HOPPER
HS-2012/2024
HPRO-2012/2024

Technical Manual (Preliminary)

09/2004

CONTENTS

1 – GENERAL INFORMATION

1.1 DESCRIPTION

The Hopper HS/HPRO is a new and versatile coin and token dispenser that can be used in a wide range of different applications like vending machines and gaming.

1.2 MAIN FEATURES

1.2.1 COIN EXIT

Hopper HS/HPRO lets you choose coin/token exit position. In fact, using simple plastic components, provided as accessories with the Hopper HS/HPRO, it is possible to divert coin flux on the right side of standard exit window. Fig 1. This is particularly useful in the TWIN CONNECTION feature.

Figure 1: Single Connection

1.2.2 TWIN CONNECTION FEATURE

Diverting coin flux on the Hopper HS/HPRO's side gives the possibility to place two Hopper HS/HPRO side by side in the so called TWIN CONNECTION, Fig.2, and to obtain 4 different functioning configurations, Fig.3, suitable for different uses. Actually, it is possible to select a single coin exit in which divert coins of both Hoppers. It is also possible to choose among standard exit window, lateral exit window or both contemporaneously.

Figure 2: Twin Connection

Figure 3: Twin Connection configurations

1.2.3 ELECTRIC STIRRER

The Hopper HS/HPRO do not contain any mechanical stirrer device. Its function is replaced by a particular internal structure and by a vibrating movement that the electric motor performs periodically.

1.2.4 ERROR CODE

In case of error, Hopper's green LED (only MOD. HS-2012/2024) indicates the error code through a number of blinks. It permits to easily find out malfunction's cause. See section 3.6

1.2.5 PCB LOCATION

The PCB contains all electronic functions of the Hopper HS/HPRO and it is located in a slot on right side of the standard exit window. It is easily reachable for eventual maintenance without need to open Hopper HS/HPRO's case. It is possible to remove the PCB simply unscrewing two screws and sliding out its plastic support.

Figure 4: PCB removal

1.2.6 STANDARD ccTALK

The Hopper HPRO-2012/2024 works using the communication standard ccTalk. Its address can be easily selected via hardware through three inputs of the 12-pin standard connector. If the 10-pin connector is being used, the address must be set through the Dip-Switch. See section 4.

1.2.7 CONNECTORS LOCATION

The 12-pin connector and 10-pin connector can be in one of two possible positions. On standard exit window's opposite side (standard position) or on the same side (reverse position).

1.2.8 DEJAMMING FEATURE

If motor current rise above a preset value, see section 5.2, during normal operations, a jam is deemed to have occurred. The motor brakes, start in reverse direction and after a second brake starts again in forward direction. If the jam is not cleared, cycle is repeated.

1.3 SAFETY

Do not put hands into the Hopper HS/HPRO while functioning since it contains moving mechanical parts.
The Hopper HS/HPRO do not have to be installed/removed from base plate with power connected.

1.4 INSTALLATION

Important: Power do not have to be applied until Hopper HS/HPRO's installation has been completed.

1. Fix the base plate through apposite screws.

MOD. HS-2012/2024

2. Slide the Hopper HS into base plate until 12-pin connector is firmly inserted
3. Wire up the base plate connector to the host machine, using pins' meaning specified in section 4.2, with a wire that is capable to handle maximum currents and voltages indicated in section 5.2
4. Turn on the power.

MOD.HPRO-2012/2024

2. Slide the Hopper HPRO into base plate.
   If 12-pin connector is being used, control that the connector is firmly inserted.
3. Wire up the base plate 12-pin connector or 10-pin connector using pins' meaning specified in section 4.3, with a wire that is capable to handle maximum currents and voltages indicated in section 5.2
4. If 10-pin connector is being used, select the Hopper HPRO's address through the Dip-Switch. See section 4.4
5. Turn on the power.

2 – MECHANICAL DESCRIPTION

2.1 GENERAL DESCRIPTION

The Hopper HS/HPRO is a coin and token dispenser designed to obtain the maximum maintenance simplicity.
The lift belt used offers high reliability in coin payout even after millions of operations.

2.2 EXPLODED DIAGRAM

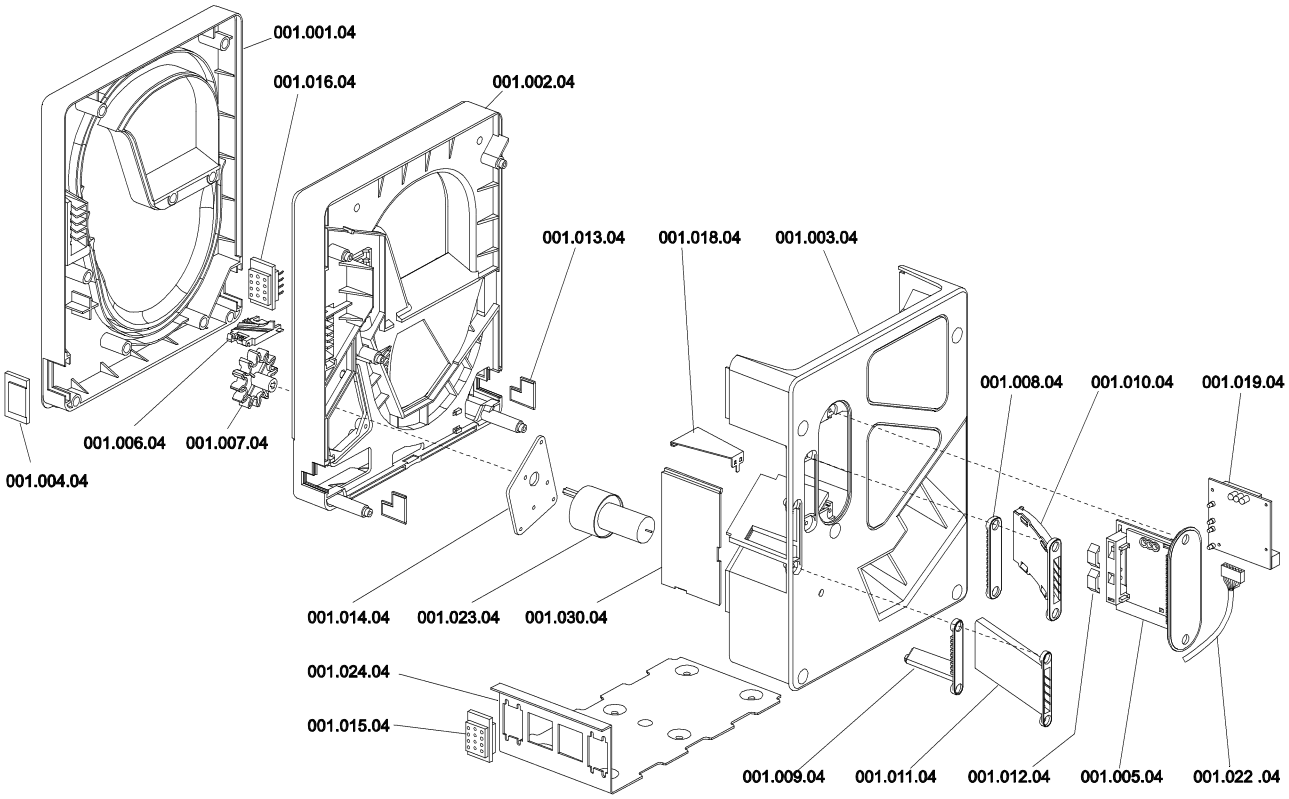


Figure 5: Exploded diagram

3 – ELECTRICAL DESCRIPTION

3.1 GENERAL DESCRIPTION

The Hopper is operated by a microcontroller that makes it work in 3 different operating modes (only Hopper HS), manage ccTalk communication protocol (only Hopper HPRO), motor's drive, optical sensors.

3.2 POWER SUPPLY

The Hopper HS's logic part is powered with 12V DC voltage and can mount a 12V DC motor (MOD. HS-2012) or a 24V DC motor (MOD. HS-2024). Just a 24V DC voltage has to be supplied to operate Hopper HPRO-2024. HPRO-2012 works with 12V DC voltage.
These voltages are provided through connectors indicated in section 4.

3.3 OPERATING MODES

MOD. HS-2012/2024

The Hopper HS can operate in 3 operating modes selected through input IN1 and IN2 as indicated in the following table and where input IN3 assumes different meanings.

Motor Drive	IN1	IN2	IN3
Direct power	High	High	-
Logic drive	Low	Low	Run Stop
Coin counting	High	Low	Count pulse
Logic reset	Low	High	Sensor test

Direct power: It is the default operating mode. It affects motor operations simply establishing or removing motor's power line (pin 9).

Logic drive: Motor control depends on the value of input IN3. A low level on IN3 starts the motor and a high level brakes it. In this case the motor power line can be left permanently connected.

Coin counting: Each received pulse on input IN3 increments an internal register, a coin is emitted and then the register is decremented.

Logic Reset: It is a reset instruction selected through input IN1 and IN2. It resets the microprocessor and stops the motor irrespective of its mode of operation. While in this mode, output sensors' functionality can be tested by lowering input IN3. A signal on output OUT1(pin3) e OUT2 (pin11) will be activated.

MOD.HPRO-2012/2024

It works through the ccTalk communication protocol, so there are not operation modes like in Hopper HS-2012/2024.

3.4 OPTICAL SENSORS

Two optical sensors are fitted in the standard coin exit window.

MOD. HS-2012/2024
Optical sensors detect coins payout; output lines OUT1 and OUT2 are activated and yellow LED goes on.
Signal coming from optical sensors is monitored from the microprocessor. If it stays active more than a second it means that probably the exit window is obstructed, so Error Out signal (pin 5) is activated. Red LED goes on, motor brakes and remains off until optical sensors are cleared. If the problem is due to a sensor failure, it is easy to check it lowering IN3 during Logic Reset instruction.

MOD.HPRO-2012/2024
Communication protocol ccTalk monitors all optical sensor functions through data line.

3.5 LED INDICATORS

MOD. HS-2012/2024
The Hopper HS has 3 LED indicators located in the coin standard exit window and give a visual indication of the Hopper HS status.
Green LED: it shows the presence of logic supply and in case of error (red LED on) communicates the error code through a number of blinks. See section 3.6
Yellow LED: it goes on during coin payout.
Red LED: An error is occurred. Its code is given by the number of blinks of green LED.

MOD.HPRO-2012/2024
It has only one green LED that blinks quickly (once every 50ms) when logic supply is present. The blink is slower when Hopper HPRO receive instructions on ccTalk data line.

3.6 ERROR CODES MEANING

In case of error, green LED in the HOPPER HS-2012/2024 blinks periodically a fixed number of times indicating the kind of error that have occurred. Possibilities are indicated in the following table.

Num. of blink	Meaning
1	Reached max motor current. Trying dejamming
2	Optical sensors blinded from outside
3	Dirty optical sensors
4	Obstructed optical sensors
5	Blocked elevator belt/motor. Exceeded number of dejamming attempts.
6	Expired coin emission time. No coin inside.

3.7 LEVEL SENSE PLATE

Brass plates are fitted in the Hopper HS/HSPRO for coin level sensing.

MOD. HS-2012/2024

A low number of coins removes the electrical contact between the 2 parts of sense plates that are at different voltage. The red LED goes on.
Low level sense plate is wired to pin 7 of 12-pin connector, while the high level sense one is wired to pin 6.

MOD.HPRO-2012/2024

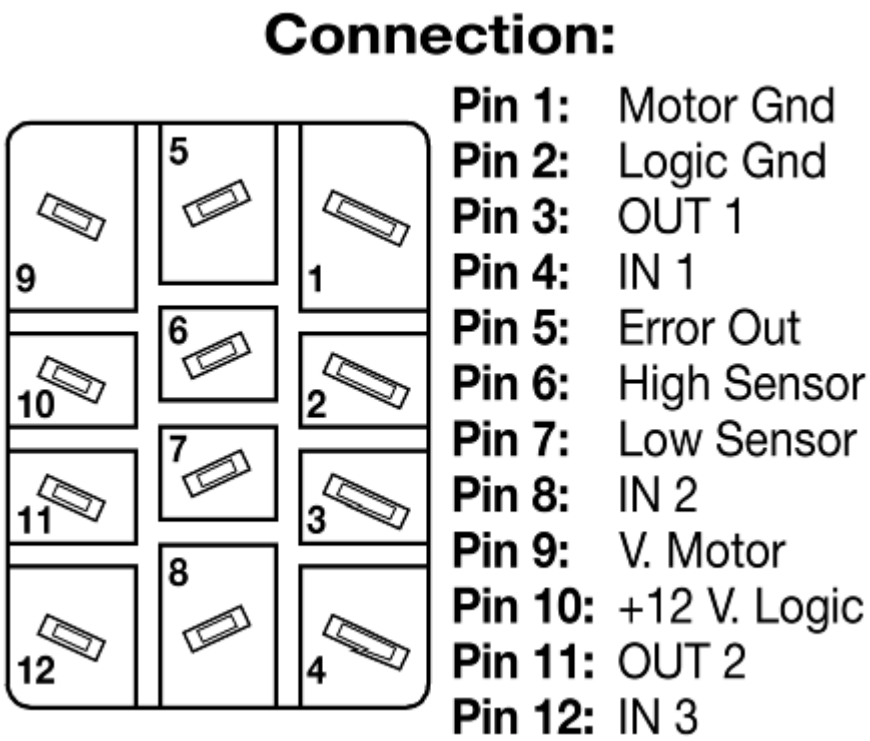
Signals related to sense plates are managed within ccTalk protocol.

4 – ELECTRICAL SPECIFICATION

4.1 INPUT/OUTPUT SIGNALS

Input/output signals used with Hopper HS/HPRO are considered actives when line is 0V; they work in negative logic.
Outputs are realized with open collector NPN transistors to make interfacing with other logic families like TTL, CMOS, Relay, easier.

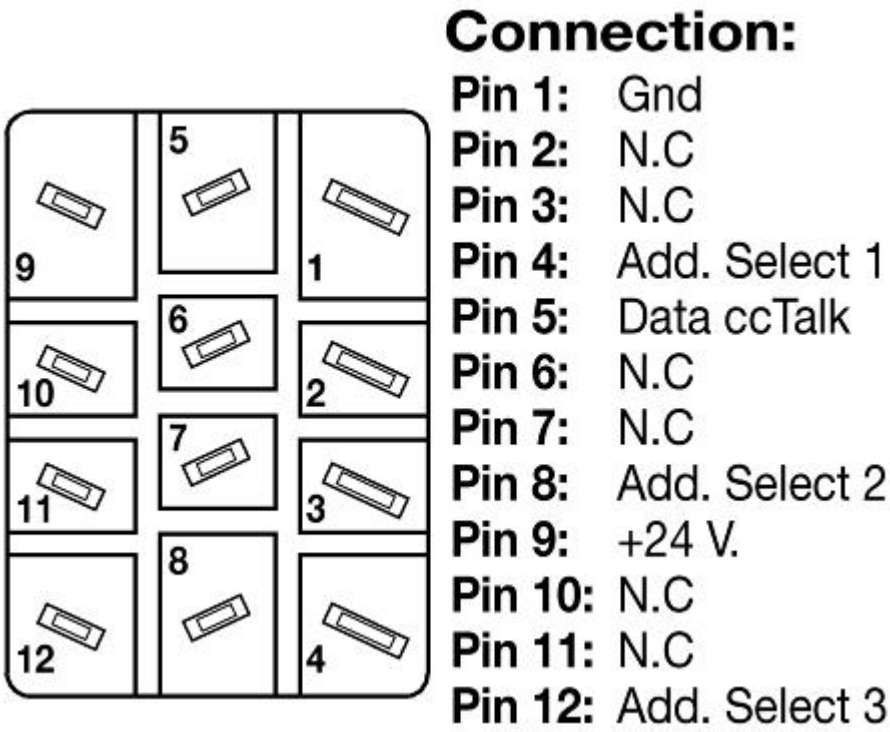
4.2 CONNECTION MOD. HS-2012/2024



pin1 and **pin2** are motor and logic ground lines. They are separated to reduce electrical noise.
pin 3 and **pin 11** refers to optical sensors output and they perform a similar function.
pin 4 and **pin 8** are inputs used to select the Hopper's operating mode and they control the motor movement together with **pin12.**
pin 5 refers to an error signal due to problems with optical sensor, coin exhausting or high current detected.
pin 6 and **pin 7** are sense plates input. Respectively high and low.
pin 9 is the motor power supply. It must be connected to 12V DC voltage with Hopper HS-2012 and to 24V DC voltage with Hopper HS-2024.
pin 10 is logic power supply.

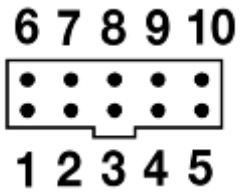
4.3 CONNCTIONS MOD. HPRO-2012/2024

STANDARD CONNECTOR WITH 12-PIN



pin 1 is the ground line and **pin 9** is the power line.
pin 4, **pin 8** and **pin 12** select Hopper HPRO address. See section 4.4
pin 5 is the data line.
All other pins must be left disconnected.

FLAT CONNECTOR WITH 10-PIN



Connection:

Pin 1:	Data ccTalk
Pin 2:	N.C
Pin 3:	N.C
Pin 4:	VCC
Pin 5:	N.C
Pin 6:	N.C
Pin 7:	Gnd
Pin 8:	N.C
Pin 9:	Gnd
Pin 10:	VCC

Pins meaning is similar to the one of standard connector.
In this case the Hopper HPRO's address selection is made through the Dip-Switch. See section 4.4

4.4 ADDRESS SELECTION MOD. HPRO-2012/2024

Hopper HPRO's address selection is selected through signals Add.Select1, Add.Select2, Add.Select3 as indicated in the following table:

Address:

Add.Sel 3	Add.Sel 2	Add.Sel 1	Serial Address
			3
		ON	4
	ON		5
	ON	ON	6
ON			7
ON		ON	8
ON			9
ON		ON	10

The choice can be made through Dip-Switch if 10-pin flat connector is used, or via hardware through pin 4, pin 8 and pin 12 if 12-pin connector is used.

5 – TECHNICAL SPECIFICATION

5.1 COIN SIZES

The Hopper HS/HPRO works with coin and token in the range 17mm - 31mm diameter.

5.2 MOTOR AND LOGIC SUPPLY

HS-2012:
Current consumption with 12V DC power supply

	Standby	Empty	Max load	Forced stop
Logic 12Vdc ±10 %	**80 mA**	**80 mA**	**80 mA**	**-**
Motor 12 Vdc ± 10%	**0 mA**	**150mA**	**750 mA**	**(transient) 750mA**

HS-2024:
Current consumption with 24V DC power supply

	Standby	Empty	Max load	Forced stop
Logic 12Vdc ±10 %	**80 mA**	**80 mA**	**80 mA**	**-**
Motor 24 Vdc ± 10%	**0 mA**	**80mA**	**500 mA**	**(transient) 500 mA**

HPRO-2012:
Current consumption with 12V DC power supply

Standby	Empty	Max load	Forced stop
50 mA	**230 mA**	**750 mA**	**(transient) 750 mA**

HPRO-2024:
Current consumption with 24V DC power supply

Standby	Empty	Max load	Forced stop
50 mA	**130 mA**	**500 mA**	**(transient) 500 mA**

Standby: Hopper is powered but it is not working.
Empty: Hopper's normal functioning condition.
Max Load: Hopper's maximum coin load functioning condition.
Forced Stop: Value of current that cause a motor forced brake because motor or elevator belt is considered to be blocked. Dejamming procedure is activated.

5.3 OVERALL DIMENSIONS

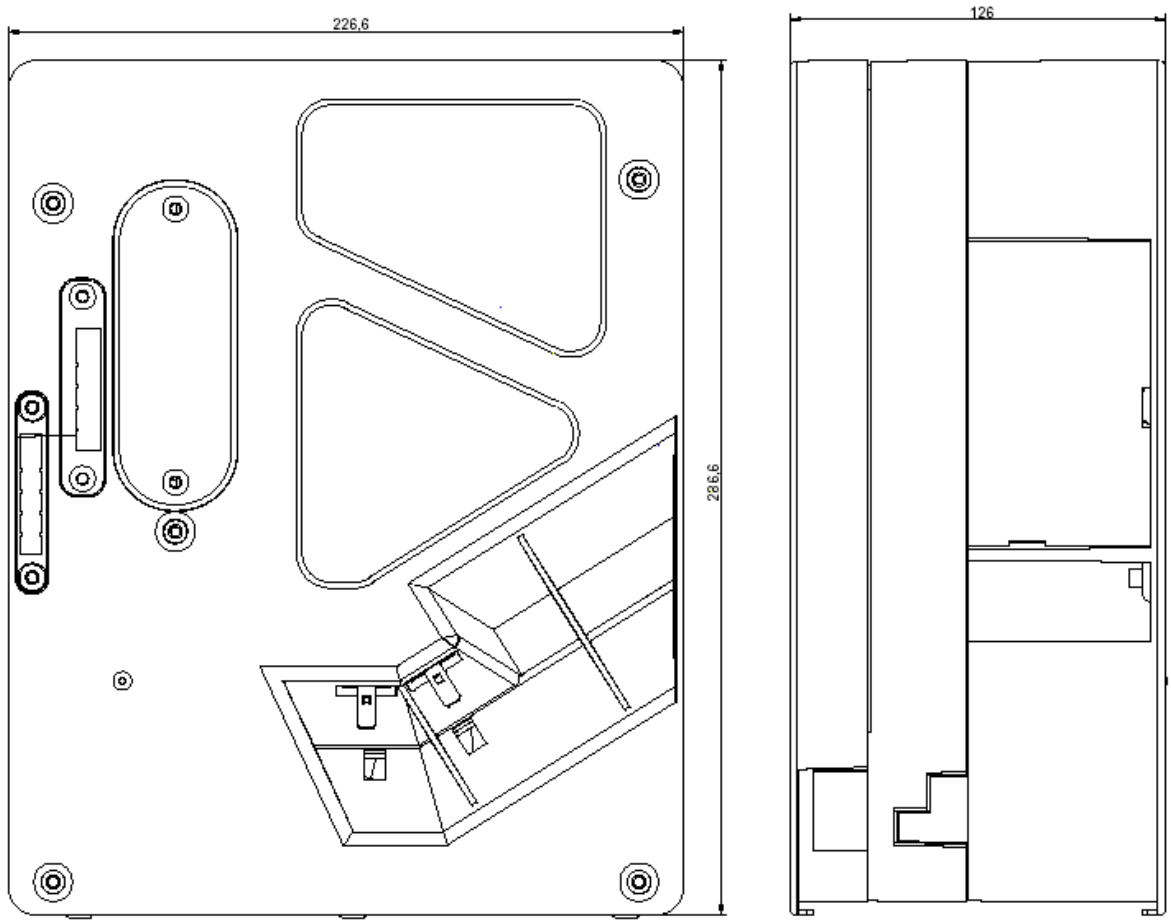


Figure 6: Overall dimensions (mm)

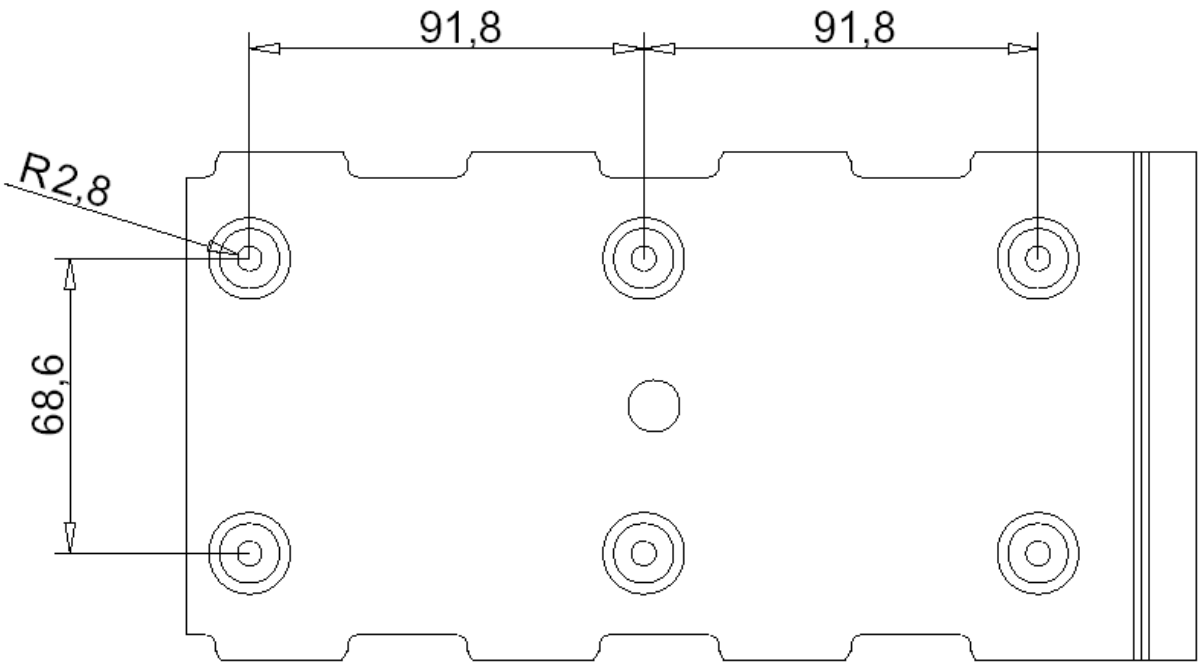


Figure 7: Base plate