inertia Optimized

Brakes
- Holding
- Dynamic

Terminations
- Flying Leads: Cable, Lead Wire, Pigtails
- Connectors
- MS
- TE



Complete servo motor assemblies can include the entire motion control system. The separated housing details both the motor, with end shaft magnet, and complete electronics sections. The compact end assembly houses the encoder, servo drive with internal motion control, external I/O and digital network communications for standalone capability and operation (courtesy of ADVANCED Motion Controls).

PMSM System Considerations and Design Criteria

When considering a PMSM as a part of the entire machine design, most motor design parameters are alterable and can be tailored to the requirements as desired. A systematic and considerations process approach can overcome most limitations and deliver a best possible solution. End results can quickly be prototyped, and production units made readily available.

SPEED
The applied voltage to a motor is directly proportional to motor speed. Where higher or lower speeds are required, applied motor voltage may limit desired outcome. However, stator windings can easily be made to specifications that allow for increased or decreased speeds given the voltage requirement, with consideration for torque. This factor is called K_e and given in Volts/krpm and can have a wide range of possibilities.

TORQUE
Available current to a motor is directly proportional to motor torque. Where increased or decreased torque is needed, available current may not always be in line. As well with speed, the stator winding specification can easily be made to increase the torque for lowered available current, with consideration for speed. This factor is called K_t and given in Nm/Amp. Another option to increase torque, where plenty of current is available and overall length is not an issue, is to add to the stator length and/or number of stacks while retaining the frame size.

VOLTAGE
The nominal or expected voltage sourced to the motor will determine the speed (see above). The windings in the motor are produced knowing that applied voltage. Since power electronics are in the system, i.e. servo drives, the resulting voltage the motor observes is considered DC, whether the power to the electronics is connected to a DC source or rectified DC from an AC line. Motor windings can therefore explicitly be specified for any voltage, including 10-80+ VDC for low voltage needs, typical: 90, 120, 240, 480, 525 VACs line sources or higher. Knowing supply voltage is critical to any application success.

INERTIA
The overall design of the rotor results in the angular mass and determines needed torque while accommodating targeted acceleration/deceleration aspects. Considering in advance all aspects of design and materials, load inertia matching can be key specifications to a given application. Mismatches in inertia can be of large concern given overall momentum of the load.

FRAME SIZE
Sizing is typically predicated by the torque requirements. As standards are always available, so too come with them the general constraints of housing sizes. When defining specifications to any given application, these can readily be opened for 'best fit' considerations while not having to follow any 'standard' as desired for operation. As well, frame-less motors allow for stators to become a part of the machine frame itself and are increasingly popular while driving down overall costs/size.

IP RATING
Ingress Protection ratings afford the application proper sealed motor enclosures as required. Increased protection comes with vastly improved sealing, and with multiple methods, for both the housing portions and bearings where required.

MOUNTING
Again, standards are readily available but can also be expanded where additional requirements may be desired. Not having to follow a pre-determined mechanical interface allows for increased options.

SHAFT
Typically, these are stainless steel with available standards defining potential interface to the motor. However, multiple alterations of material and configuration can be specified as deemed necessary by the developer/application. This ranges widely and includes specifics for diameter differences, shape variations, keying, etc.

HOUSING MATERIAL
With housings typically made from aluminum, or powder coated external laminations, and the fact that they can see differing environmental conditions, dictates reviewing all types of variations to match application needs. Metals and coatings can be specified as required to match expected use.

WIRING / CONNECTION
Multiple variations for termination of wiring to the motor can be made. Available components can readily be applied or, specifying both wire and connector types, can easily be adapted.

GEARBOX / ACTUATOR
As the motor itself becomes part of a larger assembly, incorporating other mechanical aspects such as gearing or actuation, the new 'system' can be made to stand alone. This further reduces size and unit costs to be inclusive as an 'all-in-one' component.

BRAKE
As another optional component to ensure proper application solution, adding brakes to a motor can easily be achieved where necessary and included as part of the motor system.

FEEDBACK
Many market encoding devices are available and can be specified as required for the application. Usually rear mounted, this portion of the rotor's shaft can be altered as needed and the end cap of the motor modified to fit overall motor design.

ELECTRONICS: DRIVES / NETWORKS
Incorporating the drives power electronics and digital network is another trend in servo motor technology. This further reduces not only the number of machine components overall but also the complexity of the wiring. In the age of Industry 4.0, the ability to incorporate intelligent electronics in the motor is here to stay.

AGV/AGC

PMSM powered wheels available from 6” to 22”. Inner or outer rotational designs low voltage, high torque requirements as required.

Recreation

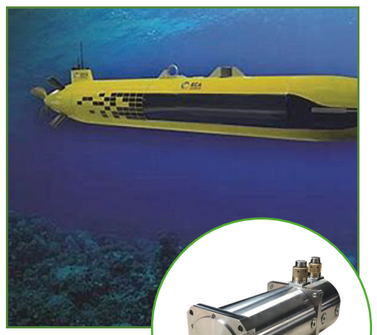
Saltwater compatible PMSMs for marine underwater or surface use with IP68 rating. Hard coat anodizing with special hardware and sealing.

Food Grade

Completely sealed PMSMs designs for IP69K rated operations and wash-down environments available in stainless or epoxy coating.

Food Processing

IP67, 300mm (O.D.) hollow shaft, high voltage and torque, outer rotational PMSM.



Nautical

Deep sea motors
Deep sea PMSMs designed with fail-safe protections to depths of 300 meters. Can be manufactured in stainless or with hard coat anodization housings.

Military/ US Defense

Part sets in applications from drone propulsion, fuel pumps, cargo release mechanisms, anti-missile deployment. IP 68 seamless enclosure, stainless-steel housing PMSM with watertight cable entry glands and customer specified pitched screw shaft adapter for harsh environment compliance.

Wind Generation

Heavy duty industrialized tooling with low voltage PMSM requirements of 12, 24 and 48 VDC powered systems needed for the assembly of these generators.

Power Tools

Small frame, assembly tool arm integrated PMSM used in the manufacturing process for tightening fasteners.

Flight Simulator

Integrated PMSM servo drive system for use in six-axis hexapods providing simulated pitch, yaw and roll motions.

Pond Aeration

IP67, 330mm (O.D.) PMSM used in submersible water pumps optimized for delivering high torque at low speeds.

Fitness Equipment

This unique PMSM design provided a lower cost package with increased performance in a smaller overall system design. Our analysis and capabilities removed ancillary components, weight but also added feedback and smoother motion profiles.

SatComm

PMSM system achieves high-accuracy communications satellite position requirements with fault-compliant components alleviating any potential power failure events.

We work with you to design for Tru Success. Whether optimizing any basic motor or developing a new concept considered simple or complex, we understand the process needed to deliver to your requirements.

MISSION STATEMENT(S)

Integrity – Provide the customer with the best product for their application.

Our goal is to work with you to learn your objectives so we can deliver precisely what you need—whether it's one component or a complete system. Our dedicated TruTech team will meet your objectives by focusing on your needs to provide a solution; including prototypes through to high-volume production orders.

Responsiveness – Give representative and customer access to all personnel to provide timely consultation.

We have a highly competent and educated staff to meet our clients' engineering and production needs. We maintain high inventories for our basic products which can be modified on-site with our vast internal equipment and product verification systems.

Conscientious Workmanship – Best practices to ensure 100% customer satisfaction from design through manufacturing are always applied.

Visit us at **trutechmotors.com** today.

We are ready to get to know your system needs and collaborate with preferred manufacturers to meet your requirements and deliver part sets to complete systems; including motor, feedback, brake, gearbox and drive controller.

Tru SOLUTIONS
Tru SUCCESSES

TruTech
Servo Motors & Systems

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