PHASE
MOTION CONTROL

IoT ready

TWX

Compact BLDC Integrated
Servo eMotor
CanOpen/EtherCAT FieldBus

TWX

SUMMARY

Phase Motion Control is this:

1. *The aim of the Company is to **expand scientific knowledge** and to progress **technology** through **invention**, design and efficient production of **innovative devices** in the field of **cybernetics, motion control** and **energy conversion**, in the belief that the advance of science is as much **the driving force of humanity** as it is the only means of offering **the best future for all living beings**.*

1. *The Company aims to make a profit, because **profit guarantees growth, independence and freedom of choice**, all factors which contribute towards the pursuit of its aims. Any profit which requires non ethical methods or which does not work towards the aims of the Company will not be pursued*

2. *As **innovation** and **discovery** are exclusive to **individual creativity**, the Company considers its human capital at al-levels to be the key asset of the firm and places it at the center of its interests. Accordingly, the Company promotes and d**emands behavior which is ethical, just and open**, both internally and in its external relationships, in the belief that this is the only principle capable of guaranteeing the growth of any social group in the long term.*

30%

OF THE WORKFORCE IS DEDICATED TO R&D.
PHASE OPERATES AND CONTINUOUSLY DEVELOPS ITS OWN TECHNOLOGIES AND INTERNATIONAL PATENTS IN THE GENOA HQ.
INNOVATION AND R&D SEAMLESSLY INTEGRATE WITH AUTOMATED PRODUCTION AT THE NEW GENOA BLUE GATE PLANT.

TWX - INTEGRATED MOTION CONTROL REDEFINED

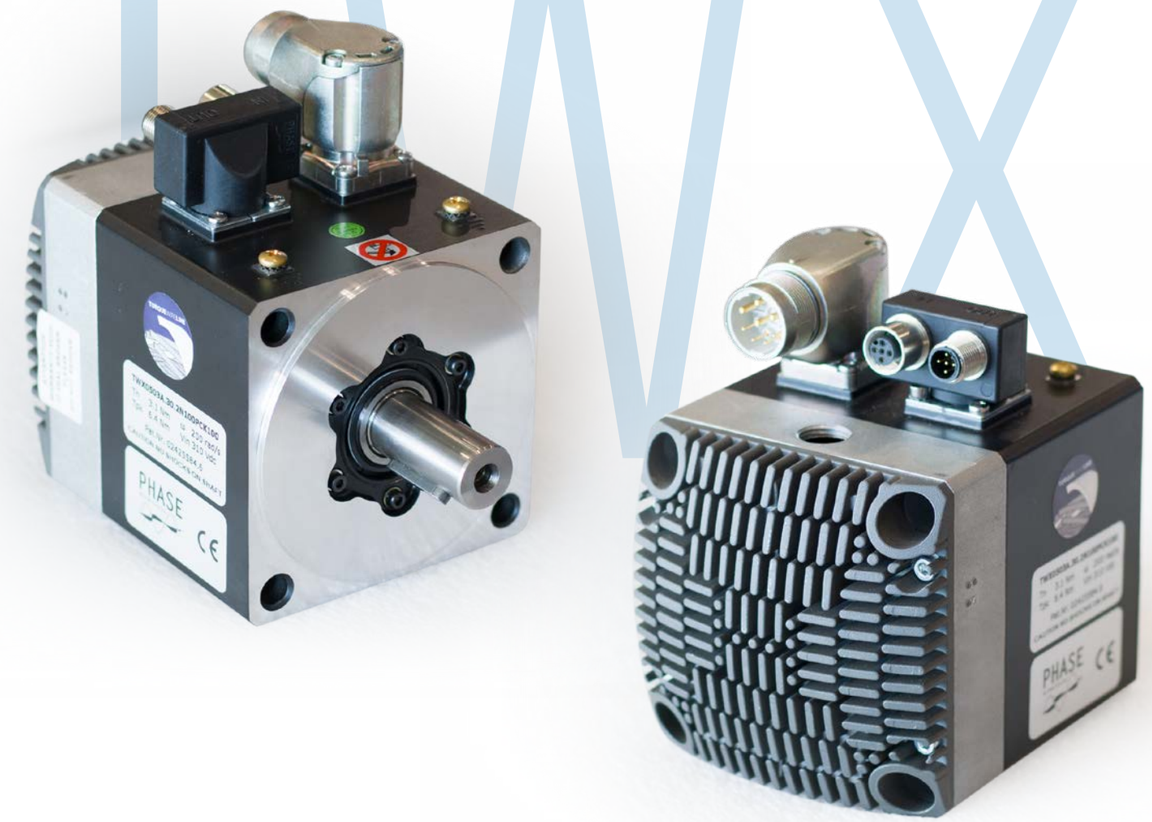
Phase Motion Control introduced the TWX series as a groundbreaking innovation in motion control technology. By integrating the drive, encoder, and motor into a single compact unit, the TWX eliminates the need for traditional cabinets and cabling, setting a new standard in simplicity and efficiency.

This advancement addresses critical challenges in industrial automation, reducing electromagnetic interference and increasing reliability in high-precision applications. The TWX design, free of electrolytic capacitors, ensures exceptional durability, even in demanding environments with high temperatures and vibration.

Building on decades of expertise in motor technology, the TWX represents the future of integrated solutions, offering unparalleled performance with speeds up to 4,000 RPM, nominal torques up to 6.4 Nm, and seamless compatibility with EtherCAT and CanOpen protocols. Phase Motion Control continues to lead innovation, empowering industries with robust, efficient, and cutting-edge solutions for modern automation challenges.

PHASE MOTION CONTROL S.P.A.
THE EXPERTISE CENTRE IN **POWER ELECTRONICS** AND **ENERGY CONTROL**

Phase Motion Control operates according to the Integrated Management System (IMS) for Quality, Health, Safety, and the Environment, certified by **TÜV SÜD** in 2022, based on **ISO 9001:2015**, **ISO 45001:2018**, and **ISO 14001:2015**.
Continuous innovation is fed by an interdisciplinary and intercompany team, spanning magnetics, mechanics, power electronics, advance electrochemistry and material science, both internally and via co-engineering with Customers, suppliers and partners, to define the moving frontier of energy technology.



APPLICATIONS

CNC AUTOMATION

COORDINATED MULTI-AXIS MACHINERY

CUTTING & FORMING

LASER PLOTTER/SCANNER

MEASURING & TEST

PRECISION INJECTION MOLDING

PLASTIC FLEXO PRINTING

TORQUEWIRE MOTORS

THE **FUTURE** OF **COMPACT**, **HIGH-PERFORMANCE MULTI-AXIS SOLUTIONS**

TorqueWire motors are complete, self-sufficient servo axis building blocks which allow the design, integration, and operation of large multi-axis systems with minimal hardware and surprising ease.

The TorqueWire motor system consists of an advanced, high-performance rare-earth brushless servo motor, a DSP-based high-voltage interpolating servo drive, and a single or multi-turn absolute encoder, all assembled in a very compact IP65-protected frame.

The motor systems are controlled via an EtherCAT or CANopen fieldbus, linking together groups of motors on a single bus system.

The motors are powered by a common DC bus, and braking energy from any drive is intrinsically recycled by any other axis on the network.

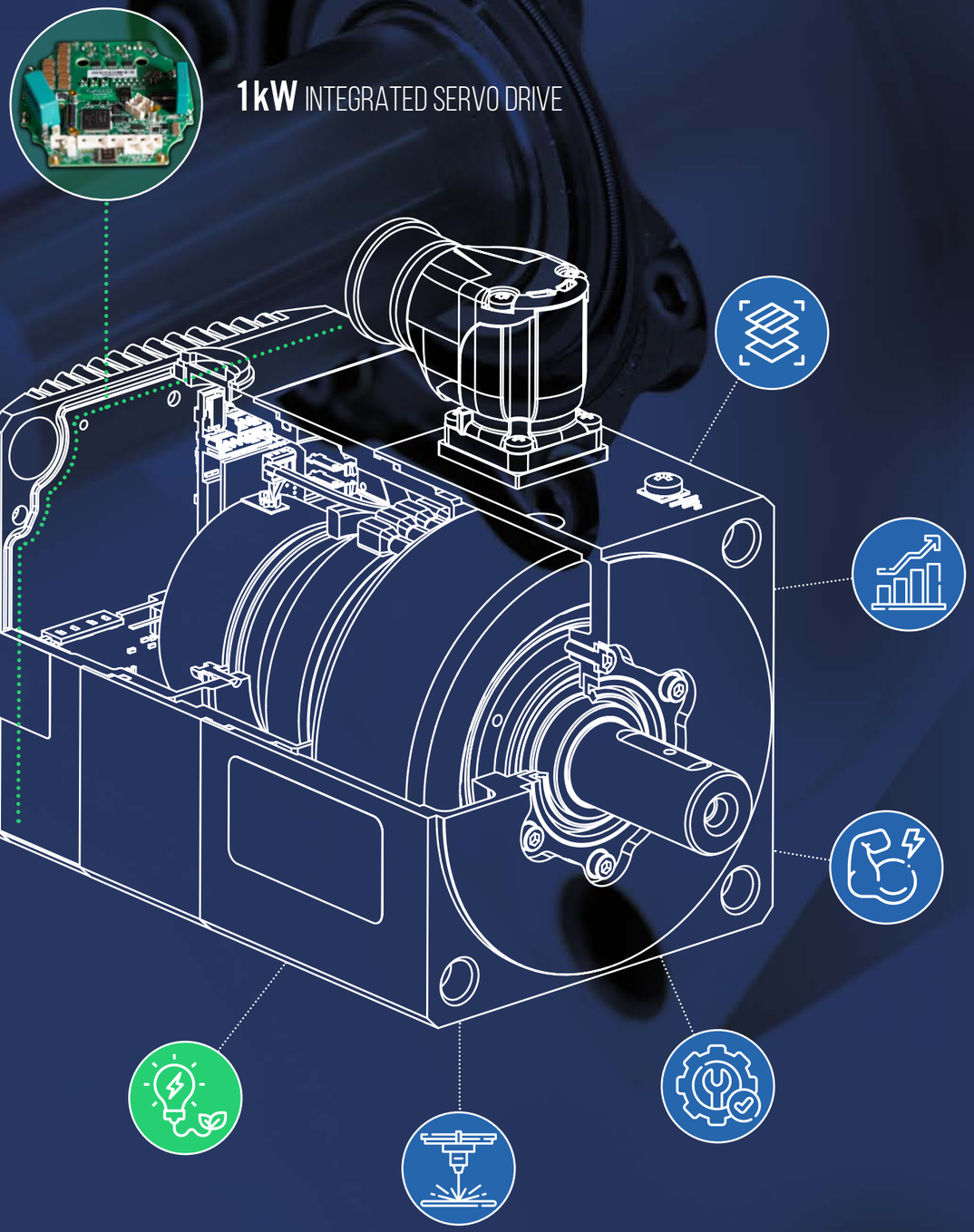
The performance of TorqueWire originates from the advanced design of both motor and drives.

The motor components benefit from a novel, highly optimized winding design, new magnetic materials, and a special winding technique, all of which result in a servo motor with about 60% of the size of a conventional servo design.

This advantage is utilized in both temperature rise derating and space for the drive, making TorqueWire motors, including the drive, smaller than comparable motors with a similar rating.

The TWX series is particularly innovative in its electromagnetic compatibility approach. As there are no cables between the drive and motor, nor between the sensor and drive, the system has a very low RFI emission signature and an equally reduced susceptibility to electromagnetic interference.

The drive is designed and validated for high-level vibration and a wide temperature range. The design is free from electrolytic capacitors, enabling long life even in extreme temperatures.



WHY TWX?

Key Advantages of TWX for Industrial Applications

- **COMPACT DESIGN AND INTEGRATION**
  Cabinet free servomotor with integrated drive and encoder.
  Eliminates the need for cables between motor and drive thanks to TorqueWire® technology.
- **HIGH RELIABILITY**
  No electrolytic capacitors, enhancing durability in high-temperature environments.
  Improved resistance to interference and reduced electromagnetic emissions.
- **VERSATILITY AND FLEXIBILITY**
  Compatible with EtherCAT and CanOpen communication protocols.
  Supports Canopen motion profiles (position, velocity, torque, interpolation).
- **HIGH PERFORMANCE**
  Speeds up to 4,000 RPM.
  Nominal torque ranging from 3.7 Nm to 6.4 Nm, suitable for power-demanding and precision applications.
- **EMC STANDARD COMPLIANCE**
  Low RFI signature, ensuring safe operation and compatibility with other electronic equipment.
- **EASE OF INSTALLATION**
  Fewer components and cabling requirements simplify integration into existing systems.
  Integrated USB port for quick, fieldbus free, PC commissioning.
- **DURABILITY AND LOW MAINTENANCE**
  Rugged design for demanding industrial environments.
  Reduced maintenance due to the absence of quickly wearing components.
- **COST OPTIMIZATION**
  Eliminates external components (drives and cables), lowering overall installation and management costs.
- **ECO-FRIENDLY SYSTEM**
  High efficiency contributes to reduced industrial energy consumption.
  Common DC Bus for Energy Sharing and Saving.
- **WIDE APPLICATION RANGE**
  Ideal for industrial automation, robotics, packaging, and other high-precision sectors.
- **STO SAFETY FUNCTION - SIL2 / SIL3 CERTIFIED**
  EN 61800-5-2:2007 EN 61508:2010 EN ISO 13849-1 EN ISO 13849-2

MAIN FEATURES

- Supply Voltage Range: 310 – 600 Vdc
- Rated Torque Range: 3.7 Nm – 6.4 Nm
- Type of cooling: natural convection
- Servo Integrated Drive
- Protection Class: IP 65
- USB PC Connection

SAFE TORQUE OFF

- STO Safety Function
  Class SIL2 / SIL3

FIELDBUS TYPE CHOICE

- EtherCAT (COE)
- CANOpen (DS301 DSP402)

FEEDBACK DEVICES

- Endat Heidenhain Absolute Encoder single or multi-turn
  180 arcsec accuracy
- Two pole resolver

TWX CONFIGURATOR

TWX SPECIFIC FUNCTIONS

- Aux digital input functions (quick-stop, touch-probe, homing)
- Rotary Table Control (with automatic best route)

3D CATALOGUE

STANDARDIZED MOTION PROFILES

TWX motors are compliant to International CiA DS301/DSP402, and more recent IEC 61800-7-201 motion control reference profiles. This leads to highest integration with existing or future fieldbus networks, software compatibility and routine reutilization.

TWX drives implement all the most common profiles available:

CIA DSP 402 MOTION PROFILES

- Profile position mode
- Profile velocity mode
- Profile torque mode
- Profile interpolated mode with linear trajectory generator
- Homing Mode

IEC MOTION PROFILES

- Cyclic Synchronous Position mode (CSP)
- Cyclic Synchronous Velocity mode (CSV)
- Cyclic Synchronous Torque mode (CST)

USB TYPE-C PORT FOR PC SET UP AND COMMISSIONING

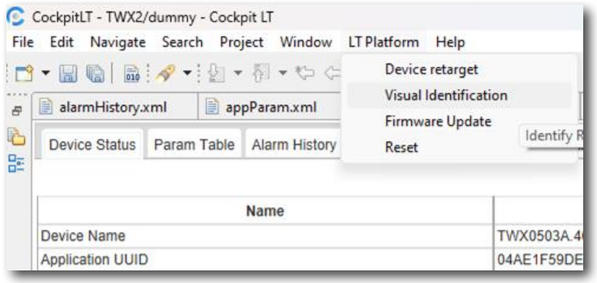
Type-C USB Plug & Play Port.

Easy and Real Time Set up, Test, Commissioning, Fault Check, Firmware Upgrade

- With Free Phase Motion Control CockpitLT PC tool
- Only USB connection. No DC bus required for set up
- Simultaneous connections to multiple Drives
- 1 click drive identification and Fieldbus Node setting

STATUS LED WITH DRIVE VISUAL IDENTIFICATION

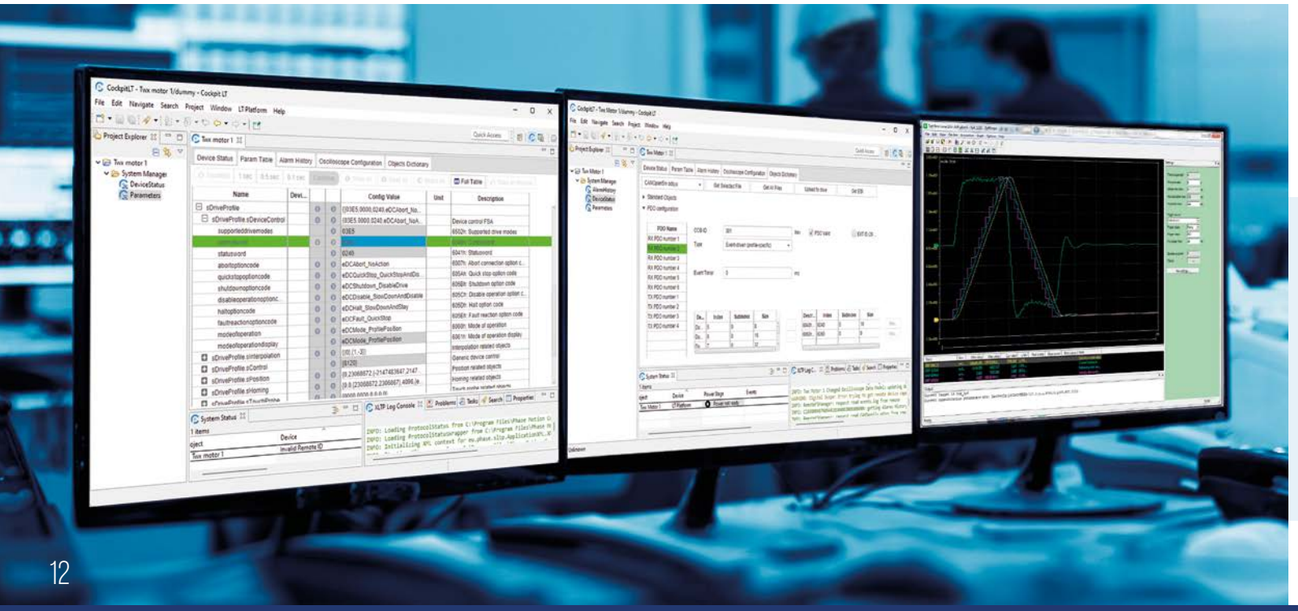
Leds on both side of eMotor for easy Drive and Fieldbus status, alarms and faults check “Visual identification” while using CockpitLT tool for easy identification of connected device.



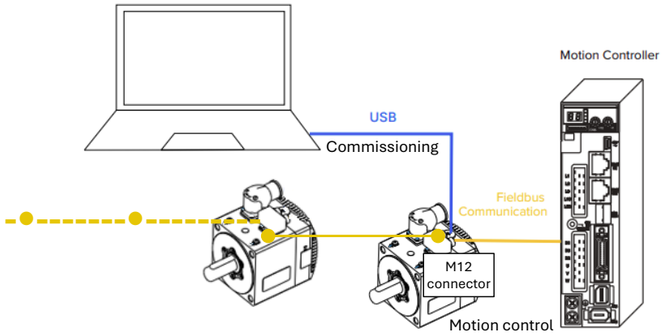
FREE CONFIGURING & COMMISSIONING TOOLS

CockpitLT Windows® PC Tool, specific for TWX series, integrate User Friendly interfaces for easy set up, maintenance, programming and tuning.

- Online data monitor and commissioning
- Structured view of projects and parameters
- Read/write eMotor data and Canopen objects
- FieldBus and Node configuration
- Alarm History and Oscilloscope
- 2nd order digital IIR filter



TWX POWER AND FIELDBUS CONNECTORS VIEW

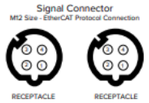


EtherCAT®
CANopen DS402

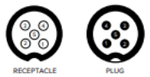
Power Connector
M23 Size - PLUG

Power Connector
M23 Size - PLUG

Signal Connector
M12 Size - EtherCAT Protocol Connection



Signal Connector
M12 Size - CAN Protocol Connection



Power connector
PHOENIX CONTACT 6pins SF-5EPIN8AAD00

Pin	Description
1	DC+
2	DC-
3	GND
4	Auxiliary input (+24V)
5	0V Supply
6	+24V Supply

Power connector
PHOENIX CONTACT 8pins SF-7EPIN8AAD00

Pin	Description
1	DC+
2	GND
3	DC -
4	0V Supply
A	+24V STO H Input
B	Auxiliary Input (+24 V)
C	+24V Supply
D	+24V STO L Input

Signal connectors
EtherCAT protocol (M12 Codification D)

Pin	Description
1	Tx+
2	Rx+
3	Tx-
4	Rx-

Signal connectors
CANOpen protocol (M12 Codification A)

Pin	Description
1	Shield
2	+ 24 V Supply
3	CAN GND / 0 V Supply
4	Can-H
5	Can-L

DC BUS POWER UNIT WITH BRAKING RESISTOR & BLUETOOTH

TWX requires 300/600 VOLTS DC BUS and braking resistor to properly work.

It is highly suggested to use Phase Motion Control **PX1 Series** Power Supply

- 220V-380V AC single or three phase Input
- Power on relay output (DCBus SYS ready signals)
- External DCBus capacitors charge capability
- Automatic DCBus capacitor discharge
- Dynamic braking (external resistor required)
- Desaturation protection of braking IGBT
- Over voltage, current and temperature protection
- Bluetooth Monitor
- Heat dissipation by a cooling fan

ENVIRONMENTAL CONDITIONS

AMBIENT TEMPERATURE -10°C TO 65°C
WORKING/STORAGE

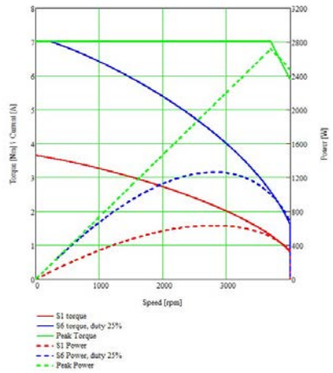
AMBIENT HUMIDITY 95% MAX
NO CONDENSATION

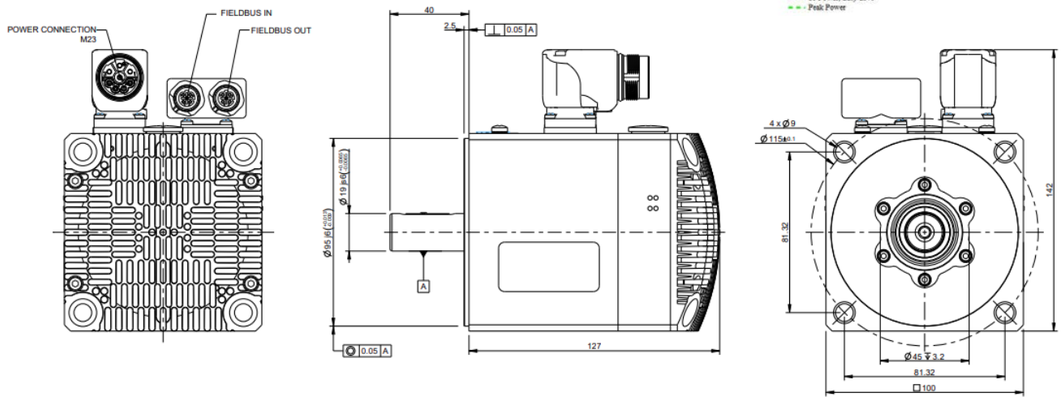
PROTECTION CLASS IP65
CONNECTED CONNECTORS, CLOSED USB

SHOCK LEVEL UP TO 5.G
STO VIBRATION LEVELS EN 60068-2-6: 2008

TWX 3NM VERSION

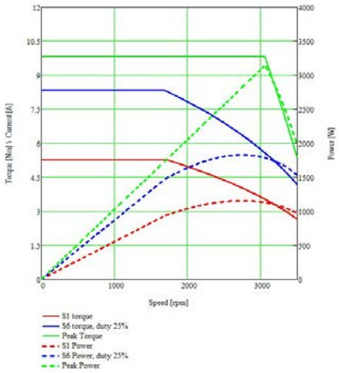
MODEL 3 NM - TWX 0503.A.40.4

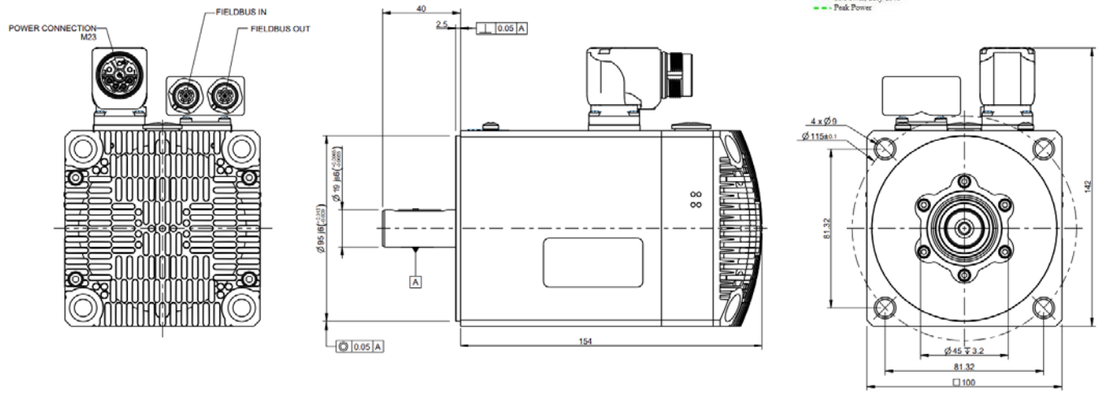




TWX 6 NM VERSION

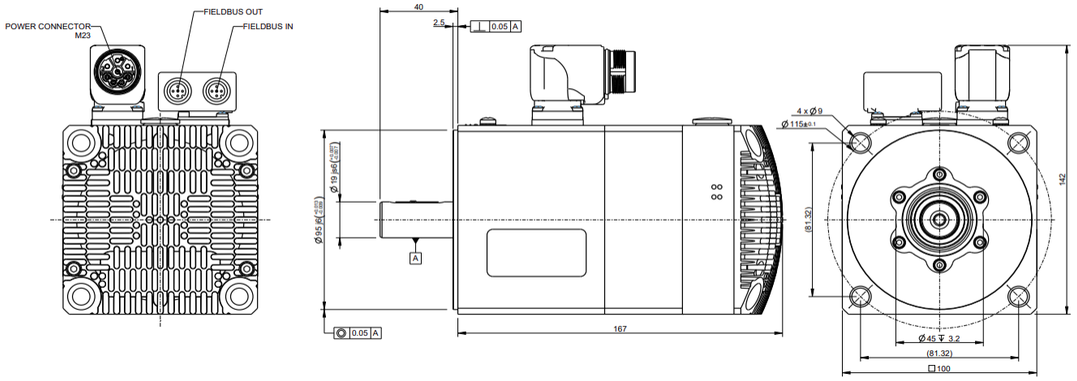
MODEL 6 NM - TWX 0506.A.30.4



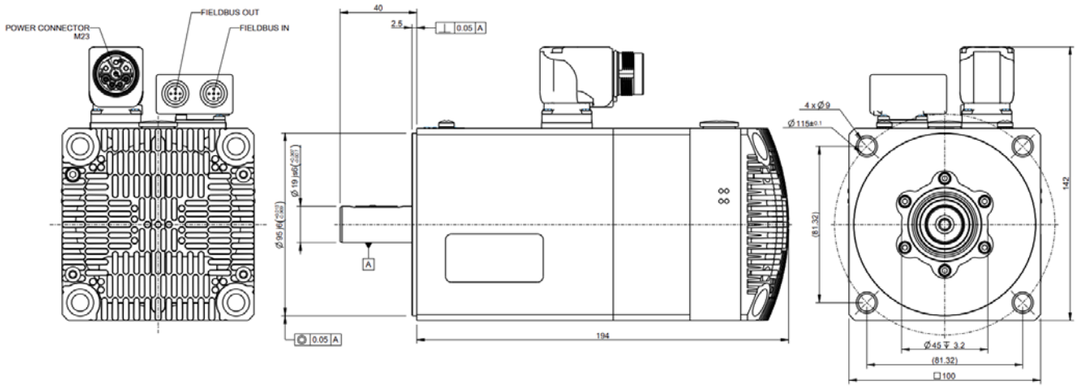


*Shaft diameter is also available in 14mm version

MODEL 3 NM W/ INTEGRATED BRAKE - TWX 0503.A.40.4XXXB



MODEL 6 NM W/ INTEGRATED BRAKE - TWX0506.A.30.4XXXB



TWX SPECIFICATIONS

MODEL 3NM - TWX 0503.A.40.4

	SYMBOL	VALUE	UNITS
Performance Data			
S1 Torque @ 100 rpm	T0	3.7	Nm
Nominal Torque @ Pn	Tn	2.2	Nm
Nominal Speed @ Pn	wn	2800	rpm
Nominal Shaft Power @ wn	Pn	645	W
Peak Torque	Tpk	7.1	Nm
Peak Power	Ppk	2500	W
Maximum Operational Speed @ Vn	wmax	4000	rpm
Electrical Data			
Nominal Input Voltage (DC Bus)	Un_dc	540	V
Nominal Input Current @ Pn	In_dc	1.4	A
Max Input Voltage (DC Bus)	Umax_dc	750	V
Motor Current @ T0	I0	3.06	Arms
Motor Current @ Tn	In	1.82	Arms
Motor Current @ Tpk	Ipk	6	Arms
Motor Torque Constant	Kt	1.25	Nm/Arms
Physical Data			
Rotor Inertia	J	0.27x10^-3	kg*m2
Total weight	M	3.8	kg*m2
Protection Class		IP65	
Insulation Class		H	
Thermal Data			
Thermal Time Constant	Tax	382	s
Motor Loss @ Pn	Ln	90	W
Motor Thermal Protection Threshold		130	°C
Drive Thermal Protection Threshold		150	°C

TWX SPECIFICATIONS

MODEL 6NM - TWX 0506.A.30.4

	SYMBOL	VALUE	UNITS
Performance Data			
S1 Torque @ 100 rpm	T0	5.3	Nm
Nominal Torque @ Pn	Tn	3.9	Nm
Nominal Speed @ Pn	wn	2800	rpm
Nominal Shaft Power @ wn	Pn	1160	W
Peak Torque	Tpk	9.8	Nm
Peak Power	Ppk	3120	W
Maximum Operational Speed @ Vn	wmax	3500	rpm
Electrical Data			
Nominal Input Voltage (DC Bus)	Un_dc	540	V
Nominal Input Current @ Pn	In_dc	2.4	A
Max Input Voltage (DC Bus)	Umax_dc	750	V
Motor Current @ T0	I0	3.2	Arms
Motor Current @ Tn	In	2.5	Arms
Motor Current @ Tpk	Ipk	6	Arms
Motor Torque Constant	Kt	1.72	Nm/Arms
Physical Data			
Rotor Inertia	J	0.51x10^-3	kg*m2
Total weight	M	4.9	kg*m2
Protection Class		IP65	
Insulation Class		H	
Thermal Data			
Thermal Time Constant	Tax	453	s
Motor Loss @ Pn	Ln	120	W
Motor Thermal Protection Threshold		130	°C
Drive Thermal Protection Threshold		150	°C

PHASE
MOTION CONTROL

Phase USA Inc.
In the heart of U.S.A (Chicago) to provide support and solutions in the United States.
sales@phaseusa.us

Phase Automation GmbH
The technical and commercial support in German-speaking countries.
office@phase-automation.at

Phase Automation Sarl
Technical and commercial support in French-speaking countries.
contact@phase-automation.com

PHASE ITALY HQ. Genoa
• The Italian Factory is the Main Manufacturing and R&D Plant.
• Ongoing equipment upgrade
• New CNC manufacturing area, high density winding, vacuum potting facility, high accuracy balancing, multiple NC measuring.
(160 Employees)

At Phase Motion Control, we are committed to providing comprehensive mechanical and electrical support. Since 1994, with over 100,000 torque motor units in operation worldwide, we have consistently remained at the forefront of innovation, helping to drive progress in motion control technologies. For any support needs, contact us at:

- **support@phase.eu** for technical support
- **repair@phase.eu** for failure analysis and repair activities
- **customercare@phase.eu** for any enquiry and customer assistance

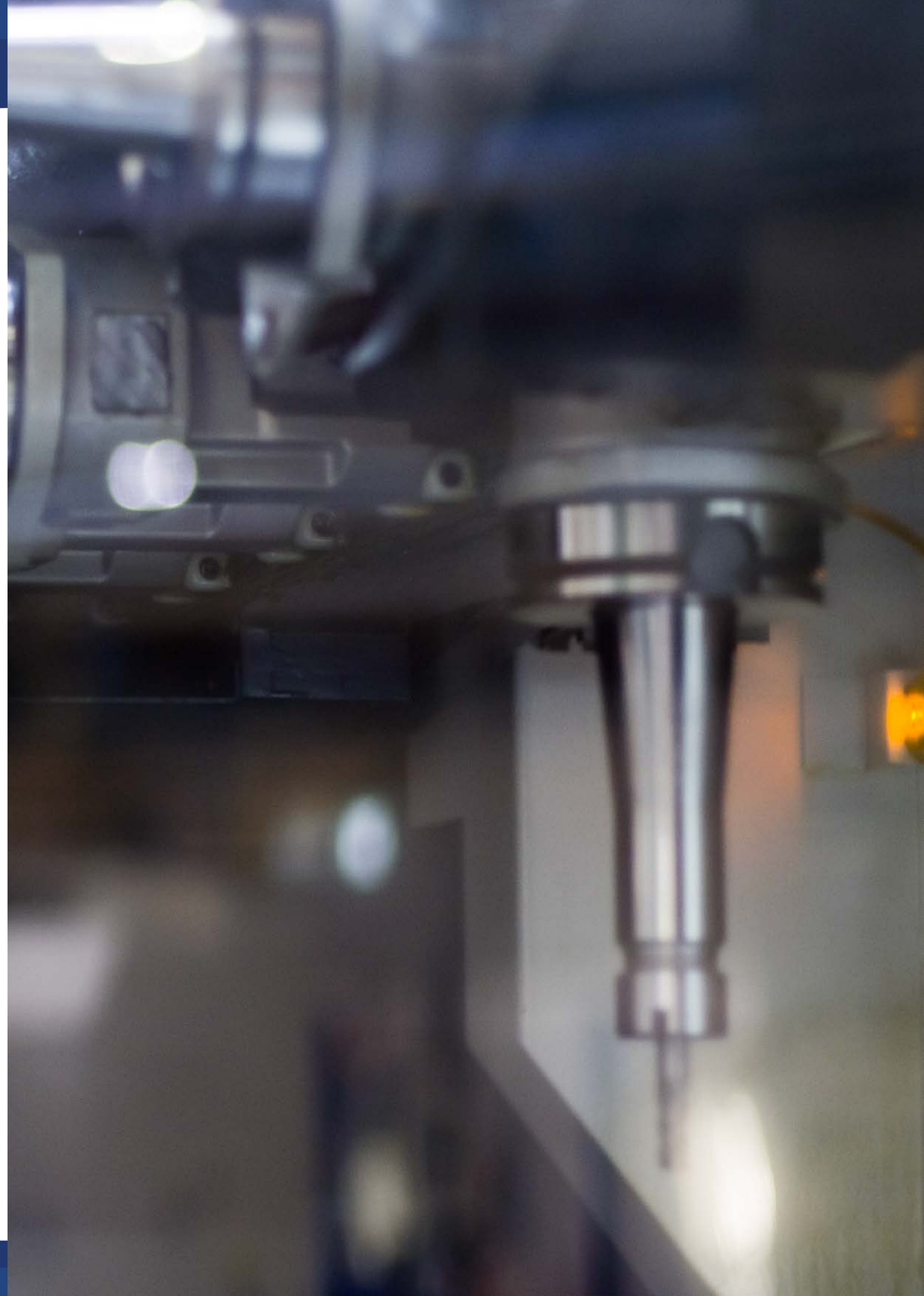
We are committed to helping our customers achieve their goals and overcome their technological challenges with our comprehensive range of motion control solutions.

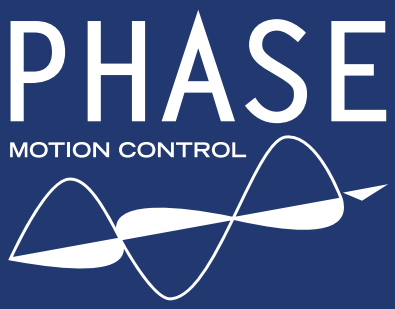
OUR WORLDWIDE EXPERTS' NETWORK AT YOUR SERVICE

Phase Motion Control engineering team cooperates with customers around the globe to solve technological challenges. To respond to diverse needs across motion control solutions, Phase Motion Control offers a wide range of expertise with a team of interdisciplinary electric, mechanical, servo and power conversion experts available worldwide.

IN LINE WITH OUR STRATEGY OF CO-ENGINEERING ADVANCED SOLUTIONS, WE PROVIDE:

- Expertise and experience in many application fields, from automation and robotics, to NC machine tools and servo press, all the way to lifting, HVAC, flight simulation and motion systems;
- Electric mobility technology: from battery to drive to motors, for undersea, oversea, land and air propulsion;
- High power density, low mass advanced drives and actuators for avionics;
- Electrical and mechanical failure analysis, remedial actions;





www.phase.eu

Phase Motion Control S.p.A.
Via Luigi Cibrario, 4 - 16154 Genova - Italy - Tel. +39 010 835161 - Fax +39 010 9998872 - P.IVA 03425740101