BARCODES
for BRUKER Automation

User Information

Version 001

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Contents

Contents

BRUKER **User Information Version 001**

Introduction

1

General

This brochure will provide you with information about barcode labels used for sample and tray identification in the automation, especially in the B-ACS Sample Changer, the Bruker Efficiency Sample Transfer (BEST) - System and the Bruker SampleTRACK[TM] system.

Introduction

BRUKER   **User Information Version 001**

Sample Changer

2
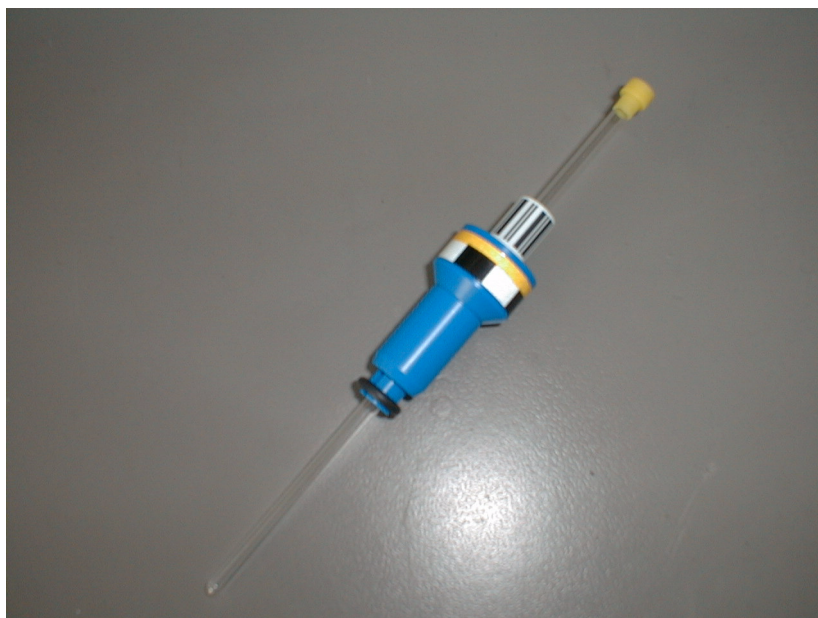
General   *2.1*

The Bruker Sample Changer can optionally be equipped with a barcode reading device for automatic sample identification. The barcodes are printed on labels, which are then pasted on the barcode collars.

Figure 2.1.   A sample in a glass tube with spinner and barcode collar

Label Size   *2.2*

The barcode collars have a height of 20 mm and a diameter of 12 mm. Thus the label size must be at least 37.7 x 20 mm. We recommend using a barcode label size of 40 x 20 mm.

Barcode Orientation *2.3*

The barcodes must be printed on the label in such a manner, that a rotating collar displays the barcode pattern to a barcode reader, in order that the code can be read around the circumference of the collar:

Figure 2.2.   A barcode collar with a circumference-orientated barcode

In a future development we will be able to use axial barcodes. An axial barcode can be read from top to bottom of the collar. This barcode orientation makes the rotation of the collar obsolete.

Figure 2.3.   Barcode collar with axial barcode

Circumference-Orientated Barcodes   *2.4*

It is possible to use different barcode types on the labels. The following codes are currently supported:

1. Code EAN 13

2. Code 2-of-5 interleaved

The following sections present an overview of the two different barcode types.

Code EAN 13   *2.4.1*

This code can encode 12 numeric digits. The 13th character is a checksum.

The 12 digit number encodes the Experiment ID (2 digits), the Solvent ID (2 digits), the User ID (3 digits) and the Sample ID (5 digits) in the following way:

Table 2.1.   EAN 13 information encoding

Digit	1	2	3	4	5	6	7	8	9	10	11	12	13
Info:	Exp. ID		Solv. ID		User ID			Sample ID					C*

* EAN 13 check sum

The Experiment ID , the Solvent ID and the User ID are equivalent to the corresponding numbers in the files on the spectrometer computer. The four different ID's in an EAN 13 barcode label can be reported seperately by using the corresponding software command.

Figure 2.4.   Example of an EAN 13 barcode label

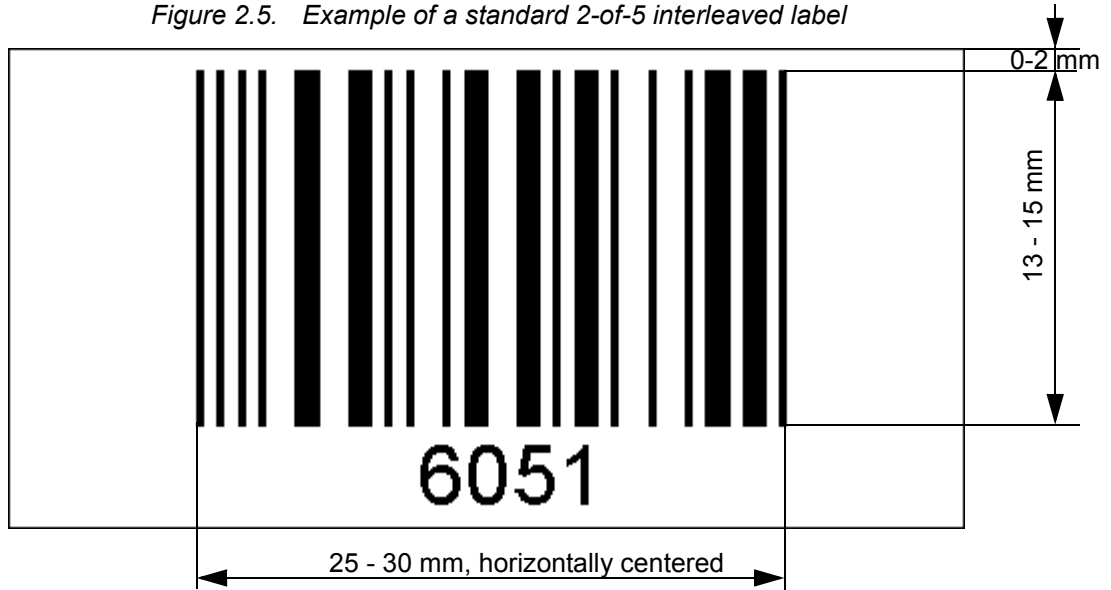*Code 2-of-5 interleaved*   *2.4.2*

All Sample Changer's currently in use can encode 2-of-5 interleaved barcode labels with 4 or 6 digits. The Sample ID is the only information encoded in the barcode. The ratio should be 2.5 : 1, which means that the thickness of a thick line is 2.5 times the thickness of a thin line.

Figure 2.5. Example of a standard 2-of-5 interleaved label

6051

0-2 mm

13 - 15 mm

25 - 30 mm, horizontally centered

Using a future-planned Sample Changer Firmware update, you will also be able to encode 2-of-5 interleaved barcode labels with up to 16 digits. In any case be sure to use a good quality printer and white paper only. Tests with other colored paper have shown, for example, that a 16-digit-barcode on silver label paper can only be read if the rotating speed of the motor is decreased. However a decreased rotation speed creates a problem that 4- or 6-digit standard barcodes can no longer be read!

➡ *For good barcode reading the line thickness of the barcode, rotation speed of the barcode collar and the print contrast between lines and gaps (corresponding with the paper quality and color) must be coordinated.*

Figure 2.6. Example of a 16 digit 2-of-5 interleaved label

1234567890123456

0-2 mm

13 - 15 mm

31 - 33 mm, horizontally centered

Sample Changer

This code is currently not supported in the sample changer firmware.This code will be available around the beginning of 2001.

Axial Barcode Orientation   *2.5*

This barcode type is currently not supported in the sample changer Firmware. This code will be available around the beginning of 2001.

BEST

3

General *3.1*

This chapter provides information on the barcodes and barcode labels used in the Gilson BEST System.

Label Size *3.2*

The BEST System is designed to work with barcode labels with a size of 70mm x 35 mm, e.g. No 3422 from Zweckform.

General Barcode Information *3.3*

Each label which is glued on a rack or wellplate must contain two barcodes:

The upper barcode should contain the Matrix ID and the lower barcode the Matrix Type.
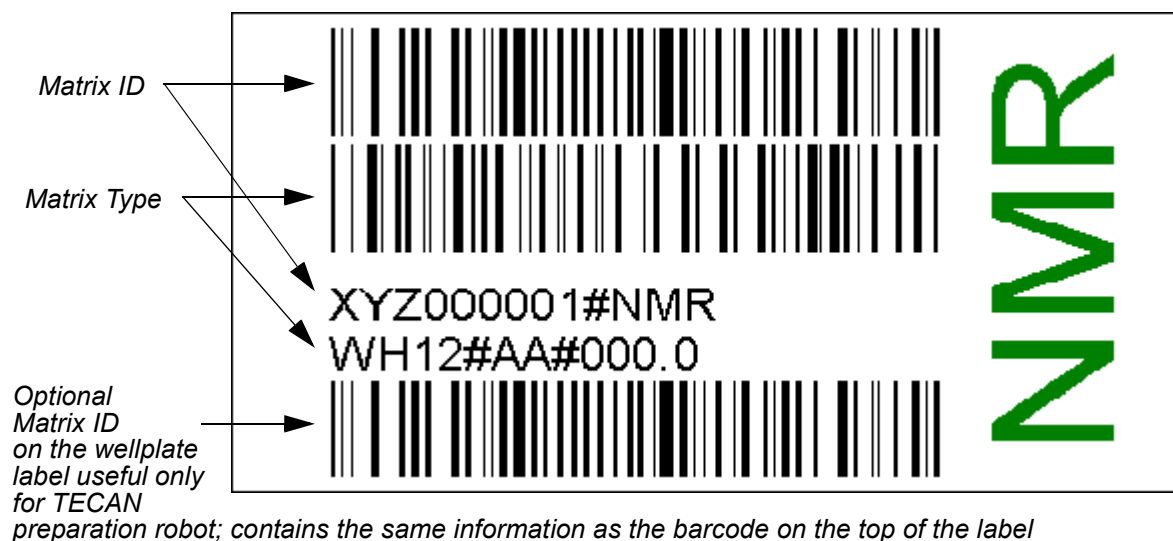
Notice:

1. The term „Matrix" is the generic term used for racks and wellplates. Therefore, Rack Type and Wellplate Type are both Matrix Types, and likewise, Rack ID and Wellplate ID are both Matrix ID´s.

2. If a TECAN preparation robot should also read the Wellplate ID, it must be placed on free space on the wellplate labels in the lower part of the label as shown in ***"Matrix ID and Matrix Type on a Wellplate label example" on***).

⇨ *It is recommended that you print the barcode information also as human-readable text on the labels.*

Barcode type Code 128 is used for all barcodes. Other barcode types are ignored by the barcode reader due to its initialization sequence.

Figure 3.1. *Matrix ID and Matrix Type on a Wellplate label example*

Matrix ID

Matrix Type

XYZ000001#NMR
WH12#AA#000.0

Optional
Matrix ID
on the wellplate
label useful only
for TECAN
preparation robot; contains the same information as the barcode on the top of the label

Matrix ID   3.4

The Matrix ID is a user specific, unique ID which may contain a three-character company name, followed by a serial number, and optionally by the analytical method divided by a hash - character (#).

➡ *The Matrix ID is the first part of the spectrometer search string for order files for this matrix.*

Example: When the label with the Matrix ID „XYZ000001#NMR" (which repre-sents company XYZ´s first NMR experiment) is glued on a wellplate, all order files which start with the string „XYZ000001#NMR" (e.g. XYZ000001#NMR A1, XYZ000001#NMR A2 etc.) are associated with this wellplate.

Matrix Type   3.5

The Matrix Type is a string in a specific format which contains information about the geometry of the rack, the position of probes in the rack, the numbering of the probe in the rack (Arrangement), the Working Order and the Submersion Offset.

The first 5 characters of the string are a code representing the rack type used, fol-lowed by a hash character (#), e.g. 209 # for a rack code 209 or WH12# for a Welllplate having positions from A to H and from 1 to 12.

Following the Matrix Type code are characters representing the Arrangement and Working Order. These are encoded as follows:

Table 3.1.   Encoding of Arrangement and Working Order

	upper left (ul)	upper right (ur)	lower left (ll)	lower right (lr)
	ulhs =Code 0	urhs =Code 1	llhs =Code 2	lrhs =Code 3
horizontal stacked (hs)				
	ulhf =Code 4	urhf =Code 5	llhf =Code 6	lrhf =Code 7
horizontal folded (hf)				
	ulvs =Code 8	urvs =Code 9	llvs =Code A	lrvs =Code B
vertical stacked (vs)				
	ulvf =Code C	urvf =Code D	llvf =Code E	lrvf =Code F
vertical folded (vf)				

If the rack can contain wellplates (e.g. Rack Type 205), the Matrix Type string ends after the Working Order. In this case the Wellplate Matrix Type contains the missing information about the Submersion Offset. Otherwise, the Submersion Offset is added to that string following a hash - character (#). The Submersion Offset is always a number from -99.9 to 999.9 or the string Rcovr for recover-racks and has **always 5 characters**!

Example 1:

You are using Rack Type 209 and you want to count through the rack using the „llvs" method. The probes should be measured and / or prepared using the „urvf"-

method. The Submersion Offset for the whole rack is 2.7 mm. You would encode the string as follows:

Matrix Type = 209 #AD#002.7

Example 2:

You are using Rack Type 205. In this case the Arrangement on the rack label and on the Wellplate label have to be identical and can only be Code 9 or Code A. The Working Order on the Rack label can be only code 9 or code A, too, whereas the Working Order on the Wellplate label can be any code from 0 to F. The Submersion Offset (here recover-rack) is visible and encoded only on the Wellplate label:

Matrix Type on the rack = 205 #AA

Matrix Type on the Wellplate = e.g. WH12#A3#Rcovr

It is recommended that you use the Label Designer tool which provides an easy way to create Matrix Types.

Barcode Positioning *3.6*

It is necessary to always place the barcodes in the correct position on the label to ensure correct barcode reading:

Figure 3.2.   Barcode positions on the barcode label
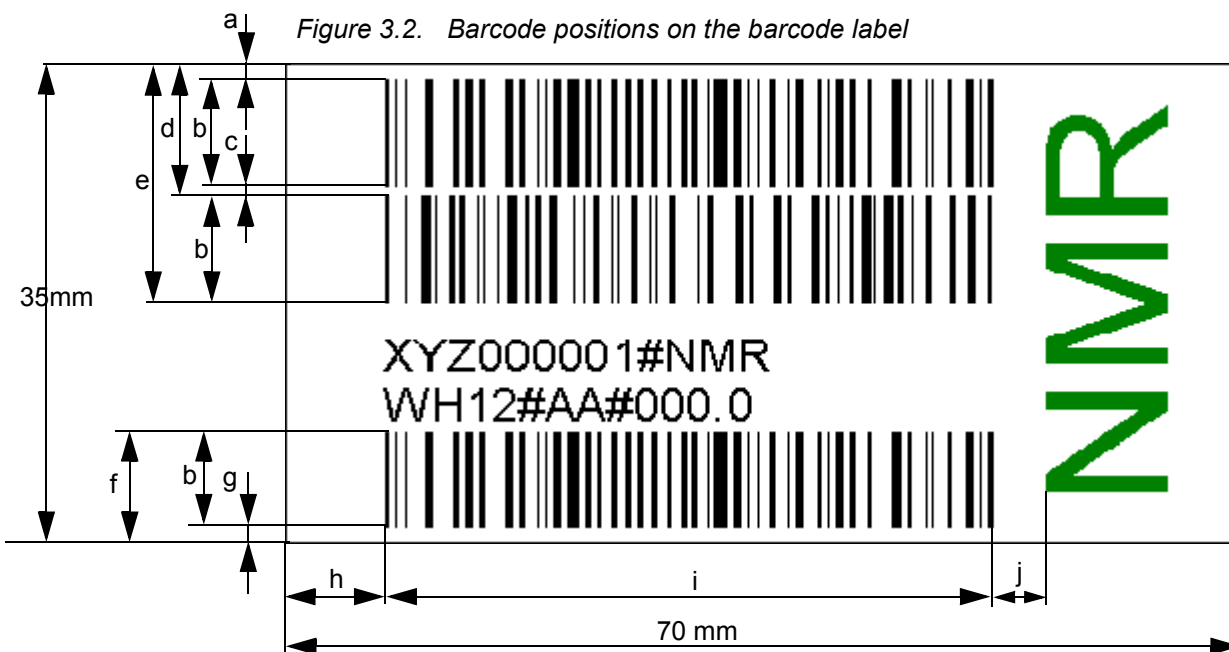
The following specifications should be met by the barcodes:

Table 3.2.   Maximum Barcode Dimensions

Variable	Min	Best	Max
a	0 mm	1mm	2 mm
b	7 mm	8 mm	10 mm
c	0.5 mm		
d	8.5 mm	9.5 mm	10.5 mm
e	16.5 mm	17.5 mm	
f	9 mm	10 mm	
g	0 mm	2 mm	3 mm
h	5 mm	7 mm	15 mm
i			45 mm
j	5 mm		

Other important specifications

1. Module width: 8 - 15 mils (0.2 mm - 0.381 mm)

2. Print Contrast Ratio: PCS > 70 %

3. Number of characters: max. 20

4. Colors: black code on white background

5. Code Type: code 128

When you paste the labels on the racks be sure to align the edges of the metal plate at the front of the rack. Working precisely here avoids barcode reading errors.

When you paste the labels on the wellplates, be sure to place them on the lower edge of the wellplate feet as shown in ***"Position of a barcode label on a Wellplate" on page 18***

Figure 3.3.   Position of a barcode label on a Wellplate

Examples   3.7
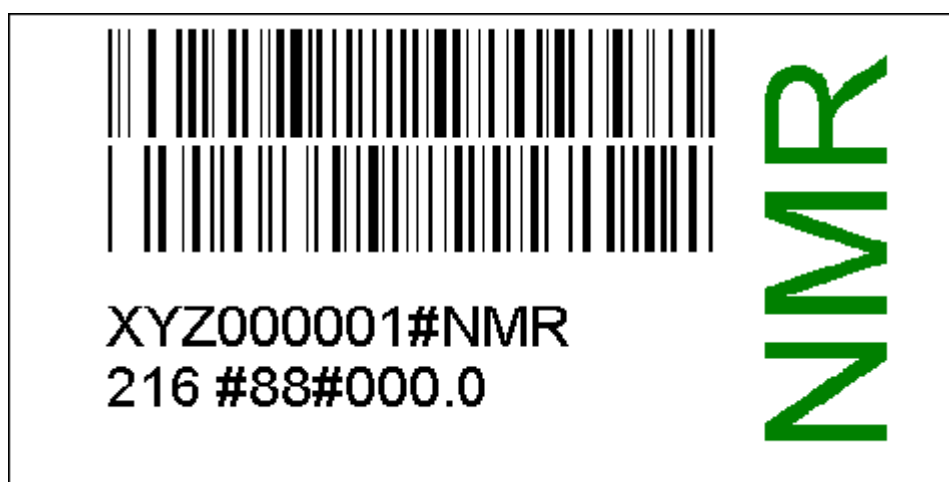
Figure 3.4.   Example of a label for rack type 205
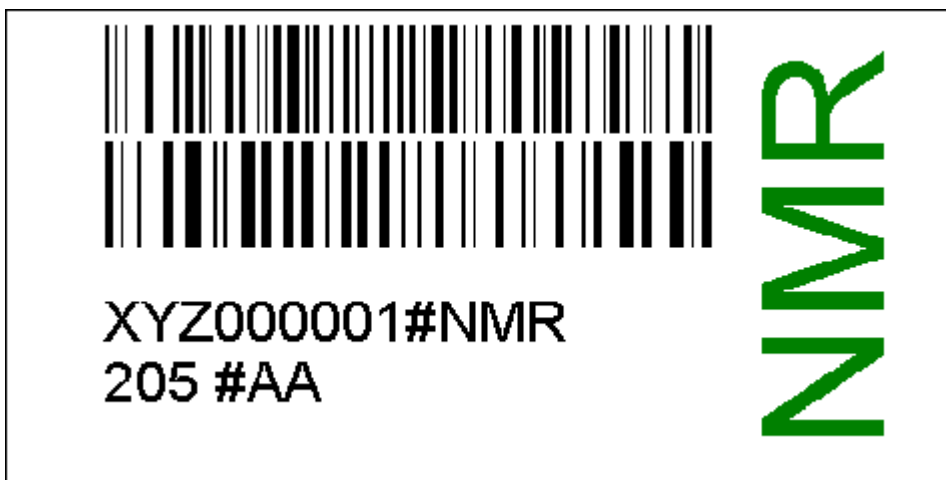
Figure 3.5.   Example of a Wellplate label

Figure 3.6.   Example of a label for rack type 209

Figure 3.7.   Example of a label for rack type 216

Figures

Figures

BRUKER   **User Information Version 001**

Tables

Tables