HOPPER
HS-2012/2024
HPRO-2012/2024
HPROLight-2012/2024

wh münzprüfer berlin gmbh

Technical Manual

V2.1 – 02/2006

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. It is available with parallel interface (HS) and ccTalk interface with 2 connectors (HPRO) or single connector (HPROLight).

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 diverting coins of both Hoppers HS/HPRO. 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 MECHANICAL STIRRER

The Hopper HS/HPRO can be fitted with a mechanical stirrer device that moves along with the belt making the payout of coins/tokens easier. The stirrer device can be mounted on request. It is also possible to fit it in a second time in all Hoppers who have plastic parts built for its housing.

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. → section 3.6

1.2.5 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 Cinch standard connector. If the 10-pin connector is being used, the address must be set through the DIP-Switch. → section 4.

1.2.6 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).

1.2.7 DEJAMMING FEATURE

If motor current rise above a preset value (→ section 5.2) during normal operations, a jam is deemed to have occurred. The motor brakes, starts 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/HPROLight-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

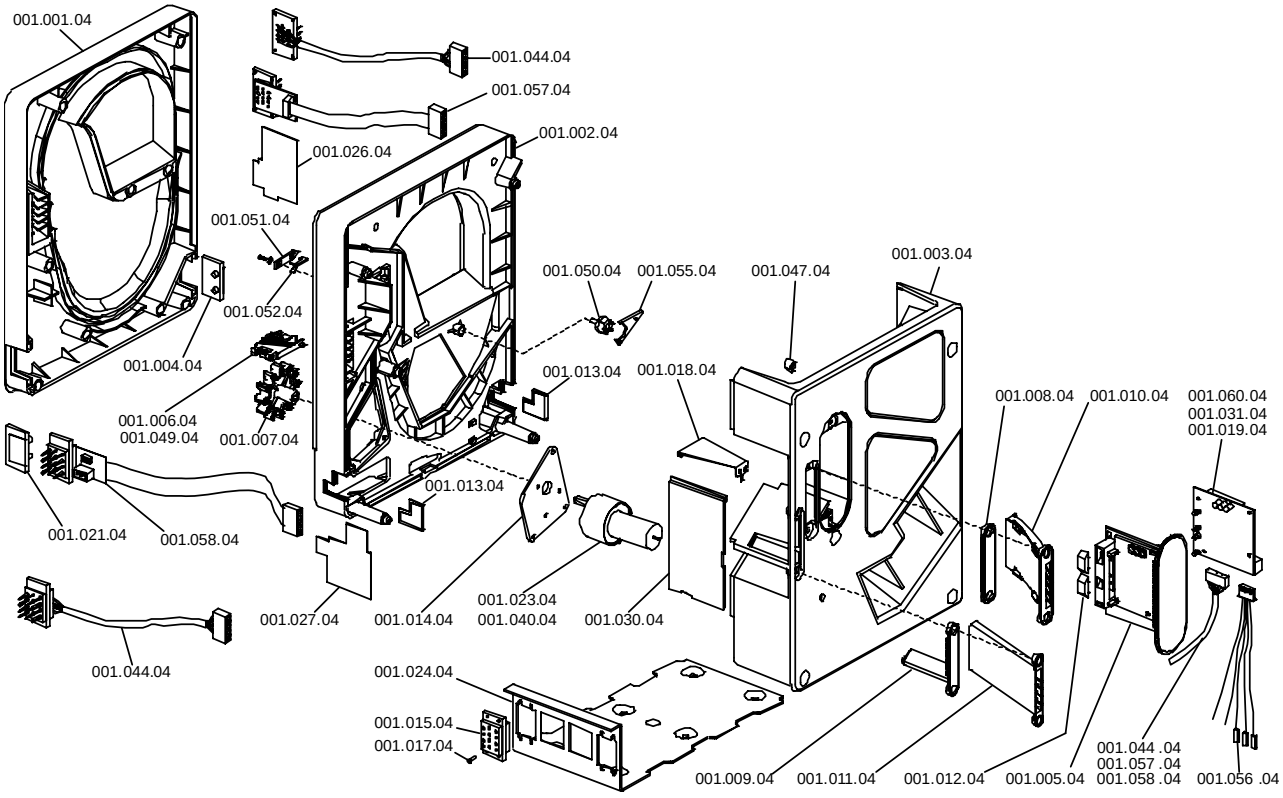


Figure 4: Exploded diagram

Cod. 001.006.04 = Standard Belt
Cod. 001.019.04 = Electronic board for Hopper HS
Cod. 001.023.04 = 24VDC Motor
Cod. 001.031.04 = Electronic board for Hopper HPRO 24VDC
Cod. 001.040.04 = 12VDC Motor
Cod. 001.044.04 = Cinch Harness for Hopper HS
Cod. 001.049.04 = Small Belt
Cod. 001.057.04 = Connectors Harness for Hopper HPRO Standard
Cod. 001.058.04 = Connectors Harness for Hopper HPRO Reverse
Cod. 001.060.04 = Electronic board for Hopper HPRO 12VDC

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 (MOD. HPRO/HPROLight), motor's drive, optical sensors.

3.2 POWER SUPPLY

The Hopper HS's logic part is powered with 12Vdc voltage and can mount a 12Vdc motor (MOD. HS-2012) or a 24Vdc motor (MOD. HS-2024). Hoppers HPRO/HPROLight-2012 and HPRO/HPROLight-2024 work with single power supply, respectively 12Vdc and 24 Vdc.
These voltages are provided through connectors indicated in section 4.

3.3 OPERATING MODES

MOD. HS-2012/2024

HS Hopper can works in MK4 Money Controls compatibility or in Hopper Modality. From software version 1.04 on, selection is made through J1 jumper located on the PCB. (see Figure 5 and table)

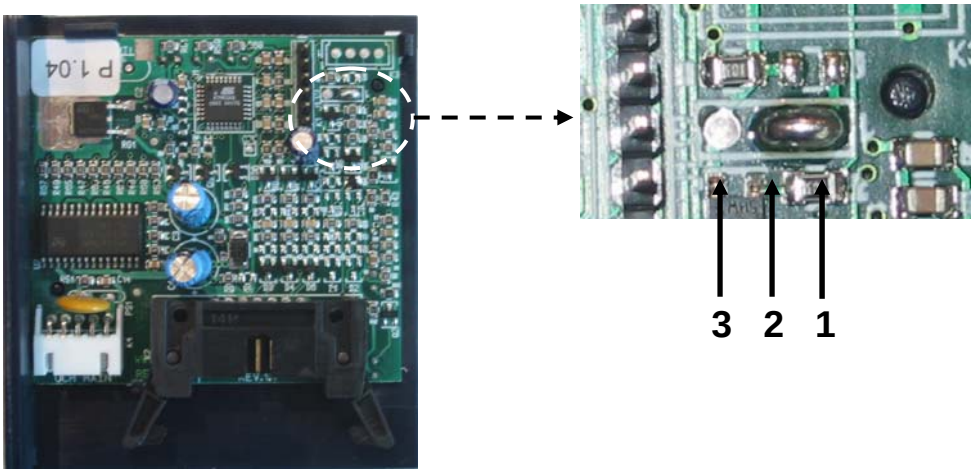


Figura 5: Jumper J1

HOPPER MODALITY	MK4 MONEY CONTROLS COMPATIBILITY MOD.
Solder between pin 2 and 3 of J1	Solder between pin 1 and 2 of J1
Expired Coin Emission Time error activated in *Coin Counting* mode. After a certain time of attempted payout without coin exit, motor stops. Hopper blocks and goes in error condition. A Machine reset is needed to restart working.	Expired Coin Emission Time error deactivated in *Coin Counting* mode (Mode 2). Motor keeps running even if no payout money are detected. Hopper does not block in error condition. Motor stop signal must be provided from external logic of the host machine. No timeout.
Red LED is normally turned off. It goes on only when an error occurs. Pin 5 follows red LED behavior.	Red LED is normally turned on. It goes off only when an error occurs. Pin 5 follows red LED behavior.

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	Functioning Mode	IN1	IN2	IN3
Direct power	0	High	High	-
Logic drive	1	Low	Low	Run Stop
Coin counting	2	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: Every received pulse on input IN3 increments an internal register, a coin is emitted and then the register is decremented. Payout stops when the internal register reach the 0 value.

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.

Please Note: IN1, IN2, IN3 are internally pulled up lines, so they can be left floating to be in HIGH state, or connected to ground to be in LOW state.

MOD.HPRO/HPROLight-2012/2024
It works through the ccTalk communication protocol, so there are no 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 points out the presence of an error, 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 that give a visual indication of the Hopper HS status.
Green LED: it shows the presence of logic supply and in case of an error occurred, communicates the error code through a number of blinks. (See section 3.6)
Yellow LED: it turns on during coin pass ahead of optical sensors.
Red LED: Reflects Hopper status. Normally off (Hopper modality) it turns on if an error occurs. Normally on (MK4 Money Controls Compatibility modality) it turns off if an error occurs. Error code is given out by the number of blinks of green LED.

MOD.HPRO/HPROLight-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 darkened 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.

N.B. “Expired coin emission time” error is not active in MK4 compatibility modality.

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. 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/HPROLight-2012/2024
Signals related to sense plates are managed within ccTalk protocol.

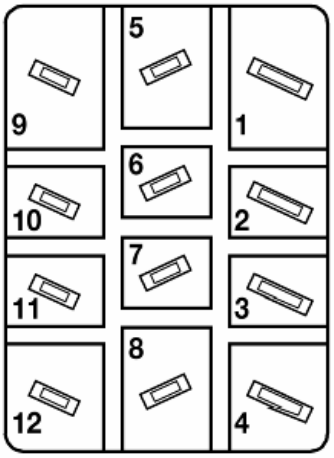
4 – ELECTRICAL SPECIFICATION

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

HS Hopper has a Cinch R76-77848 12-way male connector:



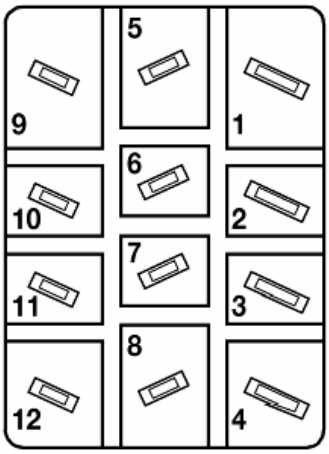
PIN 1: Motor Gnd
PIN 2: Logic Gnd
PIN 3: OUT 1
PIN 4: IN 1
PIN 5: Security / Error
PIN 6: High sensor
PIN 7: Low sensor
PIN 8: IN 2
PIN 9: V. motor
PIN 10: +12Vdc (Logic)
PIN 11: OUT 2
PIN 12: IN 3

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. OUT2 is a raw signal and OUT1 is a de-bounced signal.
pin 4 and **pin 8** are inputs used to select the Hopper's operating mode and they control the motor movement together with **pin12**. They are internally pulled up.
pin 5 refers to red LED status. It shows error conditions 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 12Vdc voltage with Hopper HS-2012 and to 24Vdc voltage with Hopper HS-2024.
pin 10 is logic power supply.

4.3 CONNECTIONS MOD. HPRO/HPROLight-2012/2024

Hopper model HPRO has a Cinch R76-77848 12-way male connector and a 10-pin, dual row 0.1-inch center jack connector as specified by DIN 41651.
Hopper model HPRO/Light has got the only 10-pin connector.

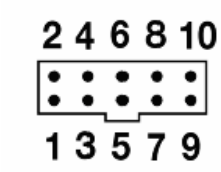
CINCH STANDARD CONNECTOR WITH 12-PIN



PIN 1: Gnd
PIN 2: N.C.
PIN 3: N.C.
PIN 4: Address Select 1
PIN 5: Data ccTalk
PIN 6: N.C.
PIN 7: N.C.
PIN 8: Address Select 2
PIN 9: Vcc
PIN 10: N.C.
PIN 11: N.C.
PIN 12: Address Select 3

pin 1 is the ground line
pin 9 is the power line. And must correspond to 12Vdc for Hopper HPRO/HPROLight-2012 and 24Vdc for Hopper HPRO/HPROLight-2024.
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



PIN 1: Data ccTalk
PIN 2: N.C.
PIN 3: N.C.
PIN 4: Gnd
PIN 5: N.C.
PIN 6: N.C.
PIN 7: Vcc
PIN 8: Gnd
PIN 9: N.C.
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)
Please note: both power supply pin7, pin 10 and both ground lines pin4, pin 8 must be connected.

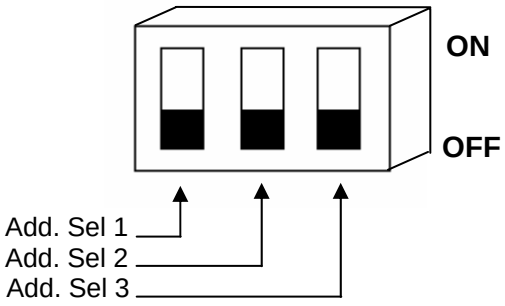
4.4 ADDRESS SELECTION MOD. HPRO/HPROLight-2012/2024

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

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

The choice can be made via hardware through pin 4, pin 8 and pin 12 of 12-pin Cinch connector. These pins are pulled-down so they have to be connected to Vcc to put them in ON condition.
Alternatively, the DIP-Switch can be used, setting it as shown in the table.
HPROLight model has only the 10-pin connector so address selection has to be made through DIP-Switch.
Attention: In the HPRO model do not use both address selection modes at the same time because short circuits can occur!!

DIP-Switch:



5 – TECHNICAL SPECIFICATION

5.1 COIN SIZES

The Hopper HS/HPRO works with coins and tokens with different diameters and thickness depending on the used belt:

	Diameter	Thickness
Standard belt (0.05€, 0.20€, 0.50€, 1€, 2€)	21,01mm – 31.5mm	1,25mm – 3,30mm
Small belt (0.01€, 0.02€, 0.10€)	16,25mm – 21,25mm	1,00mm – 2,20mm

5.2 MOTOR AND LOGIC SUPPLY

HS-2012:
Current consumption with 12Vdc (±10%) 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 24Vdc (±10%) 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/HPROLight-2012:
Current consumption with 12Vdc (+10% -0%) power supply

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

Please note: If power supply drop down, the Hopper is not able to save data in the memory.

HPRO/HPROLight-2024:
Current consumption with 24Vdc (±10%) 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: Empty hopper's 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 SUPPORTED ccTalk COMMANDS

HEADER	FUNCTION	ANSWER, DATA and NOTES
Header 254	Simple poll	Answer with ACK
Header 253	Address poll	MDCES support acc. to specification
Header 252	Address clash	MDCES support acc. to specification
Header 251	Address change	MDCES support acc. to specification
Header 250	Address random	MDCES support acc. to specification
Header 247	Request variable set	[Current limit] [Motor stop delay] [Payout timeout] [Max current measured] [Supply voltage] [Connector address]
Header 246	Request manufacturer id	"HOPPER Srl"
Header 245	Request equipment category id	"Payout"
Header 244	Request product code	"UCH1-NOENCRYPT"
Header 242	Request serial number	[serial 1- LSB] [serial 2] [serial 3 - MSB]
Header 241	Request software revision	"UCH1-V1.09" or later version
Header 236	Read opto states	[bit mask] Bit 0 = opto A; Bit 1 = opto B; Bit 2 = opto A+B 0=opto clear; 1=opto blocked
Header 219	Enter new PIN number	Answer with ACK
Header 218	Enter PIN number	Answer with ACK
Header 217	Request payout high / low status	[level status] Bit 0 = Low level sensor status Bit 1 = High level sensor status Bit 4 = Low level sensor support Bit 5 = high level sensor support
Header 216	Request data storage availability	[002][004][008][003][008]
Header 215	Read data block	<variable>
Header 214	Write data block	Answer with ACK
Header 192	Request build code	"Lev HiLo"
Header 172	Emergency stop	[payout coins remaining]
Header 171	Request hopper coin	[45][45][45][45][45][45]
Header 169	Request address mode	[106] Address is stored in RAM, may be selected via connector, may be selected via switch and can be changed.
Header 168	Request hopper dispense count	[count 1][count 2][count 3]
Header 167	Dispense hopper coins	Answer with ACK or NAK
Header 166	Request hopper status	[event counter] [payout coins remaining] [last payout: coins paid] [last payout: coins unpaid]
Header 165	Modify variable set	Answer with ACK
Header 164	Enable hopper	Answer with ACK This command must be used to enable hopper before paying out coins
Header 163	Test hopper	[Bit mask: hopper status register 1] [Bit mask: hopper status register 2] 1= condition on; 0= condition off
Header 161	Pump RNG	<not implemented>
Header 160	Request cipher key	8 bytes
Header 004	Request comms revision	[001][003][002] ccTalk level 1, Specification 3.2
Header 003	Clear comms status variables	Answer with ACK Clear communication error counters
Header 002	Request comms status variables	[rx timeouts][rx bytes ignored][rx bad checksum] Provides 3 communication error counters
Header 001	Reset device	Answer with ACK Carries out software reset

For information on commands meaning, refers to:
cctalk Serial Communication Protocol.

5.4 OVERALL DIMENSIONS

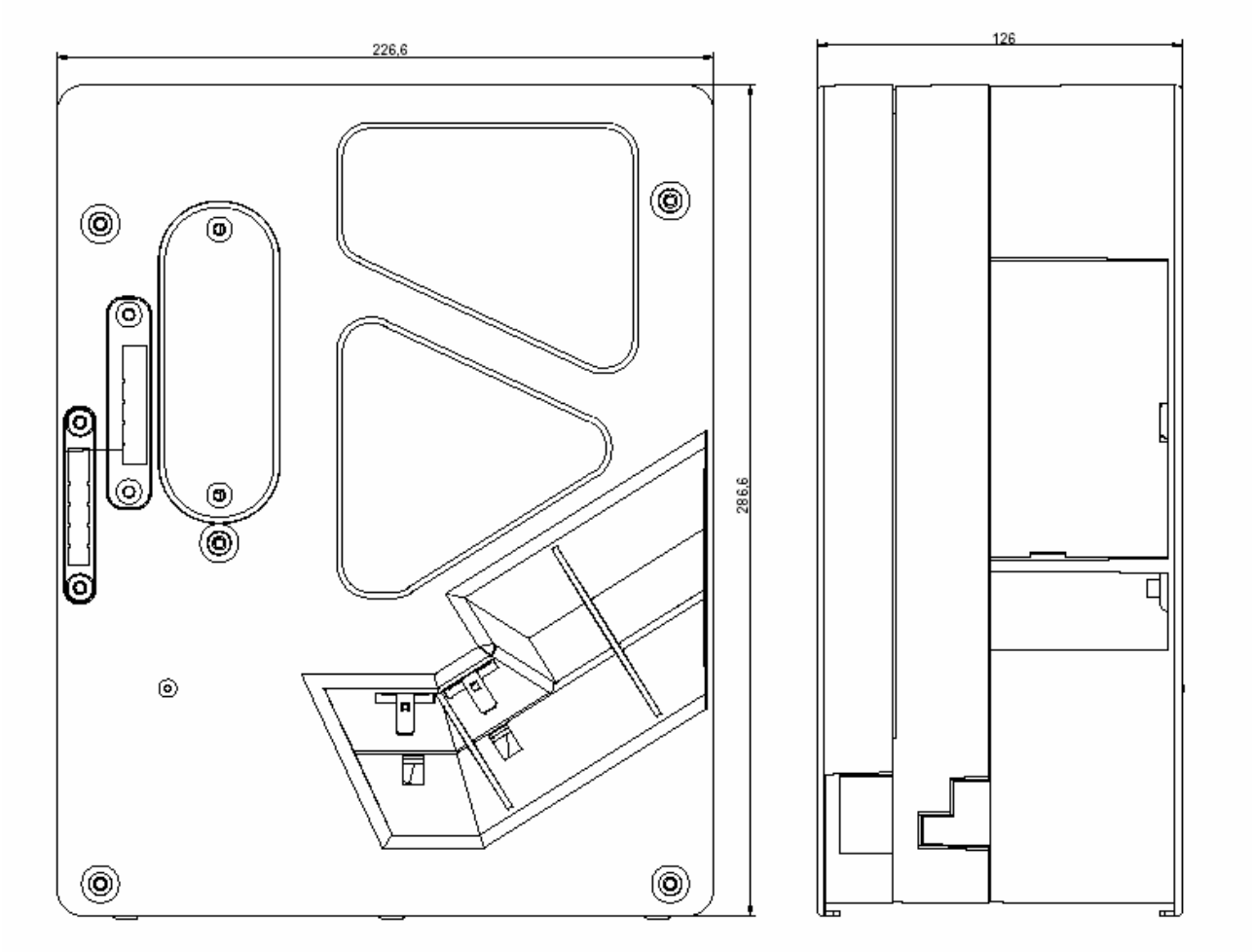


Figure 6: Overall dimensions (mm)

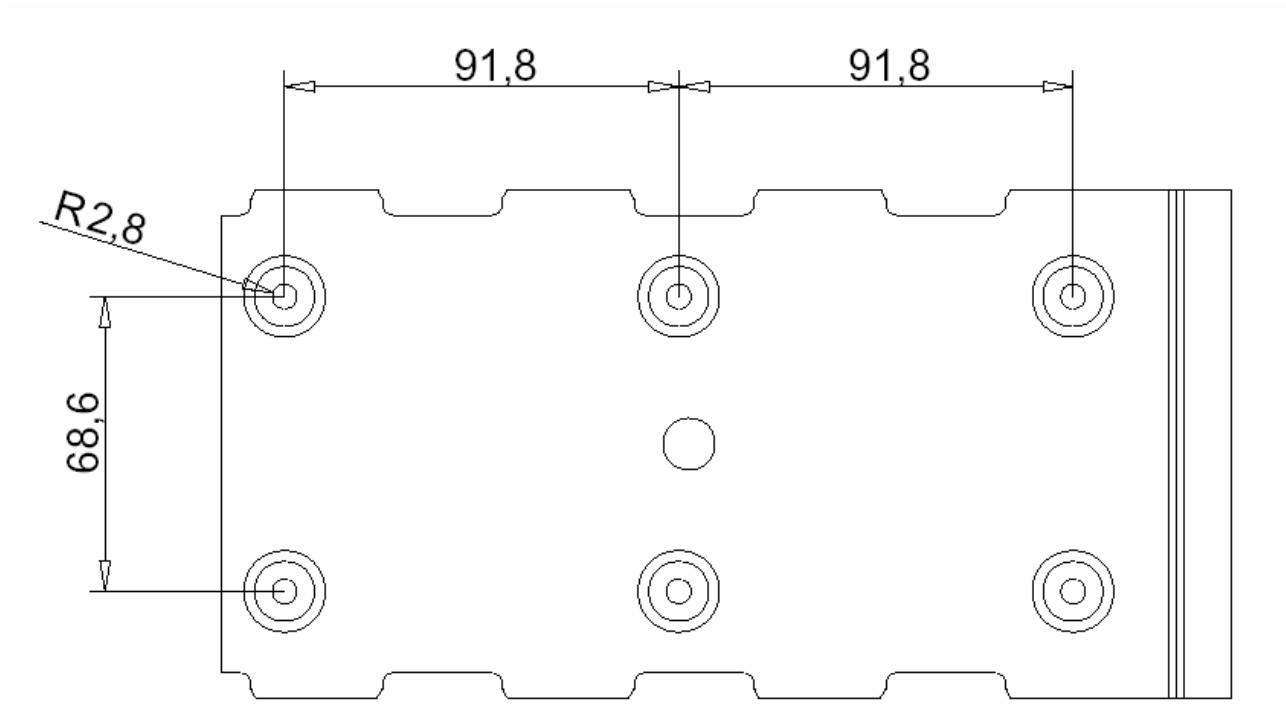
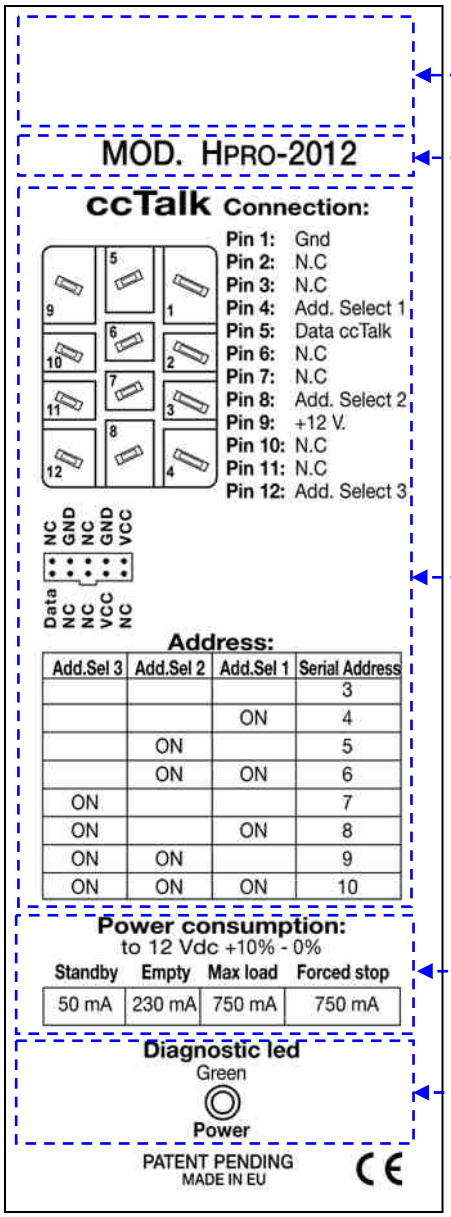


Figure 7: Base plate

5.5 LABEL


MOD. HPRO-2012
ccTalk Connection:
Pin 1: Gnd
Pin 2: N.C
Pin 3: N.C
Pin 4: Add. Select 1
Pin 5: Data ccTalk
Pin 6: N.C
Pin 7: N.C
Pin 8: Add. Select 2
Pin 9: +12 V.
Pin 10: N.C
Pin 11: N.C
Pin 12: Add. Select 3
NC GND NC GND VCC
Data NC NC VCC NC
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 ON 9
ON ON ON 10
Power consumption:
to 12 Vdc +10% - 0%
Standby | Empty | Max load | Forced stop
50 mA | 230 mA | 750 mA | 750 mA
Diagnostic led
Green
Power
PATENT PENDING
MADE IN EU
Space reserved for personalization
Hopper model
Connectors and functioning information
Power supply and current consumption
Information on LEDs

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