

HKS® printing inks for bar codes

Background and bar code inks

Article numbers used to identify goods are depicted as a combination of bars in the European Article Number (EAN) and American Universal Product Code (UPC) systems.

In addition, bar codes have also been developed for numerous other applications. The most common codes are:



Code a 39 is an alphanumeric bar code which is mainly used in the pharmaceutical industry.

EAN-Code

The optical reading system uses an HeNe laser as its light source. This laser emits red light with a wavelength of 633 nm. During scanning, the light/dark sequence is picked up by a photodiode and converted to an electrical pulse group. When printing this code, specifications have to be complied with that are described in DIN 66 236.

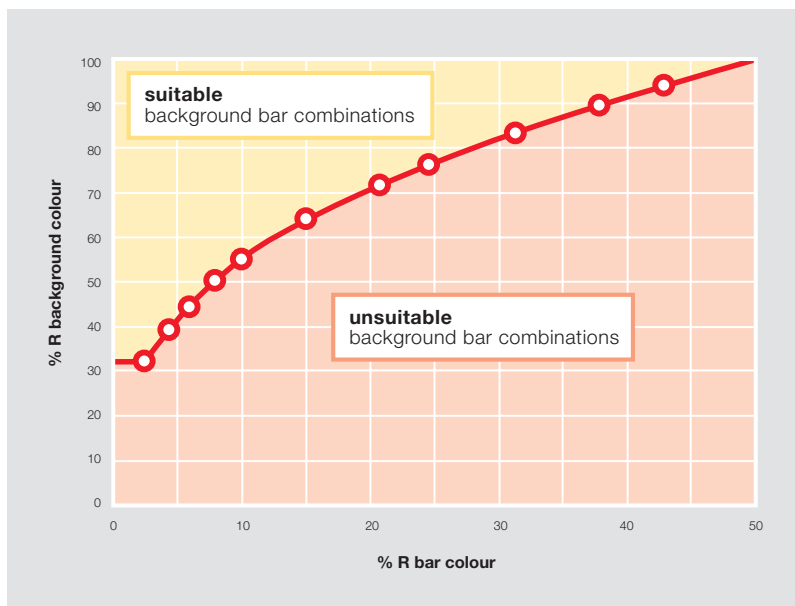
The following applies for the contrast between the characters and the background:

$$K = \frac{\text{reflectance of background} - \text{reflectance of character}}{\text{reflectance of background}}$$

The required minimum contrast depends on the reflectance of the background. The EAN code is usually printed black on white, but the required contrast can also be achieved through a combination of chromatic colours for characters and background if the reflectance values at 633 nm are far enough apart. The optical reading system, therefore, does not “see” the colours in the same way as the human eye; rather it evaluates the contrast only at this one wavelength. Similar to the case with document reader inks, it is not possible to judge whether they are readable or not by simply looking at them.



These reflectance values are known for the inks that belong to the HKS® range and listed on the following pages. This list can be used to choose from a large number of suitable colour combinations for the EAN code, so long as you make use of the chart below which uses a characteristic curve to separate the suitable combinations from the unsuitable ones. In practice, a check must be conducted on print run paper using a code reader before an actual print run is printed.



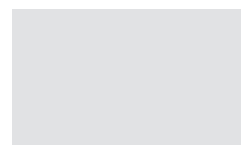
Characteristic curve for evaluating colour combinations for EAN code

The following example should make it clear how to use the chart:

A light yellow background such as HKS® 4 is wanted for the new colour design of a piece of packaging. The colour of the bar should be dark blue. On looking through the list of background colours, you find the reflectance value 86% for HKS® 4. From the chart, you can now see that with this level of background reflectance, only those bar colours whose reflectance value does not exceed 34% come into question. You then turn to the list of bar colours and check the dark blue you want to use to see whether or not it is suitable.

Background colours

Reflectance values R in % at 633 nm of HKS® colours



HKS®	% R	HKS®	% R	HKS®	% R	HKS®	% R
01	86,7	12	82,9	25	79,7	71	56,5
02	77,7	13	83,8	26	53,5	72	53,6
03	85,3	14	77,3	27	77,0	73*	37,0
04	86,0	15	67,8	28	51,9	81	47,6
05	85,0	16*	35,7	29	41,6	82*	31,9
06	86,0	17	39,3	31	54,1	89	39,8
07	85,2	21	87,0	32	61,5	91*	33,3
08	85,4	22	85,0	33	63,0		
10	84,6	23	83,4	68	54,9		
11	85,3	24	61,7	69	60,8		

* critical

The reflectance values of commercially available coated paper and board stocks lie between 80 and 90%.

Bar colours

Reflectance values R in % at 633 nm of HKS® colours



HKS®	% R	HKS®	% R	HKS®	% R	HKS®	% R
18*	20,1	46	8,8	59	2,2	78	17,2
34*	19,4	47	1,5	60	9,2	83	22,7
35	9,8	48	1,4	61	4,2	84	13,9
36	15,1	49	1,3	62	11,9	88	2,3
37	9,3	50	13,8	63	9,6	90	9,3
38	2,7	51	4,2	64	6,9	92	16,6
39	5,2	52	4,1	65	10,5	93	7,9
40	5,7	53	3,0	66*	21,4	95*	30,1
41	2,7	54	2,8	67	16,3	96*	20,0
42	3,6	55	2,1	74*	22,0	97	3,5
43	2,2	56	1,9	75*	19,8		
44	3,6	57	3,3	76	9,5		
45	10,5	58	6,0	77	12,5		* critical

Background colours with less than 40% reflectance and bar colours with more than 20% reflectance should be stringently tested by the user to ensure their suitability.

Remark

If you would like more information on the topic of "Printing Inks for Machine Reading", please refer to our [TI 29.1.04 E](#) which covers the subjects of reading techniques, optical reading and electromagnetic reading from the viewpoint of the printing ink manufacturer.