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Preferred Numbers and Series of Preferred Numbers
Basic Values Calculated Values Rounded Values

DIN 323 Part 1

Normzahlen und Normzahlreihen; Hauptwerte, Genauwerte, Rundwerte

For connection with the standards ISO 3 - 1973, ISO 17 - 1973 and ISO 497 - 1973 published by the International Organization for Standardization (ISO), see Explanations.

Table 1. Basic series

Basic values, Basic series R 5	R 10	R 20	R 40	Serial numbers N	Mantissae of logarithms	Calculated values	Variation of basic values compared with calculated values %
1,00	1,00	1,00	1,00	0	000	1,0000	0
			1,06	1	025	1,0593	+ 0,07
		1,12	1,12	2	050	1,1220	− 0,18
			1,18	3	075	1,1885	− 0,71
	1,25	1,25	1,25	4	100	1,2589	− 0,71
			1,32	5	125	1,3353	− 1,01
		1,40	1,40	6	150	1,4125	− 0,88
			1,50	7	175	1,4962	+ 0,25
1,60	1,60	1,60	1,60	8	200	1,5849	+ 0,95
			1,70	9	225	1,6788	+ 1,26
		1,80	1,80	10	250	1,7783	+ 1,22
			1,90	11	275	1,8836	+ 0,87
	2,00	2,00	2,00	12	300	1,9953	+ 0,24
			2,12	13	325	2,1135	+ 0,31
		2,24	2,24	14	350	2,2387	+ 0,06
			2,36	15	375	2,3714	− 0,48
2,50	2,50	2,50	2,50	16	400	2,5119	− 0,47
			2,65	17	425	2,6607	− 0,40
		2,80	2,80	18	450	2,8184	− 0,65
			3,00	19	475	2,9854	+ 0,49
	3,15	3,15	3,15	20	500	3,1623	− 0,39
			3,35	21	525	3,3497	+ 0,01
		3,55	3,55	22	550	3,5481	+ 0,05
			3,75	23	575	3,7584	− 0,22
4,00	4,00	4,00	4,00	24	600	3,9811	+ 0,47
			4,25	25	625	4,2170	+ 0,78
		4,50	4,50	26	650	4,4668	+ 0,74
			4,75	27	675	4,7315	+ 0,39
	5,00	5,00	5,00	28	700	5,0119	− 0,24
			5,30	29	725	5,3088	− 0,17
		5,60	5,60	30	750	5,6234	− 0,42
			6,00	31	775	5,9566	+ 0,73
6,30	6,30	6,30	6,30	32	800	6,3096	− 0,15
			6,70	33	825	6,6834	+ 0,25
		7,10	7,10	34	850	7,0795	+ 0,29
			7,50	35	875	7,4989	+ 0,01
	8,00	8,00	8,00	36	900	7,9433	+ 0,71
			8,50	37	925	8,4140	+ 1,02
		9,00	9,00	38	950	8,9125	+ 0,98
			9,50	39	975	9,4406	+ 0,63
10,00	10,00	10,00	10,00	40	000	10,0000	0

The method of writing preferred numbers without final zeros is also international practice.

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Explanations on page 4

1. Basic series

Preferred numbers are numbers to be preferentially used for the selection of given quantities, including applications outside the field of standardization. They are specified by the international standards ISO 3 - 1973, ISO 17 - 1973 and ISO 497 - 1973; see also Explanations.

Preferred numbers are rounded terms of geometrical progressions containing integral powers of 10, i.e. the numbers 1, 10, 100; 0.1 etc. The series are designated by the letter symbol R (after Renard, the discoverer of preferred numbers) and appended figures indicating the number of terms per decimal range. The relationship of a term to the one preceding it is termed the ratio. The following ratios apply

R 5: $q_5 = \sqrt[5]{10} \approx 1.6$ R 10: $q_{10} = \sqrt[10]{10} \approx 1.25$ R 20: $q_{20} = \sqrt[20]{10} \approx 1.12$ R 40: $q_{40} = \sqrt[40]{10} \approx 1.06$

Normally, only the basic values so defined (the actual preferred numbers) according to Table 1 and the basic series obtained from them are used. Coarser series take precedence over finer series, i.e. R 5 before R 10, R 10 before R 20, R 20 before R 40.
As infinite series, preferred numbers series are unlimited in both directions. In practice, however, only limited ranges, i.e. finite series, are used. Table 1 contains preferred numbers only for the decimal range from 1 to 10. Smaller and larger values result from shifting the decimal point and, where necessary, by appending zeros.
For details of the nature and use of preferred numbers and series of preferred numbers, and for information about the history, terminology and literature see DIN 323 Part 2 (successor issue at present circulating as draft).

2. Exceptional R 80 series

The exceptionally fine-graded series R 80 in which the number of terms is doubled compared with R 40 should be used only for special purposes. The ratio is

$$q_{80} = \sqrt[80]{10} \approx 1.03$$

Table 2. Exceptional R 80 series

R 40	R 80	R 40	R 80	R 40	R 80	R 40	R 80	R 40	R 80
1,00	1,00	1,60	1,60	2,50	2,50	4,00	4,00	6,30	6,30
	1,03		1,65		2,58		4,12		6,50
1,06	1,06	1,70	1,70	2,65	2,65	4,25	4,25	6,70	6,70
	1,09		1,75		2,72		4,37		6,90
1,12	1,12	1,80	1,80	2,80	2,80	4,50	4,50	7,10	7,10
	1,15		1,85		2,90		4,62		7,30
1,18	1,18	1,90	1,90	3,00	3,00	4,75	4,75	7,50	7,50
	1,22		1,95		3,07		4,87		7,75
1,25	1,25	2,00	2,00	3,15	3,15	5,00	5,00	8,00	8,00
	1,28		2,06		3,25		5,15		8,25
1,32	1,32	2,12	2,12	3,35	3,35	5,30	5,30	8,50	8,50
	1,36		2,18		3,45		5,45		8,75
1,40	1,40	2,24	2,24	3,55	3,55	5,60	5,60	9,00	9,00
	1,45		2,30		3,65		5,80		9,25
1,50	1,50	2,36	2,36	3,75	3,75	6,00	6,00	9,50	9,50
	1,55		2,43		3,87		6,15		9,75

3. Rounded value series

Rounded value series, see Table 3, contain rounded values as well as basic values. A distinction is made between series with first rounded values (R'10, R'20 and R'40) and series with second rounded values (R"5, R"10 and R"20).

Rounded values are inexact, and hence series of rounded values are irregularly graded. Because of these disadvantages, rounded values and series of rounded values are to be used only in cases where they are indispensable, see DIN 323 Part 2 (successor issue at present circulating as draft).

If their use is unavoidable, the first rounded values are to be given preference. The ranking for using the values and the series is denoted in Table 3 by the type and width of line used for the "tracks" and "points" and by the use of type of different boldness.

Table 3. Rounded value series

Basic values and rounded values Basic series and rounded value series																Calculated values	Percentage variation of the rounded values (and basic values) from the calculated values		
R 5	R'' 5	R 10	R' 10	R'' 10	R 20	R' 20	R'' 20	R 40	R' 40								R 5 to R 40	R' 10 to R' 40	R'' 5 to R'' 20
1		1			1,0			1,0								1,0000	0		
								1,06	1,05							1,0593	+ 0,07	- 0,88	
					1,12	1,1		1,12	1,1							1,1220	- 0,18	- 1,96	- 1,96
								1,18	1,2							1,1885	- 0,71	+ 0,97	
		1,25		(1,2)	1,25		(1,2)	1,25								1,2589	- 0,71		- 4,68
								1,32	1,3							1,3335	- 1,01	[- 2,51]	
					1,4			1,4								1,4125	- 0,88		
								1,5								1,4962	+ 0,25		
1,6	(1,5)	1,6		(1,5)	1,6			1,6								1,5849	+ 0,95		[- 5,36]
								1,7								1,6788	[+ 1,26]		
					1,8			1,8								1,7783	+ 1,22		
								1,9								1,8836	+ 0,87		
		2			2,0			2,0								1,9953	+ 0,24		
								2,12	2,1							2,1135	+ 0,31	- 0,64	
					2,24	2,2		2,24	2,2							2,2387	+ 0,06	- 1,73	- 1,73
								2,36	2,4							2,3714	- 0,48	+ 1,21	
2,5		2,5			2,5			2,5								2,5119	- 0,47		
								2,65	2,6							2,6607	- 0,40	- 2,28	
					2,8			2,8								2,8184	- 0,65		
								3,0								2,9854	+ 0,49		
		3,15	3,2	(3)	3,15	3,2	(3,0)	3,15	3,2							3,1623	- 0,39	+ 1,19	[- 5,13]
								3,35	3,4							3,3497	+ 0,01	+ 1,50	
					3,55	3,6	(3,5)	3,55	3,6							3,5481	+ 0,05	+ 1,46	- 1,38
								3,75	3,8							3,7584	- 0,22	+ 1,11	
4		4			4,0			4,0								3,9811	+ 0,47		
								4,25	4,2							4,2170	+ 0,78	- 0,40	
					4,5			4,5								4,4668	+ 0,74		
								4,75	4,8							4,7315	+ 0,39	+ 1,45	
		5			5,0			5,0								5,0119	- 0,24		
								5,3								5,3088	- 0,17		
					5,6		(5,5)	5,6								5,6234	- 0,42		- 2,19
								6,0								5,9566	+ 0,73		
6,3	(6)	6,3		(6)	6,3		(6,0)	6,3								6,3096	- 0,15		- 4,90
								6,7								6,6834	+ 0,25		
					7,1		(7,0)	7,1								7,0795	+ 0,29		- 1,11
								7,5								7,4989	+ 0,01		
		8			8,0			8,0								7,9433	+ 0,71		
								8,5								8,4140	+ 1,02		
					9,0			9,0								8,9125	+ 0,98		
								9,5								9,4405	+ 0,63		
10		10			10,0			10,0								10,0000	0		
Maximum variation of ratio from theoretical value in %																			
+ 1,42	- 5,37	+ 1,66	+ 1,66	- 5,61	- 1,83	- 1,97	- 4,48	+ 1,15	+ 2,94										

The values in brackets () of the rounded series R''5, R''10 and R''20, and the value 1.5 in particular should be avoided as far as possible. The following meanings apply:

[+ 1,26]	Maximum variation of basic values from calculated value (R 5 to R 40)
[- 2,51]	Maximum variation of first rounded values from calculated value (R'10, R'20 and R'40)
[- 5,36]	Maximum variation of second rounded values from calculated value in the series R''5 and R''10
[- 5,13]	Maximum variation of second rounded values from calculated value in the series R''20

Other relevant standards

DIN 323 Part 2 Preferred numbers and series of preferred numbers; introduction (successor issue at present circulating as draft)

Explanations

This Standard agrees factually with the two standards issued by the International Organization for Standardization (ISO), as follows

ISO 3 - 1973

E: Preferred numbers - Series of preferred numbers.
F: Nombres normaux - Séries de nombres normaux.

ISO 497 - 1973

E: Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers.
F: Guide pour le choix des séries de nombres normaux et des séries comportant des valeurs plus arrondies de nombres normaux.

In this new issue of DIN 323 Part 1, which has also undergone re-editing, the values of the exceptional R 80 series from ISO 3 - 1973 have been adopted and the rounded value series according to ISO 497 - 1973 added. In ISO 497 the problem of greater rounding of preferred numbers, which arises in particular in the case of linear measurements, is dealt with in general terms for all types of measurement.

In conformity with the procedure adopted by ISO, preferred numbers and rounded preferred numbers are now dealt with in the same standard.

Table 3 supersedes the previous standard DIN 3, Preferred sizes. This removes the dualism which has existed for decades between DIN 323, which recommended the application of basic values of preferred numbers, and DIN 3 which provided more rounded values for certain quantities.

In this new issue of DIN 323 Part 1 the terminology has been brought into line with ISO 3. A detailed introduction to the nature and use of preferred numbers, and to their terminology and historical background is contained in the shortly to be published new issue of DIN 323 Part 2, Preferred numbers and series of preferred numbers; introduction. This new issue also contains the essential content of

ISO 17 - 1973

E: Guide to the use of preferred numbers and of series of preferred numbers
F: Guide pour l'emploi des nombres normaux et des séries de nombres normaux