Engineering
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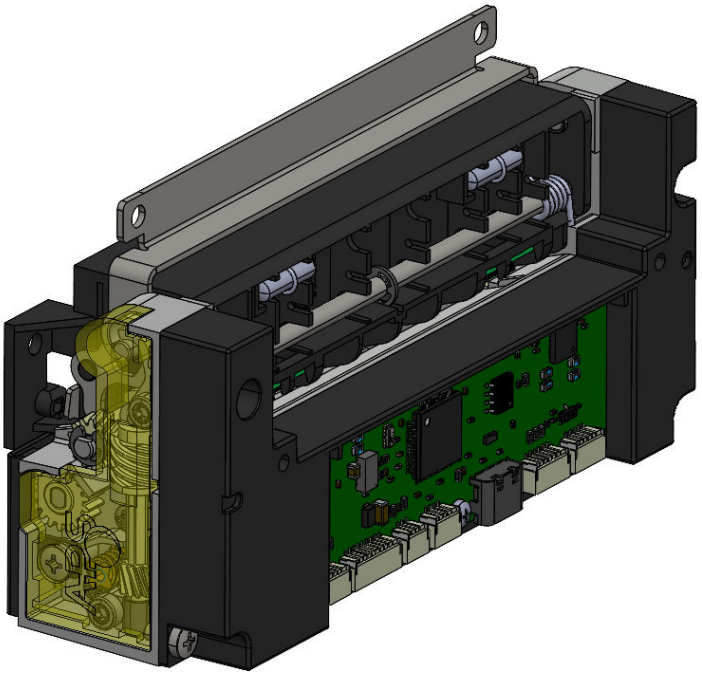
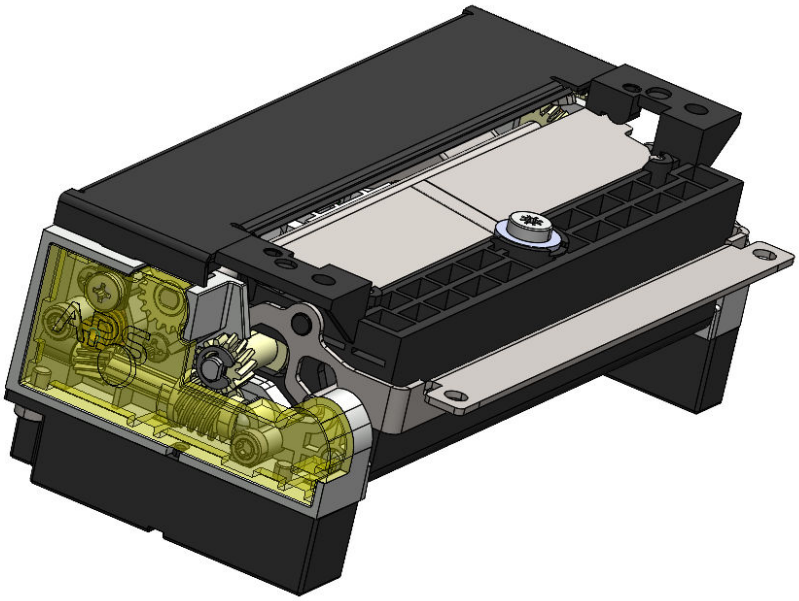
ECP 3212/3224-M0

Technical Manual





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ADVANCED PRINTING SYSTEMS

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Preface

- This manual provides complete technical information about the **ECP 3" 3212 & 3224** thermal printer mechanism 200 dpi with driver board.
- For customized printers, A.P.S. supplies documentation in addition to the present specification.
- The present specification is valid also for customized types, where the different condition has no effects on common data (eg. different length of elec. cables).

Revision History

Rev. Index	Date	Page/ Sec.	Description	Author
Prelim 1	29-Oct-2021	-	Issuing preliminary	P.S.
Prel.2	03/12/2021		General update	P.S.
A	04/02/2022		Official issue	P.S.

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1. INTRODUCTION

The ECP printer has been designed to be the most compact printer with cutter and driver board, operating at 12V or 24V. The ECP3212/3224-HRS+ printer has two versions: kiosk and easy-loading mechanism. Its really compact dimensions associated with the unique APS easy loading concept make the integration very simple.

1.1 ECP 3" WITH M0 FEATURES

- *3 inches paper width - up to 82.5 mm*
- *High resolution printing (8 dots/mm)*
- *High printing speed (up to 150 mm/s)*
- *Guillotine cutter (full & partial cuts)*
- *Easy to integrate in your design*
- *Powerful controller board*
- *2 Communication ports*
- *Programmable energy consumption*
- *Full control over printing quality/speed*
- *For resident fonts*
- *Downloadable character set*
- *Powerful text / Graphic Modes and 2D barcodes*
- *Hardware QR barcode support*
- *Hole/Mark Detection/Correct Paper*
- *Easy firmware and font upgrades*

2. GENERAL CHARACTERISTICS

Item	Specification	
Printing method	Thermal dot line printing	
Number of dots/line	640	
Main scanning density (dot/mm)	8	
Printing width (mm)	80	
Paper width (mm)	80 to 82.5 +0/-1	
Paper feed pitch (mm)	0.125 mm (every 3/4 step of the motor drive signal)	
Max. paper thickness (µm)	~ 150	
Dimension W x D x H (mm)	113.4x60.3x40.5	
Weight (g)	Approx.200	
Head temperature detection	Thermistor	
Cover opened detection	Mechanical switch	
Paper end detection	Opto sensor	
Operating voltage range	Logic: from 3.3V to 5.5V Power: 12V or 24V typical, 20 or 28V max	
Current consumption max	At printing (12/24V):	~13.6 A (Head power) (320 dots on)
		220 mA (Head logic)
		1000 mA (Motor)
	At paper feeding (12/24V):	1000 mA (Motor)
		<100 µA (Head Logic)
	Cutting	1 A Cutter Motor
Recommended Paper	JUJO-AF50KS-E (standard grade), JUJO-AF50KS-E3 (high sensitivity), Kanzan KP 470 Equivalent types can be used	
Operating temperature range (°C)	-25/+70 (the printed optical density is not guaranteed out of the range – 5°C ~ +50°C)	
Operating humidity (RH %)	10-90 (no condensation)	
Storage temperature range (°C)	-40/+80	
Storage humidity (RH %)	5-90 (no condensation)	
Character set	3 resident + downloadable	
Character size	8x16 / 7x16 / 12x20	
Interfaces	RS232 and USB	
Graphics	Optional – 3 modes	
Barcodes	UPC A-E, EAN 13-8, Code 39, ITF 2/5, Codabar, Code 128, PDF417, QR code	
Sensor	End Of Paper / Head Up Sensors	

Drivers		Windows/Linux/Android	
Label/Black mark detection		Y	
Printer life			
	Durability	**Basic conditions**	**Maximum variations**
Thermal head pulse resistance	100 million pulses	• Room temp.: 20 ÷ 25 °C • Head temp.: 65 °C max. • Rated energy	Max. 15% in resistance value (Ω) of any dot, from its initial value
Abrasion/wear resistance	100 km of paper /duty cycle 12.5%		
Cutter life	2 million cuts		

3.THERMAL HEAD AND PRINTING CONFIGURATION

3.1 OUTLINES

Number of heat elements	640 dots
Heat element pitch	0.125 mm
Print width	80 mm (centred on paper)
Average resistance	**700**Ω ±3% for **ECP3224** **300**Ω ±3% for **ECP3212**

3.2 OPERATING PRECAUTIONS

1. The print-head substrate surface is coated with glass, for this reason, mechanical stresses, shocks, dust and scratches should be avoided to prevent damage.
2. Avoid condensation, if condensation occurs, do not switch on the print-head power, until condensation has disappeared.
3. Print quality would become degraded if paper or ink residue were stuck on the heat element area. In this case, clean the print-head with an applicator and alcohol. Do not use sandpaper as this will destroy the heating elements.
4. If sticking sound is heard while printing, please check and adjust the paper feed mechanism and the electrical pulse program to eliminate the sound.
5. Make sure the paper does not have high abrasion factor, low sensitivity or abnormal chemicals.

4. CONTROL BOARD

4.1 GENERAL FEATURES

- **Full APS set or ESC/POS compatibility**
- **High-speed printing with historic control**
- **Windows, Linux and Android drivers**
- **Wide operating temperature range**

4.2 CONTROL BOARD INTERFACES

- **Serial communication interface**
- **USB communication interface**

  Complies with the *Universal Serial Bus specification Rev. 2.0 (basic speed)*

4.3 CONTROL BOARD PRINTING ENGINE

- **Full control over printing quality/speed**
- **Powerful text printing modes**
- **Powerful graphic printing modes**
- **Page mode printing**
- **Macro support**
- **Barcode support**

  Support for UPC-A, UPC-E, EAN13, CODE39, ITF, CODABAR and QR code
- **Dedicated user non-volatile (NV) memory**
- **Three resident characters fonts, easy font upgrades**

  Fonts are 16 x 24 pixels, 12 x 10 and 8 x 8 and 12 x 24

  User fonts may be of any width and height
- **Easy firmware and font upgrades**

4.4 GENERAL SPECIFICATIONS

Item	Specification
Voltage range (V)	From 10V to 28V
Current consumption (A)(*)	From 1 to 7, 3.5 typical
Operating temperature (°C)(**)	From -25 to +70
Operating humidity (%RH)(**)	From 20 to 85 (no condensation)
Storage temperature (°C)	From -40 to +85
Storage humidity (%RH)	From 10 to 90 (no condensation)
EMC standard	Designed to comply with FCC/CE class B

(*) Dynamic current consumption can be programmed through the use of firmware commands.

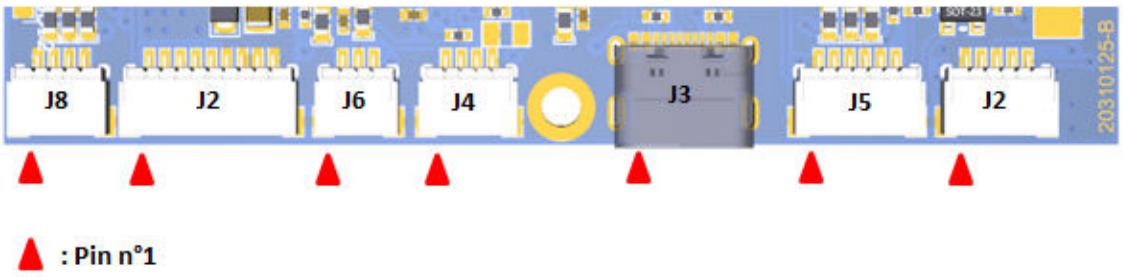
(**) Extended temperature and humidity ranges information is available from APS upon request.

4.5 PRINTER DEVICE INTERCONNECTIONS

4.5.1 INTERCONNECTIONS SUMMARY

From Left side to right side:

Reference	Type of connector	Description
J8	JS-1254R-04 (Chyaoshiunn *)	APS Keyboard port
J2	JS-1254R-09	Power supply
J6	JS-1254R-03	NEOP opto-sensor
J4	JS-1254R-04	USB interface 2
J3	USB type C	USB interface 1
J5	JS-1254R-06	UART interface
J2	JS-1254R-05	RS232 interface



*compatible connectors with also JST and KLS Electronic

4.5.2 INTERCONNECTIONS DETAILS

- **Power supply connector**

The control board runs on a single 12V/24V power supply input (depending product reference)
Current consumption while printing is configurable *via* software escape commands.

Pin	Signal
1	GND
2	GND
3	GND
4	GND
5	GND
6	VIN
7	VIN
8	VIN
9	VIN

Parameter	Symbol	Min.	Typ.	Max.	Unit
Recommended Power supply input voltage	VIN	11	24	27	V

- **USB interface**

The control board offers a USB communication interface using type C or Molex connector.

- USB type C

Pin	Signal	Direction	Description
A4/B9 A9/B4	VBUS	Power	USB bus 5V power
A7/B7	D-	I/O	Differential data signal
A6/B6	D+	I/O	Differential data signal
A8/B8	SBU1/SBU2		Unconnected
A5/B5	CC1/CC2		Connected to gnd. through 5.1 KΩ resistance.
A1/B12 A12/B1	GND	Ground	USB bus ground

- USB Molex

Pin	Signal	Direction	Description
1	VBUS	Power	USB bus 5V power
2	D-	I/O	Differential data signal
3	D+	I/O	Differential data signal
4	GND	Ground	USB bus ground

- **SERIAL interface**

The control board offers both standard RS232 serial communication interface and UART levels.

- **RS232C interface**

This interface uses RS232 signal levels (+/- 12V).

Pin	Signal	Direction	Description
1	GND	Ground	Serial ground
2	TXD	Output	Serial transmit data
3	RXD	Input	Serial receive data
4	CTS / DSR	Input	Clear to send handshaking signal
5	RTS / DTR	Output	Ready to send handshaking signal

Parameter	*Symbol*	*Min.*	*Typ.*	*Max.*	*Unit*
HIGH level input threshold	V_{IH}(RS232)		1.5	2.4	V
LOW level input threshold	V_{IL}(RS232)	0.6	1.2		V
HIGH level output voltage	V_{OH}(RS232)	5	5.4		V
LOW level output voltage	V_{OL}(RS232)		-5.4	-5	V

- **UART interface**

The control board also offers a TTL serial communication interface.

Pin	Signal	Direction	Description
1	V 3.3	Input	V logic
2	RTS / DTR	Output	Ready to send handshaking signal
3	CTS / DSR	Input	Clear to send handshaking signal
4	RXD	Input	Serial receive data
5	TXD	Output	Serial transmit data
6	GND	Output	Serial ground

Logic Signal	Voltage Level on UART Connector
0	From 0V to 0.2V
1	From 2 to 5V

- **A.P.S keyboard port**

The standard A.P.S keyboard gathers user buttons and status LED.
One standard A.P.S. keyboard port is provided on the control board.
Switches are normally open, and connect signal to ground when closed.
Internal pull-up resistors are provided on the control board.
During normal board operation, pressing paper feed switch triggers a paper feed sequence.
During normal board operation, pressing ON/OFF line switch continuously during more 3s triggers a hardware reset.
Self-test is being executed by pressing and holding button ON/OFF line and twice quick pressing FEED button.

The control board integrates a current limiting resistor for status LED to minimize external components count.

Pin	Signal	Direction	Description
1	GND	Ground	Ground
2	OFFLINE_SW	Input	ON/OFF line switch
3	FEED_SW	Input	Paper feed switch
4	SYS_LED	Output	Status LED

Parameter	Symbol	Min.	Typ.	Max.	Unit
Status LED current (V_F=2V)	I_{LED}		10		mA

These connectors enable the user to design a remote interface including paper feed, online/offline
buttons and status LED.

- **NEOP opto-sensor**

The Driver board provides an interface for near end-of-paper sensor.

Near end-of-paper triggers when paper roll is nearly empty.

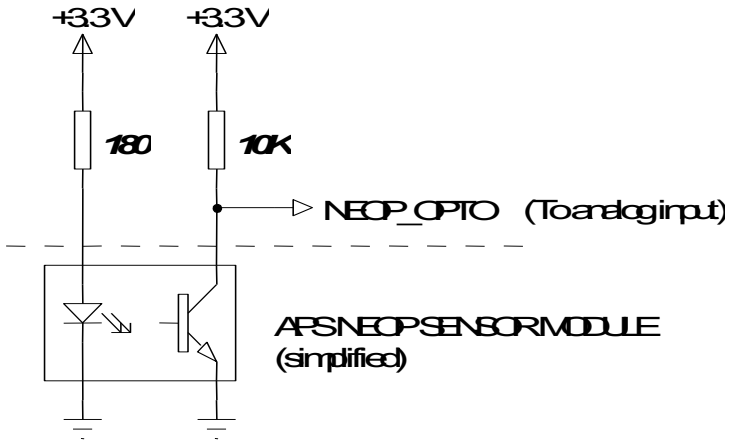
The controller board integrates a 10K resistor pull-up on opto-sensor collector signals.
The controller board integrates a current limiting resistor for opto-sensor LED to minimize external components count.

Pin	Signal	Direction	Description
1	NEOP_LED	Output	NEOP opto-sensor LED anode
2	NEOP_OPTO	Input	NEOP opto-sensor collector output

3	GND	Ground	Ground

Parameter	Symbol	Min.	Typ.	Max.	Unit
Sensor LED current (V_F=1.2V)	I_{LED}		10		mA
Sensor HIGH level input voltage	V_{IH}	2.31		3.3	V
Sensor LOW level input voltage	V_{IL}	0		1.15	V

Here is a simplified schematic of the electronics driving the NEOP sensor on the controller board:



APS can provide the NEOP sensor as an accessory, see end of the technical manual.

4.6 CONTROL BOARD OPERATIONS

4.6.1 SELF-TEST MODE

The control board enters self-test mode when pressing and holding button ON/OFF line and twice quick pressing FEED button.

In this mode, the board prints a ticket containing board name and main features, A.P.S code, firmware revision, communication settings and finally all internal character sets

The board reverts to default state once self-test printing is over.

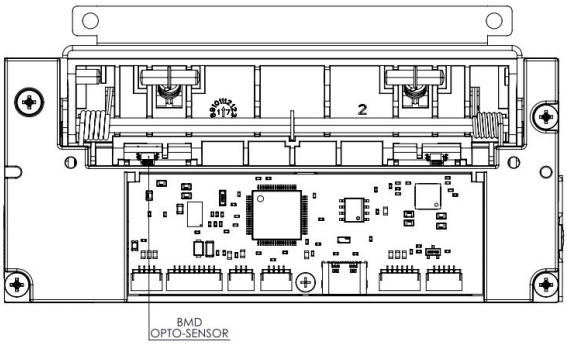
4.6.2 CONTROL CODE SEQUENCES

Please refer to the programming manual of the **M3 driver board architecture.**

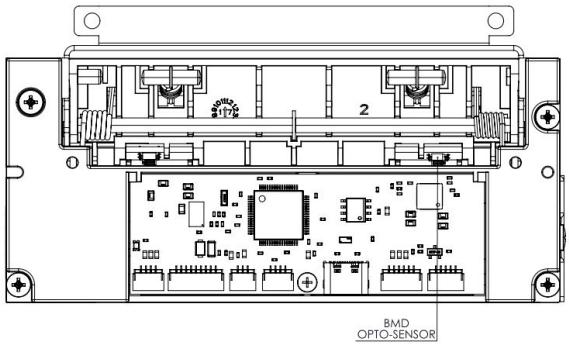
5. MECHANICAL AND HOUSING

5.1 KIOSK VERSION AND EASY LOADING VERSION

ECP 3212/3224-M0 offers two possible configurations:
It can be a stand-alone mechanism for Kiosk applications. The platen roller support is fixed to the mechanism by the mean of the provided shaft. The lever allows customer to extract the platen roller support and thus easily clean the thermal head. This is "**Kiosk**" version. There are two types of "Kiosk" applications – Kiosk Right (KSR) and Kiosk Left (KSL). The only difference between KSR and KSL is the position of the BMD opto-sensor on the Platen Roller Support as shown on the image. For ordering the desired configuration, refer to Order Codes Section.



KSL



KSR

ECP can also be turned into a complete easy loading mechanism for Gaming applications. The platen roller support is independent from the mechanism and can be mounted on the door of the customer. This is the "**Easy Loading**" version.

5.2 DESIGNING THE DOOR

The rubber roller easy loading module can be fixed on customer's door. The integrated opening lever can easily be dressed with customer's cosmetic part.
Pay attention to STRICTLY respect hinge's position recommendations as per attached drawing.

5.3 THE EASY DOOR OPENING SYSTEM

Because the rubber roller is only referenced to the chassis and has no dependence on the cover, the mechanism is very reliable. To achieve this reliability, the rubber roller assembly must be strongly locked inside the chassis.
To avoid any twist, and mechanical stress on the cover and more generally on the customer plastic, thus increasing reliability and quality, APS developed a unique and patented feature to ease the opening of the door, that makes the mechanism very easy to open, and does not require any access to the cover's sides, giving more flexibility and ergonomics to the customer design.
This is achieved by using roller assembly's lever that pushes symmetrically on both sides of the rubber roller. So, the mechanism's shape has been optimized to concentrate the effort locally and always refer this effort to the chassis.
Doing so there is no need to have access to the cover side, giving more freedom to design the cover, and allowing reducing the width of the unit.

5.4 OVERALL DIMENSIONS AND FIXING POINTS

See attached drawing or ask A.P.S. for additional mechanical details.

The printer has to be fixed using its own points as described on the overall dimensions' drawing in the end of this document, avoiding any kind of deformation or torsion or, if not, the print quality and printer's life will be drastically reduced.

The ECP mechanism has two holes (3) and (4) for fixation by screws as well as two blind holes (1) and (2) at the bottom and openings on the rear side (5) and (6) for fixation by tabs/hooks. They are depicted on the image below. Their exact sizes and positions are shown on the drawings at the end of this document.

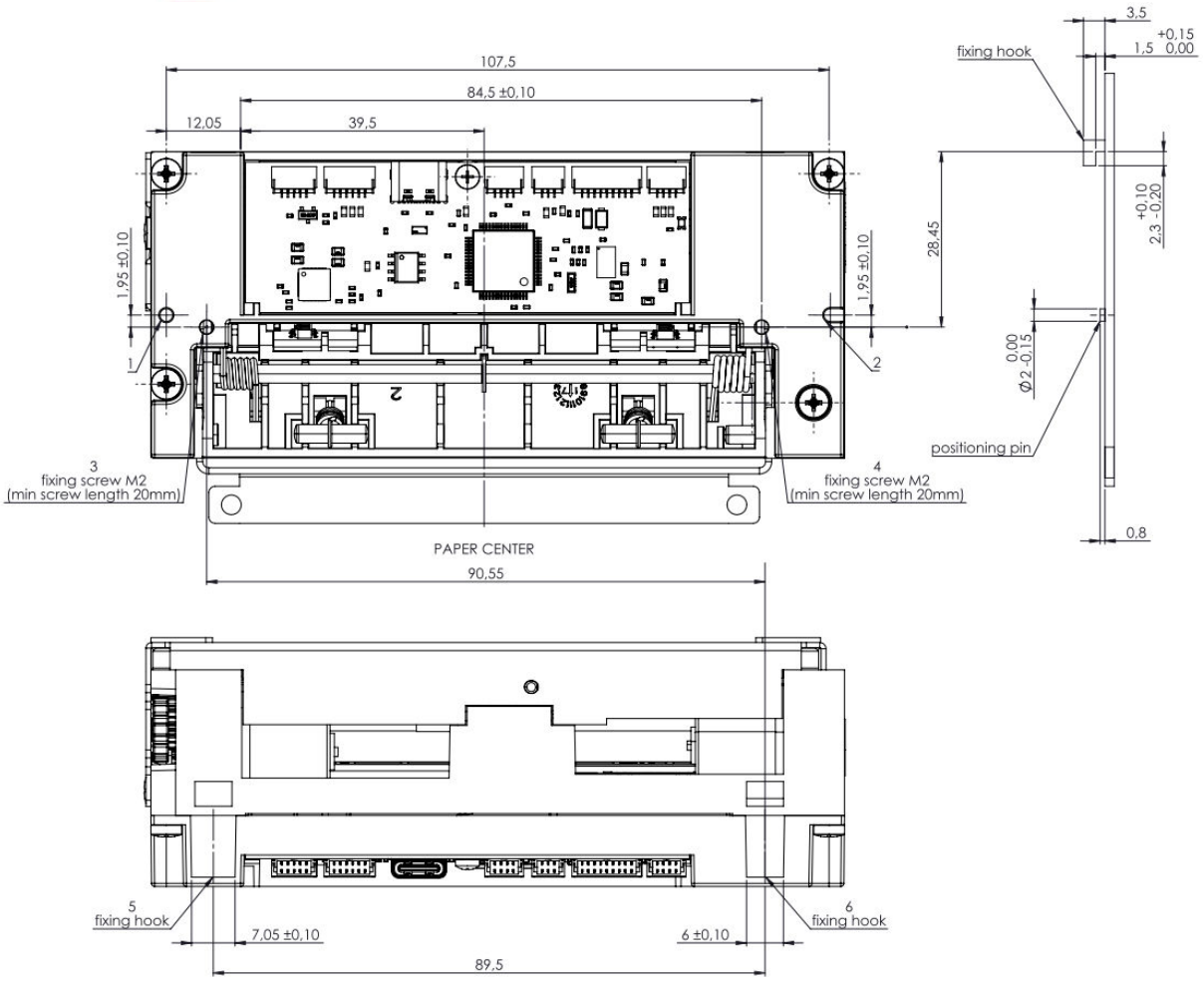
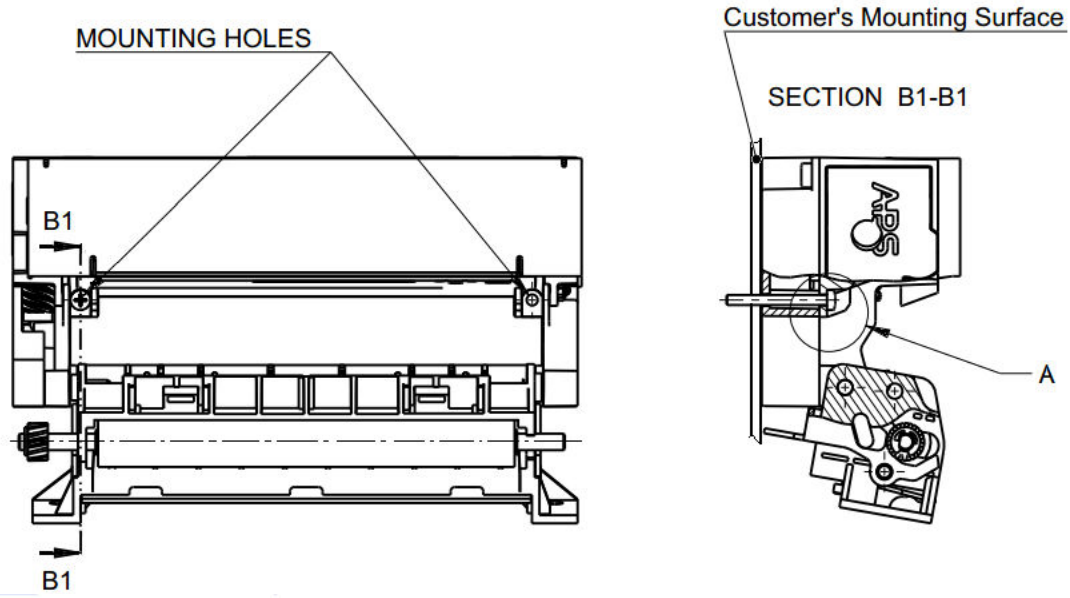


Image B below shows printer mounting for both easy-loading and kiosk mechanisms. Recommended screw for fixation is M2 of length 18mm or longer. When positioning the ECP mechanisms it should be allowed for free space required for servicing/opening of its mobile parts. For more details refer to the drawings in the end of the manual.

KIOSK VERSION



EASY LOADING VERSION

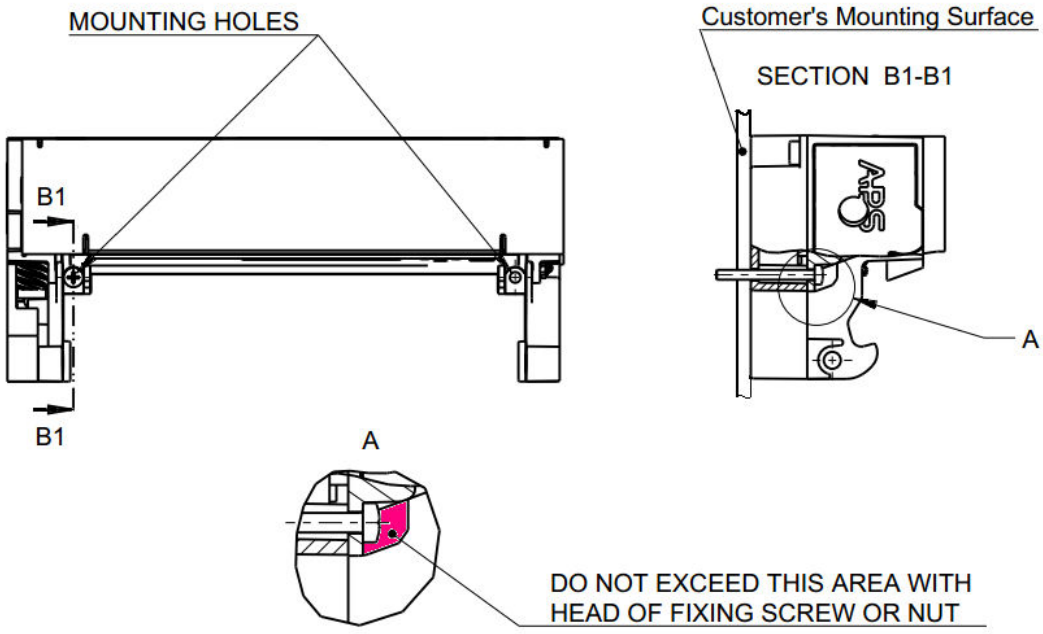


IMAGE B

5.5 APPLICATION NOTES

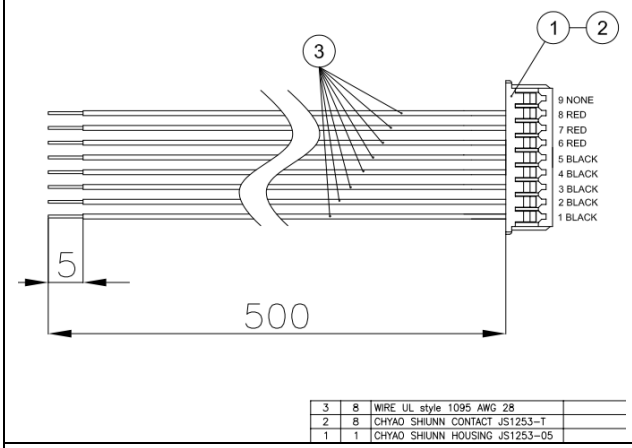
For further information for a better ECP integration refer to APS

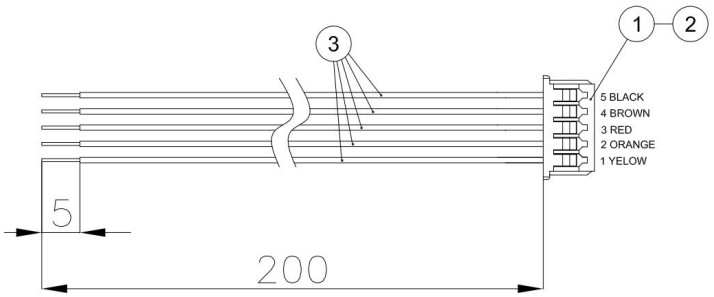
6. ORDERING CODES

Product Name	Ordering code
ECP3224-S-M0 EL PRT 3" 24V 200DPI	**90ECP322Axxxx**

xxxx : firmware revision

7. ADDITIONNAL ACCESSORIES

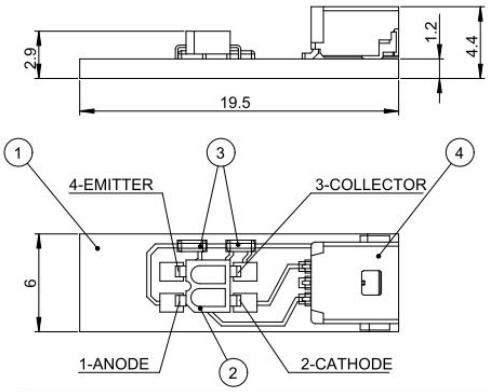
Product Name	Ordering code
Cable power supply L=500 mm ECP JST 9 pins pitch 1 mm 	91301337
Cable RS232 (L=200 mm, JST 5 pins 1 mm pitch only on one side)	91301334



3	5	WIRE UL style 1095 AWG 28		
2	5	CHYAO SHIUNN CONTACT JS1253-T		
1	1	CHYAO SHIUNN HOUSING JS1253-05		

NEOP opto-sensor PCB

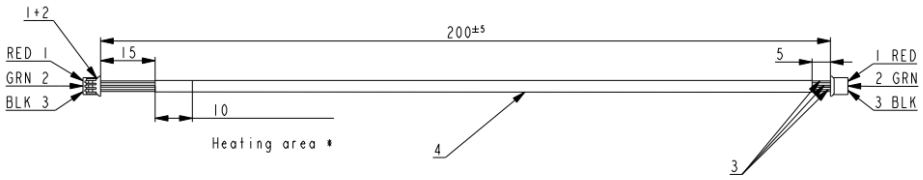
91100107



4	1	CHYAO SHIUNN CONNECTOR JS-1254R-03
3	2	22pF/50V 0402 CAPACITOR
2	1	OPTO SENSOR KODENSHI SG-105F6 SMT
1	1	PCB

NEOP cable

91301128



* Only the first 10 mm of the tube are heated

4	1	THERMAL SHIELD Ø1.5		
3	3	WIRE UL style 10368 AWG # 32		MAX INSULATION O.D. 0,75 MM
2	6	JST CONTACT SSH-003T-P0.2-H		
1	2	JST HOUSING SHR-03V-S-B		