THERMAL PRINTER COMPONENTS

ELECTRON PRINTER MECHANISM SERIES

USER MANUAL
ELECTRON

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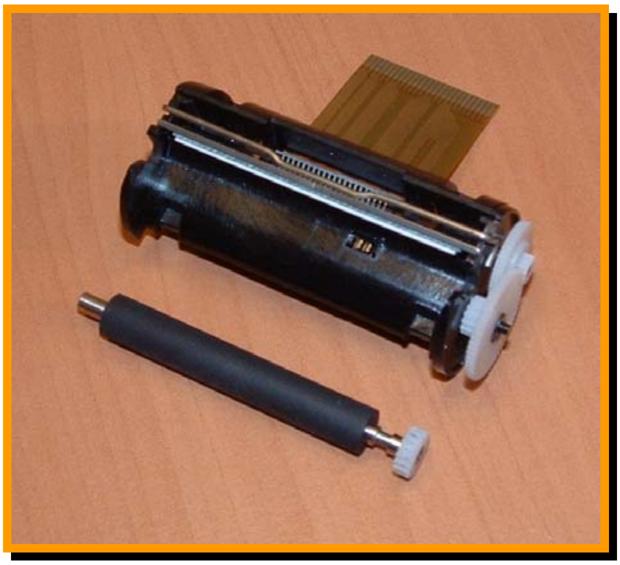

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Axiohm™

EVOLUTIONS

Date	Issue	Modifications
02/2005	Z	Creation

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IMPORTANT

**This manual contains the basic instructions for printer operation.
Read it carefully before printer use, paying special attention
to the "Recommendations" section.**

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1 UNPACKING

Each printer mechanism is packaged in an antistatic bag.
Observe precautions while handling in electrostatic protected areas.

2 OVERVIEW

UL 60950
CSA 22.2 - 60950 / Project n°04CA45602

This printer is designed for the use of a clamshell cover, a latch if required, and an optional tear bar.

SUMMARY OF PRINTER SPECIFICATIONS

ITEM	VALUE	UNITS
Print method	Static thermal dot line printing	-
Print width	48	mm
Maximum print speed	see "heating time": depends on voltage, temperature and control way	mm/sec
Paper loading	Clamshell	-
Paper width	58 (+0, -1)	mm
Maximum paper thickness	60	g/m^2
Recommended paper	JUJO AF50KSE3	-
Number of resistor dots	384	-
Maximum number of dots energized simultaneously	128*	-
Resolution	8	dots/mm
Paper feed pitch	2	motor steps
	0.125	mm
Head temperature detection	By thermistor	-
Out of paper detection	By opto-sensor	-
Maximum size for the roll paper	58	mm

*: The printing density variation may become significant when the number of dots energized simultaneously becomes greater than 64. Print head is allowed to have 4.0A maximum.

SUMMARY OF PRINTER SPECIFICATIONS (continued)

ITEM		VALUE	UNITS
Maximum duty cycle (1 sec "on" max)		21	%
Storage temperature range		- 25 to + 70	°C
Operating temperature range		0 to +50	°C
Relative humidity (*operating*)		10 to 90	%
Operating voltage range Vcc (*logic*)		2.7 to 5.5	V DC
Operating voltage range Vch (*dot*)		4 to 8.5	V DC
Energy Supply		0.23	MJ/dot
Current consumption: Vch (at nominal value: 5V)		38	mA per resistor dot «on»
Current consumption: Icc max (at value : 5V)		24	mA
Current consumption: Stepping motor (at nominal value)		277	mA per activated phase
Electrical life time**		$1.\ 10^{8}$	pulses
Mechanical life time **		50	km
Over all dimensions ***:	Height	26.3	mm
	Width	68.6	mm
	Depth	30	mm
Weight		32	g

: **Per AXIOHM standard test conditions (which are mainly: 5V, ≈ 25 °C, dot printing duty cycle = 30%)
***: *Note: general tolerances ± 0.2 (when no other is specified)*

3 MECHANICAL SPECIFICATIONS

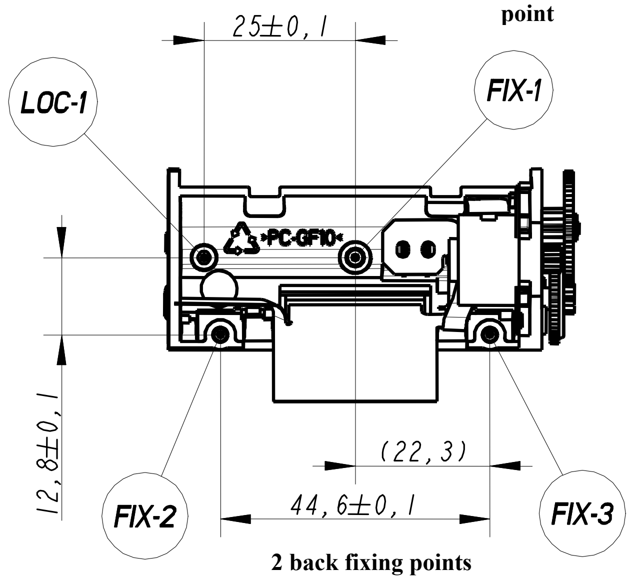
3.1 General Description

This mechanism consists of:

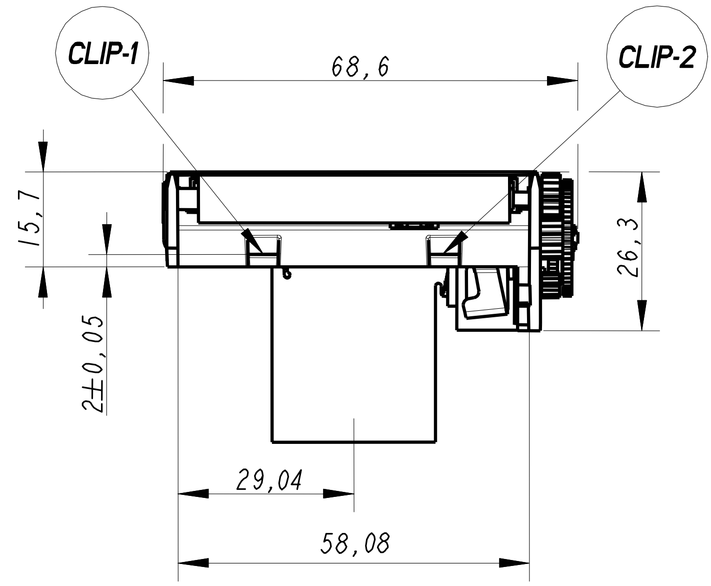
- Plastic chassis
- Stepper motor
- Gears train
- Print head module with flex cable and opto sensor
- Platen roller

3.2 External Dimensions

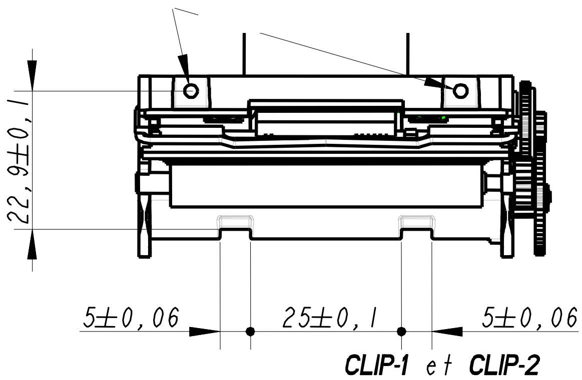
Locating Points **Central fixing point**



2 back fixing points



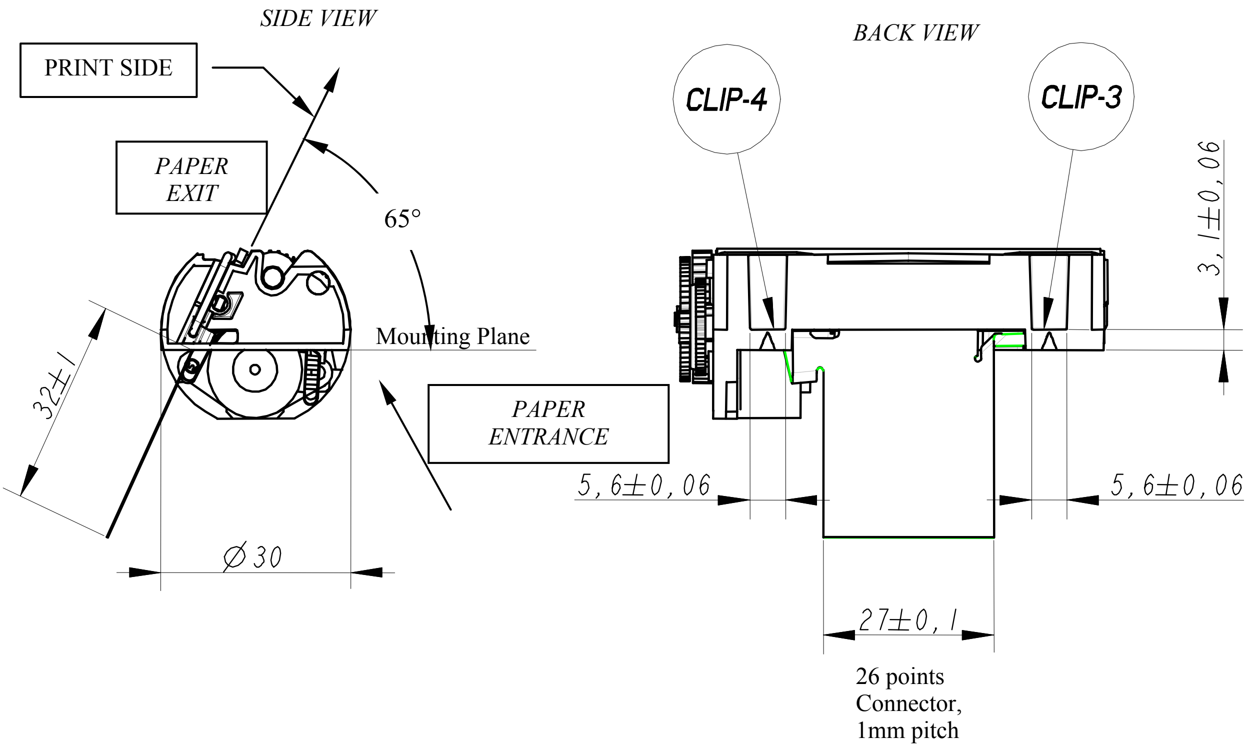
2 fixing points **Paper path MAX**



TOP VIEW

2 front clips

Mechanical views (continued)



The printed ticket exits at 65° in comparison to the mounting plane. The paper entrance into the mechanism can be made according to angles of 0° to 90° as compared to the mounting plane.

3.3 *Fixing Elements*

3.3.1 Screw Mounting

There are two possible ways to mount the print mechanism using screws.

a) _ Central Screwing, by a Ø3mm auto-tapping plastic screw in ***Fix-1***. Positioning by an axis of locating ***Loc-1*** of Ø2mm (see diagrams on the following pages).

b) _ Using the screw mounts at the back of the mechanism:

Either mount from below with two Ø2,5mm auto-tapping plastic screws in the printer frame at ***FIX-2*** and ***FIX-3***.

If it is chosen to mount at the back of the mechanism, one must use the front clipping zones, at ***CLIP-1*** and ***CLIP-2***.

Warning: The auto-tapping plastic screws should have a net point angle of 30°.

3.3.2 Clip Mounting

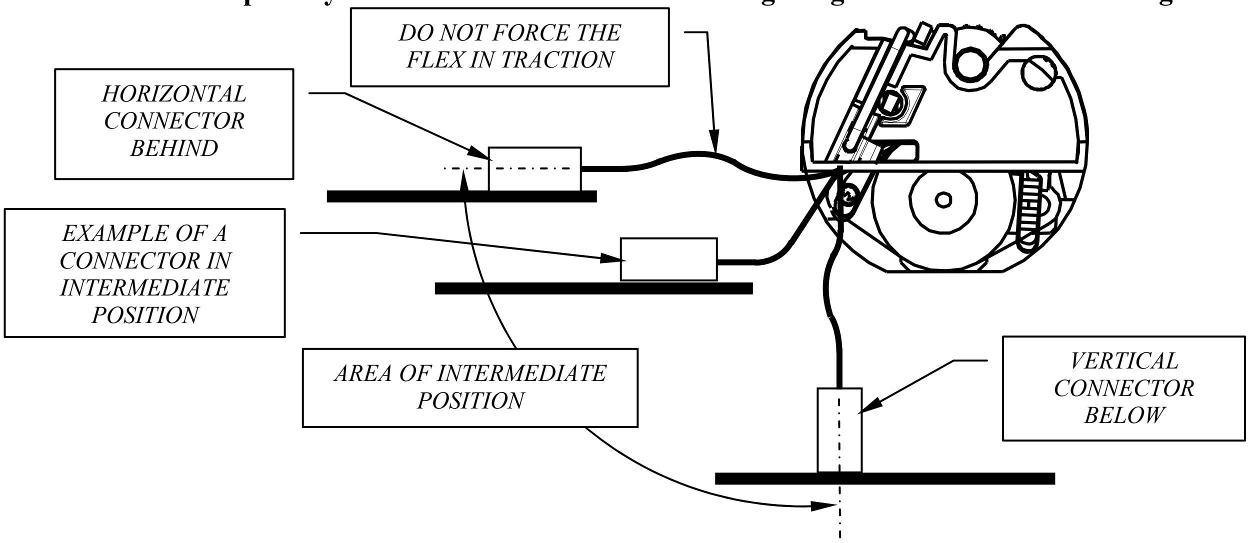
There are four clipping points on this printer mechanism ***CLIP-1***, ***CLIP-2***, ***CLIP-3*** and ***CLIP-4*** (see drawings on the next page).

3.4 *Flex Cable Position*

Connections are done via unique flex cable containing all electrical functions of the printer (thermal head, motor rand opto-sensor).

The flex cable is to be connected on a 26 pin connector with a 1mm pitch.
The connector can be located at the back of the printer (horizontal connection) or below the printer (vertical connection) or in another intermediate position.

WARNING: Do not put any constraint on the flex cable during integration or while connecting.



3.5 *Chassis Mounting*

Mounting hole position is shown on figure in chapter 3.2. Use 3 x M2.5 self threading screws pan head eco-syn length 6 mm (for example from our supplier BOSSARD) for the 3 diameters Ø2,2 ± 0.05.

3.6 *Cover Integration*

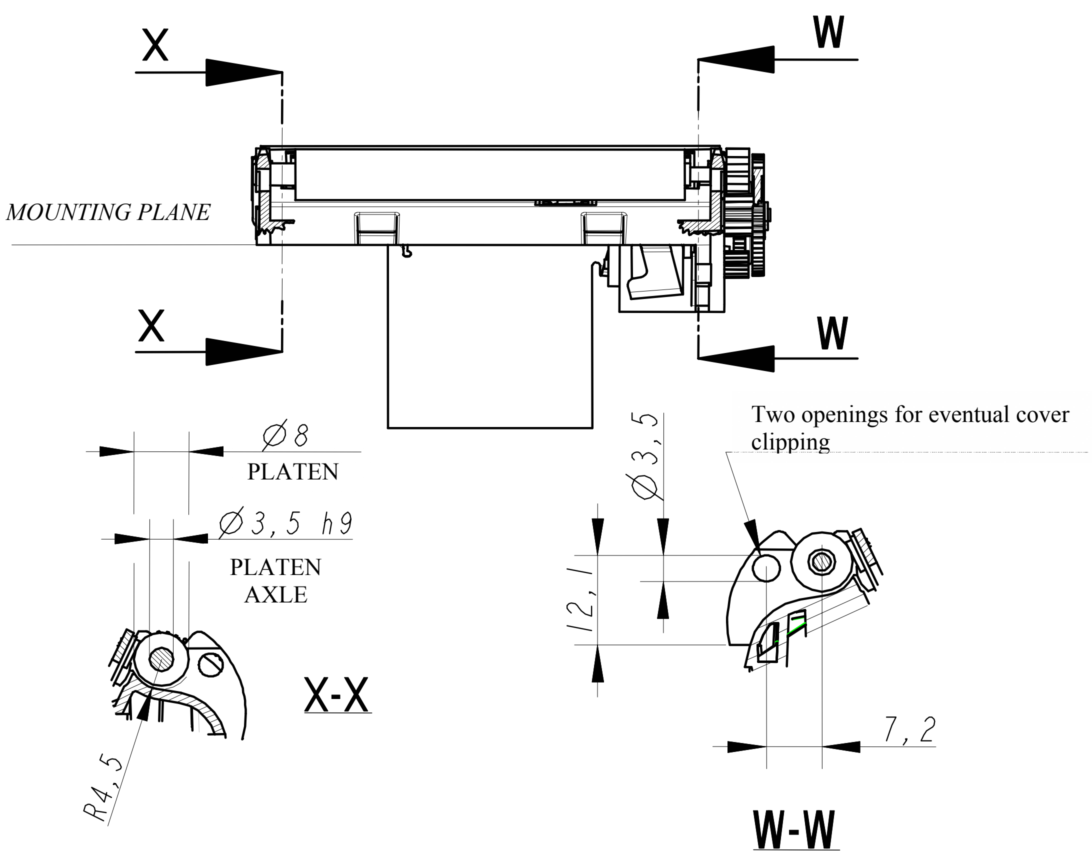
The "ELECTRON" printer can only accept paper loading by "CLAMSHELL" cover design. **As the printer as not been design for the "auto-load" paper feature, contact Axiohm representatives for more information if you want to use it in this mode.**

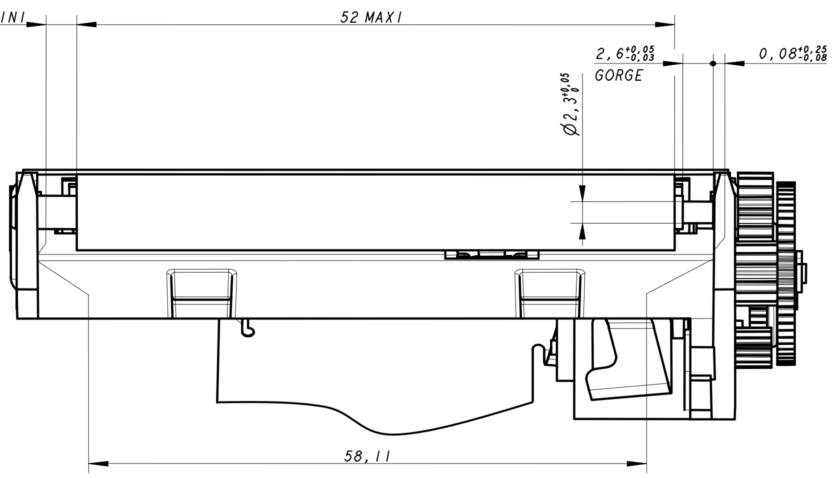
Axiohm does not supply the cover.

3.6.1 Information for Cover Dimensioning

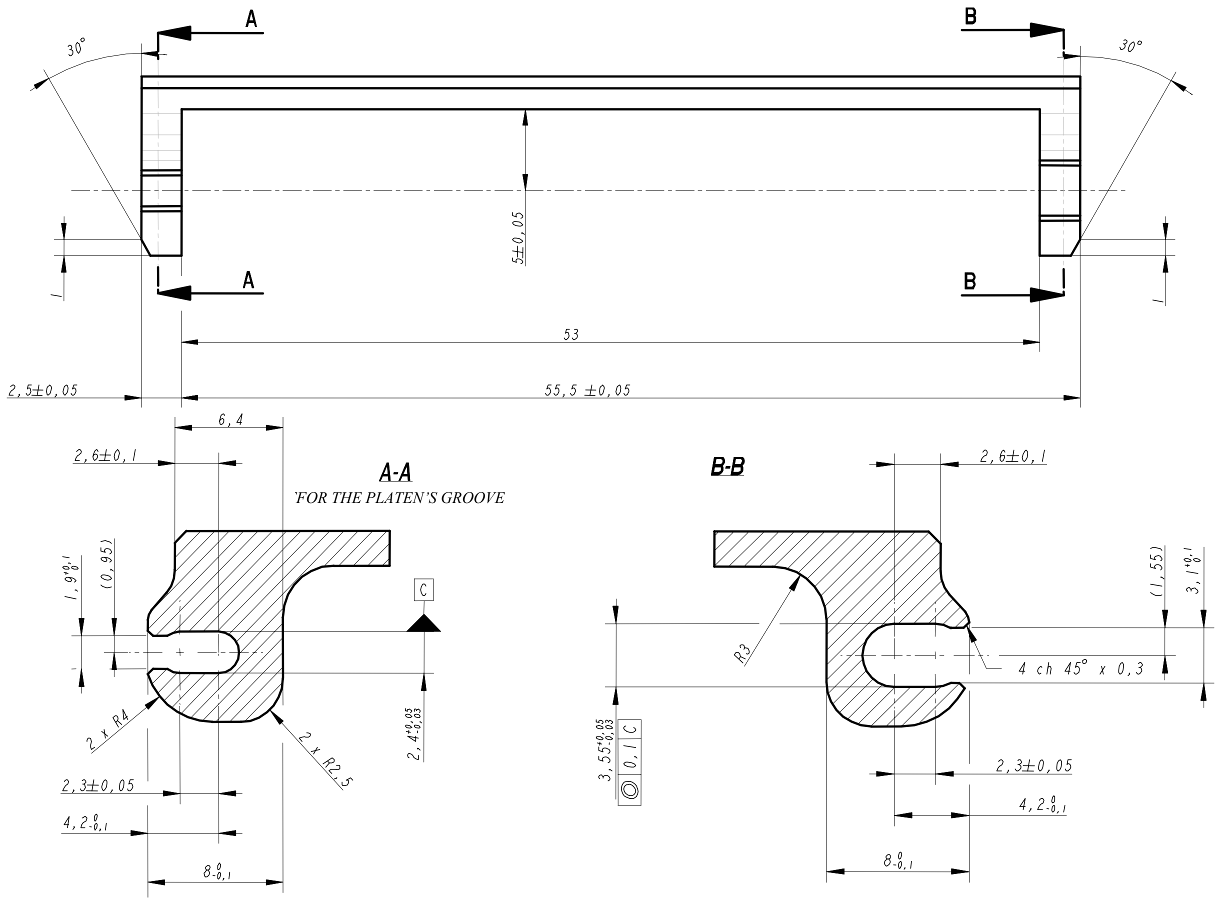
The cover is essential. It must maintain the platen and allow the positioning within the printer frame ensuring good rotation of the cover itself.
These drawings show the dimensions necessary for cover design.
The length of the silicone part of the platen is a maximum of 52mm. The 58.11mm dimension is the maximum width allowed in the frame where the cover slides in.
Forks maintaining the platen must have a maximum thickness of 2.55mm and be made out of a material that supports clipping on axis, by deforming oblong shape and opening or closing effort of the cover that we measured to be of 10.3N average

For the cover, we recommend oblong shapes (see below drawings) to maintain the platen axle. These shapes must allow a light translation of the platen in the cover in order not to force positioning and rotating of the platen when cover is closed.

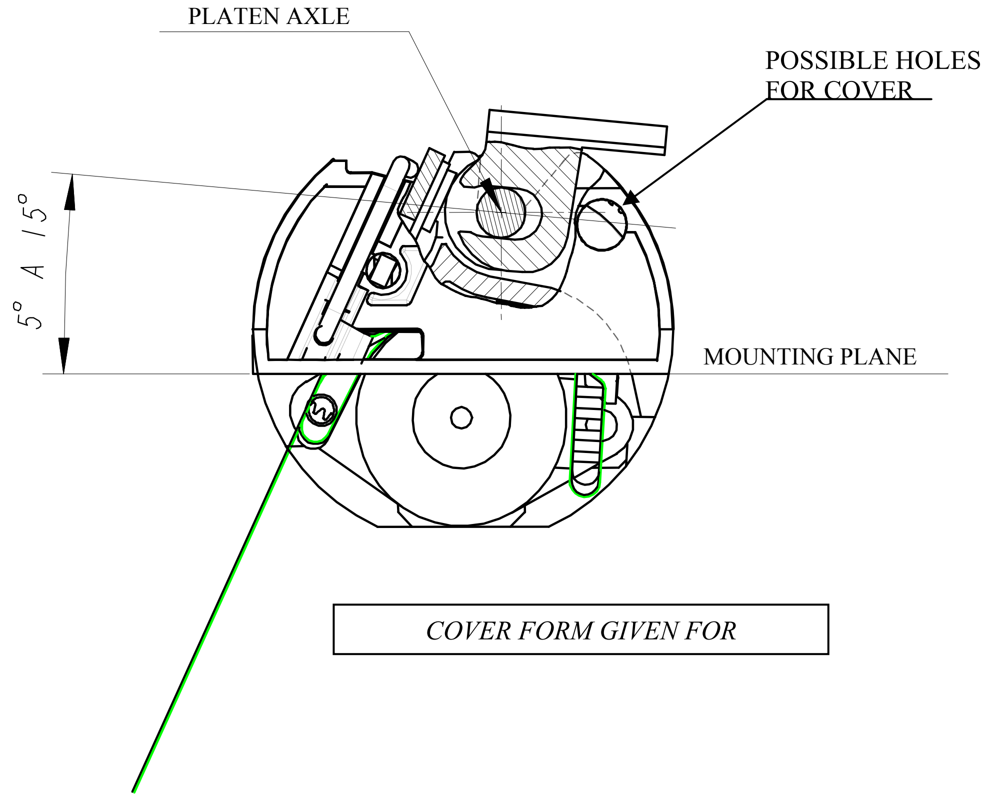




That is an example of a possible cover:



The angle of the oblong shape where the platen is located on the cover must be in the range between five (5) degrees and 15 degrees as compared to the mounting plane.

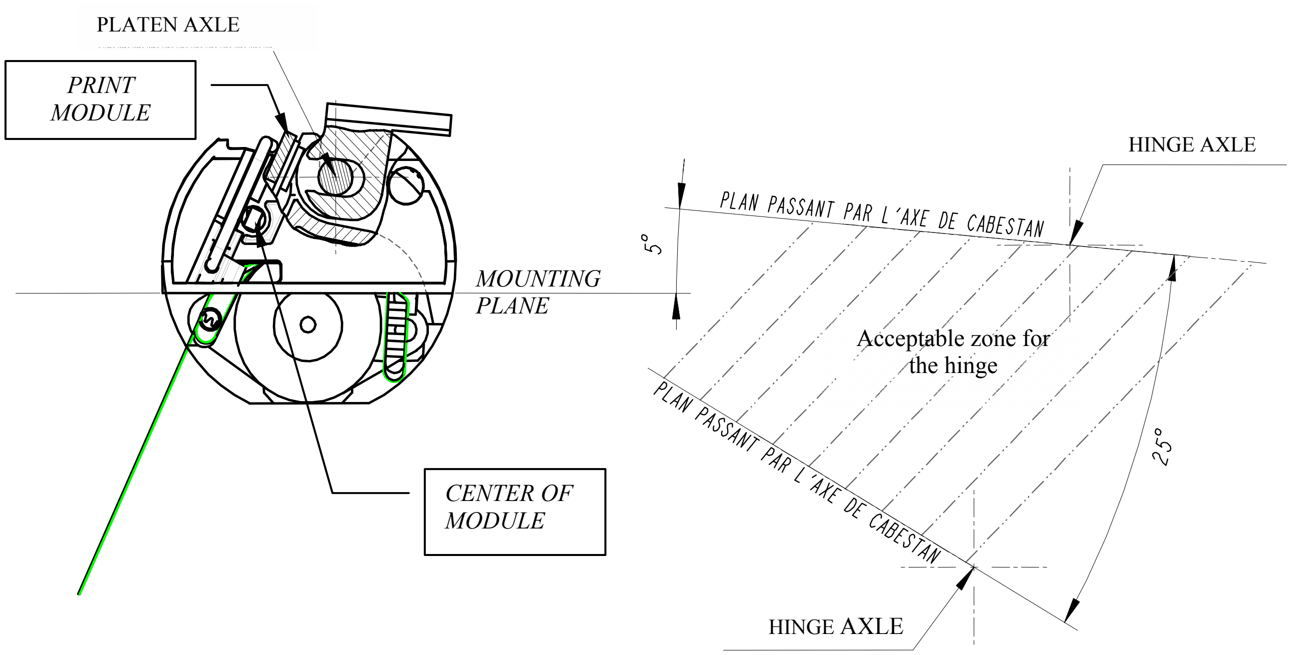


COVER FORM GIVEN FOR

We also designed special circular holes on each side of the frame to allow cover clipping from inside or outside the printer mechanism. Those holes have a diameter of 3,5mm and their highest point is located at 12,1mm from the fixing plane of the printer and at 7,2mm from the platen axle. (see drawings page 11)

3.6.2 Hinge Positioning

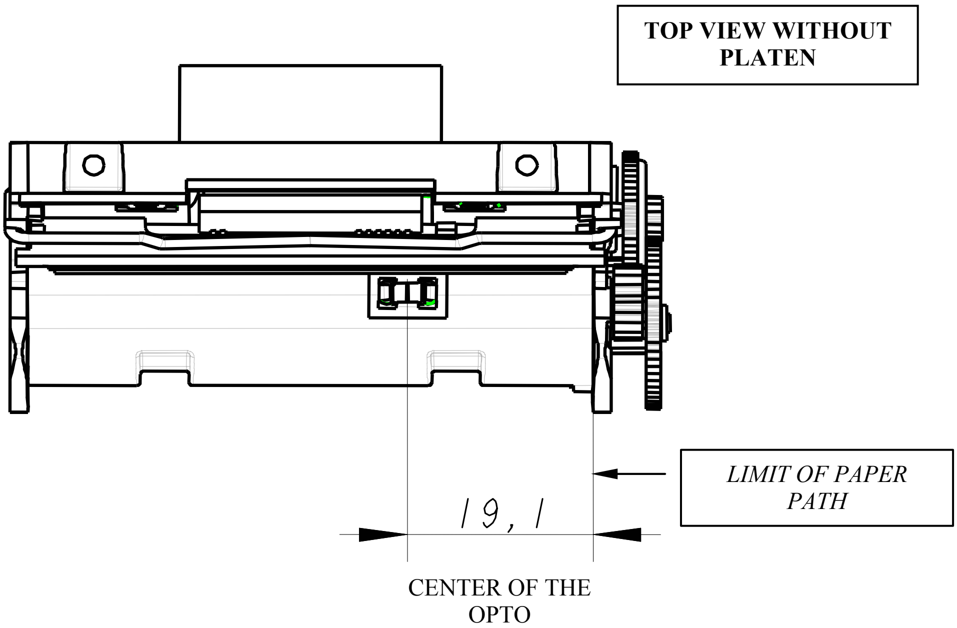
The zone where the hinge is located must be between 2 planes passing on the platen axis with a 25° maximum angle. The superior plane must not be inclined of less than 5° from the mounting plane. Therefore, the inferior plane must not be inclined more than 30°from the mounting plane (see below drawings).



Note : PLAN PASSANT PAR L'AXE DE CABESTAN = PLANE PASSING BY PLATEN AXLE

3.7 *Useful Measurements*

An infra-red opto sensor detects paper presence. It is located at approximately one third of paper path width starting from the gears side.



4 ELECTRICAL SPECIFICATIONS

4.1 Nominal Power Supply

		Value	Units
Print head:	**Logic (Vcc)**	3.3 / 5	V DC
	Dot line	4 to 8.5	-
Stepping motor		4 to 8.5	-

4.2 Nominal Consumption of Printer

		Value	Units
Print head:	**Heating current / dot (Vch)**	38	mA
	Logic current (Vcc) All high	24	mA
	Stepping motor current (*2 activated phases*)	554	mA

4.3 Description of Print Head

	Value	UNIT
Driver chips	6	-
Operating range (Vcc)	2.7 to 5.5 *[1]	V DC
Mean dot resistance (± 4%)	130	Ω
Nominal dot supply voltage	5 (min = 4, max = 8.5)	V DC
Nominal Heating current per dot (at 5V)	38*[2]	mA

*[1] Filter any transient signal and parasitic on this line. Separate Vcc from Vch because Vch can go lower than 4.75 Volts. Vcc must be connected to the same power supply than the other electronic circuits which drive the printer.

*[2] The print density variation may become significant when the number of dots energized simultaneously becomes greater than 64

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 **3.3 or 5 V** logic voltage. Take care to filter transient and parasitic on all logic lines. Undetermined states can happen and 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.

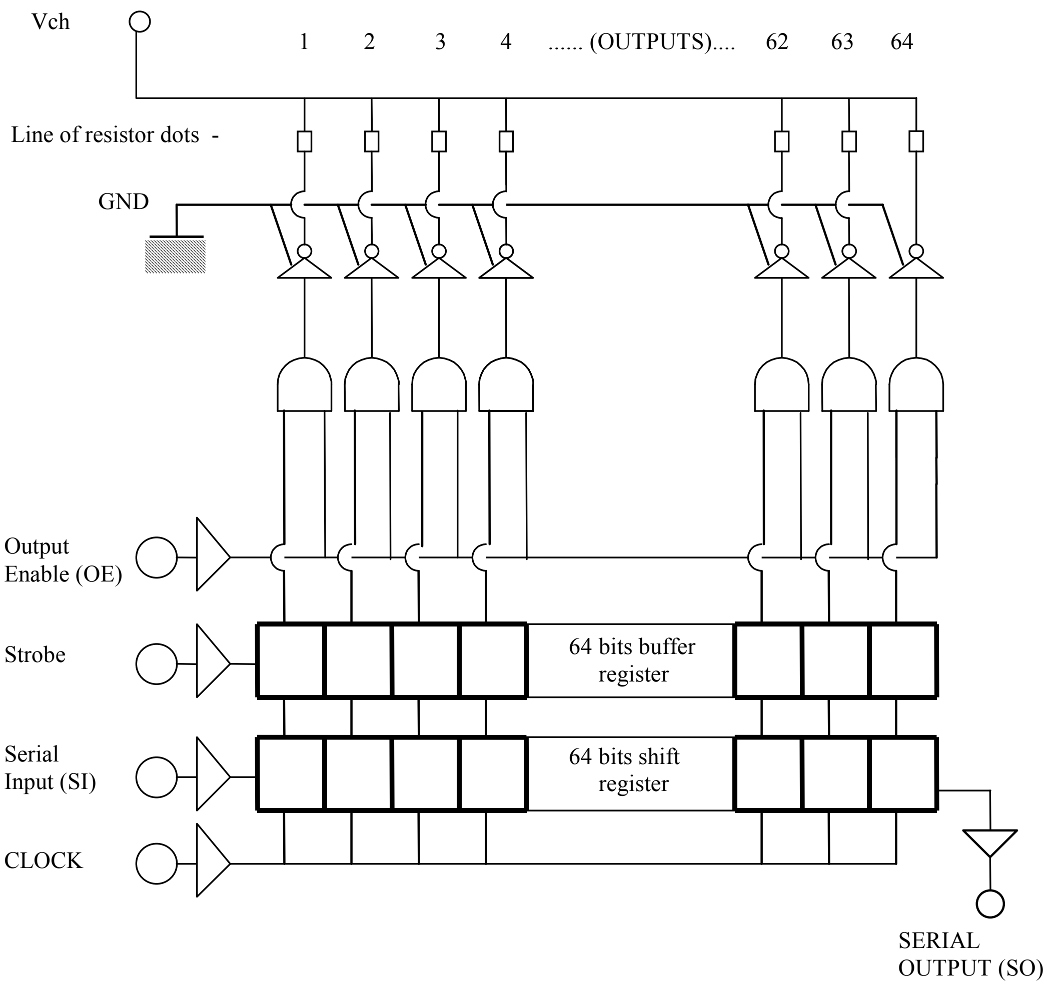


Figure 1 driver chart

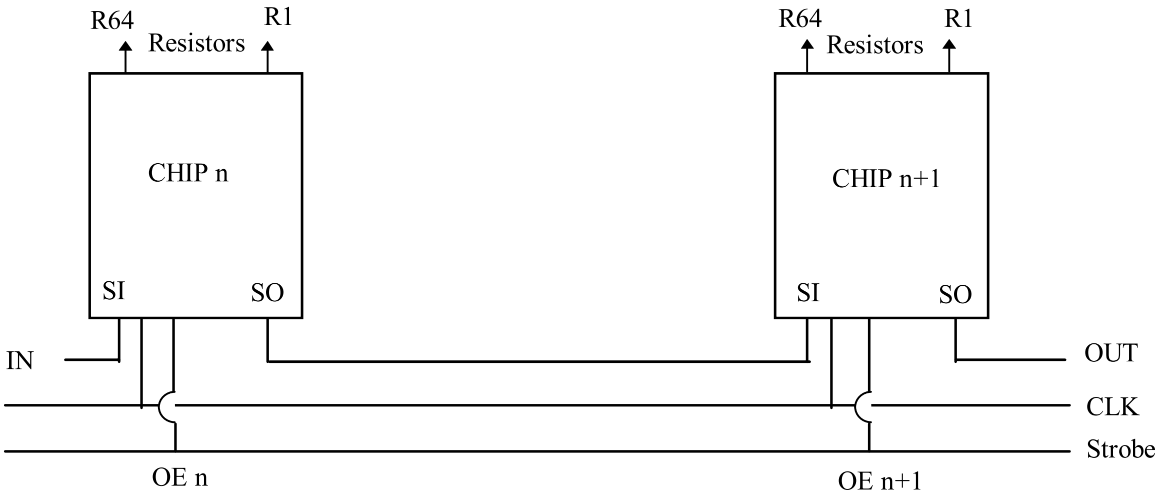


Figure 2 Routing of data to the thermistor dots

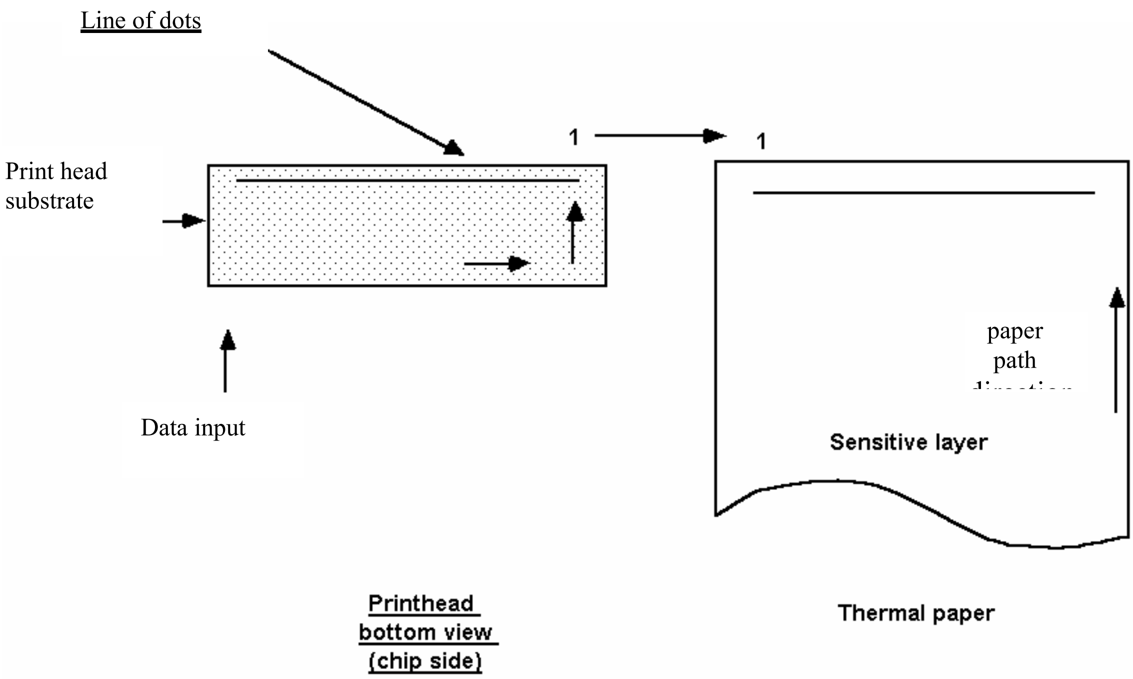


Fig.3 Dots print order

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

4.3.2 Electrical Specifications of 64-BIT LSI Driver

4.3.2.1 General Electrical Description of Drivers

Description of drivers	MIN	MAX	UNIT
Max voltage at outputs 1 to 64		8.5	Volt
Max voltage any other pin		Vcc	Volt
Max output current		40	mA
Total max output current (64 dots "On")		2.6	A
Max leakage current/driver when stand-by mode		10	µA

4.3.2.2 Other

The specifications given below are given for the following conditions:

Logic voltage on chip: 3.3 V < Vcc < 5.5V (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 (Vcc=5V)
5 MHz (Vcc=3.3V)

Logic Current (5 V)	Conditions	Values	Symbol
Min high-level input voltage	Vcc = 5 V	0.8 x Vcc	Vih
Max high-level input voltage	Vcc = 5 V	Vcc	Vih
Min low-level input voltage		0	Vil
Max low-level input voltage		0.2 x Vcc	Vil
Max high-level input current	Vih = Vcc	0.5µA	Iih
Max. low-level input current	Vil = 0	0.5µA	Iil
Min. high-level output voltage		4.45 V	Voh
Max. low-level output voltage		0.05 V	Vol

4.3.2.3 Timing

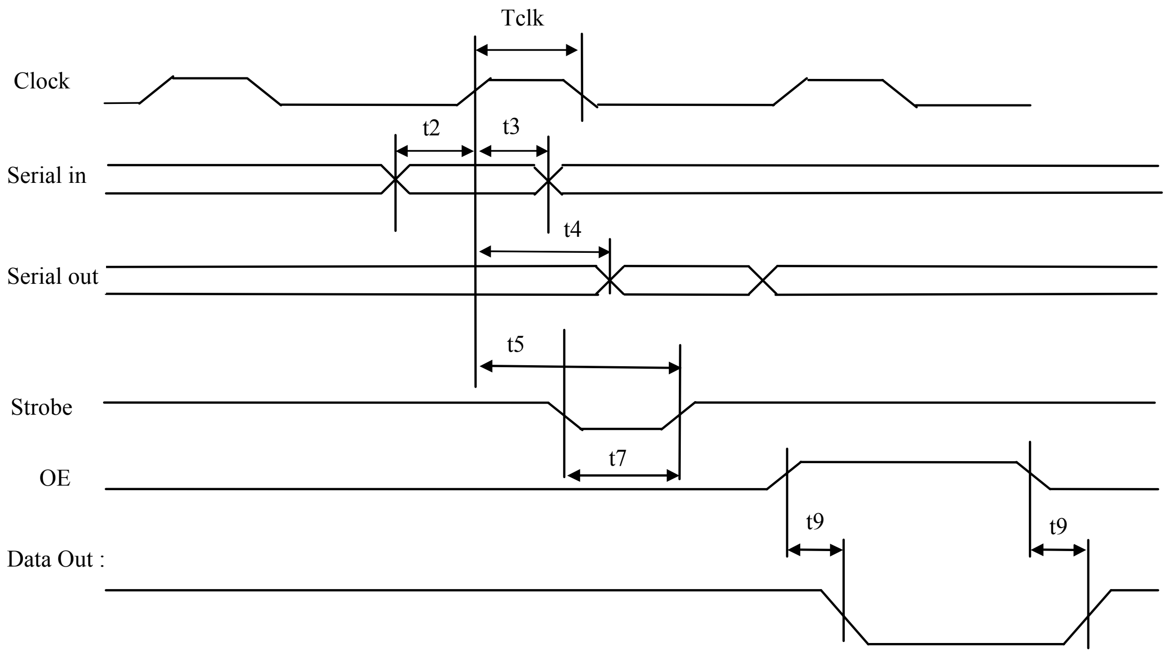


Fig.4 LSI driver timing chart

Serial in	:	Serial input for data to be printed.
Clock	:	Serial/parallel shift register clock, activated on leading edge of pulse (rest level = logic 0) Maximum clock frequency is 8 MHz.
Serial out	:	Serial data out sent back to the connector of the thermal head
STROBE	:	Signal for putting data into memory, active on logic level 0 (rest level = logic 1).
OE	:	Output Enable (OE1 to OE6) power activation signals active at logic level 1.
Data Out n	:	Internal data out to heating points (not available on connector).

***Note*: All these inputs are CMOS compatible.**

Fig. 5 LSI driver symbols

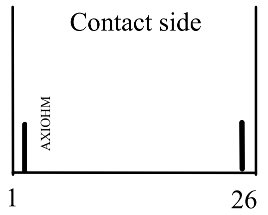
Symbol	Description	5V / 8 MHz (Max)		2.7~ 4.5 V/ 5MHz (Max)		Unit
		Min	**Maxi**	**Min**	**Maxi**	
Tclk	**Clock pulse width**	45		64		ns
t2	**Clock - SI set-up time**	30		40		ns
t3	**Clock – SI hold time**	10		10		ns
t4	**Serial out delay time**		95		160	ns
t5	**Clock – strobe set up time**	70		150		ns
t7	**Strobe pulse width**	50		100		ns
t9	**OE data out delay time**		6		15	µs

Vcc = 5V or 3.3V, Temp = 25 °C with resistive load

4.3.3 Print Head Connection

Pinout of the print head flex cable

Pin Number	Signal	Comment
1	B1	Paper feed motor B1
2	A0	Paper feed motor A0
3	A1	Paper feed motor A1
4	B0	Paper feed motor B0
5	Anode opto	Anode of en of paper opto-sensor
6	GND	GND
7	Collector opto	Collector of end of paper opto-sensor
8	Vch	Vch
9	Vch	Vch
10	Data-out	Data out
11	STROBE	Strobe signal for line print
12	GND	GND
13	GND	GND
14	OE1	OE for drivers 1,2,3
15	Thermistor1	Thermistor1
16	Thermistor2	Thermistor2
17	Vdd	Vdd
18	OE2	OE for drivers 4,5,6
19	GND	GND
20	GND	GND
21	CLOCK	Clock signal for serialising data to line
22	Data-in	Data input
23	Vch	Vch
24	Vch	Vch
25	Gnd for ESD	Ground for ESD evacuation
26	Gnd for ESD	Ground for ESD evacuation



Thickness: 300 µ

For the connection of the mechanism Axiohm recommend the following 26 pins connectors (from print head flex to board):

- JST Ref 26 FMN-BTRK-A Molex Ref :52806-2610
- JST Ref 26 FMZ-BT Molex Ref : 71226-2635

-

4.4 *Bipolar Stepping Motor*

This motor is used to drive the platen for paper feeding. It is a bipolar stepping motor and its characteristics are described bellow.

4.4.1 *Characteristics*

Recommended control voltage (voltage range: 4 to 8.5V)	5	VDC
Coil Resistance	18	Ω
Number of phases	2 (bipolar)	
Pitch angle	18°	
Number of steps per revolution	20	
Paper feed for 2 motor steps	0.125	Mm
Recommended control current	277 (=5V/18Ω)	mA/phase
Maximum starting speed *	720 (=45mm/s)	step/s

* to go faster : an acceleration ramp up must be achieved.

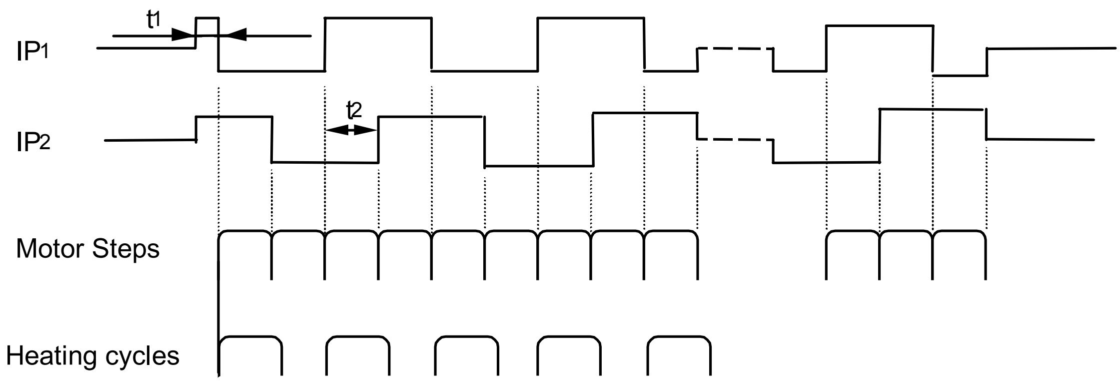
For the motor driving, see the following page and the chapter "Recommendations"

4.4.2 *Motor Connection*

The motor is connected to the main flex cable in addition to the End of paper opto sensor.
See 4.3.3 Print head connection

4.4.3 Induction Sequence and Timing (paper feed)

Motor feed timing diagram



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

Motor initialisation:

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.

4.4.4 *Printing Mode*

There are 4 different positions for the motor phases.

The circulation is:

P1 = A0B0; P2 = A1B1

$P1P2 \Rightarrow \overline{P1}P2 \Rightarrow \overline{P1P2} \Rightarrow P1\overline{P2} \Rightarrow P1P2$

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 = ± 277 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.

4.5 Sensor Specifications

4.5.1 End of Paper Opto-sensor

This opto-sensor detects the end of paper

4.5.1.1 Electrical Characteristics

Absolute maximum ratings					
IF (mA)	VR (V)	PD(mW)	VCEO(V)	IC(mA)	PC(mW)
50*	5	70	20	20	70

<table>
<tr><td colspan="7">Operating characteristics</td></tr>
<tr><td></td><td>VF (V)</td><td>IR (µA)</td><td>ICEO (A)</td><td>IC (mA)</td><td>VCE(sat)(v)</td><td>tr (µs)</td></tr>
<tr><td>Value</td><td>Maxi 1.6</td><td>Maxi 10</td><td>Maxi 2.10-7</td><td>Mini 80 µA /
Maxi 1100 µA</td><td>Max 0.5</td><td>Typical 5</td></tr>
<tr><td rowspan="3">Conditions</td><td rowspan="3">IF = 10 mA</td><td rowspan="3">VR = 5 V</td><td rowspan="3">VCEO = 10V</td><td rowspan="2">IF = 10 mA</td><td rowspan="2">IF = 10 mA</td><td>IC = 1 mA</td></tr>
<tr><td>RL = 100 Ω</td></tr>
<tr><td>VCE = 5 V</td><td>IC = 50 µA</td><td>VCC = 5V</td></tr>
</table>

* : Axiohm advise to pulse it

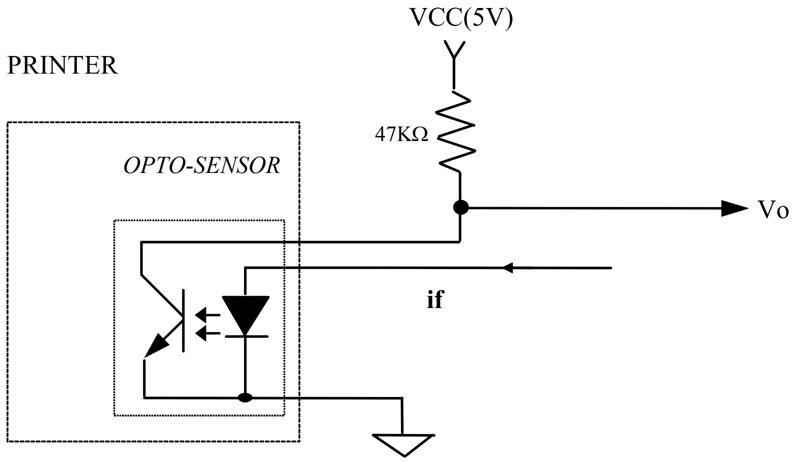
4.5.1.2 Connection

Integrated with the main flex cable, see 4.3.3

4.5.2 Recommended Use for Opto-sensor

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

4.5.2.1 Opto Sensor: Sample Minimal External Circuit

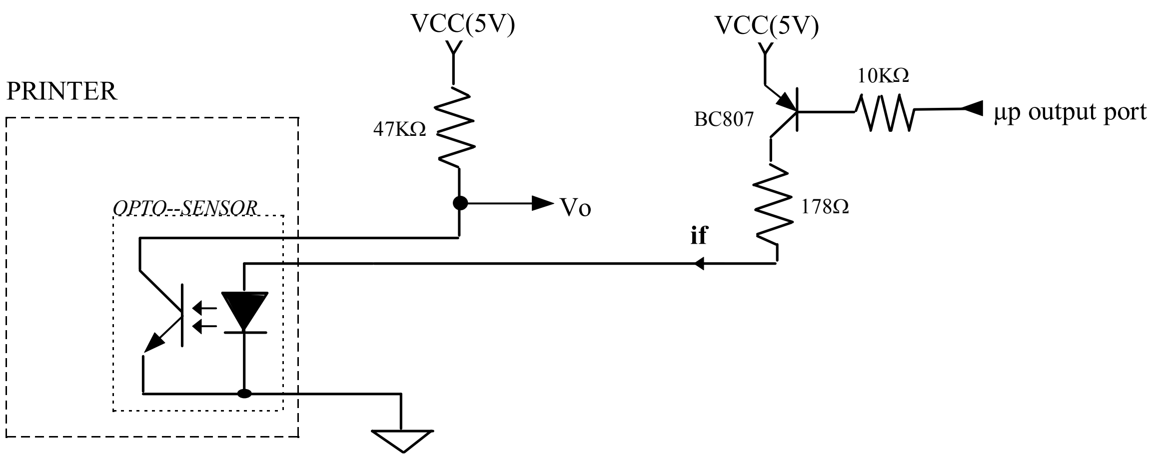


Condition:

✓ For **If** = 20 mA ....Output signal is LOW when paper is PRESENT Vo<0.7V.

.........Output signal is HIGH when paper is EXHAUSTED Vo>3.4V.

4.5.2.2 Sample external circuit with low consumption



Condition:

✓ Pulse wave from output port with low level during 0.6 ms, measuring Vo 0.2 ms after pulse falling edge.

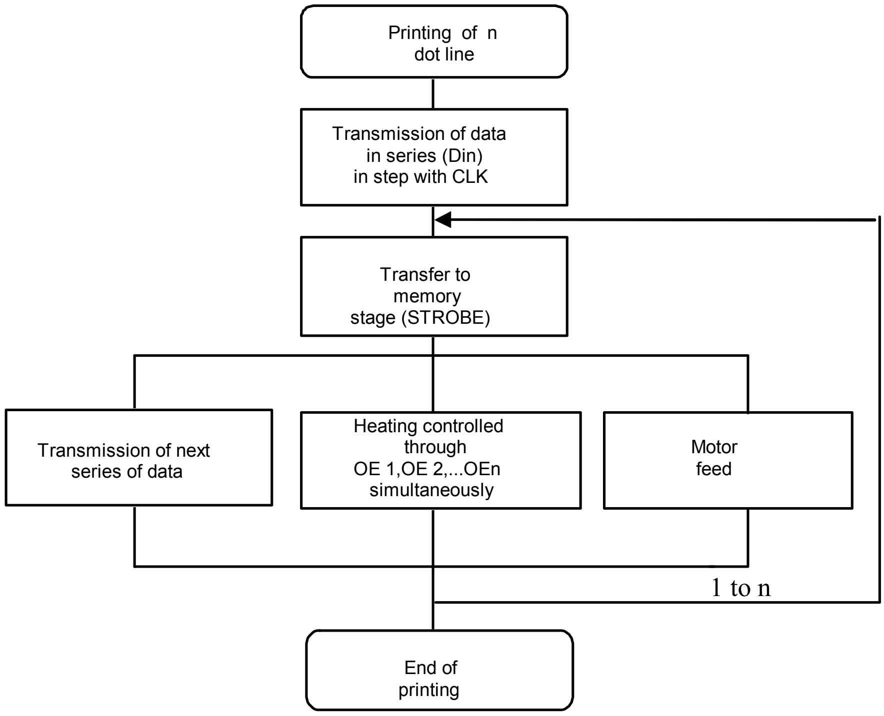
✓ Same conditions for output signal Vo, as chapter above.

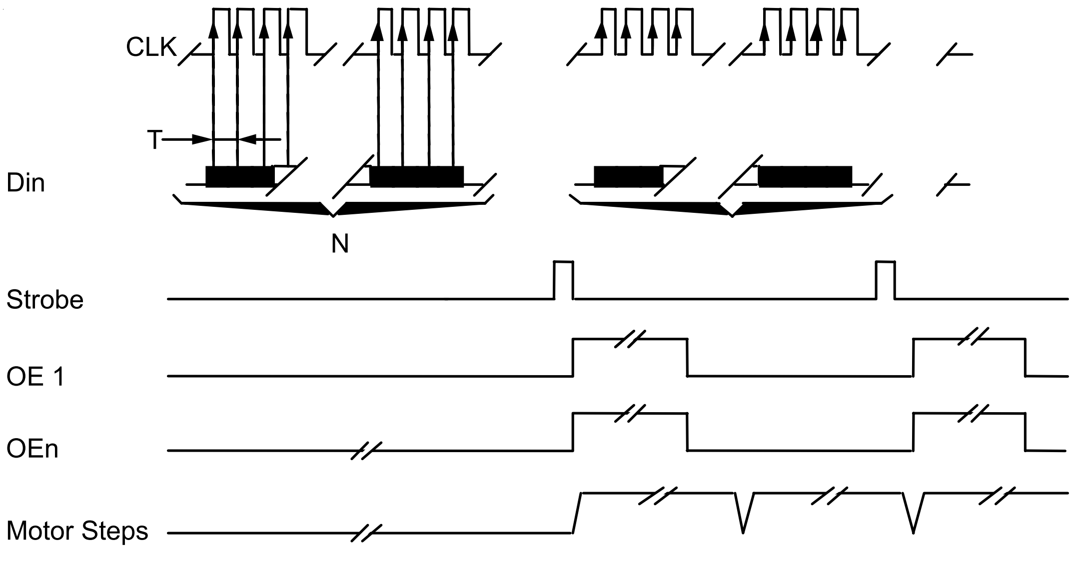
5 PRINTER CONTROL TECHNIQUES

For printer control techniques, in order to operate the printer, we depict hereafter three possible modes.

5.1 *Mode 1*

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



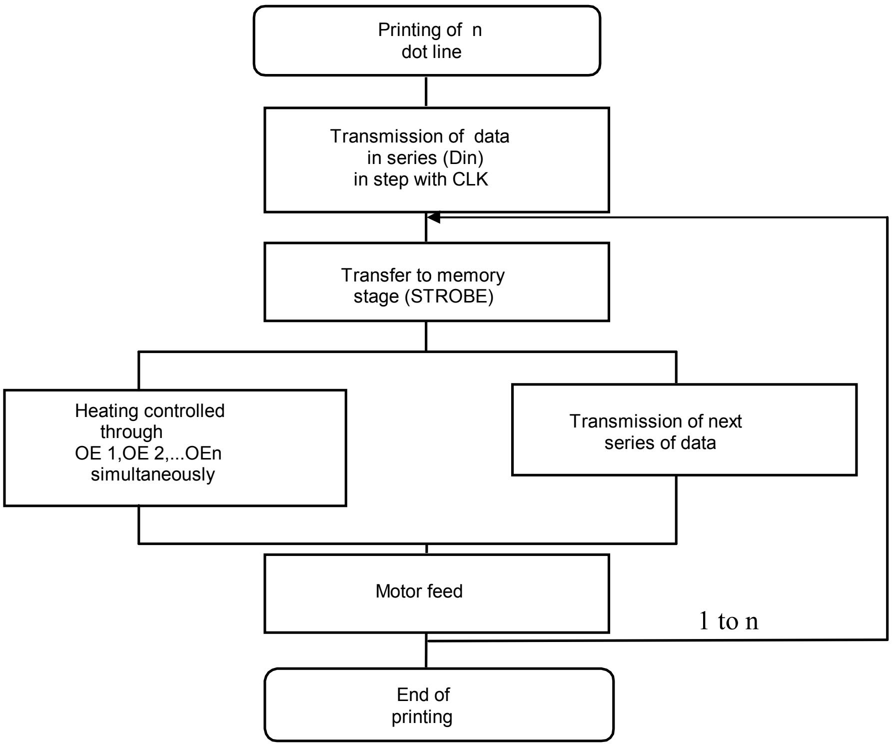


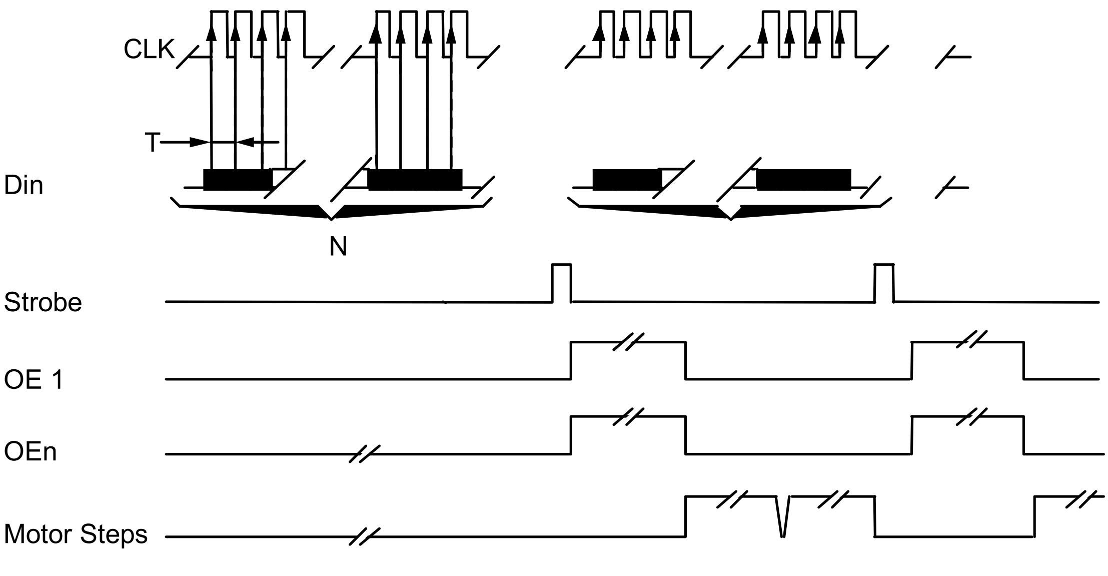
T : Clock frequency 8 MHz maximum (or 5 MHZ if VCC< 5V)

Timing diagram for mode 1

5.2 Mode 2

The paper feed occurs after the heating cycle resulting in high quality printing.



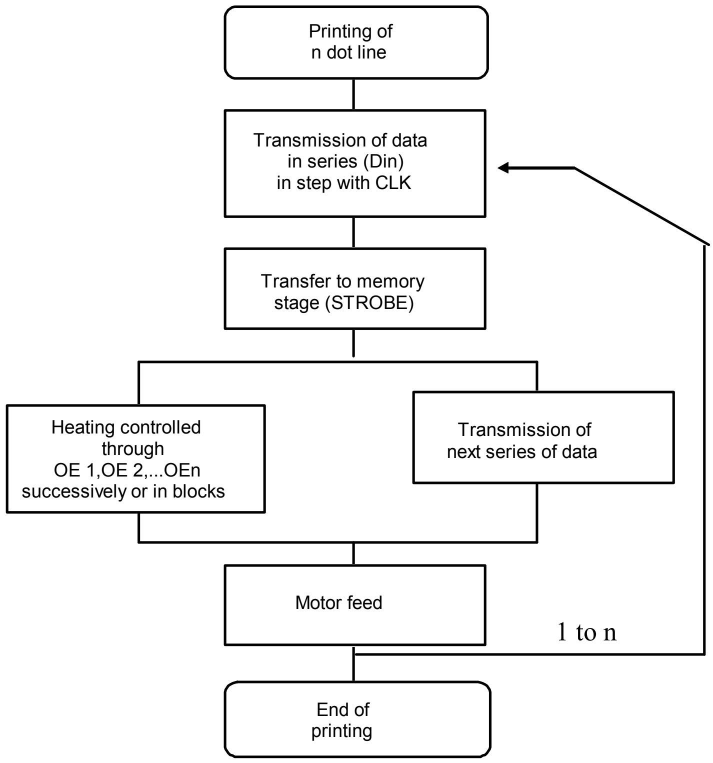


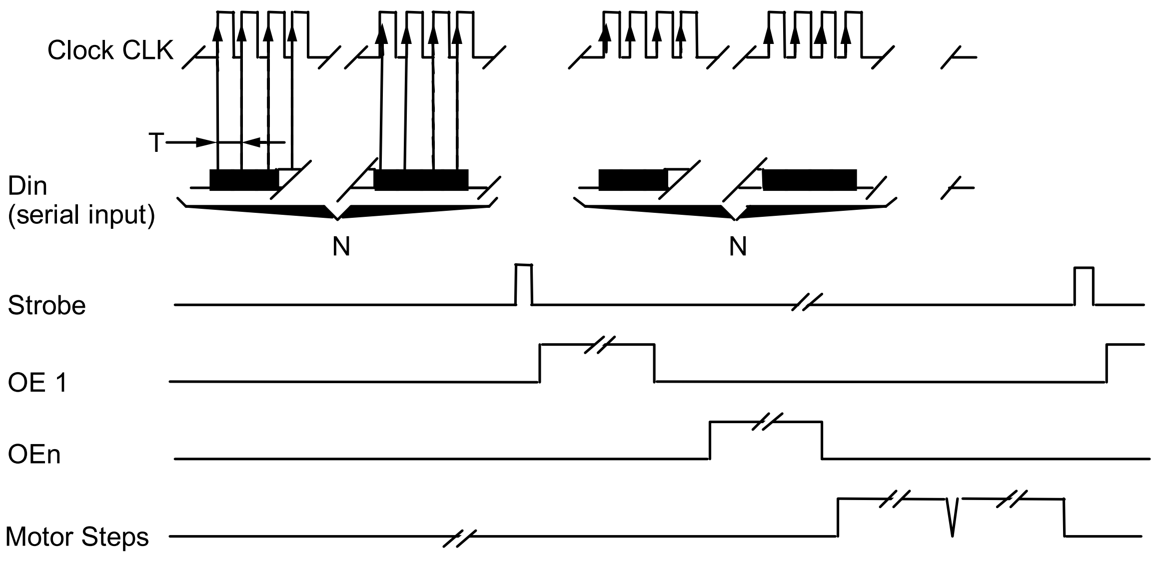
T : Clock frequency 8 MHz maximum

Timing diagram for mode 2

5.3 *Mode 3*

This mode is used in conditions where there is a limit of electrical current. The dot line is printed in stages heating only a portion of the line at a time. This effectively gives a reduced power consumption.





T : Clock frequency 8 MHz maximum

Timing diagram for mode 3

6 RECOMMENDATIONS

6.1 Mechanical Recommendations

- Never apply mechanical stress to the printer; 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 integration" to design an easy loading Clamshell cover.
- The paper should be guided to the mechanism to make sure it is centred in the mechanism paper path (particularly when the paper width is less than 58mm).

Flatness Support:

- The « ELECTRON » printer must not be put in constraint during integration. For that, the support on which it is fixed must have a flatness of 0,15mm.

  During integration, the mounting plane can be tilted according to an indifferent angle of the horizontal.

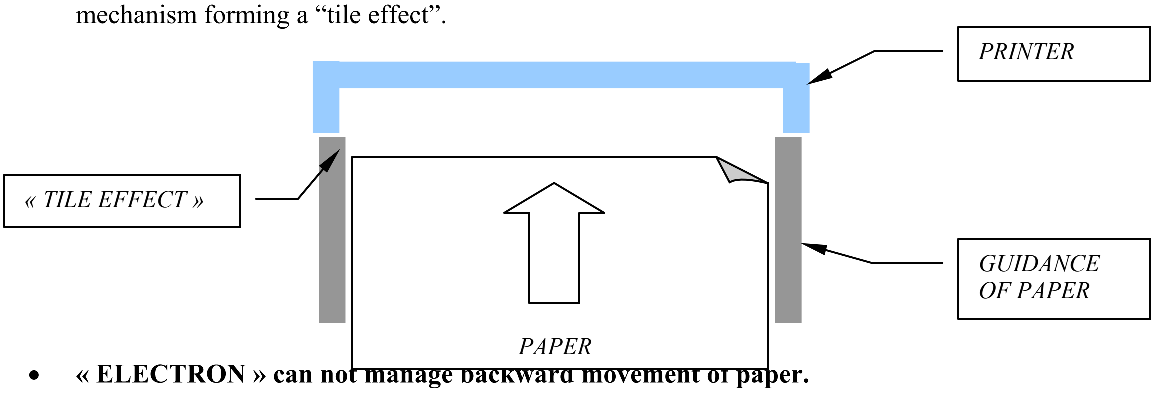
General Constraints of Integration :

- The thermal head has a light oscillating movement around its axis during the opening or the closing of the cover. One must hold account for the integration and not place elements too close to the print head.
- The unit's surfaces for the integration must be situated in more than 0,5mm of the pieces in movement in the printer: gears printing head, spring of head, platen, except the oblong forms or "forks" to maintain the platen.

  If it is necessary, we can supply a plan or an IGES file for an example of the cover.

Paper characteristics and paper guide

- « ELECTRON » uses paper of 58mm maximum width and 68µm maximum thickness. **The paper roll must not exceed 120g weight, corresponding to a diameter of approximately 60 mm rolled on a plastic roll of Ø16mm.**
  Printing width is 48mm.
  To feed the paper to the printer we recommend guidance as close as possible to the entry of the printer mechanism forming a "tile effect".



- **« ELECTRON » can not manage backward movement of paper.**

  If printer is used in bi-station mode (2 parallel paper rolls printed simultaneously), there is no paper detection on the opposite side of the gears. If required, it will have to be integrated into the system bucket.

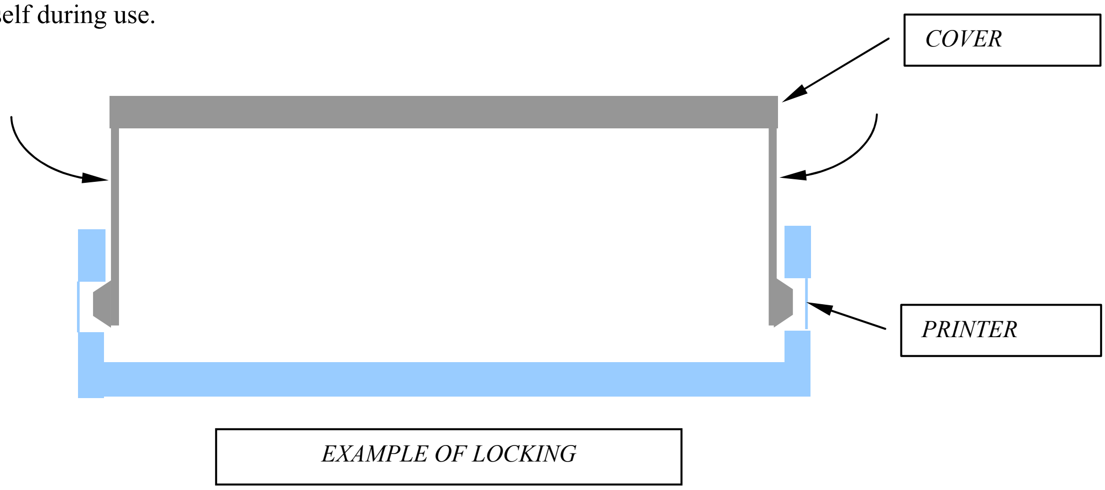
Different Possibilities of Integration :

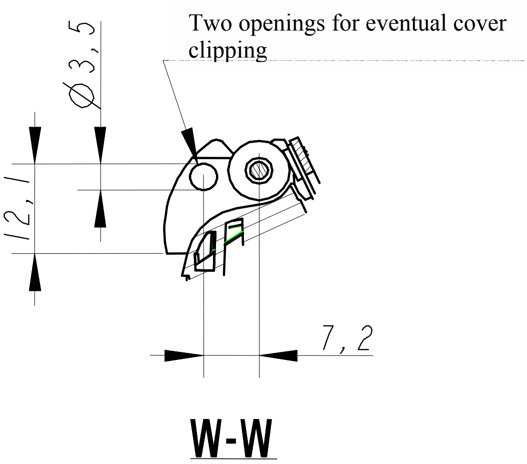
- In a simple application :

The paper loading of this mechanism uses a CLAMSHELL system. Our mechanism allows a simple application of the cover for a paper reservoir. No control lever is necessary for the opening of the cover.

In the case that the lightness and the compactness of the customer's application is most important, the cover can be reduced. The operator will act directly on the cover by pulling to open it.

We advise a simple locking of the cover. There are places foreseen for that purpose on the walls of mechanism extremity (to see §2.1.) for the preservation of the cover during the manual cutting of the paper. Make sure that the cover does not deform itself during use.

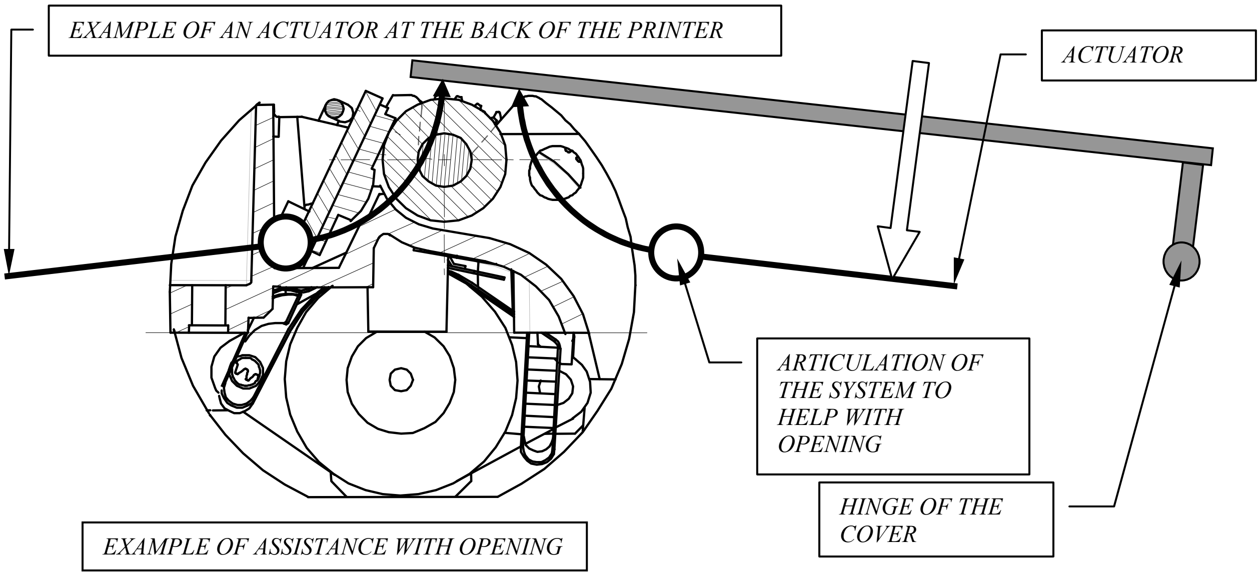




W-W

- In an application with assistance in opening

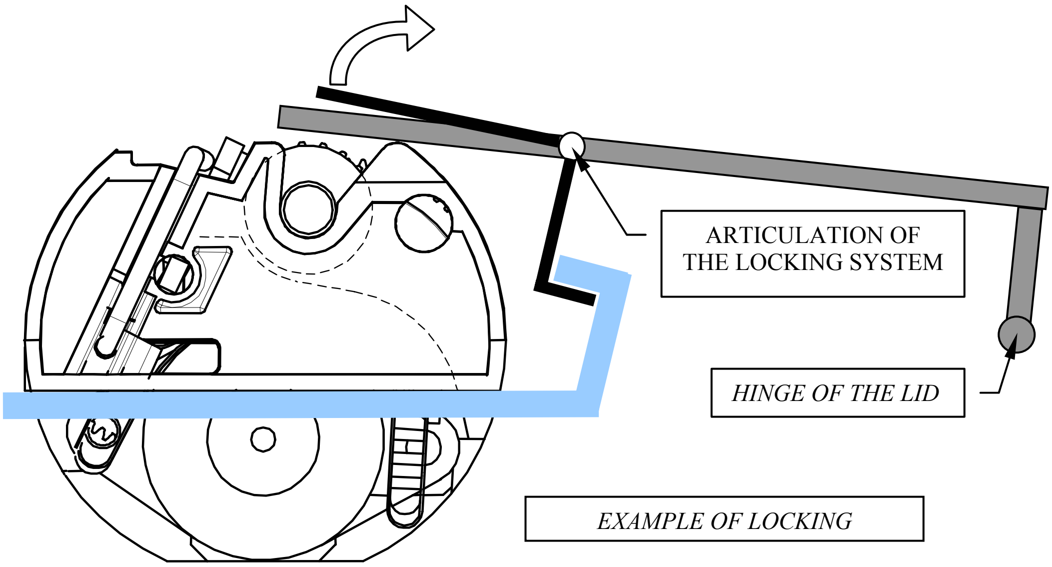
If necessary, help with the opening of the cover by pushbutton or lever can be necessary (see the figures below).

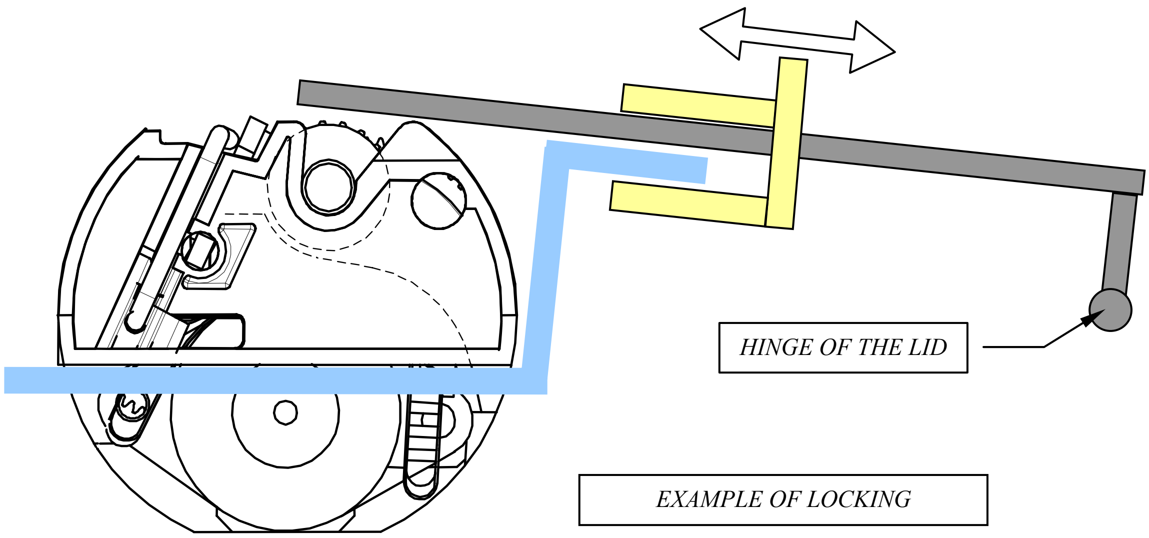


This help example of opening could be applied to a side of the cover, preferably the side with platen gears. Or, both sides of the cover by placing the actuator behind the hinge of cover or on the other side of the printer, not to obstruct the installation of the paper roller.

Locking System :

- Locking can be directly made on the printer (see above) or on some part of the customer application.


ARTICULATION OF
THE LOCKING SYSTEM
HINGE OF THE LID
EXAMPLE OF LOCKING


HINGE OF THE LID
EXAMPLE OF LOCKING

6.2 Electrical Recommendations

When energising the thermal print head, it is important to apply the logic supply voltage first and the print head supply voltage next.

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 down. The supply voltage Vch must be switched off before the logic supply voltage Vcc.
Care should be taken to allow enough time for residual capacitive charge to dissipate.

6.3 Motor Driving Recommendations

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

When the motor is under voltage control, it is recommended to connect it to the same supply as logic current (from 2.7V to 5.5V).

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 5.25 V, or the current is greater than 280 mA per phase, it is necessary to determine a duty cycle time (max recommended: 21% ton/toff, with a sec "on" max) to avoid the motor temperature rising.

This has to be achieved with the customer host chassis, as the cooling depends on air volume and circulation around the motor.

This motor can be controlled either under voltage or current.
The maximum voltage is 8.5 V, the maximum current is 470 mA per phase.
The maximum temperature on the external motor frame is 80°C.

7 HEATING TIME CALCULATIONS

7.1 Real Heating Times

Density vs Energy	At Nominal Speed & Nominal Temperature

$$t1 = \frac{Rmean}{V'^2} \times E0$$

Voltage	6 Volts	
Temperature	23 °C	
Speed	50 mm/s	
Paper	AF50KSE3	
Eo saturation	0,31 mJ	(cf Density Sheet)
Tch (saturation heating time	1,120 ms	
Température statique	80 °C	

Heating Time vs Speed	At Nominal Voltage & Nominal Temperature

$$t2 = t1 \times (a \times Log(tm) + b)$$

tm = Time for motor step (ms)

Voltage	6 Volts
Temperature	23 °C
Paper	AF50KSE3
Coeff "a"	0,4071
Coeff "b"	0,6269

Heating Time vs Temperature	At Nominal Speed & Nominal Voltage

For linear modelisation (Coeff "c", Coeff "d")

$$t3 = t2 \times (cT + d)$$

For polynomial modelisation (Coeff "g", "h", "i", "j")

$$t_3 = t_2 \times (g \times T^3 + hT^2 \times iT + J)$$

Voltage	6 Volts
Speed	50 mm/s
Paper	AF50KSE3
Coeff "c"	-0,01420000
Coeff "d"	1,32660000
Coeff "g"	-0,00000477
Coeff "h"	0,00050244
Coeff "i"	-0,02740654
Coeff "j"	1,42268041

Heating Time vs Voltage	At nominal Temperature & Speed

$$V' = eV + f$$

Temperature	23 °C
Speed	50 mm/s
Paper	AF50KSE3
Coeff "e"	0,9490
Coeff "f"	0,3100

7.2 *Historical Control*

The history coefficient depends on the speed (explained below).
It gives the reduction (in %) of the TCH (nominal heating time), which has to be applied on a dot previously heated (on N-1).

Paper feed motor control parameters:

Min Speed =	15	mm/sec
Max Speed =	71	mm/sec
Ramp Size =	8	

Speed = MIN_SPEED + (MAX_SPEED – MIN_SPEED) x Index / (RAMP_SIZE-1)

History control :

Tb = (COEFA x ln(6.25) + COEFB)

Tb = 1,716

TbTmp = (COEFA x ln(StepTime/1000) + COEFB)
HistTmp = 100 x (Tb-TbTmp) / Tb

if (HistTmp < 0) HistCoef = 0 else HistCoef = HistTmp

Index	Step Time (µs)	Speed (mm/sec)	History Coef (%)
0	8332	15	0
1	5434	23	4
2	4020	31	13
3	3204	39	19
4	2657	47	25
5	2272	55	30
6	1984	63	34
7	1760	71	37

History control				
Raster (N)	1	1	1	1
Raster (N-1)	0	0	1	1
HistoryEn	0	1	1	1

Actual heating time =
TCH x (1 – HistoryCoef x HistoryEn)

The Heating time table is given on next page.

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

Column 3 (indicated with: speed <20 mm/s, and motor cycle time > 6.25 ms) gives the required heating time, giving the necessary energy to obtain an optical density of 1.2.

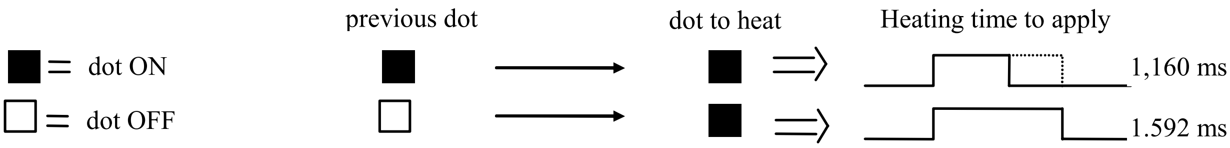
Three areas are then defined in the heating time table:

Area 1: “white”
The motor cycle time for one dot line is greater than the heating time indicated in column 3.
Area 2: “grey area”
The heating time in column 3 is greater than the motor cycle time.
Area 3: “bold numbers”
The indicated heating time (depending on speed, voltage and temperature) would be greater than the motor cycle time.

In areas 1 and 2, the heating time can be controlled either with or without historical control.

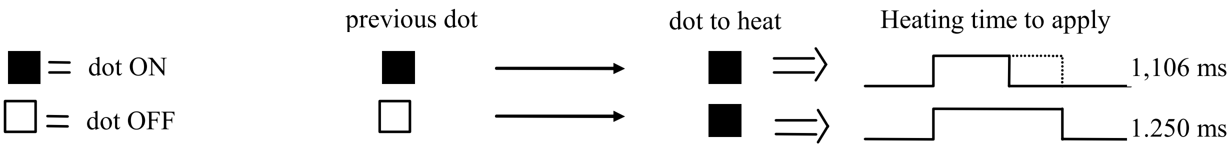
How to use the tables:
Without historical control: apply the indicated heating time given as a function of speed, voltage and temperature. At high speed, printing quality for isolated dots might be affected with this method.
Example: at 20 mm/s, 30°C and 6 volts, heating time = 1.418 ms (time from column 3).

With historical control in area 1: apply the indicated heating time (function of speed, voltage and temperature) when the dot has been heated on the previous dot line, and the time from column 3 when it has not. This method gives the best printing quality.
Example: at 50 mm/s, 20°C and 6 volts:



With historical control in area 2: apply the indicated heating time (function of speed, voltage and temperature) when the dot has been heated on the previous dot line, and the motor cycle time when it has not. At high speed, printing quality for isolated dots might be slightly affected with this method.

Example: at 100 mm/s, 25°C and 5 volts:



We do not recommend the use of the printer in area 3 as the pint quality would be seriously affected.

Axiohm™

7.3 Heating Time Table

With Paper AF50KSE3

Voltage (V) Real	Temp (°C)	Speed (mm/s)				R=	130 Ohms						
		< 20 mm/s	30 mm/s	35 mm/s	40 mm/s	50 mm/s	56 mm/s	60 mm/s	65 mm/s	70 mm/s	80 mm/s	90 mm/s	100 mm/s
Motor time for an under line		6,250 ms	4,170 ms	3,570 ms	3,130 ms	2,500 ms	2,230 ms	2,080 ms	1,920 ms	1,790 ms	1,560 ms	1,390 ms	1,250 ms
4,00 Volts	0 °C	4,669 ms	4,109 ms	3,894 ms	3,712 ms	3,401 ms	3,243 ms	3,146 ms	3,035 ms	2,938 ms	2,748 ms	2,588 ms	2,441 ms
4,00 Volts	10 °C	3,919 ms	3,449 ms	3,268 ms	3,116 ms	2,854 ms	2,722 ms	2,641 ms	2,548 ms	2,466 ms	2,306 ms	2,172 ms	2,049 ms
4,00 Volts	20 °C	3,405 ms	2,996 ms	2,839 ms	2,707 ms	2,480 ms	2,364 ms	2,294 ms	2,213 ms	2,142 ms	2,004 ms	1,887 ms	1,780 ms
4,00 Volts	25 °C	3,207 ms	2,822 ms	2,674 ms	2,549 ms	2,335 ms	2,227 ms	2,160 ms	2,084 ms	2,018 ms	1,887 ms	1,777 ms	1,676 ms
4,00 Volts	30 °C	3,032 ms	2,668 ms	2,529 ms	2,410 ms	2,208 ms	2,105 ms	2,043 ms	1,971 ms	1,908 ms	1,784 ms	1,681 ms	1,585 ms
4,00 Volts	40 °C	2,707 ms	2,382 ms	2,258 ms	2,152 ms	1,972 ms	1,880 ms	1,824 ms	1,760 ms	1,704 ms	1,593 ms	1,500 ms	1,415 ms
4,00 Volts	50 °C	2,336 ms	2,056 ms	1,948 ms	1,857 ms	1,702 ms	1,622 ms	1,574 ms	1,519 ms	1,470 ms	1,375 ms	1,295 ms	1,221 ms
5,00 Volts	0 °C	3,081 ms	2,711 ms	2,569 ms	2,449 ms	2,244 ms	2,139 ms	2,076 ms	2,003 ms	1,939 ms	1,813 ms	1,707 ms	1,611 ms
5,00 Volts	10 °C	2,586 ms	2,275 ms	2,156 ms	2,056 ms	1,883 ms	1,796 ms	1,742 ms	1,681 ms	1,627 ms	1,522 ms	1,433 ms	1,352 ms
5,00 Volts	20 °C	2,246 ms	1,977 ms	1,873 ms	1,786 ms	1,636 ms	1,560 ms	1,513 ms	1,460 ms	1,413 ms	1,322 ms	1,245 ms	1,174 ms
5,00 Volts	25 °C	2,116 ms	1,862 ms	1,764 ms	1,682 ms	1,541 ms	1,469 ms	1,425 ms	1,375 ms	1,331 ms	1,245 ms	1,173 ms	*1,106 ms*
5,00 Volts	30 °C	2,000 ms	1,760 ms	1,668 ms	1,590 ms	1,457 ms	1,389 ms	1,348 ms	1,300 ms	1,259 ms	1,177 ms	1,109 ms	1,046 ms
5,00 Volts	40 °C	1,786 ms	1,572 ms	1,490 ms	1,420 ms	1,301 ms	1,240 ms	1,203 ms	1,161 ms	1,124 ms	1,051 ms	0,990 ms	0,934 ms
5,00 Volts	50 °C	1,541 ms	1,356 ms	1,285 ms	1,225 ms	1,123 ms	1,070 ms	1,039 ms	1,002 ms	0,970 ms	0,907 ms	0,854 ms	0,806 ms
6,00 Volts	0 °C	2,184 ms	1,922 ms	1,821 ms	1,736 ms	1,590 ms	1,516 ms	1,471 ms	1,420 ms	1,374 ms	1,285 ms	1,210 ms	1,142 ms
6,00 Volts	10 °C	1,833 ms	1,613 ms	1,529 ms	1,457 ms	1,335 ms	1,273 ms	1,235 ms	1,191 ms	1,153 ms	1,079 ms	1,016 ms	0,958 ms
6,00 Volts	20 °C	*1,592 ms*	1,401 ms	1,328 ms	1,266 ms	*1,160 ms*	1,106 ms	1,073 ms	1,035 ms	1,002 ms	0,937 ms	0,883 ms	0,832 ms
6,00 Volts	25 °C	1,500 ms	1,320 ms	1,251 ms	1,192 ms	1,092 ms	1,041 ms	1,010 ms	0,975 ms	0,944 ms	0,882 ms	0,831 ms	0,784 ms
6,00 Volts	30 °C	1,418 ms	1,248 ms	1,183 ms	1,127 ms	1,033 ms	0,985 ms	0,955 ms	0,922 ms	0,892 ms	0,834 ms	0,786 ms	0,741 ms
6,00 Volts	40 °C	1,266 ms	1,114 ms	1,056 ms	1,007 ms	0,922 ms	0,879 ms	0,853 ms	0,823 ms	0,797 ms	0,745 ms	0,702 ms	0,662 ms
6,00 Volts	50 °C	1,093 ms	0,962 ms	0,911 ms	0,869 ms	0,796 ms	0,759 ms	0,736 ms	0,710 ms	0,688 ms	0,643 ms	0,606 ms	0,571 ms
7,00 Volts	0 °C	1,628 ms	1,433 ms	1,358 ms	1,294 ms	1,186 ms	1,131 ms	1,097 ms	1,058 ms	1,025 ms	0,958 ms	0,903 ms	0,851 ms
7,00 Volts	10 °C	1,367 ms	1,203 ms	1,140 ms	1,086 ms	0,995 ms	0,949 ms	0,921 ms	0,888 ms	0,860 ms	0,804 ms	0,758 ms	0,714 ms
7,00 Volts	20 °C	1,187 ms	1,045 ms	0,990 ms	0,944 ms	0,865 ms	0,824 ms	0,800 ms	0,772 ms	0,747 ms	0,699 ms	0,658 ms	0,621 ms
7,00 Volts	25 °C	1,118 ms	0,984 ms	0,933 ms	0,889 ms	0,814 ms	0,777 ms	0,753 ms	0,727 ms	0,704 ms	0,658 ms	0,620 ms	0,585 ms
7,00 Volts	30 °C	1,057 ms	0,931 ms	0,882 ms	0,841 ms	0,770 ms	0,734 ms	0,712 ms	0,687 ms	0,665 ms	0,622 ms	0,586 ms	0,553 ms
7,00 Volts	40 °C	0,944 ms	0,831 ms	0,787 ms	0,751 ms	0,688 ms	0,656 ms	0,636 ms	0,614 ms	0,594 ms	0,556 ms	0,523 ms	0,494 ms
7,00 Volts	50 °C	0,815 ms	0,717 ms	0,679 ms	0,648 ms	0,593 ms	0,566 ms	0,549 ms	0,530 ms	0,513 ms	0,479 ms	0,452 ms	0,426 ms
8,00 Volts	0 °C	1,261 ms	1,109 ms	1,051 ms	1,002 ms	0,918 ms	0,875 ms	0,849 ms	0,820 ms	0,793 ms	0,742 ms	0,699 ms	0,659 ms
8,00 Volts	10 °C	1,058 ms	0,931 ms	0,882 ms	0,841 ms	0,771 ms	0,735 ms	0,713 ms	0,688 ms	0,666 ms	0,623 ms	0,586 ms	0,553 ms
8,00 Volts	20 °C	0,919 ms	0,809 ms	0,767 ms	0,731 ms	0,670 ms	0,638 ms	0,619 ms	0,598 ms	0,578 ms	0,541 ms	0,509 ms	0,481 ms
8,00 Volts	25 °C	0,866 ms	0,762 ms	0,722 ms	0,688 ms	0,631 ms	0,601 ms	0,583 ms	0,563 ms	0,545 ms	0,509 ms	0,480 ms	0,453 ms
8,00 Volts	30 °C	0,819 ms	0,720 ms	0,683 ms	0,651 ms	0,596 ms	0,568 ms	0,552 ms	0,532 ms	0,515 ms	0,482 ms	0,454 ms	0,428 ms
8,00 Volts	40 °C	0,731 ms	0,643 ms	0,610 ms	0,581 ms	0,532 ms	0,508 ms	0,492 ms	0,475 ms	0,460 ms	0,430 ms	0,405 ms	0,382 ms
8,00 Volts	50 °C	0,631 ms	0,555 ms	0,526 ms	0,501 ms	0,459 ms	0,438 ms	0,425 ms	0,410 ms	0,397 ms	0,371 ms	0,350 ms	0,330 ms

7.4 Thermistor Specifications

Operating Temperature: - 20 to + 80 °C

Thermistor time constant: 5 sec (at 25°C)

Dissipation constant: 0.9 mW/°C
Maximum power: 4.5 mW (at 25°C)

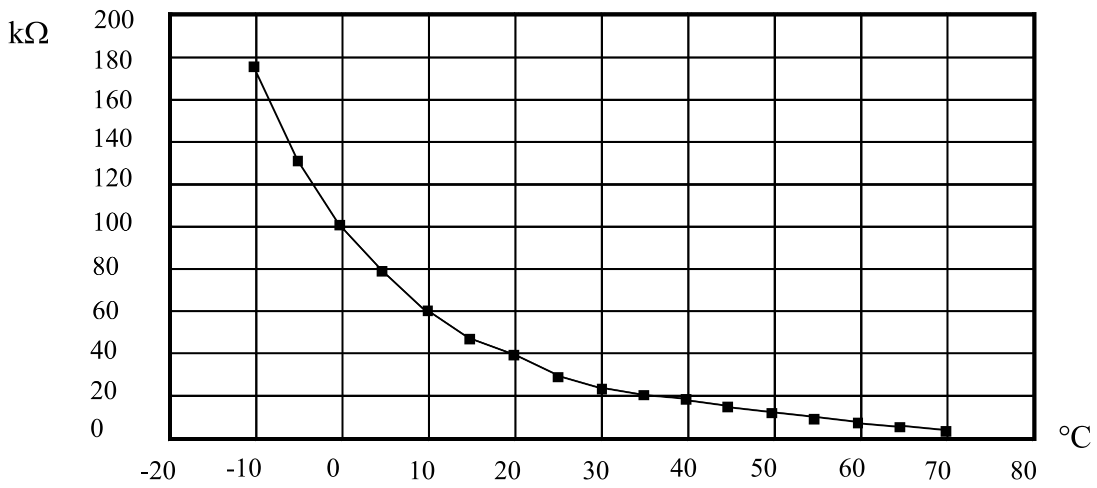
This thermistor has a rated value of 30 kΩ ± 5 %. Its resistance variation can be expressed as follows:

$R = Rn \exp(B(\frac{1}{T} - \frac{1}{Tn}))$ where T is in Kelvin degrees (K). This gives the following curve (for T in °K)

(T(°K) = 273.15 (°K) + each temperature (°C)

B = 3950 K ± 2%

Rn = reference value at temperature Tn (298° K)

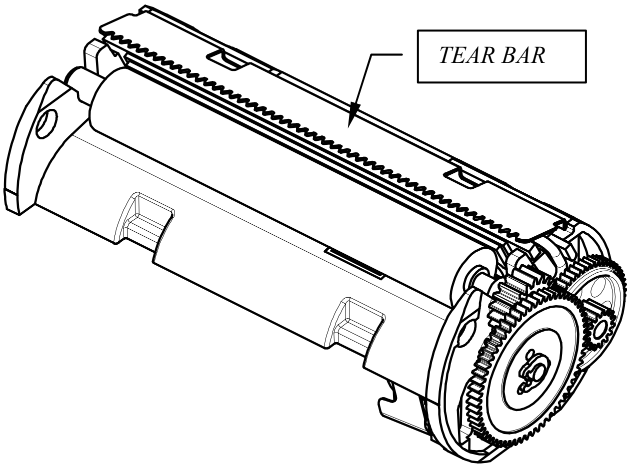


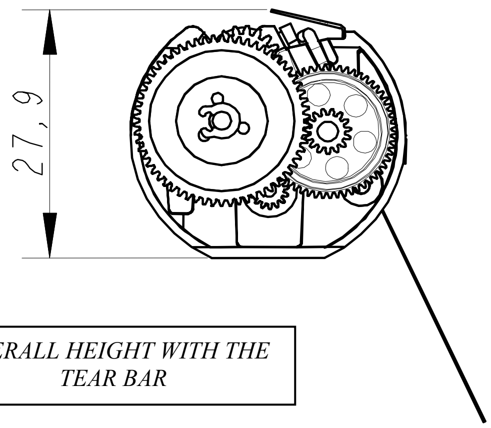
8 PAPER SUPPLIERS

JUJO AF50KSE3
Ref: 3104208

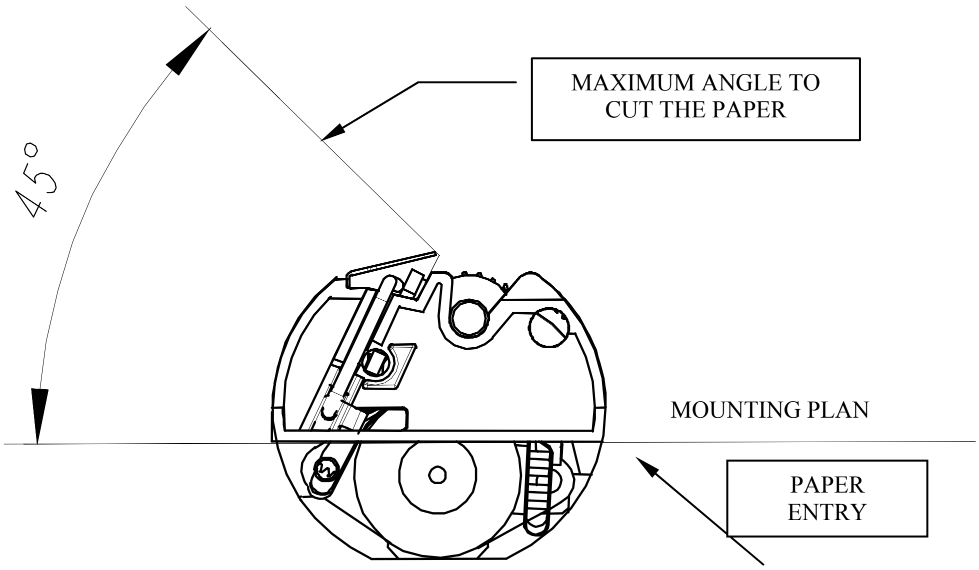
9 TEAR BAR OPTION

As an option there is a metal tear bar assembly, which can be clipped on this printer.





WARNING: Do not attach the tear bar on the cover or any other moving part in relation to the printer.



To cut paper with the tear bar, it is important to draw the paper according to an angle lower than 45° as compared to the mounting plane. Otherwise, the platen is likely to be ejected.