NEXILICA

Nexor

Modular sensor carrier core

Revision 1.0a

1. Features

- **32-bit Arm Cortex-M0+ core, up to 64 MHz**
- **Dual-face sensor daughterboard interface**
- **CAN FD system bus**
- **Per-face SPI + I^{2}C + 2 analog inputs**
- **On-board 512 Kbit SPI EEPROM**
- **Wide 9–28 V DC supply, reverse-polarity and transient protected**

2. Applications

- Common core for a modular CAN sensor line
- Dual-sensor nodes (two daughterboards on one carrier)
- Distributed sensing / actuation on a CAN FD backbone
- Field-identifiable and field-calibrated sensor endpoints

3. Description

Nexor is the carrier board that acts as the common core of the Nexilica sensor line. It concentrates power conditioning, the microcontroller and the CAN bus into a single reusable module and exposes a sensor interface on *both* faces of the PCB. Each sensor is built as a daughterboard that solders onto one face of the carrier through castellated pads: by changing only the daughterboard, an entire product line is obtained while the power supply, processing core and communication bus stay unchanged.

Built around a 32-bit Arm Cortex-M0+ microcontroller with FDCAN, Nexor operates from a wide 9–28 V DC rail and brings out, on each face, an SPI bus, an I^{2}C bus and two analog inputs, plus a shared I^{2}C identification bus. A small EEPROM on each daughterboard lets the firmware detect which board is mounted on the TOP and which on the BOTTOM face, and load the matching configuration and calibration.

Image to be added

`nexor_render.png`

Figure 1: Nexor carrier board

4. Technical Characteristics

Absolute maximum ratings

Stresses beyond those listed in Table 1 may cause permanent damage to the device. These are stress ratings only; functional operation at or beyond the values listed under *Electrical characteristics* is not implied.

PARAMETER	MIN	MAX	UNIT
Supply voltage (VDD, J1)	-33	+33	V
Voltage on 5 V-tolerant pads (to GND)	-0.3	+5.5	V
Voltage on standard pads (to GND)	-0.3	+3.6	V
Storage temperature	-40	+125	°C

Table 1: Absolute maximum ratings

Electrical and environmental characteristics

PARAMETER	MIN	TYP	MAX	UNIT
Supply voltage	9	24	28	V
Quiescent supply current (1)	—	20	35	mA
CAN bit rate (classic)	—	—	1	Mbit/s
CAN FD data bit rate	—	—	5	Mbit/s
Operating temperature	-40	—	+125	°C

Table 2: Electrical and environmental characteristics

(1) Carrier only, with no daughterboard fitted. The total node current depends on the populated sensor boards.

5. Connectors and pin-out

Nexor exposes one wired system connector (J1) and one debug pad pattern (J2). The sensor daughterboards do not use a connector: they solder onto the castellated pads of the TOP and BOTTOM faces.

Image to be added

`nexor_connectors.png`

Figure 2: Connectors and pad layout

PIN	SIGNAL	WIRE	RANGE	DESCRIPTION
1	CAN1_L	● Blue	0 – 5 V	CAN bus low (ISO 11898-2, FD-capable)
2	CAN1_H	○ White	0 – 5 V	CAN bus high (ISO 11898-2, FD-capable)
3	GND	● Black	0 V (ref.)	Board return
4	VDD	● Red	9 – 28 V	Board supply (24 V nom.)

Table 3: J1 – system connector (4-pin Molex PicoBlade, MPN 53261-0471)

6. System architecture

Nexor brings together the parts that every product in the line shares: the power supply, the processing core and the CAN interface. Each sensor is added as a daughterboard on one face of the carrier, so a node can carry one sensor per face. The node powers itself and the mounted sensors from a single supply input and exchanges data with the rest of the system over the CAN bus.

Each sensor board stores its own identification data, so the node automatically recognises which sensor is fitted on each face — even when two identical boards are used — and applies the matching calibration. The node also monitors its own supply and temperature for diagnostics.

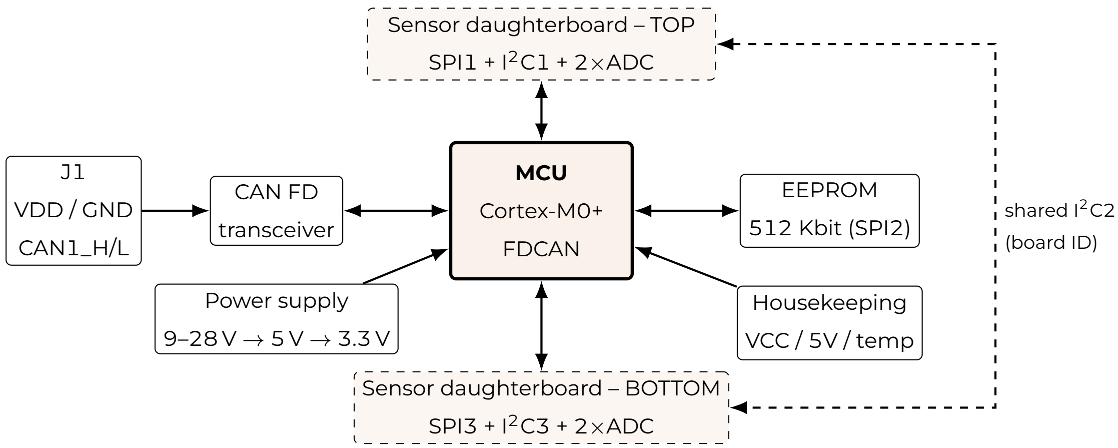

Figure 3: System block diagram. Dashed blocks are the field-replaceable sensor daughterboards.

7. Hardware

7.1 Power supply

The board runs from a single 9–28 V DC input (24 V nominal) on the J1 connector and needs no external regulation. The supply input is protected against reverse polarity and against fast voltage transients on the line, so accidental miswiring and supply surges do not damage the board. The carrier also powers the sensor daughterboards mounted on it, so no separate sensor supply is required. Typical quiescent current is 20–35 mA across the full input range (carrier alone, without daughterboards); total consumption depends on the fitted sensors.

7.2 CAN interface

The board communicates over a single CAN bus compliant with ISO 11898-2, supporting both classic CAN and CAN FD at data rates up to 1 Mbit/s and 5 Mbit/s respectively. The CAN transceiver operates at 5 V, providing standard high-speed CAN bus levels compatible with other 5 V CAN nodes on the same bus. The bus is brought out on the J1 connector together with the supply.

7.3 Status indicators

Two LEDs on the top of the board show its state: a green LED for normal operation and a red LED for error conditions.

7.4 Connectors and mounting

External wiring uses a single 4-pin Molex PicoBlade header (J1) for supply and CAN. Two M2 mounting holes are provided. The board is shipped without enclosure; mechanical integration is the responsibility of the system integrator.

8. Firmware

This section is preliminary and will be completed in a later revision.

8.1 Architecture

TBD — RTOS task partition, layered model and inter-task communication.

8.2 Boot and initialization

TBD — reset-to-operational sequence, time budget and safe state on failure.

8.3 Board detection and setup

TBD — reading the daughterboard ID EEPROM on each face, selecting the bus/function configuration per board code and loading calibration.

8.4 System communication

TBD — CAN protocol stack, addressing and process / configuration data exchange.

8.5 Configuration and storage

TBD — persistent configuration model in the on-board EEPROM, integrity protection and defaults.

8.6 Diagnostics and recovery

TBD — error model, watchdog strategy and field firmware update.

9. Use cases

Nexor is a platform, not a finished product: it is the shared base on which the Nexilica sensor line is built. The families below describe how the carrier is typically used.

Line core. Provide the same power, processing and CAN core to every member of a sensor family, so that only the daughterboard changes between products.

Dual-sensor node. Mount two different daughterboards, one per face, to build a single node that exposes two sensing functions on one CAN connection.

Distributed sensing. Deploy many carriers on a CAN FD backbone, each publishing its sensor data and self-monitoring information.

Identified endpoints. Use the per-daughterboard ID EEPROM so the firmware auto-detects the mounted boards and applies the correct calibration in the field.

Development platform. Prototype a new sensor on a stable, pre-validated core, reusing the existing power, CAN and firmware base.

10. Mechanical dimensions

The carrier is a 6-layer PCB measuring 25 $\times$ 35 mm, 1.6 mm thick, with two M2 mounting holes.

Image to be added

`nexor_mechanical.png`

Figure 4: Board outline and overall dimensions