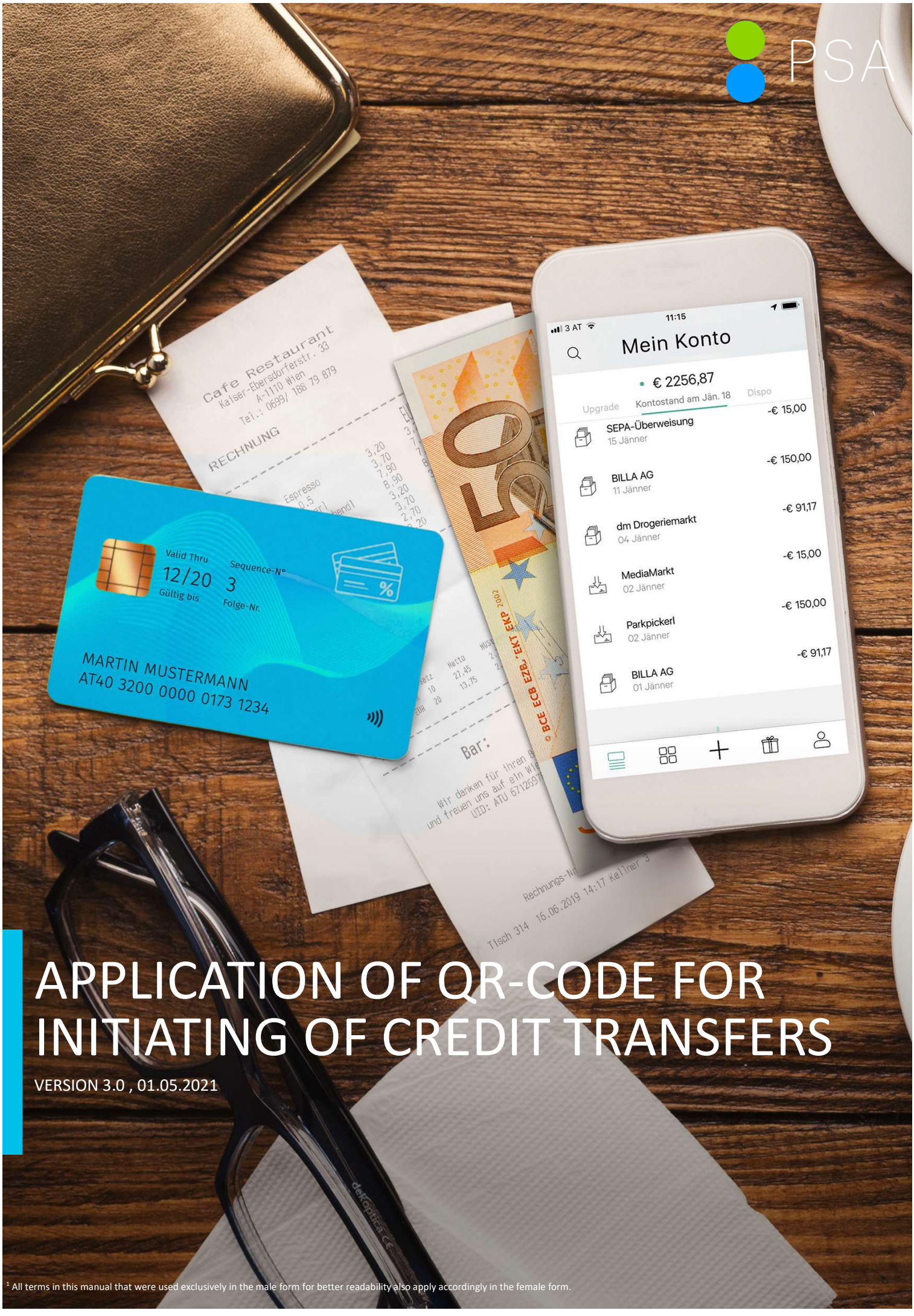

APPLICATION OF QR-CODE FOR INITIATING OF CREDIT TRANSFERS

VERSION 3.0 , 01.05.2021

[1] All terms in this manual that were used exclusively in the male form for better readability also apply accordingly in the female form.

PROLOG

This Document standardises the content of a two dimensional barcode described in ISO 18004 (QR-Code) for initiation of credit transfers and physical rules on application and printout.

The base used is the ISO 18004 Third Edition from 2015-02-01 (Information technology - Automatic identification and data capture techniques - QR Code bar code symbology specification).

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CONTENT

1. SUMMARY

The growing availability both of devices with sufficient camera and display capability to grab and output pictures and of standards and decoding software, allow the utilisation of barcodes with complex content on a large scale.

The advantages of this technique are both the easy handling and the best and lossless transmission of content, benefitting all parties. Easy and comfortable handling for the customer, good processing capabilities for the payment service providers and excellent reconciliation possibilities at payment recipient are enabled by this technique.

The content of such a barcode later described can most likely be compared with a payment slip, which both is appropriate to initiate a SEPA payment and is primarily populated by the details of payment recipient with account details. Anyhow, the possibilities outgrow of this application is remarkable. Therefore some fields have already been reserved for extended capabilities and precaution was taken to enable delimitation and recognition.

The guidelines in this document on content and application ensure to the most reachable extent a seamless and content safe transmission of all contained data, which are essential for a successful initiation of a payment instruction in online environments. Special care was taken to ensure the successful interaction with current payments systems by respecting their needs in terms of complete data content.

2. GLOSSARY

QR-Code	**Two dimensional, square barcode following ISO 18004**
QR-Code Version	Size of QR-Codes. The version determines the count of →modules in both directions. A value from 1 up to and including 40. This value also points to the →module count of the code.
QR-Code Error correction	4 different levels of special redundant data to enable and ensure readability of damaged codes.
Module	Name of the smallest information unit of barcodes, comparable with the name "bit" in IT systems. The module count of QR-Codes is calculated with QR-Code Version*4+17
mil	Metering unit of module width, 1 mil = 0.001 inch = 0.0254 mm
DPI	Dots Per Inch, a metering unit for the solution of output systems, e.g. printers, screens etc.. Count of presentable dots per inch.
Cardinality	Information on occurrence of an element or content, for instance the minimal or maximal count.

3. CONTENT DEFINITION

Data elements

Element		Length in character	fix / var	M / R	CE	Content	N
Service tag		3 B	fix	M	A	BCD	1
Version		3 B	fix	M	A	001, 002	2,4
Coding		1 B	fix	M	A	1,2,3,4,5,6,7,8	2
Function		3 B	fix	M	A	SCT	3
BIC		8 B / 11 B	var	D	A	BIC ReceiverBank	4
Receiver		70 C	var	M	*	Name ReceiverAccountOwner	
IBAN		34 B	var	M	A	IBAN ReceiverAccount	
Amount / Currency		15 B	var	R	A	Amount and Currency	5
Purpose		4 B	var	O	A	Purpose code	
Reference	Content mutually exclusive	35 B	var	R	A	Reconciliation reference	6,7
Text		140 C	var	O	*	Reconciliation text	7
Display		70 C	var	O	*	User note	8

Explanation

Column 2, Length in B / C: Element length, Maximum count
B = Byte (all characters in coding limits h20 to h7E) or
C = Character (depending on coding one or more byte per char)

Column 3, fix / var: Element length:
fix = fixed, i.e. the element must be exactly count long, or
var = variable

Column 4, M / R / O: Element occurrence
M = Mandatory
D = depending on other content
R = optional, but Recommended
O = optional

Column 5, CE: Character encoding
A = ISO 646
* = according encoding

Column 7, N: Notes

Notes

Elements are separated with line endings, where both variants Lf and CrLf are permitted. The line ending found directly after the service tag BCD must be identical for all lines.

Unused elements are dropped out with a line ending. No line endings are allowed after the last populated element.

1) Data extracted from a *QR-Code*, which starts with BCD immediately followed by a line ending, indicate a data set for payment initiation. Further content checking shall rely on service tag recognition.
2) The version 001 stands for variant 1, version 002 for variant 2, both described in this document. Extensions of elements and functions will always trigger a new version number and a new documentation.
   The values 1,2,3,4,5,6,7 and 8 determine the interpretation of data to be used. In that order they qualify UTF-8, ISO 8895-1, ISO 8895-2, ISO 8895-4, ISO 8895-5, ISO 8895-7, ISO 8895-10 and ISO 8895-15
3) The Function is defined by its key value: SCT - SEPA Credit Transfer
4) With selection of version 001 the BIC is mandatory. With selection of version 002 the BIC may be populated or empty.
5) The Amount is a recommended, but optional element. With missing Amount, likewise payment slips with no amount, population of amount has to follow during initiation.
   The maximum amount is 999,999,999.99 and has at most two decimals, no thousands separators and the dot as decimal sign. It need to follow immediately after the three capital letter currency code.
   The only Currency value available with this version is EUR
   The appearance of Amount shall be as short as possible in respect of the resulting code size, i.e. e.g. better 3EUR as 3.00EUR. Leading zeros are not permitted.
6) The Reference is a recommended, but optional element.
7) Reconciliation reference and text elements always exist concurrently, although only one may carry content. During processing this will populate the according appropriate element of payment system.
8) The text contained in Display must be shown to the user after decoding and serves a short textual description of what the user is going to initiate.
   This text must not be forwarded with the data handed over to the payment system.

Clarification on amount format (9.10.2013)

EUR0.01	EUR.01	Decimal without digit
EUR0.2	EUR.2	Decimal without digit
	EUR.20	Trailing zero, decimal without digit
EUR0.97	EUR.97	Decimal without digit
EUR45	EUR45.	Decimal without digit
	EUR45.0	Trailing zero
	EUR45.00	Trailing zero
	EUR00045.0	Leading zero, trailing zero
EUR184.6	EUR184.60	Trailing zero
	EUR000184.60	Leading zero, trailing zero
	EUR184,6	Wrong decimal
EUR58723.01	EUR000058723.01	Leading zero
EUR999999999.99	EUR999.999.999,99	Wrong decimal, separators
	EUR999999999,99	Wrong decimal

4. CODE GENERATION

Before generating the code it has to be ensured, that the total amount of data to be encoded under no circumstances exceeds 331 bytes (not characters!). This may happen, when the elements Receiver, Text and Display contains larger amounts of special characters while encoding is set to UTF-8. In this case it's necessary to change either coding or content.

Code generation has to be done with *QR-Code Error correction* level set to "M", i.e. the error correction capability or data redundancy is around 15%.

The resulting code has to have a maximum *QR-Code Version* of 13. This is equivalent to the count of *modules* with 69.
Smaller *QR-Code Versions* are permitted.

5. PRINTING

The minimal width of *modules* in printouts is 15 *mil*. The maximum width of *modules* shall not exceed 20 *mil*

When printing the *QR-Code* on invoices the *QR-Codes* position shall be at the right most or left most lower edge of the page.

On screen output the width of *modules* can be chosen larger.

Printing on payment slips

When printing on a payment slip care has to be taken due to the limited space and narrow distances to critical areas. Therefore the *module* width is limited to 0.4 mm±5%. This is an equivalent *module* width of 14.96 - 16.54 *mils*. This width shall be used for all resulting *QR-Code Versions*.

The position of the *QR-Code* must not hinder the automated slip processing and must be chosen carefully. In example of the Austrian "Zahlungsanweisung" the *QR-Code* is placed on the right under the line for the remittance reference (Zahlungsreferenz) in the lines for textual payment reason (Verwendungszweck) and account owner/ ordering customer (KontoinhaberIn/AuftraggeberIn), as this position ensures enough distance to both the position marks (+) and the slip id.

Calculation examples of image sizes

0.4 mm±5%, printer resolution 600 *DPI*, *QR-Code Version* 13

0.38 mm/*module*: 25.4 mm/inch * 600 pixel/inch = 8.98 pixel per *module* lower limit

0.42 mm/*module*: 25.4 mm/inch * 600 pixel/inch = 9.92 pixel per *module* higher limit

9 pixel/*module* * 69 *module* = 621 pixel image-width/-height

19 *mil*, printer resolution 720 *DPI*, *QR-Code Version* 12

19 mil/*module* * 0.0254 mm/*mil*: 25.4 mm inch * 720 pixel/inch = 13.86 pixel per *module*

14 pixel/*module* * 65 *module* = 910 pixel image-width/-height

18 *mil*, screen resolution 120 *DPI*, *QR-Code Version* 13

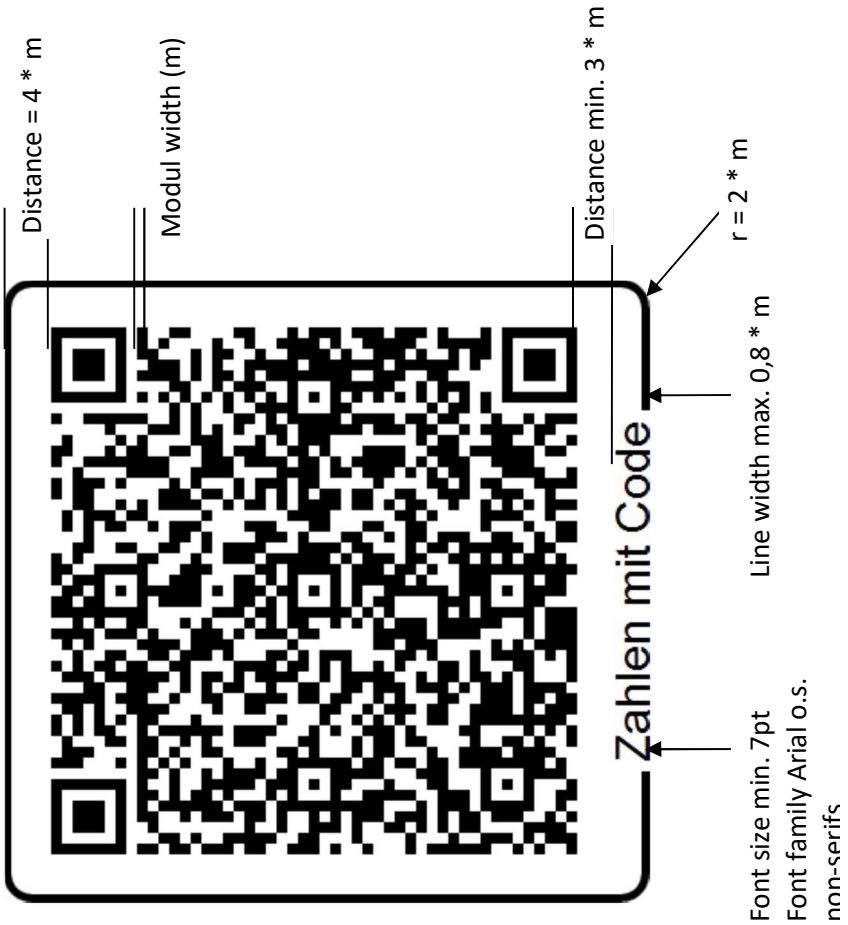
18 mil/*module* * 0.0254 mm/*mil*: 25.4 mm/inch * 120 pixel/inch = 2.16 pixel per *module*

2 pixel/*module* * 69 *module* = 138 pixel image-width/-height

Securing the ability of identification

To highlight the function of the codes and to secure the ability of identification, a surrounding frame and the words "Zahlen mit Code" (to the right from bottom to top) are applied.

Following measurements shall be observed.



6. TECHNICAL BACKGROUND

The limitation to *QR-Code Version* 13 as maximal size for the *QR-Code* to be used for this application follows principle estimations on resolution capacity, view field and reading distance of supporting devices. Meanwhile the cameras of mobile phones and computers are having resolution capacities that in principal enable a good recognition. Anyhow the remaining quality of the pictures is limited for this application due to the construction of such devices. The estimations made where proofed by several tests.

QR-Codes come with various levels of *QR-Code Error correction* capabilities that ensure recognition even if parts of the *QR-Code* is damaged due to various reasons. Unfortunately the higher the *QR-Code Error correction*, the lower is the possible pay load. The *QR-Code Error correction* level chosen is level "M", which has a correction capacity of 15% and therefore covers slight stain contamination and paper folding.

With both the chosen *QR-Code Version* and *QR-Code Error correction* level the maximum pay load is determined. The maximum amount of data therefore is 331 bytes (not characters!). This amount must not be exceeded.

*QR-Code*s just encapsulates a pile of bytes and therefore transports any wanted content. The *QR-Code* has no own functionality. ISO 18004 offers four different possibilities of encoding: Just numbers, a limited (45 characters) set of alpha numeric signs, a special coding for Japanese symbols and just bytes. The first three encodings expect the payload in a prepared coded manner allowing the reading process regaining the original data. The latter encoding puts the byte stream 1:1 in an image representation. Furthermore a technique is available to combine 16 *QR-Code*s to a single entire message that allow to transport quite large amounts of data, e.g. one could think about a photo.

For the concrete application the possible variety is limited to encapsulate binary data. Therefore the encoding of contained bytes needs to be submitted within the data encapsulated to enable correct data interpretation at reading time.

Analysing already existing applications one will find out that the *QR-Code* is simply used to encapsulate other available data formats. As an example data streams for a calendar entry follows the vCal or for a business card follows the vCard specification. Therefore a structure for the content was worked out which, in analogy to a vCal or vCard data format, would be applicable to carry recipient information in textual representation as well as having a mark for a unique identification.

Simultaneously care was taken to support the European SEPA standard and to ensure, that national specifics are not getting limiting restrictions. The fundamental data used for the recipients identification (Name, IBAN, BIC) are chosen in the light of the SEPA payment services. Therefore customers receiving invoices from other SEPA countries can conveniently use the *QR-Code* for transmitting the data into their online banking - given the supplier has printed the described *QR-Code* on the invoice.

Format identifier as well as version, interpretation and function marks are all coded in a way, that - regardless the encoding (UTF-8, ISO 8895-1 .. ISO 8895-15) used - recognition of information is always possible. Both line endings of commonly used hardware architectures are permitted. All characters needed for these information are encoded in all named character encodings at the same code point.

7. PROCESSING NOTES

The BCD data set in a *QR-Code* contains different types of data. Mandatory are only the data qualifying the recipients side of a transfer. The ordering side is completely missing. Therefore the *QR-Code* is applicable only in environments, where the ordering side can be identified by other mechanisms, to complete a set of data, which can be used for payment systems.

Information in the *QR-Code* not belonging to the recipients side are:

the amount	if missing an amount has to be retrieved by either interrogation e.g. on an online mask or other suitable methods e.g. like reading of an amount out of an amount field of a payment slip before forwarding the order into the payment system
the reference	or
the text	shall populate the respective elements of the to the payment system after the data handover
display text	this text can - and shall - be used by the recipient to transmit explaining text of any kind that is connected to the credit transfer to be initiated to the user of the code. This text is to be displayed but not to be transmitted into the payment system

After reading and decoding the data of a *QR-Code*, it is necessary to enrich them with the data of the ordering customer. The data identifying the receiving side as well as the display text and the amount need to be displayed to the ordering customer. A missing amount has to be interrogated. The information to check the data before initiating the transfer is mostly done during the following process of an initiation and therefore it is regularly not needed to connect this information with the reading process of a *QR-Code*.

It is permitted to offer the user the possibility to qualify an additional, 35 character long information before handing over the data to the payment system. This information can be used for the account statement of the ordering customer.

The reference of the ordering customer is mandatory in the SEPA payment chain but is not contained in the *QR-Code*, just alike it is not contained on a payment slip. In the case of a missing initiator reference the processing has to fill this reference with the value "NOTPROVIDED". If the customer is given the possibility to qualify an additional information e.g. for the own account statement, it is permitted to use this information for the initiators reference too.

It is strongly advised, especially for the receiver data and a possibly contained reference, to preserve the read data and not to allow alternation by the payer, as this will hinder the reconciliation and payee identification on receiving bank and beneficiary.

8. EXAMPLES

The following pages shows examples for invoices with and without attached payment slip.

INVOICE

Example 1 (SCT) on Invoice with no Zahlungsanweisung (Version 001)

```
BCD
001
1
SCT
BICVXXDD123
35 Zeichen langer Empfängername zum
XX17LandMitLangerIBAN2345678901234
EUR12345689.01

35ZeichenLangeREFzurZuordnungBeimBe

Netter Text für den Zahlenden, damit dieser weiß, was er
zahlt und auc
```

We thank for your purchase

INVOICE

Example 2 (SCT) on Invoice and Zahlungsanweisung (Version 001)

```
BCD
001
1
SCT
GIBAATWW
Max Mustermann
AT682011131032423628
EUR1456.89

457845789452

Diverse Autoteile, Re 789452 KN 457845
```

We thank for your purchase

INVOICE

Example 3 (SCT) on Invoice and Zahlungsanweisung (Version 001)

```
BCD
001
2
SCT
GENODEF1KIL
Max Mustermann
DE52210900070088299309
EUR1456.89

457845789452

Diverse Autoteile, Re 789452 KN 457845
```

We thank for your purchase

AT

ZAHLUNGSANWEISUNG

EmpfängerIn Name/Firma

Max Mustermann

IBAN EmpfängerIn

DE52 2109 0007 0088 2993 09

BIC (SWIFT-Code) der Empfängerbank

GENODEF1KIL

Kann bei Zahlungen innerhalb EU/EWR entfallen

EUR

Betrag Cent

1456,89

457845789452

Nur Zeichen A-Z, 0-9 und / bei Bedrucken der Zahlungsreferenz

3112 Prüfziffer

Verwendungszweck wird bei ausgefüllter Zahlungsreferenz nicht an Empfänger:in weitergeleitet

Diverse Autoteile, Re 789452 KN 457845

Zahlen mit Code

IBAN KontoinhaberIn/AuftraggeberIn

KontoinhaberIn/AuftraggeberIn Name/Firma

006

Unterschrift ZeichnungsberechtigteR

00000145689< 32+

Betrag < Beleg +

Druckerei Name ID

V10/15

©PSA FN370048p

INVOICE

Example 4 (SCT) on Invoice with no Zahlungsanweisung (Version 002 with BIC)

```
BCD
002
1
SCT
BICVXXDD123
35 Zeichen langer Empfängername zum
XX17LandMitLangerIBAN2345678901234
EUR12345689.01

35ZeichenLangeREFzurZuordnungBeimBe

Netter Text für den Zahlenden, damit dieser weiß, was er
zahlt und auc
```

We thank for your purchase

INVOICE

Example 5 (SCT) on Invoice and Zahlungsanweisung (Version 002 with BIC)

```
BCD
002
1
SCT
GIBAATWW
Max Mustermann
AT682011131032423628
EUR1456.89

457845789452

Diverse Autoteile, Re 789452 KN 457845
```

We thank for your purchase

INVOICE

Example 6 (SCT) on Invoice and Zahlungsanweisung (Version 002 with BIC)

```
BCD
002
2
SCT
GENODEF1KIL
Max Mustermann
DE52210900070088299309
EUR1456.89

457845789452

Diverse Autoteile, Re 789452 KN 457845
```

Zahlen mit Code

We thank for your purchase

INVOICE

Example 7 (SCT) on Invoice with no Zahlungsanweisung (Version 002 without BIC)

```
BCD
002
1
SCT

35 Zeichen langer Empfängername zum
XX17LandMitLangerIBAN2345678901234
EUR12345689.01

35ZeichenLangeREFzurZuordnungBeimBe

Netter Text für den Zahlenden, damit dieser weiß, was er
zahlt und auc
```

We thank for your purchase

INVOICE

Example 8 (SCT) on Invoice and Zahlungsanweisung (Version 002 without BIC)

```
BCD
002
1
SCT

Max Mustermann
AT682011131032423628
EUR1456.89

457845789452

Diverse Autoteile, Re 789452 KN 457845
```

Zahlen mit Code

We thank for your purchase

INVOICE

Example 9 (SCT) on Invoice and Zahlungsanweisung (Version 002 without BIC)

```
BCD
002
2
SCT

Max Mustermann
DE52210900070088299309
EUR1456.89

457845789452

Diverse Autoteile, Re 789452 KN 457845
```

We thank for your purchase