

Product Description

CHERRY_HPT Motor Driver is one of the members of CHERRY family of Permanent Magnet Brushed DC(PMDC) motor drivers. CHERRY_HPT Enjoys smart Sensor-less Torque control of PMDC motors up to the power range of 1300W.

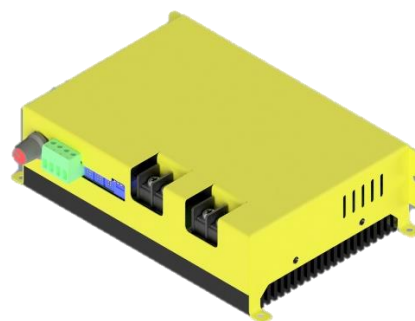
The sensor-less Torque control is done in an advanced closed-loop manner with complete automatic Motor parameter identification and self-tuning done by CHERRY_HPT without any user interference required. This novel feature makes CHERRY_HPT extremely easy to use and simplifies the system design by eliminating the need to any external mechanical sensors such as Encoders, Hall sensors and so on.

Power Range

Supply Voltage Range	12 – 48 VDC
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Peak Current	60A
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Continues Current	30A
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Features

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| <ul style="list-style-type: none"> • Extremely easy to use • Four Quadrant Regenerative Operation • Configurable Current Limits • Reverse Polarity Protection • Over Current Protection • Output Short Circuit Protection | <ul style="list-style-type: none"> • Closed-loop Torque Control • Open-loop speed control • Automatic Torque Loop Tuner • Automatic Identifier of Motor Parameters • Tunable Acceleration/ Deceleration • 32-bit Processing Unit |
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MODES OF OPERATION

- Sensor-less Closed-Loop Torque Control
- Open-loop Speed Control

COMMAND SOURCE

- 0-10V Analogue Speed Input
- 10kHz PWM Speed Input
- External Potentiometer Input
- Manual Speed Potentiometer Mounted on the Driver
- Direction
- Current Limit
- Motor Identification
- Acceleration and Deceleration

Applications

- Industrial Automation
- Traction units and vehicles
- Tracking, Pan & Tilt systems
- Automatic Guided Vehicles (AGV)
- Robotics
- Electric Vehicles

CHERRY_HPT PMDC Driver Datasheet

POWER Specifications of CHERRY_XPT			
Description	Units	CHERRY_HPT CH048060SXXNANDXXXT	CHERRY_LPT CH048030SXXNANDXXXT
DC Supply Voltage Range	VDC	12-48	12-48
DC Bus Over Voltage Limit	VDC	60	60
DC Bus Under Voltage Limit	VDC	12	12
Maximum Peak Output Current	A	60	30
Maximum Continuous Output Current	A	30	15
Maximum Continuous Output Power	W	1331	665
Maximum Power Dissipation at Continuous Current	W	69	35
Internal Bus Capacitance	μF	6600	6600
Minimum Load Inductance	μH	50	50
Switching Frequency	kHz	20	30
Maximum Output PWM Duty Cycle	%	95	95

Control Specifications		
Description	Units	Value
Command Sources	-	0-10V Analogue, PWM, Direction, Internal Potentiometer, External Potentiometer
Modes of Operation	-	Closed loop sensor-less torque control, Open-loop speed
Motors Supported	-	Permanent magnet DC motors (PMDC)
Hardware Protection	-	Reverser Polarity, over-current, output short-circuit
Current Loop Sample Time	μs	100
Velocity Estimator Sample Time	μs	100
Velocity Loop Controller sample Time	μs	100

Mechanical Specifications		
Description	Units	Value
Size (H x W x D)	mm	52 × 190×121
Weight	g	1500
Form Factor	-	Panel Mount, Wall Mount
IP Rating	-	
COMMAND Connector	-	4-pin, 5.08 mm spaced, enclosed, screw lock header
SETTINGS Piano Switch	-	3-pin, Piano switch
POWER Connector	-	2-pin, 9.50 mm spaced, screw lock header
SUPPLY Connector	-	2-pin, 9.50 mm spaced, screw lock header

Thermal Specifications		
Description	Units	Value
Heatsink (Base) Temperature Range	°C (°F)	0 to 65 (32 to 149)
Storage Temperature Range	°C (°F)	-40 to 85 (-40 to 185)
Cooling System	-	Natural Convection

Compliances	
Type	Details
ROHS	Compliant with the requirements of the RoHS II Directive 2011/65/EU, restricting the use of certain substances including lead, mercury, cadmium, hexavalent chromium and halogenated flame retardants PBB and PBDE in electronic equipment
CE	Compliant with the requirements of Low Voltage Directive 2006/95/EC and of the harmonized standard EN 60204-1 on safety of electrical equipment of machines.

COMMAND Connector			
Pin	Name	Description / Notes	I/O
1	Direction	Sets the direction of rotation	I
2	Analogue	0-10V Analogue Speed/Torque Input	I
3	PWM	10kHz, 0-10v PWM Speed/Torque Input	I
3	+12V	+12V supply for External potentiometer	O
4	GND	Ground of the driver	-

SETTINGS Piano Switch			
Pin	Name	Description / Notes	I/O
1	Mode Setting	Mode selection, Open-loop Speed or Closed-loop Torque	I
2	Current Limit1	Current Limit bit 1	I
3	Current Limit2	Current Limit bit 2	I

POWER Connector			
Pin	Name	Description / Notes	I/O
1	Motor+	Motor output1	O
2	Motor-	Motor output2	O

SUPPLY Connector			
Pin	Name	Description / Notes	I/O
1	SUPPLY+	Positive port of Bus Voltage Input	I
2	SUPPLY-	Negative (Ground) port of Bus Voltage Input	I

PIANO SWITCH Functions:

Switch	Description	PIN1	PIN2	PIN3
1	Open-Loop Speed Mode of the Driver	OFF ¹	X ²	X
2	Closed-Loop Torque Mode of the Driver	ON ³	X	X
3	Current Limit - 30A	X	OFF	OFF
4	Current Limit - 20A	X	OFF	ON
5	Current Limit - 10A	X	ON	OFF
6	Current Limit - 5A	X	ON	ON

¹ - "OFF" condition is when the switch is Pushed Up

² - "ON" condition is when the switch is Pushed down

³ - "X" refers to unimportant

Theory of Operation:

CHERRY_HPT is one of the members of CHERRY family of Brushed PMDC motor drivers with an innovative approach toward controlling motors easier and simpler with the maximum efficiency and technology available.

This member of CHERRY family is specifically designed to be a Torque controller with completely automatic operation and tunings, and this operation can be controlled by a single Analogue Input existing on the driver either in form of an analogue voltage or with PWM technique.

CHERRY_HPT after Identifying the connected DC motor performs a self-tuning of parameters and will be ready immediately to fix the torque of the motor in a closed-loop fashion based on the amount of input the user applies to CHERRY's Inputs without the need to any kinds of external sensors such as Encoders and so on.

The torque control is very essential in Traction units and all the movable systems powered by DC motors specially in direct drive manner. By fixing the torque on the shaft of a DC motor you can control the final amount of exerted force into a system and subsequently having control over lots of parameters like Acceleration, Speed and so on.

CHERRY_HPT follows a special path toward simplifying the whole process of controlling motors by minimizing the user interference with providing advanced and smart solutions embedded inside, so that the only concern of its user becomes the final system design and synergy with all the other elements existing beside CHERRY.

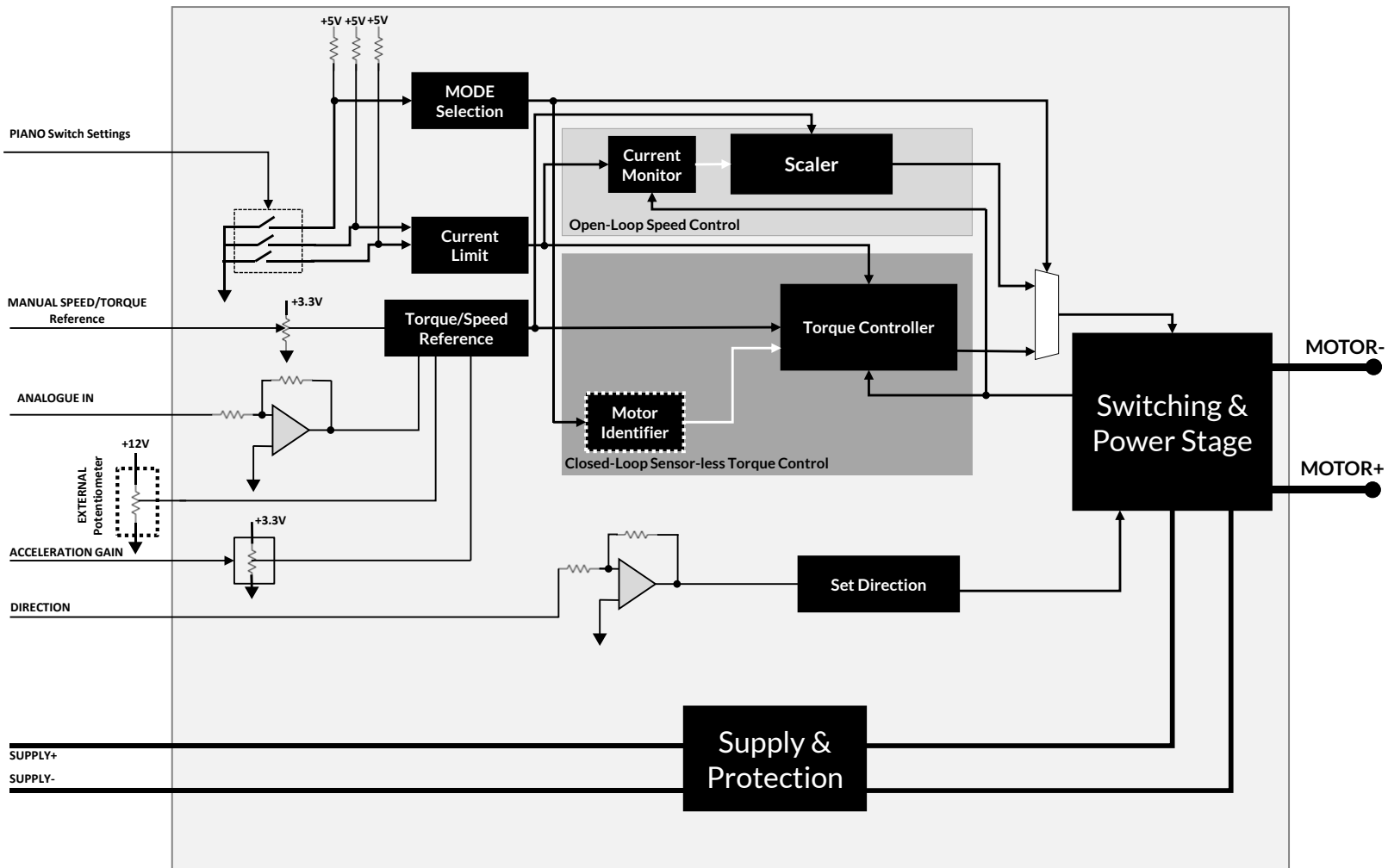
Beside all these features the users can ignore the closed-loop sensor-less Torque control mode and uses the driver in simple open-loop speed controller mode which in that case CHERRY_HPT will act as a speed controller. In both of these modes the control inputs from the users can be provided by one of the following 4 main methods:

1. Mechanical Speed/Torque Potentiometer mounted on the driver
2. 0 to +10V Analogue Input
3. 10kHz PWM input of 0-10V
4. External Potentiometer

All the mentioned inputs can be used both in open-loop or closed-loop operations with identical behavior.

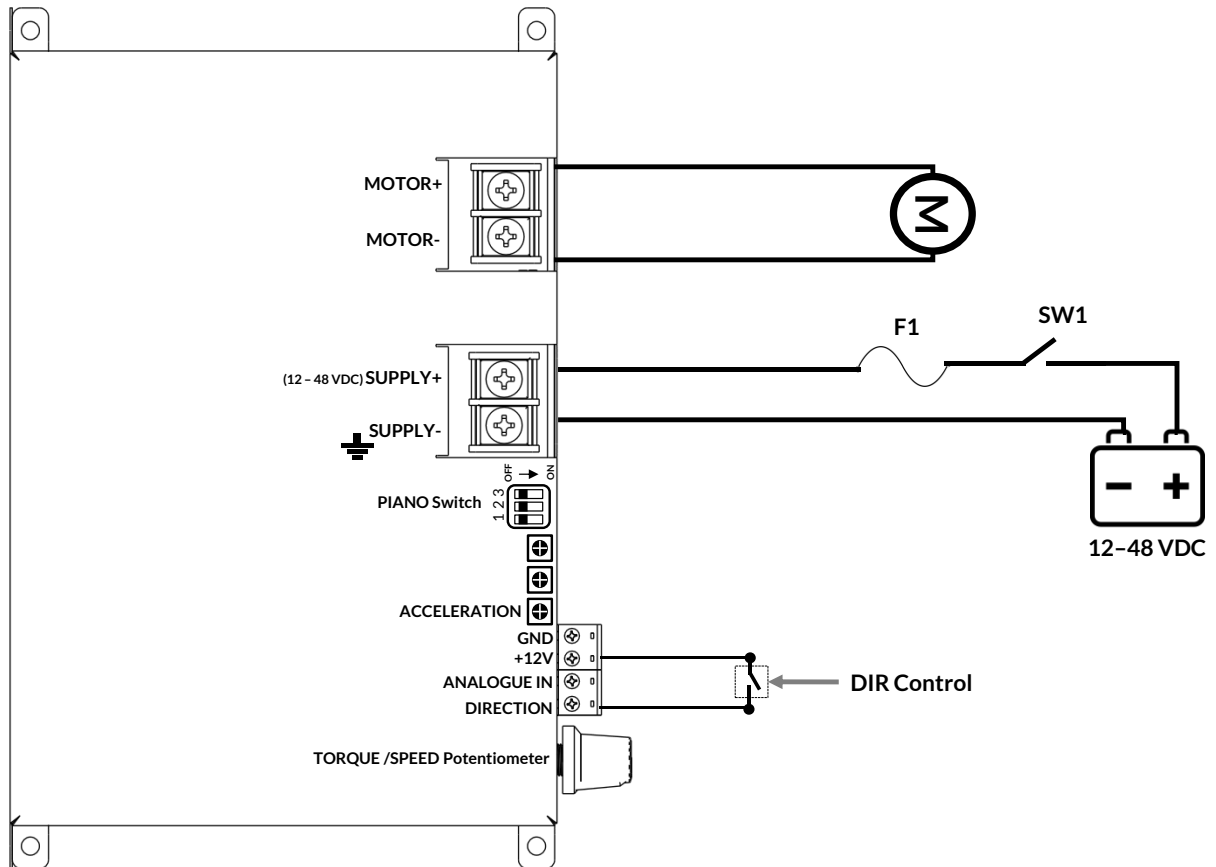
There is also a setting considered on the CHERRY_HPT which enables the users to define the maximum allowable current on the output of the Driver to the Motor starting from 5Amps up to 30Amps in 4 different steps.

Functional Block Diagram



Minimum External Wiring

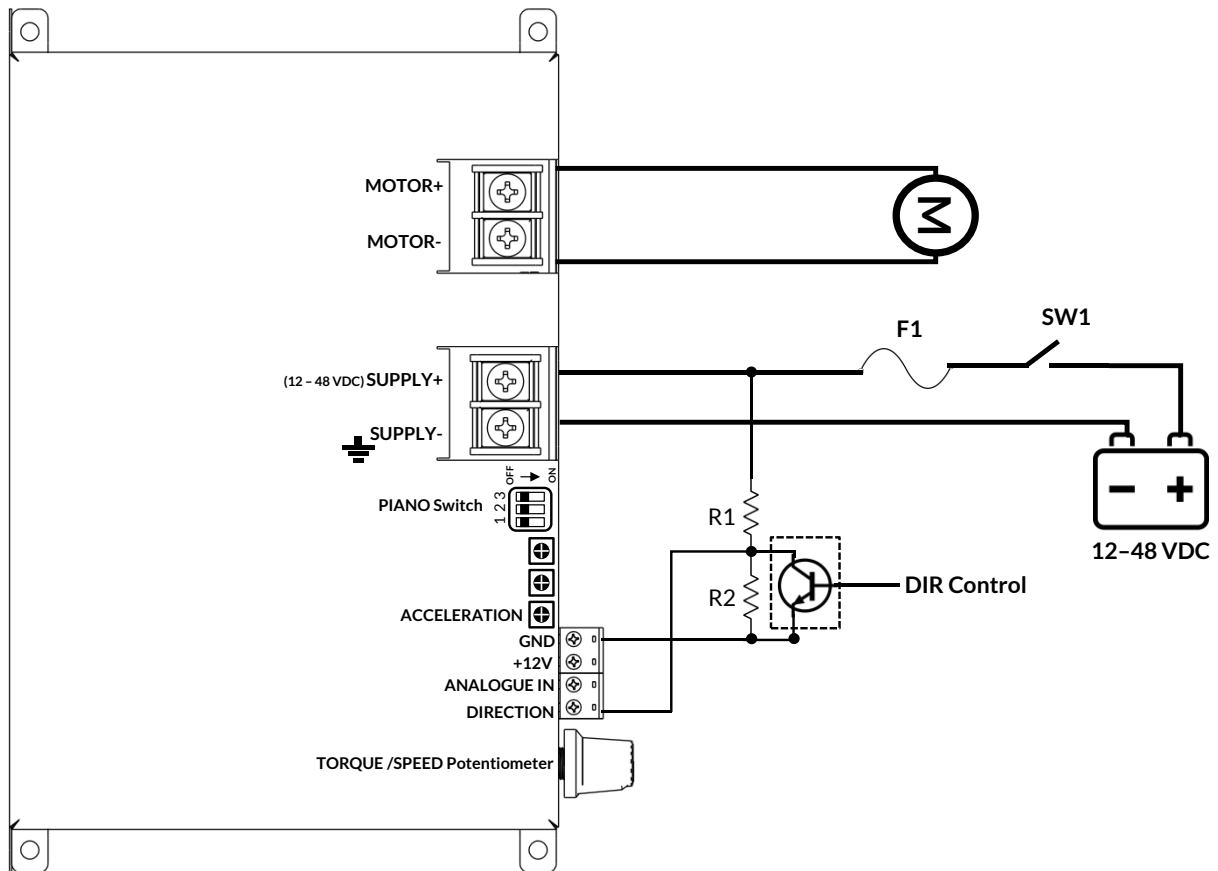
The minimum required wiring for running CHERRY_HPT is presented below. For Further information please read the CHERRY_XPT user-manual.



- "F1" is the external fuse, which can be dimensioned at maximum power as 60V, 65A
- "DIR Control", is the direction signal, by pressing the switch the Direction of the motor will be reversed

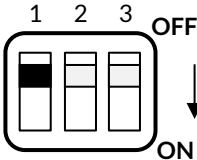
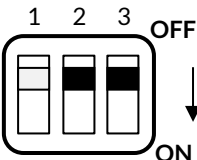
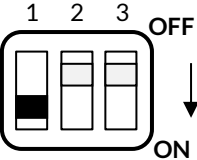
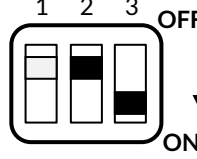
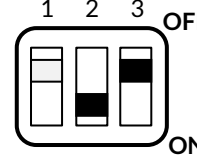
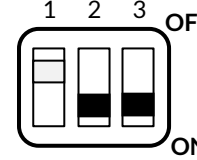
Direction Control with NPN Output

The minimum required wiring for running CHERRY_HPT with an NPN output for Direction control presented below. For Further information please read the CHERRY_XPT user-manual.



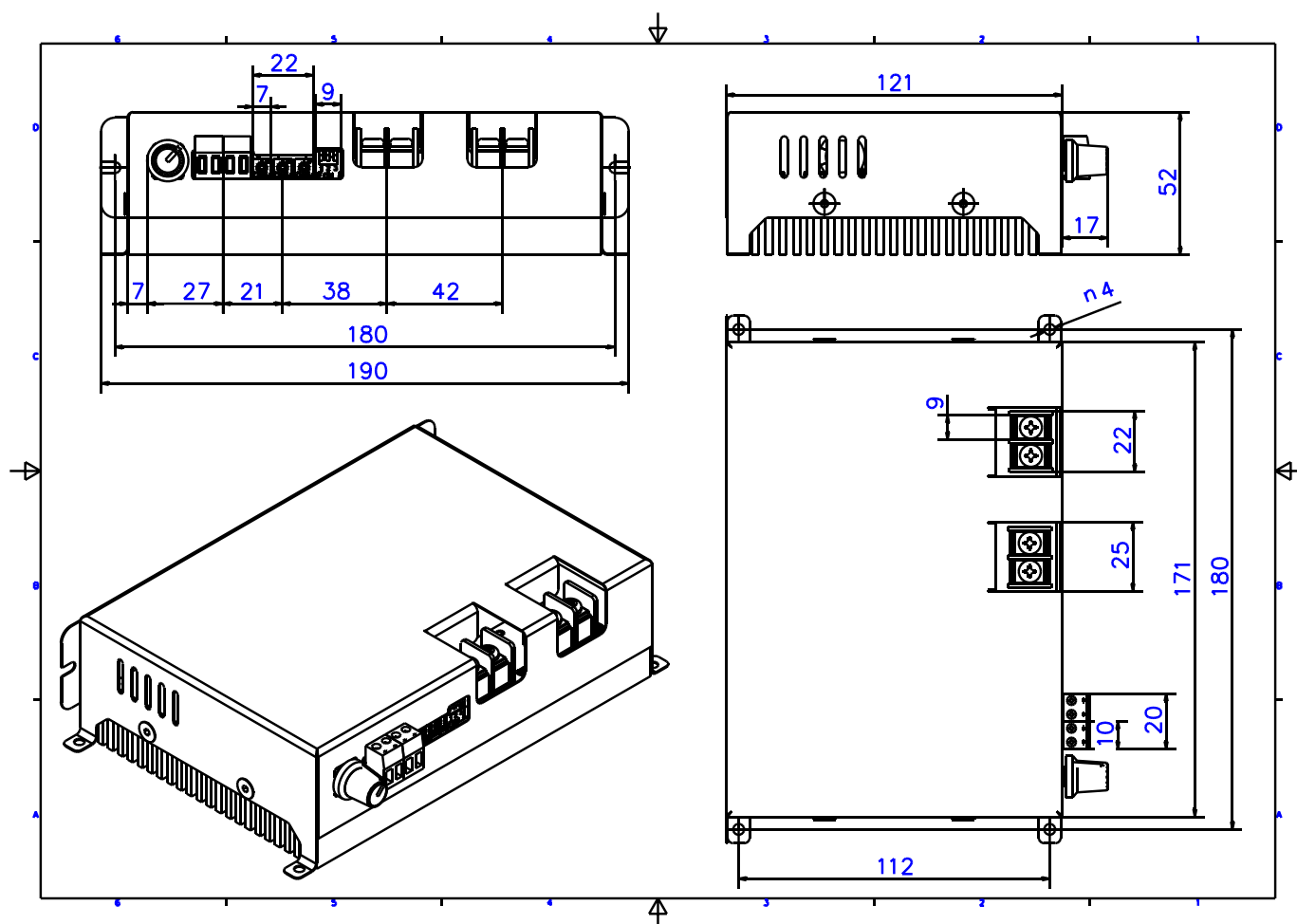
- "R1" = 15K Ω and "R2" = 10K Ω
- "DIR Control", is the direction signal coming from any digital controller or PLC
- The voltage on "DIRECTION" pin must not rise above 20V to avoid permanently damaging the driver.

PIANO Switch Settings

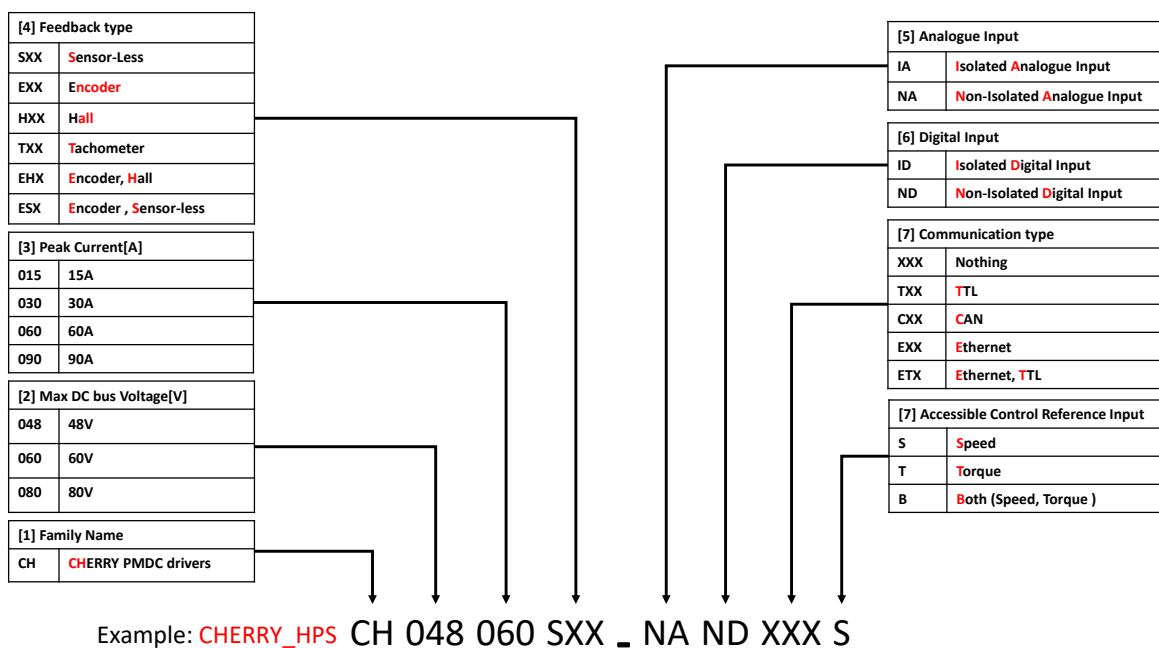
MODE Selection ⁴	CURRENT Limit
 <p>Operation Mode Current Limit1 Current Limit2</p> <p>Open-Loop Speed Mode</p>	 <p>Operation Mode Current Limit1 Current Limit2</p> <p>30A Current Limit</p>
 <p>Operation Mode Current Limit1 Current Limit2</p> <p>Closed-Loop Torque Mode</p>	 <p>Operation Mode Current Limit1 Current Limit2</p> <p>15A Current Limit</p>
	 <p>Operation Mode Current Limit1 Current Limit2</p> <p>10A Current Limit</p>
	 <p>Operation Mode Current Limit1 Current Limit2</p> <p>5A Current Limit</p>

⁴ "MODE Selection" and "CURRENT Limit" functionalities are independent from each other

Mechanical Drawings:



Product Coding and Part Numbering:



The CHERRY family products are categorized as below with their respective part numbering and main technical specifications.

CHERRY Family Products					
Description	Units	CHERRY_HPS	CHERRY_LPS	CHERRY_HPT	CHERRY_LPT
		CH048060SXXNANDXXXS	CH048030SXXNANDXXXS	CH048060SXXNANDXXXT	CH048030SXXNANDXXXT
DC Supply Voltage Range	VDC	12-48	12-48	12-48	12-48
DC Bus Over Voltage Limit	VDC	60	60	60	60
DC Bus Under Voltage Limit	VDC	12	12	12	12
Maximum Peak Output Current	A	60	30	60	30
Maximum Continuous Output Current	A	30	15	30	15
Maximum Continuous Output Power	W	1331	665	1331	665
Maximum Power Dissipation at Continuous Current	W	69	35	69	35
Internal Bus Capacitance	μF	6600	6600	6600	6600
Minimum Load Inductance	μH	50	50	50	50
Switching Frequency	kHz	20	30	20	30
Maximum Output PWM Duty Cycle	%	95	95	95	95