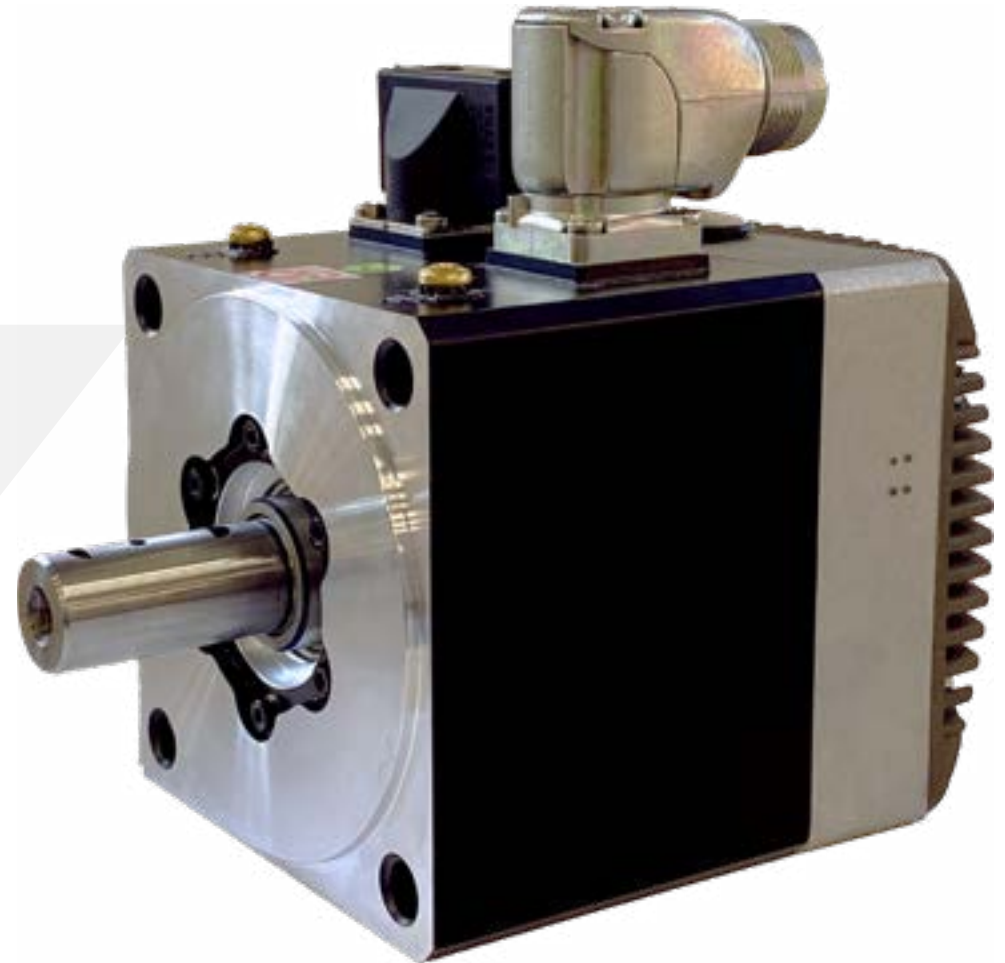


# TWX

with Integrated Servodrive



# TWX Motor

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 67 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, patent pending 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.

The 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 electrolytic capacitors, thus enabling long life even in temperature.

## Applications

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

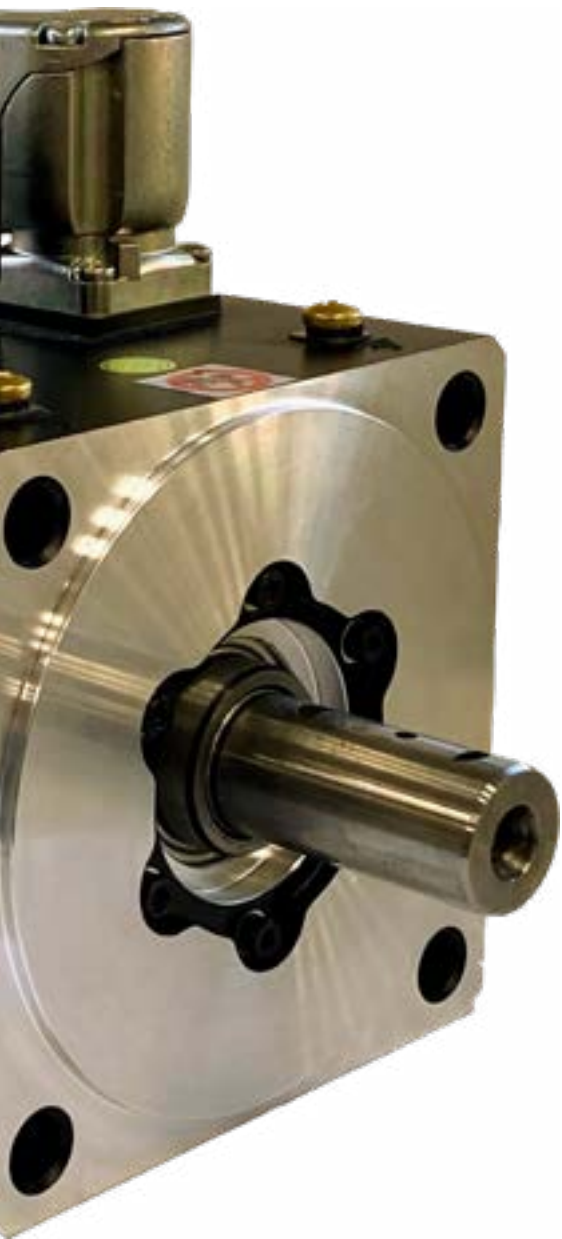
## Main features

- Typical Supply Voltage Range: 310 – 560 Vdc
- Rated Torque Range: 3.7 Nm – 6.4 Nm
- Type of cooling: natural convection,
- Servo Integrated Drive
- Protection Class: IP 67
- Expansion board:
  - EtherCAT (COE) option
  - CANOpen DS301 option

## Feedback devices

- Endat Heidenhain Absolute Encoder single or multi-turn (280 arcsec accuracy)
- Two pole resolver





## Motion Profile

The TWX motor is DSP402 V4.1.0 compatible, implementing the following profiles:

- Profile position mode
- Profile velocity mode
- Interpolated position mode
- Homing mode
- Cyclic Synchronous Velocity mode (CSV)
- Cyclic Synchronous Position mode (CSP)
- Cyclic Synchronous Torque mode (CST)
- Touch Probe Function

## TWX specific functions

The TWX Motor specific functions are:

- Auxiliary digital input (quick-stop, touch-probe, homing)
- 2<sup>nd</sup> order digital filters
- Rotary table control

## TWX option ordering code

- Optional integrated holding brake (B)
- Optional shaft forelock (K)

## TWX Commissioning Tools

Cockpit<sup>LT</sup> integrated maintenance, programming and tuning tool, with online parameters monitoring and real-time digital oscilloscope. Seamless simultaneous application tuning via integrated USB port.

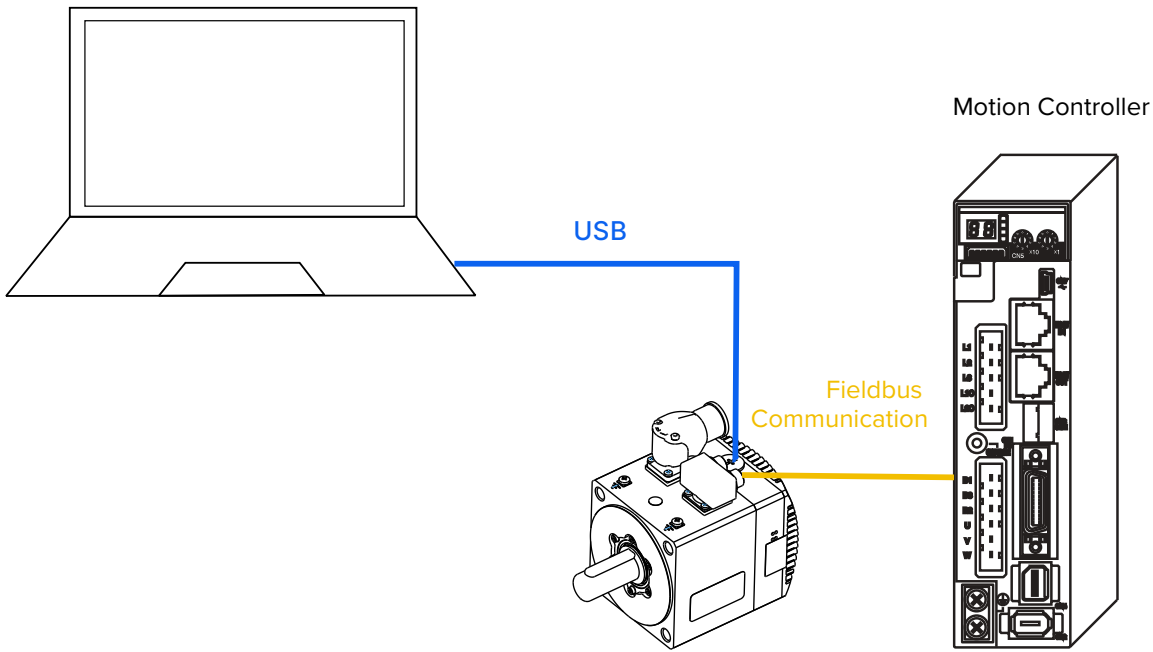
## STO function

- STO Safety Function<sup>1</sup>

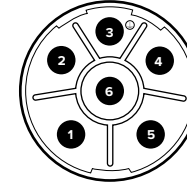
<sup>1</sup> Under certification process



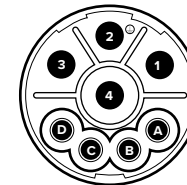
# General System Connection



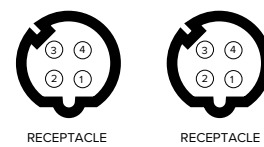
Power Connector  
M23 Size - PLUG



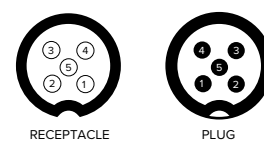
Power Connector  
M23 Size - PLUG



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                |

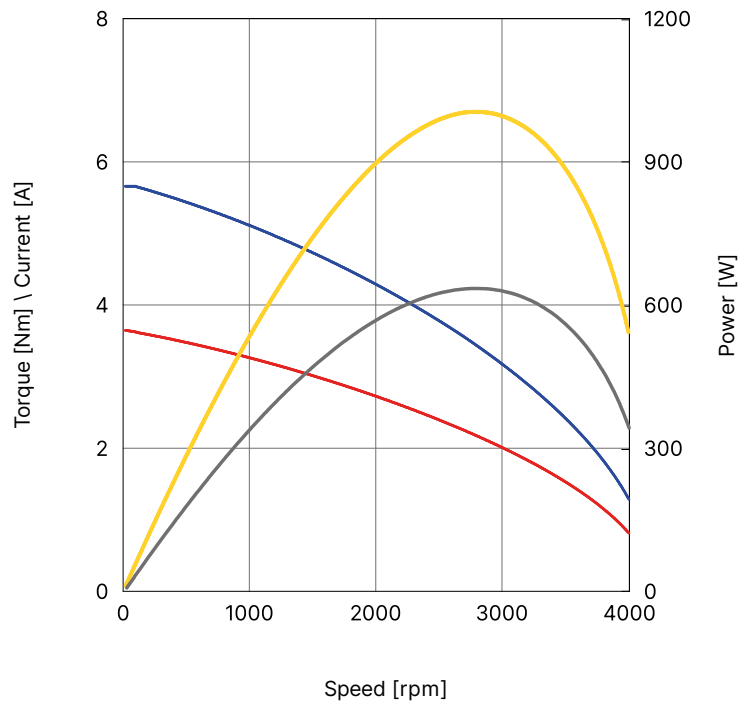




# TWX Size 5

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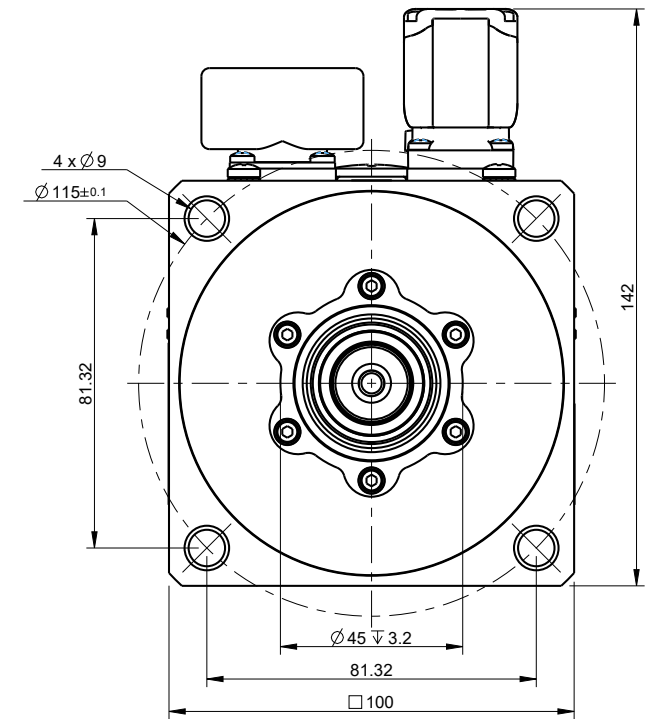
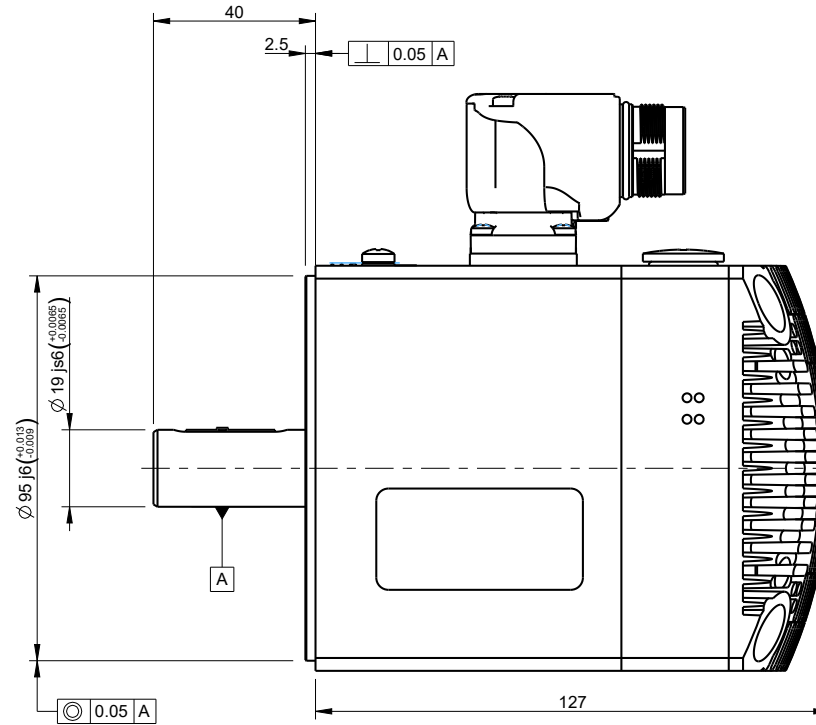
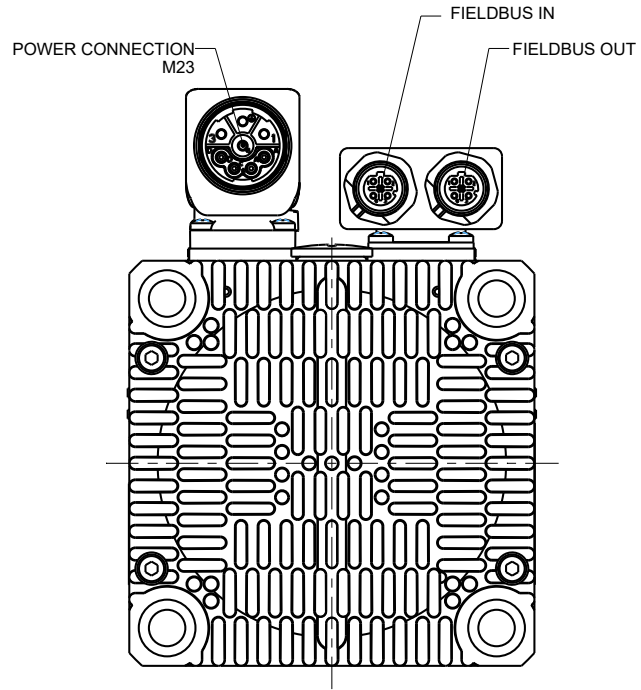
## Natural cooling



- Peak power
- S1 power
- S6 torque, duty %
- S1 torque

| Speed Data                         |  | Symbol         | Value                | Units       |
|------------------------------------|--|----------------|----------------------|-------------|
| Nominal Speed                      |  | $\omega_n$     | 2800                 | rpm         |
| Maximum Speed                      |  | $\omega_{max}$ | 4000                 | rpm         |
| Maximum Structural Speed           |  | $\omega_p$     | 4500                 | rpm         |
| Torque Data                        |  |                |                      |             |
| S1 Low Speed Torque (flanged)      |  | $T_o$          | 3.7                  | Nm          |
| S1 Nominal Torque (flanged)        |  | $T_n$          | 2.2                  | Nm          |
| S6 Peak Torque 40% duty T1=10s     |  | $T_{pk}$       | 6                    | Nm          |
| Electrical Data                    |  |                |                      |             |
| Power supply (DC Bus)              |  | $U_n$          | 540                  | $V_{DC}$    |
| Nominal Voltage                    |  | $V_n$          | 219                  | Vrms        |
| Low Speed Current                  |  | $I_o$          | 3.06                 | Arms        |
| Nominal Current                    |  | $I_n$          | 1.82                 | Arms        |
| Peak Current                       |  | $I_{pk}$       | 4.8                  | Arms        |
| Torque Constant                    |  | $K_T$          | 1.25                 | $NmA^{-1}$  |
| Power Data                         |  |                |                      |             |
| Nominal Shaft Power                |  |                | 645                  | W           |
| Physical Data                      |  |                |                      |             |
| Rotor Inertia                      |  | J              | $0.27 \cdot 10^{-3}$ | $Kgm^2$     |
| Total weight                       |  | Msta           | 3.8                  | Kg          |
| Protection Class                   |  |                | IP67                 |             |
| Insulation Class                   |  |                | H                    |             |
| Thermal Data                       |  |                |                      |             |
| Thermal Time Constant              |  | $T_a$          | 382                  | s           |
| S1 Motor Loss Low Speed            |  | $LO_c$         | 80                   | W           |
| Motor Thermal Protection Threshold |  |                | 130                  | $^{\circ}C$ |
| Drive Thermal Protection Threshold |  |                | 150                  | $^{\circ}C$ |

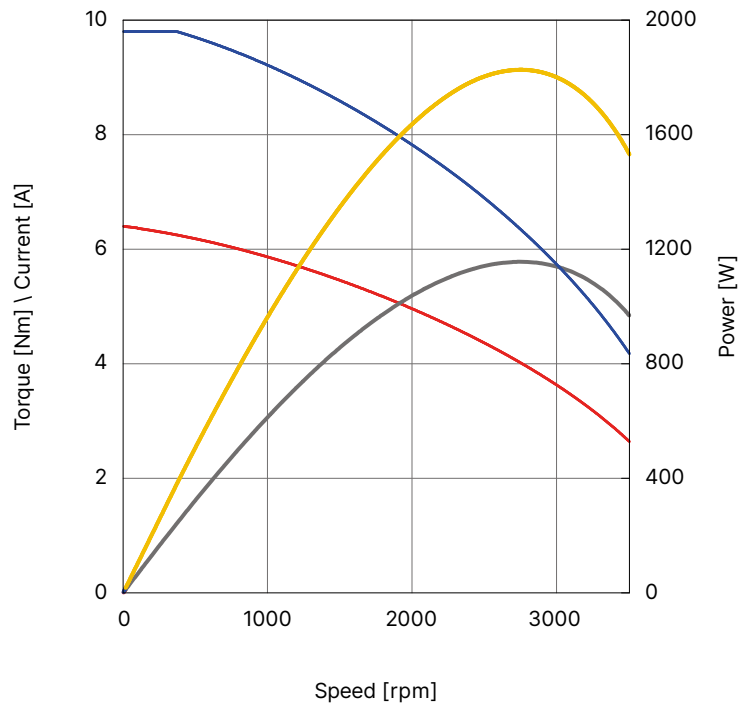
# Overall Dimensions



# TWX Size 5

0506A.30.4

## Natural cooling

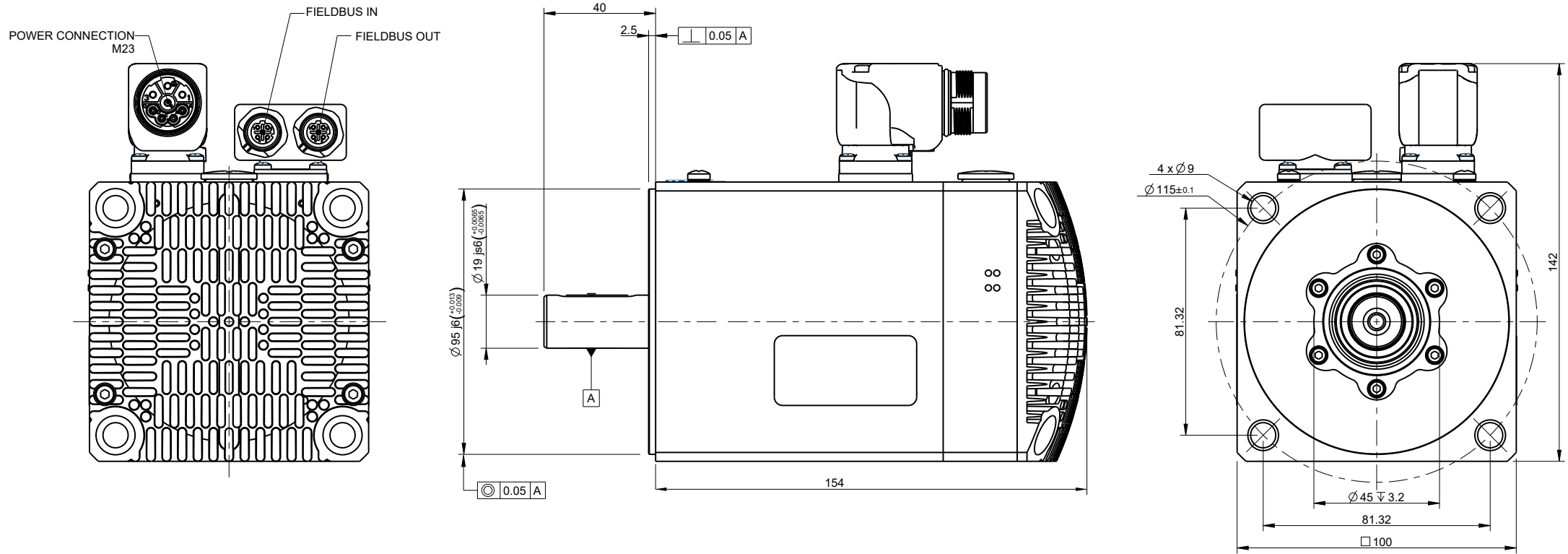


- Peak power
- S1 power
- S6 torque, duty %
- S1 torque

| Speed Data                         |  | Symbol         | Value                | Units       |
|------------------------------------|--|----------------|----------------------|-------------|
| Nominal Speed                      |  | $\omega_n$     | 2800                 | rpm         |
| Maximum Speed                      |  | $\omega_{max}$ | 3500                 | rpm         |
| Maximum Structural Speed           |  | $\omega_p$     | 4200                 | rpm         |
| Torque Data                        |  |                |                      |             |
| S1 Low Speed Torque (flanged)      |  | $T_o$          | 6.4                  | Nm          |
| S1 Nominal Torque (flanged)        |  | $T_n$          | 3.9                  | Nm          |
| S6 Peak Torque 40% duty T1=10s     |  | $T_{pk}$       | 10                   | Nm          |
| Electrical Data                    |  |                |                      |             |
| Power supply (DC Bus)              |  | $U_n$          | 540                  | $V_{DC}$    |
| Nominal Voltage                    |  | $V_n$          | 299                  | Vrms        |
| Low Speed Current                  |  | $I_o$          | 3.89                 | Arms        |
| Nominal Current                    |  | $I_n$          | 2.39                 | Arms        |
| Peak Current                       |  | $I_{pk}$       | 6                    | Arms        |
| Torque Constant                    |  | $K_T$          | 1.73                 | $NmA^{-1}$  |
| Power Data                         |  |                |                      |             |
| Nominal Shaft Power                |  |                | 1142                 | W           |
| Physical Data                      |  |                |                      |             |
| Rotor Inertia                      |  | J              | $0.51 \cdot 10^{-3}$ | $Kgm^2$     |
| Total weight                       |  | Msta           | 4.9                  | Kg          |
| Protection Class                   |  |                | IP67                 |             |
| Insulation Class                   |  |                | H                    |             |
| Thermal Data                       |  |                |                      |             |
| Thermal Time Constant              |  | $T_a$          | 453                  | s           |
| S1 Motor Loss Low Speed            |  | $LO_c$         | 110                  | W           |
| Motor Thermal Protection Threshold |  |                | 130                  | $^{\circ}C$ |
| Drive Thermal Protection Threshold |  |                | 150                  | $^{\circ}C$ |

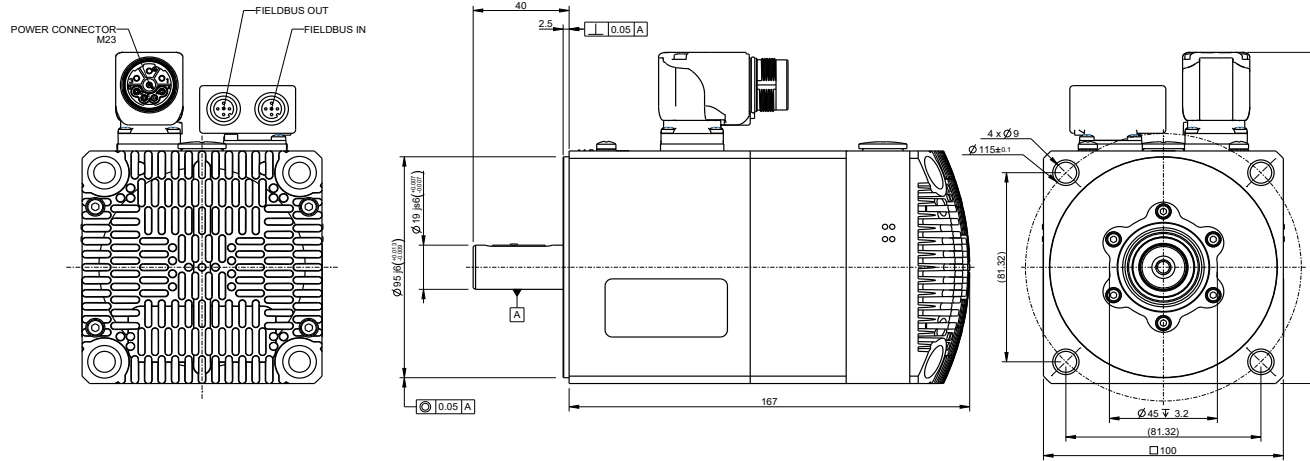


# Overall Dimensions

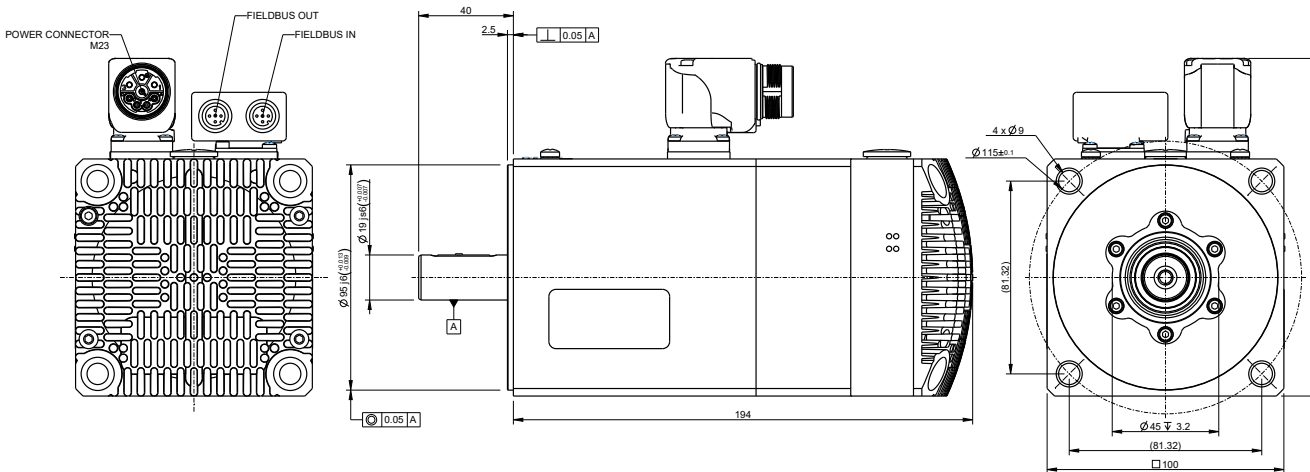


# Optional Brake Data

## TWX0503.A.40.4xxxBxxxxxx



## TWX0506.A.30.4xxxBxxxxxx



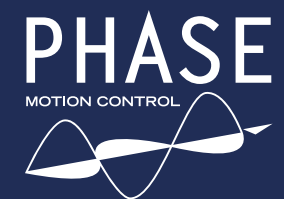
|                              | Symbol    | Value                 | Units            |
|------------------------------|-----------|-----------------------|------------------|
| Supply Voltage               | $U_n$     | 24                    | $V_{DC}$         |
| Power Consumption            | $P_{20}$  | 13                    | W                |
| Stall Braking Torque (20 °C) | $TB_k$    | 7.0                   | Nm               |
| Rated Torque                 | $TB_{kn}$ | 3.8                   | Nm               |
| Additional Inertia           | $JB_k$    | $0.416 \cdot 10^{-4}$ | Kgm <sup>2</sup> |
| Weight                       | m         | 0.55                  | Kg               |

# TWX Ordering Code

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<br>ECI 1319 - 810661-02 19b 3.6/14V |
|             |             |         |            |              | N10             |                |                       |                                |            |               | ENDAT2.2 Multi Turn Heidenhain<br>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<br>(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  |



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