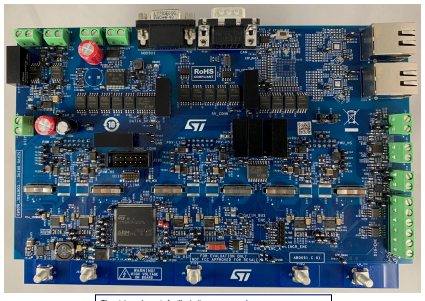
# STEVAL-ISD01KCB

Data brief

## 22 kW servo drive system with real time connectivity and safety functions



The picture shown is for illustration purpose only.
Actual product may vary depending on buyer's selection and availability.

| Product summary | |
|---|---|
| 22 kW servo drive system with real time connectivity and safety functions | STEVAL-ISD01KCB |
| ACEPACK SMIT half-bridge topology 1200 V, 50 A, M series IGBT with diode | STGSH50M120D |
| High-performance and DSP with DP-FPU, Arm Cortex-M7 MCU with 1MByte of Flash memory | STM32H743ZGT6 |
| 16-bit isolated Sigma-Delta modulator, single-ended and LVDS interfaces | ISOSD61 |
| Galvanically isolated 4 A dual gate driver | STGAP2HD |
| Single line self powered digital input current limiter in SOT23-8L | CLT03-1SC3 |
| High efficiency, high-side switch with extended diagnostic and smart driving for capacitive loads | IPS1025H |
| Quad low-side intelligent power switch | IPS4260L |
| Dual channel digital isolator | STISO621 |
| Applications | Servo Motor Drives |

## Features

- SIL 3 safe torque off (STO) (input 1oo2 CAT3; logic 1oo1 CAT2; output 1oo2 CAT3)
- SIL 2 safe brake control SBC (logic 1oo1 CAT2; output 1oo2 CAT3)
- DC power input up to 800 V
- DC logic input 24 V
- Output phase current up to 41 Arms (with forced air cooling)
- Diagnostic safety functions guaranteed on HW by OV/UV/OT/OVL circuitries and at microcontroller level using certified library included in the X-CUBE-STL package
- Absolute encoder, resolver, hall sensors, incremental encoder with quadrature signals supported
- Isolation on data line and digital signals, guaranteed using Σ-Δ modulators and dual channel isolators
- Designed to meet IEC 61508 and sub standards

## Description

The STEVAL-ISD01KCB is a servo drive board, designed to address all the application use cases, requiring high-power capability, safety function SIL 2 level in the servo motor actuation, with a compact form factor.

The system is a kit, composed by the control board STEVAL-ISD01ACB, and by the power board STEVAL-ISD01BCB.

The servo drive implies the capability to perform position control in a robot joint, in a conveyor belt or other use case. The STEVAL-ISD01ACB has been equipped to support different position sensors, such as incremental encoder, absolute encoder supporting (EnDat, Bi-SS, and hyperlink), resolver.

In consequence of board position (close to the end of the control line), the STEVAL-ISD01KCB has been equipped with several connectivity technologies, serial, with RS-485, CAN and Ethernet with EtherCAT protocol (EtherCAT device not assembled on board).

Safety is ensured with the introduction of Safe Torque Off (STO), Safe Brake Control (SBC) and all the diagnostic functions and architectural solution to achieve the SIL 2 safety level and PLd performance level.

Insulation on board is ensured, using as reference the standard IEC 61800-5-1 for motor control application that requires for the operating bus voltage in use Vbus=600 Vdc, an insulation of 6 kV.

The barrier has been designed to protect the data processing region and then the user, from a possible hazard event coming from the motor section or from a remote PLC used to manage STO signalization management.

The solution, considering the number of components and the power rating, has been designed in a stacked version with a form factor useful to have the possibility to easily mount the hardware on top of the motor.

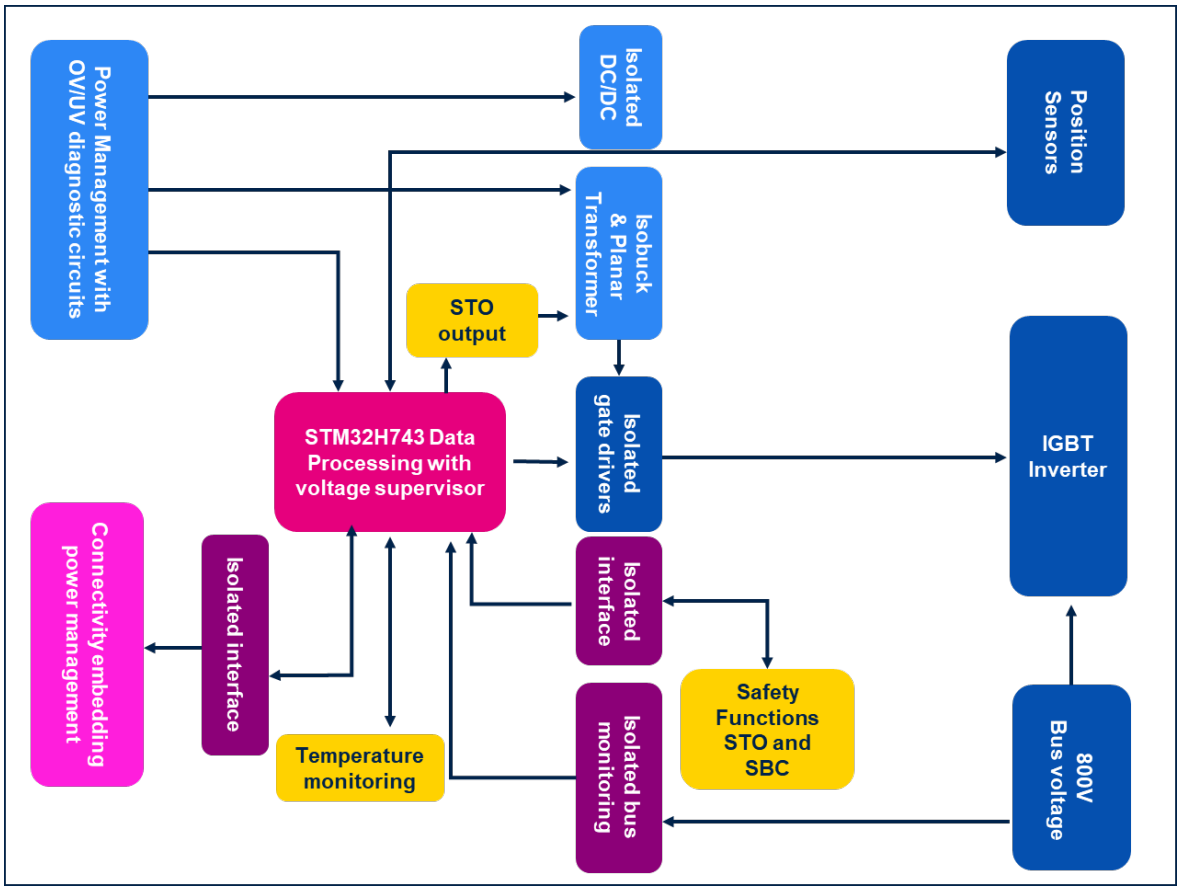
A dedicated application firmware has been designed in accordance with the STM32Cube framework and embedded in the middleware layer, the stack open source for CANopen and modbus, motor control library MCSDK 5.4.8, and the X-CUBE-STL safety library. STEVAL-ISD01KCB is designed to meet following standards: EN ISO 13849-1:2015, EN ISO 13849-2:2012, IEC/EN 61508:2010, IEC/EN 61800-5-2. To target a functional safety level SIL 2 and performance level PLd.

# 1 Solution overview

The hardware is built with a stacked approach to better fit the top side of a high voltage motor. It can be split in four different sections:

- Safety: embedding safe torque off and safe brake control safety functions, and all the set of diagnostic functions needed to achieve SIL 2 level in accordance with IEC 61508
- Power management, including:
  - Two different DC/DC converters based on L7987L in buck configuration, with post regulation using LDO devices, one for the connectivity (not relevant for SIL), and one for all the other section on the board
  - DC/DC converter in isolated buck topology using planar transformer to generate the analog voltage +15/-10 V for STGAP2HD
  - Isolated DC/DC converter to generate isolated voltage reference for sigma delta modulator devices
- Motor control including:
  - inverter IGBT based with STGSH50M120D 1200 V/50 A in ACEPACK SMIT package, working at max operating voltage 800 V
  - absolute encoder, quadrature encoder and incremental encoder supported for position control
  - insulated gated driver based on STGAP2HD
- Connectivity including: real time communication with Ethernet technology to support EtherCAT protocol; and real time communication based on serial interface to support MODBUS protocol and CANopen
- Data processing based on STM32H743ZG microcontroller for motor control algorithm and safety functions handling

**Figure 1. Block diagram**



# 2 Custom evaluation boards information

*Notice:* *These evaluation boards are custom designed and built, in small quantities, according to specific requests from customers and are destined for evaluation and testing of ST products in a research and development setting. Please contact ST to provide your specific requests and get your custom built board(s).*

## Revision history

Table 1. **Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 07-Nov-2024 | 1 | Initial release. |
| 29-Apr-2025 | 2 | Updated document title in cover page.<br>Updated Section Features, Section Description, product summary table, and Section 1: Solution overview.<br>Removed the section on schematic diagrams. |