PHASE
MOTION CONTROL

IoT ready

TWX

Compact BLDC Integrated
Servo eMotor
CanOpen/EtherCAT FieldBus

Brochure 2024

Rev. 01/2024

TorqueWire motors are complete, self sufficient servo axis building blocks which allow the design, integration and operation of large multi axis systems with minimum 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 IP 65 protected frame. The motor systems are controlled via a EtherCAT or CANopen fieldbus, linking together groups of motors on a single bus system

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

The performance of TorqueWire originates from the advanced design of both motor and drives. The motor parts take advantage of a novel, highly optimized winding design, along with 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.

Such advantage is invested in both temperature rise derating and space for the drive, so that TorqueWire motors, including the drive, are smaller than comparable motors with similar rating.

TWX series is particularly innovative in the **electromagnetic compatibility** approach.

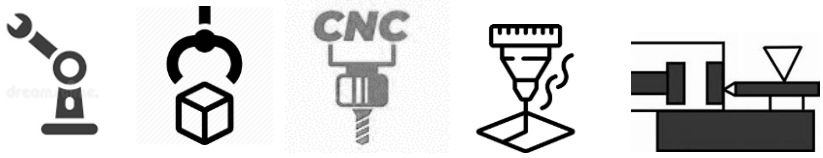
As there are **no cables between drive and motor**, and also between sensor and drive, the system has a very low RFI emission signature and an equally reduced susceptibility to electromagnetic interference.

The drive is designed and validated for **high level vibration** and wide **temperature range**.

The design is free from electrolythic capacitors, enabling **long life** even in temperature.

Applications

- Work-piece setting for wood and metal forming
- Packaging, bottling, wrapping, especially on rotary machines with single wire for multi motor/axis control
- Tool changers
- Laser plotter
- Assembly machines
- Pick and place robots
- Mould automation



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 PLd CAT 3
  (Certification in progress)

Fieldbus type choice

- EtherCAT (COE)
- CANOpen (DS301 DSP402)

EtherCAT
CANopen

Feedback devices

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

* STO certification in progress

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 modes

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

IEC motion modes

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

TWX specific functions

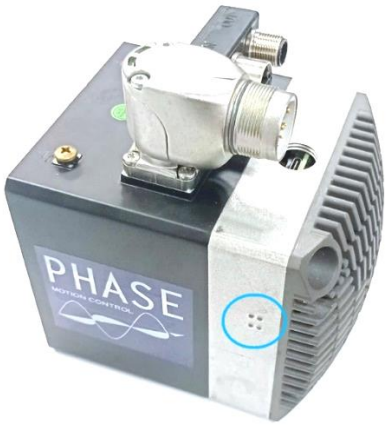
- Aux digital input functions (quick-stop, touch-probe, homing)
- Rotary Table Control (with automatic best route)

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

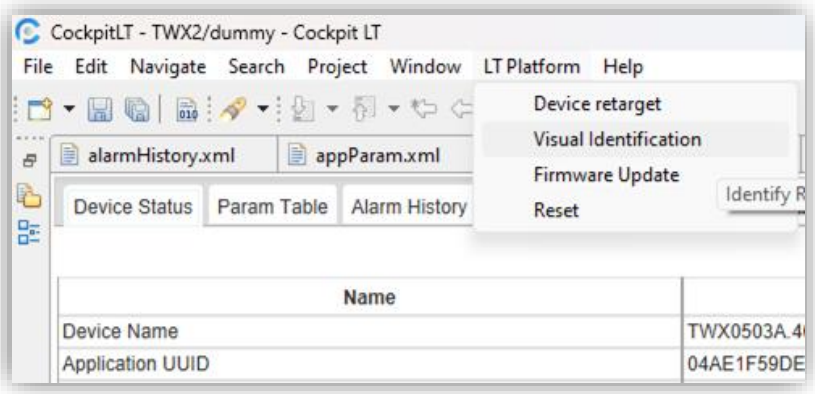
- with *Free* Phase Motion Control **CockpitLT** PC tool
- only USB connection. No DC bus required for set up
- simultaneous connections to multiple Drives
- 1 click drive identification and Fieldbus Node setting

Status LED with Drive Visual Identification

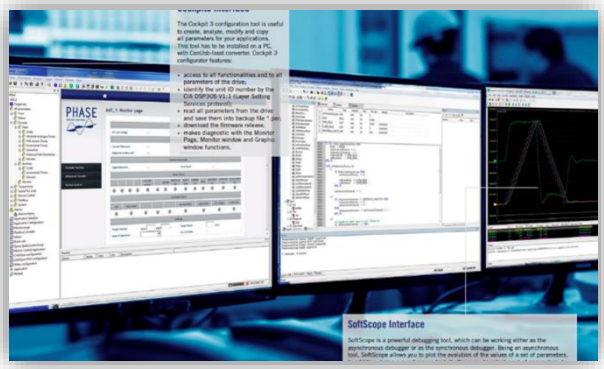


Leds on both side of eMotor for easy Drive and Fieldbus status, alarms and faults check

"**Visual identification**" while using CockpitLT tool for easy identification of connected device

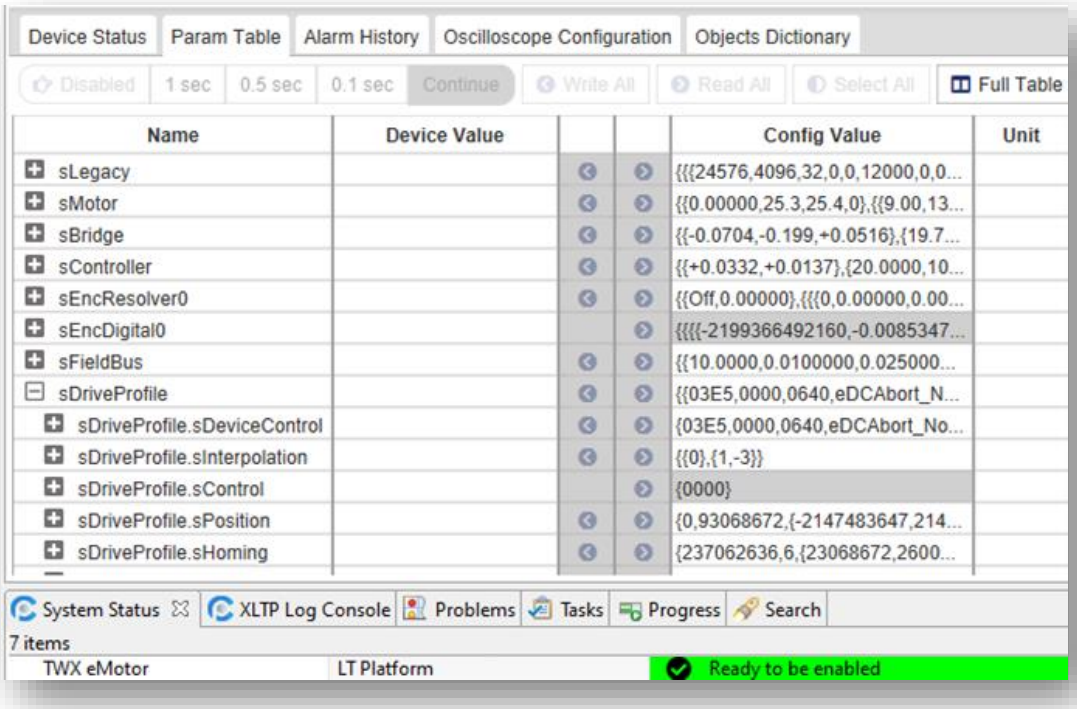


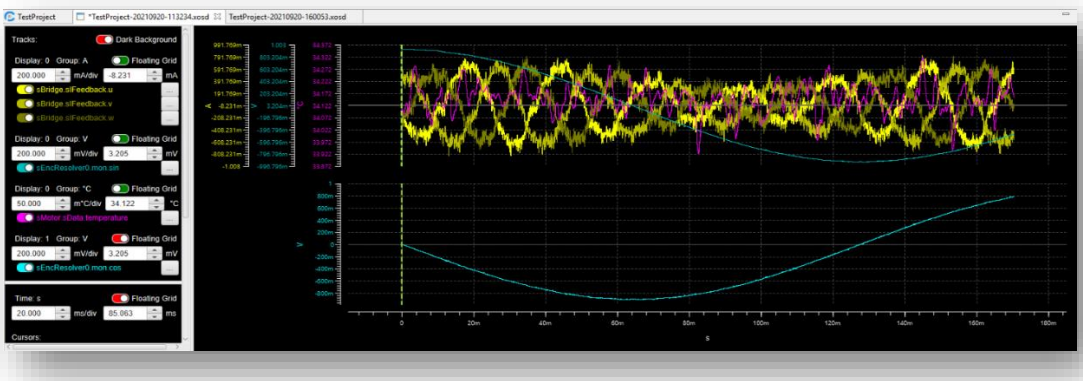
Free Configuring & Commissioning Tools



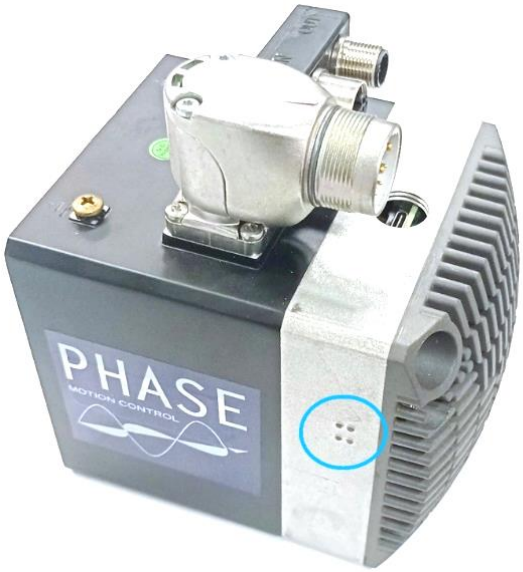
CockpitLT Windows® PC Tool, specific for TWX series, integrate User Friendly interfaces for easy set up, maintenance, programming and tuning.

- 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



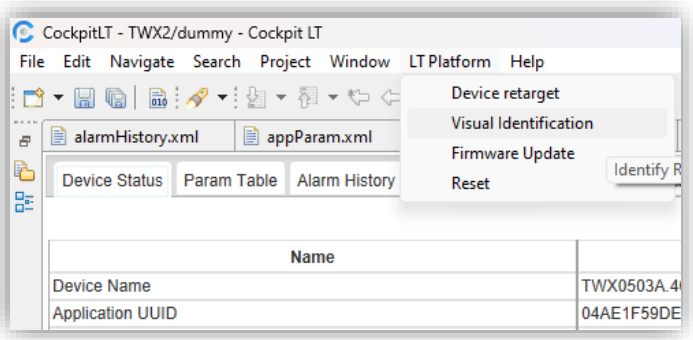


Status LED with Visual Identification function



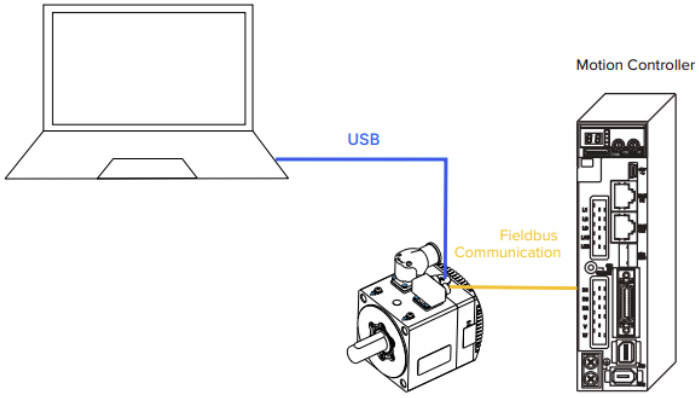
Leds on both side of eMotor for easy status, fieldbus and fault check

"**Visual identification**" function for easy connected motor view using CockpitLT commissioning tool



TWX Power and Fieldbus Connectors view

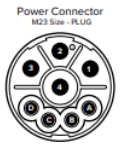
TWX Power and Fieldbus Connectors Pinout



EtherCAT
CANopen

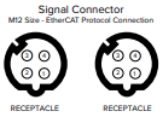
Power connector

PHOENIX CONTACT 6pins SF-5EPIN8AAD00	
Pin	Description
1	DC+
2	DC-
3	GND
4	Auxiliary input (+24V)
5	0V Supply
6	+24V Supply



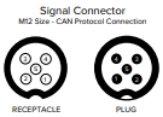
Power connector

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

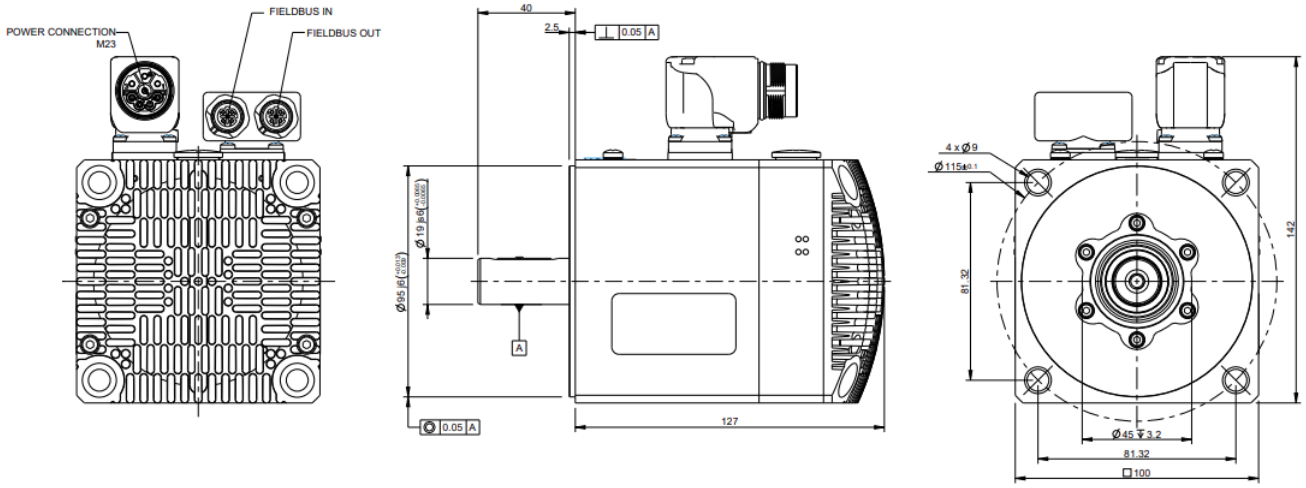
TWX requires 300/600 VOLTS DC BUS and braking resistor to properly work.

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

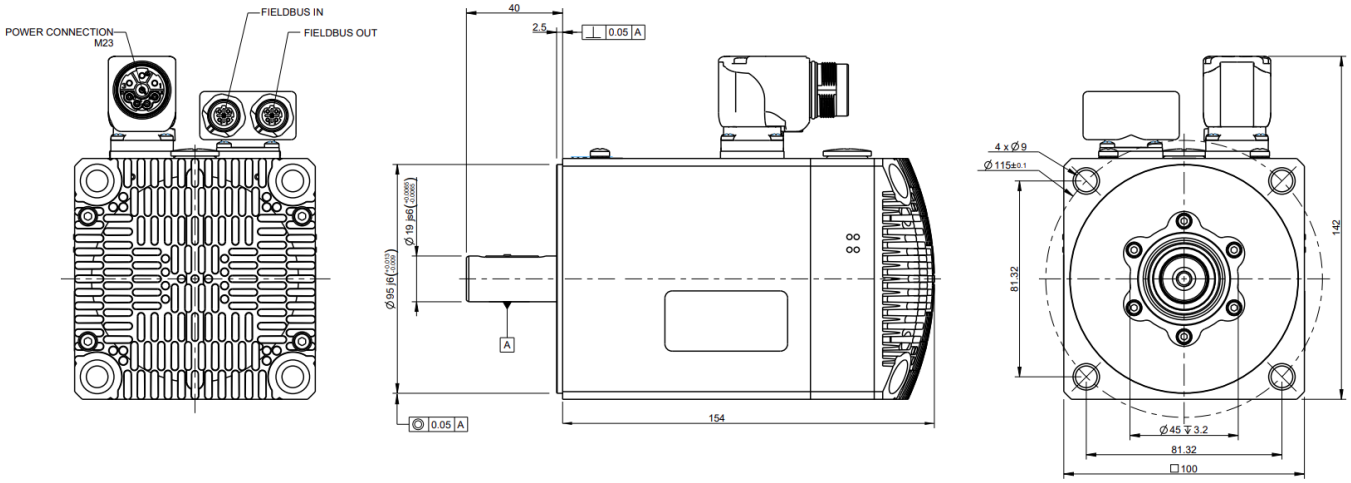
- 220V-380V AC single or three phase Input
- *Power on* relay output (DCBus SYS ready signals)
- External DCBus capacitors charge capability
- Automatic DCBus capacitor discharge
- Dynamic braking (external resistor required)
- Desaturation protection of braking IGBT
- Over voltage, current and temperature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

TWX Standard Version (no brake)

Model 3 Nm - TWX 0503.A.40.4

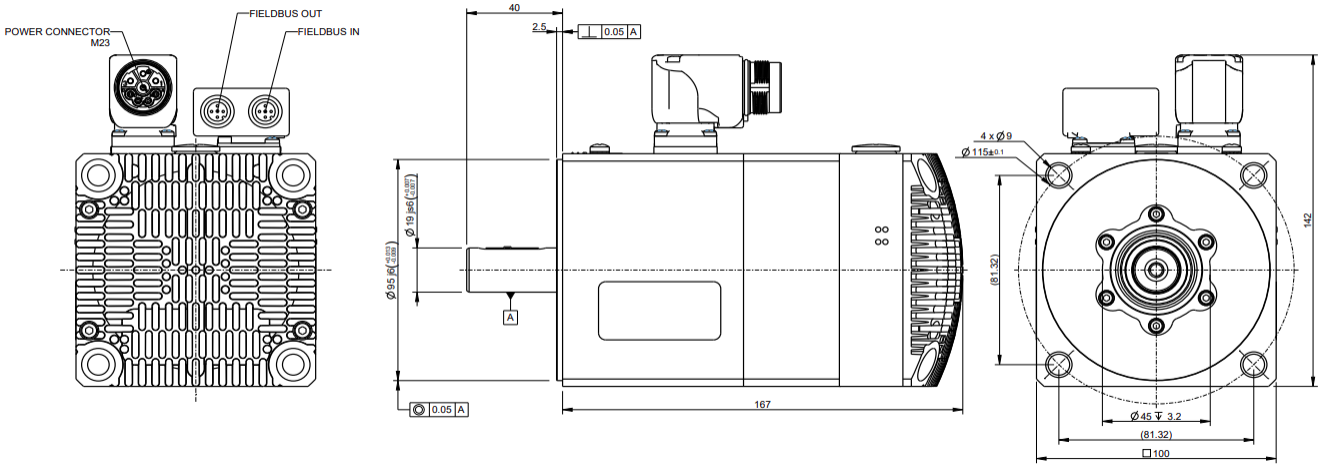


Model 6 Nm - TWX 0506.A.30.4

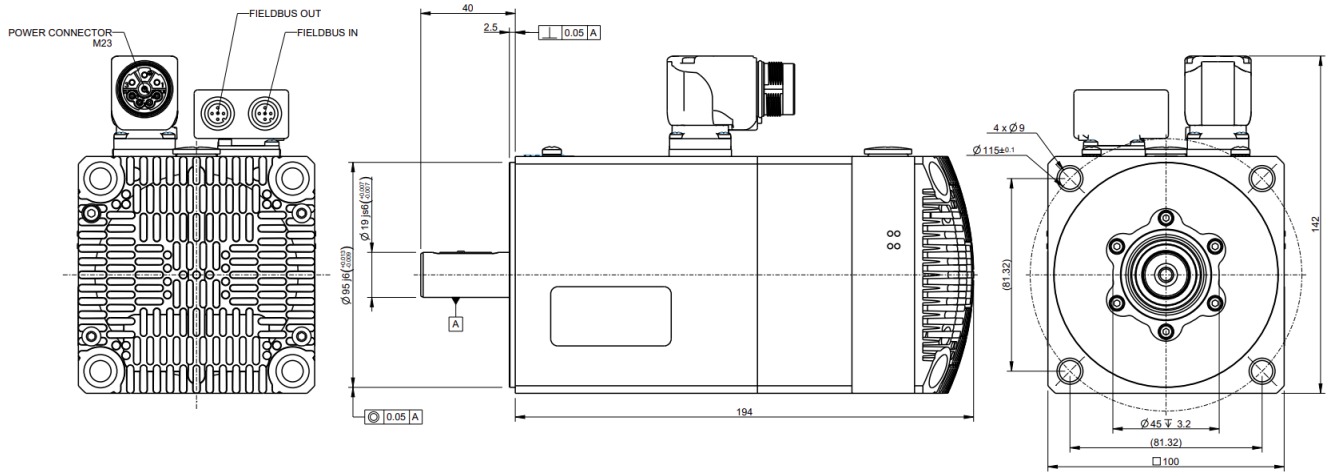


TWX Brake Version

Model 3 Nm w/ Integrated Brake - TWX 0503.A.40.4xxxBxxxxx



Model 6 Nm w/ Integrated Brake - TWX0506.A.30.4xxxBxxxxx



TWX Optional Brake data

	Symbol	Value	Units
Supply Voltage	U_n	24	V_{DC}
Power consumption	P_{20}	14	W
Stall Braking Torque (20°C)	TB_k	7.0	Nm
Rated Torque	TB_{KN}	3.8	Nm
Additional inertia	JB_k	$0.416\ 10^{-4}$	Kgm^2
Weight	m	0.55	Kg

PHASE MOTION CONTROL

TWX DC eMotor Series
with Integrated Servo Drive

TWX Ordering codes

Example Code

TWX05	03	A.	40.	4	M07	0	0	E	G1	0	0

FAMILY CODE	NOM. TORQUE	COOLING	MAX. SPEED	NOM. VOLTAGE	POSITION SENSOR	BRAKE PRESENCE	M23 CONNECTIONS STYLE	EXP. CARD FIELDBUS & M12 STYLE	SHAFT DIM.	CUSTOMIZATION	DESCRIPTION
TWX05											Torque Wire Motor REVISION X SIZE 05
	03										3.7Nm
	06										6.4Nm
		A.									Natural Cooling
			30.								3000rpm (TWX0506)
			40.								4000rpm (TWX0503)
				4							0-700VDC
					M07						ENDAT2.2 Single Turn Heidenhain ECI 1319 - 810661-02 19b 3.6/14V
					N10						ENDAT2.2 Multi Turn Heidenhain EQI 1331 - 810662-03 31b 3.6/14V
					R09						RESOLVER 2 poles TGW TS2640N101E64
						0					Motor without brake
						B					Motor with brake
							0				M23 6P (DC Bus, +24V, 1x AUX IN)
							P				M23 8P (DC Bus, +24V, 1x AUX IN, STO)
								E			ETHERCAT Fieldbus Connectors (2 x M12 4P)
								C			CAN Fieldbus Connectors (2 x M12 5P)
									G1		Shaft size 19j6 × 40
									K1		Shaft size 19j6 × 40 - Key size 6×6×28
									K2		Shaft size 14j6 × 30 - Key size 5×5×18
										00	Standard

TWX specifications

Model 3NM - TWX 0503.A.40.4

Speed Data	Symbol	Value	Units
Nominal Speed (@ 540 V_{DC})	wn	2800	rpm
Maximum Speed	wmax	4000	rpm
Maximum Structural Speed	wp	4500	rpm
Torque Data			
S1 Low Speed Torque (flanged)	T0	3.7	Nm
S1 Nominal Torque (flanged)	Tn	2.2	Nm
S6 Peak Torque 40% duty T1=10s	Tax	6	Nm
Electrical Data			
Power supply (DC Bus)	Un	540	Voo
Nominal Voltage	Vn	219	V_{DC}
Low Speed Current	I0	3.06	Arms
Nominal Current	In	1.82	Arms
Peak Current	Ipk	4.8	Arms
Torque Constant	Kt	1.25	Nm/Arms
Power Data			
Nominal Shaft Power		645	W
Physical Data			
Rotor Inertia	J	0.27 10^{-3}	Kgm^2
Total weight	Mass	3.8	Kg
Protection Class		IP65	
Insulation Class		H	
Thermal Data			
Thermal Time Constant	Ta	382	s
S1 Motor Loss Low Speed	LO	80	W
Motor Thermal Protection Threshold		130	°C
Drive Thermal Protection Threshold		150	°C

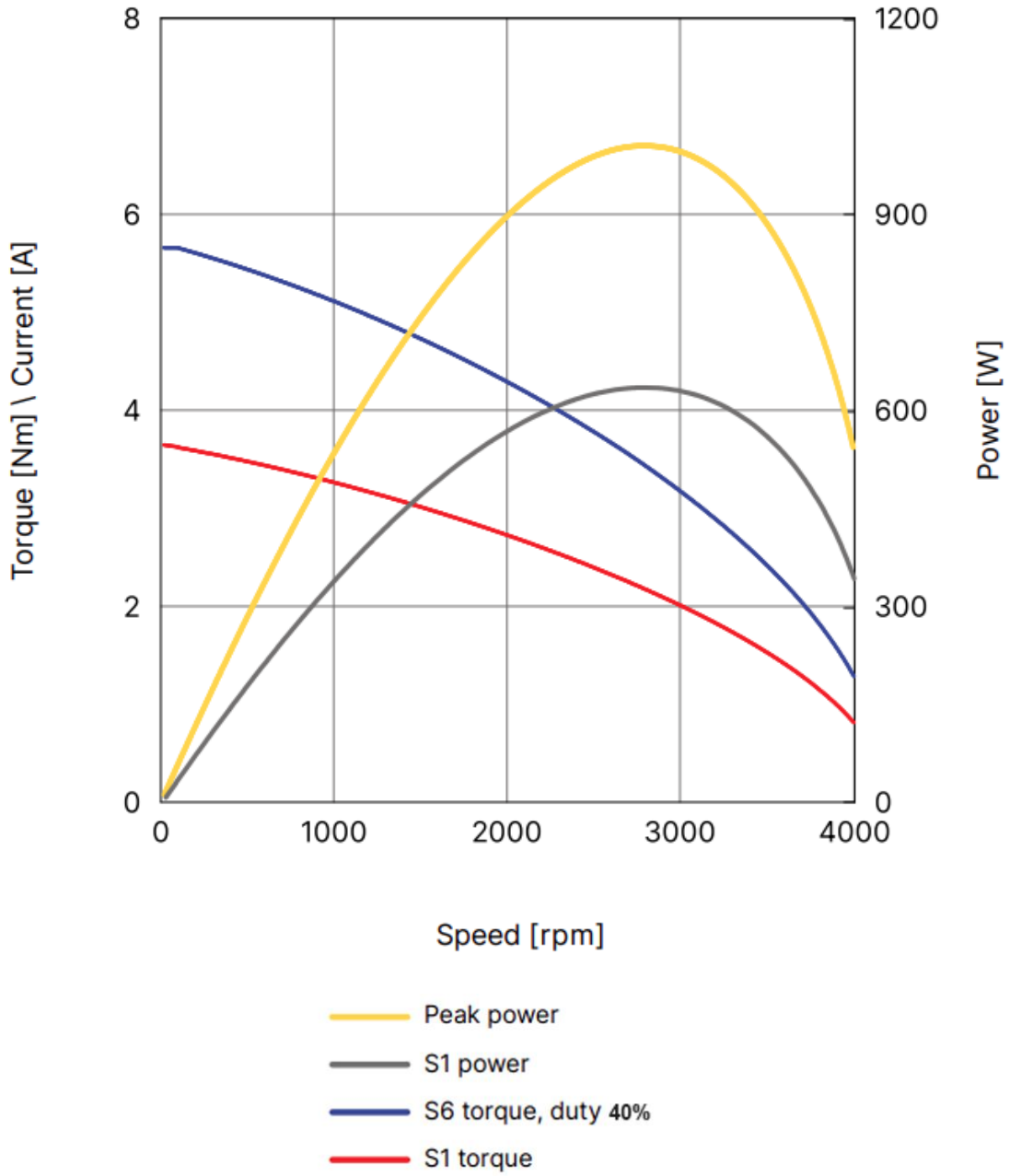
TWX specifications

Model 6NM - TWX 0506.A.30.4

Speed Data	Symbol	Value	Units
Nominal Speed (@ 540 V_{DC})	wn	2800	rpm
Maximum Speed	wmax	3500	rpm
Maximum Structural Speed	wp	4200	rpm
Torque Data			
S1 Low Speed Torque (flanged)	T0	6.4	Nm
S1 Nominal Torque (flanged)	Tn	3.9	Nm
S6 Peak Torque 40%duty T1 =10s	Tax	10	Nm
Electrical Data			
Power supply (DC Bus)	Un	540	V_{DC}
Nominal Voltage	Vn	299	Vrms
Low Speed Current	I0	3.89	Arms
Nominal Current	In	2.39	Arms
Peak Current	Ipk	6	Arms
Torque Constant	Kt	1.73	Nm/Arms
Power Data			
Nominal Shaft Power		1142	W
Physical Data			
Rotor Inertia	J	0.5110:^{3}	Kgm^{2}
Total weight	Mass	4.9	Kg
Protection Class		IP65	
Insulation Class		H	
Thermal Data			
Thermal Time Constant	Ta	453	s
S1 Motor Loss Low Speed	L0	110	W
Motor Thermal Protection Threshold		130	°C
Drive Thermal Protection Threshold		150	°C

TWX Operational Data

Model 3NM - TWX 0503.A.40.4



TWX Operational Data

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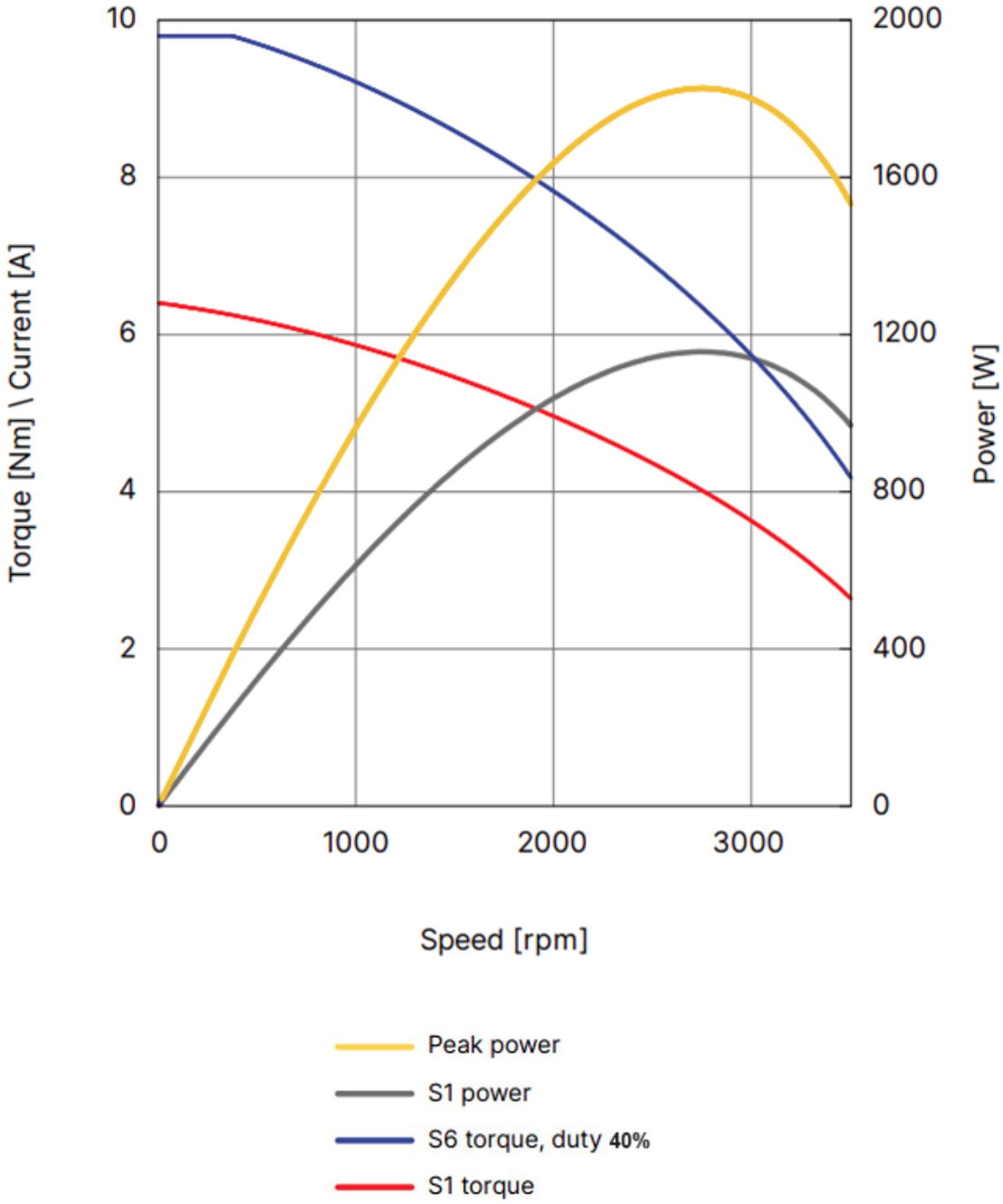

PHASE
MOTION CONTROL

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