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INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

High-voltage switchgear and controlgear – Part 100: Alternating-current circuit-breakers

Appareillage à haute tension – Partie 100: Disjoncteurs à courant alternatif

IEC 62271-100:2021-07/AMD1:2024-08(en-fr)

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 100: Alternating current circuit-breakers

AMENDMENT 1

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Amendment 1 to IEC 62271-100:2021 has been prepared by subcommittee 17A: Switching devices, of IEC technical committee 17: High-voltage switchgear and controlgear.

The text of this Amendment is based on the following documents:

Draft	Report on voting
17A/1406/FDIS	17A/1410/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Amendment is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications/.

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- reconfirmed,
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- revised.

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INTRODUCTION to Amendment 1

This amendment includes the following significant changes:

In IEC 62271-100:2021 there is a slight difference for the calculation of u_c for T10 in Table 20 and Table 21. The u_c value for T10 shall be the same for k_{pp} 1,3 and k_{pp} 1,5 because both conditions also cover transformer limited faults. For voltage ratings higher than 170 kV u_c also covers cases of three-phase line faults with effectively earthed neutral systems. See also the notes in Table 20 and Table 21. By increasing the k_{af} from 1,76 to 1,765 the u_c values are practically the same again for k_{pp} 1,3 and k_{pp} 1,5.

Furthermore:

– The definition of terminal fault has been updated.
– The description of the time parameters for the rated operated sequence has been updated (the parameters remained the same).
– Rated voltages 15,5; 27 and 40,5 kV added to Table 1.
– Additional criteria for dielectric test added.
– It has been made explicit that partial discharge test only is applicable to GIS and dead-tank circuit-breakers.
– Voltage test as condition check as per 7.2.12.103 added to 7.2.12.101.
– The t_2 for T60 are corrected to the t_2 values of T100.
– TRV values in Table 16, Table 17, Table 18, Table 19, Table 20, Table 22, Table 23, Table 24, Table 25, Table 30 and Table F.1 have been recalculated and updated.
– Requirement on having inrush making current in the same phase as minimum arcing times during three-phase back-to-back capacitor bank current tests.
– Requirement to perform mechanical operating tests on all releases added.
– Existing tolerance for single-phase and double-earth fault added to Table B.1.
– Tolerance for breaking current L_{75} updated in Table B.1.

3.5.130
alternative operating mechanism

Replace the existing definition (but not the note to entry) with the following new definition:

change in the power kinematic chain of the original operating mechanism or use of a different operating mechanism which retains the same mechanical characteristics

3.7.112
terminal fault

Replace the existing definition (but not the note to entry) with the following new definition :

short-circuit on at least one of the terminals of the circuit-breaker

5.104 rated operating sequence

Replace the existing text with the following new text:

The rated operating sequence is O – t – CO – t' – CO, where

O represents an opening operation;

CO represents a close-open operating cycle with the shortest possible close-open time such that the circuit-breaker reaches the fully closed and latched position prior to opening.

The time parameters are as follows:

– circuit-breaker for auto-reclosing: t = 3 min and t'= 3 min (alternative values for t and t' may be used, for example 15 s or 1 min);

– circuit-breaker for rapid auto-reclosing: t = 0,3 s and t' = 3 min (alternative values for t' may be used, for example 15 s or 1 min);

– circuit-breaker not for auto-reclosing: t > 3 min and t' > 3 min (values for t and t' to be specified by the manufacturer).

Table 1 – Preferred values of rated capacitive currents

Replace the existing Table 1 with the following new table:

Table 1 – Preferred values of rated capacitive currents

	Line	Cable	Single capacitor bank	Back-to-back capacitor bank	
Rated voltage	Rated line-charging breaking current	Rated cable-charging breaking current	Rated single capacitor bank breaking current	Rated back-to-back capacitor bank breaking current	Rated back-to-back capacitor bank inrush making current
U_r	I_l	I_c	I_{sb}	I_{bb}	I_{bi}
kV	A	A	A	A	kA
3,6	10	10	400	400	20
4,76	10	10	400	400	20
7,2	10	10	400	400	20
8,25	10	10	400	400	20
12	10	25	400	400	20
15	10	25	400	400	20
15,5	10	25	400	400	20
17,5	10	31,5	400	400	20
24	10	31,5	400	400	20
25,8	10	31,5	400	400	20
27	10	31,5	400	400	20
36	10	50	400	400	20
38	10	50	400	400	20
40,5	10	50	400	400	20
48,3	10	80	400	400	20
52	10	80	400	400	20
72,5	10	125	400	400	20
100	20	125	400	400	20
123	31,5	140	400	400	20
145	50	160	400	400	20
170	63	160	400	400	20
245	125	250	400	400	20
300	200	315	400	400	20
362	315	355	400	400	20
420	400	400	400	400	20
550	500	500	400	400	20
800	900	-	-	-	-
1 100	1 200	-	-	-	-
1 200	1 300	-	-	-	-

NOTE 1 The values given in this table are chosen for standardization purposes. They are preferred values and cover the majority of typical applications. If different values are applicable, any appropriate value can be specified as rated value.

NOTE 2 For actual cases, the inrush currents can be calculated based on IEC TR 62271-306 [4].

NOTE 3 The peak of the inrush current can be higher or lower than the preferred values stated in this table depending on system conditions, for example whether or not current limiting reactors are used.

NOTE 4 Preferred values for rated voltages 1 100 kV and 1 200 kV are based on applications at 50 Hz. Higher values of current could be possible in the future in systems operated at 60 Hz, however experience shows that these higher currents would not lead to a higher stress for the circuit-breaker as the recovery voltage is generally the dominant factor for breaking.

7.2.5 Criteria to pass the test

Replace the existing text with the following new text:

Subclause 7.2.5 of IEC 62271-1:2017 is applicable with the following addition:

If disruptive discharges occur and evidence cannot be given during testing that the disruptive discharges were on self-restoring insulation, the circuit-breaker shall be dismantled and inspected after the completion of the dielectric test series. If damage (for example tracking, puncture, etc.) to non-self-restoring insulation is observed, the circuit-breaker has failed the test.

For metal-enclosed circuit-breakers tested with test bushings that are not part of the circuit-breaker, disruptive discharges across the test bushings can be disregarded.

7.2.10 Partial discharge tests

Replace the existing text with the following new text:

Subclause 7.2.10 of IEC 62271-1:2017 is applicable with the following addition:

This test is only applicable to GIS and dead-tank circuit-breakers.

Normally it is not required to perform partial discharge tests on a complete circuit-breaker. However, in case of dead-tank and GIS circuit-breakers using components for which a relevant IEC standard exists that requires partial discharge measurements (for example, bushings, see IEC 60137 [8]), evidence shall be provided by the manufacturer showing that those components have passed the partial discharge tests as required by the relevant IEC standard.

7.2.12.101 Condition after mechanical or environmental test

Replace the existing text with the following new text:

Where after mechanical or environmental tests (see 7.101.1.4) the insulating properties across open contacts of a circuit-breaker cannot be verified by visual inspection with sufficient reliability, a voltage test as condition check in dry condition across the open circuit-breaker according to 7.2.12 of IEC 62271-1:2017 or 7.2.12.103 of this document shall be applied. For metal enclosed circuit-breakers test conditions refer to Table 7. For multi-unit live tank circuit-breakers with identical units according to 7.102.4.2.3 the voltage test as a condition check may be performed as unit test.

7.101.1.3 Characteristics and settings of the circuit-breaker to be recorded before and after the tests

Replace the existing last paragraph and dashed items with the following new text:

The above operating characteristics shall be recorded for the conditions below (if applicable) at:

– rated supply voltage and filling pressure for operation;
– maximum supply voltage and filling pressure for operation;
– maximum supply voltage and minimum functional pressure for operation;
– minimum supply voltage and minimum functional pressure for operation;
– minimum supply voltage and filling pressure for operation.

7.101.3.1 General requirements

Delete the existing first sentence in the first paragraph.

Add the following first sentence to the second paragraph.

The tests may be combined.

7.102.4.1 Single-phase testing of a single pole of a three-pole circuit-breaker

Replace the existing second paragraph with the following new text:

Depending on the circuit-breaker design this document permits single-pole testing to cover three-phase conditions. In those cases where the circuit-breaker is equipped with one operating mechanism for all three poles, a complete three-pole assembly shall be supplied for the tests.

Replace the existing third paragraph with the following new text:

For short-circuit tests, in order to establish whether single-pole testing to cover three-phase conditions is permitted, verification tests for making and breaking shall be performed. Furthermore, it shall be checked that the operating characteristics of the circuit-breaker to be single-phase tested correspond to the provisions of 7.101.1.1.

7.102.9.2 Insulation properties

Delete the existing note.

7.105.2.1 General

Delete the existing note.

7.105.5.1 General

Replace the existing Table 16, Table 17, Table 18 and Table 19 with the following new tables:

Table 16 – Values of prospective TRV for class S1 circuit-breakers rated for k_{pp} = 1,5

U_r	Test-duty	k_{pp}	k_{af}	u_c	t_3	t_d	u'	t'	u_c/t_3
kV		p.u	p.u	kV	µs	µs	kV	µs	kV/µs
3,6	T100	1,5	1,4	6,17	40,7	6,10	2,06	19,7	0,152
	T60	1,5	1,5	6,61	17,9	2,68	2,20	8,65	0,370
	T30	1,5	1,6	7,05	8,95	1,34	2,35	4,32	0,788
	T10	1,5	1,7	7,50	8,95	1,34	2,50	4,32	0,838
4,76	T100	1,5	1,4	8,16	44,8	6,73	2,72	21,7	0,182
	T60	1,5	1,5	8,74	19,7	2,96	2,91	9,54	0,443
	T30	1,5	1,6	9,33	9,87	1,48	3,11	4,77	0,945
	T10	1,5	1,7	9,91	9,87	1,48	3,30	4,77	1,00
7,2	T100	1,5	1,4	12,3	51,5	7,73	4,12	24,9	0,240
	T60	1,5	1,5	13,2	22,7	3,40	4,41	11,0	0,584
	T30	1,5	1,6	14,1	11,3	1,70	4,70	5,48	1,24
	T10	1,5	1,7	15,0	11,3	1,70	5,00	5,48	1,32
8,25	T100	1,5	1,4	14,1	54,0	8,09	4,72	26,1	0,262
	T60	1,5	1,5	15,2	23,7	3,56	5,05	11,5	0,638
	T30	1,5	1,6	16,2	11,9	1,78	5,39	5,74	1,36
	T10	1,5	1,7	17,2	11,9	1,78	5,73	5,74	1,45
12	T100	1,5	1,4	20,6	61,8	9,27	6,86	29,9	0,333
	T60	1,5	1,5	22,0	27,2	4,08	7,35	13,1	0,811
	T30	1,5	1,6	23,5	13,6	2,04	7,84	6,57	1,73
	T10	1,5	1,7	25,0	13,6	2,04	8,33	6,57	1,84
15	T100	1,5	1,4	25,7	67,7	10,2	8,57	32,7	0,380
	T60	1,5	1,5	27,6	29,8	4,47	9,19	14,4	0,925
	T30	1,5	1,6	29,4	14,9	2,23	9,80	7,20	1,97
	T10	1,5	1,7	31,2	14,9	2,23	10,4	7,20	2,10
15,5	T100	1,5	1,4	26,6	68,7	10,3	8,86	33,2	0,387
	T60	1,5	1,5	28,5	30,2	4,53	9,49	14,6	0,943
	T30	1,5	1,6	30,4	15,1	2,27	10,1	7,30	2,01
	T10	1,5	1,7	32,3	15,1	2,27	10,8	7,30	2,14
17,5	T100	1,5	1,4	30,0	72,5	10,9	10,0	35,0	0,414
	T60	1,5	1,5	32,1	31,9	4,79	10,7	15,4	1,00
	T30	1,5	1,6	34,3	16,0	2,39	11,4	7,71	2,15
	T10	1,5	1,7	36,4	16,0	2,39	12,1	7,71	2,28
24	T100	1,5	1,4	41,2	85,0	12,7	13,7	41,1	0,484
	T60	1,5	1,5	44,1	37,4	5,61	14,7	18,1	1,18
	T30	1,5	1,6	47,0	18,7	2,80	15,7	9,04	2,52
	T10	1,5	1,7	50,0	18,7	2,80	16,7	9,04	2,67

U_r kV	Test-duty	k_{pp} p.u	k_{af} p.u	u_c kV	t_3 µs	t_d µs	u' kV	t' µs	u_c/t_3 kV/µs
25,8	T100	1,5	1,4	44,2	88,4	13,3	14,7	42,7	0,500
	T60	1,5	1,5	47,4	38,9	5,84	15,8	18,8	1,22
	T30	1,5	1,6	50,6	19,5	2,92	16,9	9,40	2,60
	T10	1,5	1,7	53,7	19,5	2,92	17,9	9,40	2,76
27	T100	1,5	1,4	46,3	90,7	13,6	15,4	43,8	0,511
	T60	1,5	1,5	49,6	39,9	5,99	16,5	19,3	1,24
	T30	1,5	1,6	52,9	20,0	2,99	17,6	9,64	2,65
	T10	1,5	1,7	56,2	20,0	2,99	18,7	9,64	2,82
36	T100	1,5	1,4	61,7	107	16,1	20,6	51,8	0,576
	T60	1,5	1,5	66,1	47,2	7,07	22,0	22,8	1,40
	T30	1,5	1,6	70,5	23,6	3,54	23,5	11,4	2,99
	T10	1,5	1,7	75,0	23,6	3,54	25,0	11,4	3,18
38	T100	1,5	1,4	65,2	111	16,6	21,7	53,5	0,589
	T60	1,5	1,5	69,8	48,7	7,30	23,3	23,5	1,43
	T30	1,5	1,6	74,5	24,3	3,65	24,8	11,8	3,06
	T10	1,5	1,7	79,1	24,3	3,65	26,4	11,8	3,25
40,5	T100	1,5	1,4	69,4	115	17,2	23,1	55,5	0,605
	T60	1,5	1,5	74,4	50,5	7,58	24,8	24,4	1,47
	T30	1,5	1,6	79,4	25,3	3,79	26,5	12,2	3,14
	T10	1,5	1,7	84,3	25,3	3,79	28,1	12,2	3,34
48,3	T100	1,5	1,4	82,8	127	19,0	27,6	61,4	0,652
	T60	1,5	1,5	88,7	55,9	8,38	29,6	27,0	1,59
	T30	1,5	1,6	94,6	27,9	4,19	31,5	13,5	3,39
	T10	1,5	1,7	101	27,9	4,19	33,5	13,5	3,60
52	T100	1,5	1,4	89,2	132	19,8	29,7	63,9	0,674
	T60	1,5	1,5	95,5	58,2	8,73	31,8	28,1	1,64
	T30	1,5	1,6	102	29,1	4,37	34,0	14,1	3,50
	T10	1,5	1,7	108	29,1	4,37	36,1	14,1	3,72
72,5	T100	1,5	1,4	124	166	24,9	41,4	80,1	0,750
	T60	1,5	1,5	133	72,9	10,9	44,4	35,2	1,83
	T30	1,5	1,6	142	36,5	5,47	47,4	17,6	3,90
	T10	1,5	1,7	151	36,5	5,47	50,3	17,6	4,14

NOTE k_{pp} = 1,5 is specified to cover transformer-limited fault conditions with X_0/X_1 higher than 3,0 (for example non-effectively earthed transformers in effectively earthed neutral systems, or cases of transformers having one side effectively earthed and the other connected to non-effectively earthed neutral systems).

Table 17 – Values of prospective TRV for class S1 circuit-breakers rated for k_{pp} = 1,3

U_r kV	Test-duty	k_{pp} p.u	k_{af} p.u	u_c kV	t_3 µs	t_d µs	u' kV	t' µs	u_c/t_3 kV/µs
3,6	T100	1,3	1,4	5,35	35,2	5,29	1,78	17,0	0,152
	T60	1,3	1,5	5,73	15,5	2,33	1,91	7,50	0,370
	T30	1,3	1,6	6,11	7,75	1,16	2,04	3,75	0,788
	T10	1,5	1,7	7,50	8,95	1,34	2,50	4,32	0,838
4,76	T100	1,3	1,4	7,07	38,9	5,83	2,36	18,8	0,182
	T60	1,3	1,5	7,58	17,1	2,57	2,53	8,27	0,443
	T30	1,3	1,6	8,08	8,55	1,28	2,69	4,13	0,945
	T10	1,5	1,7	9,91	9,87	1,48	3,30	4,77	1,00
7,2	T100	1,3	1,4	10,7	44,6	6,70	3,57	21,6	0,240
	T60	1,3	1,5	11,5	19,6	2,95	3,82	9,49	0,584
	T30	1,3	1,6	12,2	9,82	1,47	4,08	4,75	1,24
	T10	1,5	1,7	15,0	11,3	1,70	5,00	5,48	1,32
8,25	T100	1,3	1,4	12,3	46.8	7.01	4,09	22,6	0,262
	T60	1,3	1,5	13,1	20,6	3,09	4,38	9,94	0,638
	T30	1,3	1,6	14,0	10,3	1,54	4,67	4,97	1,36
	T10	1,5	1,7	17,2	11,9	1,78	5,73	5,74	1,45
12	T100	1,3	1,4	17,8	53,6	8,03	5,94	25,9	0,333
	T60	1,3	1,5	19,1	23,6	3,54	6,37	11,4	0,811
	T30	1,3	1,6	20,4	11,8	1,77	6,79	5,70	1,73
	T10	1,5	1,7	25,0	13,6	2,04	8,33	6,57	1,84
15	T100	1,3	1,4	22,3	58,7	8,80	7,43	28,4	0,380
	T60	1,3	1,5	23,9	25,8	3,87	7,96	12,5	0,925
	T30	1,3	1,6	25,5	12,9	1,94	8,49	6,24	1,97
	T10	1,5	1,7	31,2	14,9	2,23	10,4	7,20	2,10
15,5	T100	1,3	1,4	23,0	59,5	8,93	7,68	28,8	0,387
	T60	1,3	1,5	24,7	26,2	3,93	8,23	12,7	0,943
	T30	1,3	1,6	26,3	13,1	1,96	8,77	6,33	2,01
	T10	1,5	1,7	32,3	15,1	2,27	10,8	7,30	2,14
17,5	T100	1,3	1,4	26,0	62.8	9,43	8,67	30,4	0,414
	T60	1,3	1,5	27,9	27,7	4,15	9,29	13,4	1,01
	T30	1,3	1,6	29,7	13,8	2,07	9,91	6,68	2,15
	T10	1,5	1,7	36,4	16,0	2,39	12,1	7,71	2,28
24	T100	1,3	1,4	35,7	73,6	11,0	11,9	35,6	0,484
	T60	1,3	1,5	38,2	32,4	4,86	12,7	15,7	1,18
	T30	1,3	1,6	40,8	16,2	2,43	13,6	7,83	2,52
	T10	1,5	1,7	50,0	18,7	2,80	16,7	9,04	2,67
25,8	T100	1,3	1,4	38,3	76,6	11,5	12,8	37,0	0,500
	T60	1,3	1,5	41,1	33,7	5,06	13,7	16,3	1,22
	T30	1,3	1,6	43,8	16,9	2,53	14,6	8,15	2,60
	T10	1,5	1,7	53,7	19,5	2,92	17,9	9,4	2,76

U_r kV	Test-duty	k_{pp} p.u	k_{af} p.u	u_c kV	t_3 µs	t_d µs	u' kV	t' µs	u_c/t_3 kV/µs
27	T100	1,3	1,4	40,1	78,6	11,8	13,4	38,0	0,511
	T60	1,3	1,5	43,0	34,6	5,19	14,3	16,7	1,24
	T30	1,3	1,6	45,9	17,3	2,59	15,3	8,36	2,65
	T10	1,5	1,7	56,2	20,0	2,99	18,7	9,64	2,82
36	T100	1,3	1,4	53,5	92,9	13,9	17,8	44,9	0,576
	T60	1,3	1,5	57,3	40,9	6,13	19,1	19,8	1,40
	T30	1,3	1,6	61,1	20,4	3,07	20,4	9,88	2,99
	T10	1,5	1,7	75,0	23,6	3,54	25,0	11,4	3,18
38	T100	1,3	1,4	56,5	95,9	14,4	18,8	46,4	0,589
	T60	1,3	1,5	60,5	42,2	6,33	20,2	20,4	1,43
	T30	1,3	1,6	64,5	21,1	3,16	21,5	10,2	3,06
	T10	1,5	1,7	79,1	24,3	3,65	26,4	11,8	3,25
40,5	T100	1,3	1,4	60,2	99,5	14,9	20,1	48,1	0,605
	T60	1,3	1,5	64,5	43,8	6,57	21,5	21,2	1,47
	T30	1,3	1,6	68,8	21,9	3,28	22,9	10,6	3,14
	T10	1,5	1,7	84,3	25,3	3,79	28,1	12,2	3,34
48,3	T100	1,3	1,4	71,8	110	16,5	23,9	53,2	0,652
	T60	1,3	1,5	76,9	48,4	7,26	25,6	23,4	1,59
	T30	1,3	1,6	82,0	24,2	3,63	27,3	11,7	3,39
	T10	1,5	1,7	101	27,9	4,19	33,5	13,5	3,60
52	T100	1,3	1,4	77,3	115	17,2	25,8	55,4	0,674
	T60	1,3	1,5	82,8	50,4	7,57	27,6	24,4	1,64
	T30	1,3	1,6	88,3	25,2	3,78	29,4	12,2	3,50
	T10	1,5	1,7	108	29,1	4,37	36,1	14,1	3,72
72,5	T100	1,3	1,4	108	144	21,6	35,9	69,4	0,750
	T60	1,3	1,5	115	62,2	9,48	38,5	30,5	1,83
	T30	1,3	1,6	123	31,6	4,74	41,0	15,3	3,90
	T10	1,5	1,7	151	36,5	5,47	50,3	17,6	4,14

NOTE k_{pp} = 1,5 is specified to cover transformer-limited fault conditions with X_0/X_1 higher than 3,0 (for example non-effectively earthed transformers in effectively earthed neutral systems, or cases of transformers having one side effectively earthed and the other connected to non-effectively earthed neutral systems).

Table 18 – Values of prospective TRV for class S2 circuit-breakers rated for k_{pp} = 1,5

U_r kV	Test-duty	k_{pp} p.u.	k_{af} p.u.	u_c kV	t_3 µs	t_d µs	u' kV	t' µs	u_c/t_3 kV/µs
3,6	T100	1,5	1,54	6,79	11,5	0,57	2,26	4,40	0,591
	T60	1,5	1,65	7,27	7,70	1,15	2,42	3,72	0,945
	T30	1,5	1,74	7,67	4,59	0,689	2,56	2,22	1,67
	T10	1,5	1,80	7,94	4,59	0,689	2,65	2,22	1,73
4,76	T100	1,5	1,54	8,98	13,9	0,697	2,99	5,35	0,644
	T60	1,5	1,65	9,62	9,34	1,40	3,21	4,52	1,03
	T30	1,5	1,74	10,1	5,58	0,837	3,38	2,70	1,82
	T10	1,5	1,80	10,5	5,58	0,837	3,50	2,70	1,88
7,2	T100	1,5	1,54	13,6	18,6	0,930	4,53	7,13	0,730
	T60	1,5	1,65	14,6	12,5	1,87	4,85	6,02	1,17
	T30	1,5	1,74	15,3	7,44	1,12	5,11	3,59	2,06
	T10	1,5	1,80	15,9	7,44	1,12	5,29	3,59	2,13
8,25	T100	1,5	1,54	15,6	20,4	1,02	5,19	7,83	0,761
	T60	1,5	1,65	16,7	13,7	2,05	5,56	6,62	1,22
	T30	1,5	1,74	17,6	8,18	1,23	5,86	3,95	2,15
	T10	1,5	1,80	18,2	8,18	1,23	6,06	3,95	2,22
12	T100	1,5	1,54	22,6	26,5	1,33	7,54	10,2	0,854
	T60	1,5	1,65	24,3	17,8	2,67	8,08	8,59	1,36
	T30	1,5	1,74	25,6	10,6	1,59	8.52	5,13	2,41
	T10	1,5	1,80	26,5	10,6	1,59	8,82	5,13	2,49
15	T100	1,5	1,54	28,3	31,0	1,55 (4,64)	9,43	11,9 (15,0)	0,914
	T60	1,5	1,65	30,3	20,7	3,11	10,1	10,0	1,46
	T30	1,5	1,74	32,0	12,4	1,86	10,7	5,99	2,58
	T10	1,5	1,80	33,1	12,4	1,86	11,0	5,99	2,67
15,5	T100	1,5	1,54	29,2	31,7	1,58 (4,75)	9,74	12,1 (15,3)	0,923
	T60	1,5	1,65	31,3	21,2	3,18	10,4	10,3	1,48
	T30	1,5	1,74	33,0	12,7	1,90	11,0	6,12	2,61
	T10	1,5	1,80	34,2	12,7	1,90	11,4	6,12	2,70
17,5	T100	1,5	1,54	33,0	34,5	1,72 (5,17)	11,0	13,2 (16,7)	0,958
	T60	1,5	1,65	35,4	23,1	3,46	11,8	11,2	1,53
	T30	1,5	1,74	37,3	13,8	2,07	12,4	6,66	2,70
	T10	1,5	1,80	38,6	13,8	2,07	12,9	6,66	2,80
24	T100	1,5	1,54	45,3	42,9	2,15 (6,44)	15,1	16,5 (20,7)	1,05
	T60	1,5	1,65	48,5	28,8	4,31	16,2	13,9	1,69
	T30	1,5	1,74	51,1	17,2	2,58	17,0	8,32	2,98
	T10	1,5	1,8	52,9	17,2	2,58	17,6	8,32	3,08
25,8	T100	1,5	1,54	48,7	45,1	2,26 (6,77)	16,2	17,3 (21,8)	1,08
	T60	1,5	1,65	52,1	30,2	4,54	17,4	14,6	1,72
	T30	1,5	1,74	55,0	18,1	2,71	18,3	8,73	3,04
	T10	1,5	1,80	56,9	18,1	2,71	19,0	8,73	3,15