Next-Generation LVI400 Series

Low-Voltage Inverter



Universal AC Motor Controller

The **Dana TM4 LVI400 Inverter Series** is designed to control a wide range of synchronous and asynchronous motors used in Battery Electric Vehicles (BEVs). Advanced motor control, based on **Field-Oriented Control (FOC)** algorithms, ensures optimal efficiency, dynamic response, and overall drive system performance across diverse vehicle applications.

Dedicated Functionalities and Functional Safety

The LVI400 supports multiple software configurations to meet different application requirements:

- **ACTUATOR mode:** controlled by an external Vehicle Control Unit (VCU)
- **PRIME mode:** standalone operation with integrated vehicle control features, including Single Drive, Dual Drive, Working Function, and coordinated operation through a CAN network

The inverters have been developed and validated to support vehicle safety functions up to **Performance Level d (PL d)**, in compliance with ISO 13849 and EN 1175.

A dedicated **Safety Manual** provides detailed requirements and guidelines for the correct integration of the LVI400 into safety-related systems, helping OEMs streamline certification and application development.

Vehicle Application Development

Configuration, tuning, and service operations are supported by the **One Dana Service Tool (ODST)**, offering:

- Secure access through UDS-based authentication and access control mechanisms
- Firmware flashing and software updates
- Complete parameter configuration and motor tuning
- Device diagnostics, troubleshooting, and fault code management
- Real-time monitoring and data logging of key system variables

Ideal for Forklifts, Automated Guided Vehicles, Aerial Work Platforms, Mini Excavators, Compact Wheel Loaders, Telehandlers, Turfs, Quads, and Motorcycles



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Features

Open Platform Technology

- Seamless integration with industry-standard CAN-based protocols: CANopen, J1939, and UDS.
- Reduced wiring complexity and simplified system commissioning for OEMs and machine manufacturers.

RTOS-based Firmware Platform

- High-performance Infineon AURIX™ multicore microcontroller.
- Real-time operating system (RTOS) architecture ensuring high responsiveness, deterministic behavior, and reliable operation under demanding duty cycles.
- Fast control-loop execution for enhanced performance and operational safety.

Advanced Motor Control Performance

- Multi-motor control capability supporting ASY, SYR, SRI, and IPM motor technologies.
- Advanced Field-Oriented Control (FOC) algorithms delivering optimal performance across the full speed and torque range, while minimizing motor losses.
- Extensive motor parameterization enabling integration with a wide variety of third-party motors.

Quality, Reliability, and Efficiency

- Multiple standard cooling options (Flat, Finned, and Liquid Cooled) simplify inverter integration.
- Best-in-class power density enabled by DBC (Direct Bonded Copper) Dana TM4 Power Modules with patented MOSFET multilayer technology.
- 20% current boost for 10 seconds, providing additional torque during demanding operating conditions such as hill climbing, obstacle negotiation, or peak-load events.
- Robust design for harsh environments: IP69k protection rating, 10g vibration resistance, 50g shock resistance, 1m free-fall capability.

Cybersecurity, Safety, and Protection

- Designed to support compliance with applicable Cyber Resilience Act (CRA) cybersecurity requirements.
- Multicore microcontroller and ISO 13849 Category 2 architecture support vehicle safety functions up to Performance Level d (PL d).
- 10+ validated Safety Functions available, depending on software configuration, including Safe Torque Off (STO) and Safe Stop 1 (SS1).
- All Safety Functions are fully validated and documented in the Safety Manual, including safety metrics, safe-state definition, and integration requirements.
- Comprehensive protection features, including ESD protection, battery polarity inversion protection, short-to-B- and short-to-B+ protection on I/O circuits, and wire-off detection.
- Intelligent performance derating based on inverter and motor temperature to maximize reliability and system protection.

Interface specifications	
Low-Power Connector	AMPSEAL 35 pin
Key Switch Input	1 (10A max)
Digital Inputs	8
Analog Inputs	6 (0..5V)
Driver Outputs	4 (3.4A 2s, up to 6.9A 2s for main contactor)
Digital Outputs	2 (3.4A 2s)
Motor Temperature Sensor	1 (configurable)
Motor Encoder	1 (A/B or sin/cos)
Supply Outputs	2 (5V) 1 (5V/12V, programmable)
CAN Interface	1
Status and Fault	2 built-in LEDs (green + bicolor yellow-red)
Power Line Connectors	M6 (LVI420), M8 (LVI430)
Liquid-Cooled Connectors	G 3/8" DIN ISO 228 (BSP) max depth 11 mm

Inverter performance and compliance	
Efficiency	Min 98% at nominal load
Output Frequency	0..599Hz
Storage Temperature	–40°C to +95°C (96h)
Operating Ambient Temperature	–40°C to +65°C
Thermal Derating/Cutback	T ≤ 100°C no derating 100°C < T ≤ 115°C linear cutback 115°C < T < 120°C cutback 50% 120°C ≤ T cutoff
IP Protection	IP66, IP67, IP69K
EMC/ESD Compliance	EN 12895:2019 EN 13766-1:2018, -2:2018 UNECE R10
Functional Safety	ISO 13849-1:2023, -2:2012 EN 1175:2025 ISO 19014-1:2018, -2:2022, -3:2018, -4:2020
Ruggedness	Vibration 10g (IEC 60068-2-64) Shock 50g (IEC 60068-2-27) Free-fall 1m (IEC 60068-2-31)
Certifications and Compliance	UL 583 (USA) - cUL 583 (Canada) UNECE R10 E-mark

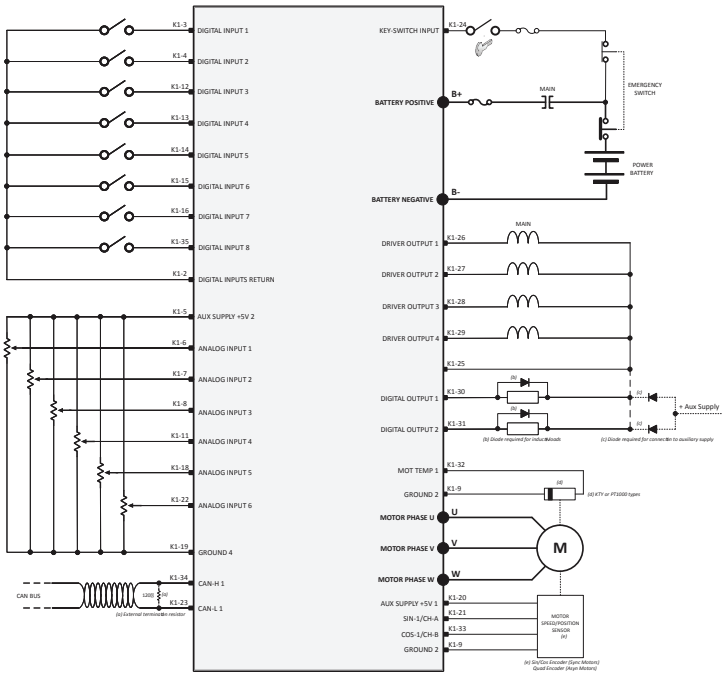


Dana TM4 LVI400 Series

Battery Supply (BS) Model Chart

- Nominal voltage ranging from 24V to 80V
- Key Switch Input supplied by the power battery

Description (*)	Nominal Voltage Range (V)	Nominal Current S2-2min (Arms)	Boost Curr. 10sec (Arms)	Cont. Current (% of Nominal Current)
LVI420-SM-24/48-300-XX-BS	24..48	300	360	C – 50%*** Av – 50% W – 65%
LVI420-SM-24/48-400-XX-BS		400	480	
LVI420-SM-24/48-500-XX-BS		500	600	
LVI430-SM-24/48-600-XX-BS		600	720	
LVI430-SM-24/48-800-XX-BS		800	960	
LVI420-SM-48/80-300-XX-BS	48..80	300	360	
LVI420-SM-48/80-400-XX-BS		400	480	
LVI430-SM-48/80-600-XX-BS		600	720	
LVI430-SM-48/80-800-XX-BS		800	960	

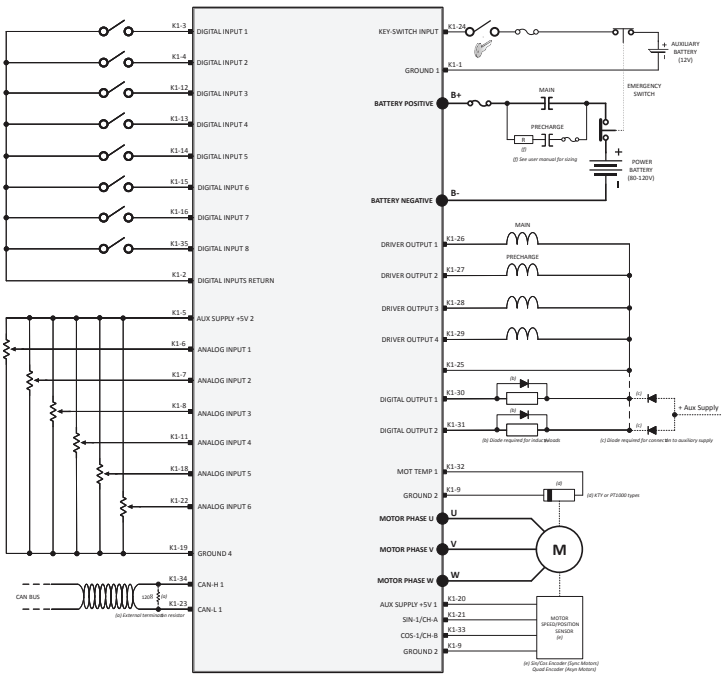


Non-Isolated Version

Auxiliary Supply (AS) Model Chart

- Nominal voltage ranging from 80V to 120V
- Key Switch Input supplied by an external +12V supply (galvanically isolated logic)

Description (*)	Nominal Voltage Range (V)	Nominal Current S2-2min (Arms)	Boost Curr. 10sec (Arms)	Cont. Current (% of Nominal Current)
LVI420-SM-80/100-250-XX-AS	80..100	250	300	C – 50%*** Av – 50% W – 65%
LVI420-SM-80/100-375-XX-AS		375	450	
LVI430-SM-80/100-500-XX-AS		500	600	
LVI430-SM-80/100-750-XX-AS		750	900	
LVI420-SM-100/120-250-XX-AS	100..120	250	300	
LVI430-SM-100/120-500-XX-AS		500	600	



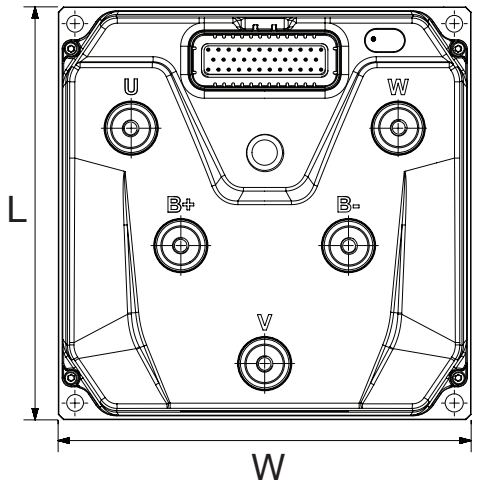
Isolated Version

* XX = C/Av/W according to the heat sink type selected
** Following integration manual prescriptions
*** C-plate continuous current depends heavily on the application; power-loss data available on request

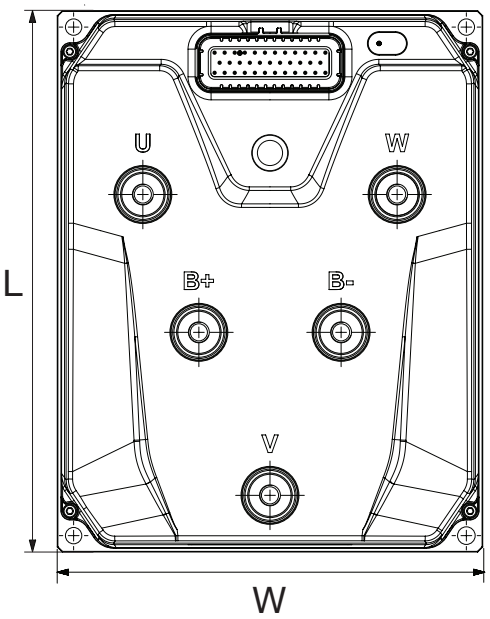
Dana TM4 LVI400 Series

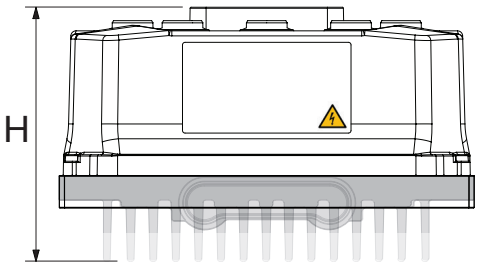
Dimensions

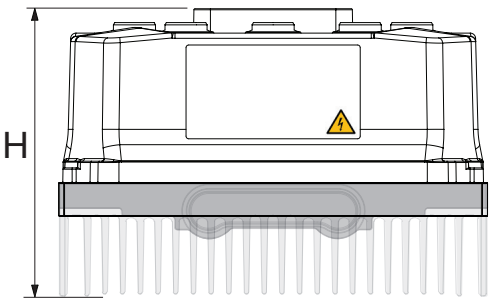
LVI420



LVI430





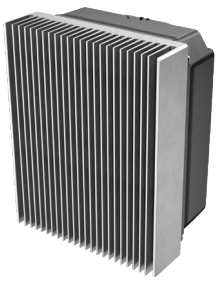


Baseplate Options

C
Conduction plate



Av
Air-Cooled vertical



W
Water-Cooled



Cooling Type	LVI420-C Plate	LVI420-Av Air-Cooled	LVI420-W Water-Cooled	LVI430-C Plate	LVI430-Av Air-Cooled	LVI430-W Water-Cooled
W (mm)	160	170	169	169	169	169
L (mm)	160	160	165	215	215	215
H (mm)	77	100	87	83	110	87
Weight (kg)	2.15	2.6	2.5	3.6	4.0	3.3
Power Connections	M6	M6	M6	M8	M8	M8

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Application Policy Capacity ratings, features, and specifications vary depending upon the model and type of service. Application approvals must be obtained from Dana TM4; contact your representative for application approval. We reserve the right to change or modify our product specifications, configurations, or dimensions at any time without notice.

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