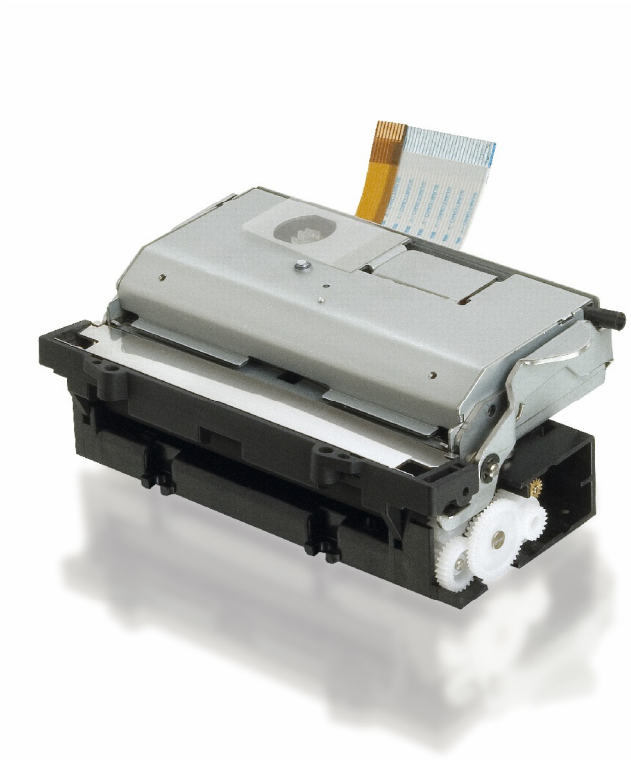
THERMAL PRINTER MECHANISM

MGTA SERIES
PRINTER MECHANISM

USER MANUAL

Reference: 31 09 342
Issue C
August 2008



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EVOLUTIONS

Date	Issue	Modifications
11/2006	Preliminary	Creation
05/2007	Z	General Update
07/2007	A	Motor values modification + Addition of Autoload version
10/2007	B	Specified standards correction
08/2008	C	Addition of electrical recommendation (Paragraph 9.2)

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IMPORTANT

This manual contains the basic operations for running your printer.

Read it carefully before using your printer.

Pay special attention to the chapter “Recommendations”.

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CONTENTS

1. SUMMARY OF TECHNICAL SPECIFICATIONS

ITEM	VALUE	UNIT
Printing method	Static thermal dot line printing	-
Paper loading	Front and bottom	-
Number of resistor dots	640	-
Resolution	8	dots/mm
Printing width	80	mm
Printing speed	180 max See recommendation	mm/s
Paper width	80 max or 82.5 max	mm
Head temperature detection	thermistor	-
Paper feed pitch	1	motor steps
	0.125	mm
Paper empty detection	opto-sensor	-
Operating voltage range Vcc (logic)	5 ± 5%	V DC
Operating voltage range Vch (dot)	20 – 26.4	V DC
Current consumption: Vch (*at nominal value* : 24V)	30	mA per resistor dot «On»
Current consumption TA: Vcc (*at nominal value* : 5V)	50	mA
Maximum number of dots energized simultaneously *	384	-

SUMMARY OF TECHNICAL SPECIFICATIONS (*continued*)

ITEM		VALUE	UNIT
Current consumption: Paper feed stepping motor (*at nominal values*) ± 5%		910 ❶ / 835 ❷ / 670 ❸	mA per activated phase
Supply voltage : Vch		24	volts
Supply power : Po		630	MW/dot
Supply energy at 25°C (On time)		0.17 to 0.28 (0.27 to 0.45)	MJ/dot (ms)
Supply current : Io		11.5	A
Duty cycle **	printer	20 ❹ / 26 ❺ / 33 ❻	%
(24V) (up to 25° C)	cutter	50	%
for t° = 60°C (** bis)	printer	16 ❹ / 20 ❺ / 29 ❻	%
	cutter	40	%
Storage		-30 to +70	°C
Relative humidity		15 to 85	%
Operating range		-20 to +60	°C
Printer electrical lifetime ***		10^8	pulses
Printer mechanical lifetime ***		100	km
Cutter mechanical lifetime 80 µ paper thickness		1 000 000	cuts
Cutter mechanical lifetime 120 µ		500 000	cuts
Recommended paper		Kanzaki P310	-
Maximum paper thickness		60 to 120 µ with front paper path.	-
		If thicker paper is needed, contact our Technical Support Team.	
Maximum paper roll diameter		❶ 230 on axis / 200 in bucket with rollers ❷ 230 on axis / 170 in bucket with rollers ❸ 195 on axis / 120 in bucket with rollers	mm
Specified standards		UL60950-1; CSA22.2 N°60950-1 (cTUVus) IEC 60950-1 (CB certification); ROHS	-

* The maximum current allowed in the print head is 12A; but the printing density variation may become significant when the number of dots energized simultaneously becomes greater than 64 (*384 dots "On" corresponds to 11.5A when applying 24V*).
** Time ON max: 1 minute 50 sec. Please, once your mechanism is integrated, check your duty cycle.
*** Per AXIOHM standard test conditions (*which are mainly 24V, 25°C, dot printing = 25%*)
**** with P310 paper
❹ Corresponds to 910 mA

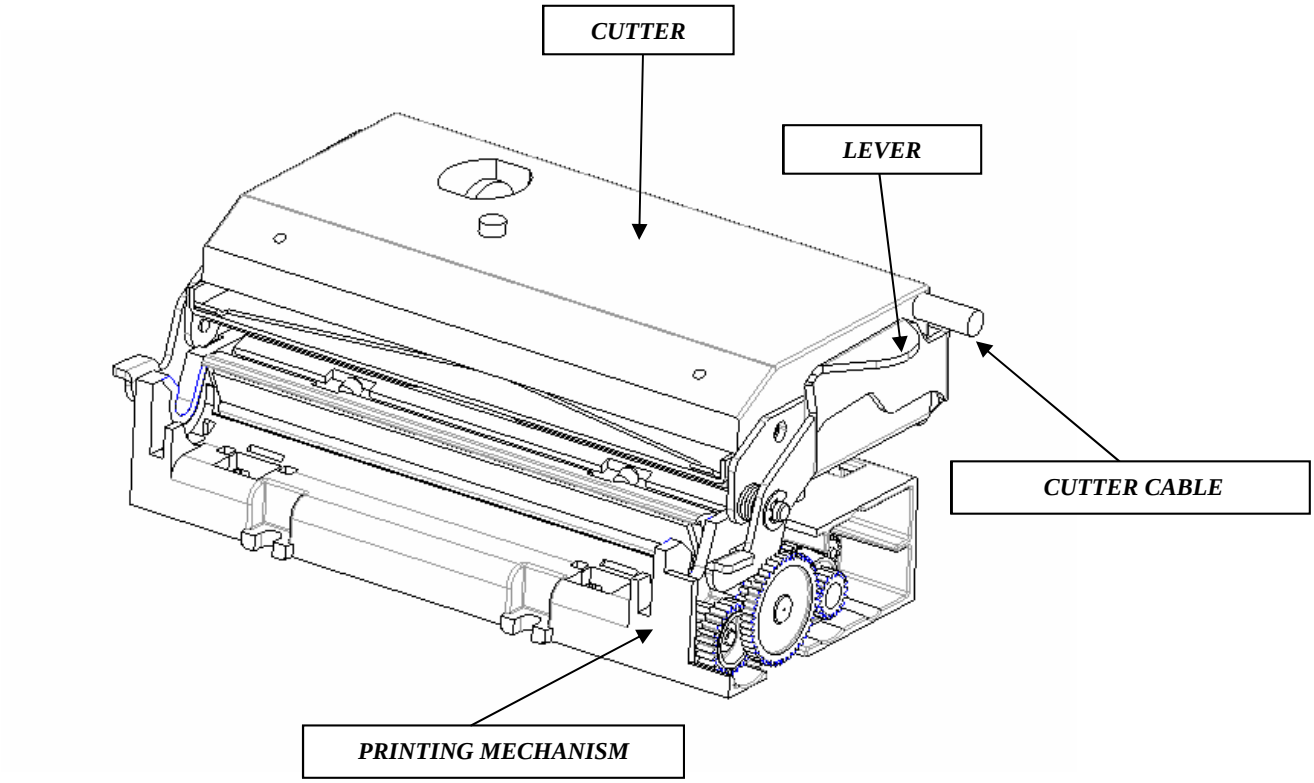
❺ Corresponds to 835 mA

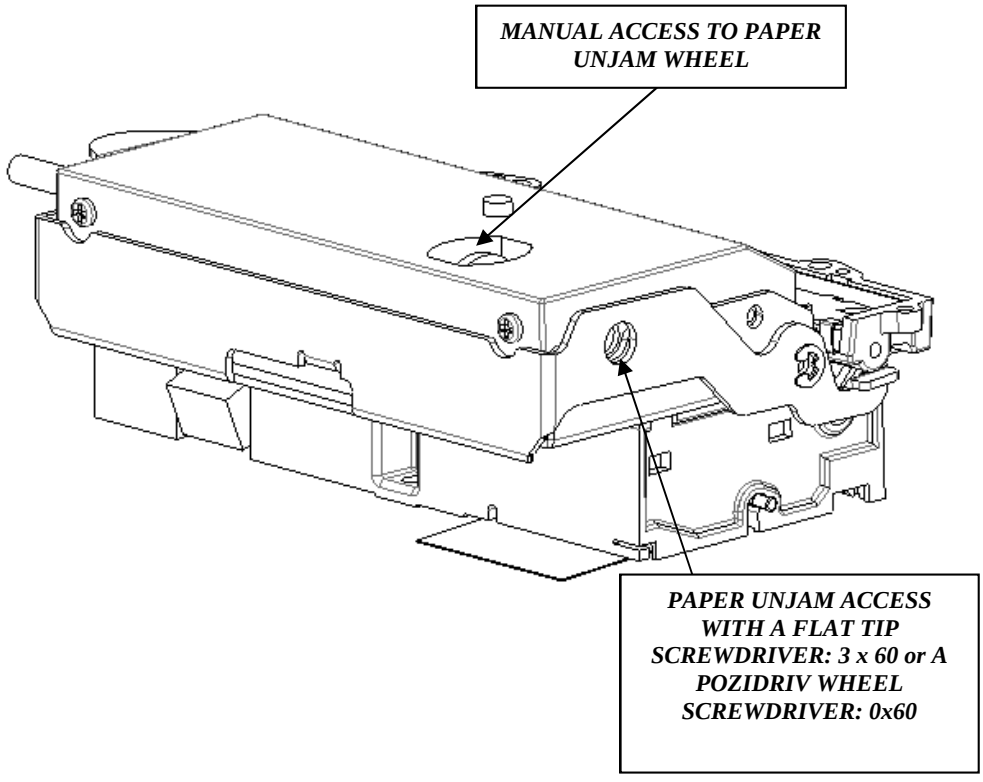
❻ Corresponds to 670 mA

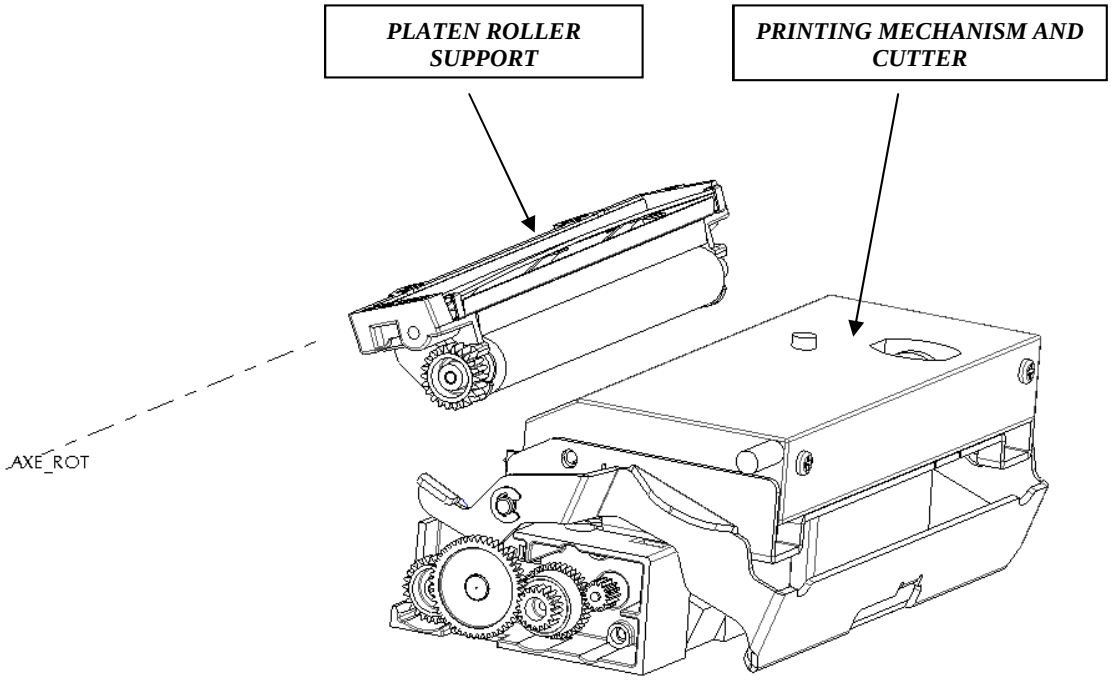
Note: For printing speed > 150 mm/s, with paper roll > 150 mm, it is advised to add a strainer

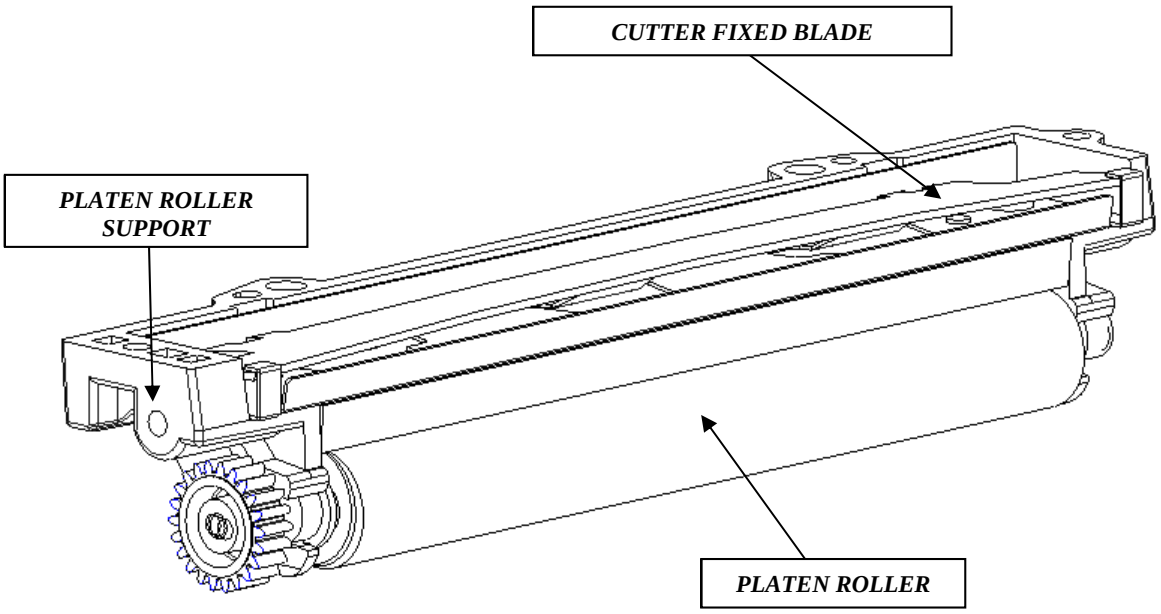
2. MECHANICAL SPECIFICATIONS FOR MGTA CLAMSHELL VERSION

2.1 General views





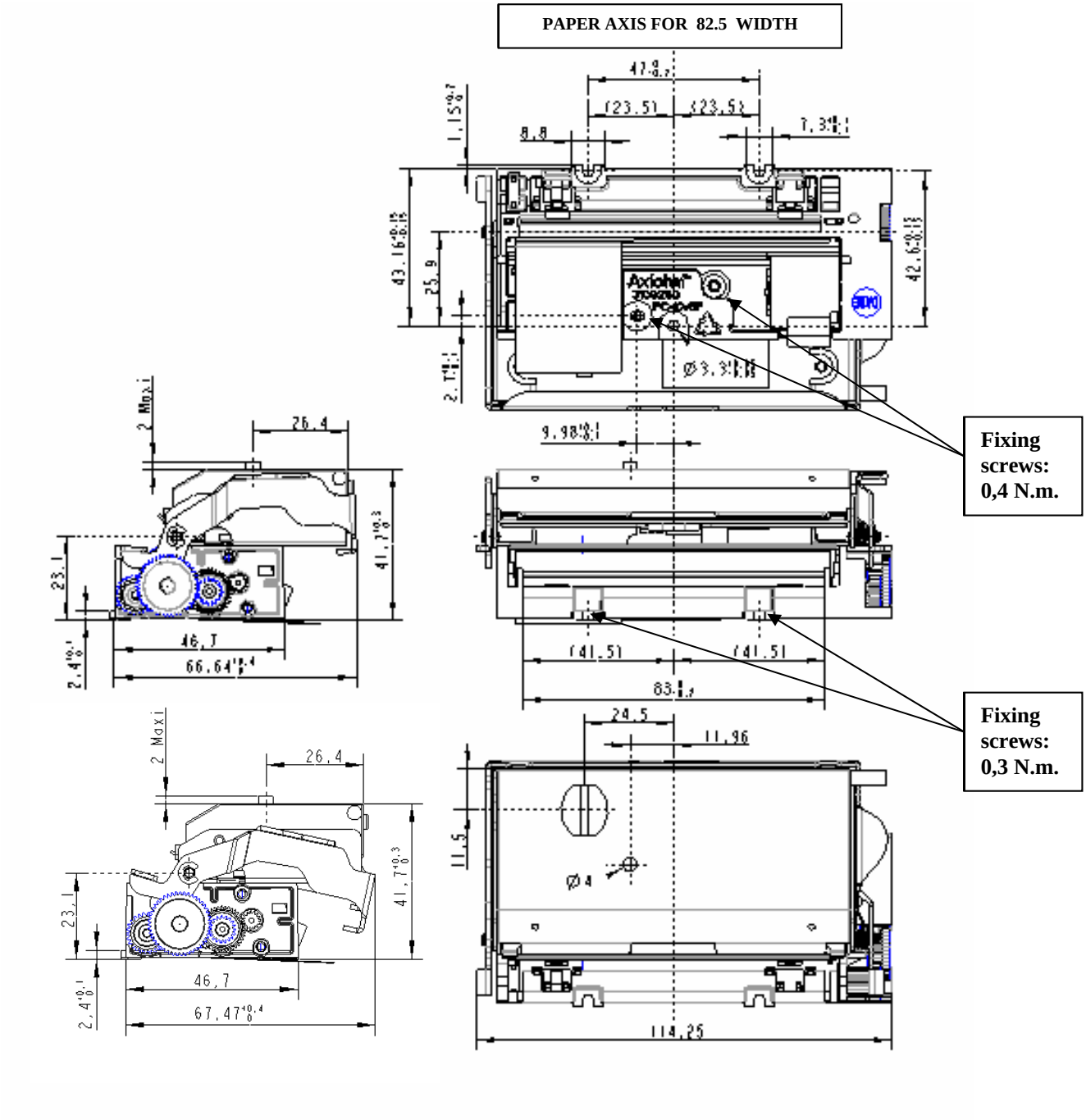

PLATEN ROLLER SUPPORT
PRINTING MECHANISM AND CUTTER
AXE_ROT


CUTTER FIXED BLADE
PLATEN ROLLER SUPPORT
PLATEN ROLLER

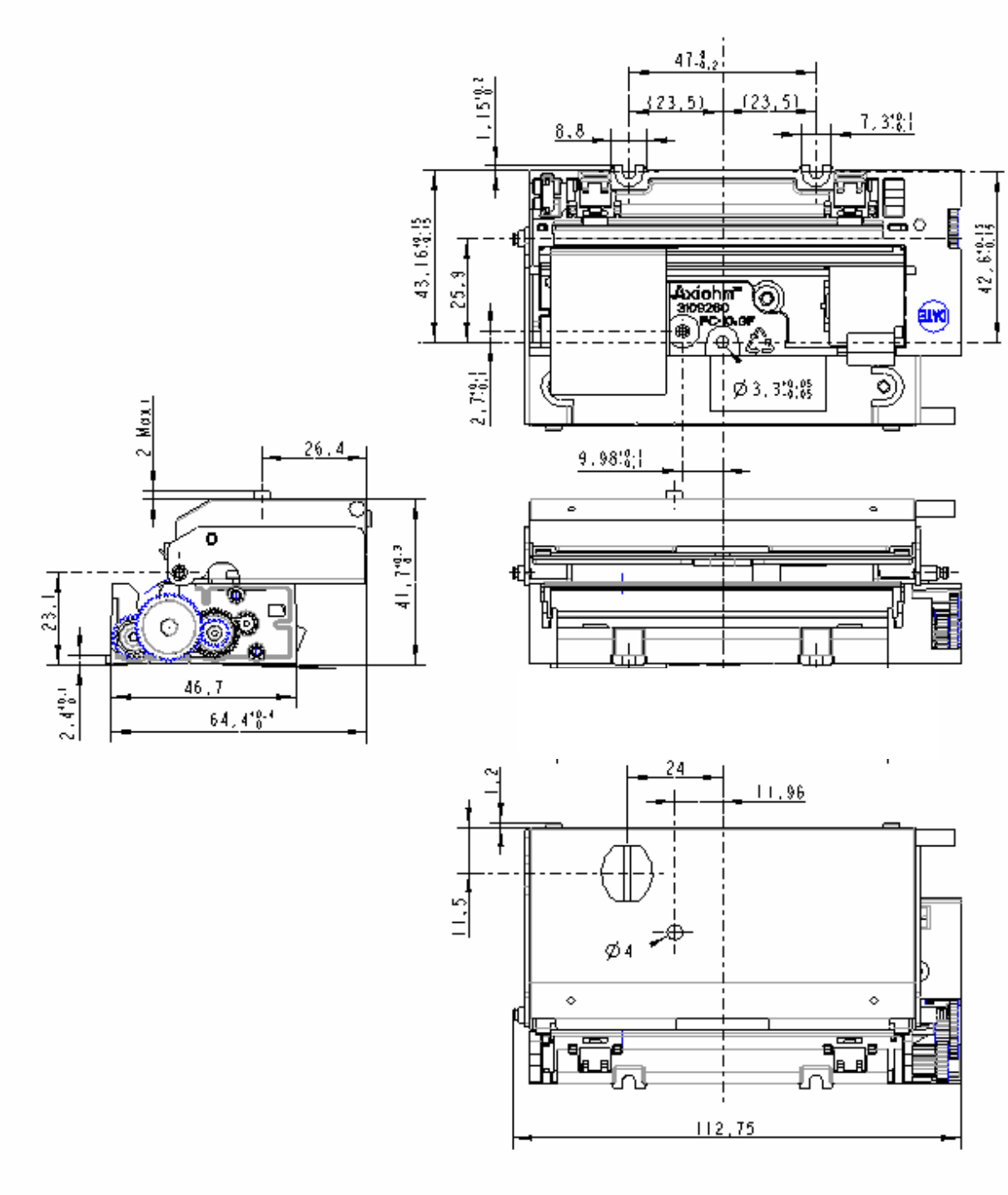
2.2 External dimensions

Mechanisms bulk with opening assistance lever:

THE MECHANISM 82.5mm HAS A 80 mm PRINTING WIDTH

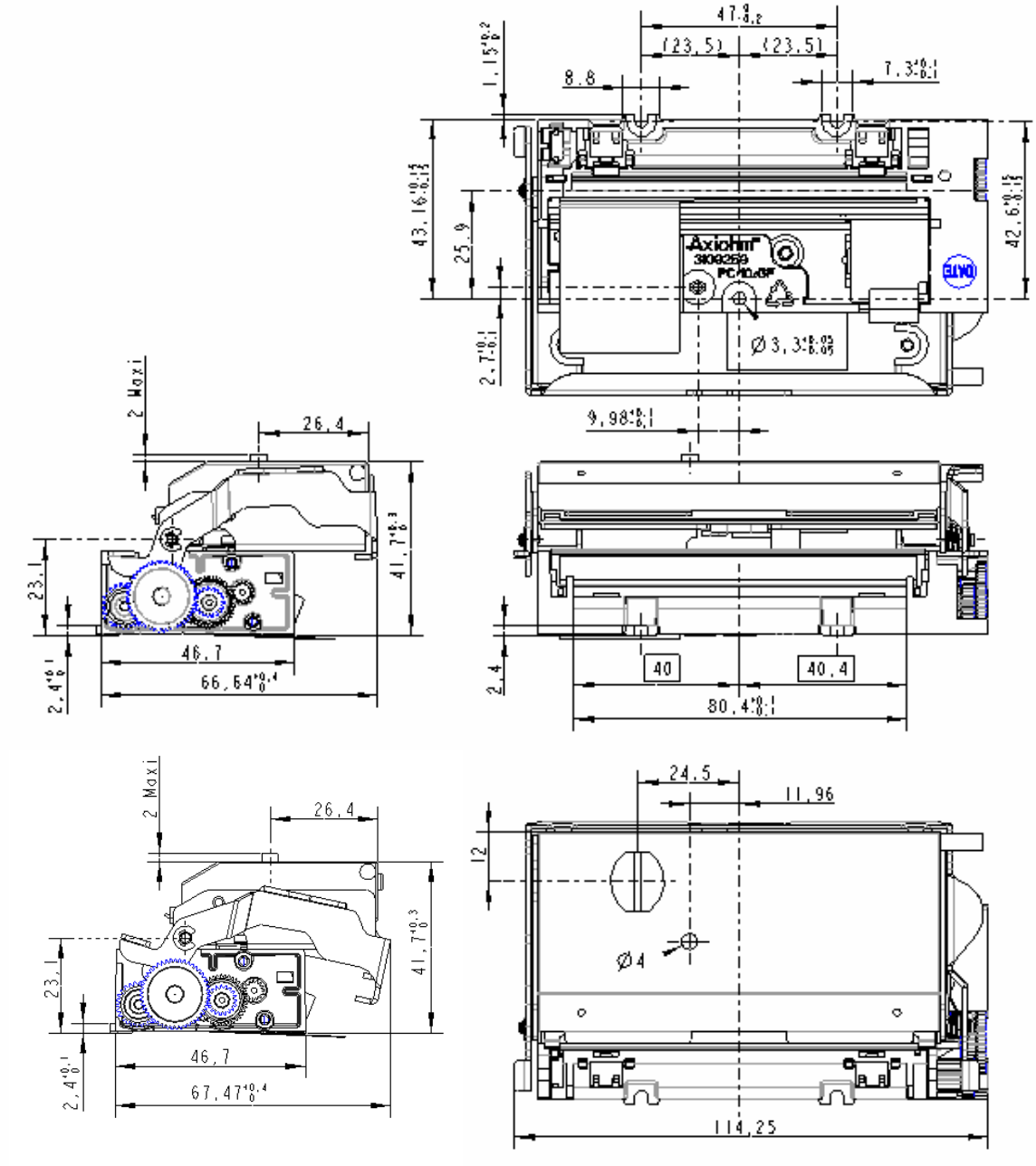


Bulk without opening assistance lever for mechanisms 80 and 82.5:



Mechanism 80 paper path position:

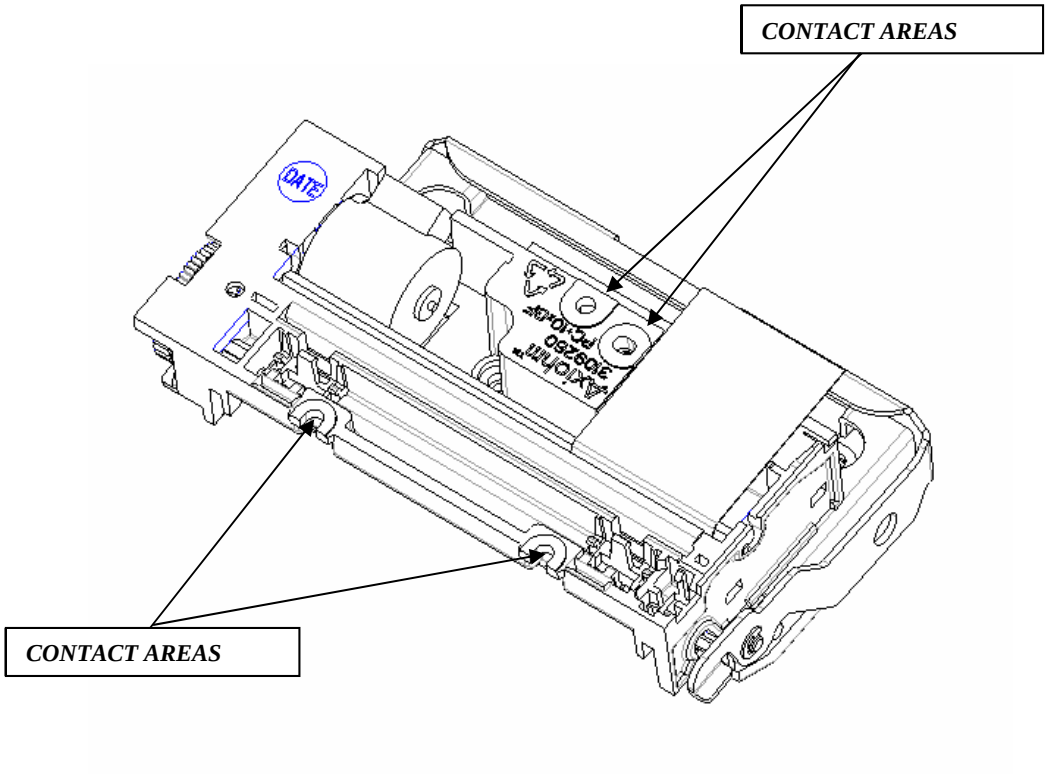
THE 80mm MECHANISM HAS A PRINTING WIDTH UNTIL 80mm



2.3 Fixations

***Note**:* general tolerances ± 0.1 *(when no other is specified)*

Contact areas:



Hitching points and fixations:

Fixing is done by hitching (ACC) on the front one, by a positioning with a locating (LOC), and a self-tapping screw (FIX1) Ø 2.5 for plastics, to lock the unit.

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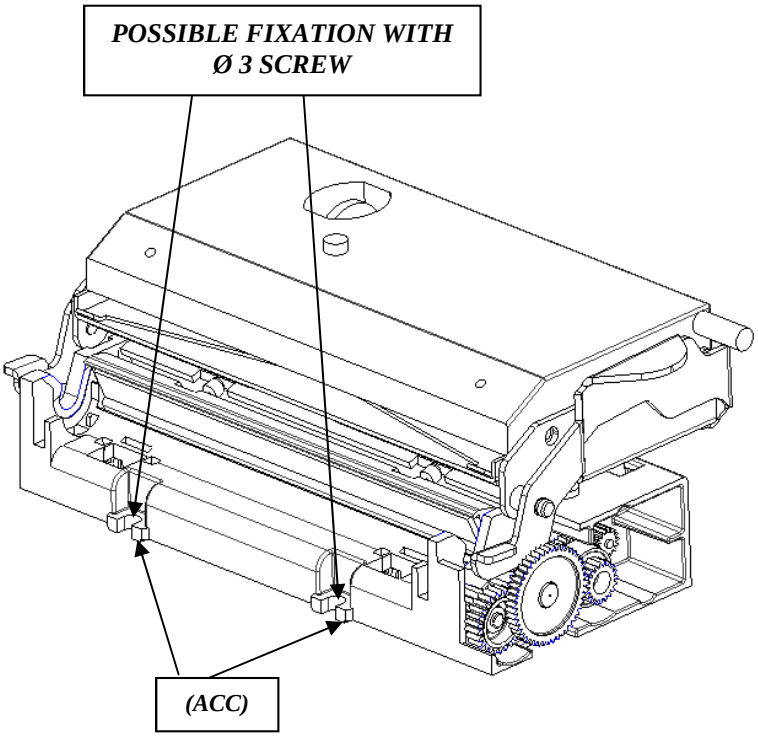
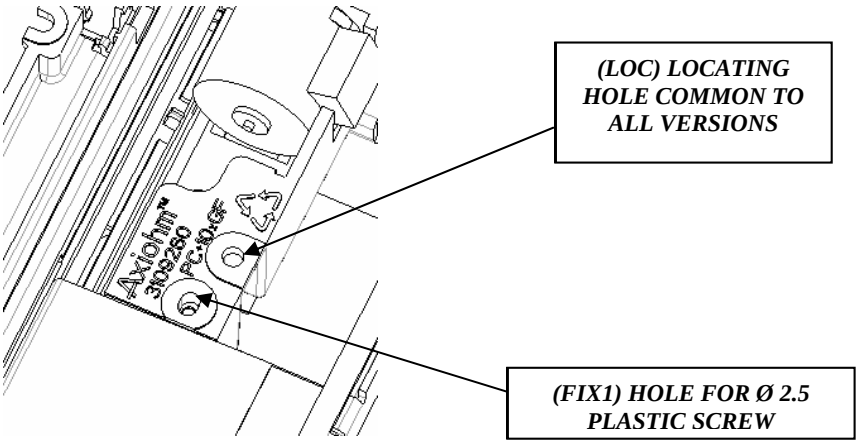
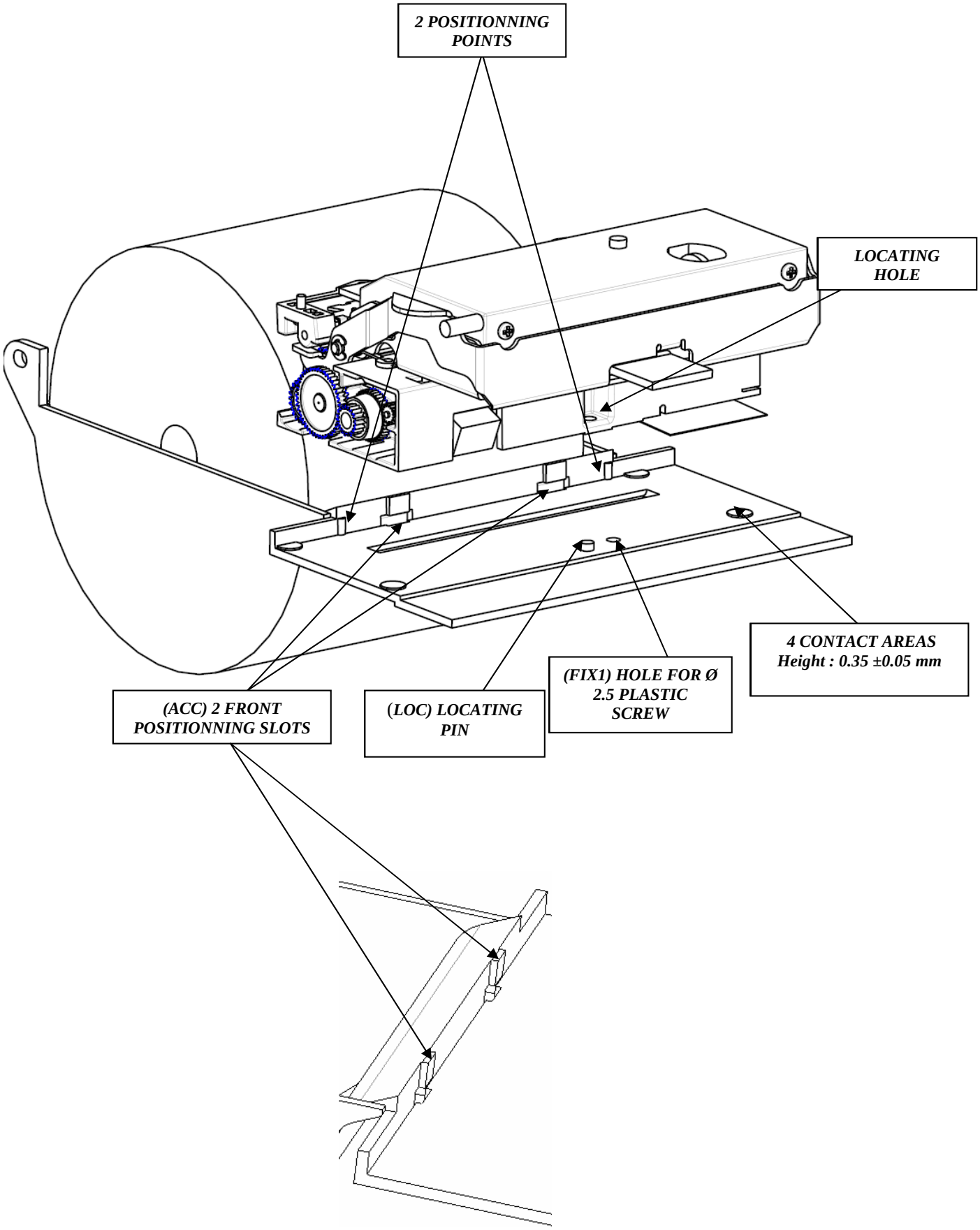
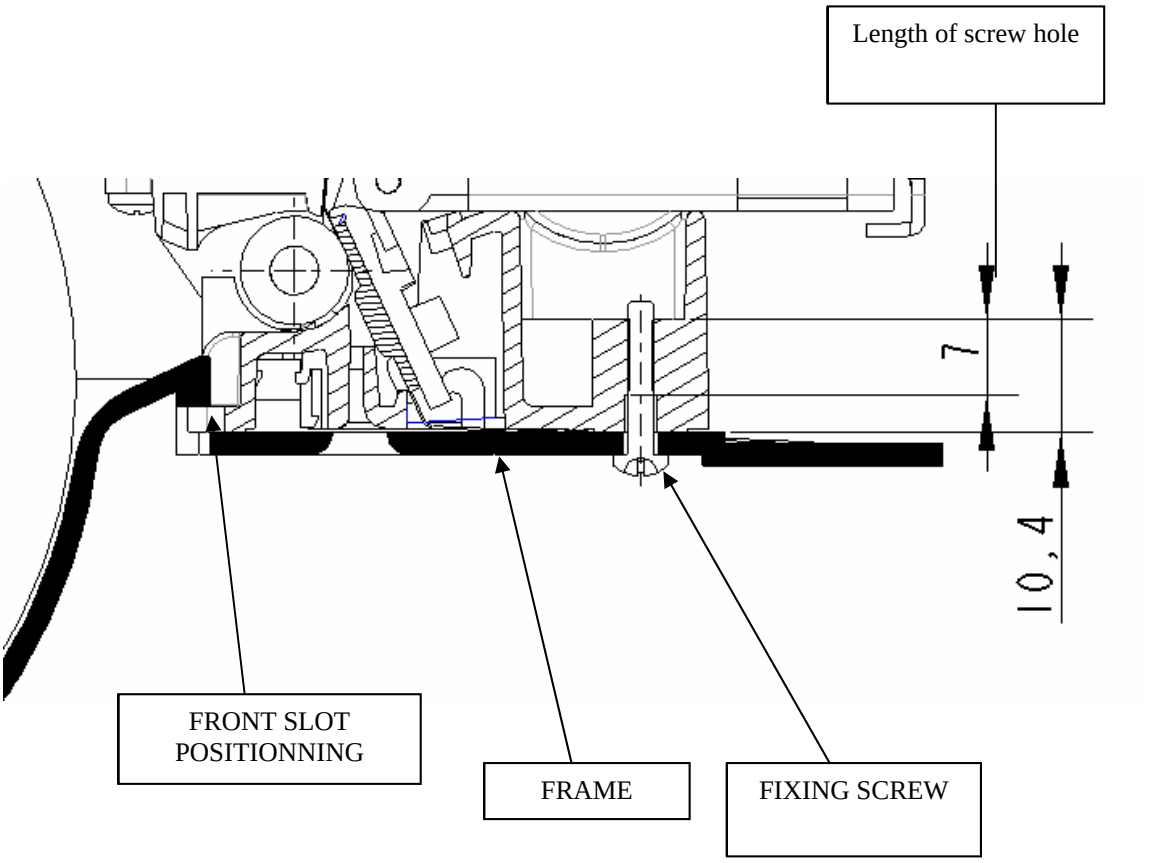


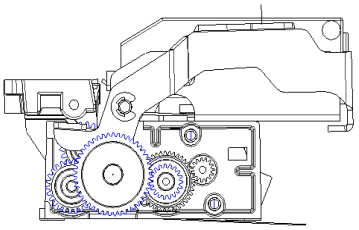



2 POSITIONNING POINTS
LOCATING HOLE
4 CONTACT AREAS
Height : 0.35 ±0.05 mm
(FIX1) HOLE FOR Ø 2.5 PLASTIC SCREW
(LOC) LOCATING PIN
(ACC) 2 FRONT POSITIONNING SLOTS

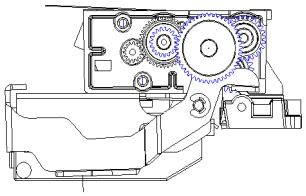

Length of screw hole
7
10,4
FRONT SLOT
POSITIONNING
FRAME
FIXING SCREW

Support plan angular position:

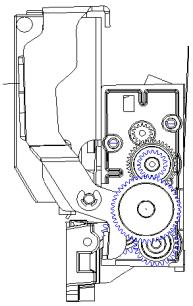
POSSIBLE



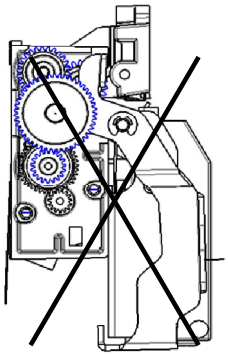
POSSIBLE



POSSIBLE



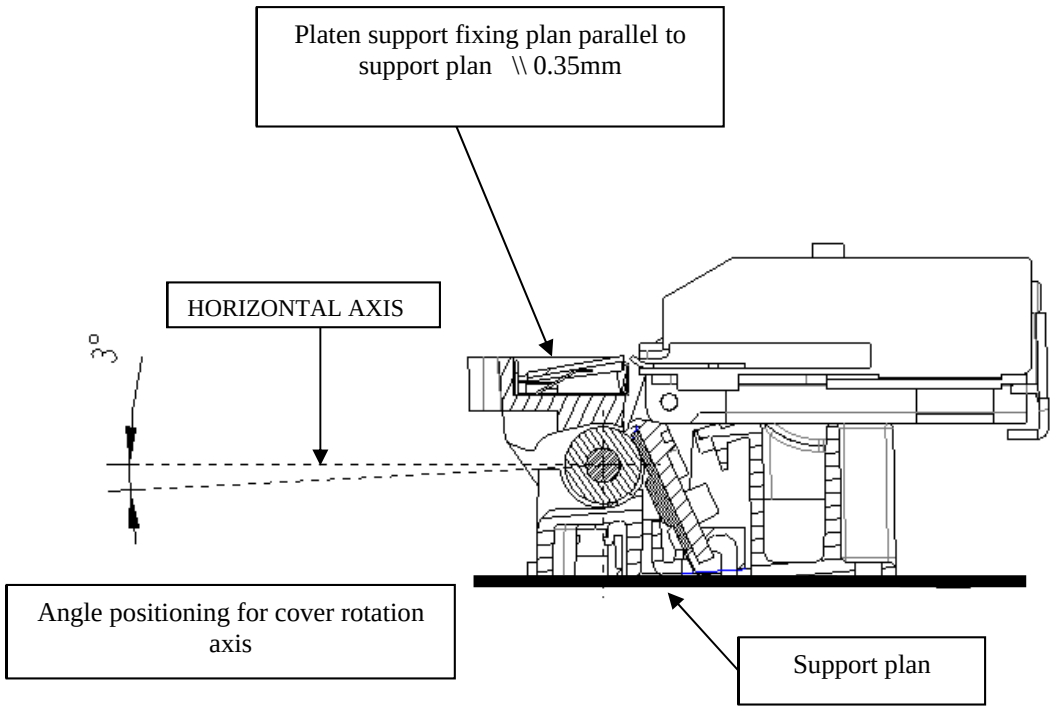
NOT RECOMMENDED



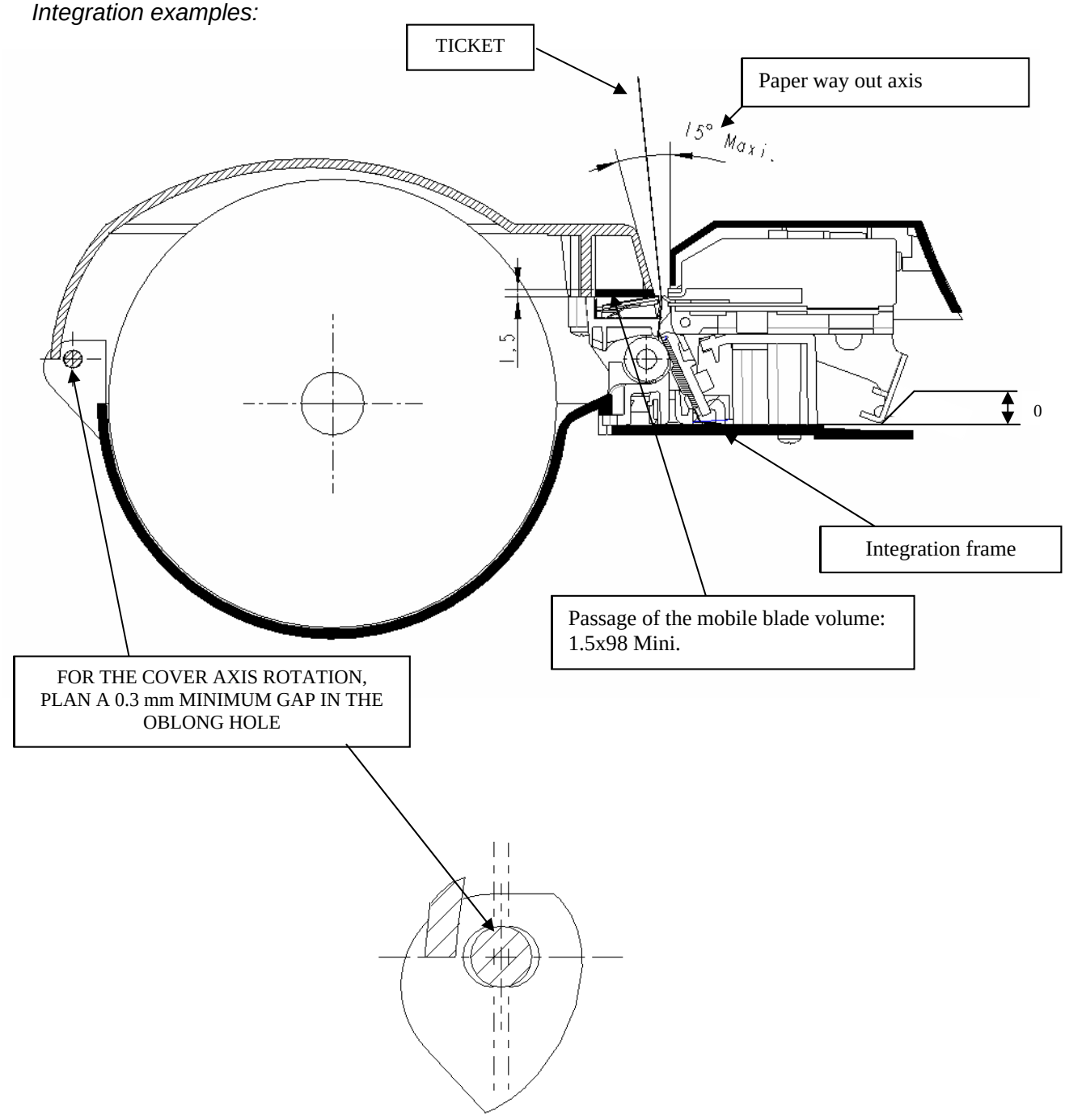
2.4 Cover integration

For the Clamshell front paper path application, a cover is mandatory in order to keep in position the platen roller support.

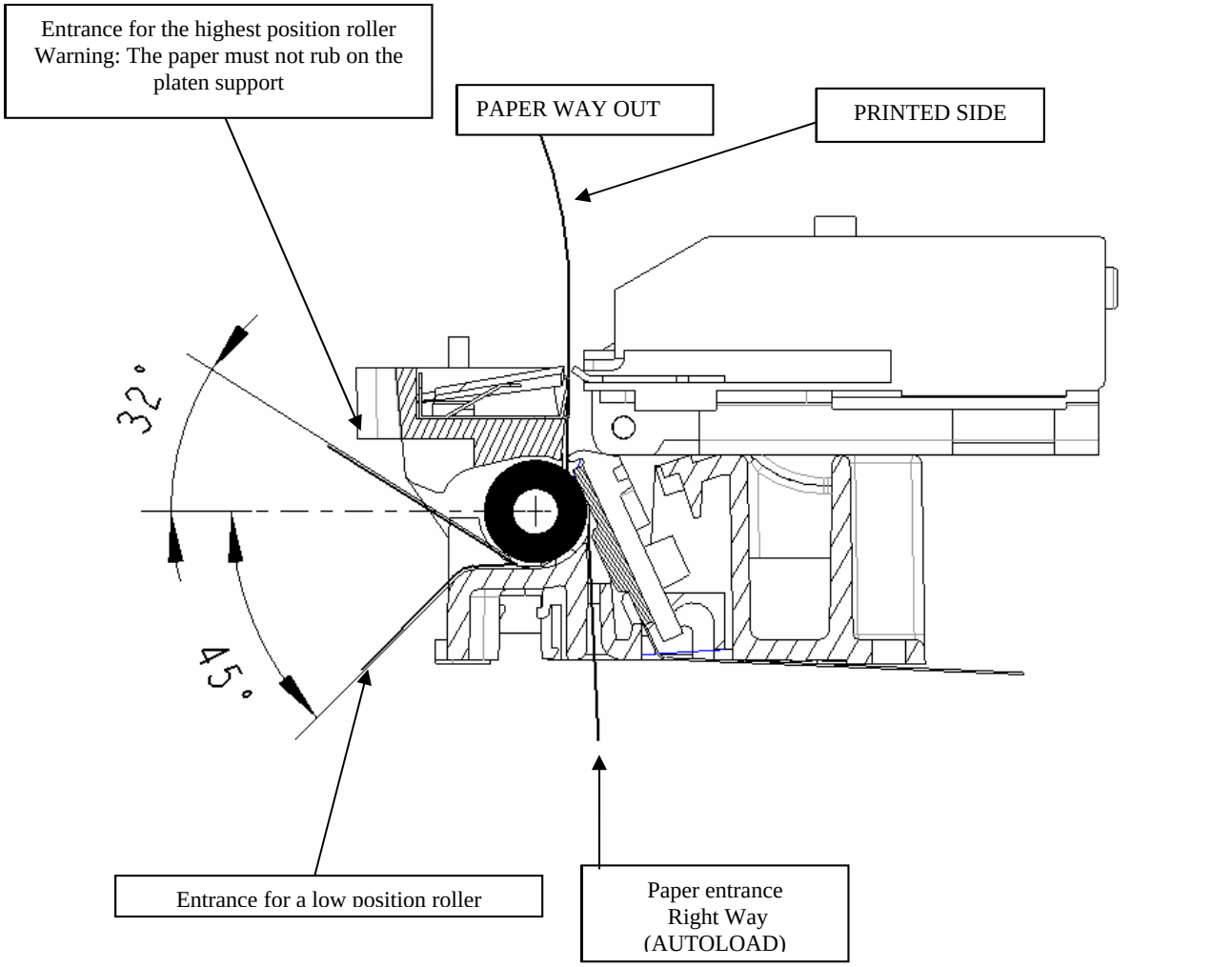
Cover axis rotation position:



Integration examples:



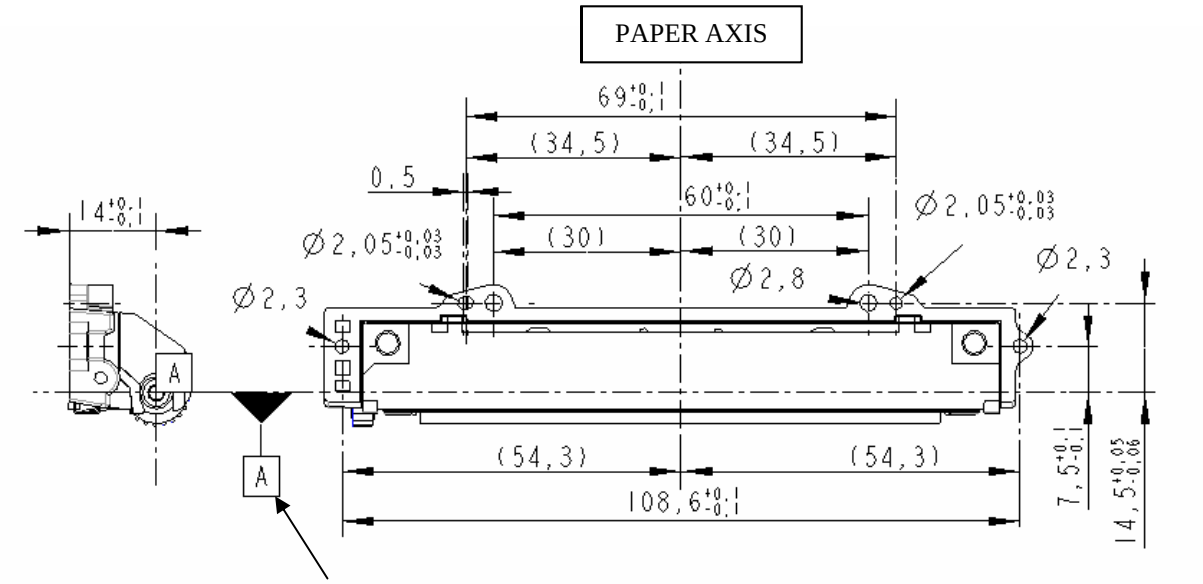
Paper path:

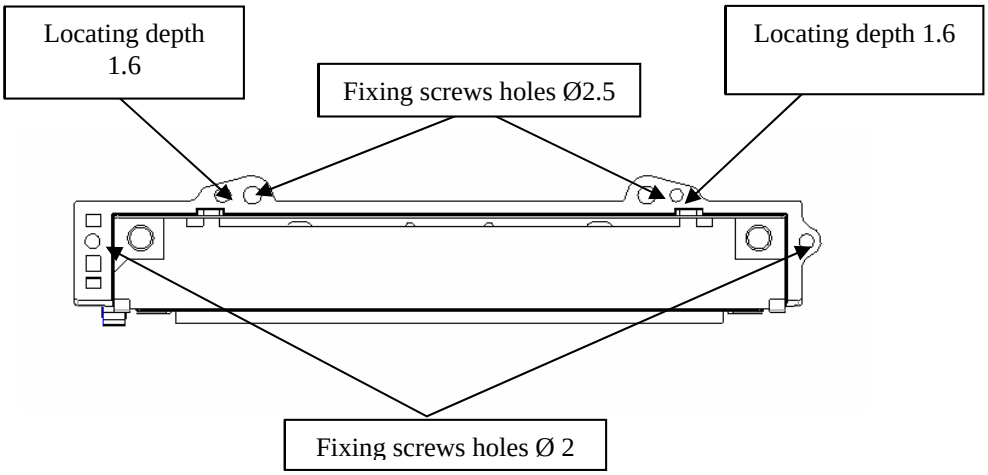

Entrance for the highest position roller
Warning: The paper must not rub on the platen support
PAPER WAY OUT
PRINTED SIDE
32°
45°
Entrance for a low position roller
Paper entrance
Right Way
(AUTOLOAD)

Platen roller support fixation:

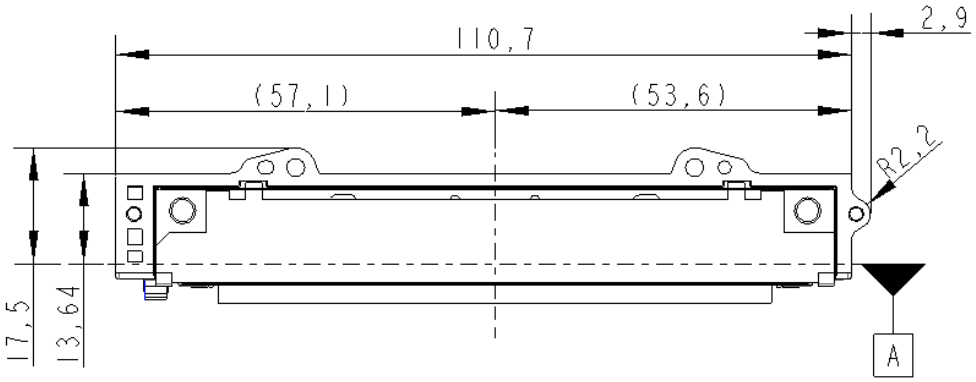
Bulk and platen support integration:

Fixing points dimensions:





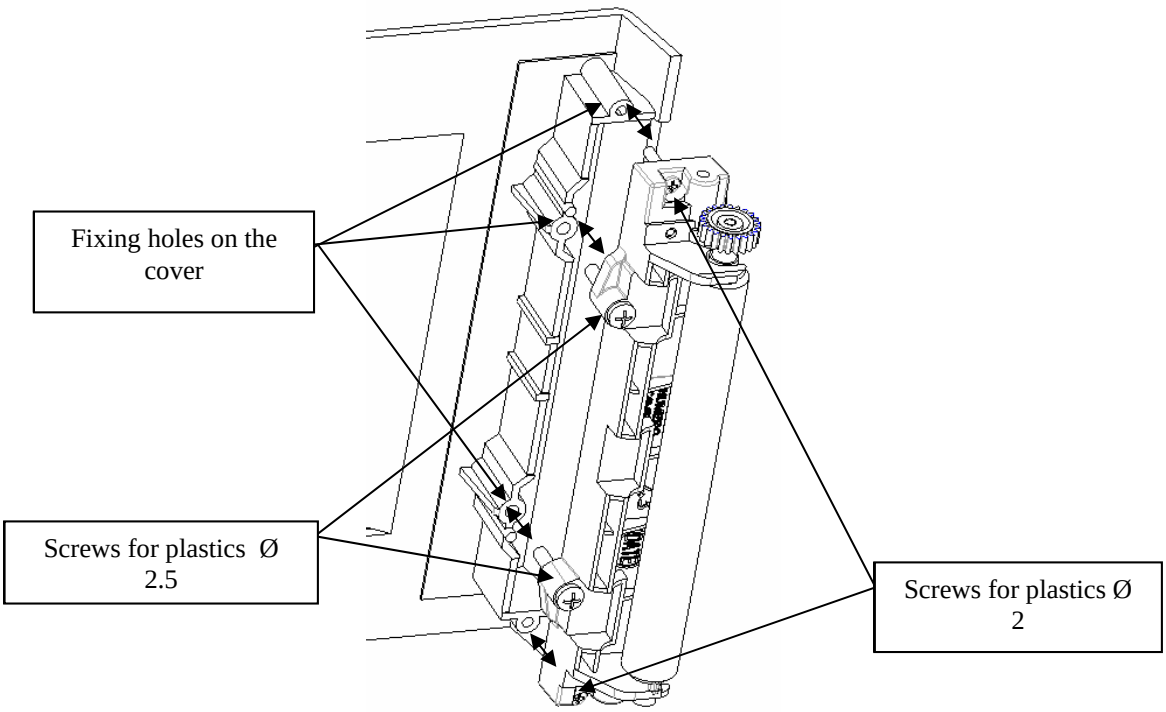
General bulk dimensions:



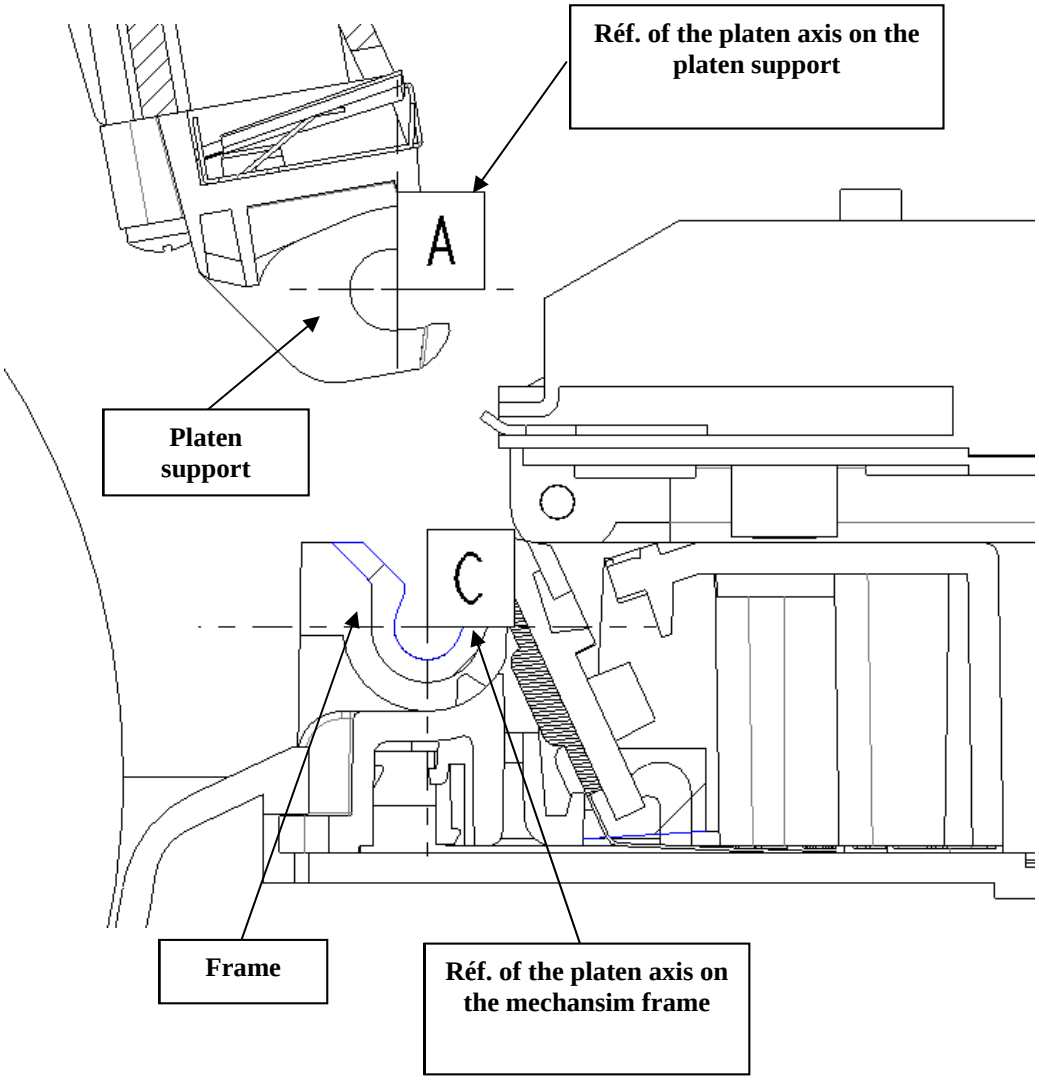
Platen support fixing on the cover:

In the case of opening assistance lever: Two fixing points are enough

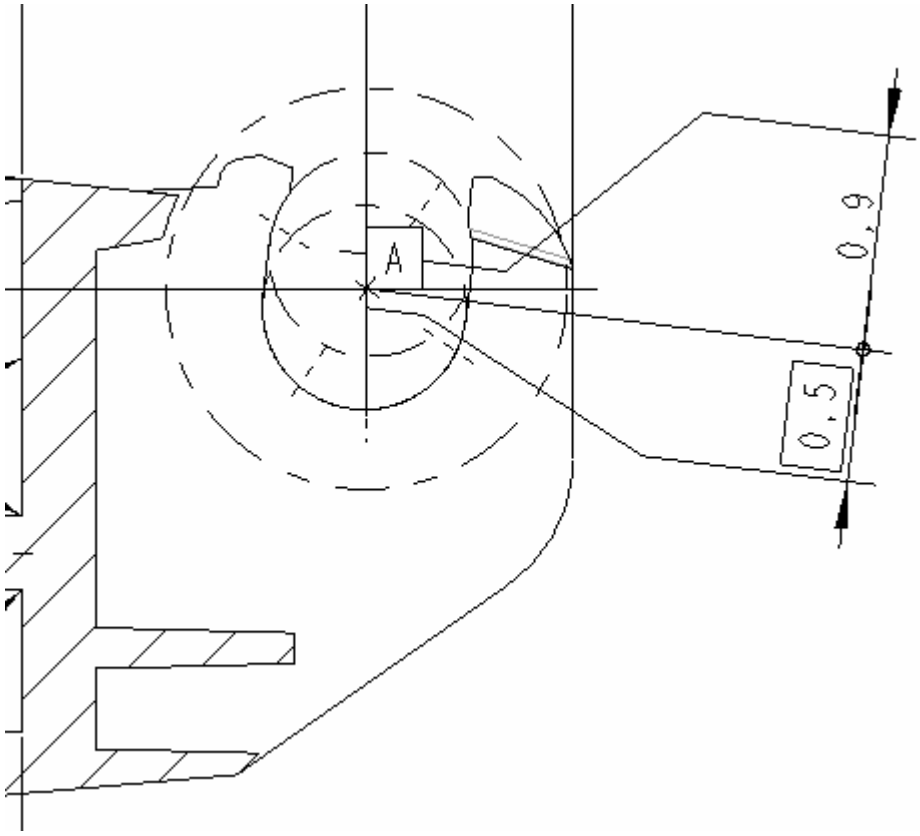
For the use without opening assistance lever, you must use the four fixing points.



The references A of the Platen support and C of the printing mechanism Frame correspond when the cover is closed.



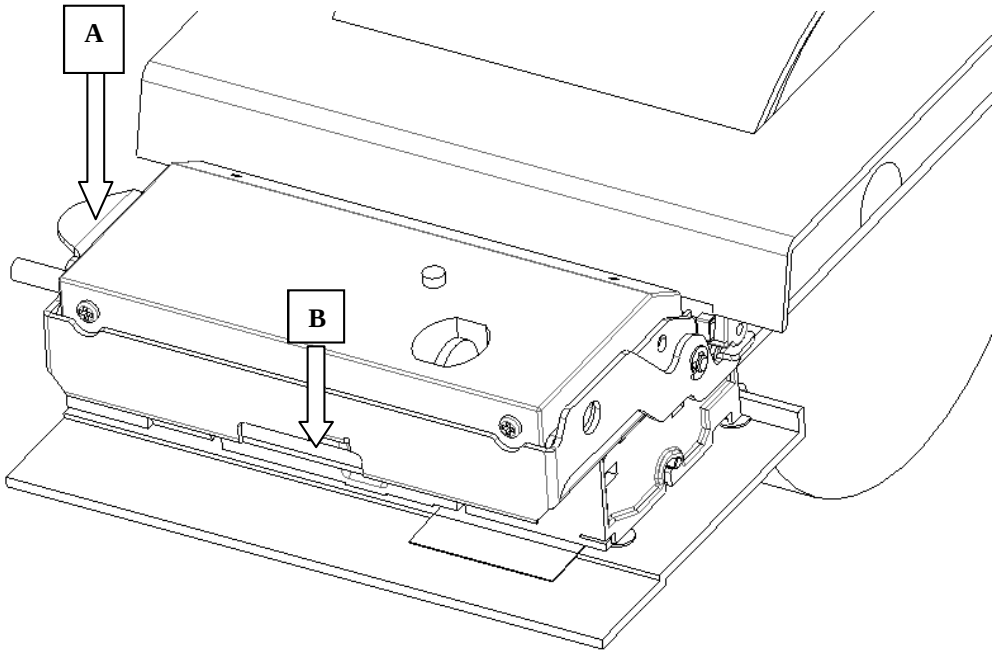
Freedom Platen in its support:



2.5 Opening system

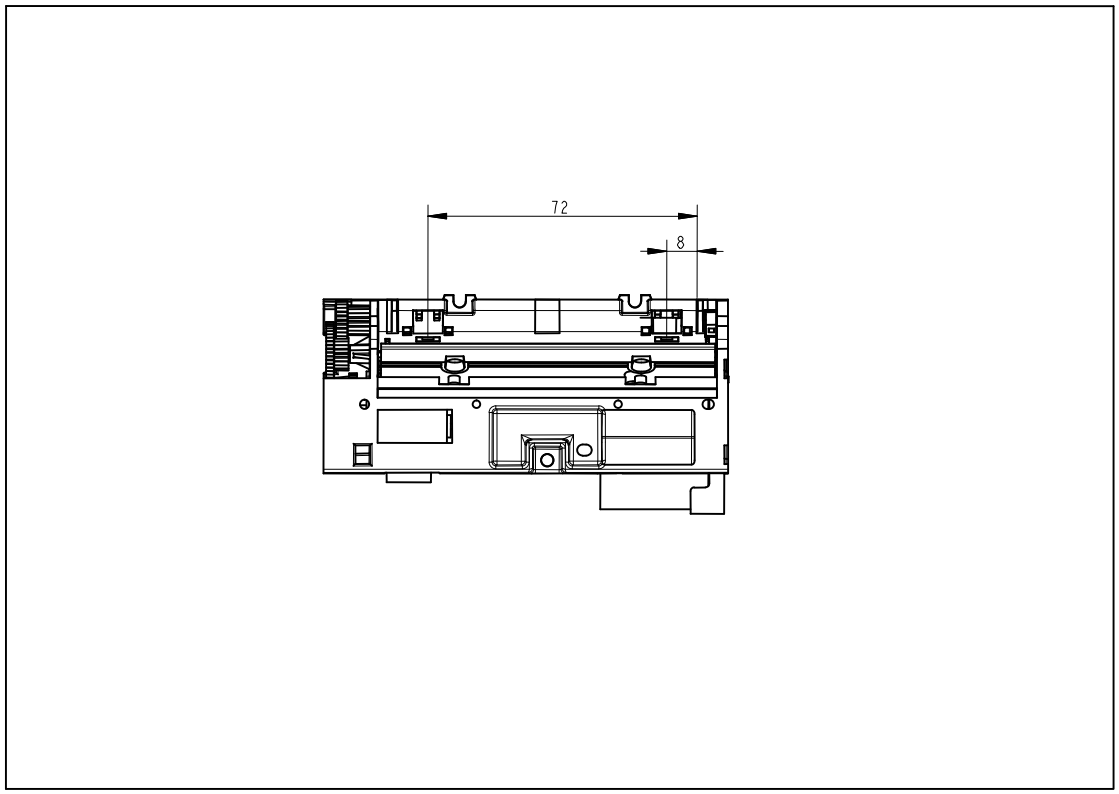
Opening lever activating possibilities:

Various possibilities to activate the assistance opening lever at the Point **A** or at Point **B**.
Opening effort at point **A 11N ± 10%**
Opening effort at point **B 6.5N ± 10%**



2.6 *Opto-sensor position*

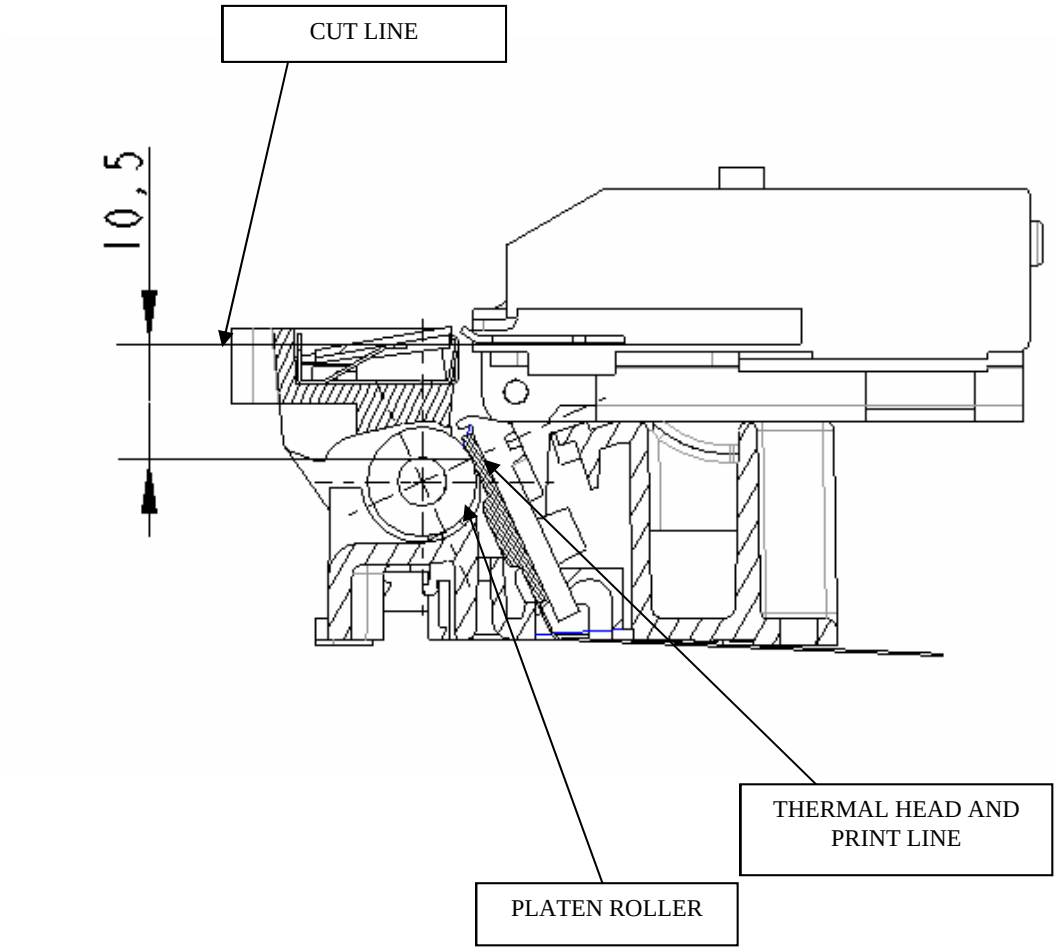
Distance between opto-sensor and line of dots: 12.5mm



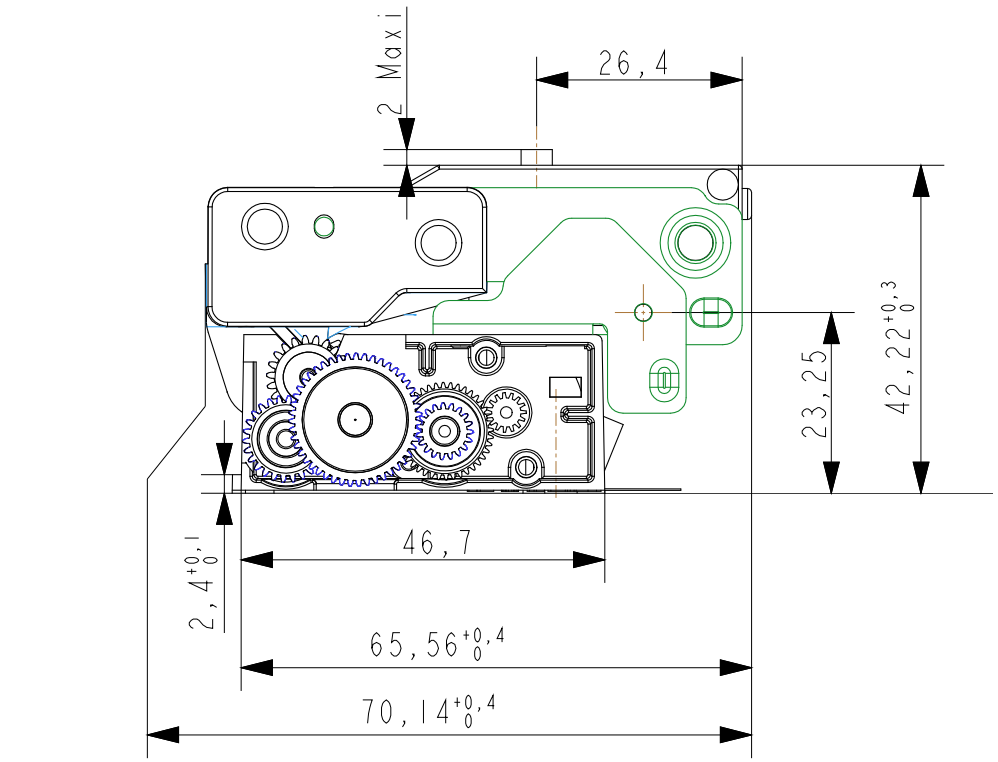
2.7 Distance between dots line & cut line

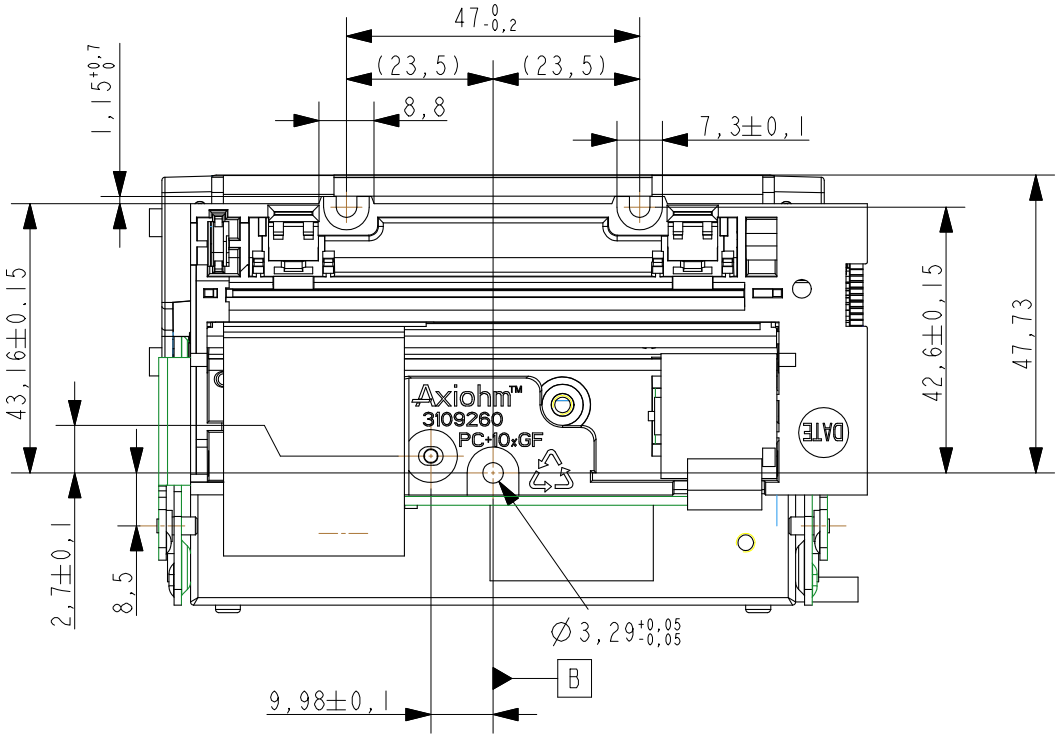
Distance between the print line and the cut line:

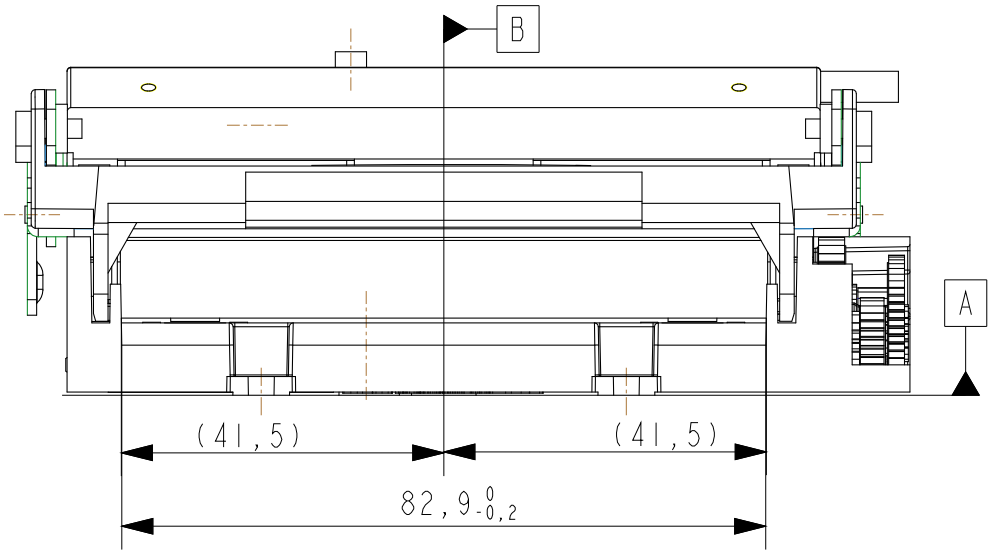
Maximum paper reverse feeding is 8 mm.

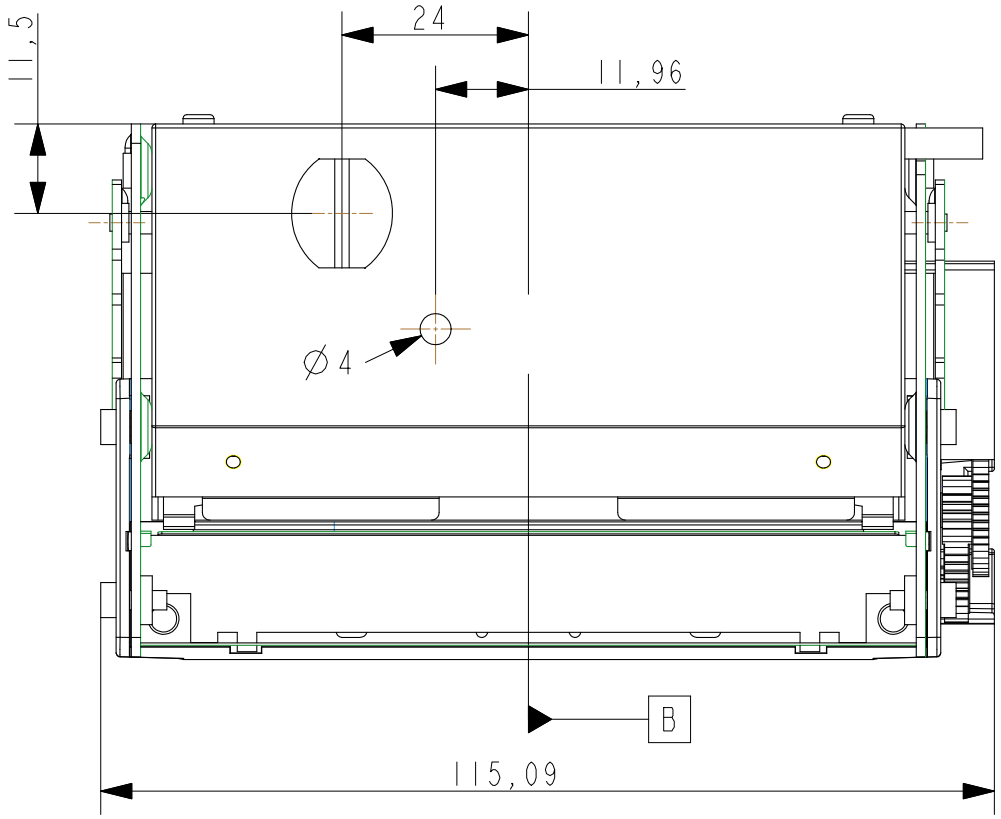


3. MECHANICAL SPECIFICATIONS FOR MGTA AUTOLOAD VERSION






B
A
(41,5)
(41,5)
82,9 0 -0,2


24
11,5
11,96
Ø4
B
115,09

4. ELECTRICAL SPECIFICATIONS

4.1 Nominal Power supply

PRINT HEAD		
Logic (Vcc)	5	Volts
Dot line (Vch)	24	
Stepping Motor	24 (but usually driven with currant)	

4.2 Nominal consumption of printer

PRINTER		
Print-head : Heating current / dot (Vch)	30	mA
Logic current complete Print-head	50	
Stepping motor currents (2 activated phases)	910 ❶ / 835 ❷ / 670 ❸	

❶ 230 mm on axis / 200 mm in bucket with rollers
❷ 230 mm on axis / 170 mm in bucket with rollers
❸ 195 mm on axis / 120 mm in bucket with rollers

4.3 Description of print-head

PRINTER	24V	
Driver chips	10	-
Operating range (Vcc)	5, ±5%	V DC
Mean dot resistance	800 ± 3%	Ω
Nominal dot supply voltage (Vch)	24 to 26,5 (max)	V DC
LSI supply voltage (± 5%)	5	V DC
Nominal Heating current per dot	30	mA
Max. number of dots to heat at once	384*	-

*** The purpose is to avoid current greater than 12A**
(384 dots "On" give 11,5 A when applying 24V at nominal resistances on 24V versions,

4.3.1 Function of 64-BIT LSI drivers chart and operation

The LSI power and multiplexing circuit drivers located on the thermal print head provide power control from logic signals and the DC power supply voltage.

These circuits are supplied by **5 V ± 5%** logic voltage. Take care to filter transient and parasitic on all logic lines. Undetermined states can happen and can destroy the head. The power source should be disconnected from the logic source. The logic source must be connected to the same source as the electronic circuits in charge of controlling the printer.

Each circuit features 64 open collector transistors, a 64-bit shift register and a 64-bit memory register.
Each circuit controls 64 resistor dots on the print head.

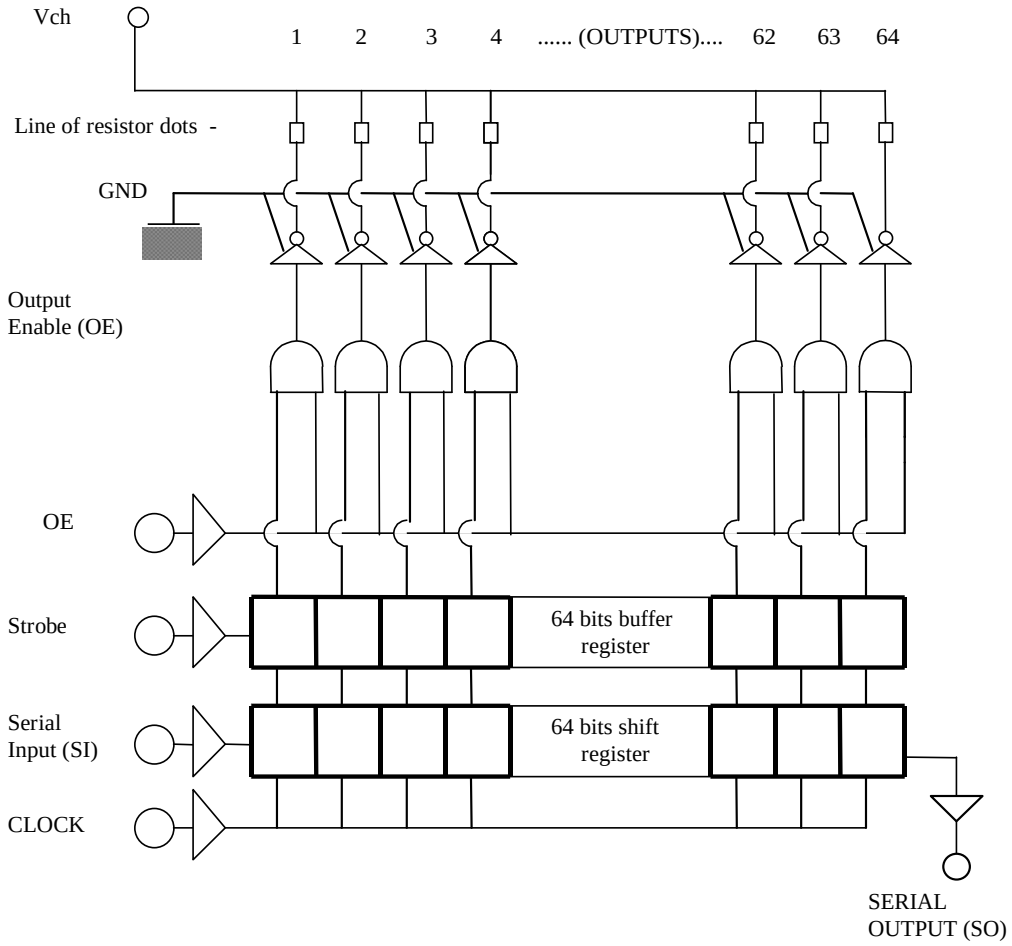


Figure 1 driver chart

Note: See the following pages for available signals on the printer connection.

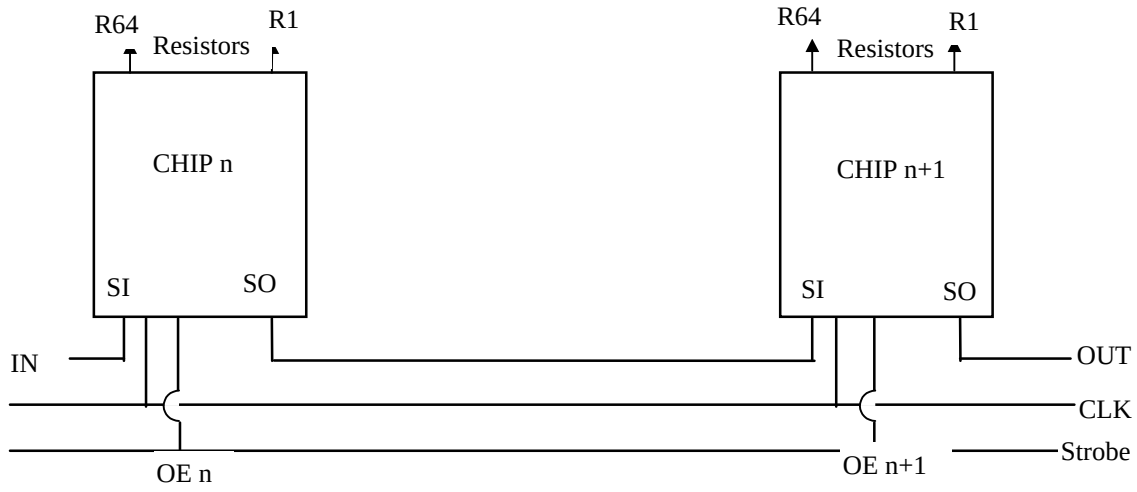


Figure 2 Routing of data to the thermistor dots

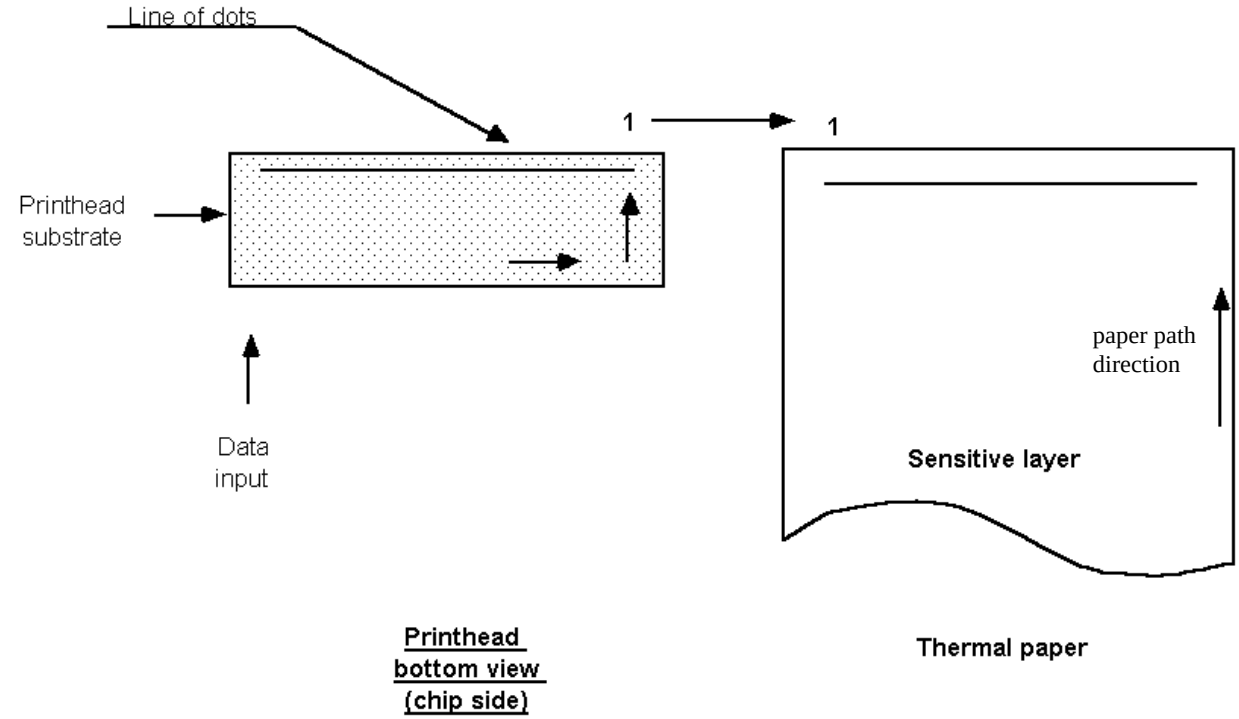


Figure 3 Dots print order

The first bit of data entered will be the first bit of data printed (FIFO).

4.3.2 Electrical specifications of 64-bits LSI driver

4.3.2.1 General electrical description of drivers

DESCRIPTION	Min	Maxi	Unit
Max. voltage at outputs 1 to 64		26,4	Volt
Max. voltage any other pin	4,75	5,25	Volt
Max. output current		31	mA
Total max. output current (384 dots "On")		11.9	A

4.3.2.2 Other

The specifications given below are given for the following conditions:

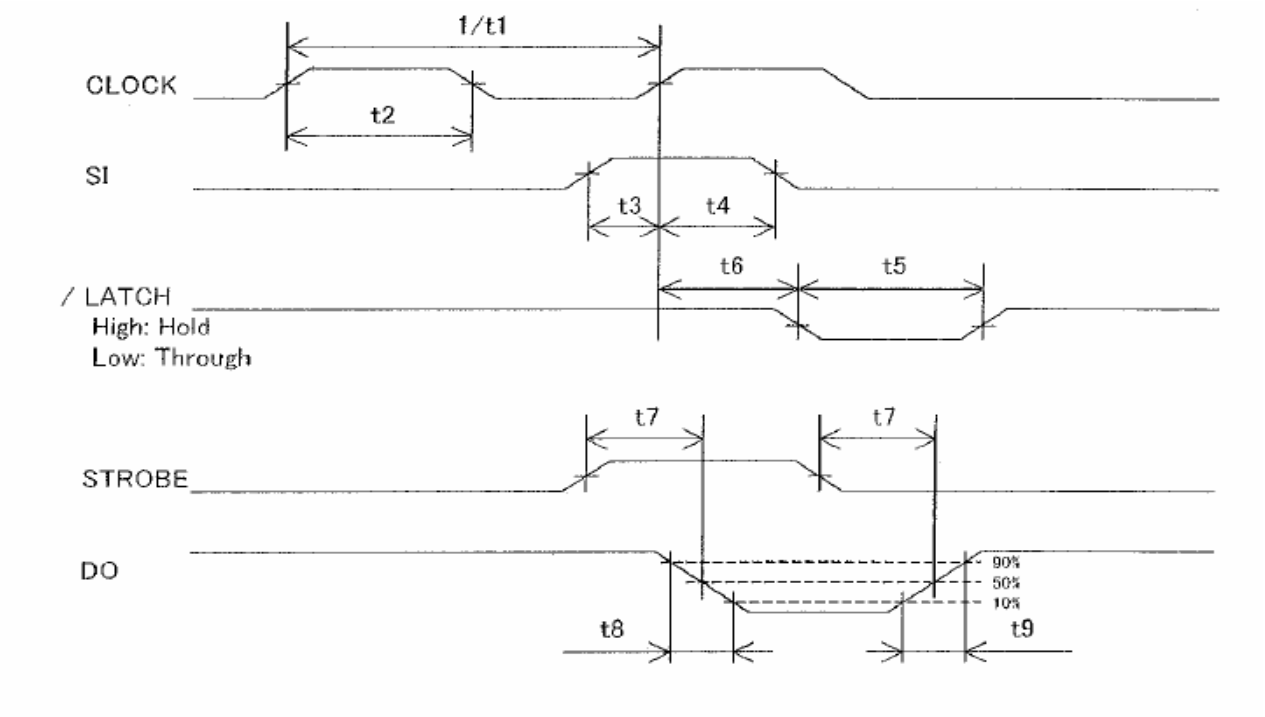
Logic voltage on chip: 4.75V < Vcc < 5.25V (*care should be taken to filter any transient signal or parasitic in order to keep the driver in a known state: failure to observe this may result in head destruction*).

Clock frequency (*max.*): 8 MHz

	CONDITIONS	VALUES	SYMBOL
Vcc supply current Complete print-head	All inputs High Level	70mA	Idd
Min. high-level input voltage	Vcc ≤ 5 Volts	0,7 × Vcc	Vih
Max. high-level input voltage	Vcc ≥ 5 Volts	Vcc	Vih
Min. low-level input voltage		0	Vil
Max. low-level input voltage		0,3 × Vcc	Vil
Max. high-level input current		0,5 µA	Iih
Max. low-level input current		0,5 µA	Iil

4.3.2.3 Timing

4.3.2.3.1 Advanced version:



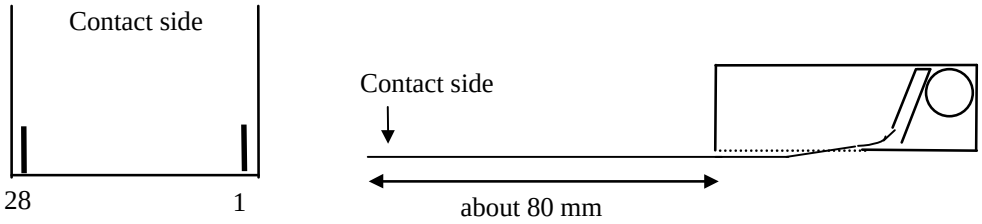
1 LSI driver symbols

SYMBOL	DESCRIPTION	Min	Typ	Maxi	Unit
Rave	Average Resistance Value	776	800	824	Ω
Vset	Output Supply Voltage	-	-	26,4	V
VDD	Supply Voltage	4.75	5.00	5.25	V
IDD	Supply Current	-	-	50	mA
V_{IH}	Hich Level Input Voltage	0.7 x VDD	-	VDD	V
V_{IL}	Low Level Inptu Voltage	0	-	0.3 x VDD	V
I_{IH}	Hich Level Input Current	-	-	0.5	µA
I_{IL}	Low Level Inptu Current	-0.5	-	-	µA
I_{LEAK}	DO Leakage Current	-	-	0.08	mA
t1	CLOCK Frequency	-	-	8	MHz
t2	CLOCK Pulse Width	50	-	-	ns
t3	CLOCK-SI Setup Time	20	-	-	ns
t4	CLOCK-SI Hold Time	10	-	-	ns
t5	LATCH Pulse Width	100	-	-	ns
t6	CLOCK-LATCH Setup Time	100	-	-	ns
t7	STROBE-DO Delay Time	-	-	10.5	ns
t8	DO Fall Time	-	3.5	10.0	µs
t9	DO Rise Time	-	2.0	6.0	µs

Table 1 Pin out of the printer flex cable

PIN NUMBER	SIGNAL	COMMENT
1	Vch	
2	Vch	
3	Serial In	Serial input for data to be printed
4	GND	
5	TM	Thermistor
6	TM	Thermistor
7	OE2	OE for driver 3 and for driver 4
8	OE1	OE for driver 1 and for driver 2
9	Vcc	Supply voltage 5volts +/- 5%
10	Strobe	Strobe signal for line print
11	GND	
12	Clock	Clock signal for serializing data to the line
13	OE5	OE for driver 9 and for driver 10
14	GND	
15	GND	
16	OE4	OE for driver 7 and for driver 8
17	OE3	OE for driver 5 and for driver 6
18	GND	
19	GND	
20	GND	
21	GND	
22	GND	
23	Vch	
24	Vch	
25	Vch	
26	Vch	
27	Vch	
28	Vch	

***Caution*:** All GND pins should be connected to Mother Board's GND (GND Signal). It is necessary to connect a capacitor (2,2µF - 10V) between Vcc and GND and another (10 µF - 35V mini) between Vch and GND.



For the connection of the mechanism, Axiohm recommends the following 28 pin connectors (from print head flex to board): - Molex series 52610 reference 52610-2890 (straight connector).

5. PAPER FEED BIPOLAR STEPPING MOTOR

This bipolar stepping motor is used to drive the platen for paper feed; its characteristics are described bellow.

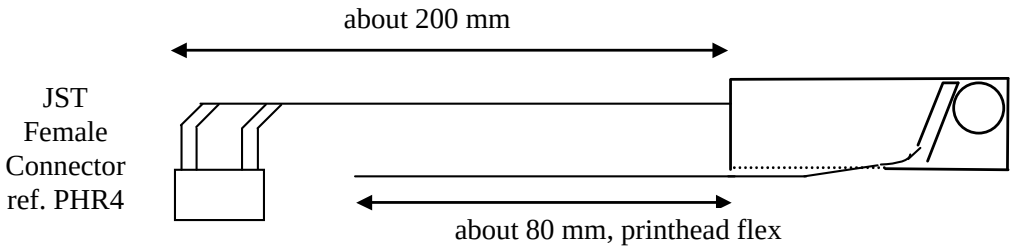
5.1 Characteristics

MOTOR SPECIFICATIONS		
Recommended control voltage*	24 +/-5%	VDC
Coil Resistance	3.5	Ω
Coil Resistance on high speed version	3.5	Ω
Number of phases	2 (bipolar)	
Pitch angle	18°	
Number of steps per revolution	20	
Paper feed for 1 motor step	0.125	mm
Recommended control currents	910 / 835 / 670	mA / phase
Maximum starting speed **	200	step / s

* Usual steeper motor control for 24V is done with current control, not with voltage control. Motor driver should be chosen accordingly.

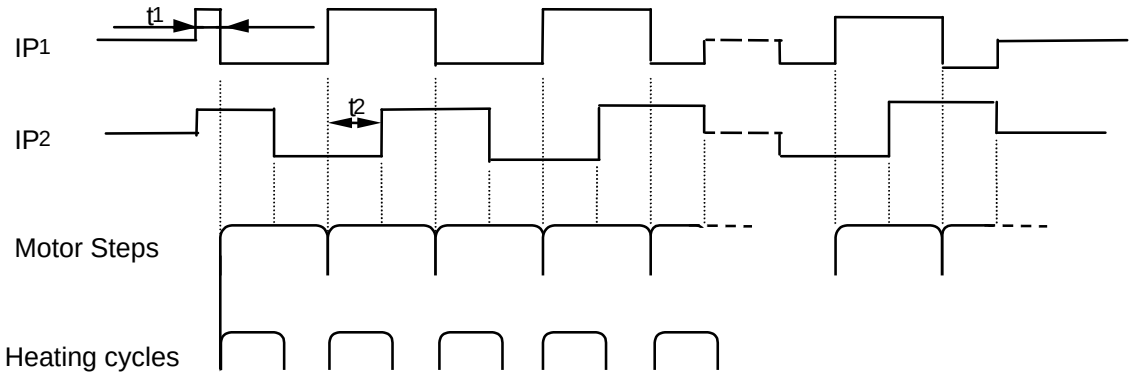
for MC/MHTA an acceleration ramp up must be achieved to reach 180 mm/s.
For motor driving, see the following page and the chapter "Recommendations".

5.2 Motor connection



5.3 Induction sequence and timing (paper feed)

Motor feed timing diagram



Note that each time the motor has been stopped for more than 8 minutes; the next step should be longer by 1 minute, in order to restart the motor in the appropriate position.

Motor initialization:

This operation is necessary to place the motor in a good position when the printer electronic is powered on or reset. Both phases must be powered with the same current during t1=1 ms. It must be followed by 16 motor steps in order to compensate the play in the gears.

5.4 Printing mode:

There are 4 different positions for the motor phases.

The circulation is:

P1 = A0B0 ; P2 = A1B1

P1P2 => $\bar{P}$1P2 => $\overline{P1P2}$ => P1$\bar{P}$2 => P1P2

The position of the phases must be kept in memory while the phase currents are switched to zero, in order to restart the motor in a good position.

IP = ± 900 mA
t2 > 1.3 ms

During printing, the motor phases should be maintained; otherwise a paper motion can occur and induce unevenly spaced sub-lines. A good way to achieve this, without over heating the motor, is to keep the motor phases "on" when the buffer contains data, and to release them when the buffer is empty.

5.5 Acceleration ramp up:

Step number	Speed (mm/s)	Motor Phase Time (µs)	Step number	Speed (mm/s)	Motor Phase Time (µs)
0	30	4167	16	102	1225
1	35	3571	17	107	1168
2	39	3205	18	111	1126
3	44	2841	19	116	1078
4	48	2604	20	120	1042
5	53	2358	21	125	1000
6	57	2193	22	129	969
7	62	2016	23	134	933
8	66	1894	24	138	906
9	71	1761	25	143	874
10	75	1667	26	147	850
11	80	1563	27	152	822
12	84	1488	28	157	796
13	89	1404	29	161	776
14	93	1344	30	166	753
15	98	1276	31	170	735
			32	180	694

6. SENSORS SPECIFICATIONS

6.1 Cover detection micro-switch

Contact resistance : < 1 Ωinitial (< 2 Ω after life-time).
Maximum rating : 0.1 A -30 V DC.

6.2 End of paper opto-sensor

This opto-sensor detects the end of paper.
(*When in a double-printing station configuration, there are two opto sensors*.)

***Note*:** Two sensors are provided with double station (*two paper rolls*).

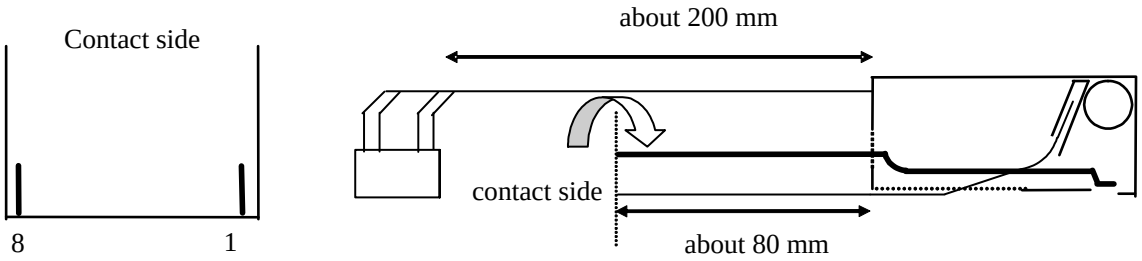
ELECTRICAL CHARACTERISTICS			
Reverse voltage : Vr Reverse current : Ir		5 0,01 (< 0,1)	Volts µA
Continuous collector-emitter voltage : Vce		16	Volts
Collector-emitter voltage	Vce Vcesat*	30 0,15 (< 0,6)	Volts
Collector-emitter current : Ice *		0.4 < ….< 1.25 0.7 Typ	mA
Forward current : If Forward voltage : Vf		50 1,25 (< 1,65)	mA Volts
Collector-emitter leakage current : Iceo (Vce = 20V)		3 (< 200)	nA
Total power dissipation : Ptot		100	mW
Thermal resistance : Rthja		400	K/W
Ambient temperature range : Ta		- 40 to + 85	°C

* ***With*: If = 10mA; Vce = 5V; 90% reflection and d = 1mm**

The user should be aware that the opto-sensor characteristics have very wide tolerances. Thus, we recommend the use of one of the schematics on the following page.

6.3 Connections

A second flex is used (*pitch = 1mm*).

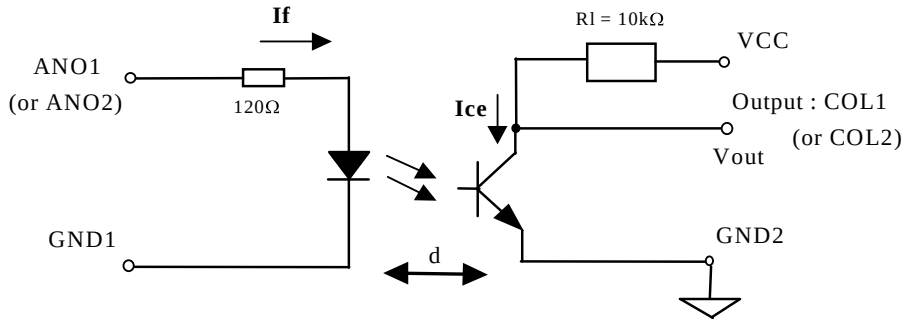


PIN NUMBER	SIGNAL	COMMENT
1	SW1	Switch
2	GND1	
3	ANO1	Photodiode's anode
4	GND2	
5	COL1	Transistor-collector
6	N.C or ANO2 *	Photodiode's anode
7	N.C or GND	
8	N.C or COL2 *	Transistor-collector

* Double station

6.4 Recommended use for Opto-sensor

Reflective Interrupter: Sample of schematic used



Vout (Volts)

Paper 0.275 V ± 10%

No paper ≥ 2.5 V

***Condition*: Ta = 25°C; Vcc = 5 volts; d = 1mm.**

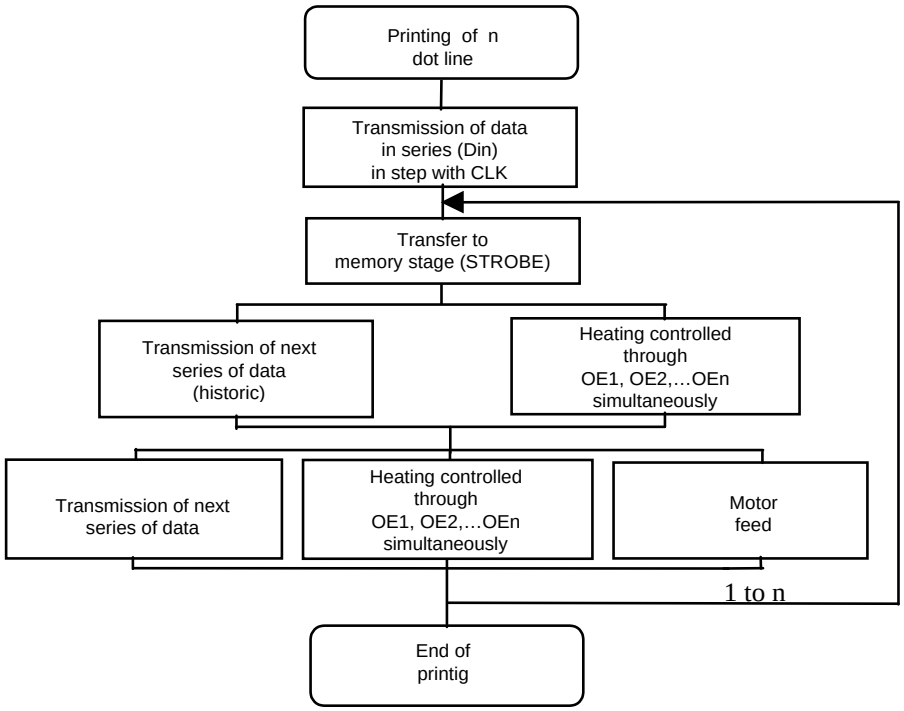
Note that Ice is as a function of the forward current of the emitting diode; the degree of reflection and the distance between reflector and component (d).

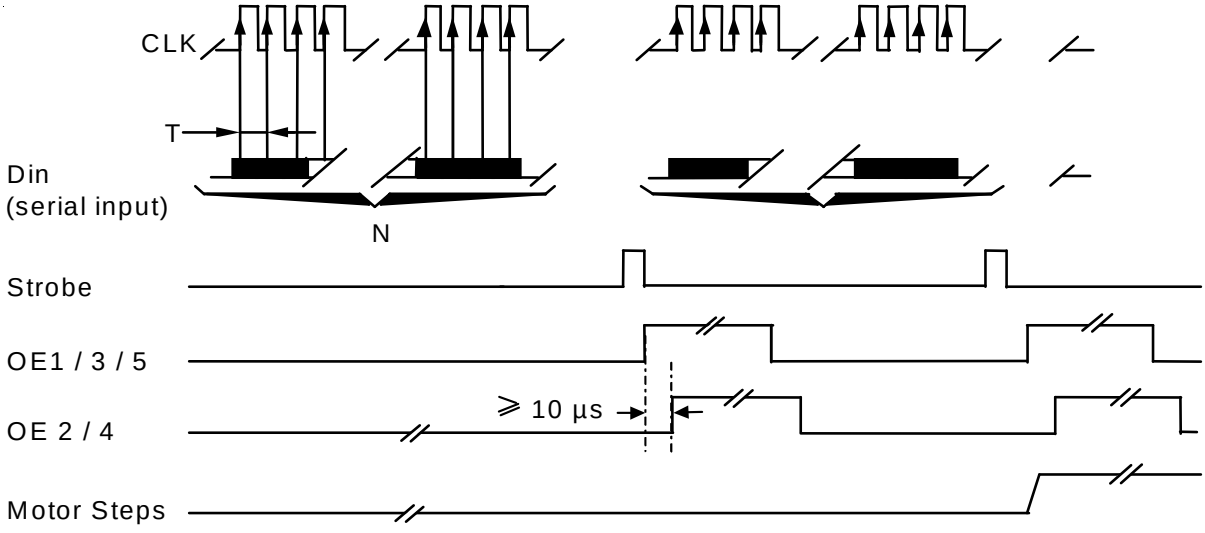
7. PRINTER CONTROL TECHNICAL

Printer control techniques in order to operate the printer. We depict hereafter three possible modes.

7.1 Mode 1

The paper feeds itself automatically during the heating cycle, thereby permitting to achieve high speed. (In this mode, it is recommended to use historical control, see chapter: "Heating Time")

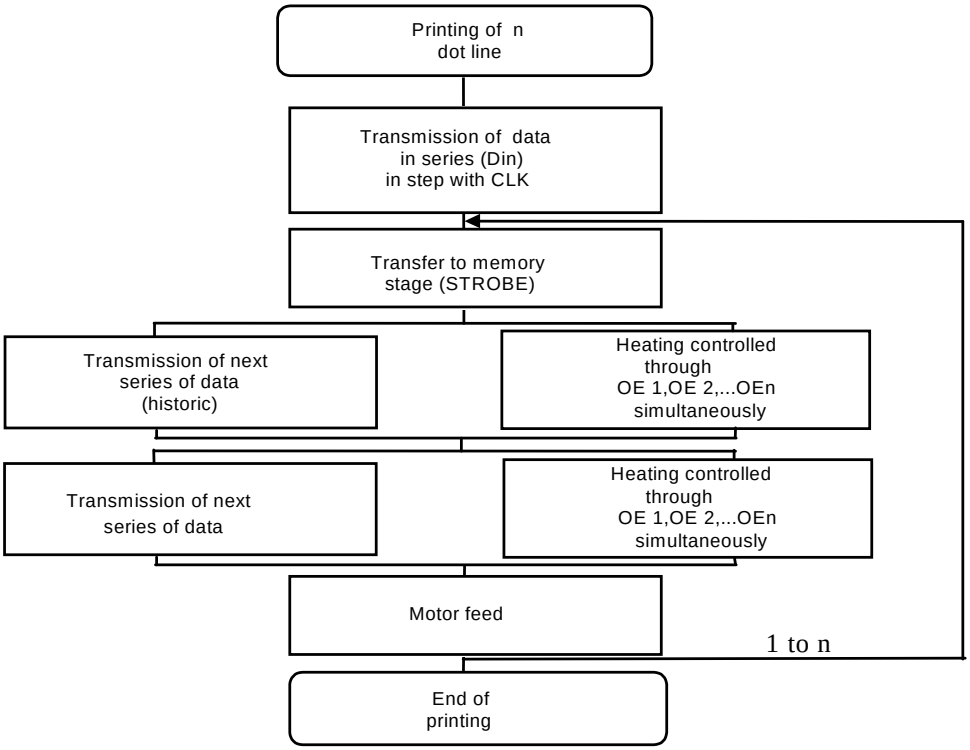


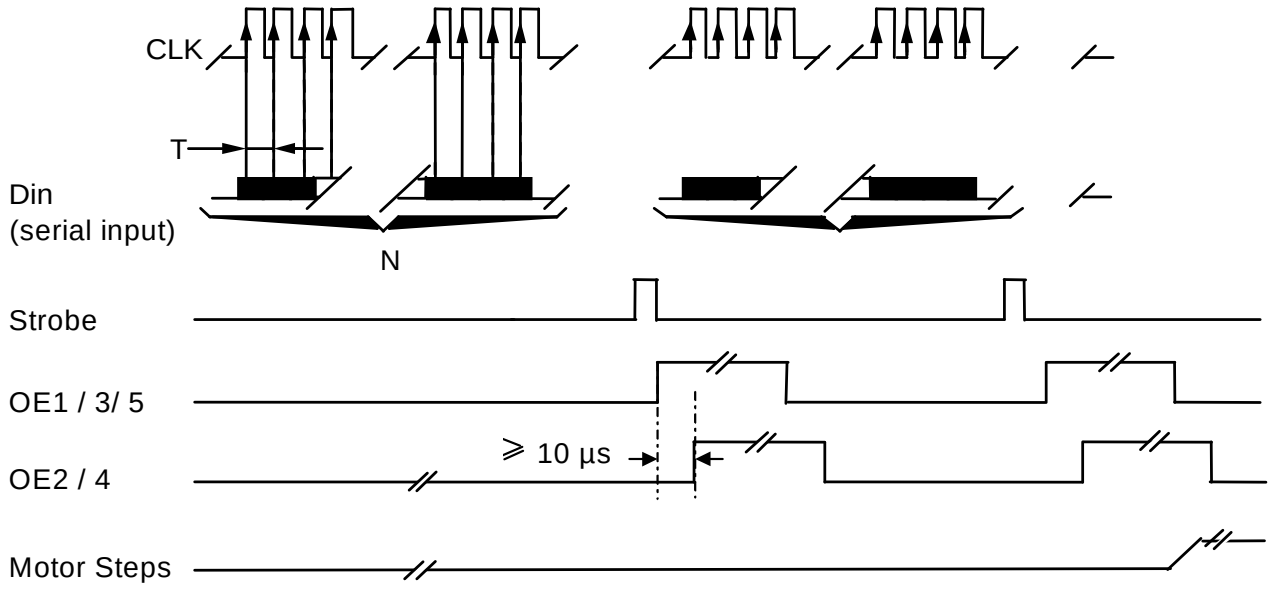


T : Clock frequency 5 MHz maximum 0 Ωn Ω5

7.2 Mode 2

The paper feed occurs after the heating cycle, giving high quality printing.

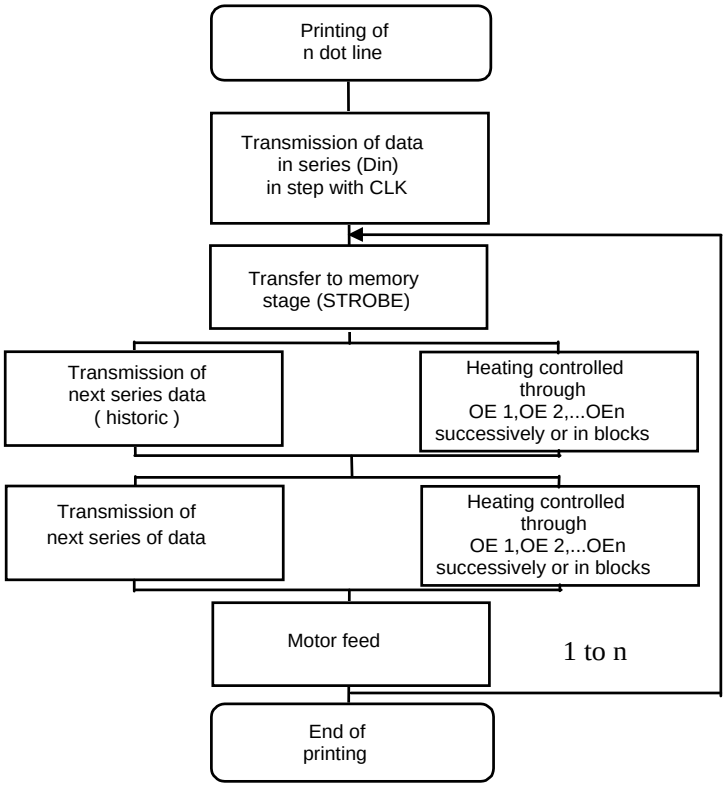


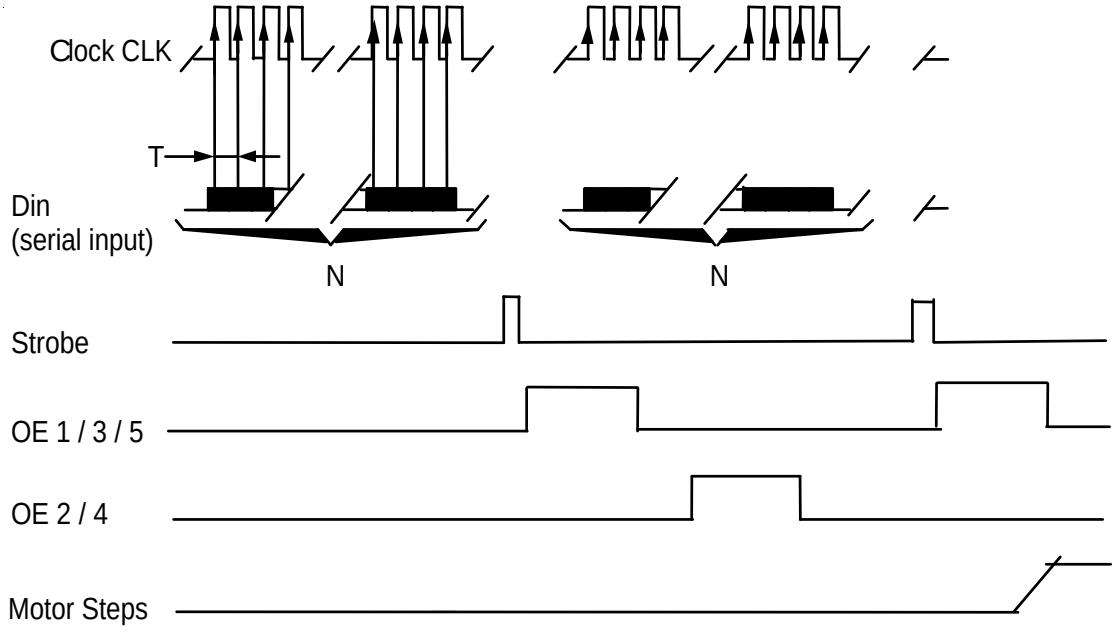


T : Clock frequency 5 MHz maximum 0 === n = 5

7.3 Mode 3

This mode is used in conditions where there is limited electrical current. The dot line is printed in stages, heating only a portion of the line at a time and effectively reducing consumption.





T : Clock frequency 5 MHz maximum o ▸ n ▸ 5

8. ELECTRICAL SPECIFICATIONS FOR CUTTER

8.1 DC motor

This DC motor is used to drive the cutting blade; its characteristics are described bellow.

8.1.1 Characteristics

Stepping motor specifications:

SPECIFICATIONS		
Recommended control voltage	24 +/- 10%	VDC
Cutting time	= 380	ms
Max current	1.2	A

8.1.2 Motor connections

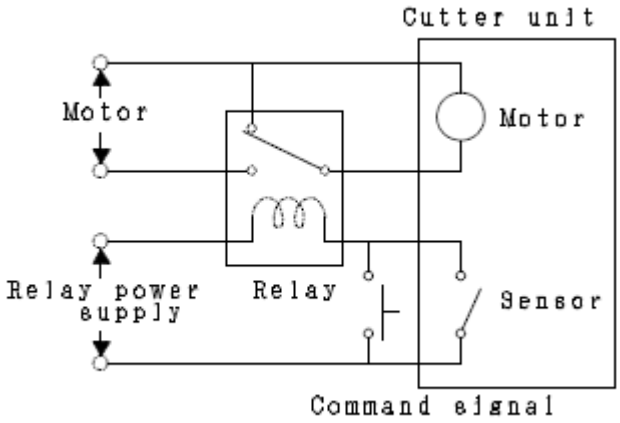
PIN NO.	FULL CUT	PARTIAL CUT
①	DC VCC	DC GND
②	DC GND	DC VCC
③	SENSOR	SENSOR
④		

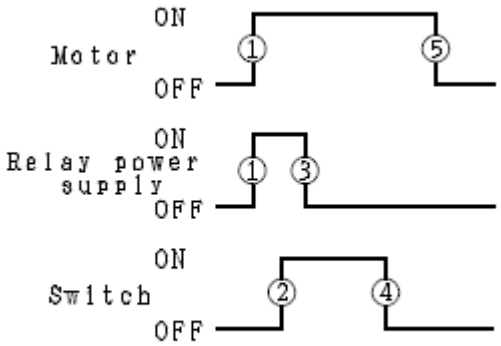
CONNECTOR : 51006-0400 (MOLEX)
LEADS : UL1061, AWG.26

Control circuit should be as follows.

① Switch ON the motor control relay by the command signal. then power supplies to the motor.
② The internal micro switch of the cutter will be turned ON.
③ Switch OFF the command signal.
④ The internal micro switch will be turned OFF.
⑤ Motor should be stopped.

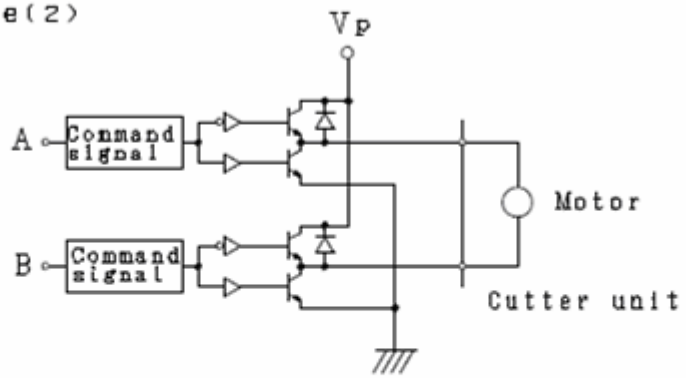
For the motor to stop instantly by using the regenerative brake, the motor terminals should be short circuited without any resistance and this should be kept for than 100 msec.





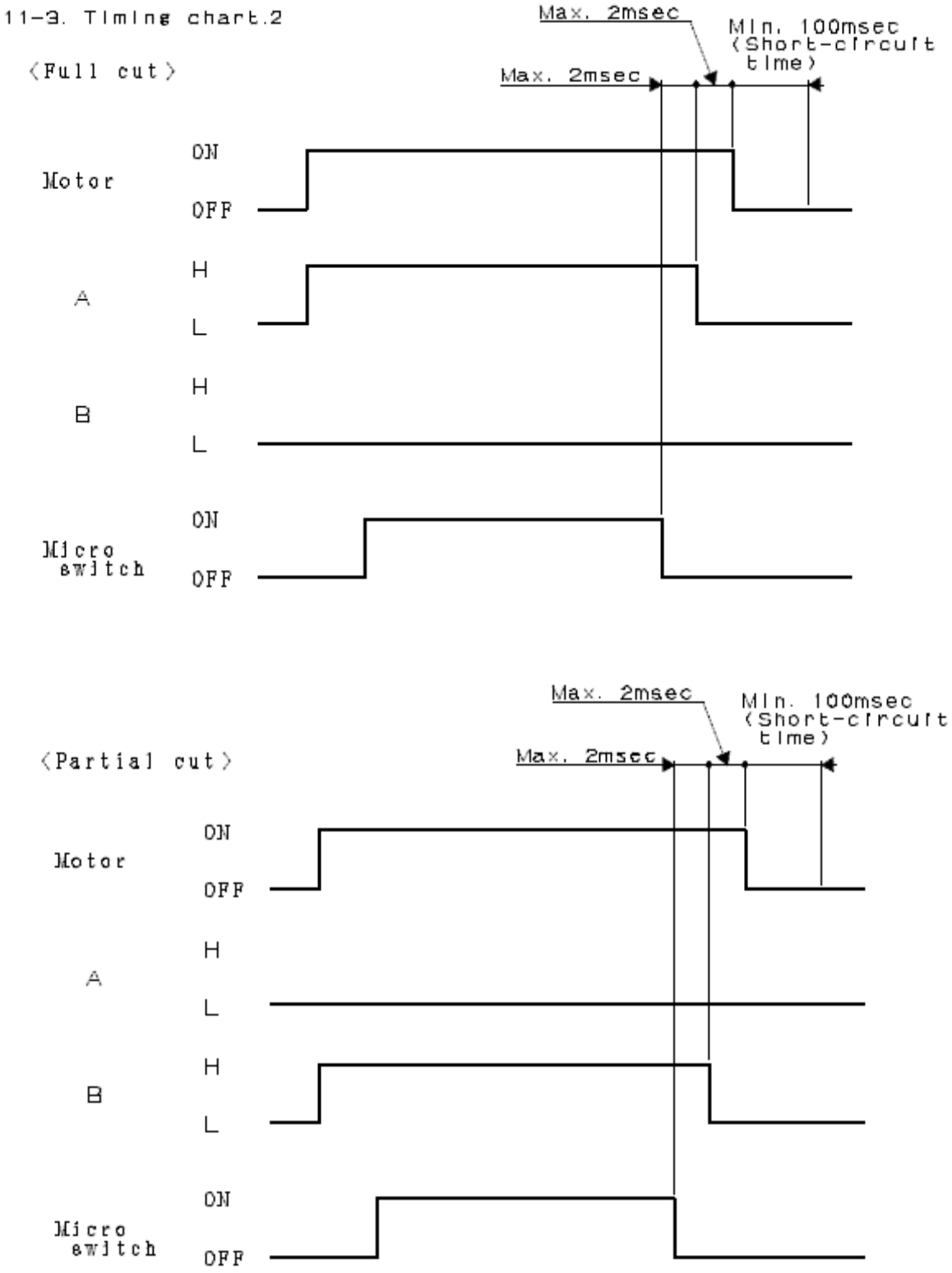
Timing chart.1

11-2. Example(2)



	Full cut	Partial cut	Regenerative brake	Stop
A	H	L	H	L
B	L	H	H	L

8.1.3 Cutting mode



11-4. Cancelling Cutter Lock

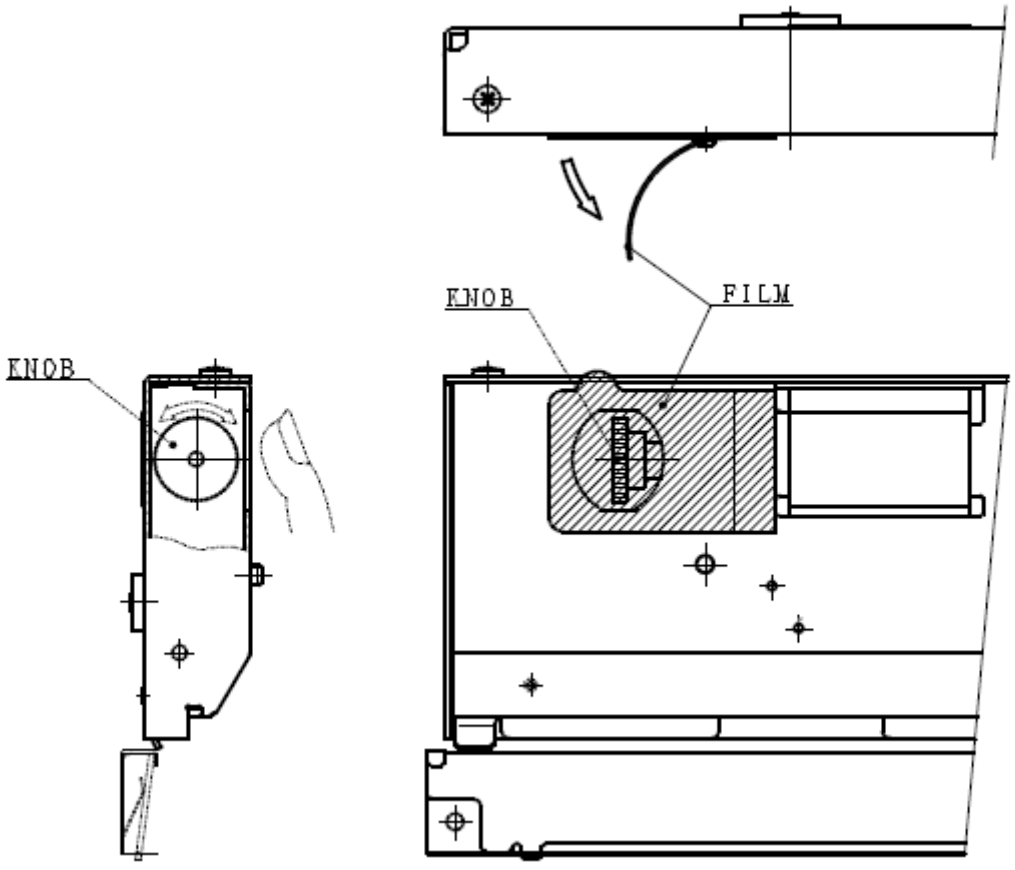
When the cutter is locked, cancel the lock by the following procedure.

(1) Stop the motor current immediately (within 2 second).

(2) Start the motor again to reverse direction to the stand-by position. Then, remove the external factor.

(3) If the motor doesn't rotate to the stand-by position, turn off the current immediately.

(4) The film is turned over and the knob shoud be turned by the finger which the hole shown below, and until the sliding blade returns to the stand-by position.
Then remove the external factor.



8.2 Cutter position Micro-switch detector

This sensor detects the cutter's initial position.

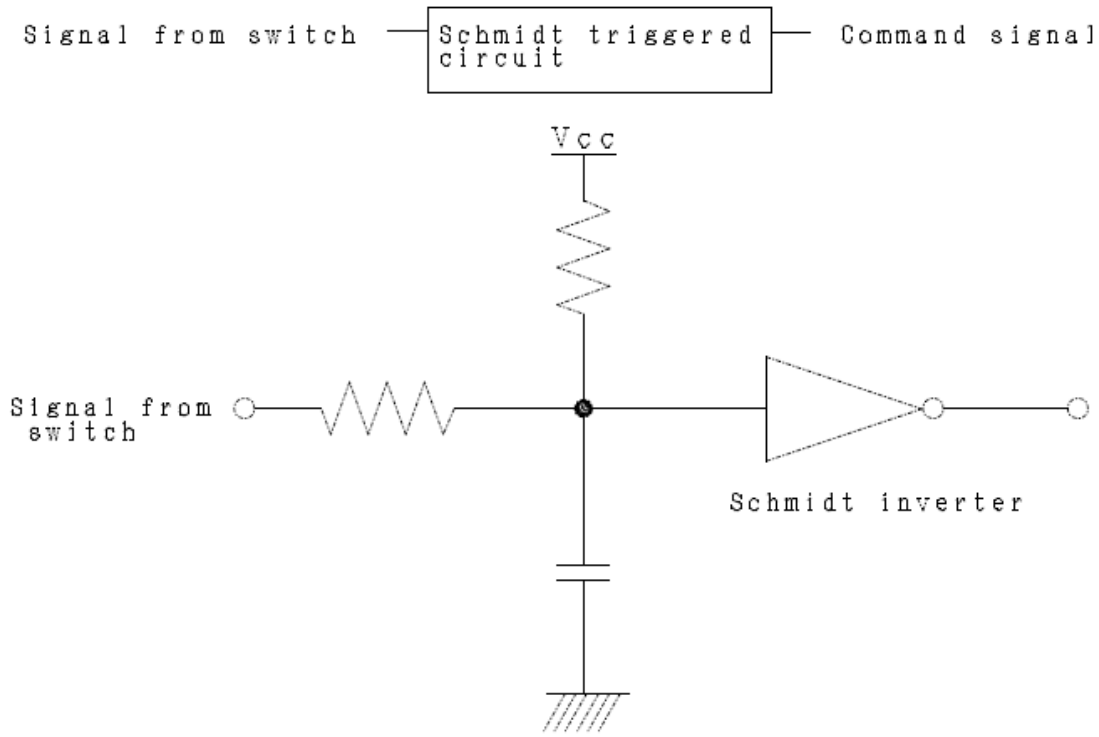
8.2.1 Electrical characteristics

- contact resistance :	<150 mΩ
- maximum rating :	100 mA/5 VDC
- operating temperature :	- 20 to + 60 °C

8.2.2 Connection

See "Motor connection" chapter.
Example of filter circuit for chattering:

The switch chattering should be filtered by CR, and Schmidt triggered circuit. However,delay of the circuit should be less than 2 msec.



Schmidt triggered circuit (ref.)

9. RECOMMENDATIONS

9.1 Mechanical Recommendations

Never apply mechanical stress to the printer, as this could result in misalignment and thus degradation of the print quality.
The thermal print head must have 1 degree of freedom. Never prevent the print head from pivoting on its axis.
Refer to the drawings in chapters "Cover switch position" & "Cover axis position" to design an easy loading Clamshell cover.
Avoid any direct contact between the printer motor and surrounding components.

9.2 Electrical Recommendations

When energizing the thermal print head (Vcc, 5 V) it is important to apply all the logic signals within 10 ms (*particularly to de-energize all the OEs*).
If the line of dots is supplied before the control logic, resistor dots may be destroyed. Because the control logic has a random state, resistors might be heated for a longer period than the specified maximum, burning out the heated resistor.
To avoid this, we recommend applying the heating voltage (Vch) after the logic supply voltage (Vcc, 5V).
The same precaution should be taken when shutting off. The supply voltage Vch must be switched off before the logic supply voltage Vcc. Care should be taken to allow enough time for residual capacitate charge to dissipate.

To avoid ESD issues, the cutter must be connected to the ground. In some cases, when printer/cutter mechanism is not used with AXIOHM controller board, it may be necessary to connect also the fixed blade to the ground (it is very depending of the integration and of the sensitivity of the controller board).

9.3 Motor Driving Recommendations

*Motor driving can be achieved with voltage control or regulated current control.

- If the motor is connected to the heating source power, it is recommended to control it under regulated current.
- **When the control voltage is greater than 26 V, or the current is greater than 670 / 835 / 910 mA per phase, it is necessary to determine a duty cycle time to avoid the motor temperature from rising.** This has to be achieved with the customer host chassis as the cooling depends on air volume and circulation around the motor.

The duty cycle and Time ON max must be respected.
See table page 8, this table was made for a mechanism not integrated.

Maximum continuous printing

Current	Maximum Printing Time (min)	Maximum Printing Length (m)
670	3	29
835	2	20
910	1,30	17

9.3.1 Printing speed:

The motor phase timing is described in chapter' paper feed motor'; this timing determines the printing speed.
The MGTA mechanism can reach 180mm/s however the paper roll diameter can impact the maximum speed. For large paper rolls a paper roll tension dampener may be required.
Please contact Axiohm tech support.to determine your maximum speed in case of bigger rolls.

9.4 Cutter Driving Recommendations

Integration of the platen roller:
The pin on the bearing must be visible in order to correctly integrate the platen roller into the paper guide.
The paper guide has a life span of 3000 open/shut cycles.
The paper exit must be free for the cutter function to work properly.
The minimum ticket length to use in order to guarantee proper functioning is 50mm.

10. HEATING TIME

10.1 Historical Control

The heating timetable is given on next page.

The motor cycle time for one dot line is given in the second the top lines of table, it is the time for two motor steps.

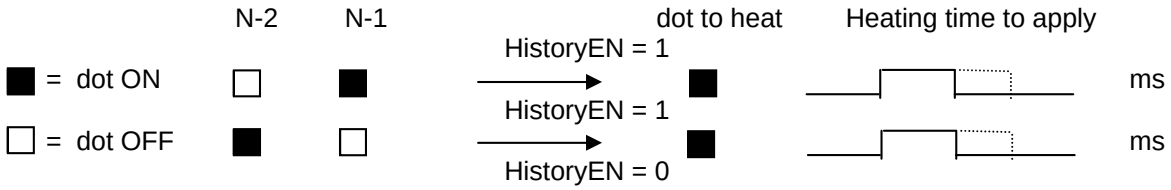
The column **(A)** (*indicated with: speed <30 mm/s and motor cycle time > 4.17 ms*) gives the required heating time, giving the necessary energy to obtain an optical density of 1,2.

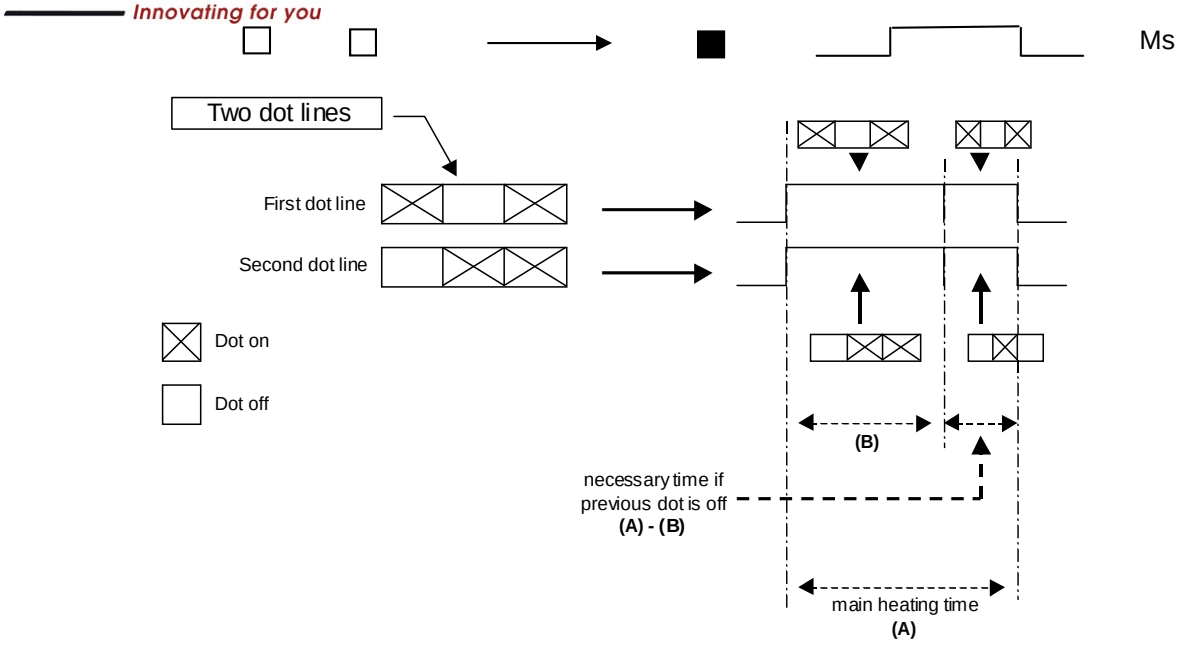
With historical control: The column **(B)** gives the required heating time, if the previous dot is on.

If not, the heating time is given by the column **(A)**.

Without historical control: Heating time is given by all the column **(B)**. At high speed, printing quality for isolated dots might be affected with this method.

Example: at 100 mm/s, 25°C and 24 volts: heating time = 0,3ms




Ms
Two dot lines
First dot line
Second dot line
Dot on
Dot off
(B)
necessary time if
previous dot is off
(A) - (B)
main heating time
(A)

10.2 Heating Table for 24Vadvanced versions

CALCULATED VALUES with KLS46 PAPER									
Voltage (V) Real	**Temperature (°C)**	**Speed (mm/s)**							
		< 30 mm/s	**80 mm/s**	**100 mm/s**	**120 mm/s**	**140 mm/s**	**150 mm/s**	**160 mm/s**	**180 mm/s**
Motor step time		4,170 ms	1,560 ms	1,250 ms	1,040 ms	0,890 ms	0,830 ms	0,780 ms	0,690 ms
Cycle time		4,170 ms	1,560 ms	1,250 ms	1,040 ms	0,890 ms	0,830 ms	0,780 ms	0,690 ms
		(A)	**(B)**						
19,00 V	**0 °C**	1,253	0,964	---	---	---	---	---	---
19,00 V	**10 °C**	1,054	0,811	0,756	---	---	---	---	---
19,00 V	**20 °C**	0,931	0,716	0,668	0,628	---	---	---	---
19,00 V	**25 °C**	0,890	0,685	0,639	0,600	0,568	---	---	**---**
19,00 V	**30 °C**	0,859	0,661	0,616	0,579	0,548	---	---	---
19,00 V	**40 °C**	0,810	0,623	0,581	0,546	0,517	0,503	---	---
19,00 V	**50 °C**	0,759	0,584	0,545	0,512	0,484	0,472	0,461	---
21,00 V	**0 °C**	1,061	0,816	0,761	---	---	---	---	---
21,00 V	**10 °C**	0,893	0,687	0,640	0,602	---	---	---	---
21,00 V	**20 °C**	0,789	0,607	0,566	0,532	0,503	0,490	---	---
21,00 V	**25 °C**	0,754	0,580	0,541	0,508	0,481	0,469	0,458	---
21,00 V	**30 °C**	0,727	0,560	0,522	0,490	0,464	0,452	0,441	---
21,00 V	**40 °C**	0,686	0,528	0,492	0,463	0,438	0,426	0,416	0,397
21,00 V	**50 °C**	0,643	0,495	0,461	0,433	0,410	0,399	0,390	0,372
24,00 V	**0 °C**	0,847	0,651	0,607	0,571	0,540	---	---	**---**
24,00 V	**10 °C**	0,712	0,548	0,511	0,480	0,454	0,443	0,432	---
24,00 V	**20 °C**	0,629	0,484	0,451	0,424	0,401	0,391	0,382	0,364
24,00 V	**25 °C**	**0,602**	**0,463**	**0,432**	**0,406**	**0,384**	**0,374**	**0,365**	**0,348**
24,00 V	**30 °C**	0,580	0,446	0,416	0,391	0,370	0,361	0,352	0,335
24,00 V	**40 °C**	0,547	0,421	0,393	0,369	0,349	0,340	0,332	0,316
24,00 V	**50 °C**	0,513	0,395	0,368	0,346	0,327	0,319	0,311	**0,297**
26,00 V	**0 °C**	0,738	0,568	0,529	0,498	0,471	0,459	0,448	---
26,00 V	**10 °C**	0,621	0,478	0,445	0,419	0,396	0,386	0,377	0,359
26,00 V	**20 °C**	0,548	0,422	0,393	0,370	0,350	0,341	0,333	0,317
26,00 V	**25 °C**	0,524	0,403	0,376	0,354	0,334	0,326	0,318	0,303
26,00 V	**30 °C**	0,506	0,389	0,363	0,341	0,323	0,314	0,307	0,292
26,00 V	**40 °C**	0,477	0,367	0,342	0,322	0,304	0,296	0,290	0,276
26,00 V	**50 °C**	0,447	0,344	0,321	0,301	0,285	0,278	0,271	0,258

10.3 Thermistor specifications

Resistance value : R25	30 kΩ +/-5%
Operating temperature	- 40°C to 125°C
Time constant	5 seconds
Max. Power	400mW at 25°C

Correlation between Thermistor resistance and Temperature :

$R = R_{25} * \exp. (B * (1/T - 1/T_{25}))$.
$B = 3950$ K +/-2%.
$T_{25} = 25$°C

T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)
-40	1205.579	25	30.000	90	2.801
-35	844.731	30	24.111	95	2.416
-30	600.612	35	19.517	100	2.093
-25	432.951	40	15.904	105	1.819
-20	316.154	45	13.044	110	1.587
-15	233.694	50	10.765	115	1.390
-10	174.737	55	8.935	120	1.221
-5	132.078	60	7.458	125	1.077
0	100.862	65	6.259	130	0.952
5	77.774	70	5.280	135	0.844
10	60.524	75	4.475	140	0.751
15	47.511	80	3.811	145	0.670
20	37.606	85	3.260	150	0.599