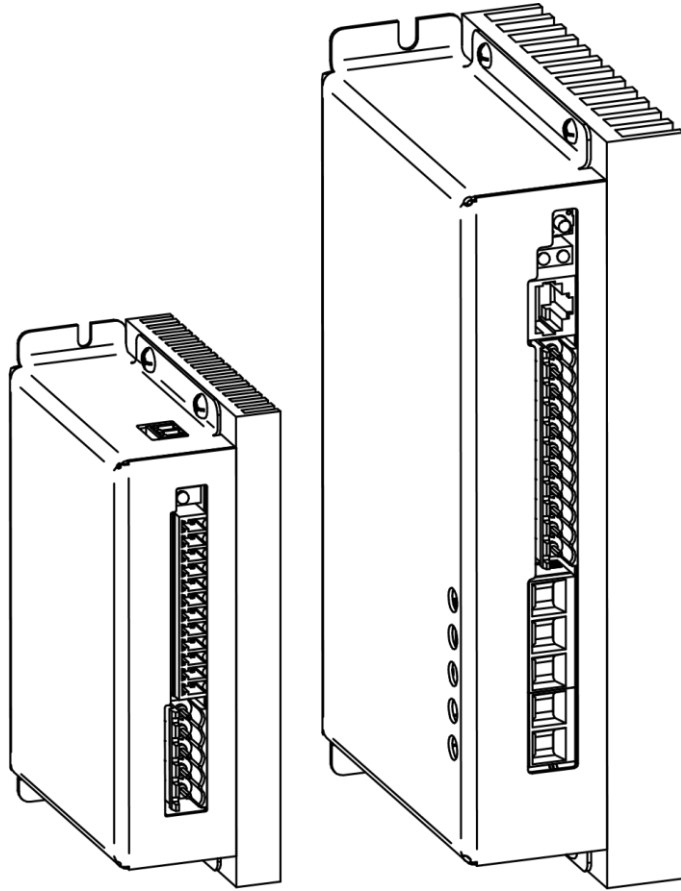




**USER MANUAL
FOR LVT20 SERIES**



CONTENTS

1. INTRODUCTION.....	2
2. SAFETY AND WARNING.....	2
3. DIMENSION AND INSTALLATION.....	3
4. SPECIFICATIONS AND FEATURES.....	5
5. STANDARD CONNECTION DIAGRAM.....	6
6. PIN ASSIGNMENT AND FUNCTIONS.....	7
7. INTERNAL FAULT INDICATION.....	12
8. COMMISSIONING.....	13

1. INTRODUCTION

MECON LVT20 series of controllers are designed to drive brushless DC motors using hall sensor feedback. Open loop as well as closed loop operation of BLDC motors up to 3000W is possible.

This manual describes all the functionalities of the controller and also describes about various operating modes and fault conditions.

2. SAFETY AND WARNING

Please read this manual carefully before using this product. Operating the controller in conditions other than specified, may permanently damage the controller.

Only specialists, having appropriate skill and training in working with motors and controllers, may install and commission the controller.

NOTE

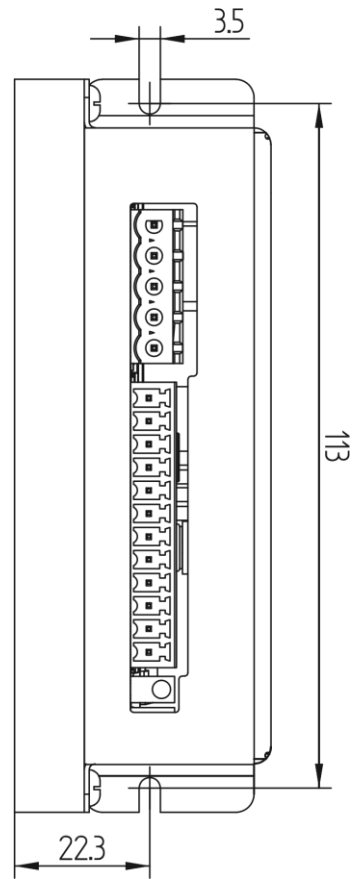
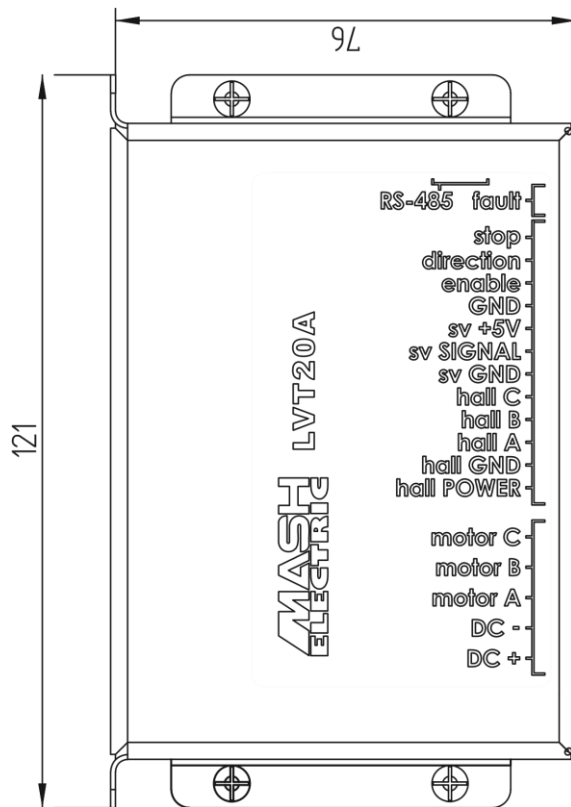
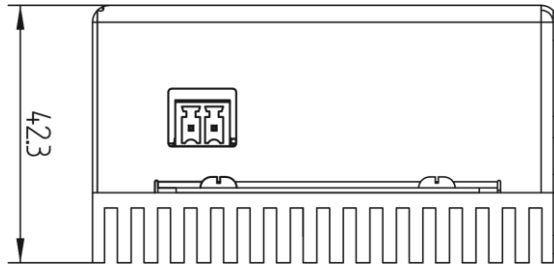
- Do not wire the controller while the power is ON.
- Changing the wires while operation may damage the controller. After switching OFF, wait until the capacitors have discharged.
- There is no polarity-reversal protection in the controller, polarity-reversal may lead to short-circuit.
- Installing a proper fuse in the supply line is highly recommended.
- This controller contains components that are sensitive to human body electrostatic.
- Supply wires, motor wires and all control wires should be firmly connected.

Operating conditions:

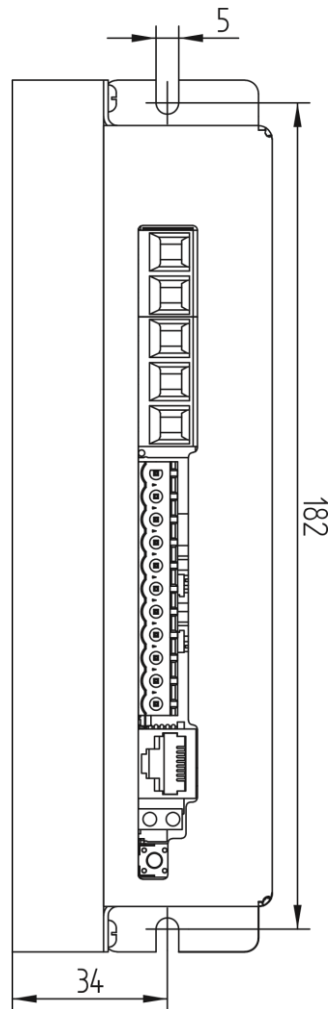
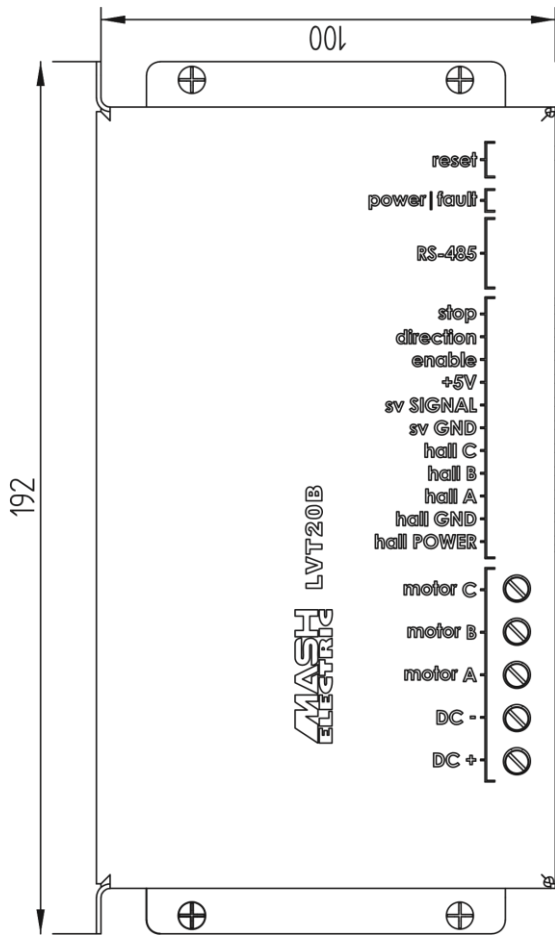
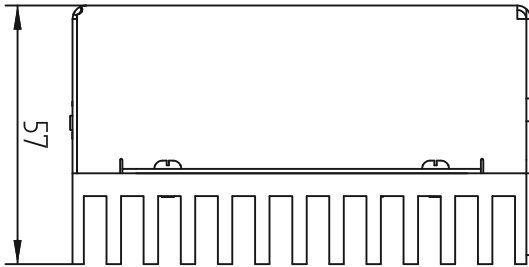
- Ambient operating temperature: (-5 to 40°C).
- Protection class: IP20.

3. DIMENSION AND INSTALLATION

LVT20A Controller dimensions:



LVT20B Controller dimensions:

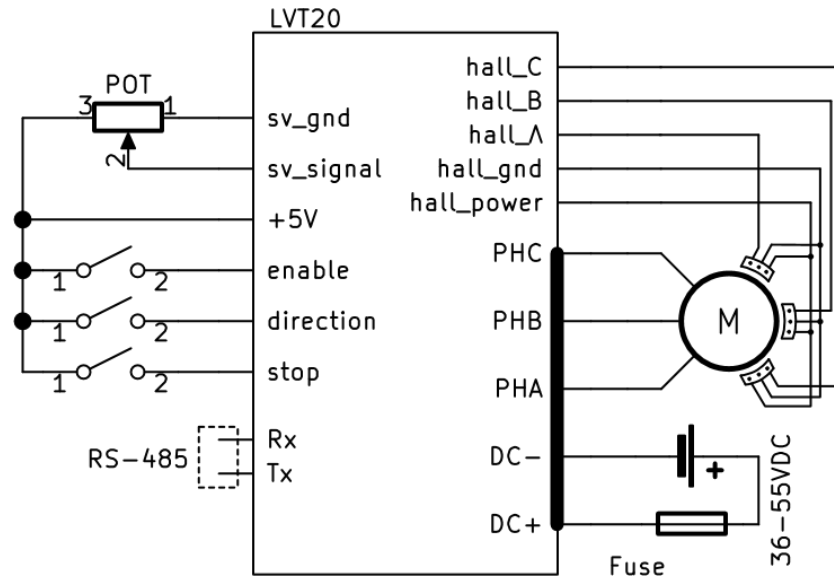


4. SPECIFICATIONS AND FEATURES

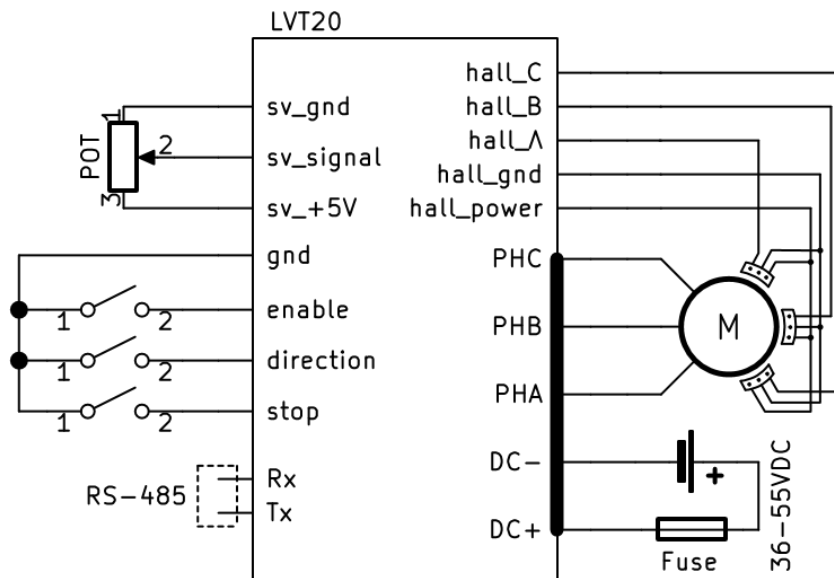
ELECTRICAL DATA	VALUE
Operating voltage.	36 VDC to 55 VDC.
Rated current (cont.).	LVT20A: 8A.
	LVT20B: 15A.
	LVT20C: 31A.
	LVT20D: 62A.
Overload capacity.	150% (60s).
Operating temperature.	Up to 80°C (heatsink).
Operating modes.	Open loop, Closed loop PID control.
Feedback.	Hall sensors.
Communication.	RS-485 Interface.
Digital inputs.	Enable, Direction, Stop.
Analog / PWM input.	Speed (0 - 5V) / (1 - 10kHz).
PWM frequency.	16 kHz.
RPM range.	0 – 20000 RPM.
Protections.	Over voltage, Under voltage, Over current, Over temperature, Motor stall protection.

5. STANDARD CONNECTION DIAGRAM

Connection diagram for LVT20B, LVT20C, LVT20D:

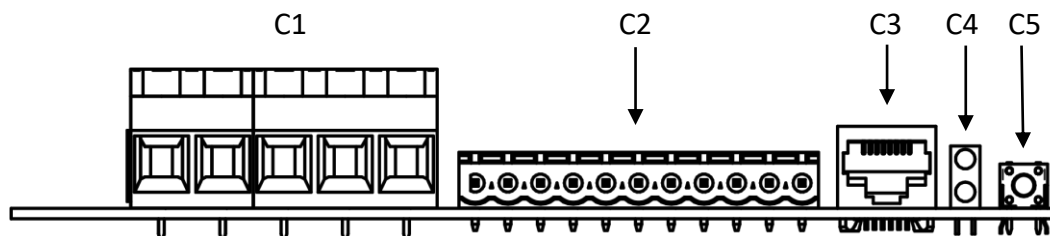


Connection diagram for LVT20A:



6. PIN ASSIGNMENT AND FUNCTIONS

LVT20B pin assignment:



Connector C1	Function
Pin1 DC +	Positive supply voltage (48 VDC).
Pin2 DC –	Negative supply voltage (GND).
Pin3 PHA	Motor phase A.
Pin4 PHB	Motor phase B.
Pin5 PHC	Motor phase C.

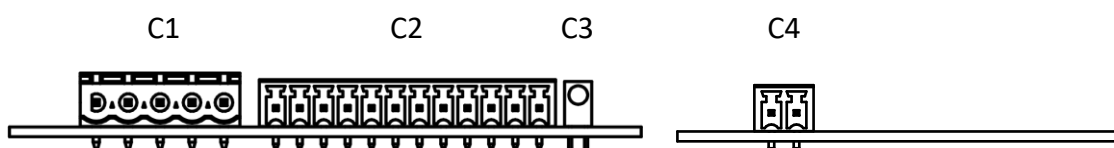
Connector C2	Function
Pin1 Vcc	Positive supply voltage for hall sensors (+5V).
Pin2 GND	Hall sensor GND.
Pin3 hall A	Motor Hall A input signal (+5V).
Pin4 hall B	Motor Hall B input signal (+5V).
Pin5 hall C	Motor Hall C input signal (+5V).
Pin6 sv GND	External potentiometer GND.
Pin7 sv SIGNAL	Analog input signal to control the rotational speed of the motor. Potentiometer (0 – 5V) PWM signal (1 – 10kHz).

Pin8 +5V	Common supply for external potentiometer, enable, direction and stop.
Pin9 enable	Logic signal to enable or disable the motor rotation. Logic 'low' : Motor stops rotating and decelerate as per the set deceleration. Logic 'high' : Motor starts to rotate as per the set speed and will accelerate as per the set acceleration.
Pin10 direction	Sets the direction of the motor. Changing the direction of the motor while in rotation will decelerate the motor till zero and accelerate the motor in other direction as per the set acceleration and deceleration. Logic 'low' : CW. Logic 'high' : CCW.
Pin11 stop	Stops the rotation of the motor without deceleration. Logic 'low' : Motor starts to rotate as per the set speed and will accelerate as per the set acceleration. Logic 'high' : Motor stops

Connector C3	Function
Pin1 +5V	Positive supply (for external mash electric keypad).
Pin2 +5V	
Pin3 n.c	--
Pin4 RS-485	RS-485 B terminal.
Pin5 RS-485	RS-485 A terminal.
Pin6 n.c	--
Pin7 GND	
Pin8 GND	GND (for external mash electric keypad).

LED C4	Function
GREEN LED	Indicates the power status of the controller.
RED LED	Indicates the fault conditions of the controller.

SWITCH C5	Function
RESET	<p>Resets the controller in case of 'fault latch' condition. Do not attempt to reset the controller in normal condition or while the controller is in operation.</p> <p>While resetting the controller in case of any fault condition, make sure that the speed reference is set to zero.</p>

LVT20A pin assignment:

Connector C1	Function
Pin1 DC +	Positive supply voltage (48 VDC).
Pin2 DC –	Negative supply voltage (GND).
Pin3 PHA	Motor phase A.
Pin4 PHB	Motor phase B.
Pin5 PHC	Motor phase C.

Connector C2	Function
Pin1 Vcc	Positive supply voltage for hall sensors (+5V).
Pin2 GND	Hall sensor GND.
Pin3 hall A	Motor Hall A input signal (+5V).
Pin4 hall B	Motor Hall B input signal (+5V).
Pin5 hall C	Motor Hall C input signal (+5V).
Pin6 sv GND	External potentiometer GND.
Pin7 sv SIGNAL	Analog input signal to control the rotational speed of the motor. Potentiometer (0 – 5V) PWM signal (1 – 10kHz).
Pin8 sv +5V	Supply for external potentiometer.
Pin9 GND	Common GND for enable, direction and stop.

Pin10 enable	<p>Logic signal to enable or disable the motor rotation.</p> <p>Logic 'high': Motor stops rotating and decelerate as per the set deceleration.</p> <p>Logic 'low': Motor starts to rotate as per the set speed and will accelerate as per the set acceleration.</p>
Pin11 direction	<p>Sets the direction of the motor. Changing the direction of the motor while in rotation will decelerate the motor till zero and accelerate the motor in other direction as per the set acceleration and deceleration.</p> <p>Logic 'high': CW.</p> <p>Logic 'low': CCW.</p>
Pin12 stop	<p>Stops the rotation of the motor without deceleration.</p> <p>Logic 'high': Motor starts to rotate as per the set speed and will accelerate as per the set acceleration.</p> <p>Logic 'low': Motor stops</p>

LED C3	Function
RED LED	Indicates the fault conditions of the controller.

Connector C4	Function
Pin1 RS-485	RS-485 B terminal.
Pin2 RS-485	RS-485 A terminal.

7. INTERNAL FAULT INDICATION

LVT20 series of controller comes with an in-built fault led, which indicates different types of fault conditions. Depending upon the fault, the led flashes in a particular pattern to indicate the specific type of fault.

Controller internal fault flashing:



Hall sensor fault flashing:



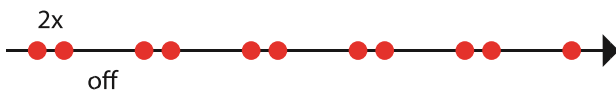
Over-Voltage fault flashing:



Under-Voltage fault flashing:



Motor stall fault flashing:



Over-Current/ Over-temperature fault flashing:



8. COMMISSIONING

This chapter describes about the hook-up and operating procedures of the controller and also describes about various parameters which can be configured to make the controller ready for operation. Controller parameters can be configured via RS-485 communication.

MEDEval software is used to configure the parameters of the controller. For further information regarding the software refer to *MEDEval QUICK GUIDE* document.

LVT20 series controller basic parameters:

No.	Function	Range	Factory Default
P1	Motor voltage	24 - 48	48
P2	Motor current	0 - 8A 0 - 15A 0 - 31A 0 - 62A	LVT20A – 8A LVT20B – 15A LVT20C – 31A LVT20D – 62A
P3	Motor RPM	0 - 20000	3000
P4	Motor poles	2 - 98	8
P5	Acceleration time	0 - 20s	2s
P6	Deceleration time	0 - 20s	2s
P7	Motor overload percent	100 - 150	100
P8	Control mode	0 1	0
P9	PID proportional gain	0.1 - 100	0.5
P10	PID integral time	0.1 - 100	5
P11	PID derivative time	0.01 - 10	0
P12	PID output upper limit	0 - 100	100
P13	PID output lower limit	0 – 100	0
P14	Minimum speed reference	0 - 100	0
P15	Maximum speed reference	0 - 100	100
P16	Display run parameter [note]	0 - 3	0

[note] : This parameter is only applicable for keypad operation.

Connecting the motor for the first time.

For connecting the motor, check the motors rated specification and accordingly set the controller parameters via RS-485 communication using MEDEval software. After setting the parameters, suitable to run the motor, connect the motor hall sensor wires and main DC supply wires to the controller (For now, do not connect the phase wires). Turn on the controller supply and rotate the motor shaft by hand in **clockwise direction only**. If the fault led turns ON, the hall wires are connected correctly (This feature will only work, when the enable input is not active. As soon as the drive is enabled, this feature will be deactivated). Or else, reset the controller and change the hall wire positions until the hall sensors are connected correctly and the fault led turns ON. Once done, reset the controller and connect the motor phase wires and check the rotation of the motor. If the phases are connected correctly, the motor should run smoothly in both the directions with minimum no-load current.

NOTE

- Motor phases (A,B,C) and hall sensors (A,B,C) and their respective colour codes will be specified in the motor manufacturers datasheet.
- As specified in the motors data, connect motor phase A,B,C and hall A,B,C wires with respect to each other in proper sequence.
- Motor phase wires should be connected separately from hall wires and other control wires to prevent noise interference.

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