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# **Application of QR-Code for initiating of Credit Transfers**

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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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## 1st 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.



## 2nd 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.



### 3rd 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 EUR0.2 EUR0.97 EUR45		EUR.01 EUR.2 EUR.20 EUR.97 EUR45. EUR45.0 EUR45.00 EUR00045.0 EUR184.60 EUR000184.60 EUR184,6 EUR000058723.01 EUR999.999.999,99 EUR999999999,99		Decimal without digit Decimal without digit Trailing zero, decimal without digit Decimal without digit Decimal without digit Trailing zero Trailing zero Leading zero, trailing zero Trailing zero Leading zero, trailing zero Wrong decimal Leading zero Wrong decimal, separators Wrong decimal
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## 4th 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.

## 5th 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*

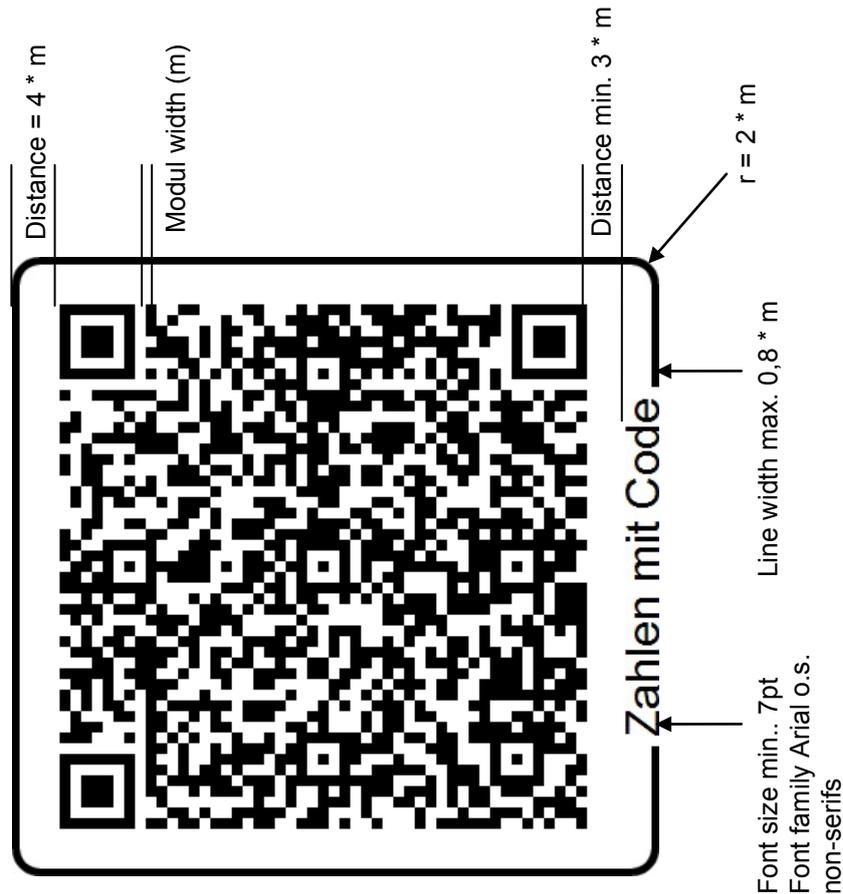
2 pixel/module \* 69 *module* = 138 pixel image-width/-height



### Securing the ability of identification

To highlight the funktion 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.



### 6th 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 payload is determined. The maximum amount of data therefore is 331 bytes (not characters!). This amount must not be exceeded.

*QR-Codes* 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-Codes* 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.



## 7th 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.

## 8th 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



AT

ZAHLUNGSANWEISUNG

EmpfängerIn Name/Firma			
Max Mustermann			
IBAN EmpfängerIn			
AT68 2011 1310 3242 3628			
BIC (SWIFT-Code) der Empfängerbank		Ein BIC ist immer verpflichtend, wenn die EmpfängerIn IBAN ungleich AT beginnt.	Betrag
GIBAATWW			
457845789452		der Zahlungsreferenz	3112 Prüfziffer
Verwendungszweck			
Diverse Autoteile, Re 789452 KN 457845			
IBAN KontoinhaberIn/AuftraggeberIn			
KontoinhaberIn/AuftraggeberIn Name/Firma			
			006
+ +			0000145689< 32+ Betrag < Beleg +





# 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		Ein BIC ist immer verpflichtend, wenn die EmpfängerIn IBAN ungleich AT beginnt.	
GENODEF1KIL		EUR	Betrag Cent
457845789452		der Zahlungsreferenz	3112 Prüfziffer
			1456,89
Verwendungszweck			
Diverse Autoteile, Re 789452 KN 457845			
IBAN KontoinhaberIn/AuftraggeberIn			
KontoinhaberIn/AuftraggeberIn Name/Firma			
006			
+		0000145689< 32+	
		Betrag < Beleg +	
Unterschrift ZeichnungsberechtigterR			





# 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



AT

ZAHLUNGSANWEISUNG

EmpfängerIn Name/Firma			
Max Mustermann			
IBAN EmpfängerIn			
AT68 2011 1310 3242 3628			
BIC (SWIFT-Code) der Empfängerbank		Ein BIC ist immer verpflichtend, wenn die EmpfängerIn IBAN ungleich AT beginnt.	
GIBAATWW		EUR	Betrag Cent
457845789452		der Zahlungsreferenz	3112 Prüfziffer
1456		89	
Verwendungszweck			
Diverse Autoteile, Re 789452 KN 457845			
IBAN KontoinhaberIn/AuftraggeberIn			
KontoinhaberIn/AuftraggeberIn Name/Firma			
006			
+		0000145689 < 32+	
+		Betrag < Beleg +	
Unterschrift Zeichnungsberechtigter			







# 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

We thank for your purchase



AT

ZAHLUNGSANWEISUNG

EmpfängerIn Name/Firma			
Max Mustermann			
IBAN EmpfängerIn			
AT68 2011 1310 3242 3628			
BIC (SWIFT-Code) der Empfängerbank		Ein BIC ist immer verpflichtend, wenn die EmpfängerIn IBAN ungleich AT beginnt.	
	EUR	Betrag	Cent
		1456	89
457845789452 der Zahlungsreferenz		3112	Prüfziffer
Verwendungszweck			
Diverse Autoteile, Re 789452 KN 457845			
IBAN KontoinhaberIn/AuftraggeberIn			
KontoinhaberIn/AuftraggeberIn Name/Firma			
006			
+		0000145689< 32+	
		Betrag < Beleg +	
Unterschrift Zeichnungsberechtigter			





# 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



AT

ZAHLUNGSANWEISUNG

EmpfängerIn Name/Firma			
Max Mustermann			
IBAN EmpfängerIn			
DE52 2109 0007 0088 2993 09			
BIC (SWIFT-Code) der Empfängerbank		Ein BIC ist immer verpflichtend, wenn die EmpfängerIn IBAN ungleich AT beginnt.	
		EUR	Betrag Cent
			1456,89
457845789452 der Zahlungsreferenz		3112 Prüfziffer	
Verwendungszweck			
Diverse Autoteile, Re 789452 KN 457845			
IBAN KontoinhaberIn/AuftraggeberIn			
KontoinhaberIn/AuftraggeberIn Name/Firma			
006			
+		00000145689< 32+	
+		Betrag < Beleg +	
<div style="border: 1px solid red; padding: 10px; display: inline-block;"> <p>Unterschrift ZeichnungsberechtigterR</p> </div>			

