

USER MANUAL

MT2460

CUSTOM  *M*®

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UNLESS OTHERWISE SPECIFIED, THE INFORMATION GIVEN IN THIS MANUAL ARE REFERRED TO ALL MODELS IN PRODUCTION AT THE ISSUE DATE OF THIS DOCUMENT.

GENERAL INSTRUCTIONS

CUSTOM S.p.A. declines all responsibility for accidents or damage to persons or property occurring as a result of tampering, structural or functional modifications, unsuitable or incorrect installations, environments not in keeping with the equipment's protection degree or with the required temperature and humidity conditions, failure to carry out maintenance and periodical inspections and poor repair work.

GENERAL SAFETY INFORMATION

Your attention is drawn to the following actions that could compromise the characteristics of the product:

- Read and retain the instructions which follow.
- Follow all indications and instructions given on the device.
- Make sure that the surface on which the device rests is stable. If it is not, the device could fall, seriously damaging it.
- Make sure that the device rests on a hard (non-padded) surface and that there is sufficient ventilation.
- Do not fix indissolubly the device or its accessories such as power supplies unless specifically provided in this manual.
- When positioning the device, make sure cables do not get damaged.
- [Only OEM equipment] The equipment must be installed in a kiosk or system that provides mechanical, electrical and fire protection.
- The mains power supply must comply with the rules in force in the Country where you intend to install the equipment.
- Make sure that there is an easily-accessible outlet with a capacity of no less than 10A closely to where the device is to be installed.
- Make sure the power cable provided with the appliance, or that you intend to use is suitable with the wall socket available in the system.
- Make sure the electrical system that supplies power to the device is equipped with a ground wire and is protected by a differential switch.
- Before any type of work is done on the machine, disconnect the power supply.
- Use the type of electrical power supply indicated on the device label.
- These devices are intended to be powered by a separately certified power module having an SELV, non-energy hazardous output. (IEC60950-1 second edition).
- [Only POS equipment] The energy to the equipment must be provided by power supply approved by CUSTOM S.p.A.
- Take care the operating temperature range of equipment and its ancillary components.
- Do not block the ventilation openings.
- Do not insert objects inside the device as this could cause short-circuiting or damage components that could jeopardize printer functioning.
- Do not carry out repairs on the device yourself, except for the normal maintenance operations given in the user manual.
- The equipment must be accessible on these components only to trained, authorized personnel.
- Periodically perform scheduled maintenance on the device to avoid dirt build-up that could compromise the correct, safe operation of the unit.
- Do not touch the head heating line with bare hands or metal objects. Do not perform any operation inside the printer immediately after printing because the head and motor tend to become very hot.
- Use consumables approved by CUSTOM S.p.A.



THE CE MARK AFFIXED TO THE PRODUCT CERTIFY THAT THE PRODUCT SATISFIES THE BASIC SAFETY REQUIREMENTS.

The device is in conformity with the essential Electromagnetic Compatibility and Electric Safety requirements laid down in Directives 2014/30/EU and 2014/35/EU inasmuch as it was designed in conformity with the provisions laid down in the following Standards:

- EN 55032 (*Electromagnetic compatibility of multimedia equipment - Emission Requirements*)
- EN 55024/EN 55035 (*Electromagnetic compatibility of multimedia equipment - Immunity requirements*)
- EN IEC/EN 62368-1 (*Audio/video, information and communication technology equipment*)

The device is in conformity with the essential requirements laid down in Directives 2014/53/EU about devices equipped with intentional radiators. The Declaration of Conformity and other available certifications can be downloaded from the site www.custom4u.it.



GUIDELINES FOR THE DISPOSAL OF THE PRODUCT

The crossed-out rubbish bin logo means that used electrical and electronic products shall NOT be mixed with unsorted municipal waste. For more detailed information about recycling of this product, refer to the instructions of your country for the disposal of these products.

- Do not dispose of this equipment as miscellaneous solid municipal waste, but arrange to have it collected separately.
- The re-use or correct recycling of the electronic and electrical equipment (EEE) is important in order to protect the environment and the wellbeing of humans.
- In accordance with European Directive WEEE 2012/19/EU, special collection points are available to which to deliver waste electrical and electronic equipment and the equipment can also be handed over to a distributor at the moment of purchasing a new equivalent type.
- The public administration and producers of electrical and electronic equipment are involved in facilitating the processes of the re-use and recovery of waste electrical and electronic equipment through the organisation of collection activities and the use of appropriate planning arrangements.
- Unauthorised disposal of waste electrical and electronic equipment is punishable by law with the appropriate penalties.



The format used for this manual improves use of natural resources reducing the quantity of necessary paper to print this copy.



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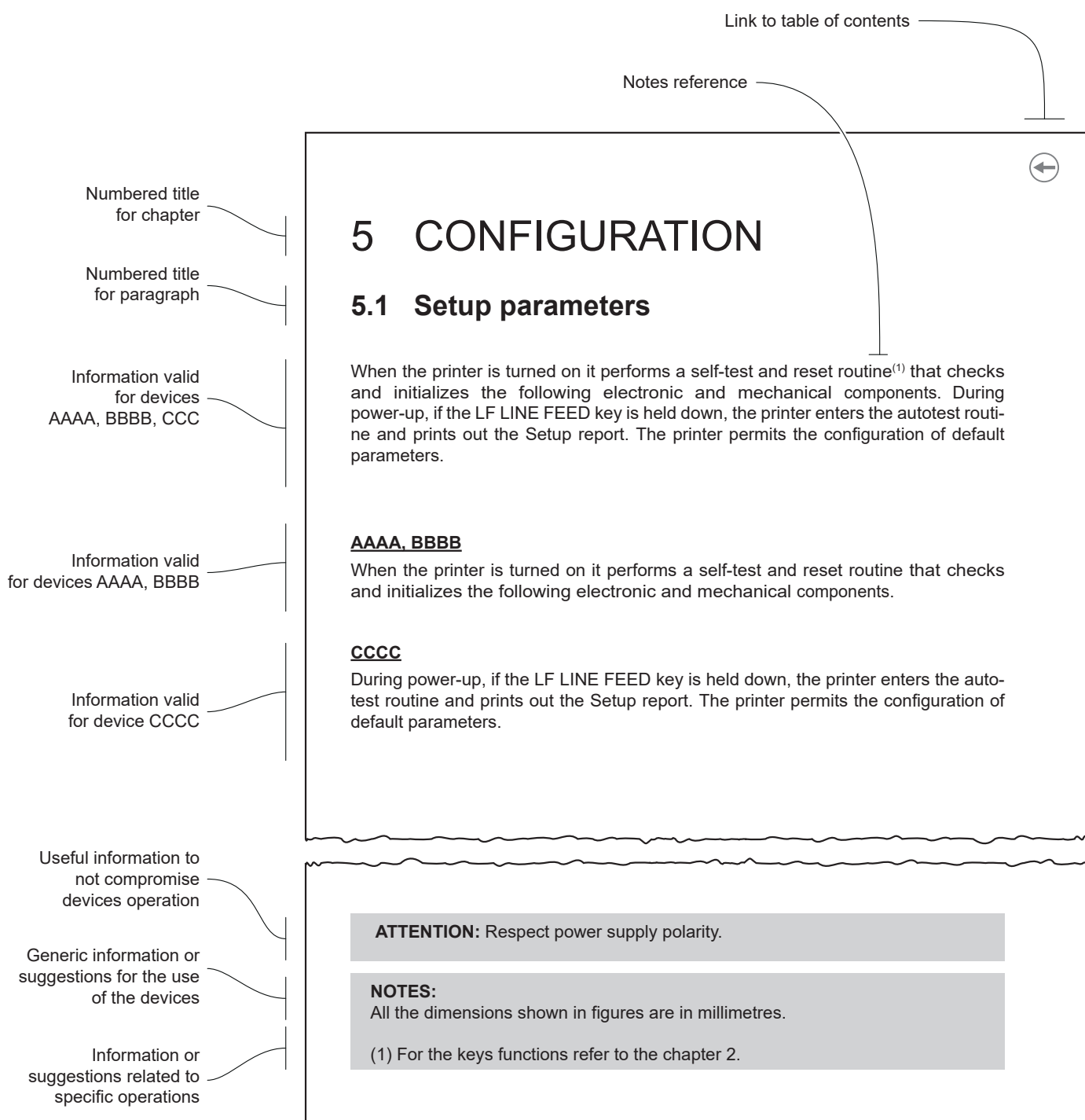
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1 INTRODUCTION

This document is divided into sections and chapters. Each chapter can be reached by the index at the beginning of this document. The index can be reached by the button on each page as shown in the diagram below.

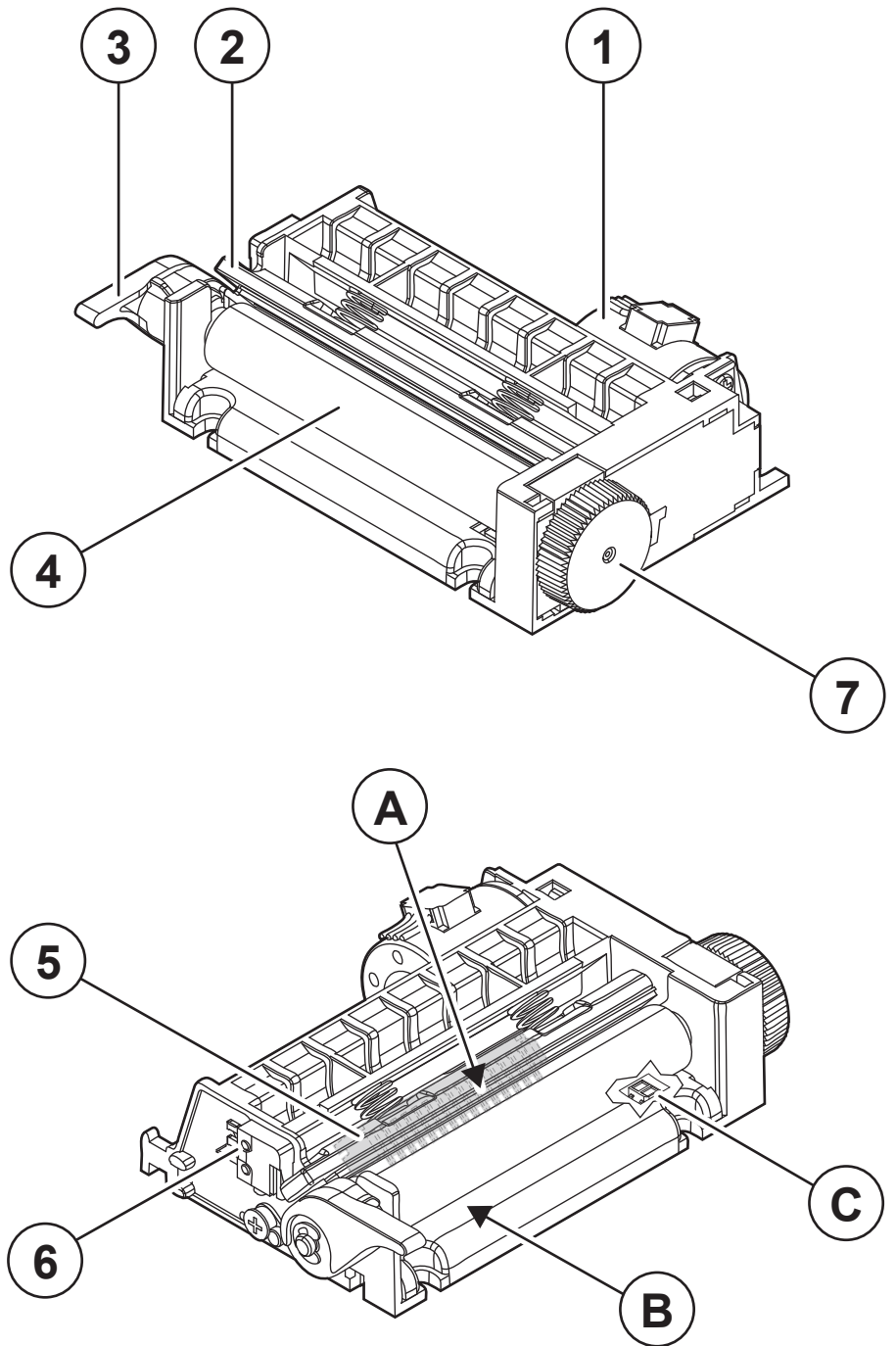




2 DESCRIPTION

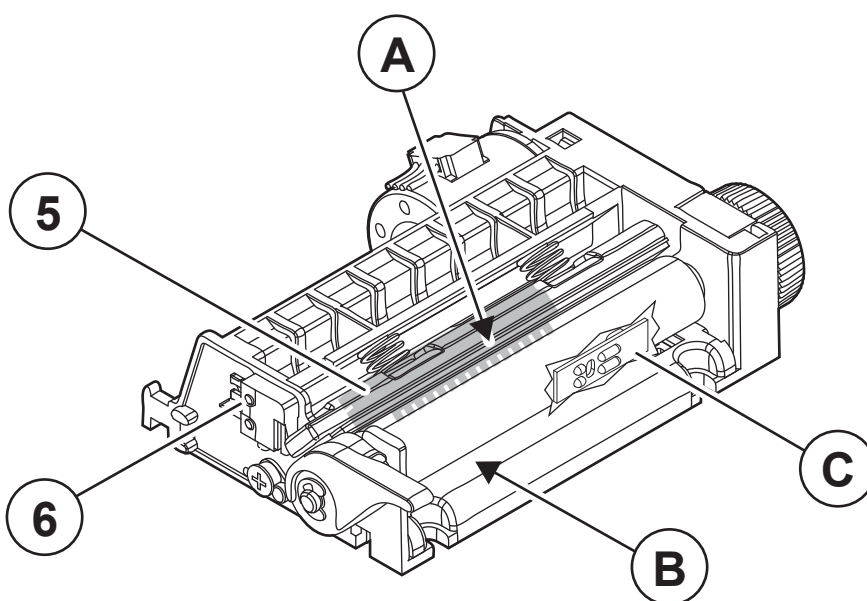
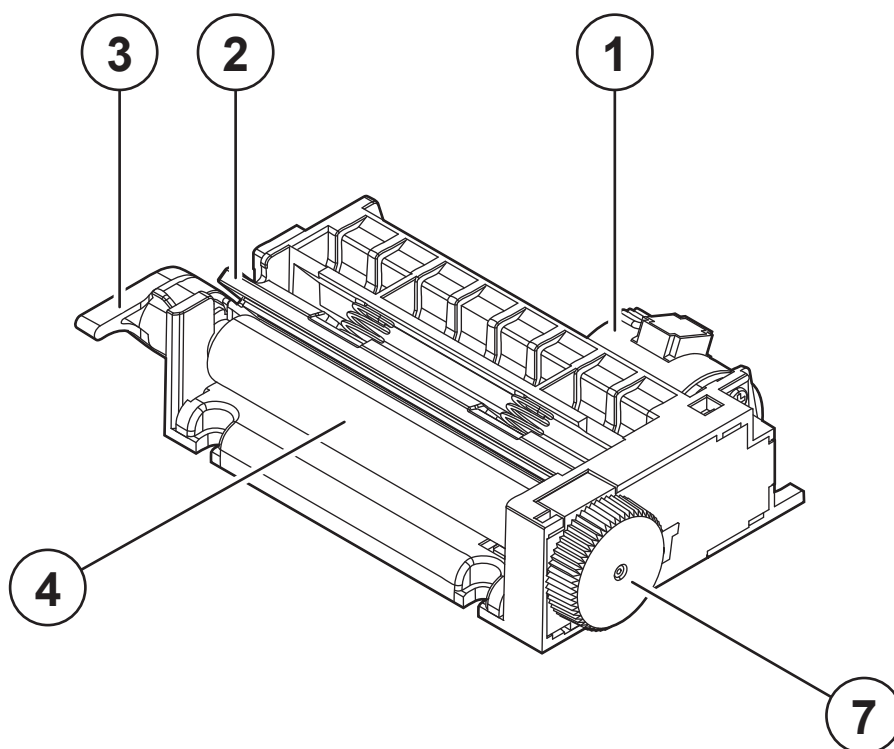
2.1 Front exterior view of MT2460 ("horizontal mounting")

- 1. Motor
- 2. Printhead
- 3. Head up lever
- 4. Platen roller
- 5. Thermal Head connector
- 6. Sensor Head up detection
- 7. Knob paper feed
- A- Paper outfeed
- B- Paper input
- C- Paper end sensor (for horizontal use)



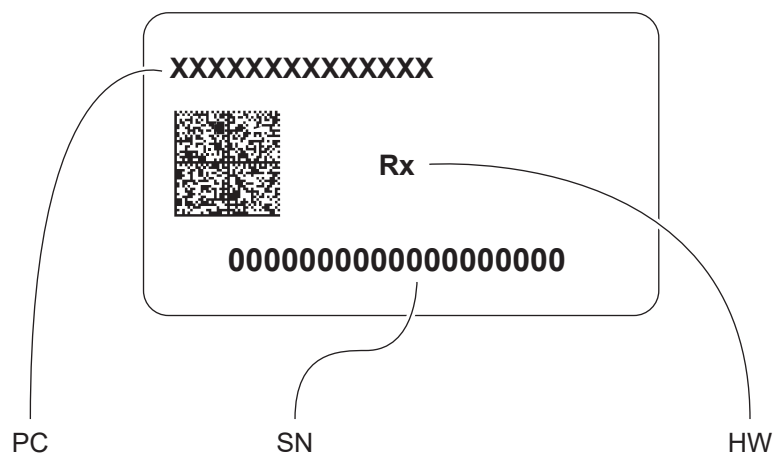
2.2 Front exterior view of MT2460 ("vertical mounting")

1. Motor
 2. Printhead
 3. Head up lever
 4. Platen roller
 5. Thermal Head connector
 6. Sensor Head up detection
 7. Knob paper feed
- A- Paper outfeed
B- Paper input
C- Paper end sensor (for vertical use)



2.3 Product label

The main data used to identify the machine are shown on the label attached to the bottom of the device. In particular, it shows the electrical data for the connection to a power source. It also shows the product code, the serial number and the hardware revision (R).

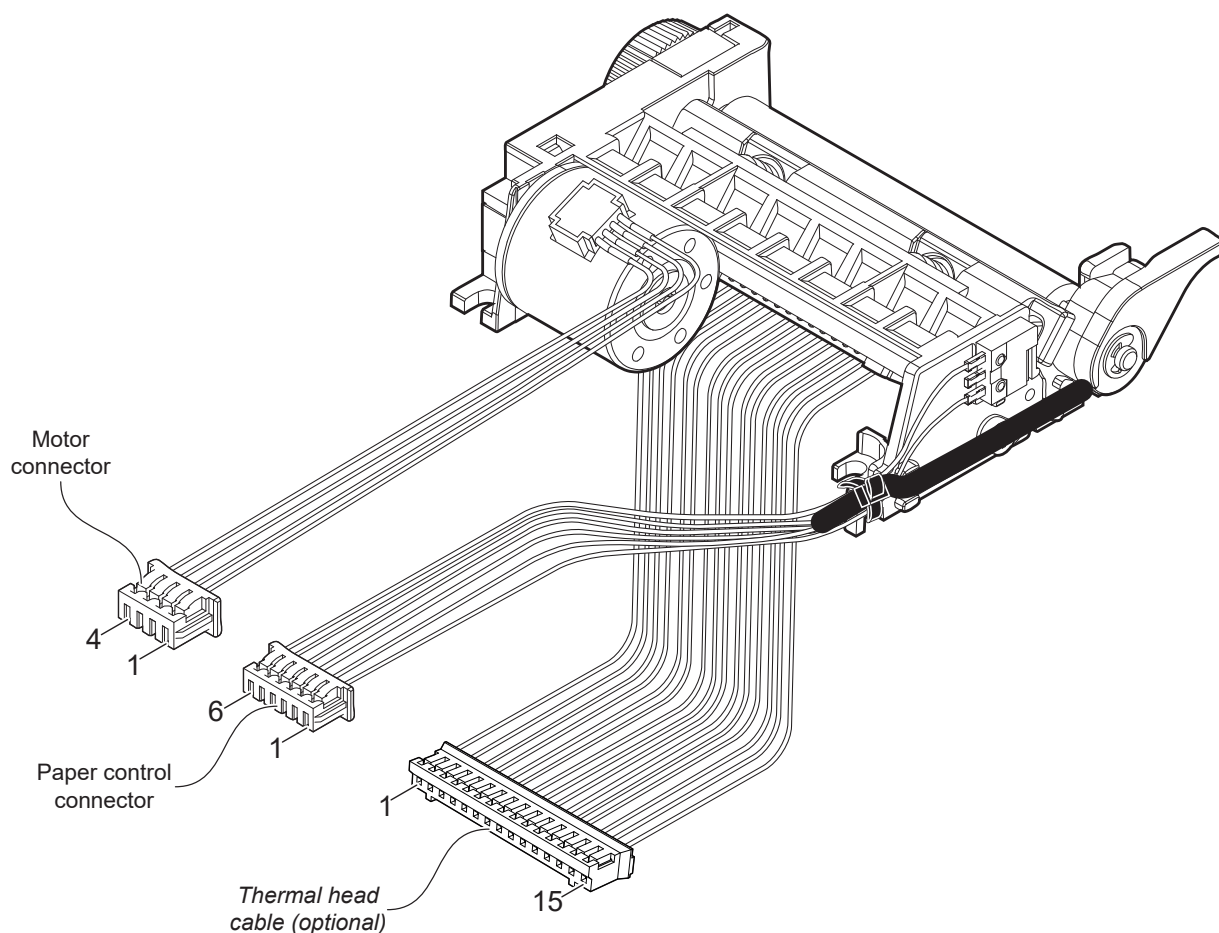




3 CONNECTIONS

3.1 Connections terminals

The mechanism has three interface connectors (see following figure), that includes the thermal head connector, motor connector and paper control connector.



In the following table are described the connectors specifications and functions:

NO.	CONNECTOR	PIN NO.	TYPE
1	Thermal head connector	15	JST connector (or equivalent) Male S15B-PH-K-S
2	Head-up sensor Paper end sensor	6	Molex connector (or equivalent) female housing 51021-0600 terminal 50058-8000
3	Motor connector	4	Molex connector female housing 51021-0400(white) terminal 50058-8000



3.2 Thermal head connector

Connector type: JST connector (or equivalent)
Male S15B-PH-K-S

The connector's pin assignments is as follows:

No.	SIGNAL	FUNCTION
1	Vset	Head power supply
2	Vset	Head power supply
3	Vset	Head power supply
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	VDD	Logic power supply
8	TM	Thermistor
9	$\overline{\text{STB1}}$	Strobe1 signal (<i>Active low</i>)
10	$\overline{\text{STB2}}$	Strobe2 signal (<i>Active low</i>)
11	$\overline{\text{STB3}}$	Strobe3 signal (<i>Active low</i>)
12	NC	Not connected
13	CLK	Serial clock
14	$\overline{\text{LATCH}}$	Latch (<i>Active low signal</i>)
15	DI	Data input

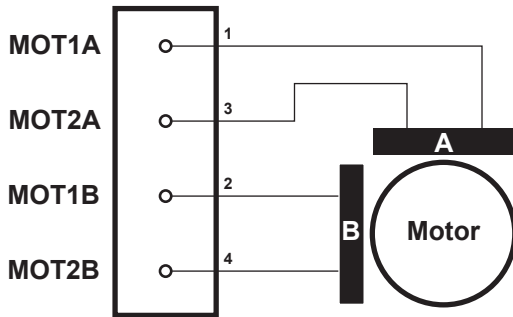
NOTE: The symbol " $\overline{\quad}$ " means a negative logical signal.

3.3 Motor connector

The connector's pin assignments is as follows:

No.	SIGNAL	FUNCTION
1	MOT1A	Phase A coil
2	MOT1B	Phase B coil
3	MOT2A	Phase A coil
4	MOT2B	Phase B coil

3.4 Electrical circuit block diagrams of motor



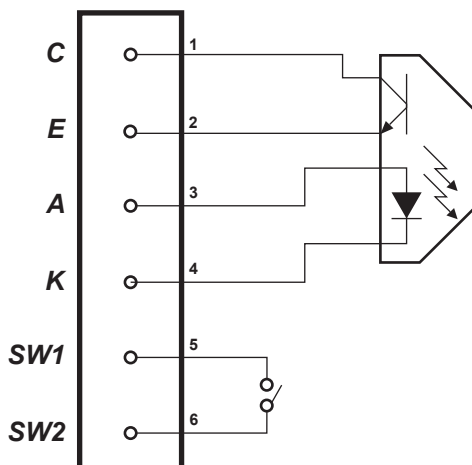
3.5 Paper-end/Head-up sensor connector

Connector type: Molex connector female housing 51021-0600
terminal 50058-8000

The connector's pin assignments is as follows:

No.	SIGNAL	FUNCTION
1	C	Collector photo transistor paper
2	E	Emitter photo transistor paper
3	A	LED Anode paper
4	K	LED Cathode paper
5	SW1	Switch signal 1 of head-up sensor output
6	SW2	Switch signal 2 of head-up sensor output

3.6 Electrical circuit block diagrams of Paper-end/Head-up sensor





4 PRINTHEAD

MT2460 has a thickfilm thermal printhead. Scanning Line Time (SLT) is the time to print one complete line using all strobes available. The relation between the printhead supply voltage and “On Time” (Ton) is as follows:

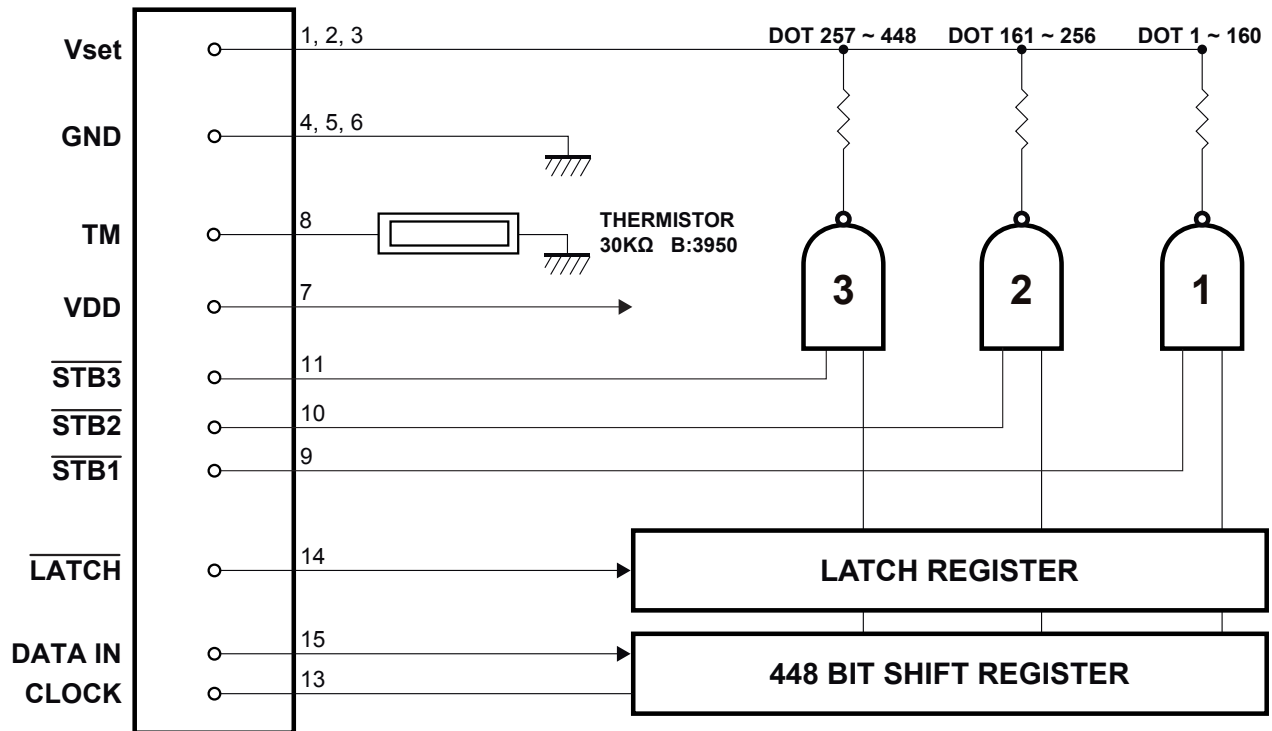
$$P_o = I_o^2 \times R_{ave} = \frac{V_{set}^2}{(N \times R_{com} R_{ave} + R_{ic})^2} \times R_{ave} \quad T_{on} = \frac{E_o}{P_o}$$

SYMBOL	PARAMETER	VALUE	UNIT
Rave	Average resistance	800	Ω
Rcom	Common terminal resistance	0.05	Ω
Ric	ON resistance value of Driver IC	33	Ω

4.1 Operation precautions

1. In order to avoid abnormal overheating of print head, please be sure the temperature at substrate does not surpass the maximum rating value (thermister detection temperature) in the spec during usage.
2. In order to avoid damage at heat element, Power on/off sequence must be in the following order.
 - Turn on : First turn the logic voltage(Vdd) on, and then turn the print head supply voltage(Vset) on.
 - Turn off : First turn the print head supply voltage(Vset) off, and then turn the logic voltage(Vdd) off.
3. In order to avoid turn on electricity to heat element by malfunction, please keep STROBE OFF when turning power ON/OFF.
4. In order to avoid electrostatic destruction to heat element or Driver IC, please do not touch substrate or terminal of connector, FFC, or FPC by empty hand.
5. In order to avoid destruction by noise or ion migraton, please reduce the print head supply voltage (including the charged voltage at capacitor) to the ground level and keep it until next usage.
6. In case of installing capacitor for noise reduction, it is recommended that capacitance is 0.1uF/16V between GND and VDD line.
7. In order to keep GND-Vset stability, please install electrolytic capacitor with high capacitance. But the capacitance is depended on current limitation of protection circuit, in case of lithium ion battery.
8. In order to keep electrical stability, please keep all GND pins connected to Mother board's GND signal while usage.
9. In order to keep the good quality of printing, please wipe residue of paper or ink by applicator dipped with ethanol or IPA. Please do not use sandpaper as it provokes destruction of heat element.
10. In order to avoid leakage or short circuit, please keep print head away from dew drop. In case there is dew drop, please do not turn on until the dew drop disappears.
11. In order to avoid such bad influence as ion migration on print head, please do not use paper with Na⁺ 500 ppm or more, K⁺ 150 ppm or more, or Cl⁻ 300 ppm or more.

4.2 Block diagram of the electrical circuit

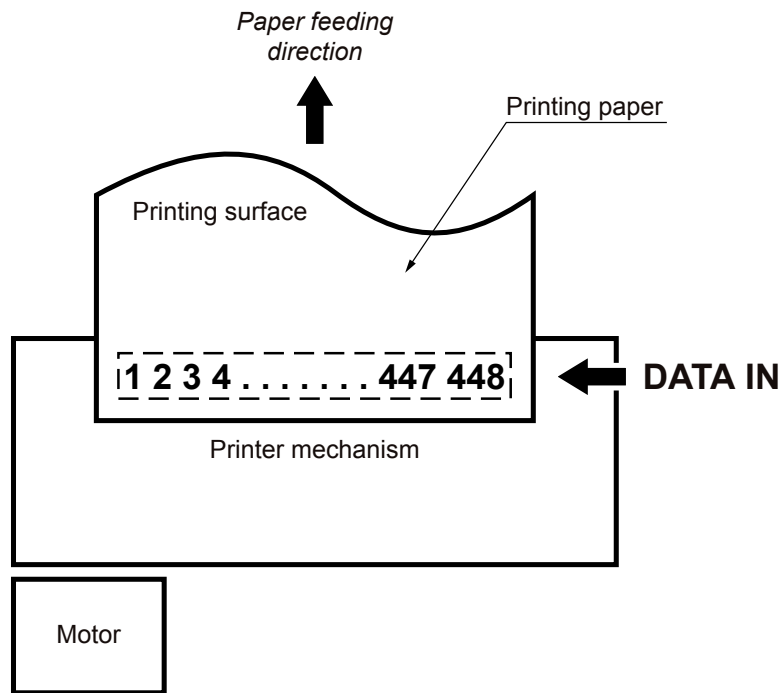


Each STB Line is pulled-down within the driver IC

STB No.	Dot No.	Number of Dots
1	1 ~ 160	160
2	161~ 256	96
3	257 ~ 448	192

4.3 Printing data and printing position

Print data of 448-bits length (1 to 448), transferred by DATA IN(DI), are printed in the arrangement as shown in the following figure :

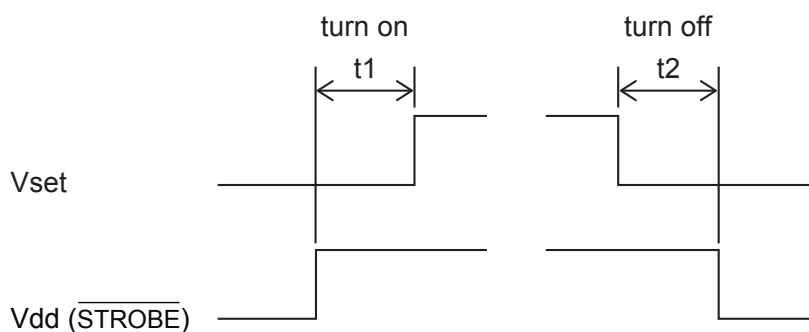


4.4 Electrical characteristics of circuit

VDD = 5.0 V ± 5%, T = 25°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITIONS
Average resistance value	Rave	776	800	824	Ω	Standard printing conditions
Ouput supply voltage	Vset	-	-	26.4	V	
Supply voltage	VDD	4.75	5.00	5.25	V	
Supply current	IDD	-	-	100	mA	ALL-HIGH
High level input voltage	V _{IH}	0.7 x VDD	-	VDD	V	
Low level input voltage	V _{IL}	0	-	0.3 x VDD	V	
High level input current	I _{IH}	-	-	2.5	μA	
Low level input current	I _{IL}	-	-	2.5	μA	DI, CLOCK, LATCH
		-	-	70.0	μA	STROBE
DO leakage current	I _{LEAK}	-	-	4.48	mA	ALL-LOW
Switching sequence (turn on)	t1	0	-	-	μs	See Fig. 4.4.1 ⁽¹⁾
Switching sequence (turn off)	t2	0	-	-	μs	
Clock frequency	t3	-	-	-	MHz	
Clock pulse width	t4	22.5	-	-	ns	
CLOCK-DI setup time	t5	10	-	-	ns	
CLOCK-DI hold time	t6	10	-	-	ns	
LATCH pulse width	t7	50	-	-	ns	See Fig. 4.4.2
CLOCK-LATCH setup time	t8	50	-	-	ns	
STROBE-DO delay time	t9	-	-	13.5	μs	
DO fall time	t10	-	3.0	7.0	μs	
DO rise time	t11	-	3.0	7.0	μs	

Fig. 4.4.1 Switching sequence of Vset and Vdd



NOTES:

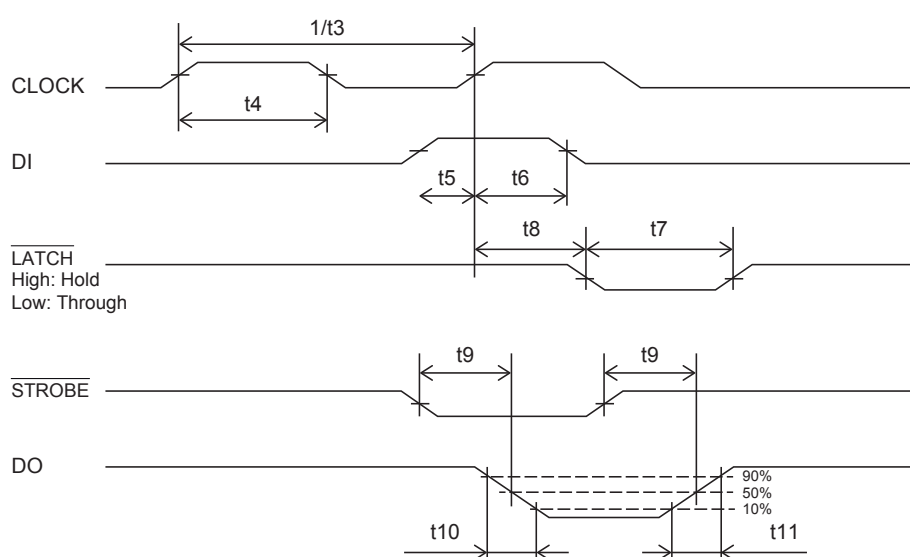
- (1) : The MIN. time should be adjusted greater than 0 μs
- (2): Vset has to turn on after Vdd becomes effective. (STROBE signal keep to non-active.)
- (3) Vdd has to keep effective on turning off Vset. (STROBE signal keep to non-active.)



VDD = 3.3 V ± 10%, T = 25°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITIONS
Average resistance value	Rave	776	800	824	Ω	Standard printing conditions
Ouput supply voltage	Vset	-	-	26.4	V	
Supply voltage	VDD	3.00	3.3	3.3	V	
Supply current	IDD	-	-	60	mA	ALL-HIGH
High level input voltage	V _{IH}	0.8 x VDD	-	VDD	V	
Low level input voltage	V _{IL}	0	-	0.2 x VDD	V	
High level input current	I _{IH}	-	-	2.5	μA	
Low level input current	I _{IL}	-	-	2.5	μA	DI, CLOCK, $\overline{\text{LATCH}}$
		-	-	32.0	μA	$\overline{\text{STROBE}}$
DO leakage current	I _{LEAK}	-	-	4.48	mA	ALL-LOW
Switching sequence (turn on)	t1	0	-	-	μs	See Fig. 4.4.1 ⁽⁴⁾
Switching sequence (turn off)	t2	0	-	-	μs	
Clock frequency	t3	-	-	-	MHz	
Clock pulse width	t4	28	-	-	ns	
CLOCK-DI setup time	t5	10	-	-	ns	
CLOCK-DI hold time	t6	10	-	-	ns	
LATCH pulse width	t7	50	-	-	ns	See Fig. 4.4.2
CLOCK-LATCH setup time	t8	50	-	-	ns	
STROBE-DO delay time	t9	-	-	21	μs	
DO fall time	t10	-	5.0	12.0	μs	
DO rise time	t11	-	5.0	12.0	μs	

Fig. 4.4.2 Timing chart



NOTE: (4) The MIN. time should be adjusted greater than 0 μs

4.5 Thermistor

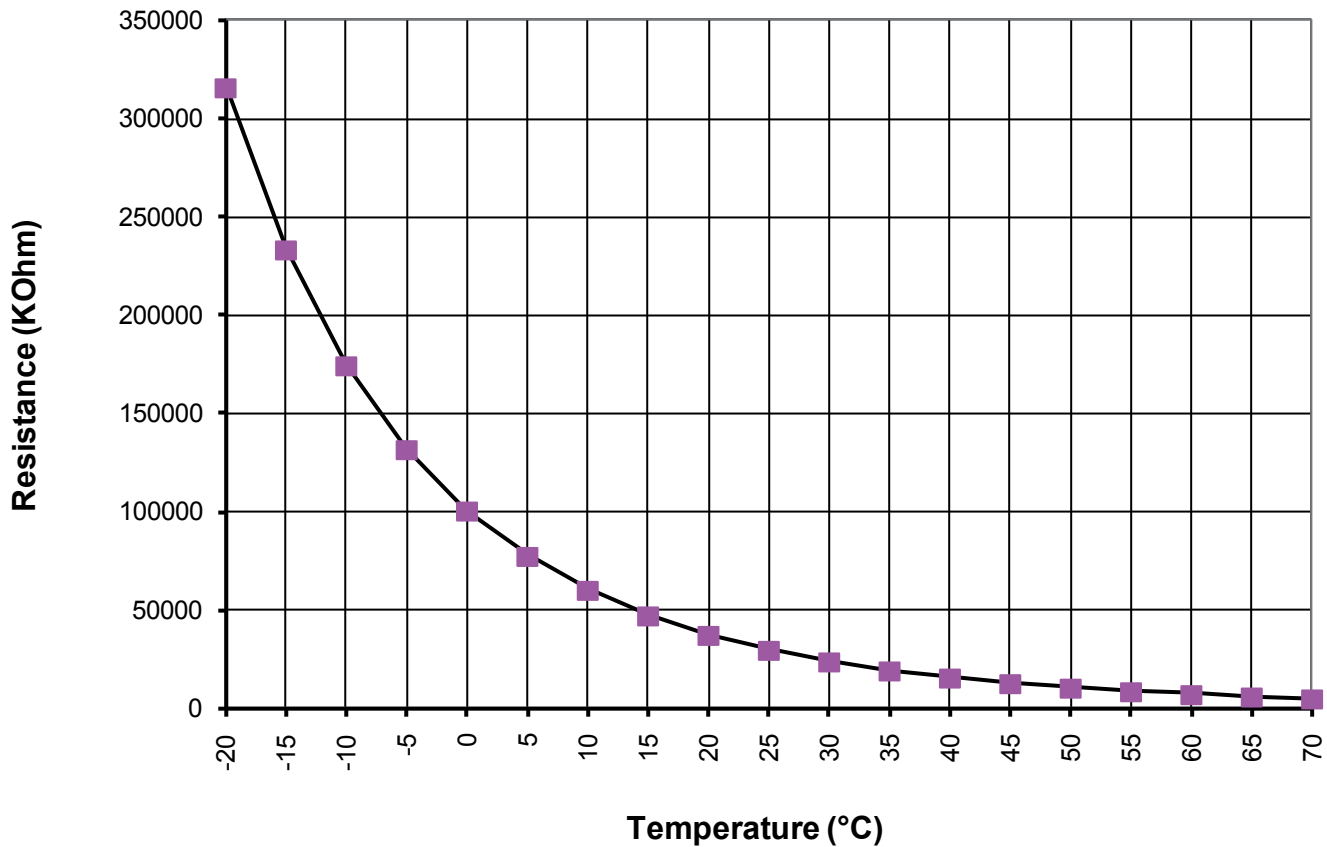
The thermistor is very important to adjust the strobe time (T_{strobe}) ~ (SLT) in function of the head temperature and to monitor the temperature to prevent the head damage if the temperature is over the limit described in the Maximum conditions table.

- Resistance R25: $30\text{k}\Omega \pm 5\%$ at 25°C
- B value: $3950\text{k} \pm 2\%$
- Operating temperature: $-20 \sim +70^\circ\text{C}$
- Time constant: 0.5 s (in the air)

Then the resistance value, R, versus temperature, T (in $^\circ\text{C}$) is given by the formula:

$$R(T_x) = R_{25} \times \text{EXP} [B \times (1/T_x - 1/T_{25})]$$

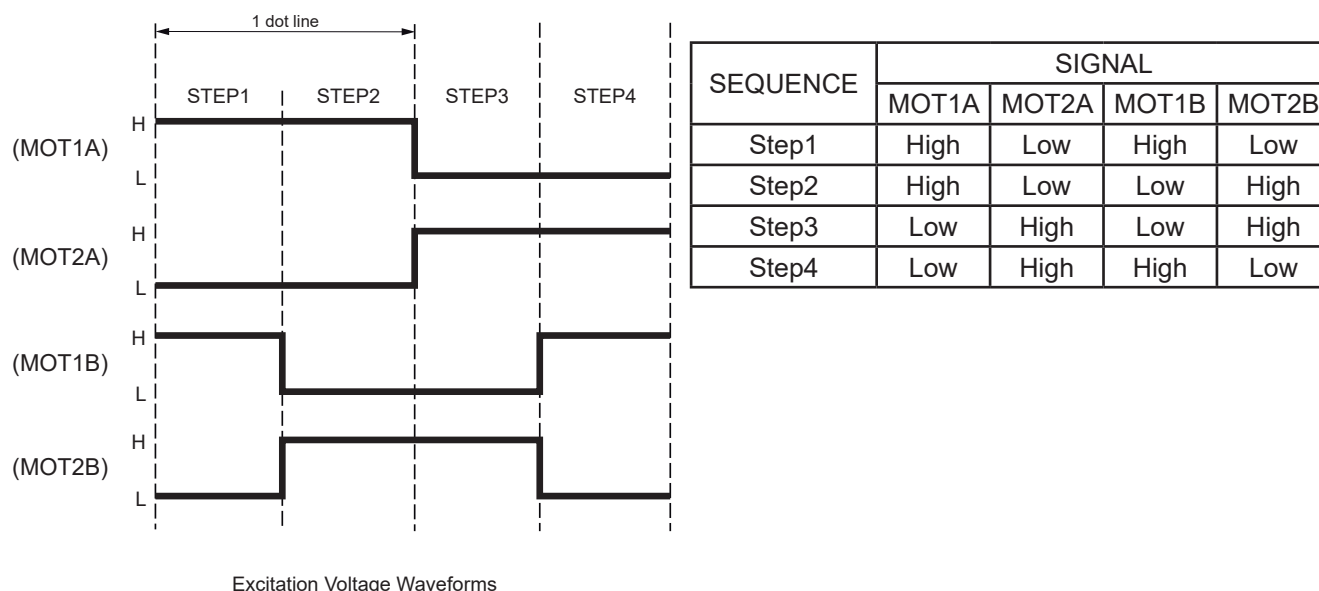
Fig. 4.5.2 Thermistor curve



5 STEPPER MOTOR

5.1 Excitation sequence Full-Step

The motor is driven in the forward direction if its excitation phases are switched as per the following steps:



The paper feed pitch for stepper motor is 2 steps for one dotline (1 dotline = 0.125 mm).

5.2 Precautions

1. An abnormal operation may extremely shorten the performance or service life.
2. Do not hold the motor by lead wire or PCB.
3. The motor is subject to change for improving the performance within the range satisfying its specification.
4. Please check the ratio print/pause to prevent the overtemperature on stepper motor.
5. If the motor is driven by more than 24 volts we suggest to use a chopper driving, in order to reduce current, please contact CUSTOM S.p.A. for further information.





6 SENSOR

Maximum ratings (Ta = 25 °C)

	PARAMETER	SYMBOL	RATING	UNIT
Input	Power dissipation	P_D	75	mW
	Reverse voltage	V_R	5	V
	Forward current	I_F	50	mA
	Pulse forward current ⁽¹⁾	I_{FP}	1	A
Output	Collector power dissipation	P_C	50	mW
	Collector current	I_C	20	mA
	Collector-emitter voltage	V_{CEO}	30	V
	Emitter-collector voltage	V_{ECO}	3	V
Operating temperature range		T_{OPR}	-25 ~ 85	°C
Storage temperature range		T_{STG}	-30 ~ 100	°C

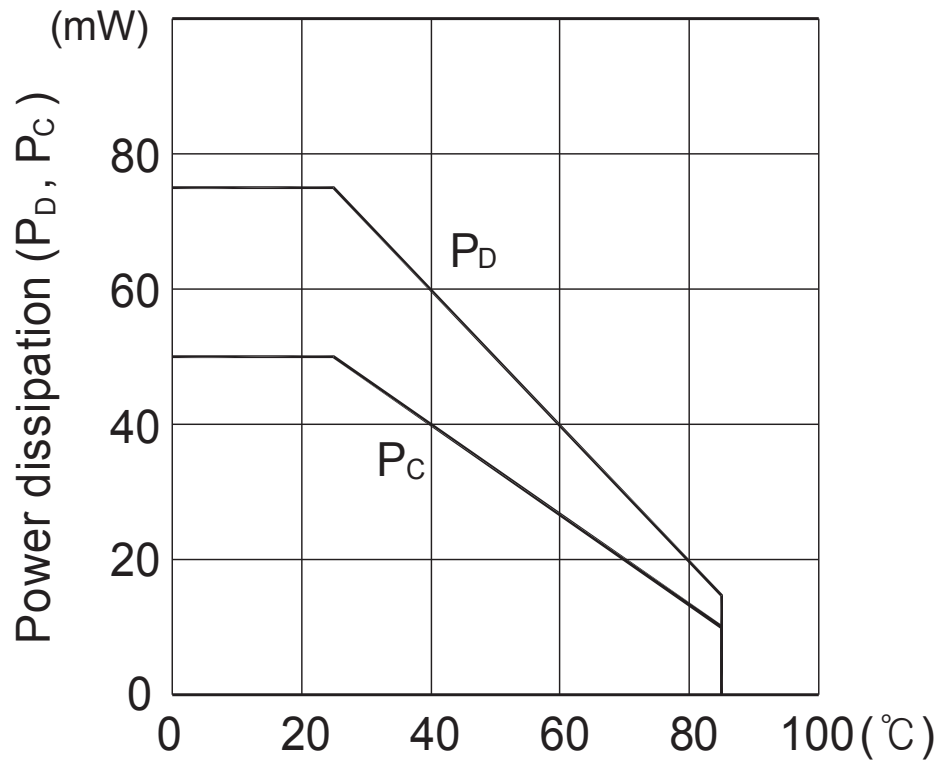
NOTE: (1) Pulse width ≤ 100 μs, period T = 10 ms

Opto-electrical characteristics (Ta = 25 °C)

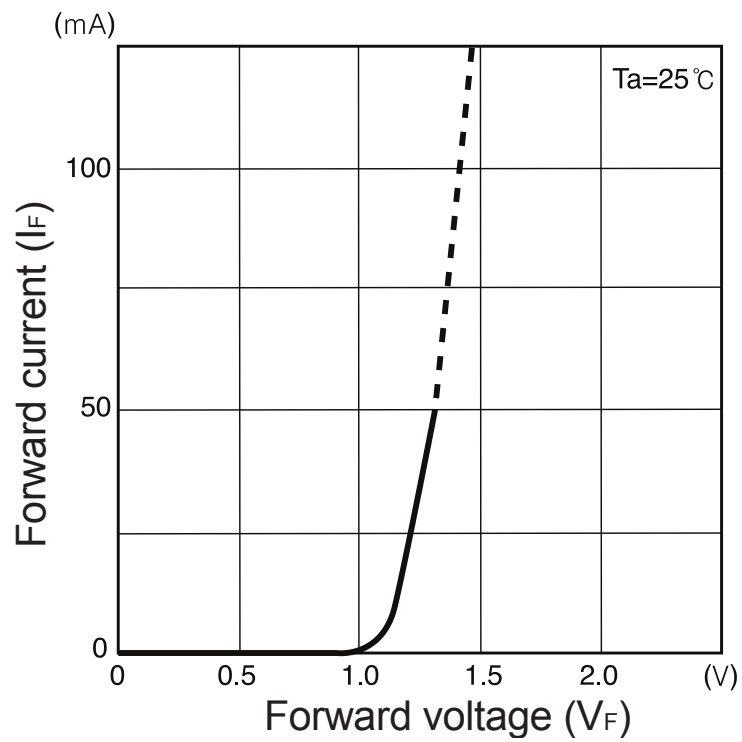
	PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX	UNIT
Input	Forward voltage	V_F	$I_F = 10\text{mA}$	-	-	1.3	V
	Reverse current	I_R	$V_R = 5\text{V}$	-	-	10	μA
	Peak emission wavelength	λ_P	$I_F = 20\text{mA}$	-	940	-	nm
Output	Collector dark current	I_{CEO}	$V_{CE} = 10\text{V}$	-	-	0.2	μA
	Peak sensibility wavelength	λ_P		-	900	-	nm
Transmission	Collector current	I_C	$V_{CE} = 5\text{V}, I_F = 10\text{mA}, d = 1\text{ mm}$	250	-	440	μA
	Leakage current	I_{CEOD}	$V_{CE} = 5\text{V}, I_F = 10\text{mA}$	-	-	0.2	μA
Response time	Rise time	t_r	$V_{CC} = 2\text{V}, I_C = 0.1\text{mA}$	-	30	-	μs
	Fall time	t_f	$R_L = 1\text{k}\Omega$	-	25	-	μs

6.1 Graphics of typical characteristics

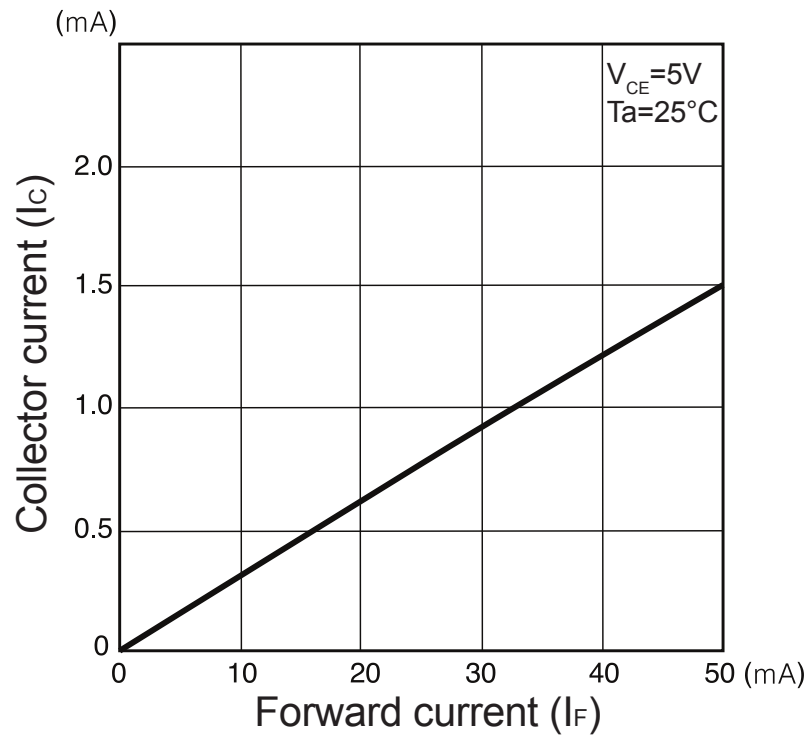
Input. Output power dissipation vs. Ambient Temperature



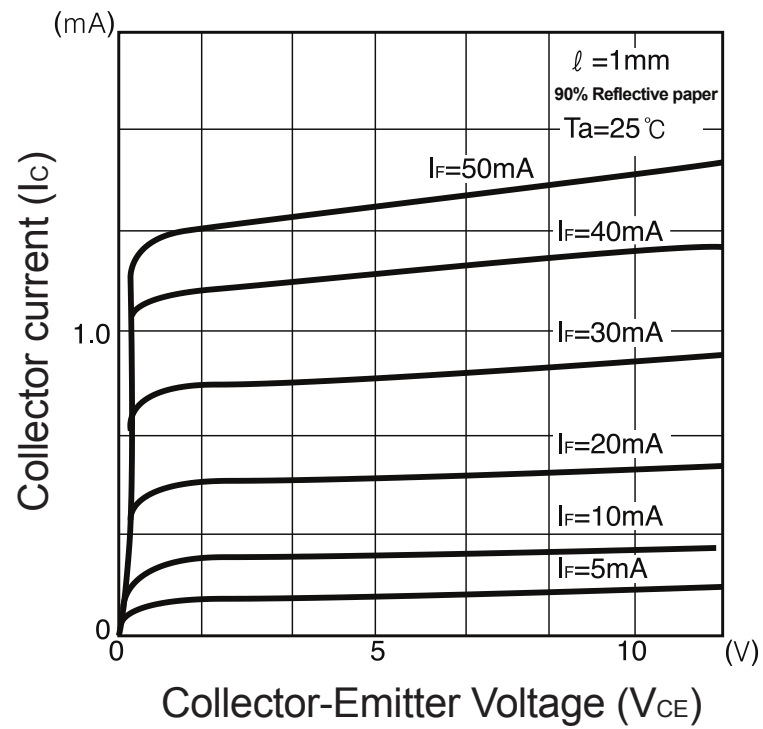
Forward Current vs. Forward Voltage



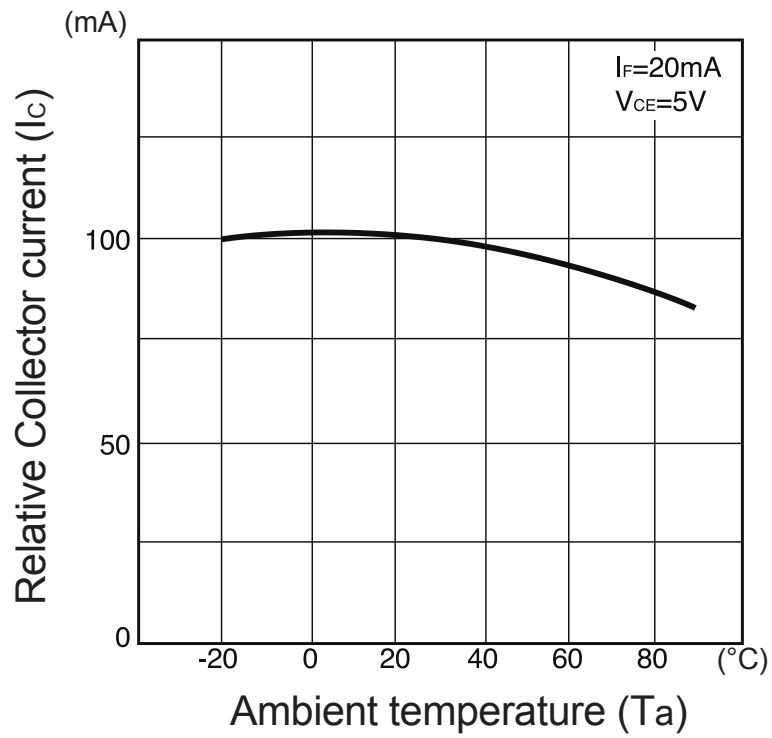
Collector Current vs. Forward Current



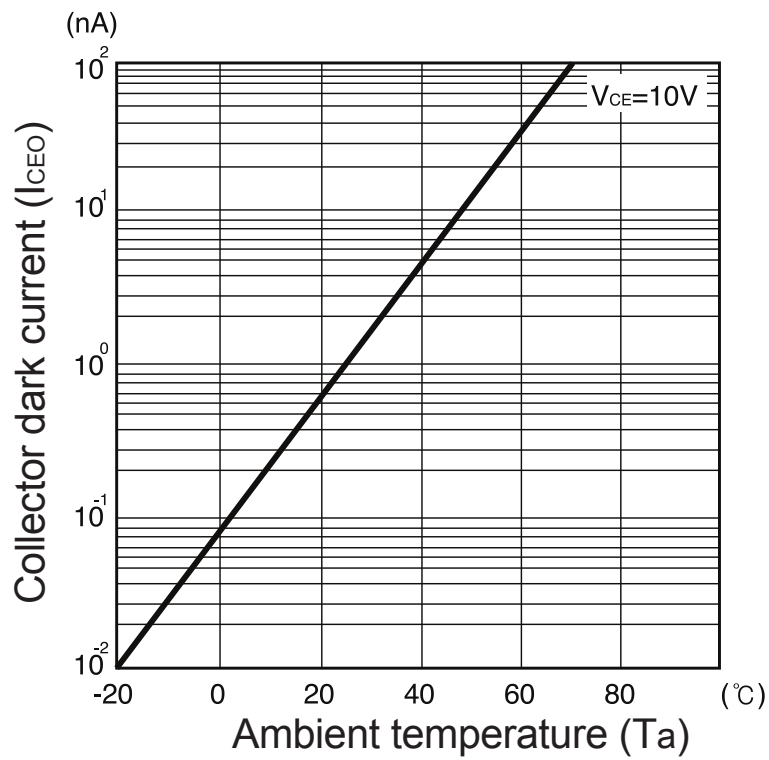
Collector Current vs. Collector-Emitter Voltage



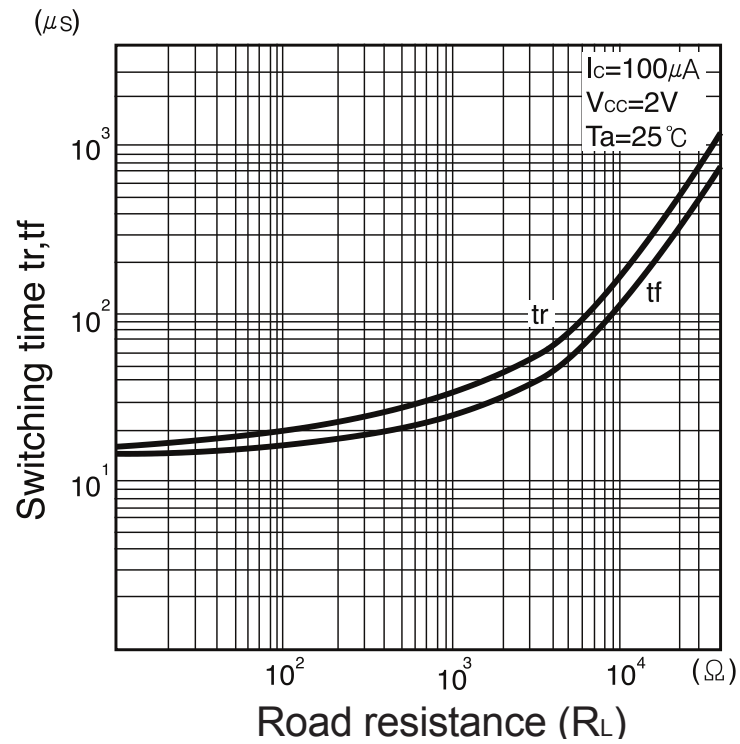
Relative collector current vs Ambient temperature



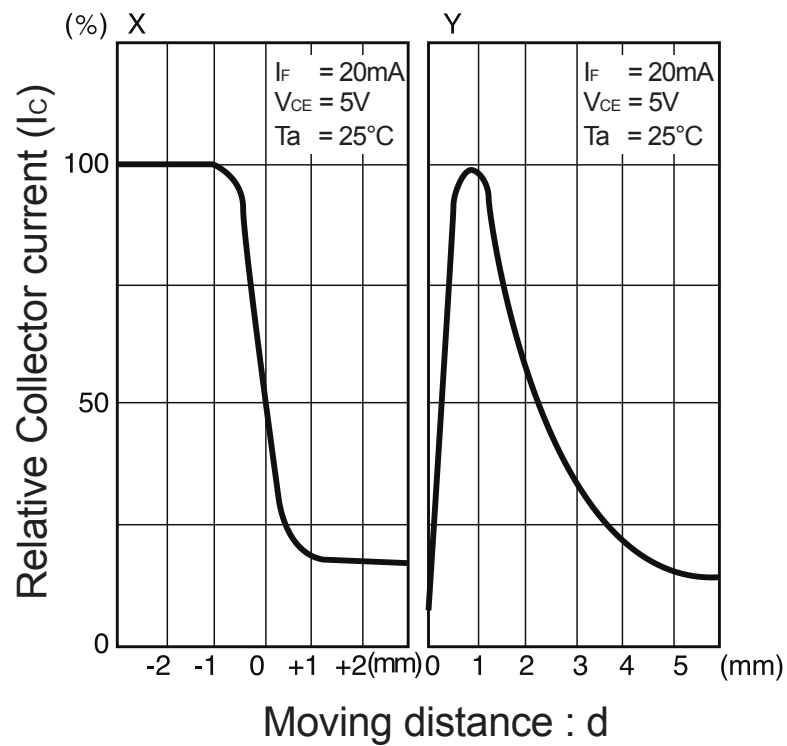
Dark current vs Ambient temperature



Switching time vs Load resistance



Relative collector current vs Moving distance







7 SPECIFICATIONS

7.1 Hardware specifications

PRINTHEAD	
Sensors	Paper presence sensor, head up detection, temperature thermistor 30 k Ω
Resolution	203 dpi (8 dot/mm)
Printing speed	150 mm/s ⁽¹⁾
Logic voltage	3.3 V, 5 V
Printing method	Thermal line dot method
Effective printing width	56 mm
Head configuration	448 dots/line
Dot pitch	0.125 mm
Head temperature sensor	Thermistor
Maximum number of dots activated at same time	192
Dot resistance (Rave)	800 Ω
Number of strobes	3
Heater Energy	
5°C	0.18 mJ/dot (0.24 ms)
25°C	0.15 mJ/dot (0.20 ms)
45°C	0.14 mJ/dot (0.19 ms)
Driver saturated Resistance (Ric)	33 Ω
Operation voltage range logic	3.3 V, 5V
Operation voltage dotline head	24 V $\pm$ 5%
Head voltage	V _H = 25.2 V (between connectors)



Supply voltage	$V_{DD} = 5.5 \text{ V}$
Current consumption	32.5 mA/dots ($\bar{R} = 700 \text{ } \Omega$)
Head life	
Abrasion resistance ⁽²⁾	50 km (with recommended paper, 12.5% duty cycle)
Pulse durability	1×10^8 pulses (referred to each dot)
Substrate maximum temperature	65 °C
Autoloading capability	
Compact layout	
High torque paper-pulling motor	
Silicon rubber paper feeding roll	

PAPER

Paper width	60 mm
Paper feed method	Friction feed, 1 dot line/1 pulses, bipolar 2-2 phase excitation
Paper detection	Reflective type photosensor
Recommended paper weight	from 55 g/m ² to 80 g/m ²
Recommended paper	KANZAN KF50 or KP460, MITSUBISHI PF5067 or TL3000

STEPPER MOTOR

Drive voltage	24 Vdc
No. of phases	2
Drive mode	Bipolar drive
Step angle	18° (Full-Step)
Rated current	350 mA / Phase
Resistance	$7 \text{ } \Omega \pm 7\%$ at 25°C (each phase)
Inductance	5.2/6.7 mH $\pm 15\%$ at 25 °C (1 kHz. 1 V rms)



Holding torque	0.009 Nm min. (two-phase On)
Pull-out torque	0.004 Nm min. (2000 pps Full-Step)
Insulation resistance	100 MΩ min. (500Vdc)
Insulation class	Class E
Dielectric strength	3 mA (at 600 Vac 1.0 s)
Temperature rise	45 °C max. (800 pps Full-Step)
Life	3000 hours min.

ENVIRONMENTAL CONDITIONS

Operating temperature	from -20 °C to 70 °C
Relative humidity (RH)	from 10% to 90% (w/o condensation)
Storage temperature	from -40 °C to +80 °C

NOTES:

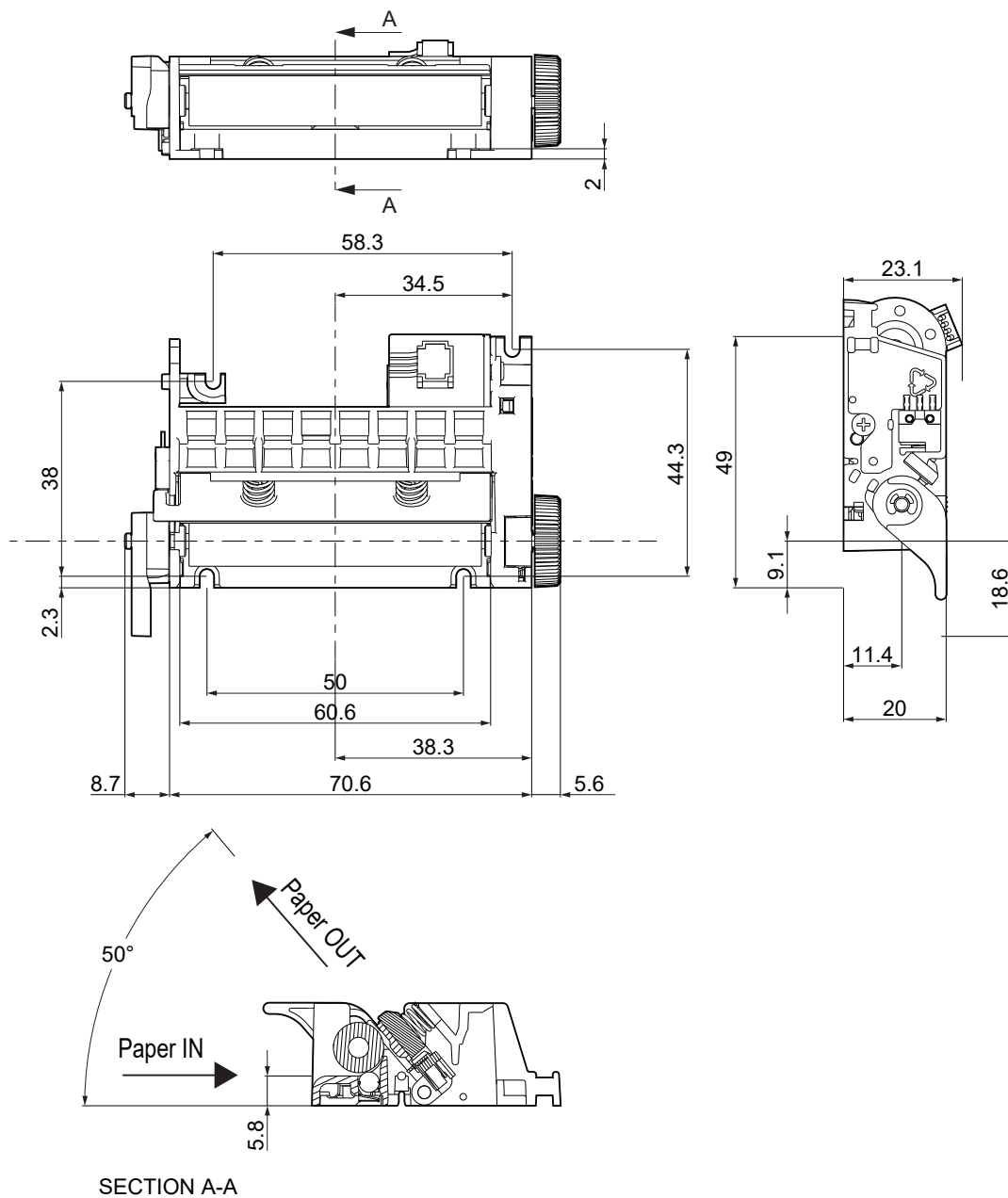
(1) : Depending on the installed control board.

(2) : Damages caused by scratches, ESD and electromigration are excluded.

7.2 Device dimensions ("horizontal mounting")

Length	58.9 mm
Height	20 mm
Width	84.9 mm
Weight	110 g

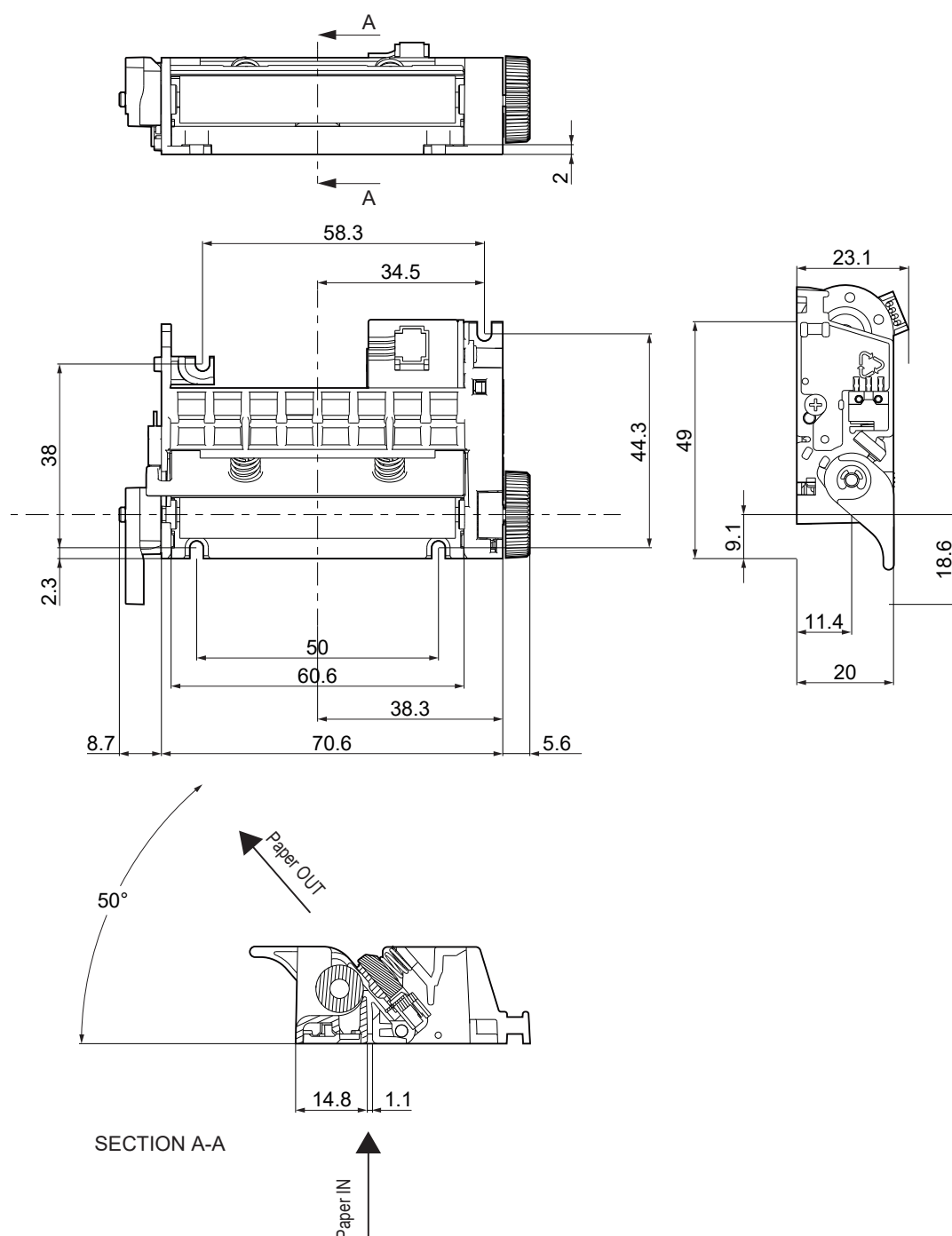
NOTE: All the dimensions shown in following figures are in millimetres.



7.3 Device dimensions ("vertical mounting")

Length	20 mm
Height	58.9 mm
Width	84.9 mm
Weight	110 g

NOTE: All the dimensions shown in following figures are in millimetres.





8 CONSUMABLES

The following table shows the list of available consumables for devices:

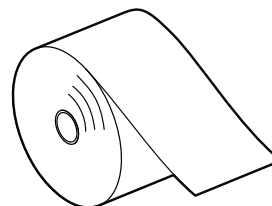
67300000000359

THERMAL PAPER ROLL

width = 60mm

Ø external = 55mm

Ø core = 15mm



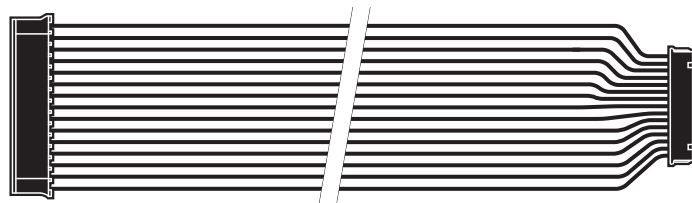


9 ACCESSORIES

The following table shows the list of available accessories for device:

26400000000315

THERMAL HEAD CABLE
for MT2460 160mm long







10 TECHNICAL SERVICE

In case of failure, contact the technical service accessing the website www.custom4u.it and using the support tools on the homepage. It is advisable to keep the identification data of the product at hand.

The product code, the serial number and the hardware release number can be found on the product label (see [paragraph 2.3](#)).





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