



ZBS | Združenje bank Slovenije

Instructions for programmers for preparing the printout of UPN (Universal Payment Order) QR of registered issuers

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1. Introduction

On April 3, 2017, banks and savings banks, members of the Bank Association of Slovenia, started introducing a new payment order with a QR code¹. Such forms bring two essential advantages. They enable the automatic capture of all data from the QR code and thus also complete information about the debtor and the purpose of payment, which are shown in the review of turnover in electronic, on-line and mobile banks and on the statement of business and personal accounts. In addition, UPN QR forms enable a more modern and simpler method of payment, such as the “scan to pay” option in mobile banking applications or payment via an ATM. Among the advantages, we can also include a smaller possibility of errors when entering data at payment points and via mobile banking.

The old Universal Payment Order UPN² had had an OCR line for fast data capture (data was captured with dedicated OCR readers), but it did not contain all the data of the order, so it was necessary to optically capture the rest of the data and convert them into computer data using special software.



Figure 1.1: Comparison of the size of barcodes with the same content.

The most important differences between UPN with OCR line and UPN QR

- Instead of the OCR line, there is a QR code on the order that contains all the written data.
- The due date shall not be entered in the “Payment purpose” field - a separate field is available for this.
- The fields “Name, street and place” of the payer and recipient are printed in individual lines.
- There is no more “Declaration” field.
- The maximum allowed lengths of some fields have been changed.
- Only characters contained in the ISO-8859-2 code table may be used.

¹ QR code is a two-dimensional barcode intended for data machine reading. QR code reading is fast, reliable and cheap, as it can be read with devices such as smartphones, scanners and dedicated readers. The abbreviation QR stands for "Quick Response" in English.

² A one-year migration period was planned for the transition from existing UPNs to UPN QRs, i.e. until April 3, 2018.

Figure 1.2: Image of the completed UPN QR of registered issuers.

2. Filling out the form

2.1 Printout fields

When printing the UPN QR **order for payment of obligations of registered issuers**, you can only fill in the fields listed below. The remaining fields on the form must be left blank.

Respect the maximum allowed length of individual fields.

Field name	Length	Filling in
Payer's name	Maximum 33	Mandatory, except for payments for humanitarian purposes.
Street and no. of the payer	Maximum 33	Mandatory, except for payments for humanitarian purposes.
Place of the payer	Maximum 33	Mandatory, except for payments for humanitarian purposes.
Amount	1 milliard -1	Mandatory, except for payments for humanitarian purposes. Format "###.#00".
Purpose code	Mandatory 4	Mandatory. From the purpose code list.
Payment purpose	Maximum 42	Mandatory.
Due date		Optional. Format "DD.MM.YYYY" or blank.
Recipient's IBAN		Mandatory with correct control number. Format "SI56 9999 9999 999 999".
Recipient reference	Maximum 4 + 22	Mandatory (Model and Reference). The model and the reference are each in their own field. SI or RF model is allowed. The reference is formatted according to SI or RF formatting rules. Correct control number.
Recipient's name	Maximum 33	Mandatory.
Street and no. of the recipient	Maximum 33	Mandatory.
Place of the recipient	Maximum 33	Mandatory.

In addition to the described fields, you must also fill in the QR code, in which you enter the same content as you wrote on the form, except that in the QR code some fields are formatted differently.

2.2 Font

For filling out the form, the specified size is 12 cpi (characters per inch), which does not mean 12 pt (font size), as many mistakenly believe. Use the same font in size 17 cpi to print the data on the counterfoil.

CORRECT

Courier New 12 cpi

1" (25,4 mm)											
1	2	3	4	5	6	7	8	9	10	11	12
A	B	C	D	E	F	G	H	I	J	K	L
M	N	O	1	2	3	4	5	6	7	8	9
10	11	12	1	2	3	4	5	6	7	8	9

Courier New 17 cpi

1" (25,4 mm)											
1	2	3	4	5	6	7	8	9	10	11	12
A	B	C	D	E	F	G	H	I	J	K	L
M	N	O	1	2	3	4	5	6	7	8	9
10	11	12	1	2	3	4	5	6	7	8	9

INCORRECT

Courier New 12 pt

ABCDEFGHIJKLMNO123456

Courier New 17 pt

ABCDEFGHIJKLMNO123456

2.3 Allowed characters

Only characters supported by the ISO-8859-2 code table can be used in the printout. The content written on the form must be identical to the record in the QR code.

ISO/IEC 8859-2															
	x0	x1	x2	x3	x4	x5	x6	x7	x8	x9	xA	xB	xC	xD	xE
0x	neuporabljeno														
1x	neuporabljeno														
2x	SP	!	"	#	\$	%	&	'	()	*	+	,	-	.
3x	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>
4x	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N
5x	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^
6x	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n
7x	p	q	r	s	t	u	v	w	x	y	z	{		}	~
8x	neuporabljeno														
9x	neuporabljeno														
Ax	NBSP	À	Á	Â	Ã	Ä	Å	Ā	Ă	Ą	Ć	Č	Ď	Ě	Ǽ
Bx	°	à	á	â	ã	ä	å	ā	ă	ą	ć	č	ď	ě	ǽ
Cx	Ř	Á	Â	Ã	Ä	Å	Ā	Ă	Ą	Ć	Č	Ď	Ě	Ǽ	Ǿ
Dx	Đ	Ń	Ň	Ó	Ô	Õ	Ö	×	Ř	Ú	Ů	Ű	Ý	Ť	ß
Ex	í	â	ã	ä	å	ā	ă	ą	ć	č	Ď	ě	ǽ	Ǿ	ǿ
Fx	đ	ñ	ň	ó	ô	õ	ö	÷	ř	ú	ů	ű	ý	ť	·

Podrobneje na https://sl.wikipedia.org/wiki/ISO_8859-2

2.4 Positions

Enter the content in the provided fields and align it to the left. Inside most fields there are also guides that are intended only **for manual entry**. Never enter characters between the manual entry guides.

CORRECT	INCORRECT
<p>Ime, ulica in kraj plačnika</p> <p>Janez Plačnik</p> <p>Skopušnikova ulica 2</p> <p>1000 Ljubljana</p> <p>Referenca prejemnika</p> <p>SI12 1234567890120</p>	<p>Ime, ulica in kraj plačnika</p> <p>Janez Plačnik</p> <p>IBAN prejemnika</p> <p>SI56 1920 0123 4567 892</p> <p>Referenca prejemnika</p> <p>S I 1 2 1 2 3 4 5 6 7 8 9 0 1 2 0</p>

2.5 Amount

Format the amount as “***#.##0,00”.

E.g.: Write the amount 5432.1 as “***5.432,10”.

CORRECT	INCORRECT
<p>Znesek</p> <p>***5.432,10</p>	<p>Znesek</p> <p>5 4 3 2 1 0</p>

2.6 Date

Format the date as “DD.MM.YYYY”.

E.g.: You write the date November 25, 2022 as “25.11.2022”.

CORRECT	INCORRECT
<p>Rok plačila</p> <p>25.11.2022</p>	<p>Rok plačila</p> <p>2 5 1 1 2 0 2 2</p> <p>Rok plačila</p> <p>25/11/2022</p> <p>Rok plačila</p> <p>2 5 / 1 1 / 2 2</p>

2.7 IBAN formatting

Format the IBAN according to the IBAN formatting rules “SI56 9999 9999 9999 999”.

E.g.: Write IBAN “SI56192001234567892” as “SI56 1920 0123 4567 892”.

CORRECT	INCORRECT
<p>IBAN prejemnika</p> <p>SI56 1920 0123 4567 892</p>	<p>IBAN prejemnika</p> <p>SI56192001234567892</p> <p>IBAN prejemnika</p> <p>S I 5 6 1 9 2 0 0 1 2 3 4 5 6 7 8 9 2</p>

2.8 QR code

The QR code was developed in 1994 in Japan for the needs of the automotive industry. Later, it quickly spread to other branches of industry in Japan and then around the world. The QR code specification was confirmed in 2000 as the international standard ISO/IEC 18004. A newer standard, amended in 2015, is currently in use and is payable. The main characteristics such as symbol characteristics, data encoding methods and dimensional characteristics remain the same.

2.8.1 Types of QR codes

When we talk about a QR code in general, we are talking about a QR code, Model 2, which is widely used and accepted as an ISO/IEC standard. It is an improved version of Model 1 and can store up to 7098 numbers. It also contains an error handling algorithm that allows partially corrupted code to be read.

We also know:

- A micro QR code, which is a smaller version of a QR code that can store a maximum of 35 numbers. We use them when we want to record a small amount of data, e.g. ID numbers, on a smaller surface. They have only one positional pattern.
- iQR code – is an alternative to the regular QR code (Model 2) and can store more data on the same surface. Up to 40,000 characters can be written into it, and it enables up to 50% reproducibility of data. It can be printed as a square or a rectangle. The code is not certified as an ISO/IEC standard.
- Secret code SQRC (Secure QR code) – enables encryption of data into a QR code. In appearance it does not differ from a normal QR code, but has the additional function of limiting reading. It contains public and private data. Private data can only be read by dedicated readers that have a cryptographic key.
- The code FrameQR – contains in the middle a special area (“Canvas area”), in which we can insert a logo, characters, a picture, etc. Inserted elements do not affect the reliability of reading.
- HCCD2D Code - (High Capacity Colored 2-Dimensional Code) High Capacity Coloured 2-Dimensional Code that uses colour to increase data density (as of 2014 still in prototyping stage).
- JAB code - (Just Another Barcode) is a colour 2D matrix symbology consisting of coloured squares arranged in a square or rectangular grid. The code was developed by Fraunhofer Institute SIT (Secure Information Technology). The code uses 4 or 8 colours. The 4 primary colours (cyan, magenta, yellow, black) are the 4 primary colours of the CMYK subtractive colour model, the other 4 colours (blue, red, green, white) are the secondary colours of the CMYK model and are created as an equivalent mixture of a pair of primary colours.

2.8.2 QR code symbol structure

The symbol consists of black and white square modules arranged in a square matrix. The black module represents the number 1, and the white module represents the number 0. One module represents one bit of data. The symbol is built from function patterns and coding field. The function patterns form the frame of the code and do not encode the message.

A QR code is always square in shape and is determined by modules, data types, error correction level and versions.

For use on UPN QR, a QR code Model 2 is used.

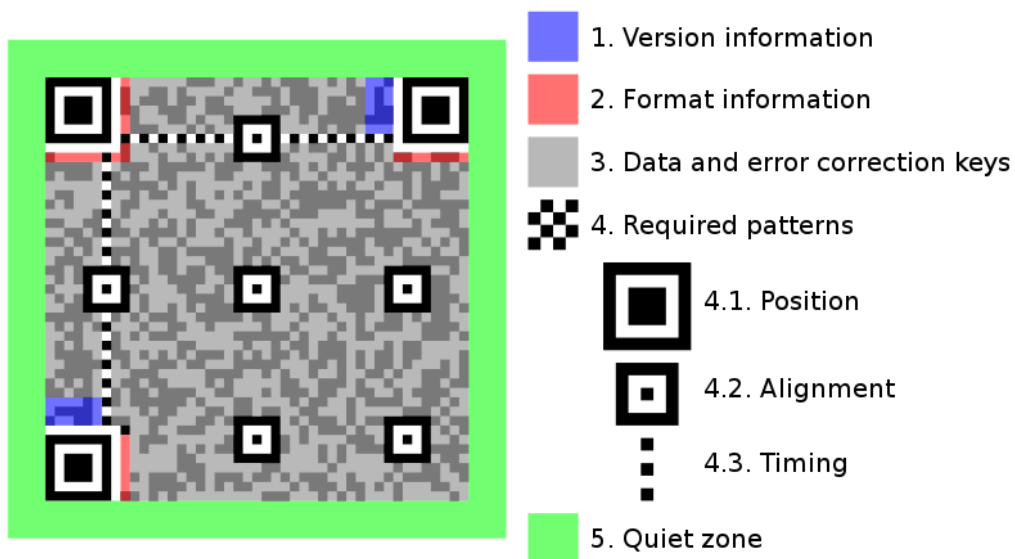
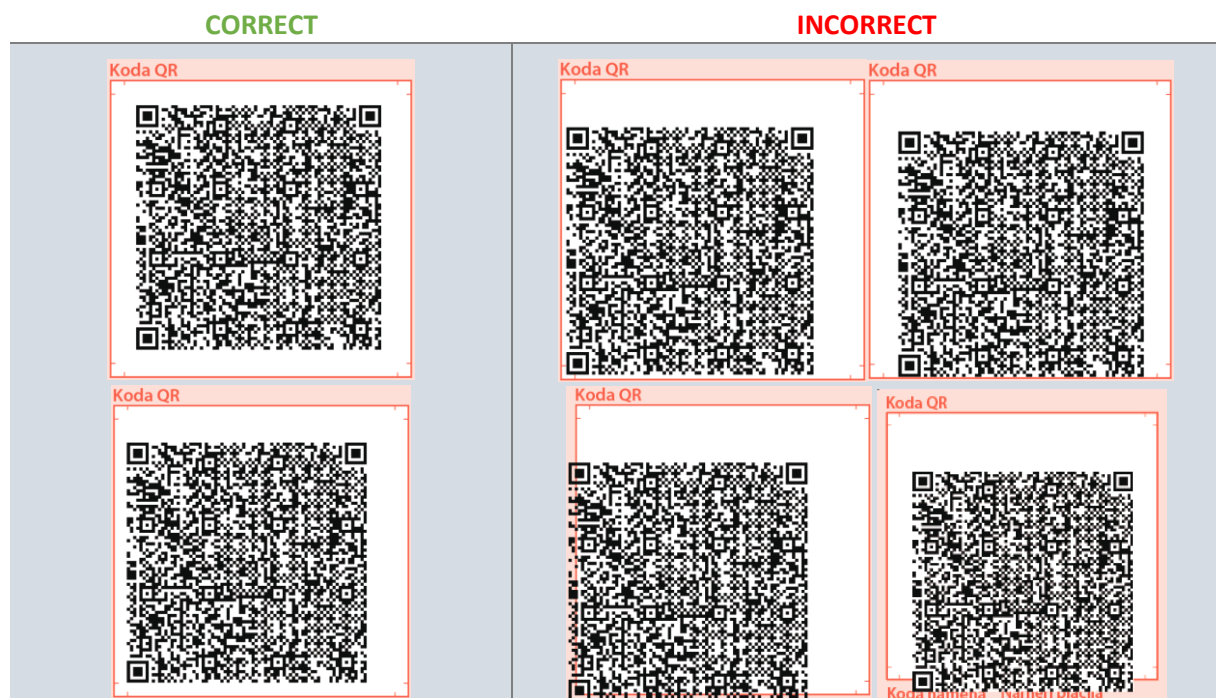


Figure 2.1: QR code symbol structure

2.8.3 Printing the QR code on the UPN QR form

Always print the QR code in the prescribed size in the field provided for this. On the form, in the field intended for printing the QR code, there are special guides that indicate the ideal positions of the QR code with permitted deviations. The QR code is surrounded by at least four modules wide “No data space”. Inside the QR code field, there are additional guides in each corner that indicate the minimum allowable offset to the edge. Prepare the content of the QR code according to the rules described in continuation.



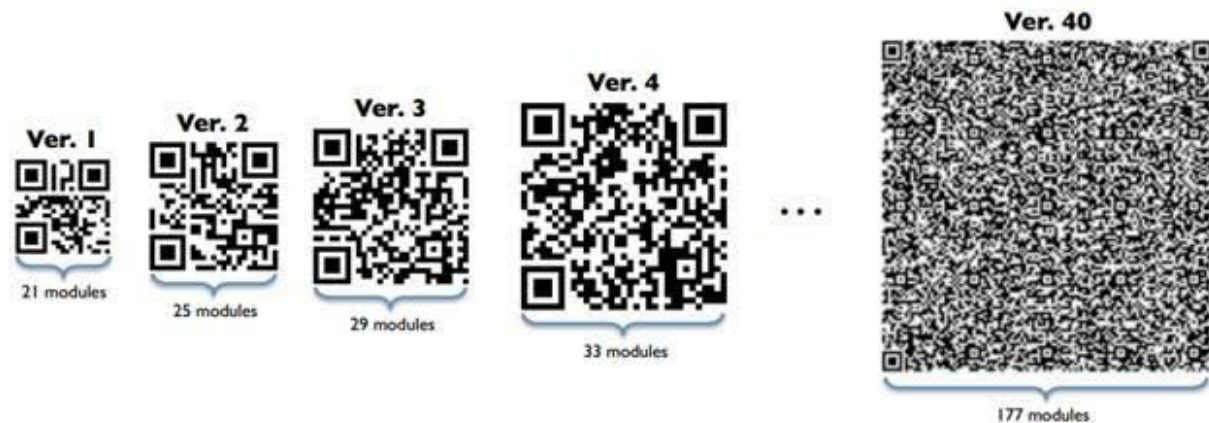
3. QR code technical data

The technical data of the QR code for use on UPN QR are:

- **Version QR:** Version 15 (77x77 modules). Version 15 is mandatory, regardless of the amount of data entered.
- **QR data type:** Byte data (Binary).
- **QR data correction level:** ECC_M (Error Correction Level M).
- **QR character set:** ISO 8859-2.
- **Code page:** Use of Extended Channel Interpretation is mandatory (ECI value 000004).
- **QR module size:** 0.42333 mm x 0.42333 mm.
- **The size of the QR code without the mandatory white border:** 32.59676 x 32.59676 mm
- **Space occupied by QR with mandatory white border:** 35.98333 x 35.98333 mm.
- **Minimum QR printout resolution:** 600 x 600 DPI.

3.1 Version

The QR version determines the size of the QR and is determined by the number of modules. Version 1 is the smallest and consists of 21 x 21 modules. The versions increase by adding four modules in width and height up to the maximum version 40, which consists of 177 x 177 modules.



The version, together with the data type and error correction level, determines the capacity and consequently the size of the QR.

When preparing the QR code for the UPN QR form, **always use version 15**. Some open source libraries for preparing QR codes do not allow version entry and depending on the amount of entered data, select the appropriate version themselves. If you use such a library, you can use the “Reserve” field, which you fill with enough spaces to achieve the appropriate amount of data for version 15 (see the point “QR code content - Reserve”).

3.2 Data type

The data type is always binary.

3.3 Data correction level

Four levels of error correction are available in the QR code, allowing for 7% to 30% reproducibility of damaged data. They are designated by L, M, Q, H in ascending order of error correction capability.

Level L 7%

Level M 15%

Level Q 25%

Level H 30%

Data correction level ECC (sometimes also ECL) is always M.

3.4 ECI - Extended Channel Interpretation

Extended Channel Interpretation (ECI) contains information about the character set used (e.g. UTF8, Windows-1251), so that your scanner knows how to interpret the data.

The use of Extended Channel Interpretation (ECI value 000004) is mandatory for the QR code, which means the ISO 8859-2 (Latin 2) code table. Some open source libraries automatically enter a value in the ECI, which they determine based on the analysis of the entered content. Most often they specify the number "26", which means UTF-8 code table, which is wrong. So always make sure to **enter the value "4" in the ECI.**

3.5 The size of the printed QR code

Always print version 15, so the size of the printed QR code, without the mandatory white margin, is constant and is always 32.597mm x 32.597mm.

4. QR code content

The content of the QR code must always be the same as the printout data. The only difference is the way individual fields are formatted. The content is prescribed and, in the case of the order of registered issuers, has the following content:

Seq. no.	Field name	Maximum length	Contents
1.	Leading style	5	Constant »UPNQR«.
2.	Payer's IBAN		Empty.
3.	Deposit		Empty.
4.	Withdrawal		Empty.
5.	Payer's reference		Empty.
6.	Payer's name	33	Mandatory. No leading or trailing spaces. <i>If you are filling out an order for humanitarian purposes and the payer is unknown, the fields can be left blank.</i>
7.	Street and no. of the payer	33	Mandatory. No leading or trailing spaces. <i>If you are filling out an order for humanitarian purposes and the payer is unknown, the fields can be left blank.</i>
8.	Place of the payer	33	Mandatory. No leading or trailing spaces. <i>If you are filling out an order for humanitarian purposes and the payer is unknown, the fields can be left blank.</i>
9.	Amount	11	Mandatory. No leading or trailing spaces. <i>If you are filling out an order for humanitarian purposes the amount field can be empty.</i>
10.	Payment date		Empty.
11.	Urgent		Empty.
12.	Purpose code	4	Mandatory. Four capital letters (A-Z).
13.	Payment purpose	42	Mandatory. No leading or trailing spaces.
14.	Due date	10	Optional. Format "DD.MM.YYYY" or blank.
15.	Recipient's IBAN	34	Mandatory. No formatting (no spaces in between).
16.	Recipient reference	26	Mandatory. (4+22) Model and reference together without spaces.
17.	Recipient's name	33	Mandatory. No leading or trailing spaces.
18.	Street and no. of the recipient	33	Mandatory. No leading or trailing spaces.
19.	Place of the recipient	33	Mandatory. No leading or trailing spaces.
20.	Checksum	3	Mandatory. Three digits.
	Reserve		Optional. Blank or spaces, no punctuation.

To each field from 1 to 20 inclusive, always add at the end the delimiter <LF> ("ASCII 10", "hex 0x0A", "\n"). Do not add punctuation to the "Reserve" field.

Space stands for<Space> (»ASCII 32«, »hex 0x20«).

4.1 Name, street and place of the payer

Fields must not be empty or contain leading or trailing spaces. Only characters contained in the ISO-8859-2 code table may be used.

If you are filling out an order for humanitarian purposes and the payer is unknown, the fields can be left blank.

4.2 Payment purpose

Field must not be empty or contain leading or trailing spaces. Only characters contained in the ISO-8859-2 code table may be used.

4.3 Due date

Due date can be blank or contain a valid date, which must be formatted as "DD.MM.YYYY".

E.g. you write the date "June 22, 2020" in the form "22.06.2020".

4.4 Amount

Multiply the amount you write on the form by one hundred and add leading zeros to a length of 11 characters.

E.g. you write the written amount "****1.234,56" as "00000123456".

If you are filling out an order for humanitarian purposes and the amount field is empty, you enter eleven zeros "00000000000".

4.5 Recipient's IBAN

You enter the IBAN unformatted, without spaces. Always check the control number.

E.g. Enter the written IBAN "SI56 1920 0123 4567 892" in the QR as "SI56192001234567892".

4.6 Recipient reference

You write out the model and the reference separately on the form, but together in the QR. Always check the control number of the reference for the corresponding model³.

E.g. Enter the written reference "SI12 1234567890120" in the QR as "SI121234567890120".

If you use the "RF" model, which is formatted the same as the IBAN on the printout, write it in the QR unformatted, without spaces.

E.g. Enter the written reference "RF45 SBO2 010" in the QR as "RF45SBO2010".

4.7 Name, street and place of the recipient

Fields must not be empty or contain leading or trailing spaces. Only characters contained in the ISO-8859-2 code table may be used.

³ https://www.uradni-list.si/files/RS_-2019-034-01510-OB~P001-0000.PDF

4.8 Checksum

You calculate the checksum by adding the length of entered fields and punctuation from field 1 inclusive to field 19 inclusive.

$$\text{Checksum} = \text{strlen}(N1) + \text{strlen}(N2) + \dots + \text{strlen}(N19) + 19$$

If the "Checksum" is less than 100, you add a leading zero to it.

E.g. When the checksum is "193", you enter "193". When the checksum is "81", you enter "081".

4.9 Reserve

The field can be empty or contain spaces and has no punctuation. Fill in the field when your QR image preparation library does not support the entry of a certain version (mandatory version 15), but determines it automatically based on the number of entered data.

The maximum length of the "Reserve" field is limited by the capacity of the QR code, which in our case is 411 characters. You calculate it by adding the lengths of the entered fields from including field 1 to including field 20, adding the number of punctuation (always 20) and subtracting the sum from 411.

$$\text{Reserve length} = 411 - (\text{strlen}(N1) + \text{strlen}(N2) + \dots + \text{strlen}(N20) + 20)$$

When you want to fill in a field, you add the calculated number of spaces to the end of the QR content. You never add a punctuation mark at the end. After adding spaces, recheck the total length, which should not exceed 411 characters.

5. Example

How to prepare a printout of the order of registered issuers with such content:

Field	Contents
Payer	Janez Plačnik, Skopušnikova ulica 2, 1000 Ljubljana
Amount	75,57
Purpose code	COST
Payment purpose	Obligations for 11/2022
Due date	5.12.2022
Recipient's IBAN	SI56 1920 0123 4567 892
Recipient reference	Model: SI12 Reference: 1234567890120
Recipient	Prejemnik d.o.o., Testna ulica 12, 1333 Kraj

5.1 Preparation of printout data

Prepare the content for printout. Pay attention to the use of allowed characters, maximum field length and correct formatting, and to fill in all required fields,

Field name on UPN QR	Content on the printout
Name, street and place of the payer	Janez Plačnik Skopušnikova ulica 2 1000 Ljubljana
Amount	***75,57
Purpose code	COST
Payment purpose	Obligations for 11/2022
Due date	05.12.2022
Recipient's IBAN	SI56 1920 0123 4567 892
Recipient reference	SI12 1234567890120
Name, street and place of the recipient	Prejemnik d.o.o. Testna ulica 12 1333 Kraj

5.2 Preparation of QR code data

Now prepare the QR code data. Fill in fields 1 to 19 with the appropriate content and add the delimiter <LF> at the end of each one. Enter only delimiter <LF> in the empty fields. Add the lengths and enter the result in field 20 - "Checksum" and add <LF>.

Pay attention to the formatting of the Amount, IBAN and Reference fields, which are formatted differently in the QR code than on the printout. No field may contain leading or trailing spaces (except for the "Reserve" field, which can contain only spaces).

If you want to use the "Reserve" field, calculate the number of spaces allowed (item "QR Code Content - Reserve") and add them to the end of the QR content. You must not add a punctuation mark at the end of spaces.

5.3 QR code content

Seq. no.	Field name	Content written in QR code
1.	Leading style	UPNQR<LF>
2.	Payer's IBAN	<LF>
3.	Deposit	<LF>
4.	Withdrawal	<LF>
5.	Payer's reference	<LF>
6.	Payer's name	Janez Plačnik<LF>
7.	Street and no. of the payer	Skopušnikova ulica 2<LF>
8.	Place of the payer	1000 Ljubljana<LF>
9.	Amount	0000007557<LF>
10.	Payment date	<LF>
11.	Urgent	<LF>
12.	Purpose code	COST<LF>
13.	Payment purpose	Obligations for 11/2022<LF>
14.	Due date	05.12.2022<LF>
15.	Recipient's IBAN	SI56192001234567892<LF>
16.	Recipient reference	SI121234567890120<LF>
17.	Recipient's name	Prejemnik d.o.o.<LF>
18.	Street and no. of the recipient	Testna ulica 12<LF>
19.	Place of the recipient	1333 Kraj<LF>
20.	Checksum	193<LF>
	Reserve	

Prepare the QR code image by following the technical requirements (version 15, ECL-M, Binary, value of ECI 4).

After creating a QR image, print it together with the prepared printout data in the appropriate fields on the document. Make sure that all fields are in the adequate places.

If you have followed the procedures correctly, the printed order will look like this:

Ime plačnika Janez Plačnik Skopušnikova ulica 2 1000 Ljubljana Namen in rok plačila Obveznosti za 11/2022, 05.12.2022 Znesek EUR ***75,57 IBAN in referenca prejemnika SI56 1920 0123 4567 892 SI12 1234567890120 Ime prejemnika Prejemnik d.o.o. Testna ulica 12 1333 Kraj		UPN QR - potrdilo <div style="display: flex; align-items: center;"> <div> Koda QR <div style="border: 1px solid black; padding: 5px; width: 100px; height: 100px; margin: 0 auto;"></div> </div> </div> IBAN plačnika Referenca plačnika Ime, ulica in kraj plačnika Janez Plačnik Skopušnikova ulica 2 1000 Ljubljana Znesek EUR ***75,57 Datum plačila 05.12.2022 Nujno <input checked="" type="checkbox"/>		Polog <input checked="" type="checkbox"/> Dvig <input checked="" type="checkbox"/>
Koda namena COST Namen plačila Obveznosti za 11/2022 IBAN prejemnika SI56 1920 0123 4567 892 Referenca prejemnika SI12 1234567890120 Ime, ulica in kraj prejemnika Prejemnik d.o.o. Testna ulica 12 1333 Kraj		UPN QR <div style="border: 1px solid black; height: 100px; width: 100%;"></div>		

6. Useful links

- Standard UPN QR – www.zbs-giz.si
- General information about the QR code – <http://www.qrcode.com/en/>
- General information about the QR code – https://en.wikipedia.org/wiki/QR_code
- ISO-8859-2 code table – https://sl.wikipedia.org/wiki/ISO_8859-2
- Rules for creating and using standardized references - creating and using standardized references in the provision of payment services - https://www.uradni-list.si/files/RS_-2019-034-01510-OB~P001-0000.PDF