



Barcode Label Printer Guide

A Guide to Choosing the
Right Printer for You



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There are many manufacturers and models of Thermal Label Printer on the market, each with different design aspects and features. No one printer is suitable for every application and it is important to ensure that for whatever Label Application you have, that you choose the correct Thermal Transfer Ribbon to match. If you found this guide useful, or have any comments, please let us know at sales@datamarkuk.com

1. Direct Thermal or Thermal Transfer?

There are two types of barcode label printer, direct thermal and thermal transfer,

Direct Thermal - Uses heat sensitive paper labels to produce black text, barcodes & images, the print lasts 6 - 12 months before fading unless exposed to direct sunlight. Standard (uncoated) labels will mark when scuffed.

Thermal Transfer - Uses standard paper or synthetic labels with an ink ribbon to produce a permanent print.

Direct thermal labels are more convenient, since you do not have to load an ink ribbon, but in general, are not as durable as thermal transfer labels. AM Labels can however provide more durable forms, e.g. coated paper labels and direct thermal synthetic labels (see label selection guide).

The quality and durability of thermal transfer print will depend on the label material and grade of ribbon used (see Section 10).

Some lower cost desktop printers are direct thermal only, but thermal transfer desktop printers and most medium volume and industrial printers will work in both modes.

2. Which Printer Class?

Thermal label printers can be split into the following groups, depending on specification and label throughput,

1. Portable/Handheld printers (used at point of label application in Shop Floor/Warehouse applications)



2. Desktop label printers (small footprint) - 500 to 1,000 labels per day



3. Medium volume label printers (mainly plastic construction, but full size Label roll and ribbon - 1,000 plus labels per day

3. Industrial label printers (mainly metal construction) - up to 100,000 labels per day.



4. Performance label printers – (mainly metal construction and the highest print speeds) - up to 100,000 labels per day

3. What Maximum Print Width Do You Require?

Most printers have a 4" (101 mm) print width, but some industrial and high performance printers are now more commonly available with 5" (125mm), 6" (150mm) or 8" print widths.

4. What Print Resolution Do You Need?

The print resolution is specified in dots per inch (or dots per mm). Printers with a higher print resolution will have a reduced maximum print speed.

203 dpi. (8 dpm) - This is the most common resolution and is suitable for most barcodes and larger font sizes. EAN 13 barcodes can be printed to 76% or 114% of the standard width.

300 dpi (12 dpm) - Most printers are available with this print resolution option. This produces smooth fonts and good quality graphics. EAN 13 barcodes can be printed to 85 or 107% of the standard width.

600 dpi (24 dpm) - Only a few industrial and high performance printers are available with this resolution. To achieve this print resolution in practice, you will need good quality media (please ask our sales team for advice).

Datamax H-Class printers are now available with a 406 dpi option, although this resolution is more unusual.

5. Is Print Speed Important?

Print speed will usually depend on the class of printer. On most printers, the print quality will deteriorate as the print speed is increased, unless higher quality media is used. Most printers are run at 50-75% of their maximum speed. The following is a guide to maximum speeds for printers with a print resolution of 203 dpi,

1. Desktop printers - up to 4" per sec *
2. Medium volume label printers - up to 6" per sec
3. Industrial label printers - up to 10" per second
4. Performance label printers - up to 12" per sec

* The Tally Genicom 7006 and 7008 printers are an exception. This is a small footprint, desktop printer with a maximum speed of 8" (204mm) per sec.

6. Printing labels with different widths?

If the media is in the centre of the print head (e.g. most desktop printers and TEC industrial printers, the head is effectively self-levelling and will automatically cope with different labels widths.

If the media is biased to one side (Datamax desktops and most medium volume and industrial printers, the head pressure will require adjusting to cope with different media widths. Zebra has one of the simplest solutions on their S4M and ZM400 printers, with left and right hand toggles which can be set to positions 1-4. Recommendations are given for the settings for 1", 2", 3" and 4" media.

7. Flat Head or Near Edge technology?

Flat Head Technology – all desktop printers, medium volume printers and most industrial printers use flat head technology. The heating elements are set back from the leading edge of the print head. Some printers struggle with print quality at the higher speeds, unless more expensive media is used. Flat head printers are however very reliable and usually need less on-going maintenance.

Near Edge Technology – some industrial printers use this technology, e.g. TEC SX4 and SX5. The heating elements are close to the leading edge of the print head and the label and ribbon separate more quickly after printing. This aids the ability of the print head to rapidly heat and cool and can provide improved print quality at higher print speeds.

8. Size of Label Roll?

The size of label rolls and hence the number of labels that can be accommodated by a printer will depend on its class.

Portable/Handheld printers will generally use rolls either without a core or on a 19mm core.

Desktop printers can generally accommodate a label roll with a 5" (127mm) outside diameter, wound on a 1" (25mm) or a 38mm core (730 labels with label height of 100mm with a 38mm core). There are some desktop printers that can accommodate a larger label roll, such as the Tally Genicom 7000 Series (with the lid open and using a second label roll position) and the TEC SV4 and Citizen desktop printers with an external label roll holder.

Medium volume and industrial printers generally accommodate a label roll with an 8" (204mm) outside diameter, on a 76mm core (1800 labels with label height of 100mm).

9. Ribbon Length?

In general, the length of ribbon required to print a roll of labels will equal the length of the roll of labels. The following is an example for a Zebra ZM400 printer.

One roll of 100mm high labels, with 1750 labels per roll and a 3mm gap between labels will require $(100+3) \times 1750 / 1000 = 180.25M$ of ribbon. The ribbon length is 450M, so one ribbon will print $450 / 180.25 = 2.5$ rolls of labels. The exception to this rule is if the printer has a ribbon save facility, e.g. TEC SX5 (see Section 14).

Desktop printers usually have shorter ribbons (74M on Zebra desktop printers, 140M on Tally Genicom 7006 and 7008 printers and 360M on the Citizen CPL 621 printer)

Medium volume and industrial printer have longer ribbons (450M on Zebra printers and 600M on the TEC SX4 & SX5 Printers).

10. Ribbon Type?

Thermal transfer ribbons come in four main formulations,

1. Wax - suitable for matt and semi-gloss paper labels. Limited smudge resistance.
2. Resin enhanced wax - suitable for matt and semi-gloss paper labels. Improved smudge resistance over wax ribbons and improved print quality on good quality label material.
3. Wax / resin - suitable for thermal transfer matt and semi-gloss paper labels and some synthetic materials. Smudge resistant, with improved print quality on good quality label material.
4. Resin - This is the highest grade of ribbon, providing water and scratch resistant print and resistance to some chemicals. Generally resin ribbons are used on synthetic materials with a thermal transfer coating.

The grade of ribbon should be matched to the quality of label material. If a high grade ribbon is used on low grade label material, you will require a higher print temperature setting (reducing the print head life) and the print quality is likely to be poor. Conversely if you use a wax ribbon on a synthetic material, to print will rub off very easily.

Printer ribbons are further categorised by either being suitable for flat head printers or near edge printers (see Section 7). Flat head printer ribbons are either outside wound (ink on the outside of the roll) for e.g. Zebra printers or inside wound for e.g. Datamax printers. Some printers can be set to accept either inside or outside wound ribbons (Citizen CPL 621)

11. Media Sensors?

Unless you are using the printer in continuous mode, you will need to calibrate the printer to the labels you are using. The printer will do this by either detecting a gap between the labels or a black mark on the backing paper. Black marks are used where it is not possible for the printer to detect a gap (e.g. card tag labels or transparent labels). Card tag labels can be made with a notch or small slot cut into them so that a gap detector can be used. The tooling for these labels is however considerably more expensive.

Most printers will have both gap and black mark (reflective) media sensors.

A moveable sensor may be necessary if you are printing labels more than one across (make sure that the gap detector does not coincide with a vertical gap) and may be necessary if you are printing circular labels (make sure that the gap detector is lined up with the top of the circle).

Moveable label sensors are found on all medium volume and industrial printers and some desktop printers, including TEC, Citizen and Tally Genicom and as an option on Datamax desktop printers.

12. Calibrating Label Length

When changing label size or when installing a printer from new, the printer must go through a calibration routine, to measure the length of the label. Printer manufactures have different ways of doing this,

Fully Automatic - Datamax & TEC printers have the ability to automatically establish the label length after printing one or two labels for the very first time.

Semi-Automatic - Zebra medium volume and industrial printers have front panel settings to either calibrate the label length (issues 4-5 labels) or carry out a full media calibration (issues more labels) on power up and / or head closure. This can be slightly wasteful when loading a new label roll of the same size.

Manual Calibration - Zebra LP and TLP printers require manual calibration (by holding down the feed button while powering up and waiting for the light to flash red twice).

Manual and semi-automatic calibration is much less of a problem if you only have one size of label (the semi-automatic calibration can be turned off once calibration has been completed).

A full media calibration may be necessary when changing media type (e.g. changing from paper labels with a wax ribbon to synthetic labels with a resin ribbon).

13. Printing Very Small Labels

Most printers are specified as printing labels from 1" (25mm) wide. Although most printers will print label widths below 1", the printer will be outside its specification. Exceptions are the 2" versions of the Tally Genicom 7006 and 7008 printers which are specified down to 1/2" (12.7mm).

One of the best printers for very small height labels is the Zebra 110 Xi III. This is specified to print 6mm high labels (lower subject to testing) in rewind mode (if the printer is back feeding to work in tear off mode, very small labels cannot be printed). The printer is specified to print down to 20mm wide labels, but can go lower if the pressure is reduced on the right hand toggle.

14. Ribbon-Save

This feature is very useful if you have long labels and are only printing on a small part of the labels (e.g. when over-printing best before dates). The ribbon save feature will lift the print head and stop the ribbon on the parts on the label where print is not required. The "no print" area needs to extend for more than 20mm for the ribbon save facility to activate.

Ribbon save is not usually available on flat head printers, but is an option on the TEC SX4 and standard on the TEC SX5 near edge printers.

15. Printing in Restricted Spaces

Printing in restricted spaces can be achieved by using smaller desktop printers. The Zebra TLP 2824 2" printer has a 99x190mm foot print and the TLP 2844 4" printer has a 198x238mm foot print. Most desktop printers are top loading, which is also useful in restricted spaces.

Most medium volume and industrial printers are side loading, requiring more space. Exceptions are the Citizen CL-S700 and the TEC SA4 medium volume printers.

The Tally Genicom 7006 and 7008 printers are classed as desktop printers, but with an 8" per second print speed and all metal print mechanism, provide industrial printer performance in a small foot print (127x255mm for the 2" printers and 175x255 for the 4" printers).

16. Interface Options

Most thermal printers have parallel, USB and serial interfaces as standard. Some of the new Zebra G-Series desktop printers (GK models) do not have the parallel interface.

Built-in LAN and wireless LAN interfaces are usually optional. The new Zebra G-Series also has the option for a built-in Bluetooth interface on the GX models.

17. Printer Options

a) Cutters

Cutters are available on most types of printer, including desktops. One application for a cutter is in reducing the number of sizes of blank labels you need to carry (the label automatically cuts to the label length set by the label design software).

Cutters can also be used with card and synthetic tag material. One application is where tag labels have to be individually cut before being automatically stitched onto bags of animal feed.

Most cutters are of the guillotine type, where the printer has to be momentarily stopped to make the cut. Some printers (e.g. TEC) have the option for a rotary cutter, where the label is cut "on the fly", without the need to stop the printer. This can provide a faster throughput.

b) Built-in Label Rewind

Built-in label rewinders allow labels to be rewound onto a hub within the printer after printing. The alternative is a separate, stand-alone rewinder, which usually works out more expensive. Internal rewind options are usually available on industrial printers, but not desktop and medium volume printers (exceptions are the Datamax M Class and the Intermec PD4, PD41 and PD42 medium volume printers, which do have internal rewind options).

c) Peel & Present

Peel & present options are designed to speed up label application by automatically separating most of the label from the backing paper. When the printer detects that the label has been taken, the next one is printed.

Peel and present options are available on most printers. On desktop and medium volume printers, without an internal rewind facility, the backing paper is ejected from the front of the printer and will need to be removed at regular intervals. For printers with an internal rewind facility, the backing paper is wound onto a hub within the printer, making for a neater solution.