Calculation of dynamic overload capability

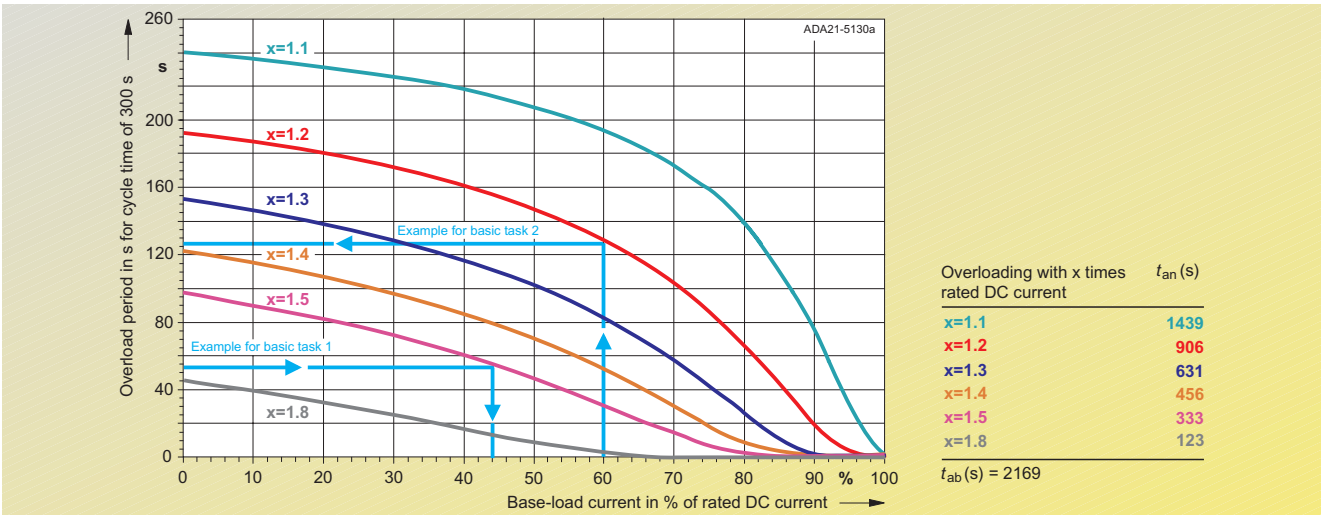


Fig. 5/1
Characteristics for example calculations for basic tasks 1 and 2

Basic task 1

- Known quantities:
  Converter, cycle time, overload factor, overload period
- Quantities to be found:
  (min.) base-load duty period and max. base-load current
- Solution:
  See Table 2

Example for basic task 1

- Known quantities:
  – 30 A converter
  – Cycle time 113.2 s
  – Overload factor 1.45
  – Overload period 20 s
- Quantities to be found:
  – (min.) base-load duty period
  – max. base-load current
- Solution:
  – Limit characteristic for 30 A converter
  – Overload factor 1.5
  – Overload period$_{300}$ = 300 s/113.2 s) x 20 s = 53 s ->
  – Max. base-load current = 44% I_{rated} = 13.2 A

Basic task 2

- Known quantities:
  Converter, cycle time, overload factor, base-load current
- Quantities to be found:
  Maximum overload period, minimum base-load period
- Solution: See Table 3

	Definition
Base-load duty period$_{300}$	Min. base-load duty period for 300 s cycle time (300 s overload period)
Overload period$_{300}$	Max. overload period for 300 s cycle time

Table 1
Explanation of terms

	Cycle time	
	< 300 s	**≥ 300 s**
1. Determine curve	Selection of limit characteristic for specific converter and overload factor (see Fig. 5/1)	
2. Overload period$_{300}$ =	300 s/cycle time x overload period	Overload period$_{300}$
3. Base-load duty period$_{300}$ =	300 s overload period$_{300}$	300 s overload period$_{300}$
4. Base-load duty period$_{300}$ < base-load duty period$_{300}$ for max. base-load current = 0	Yes: Required cycle time not configurable No: Read off max. baseload current for overload period$_{300}$ from limit characteristic	
5. Determine percentage for base-load current	Read of percentage for base-load current from diagram	

Table 2
Steps to solve basic task 1

	Cycle time	
	< 300 s	**≥ 300 s**
1. Determine curve	Selection of limit characteristic for specific converter and overload factor (see Fig. 5/1)	
2. Max. overload period =	(cycle time/300 s) x overload period$_{300}$	300 s base-load duty period$_{300}$
3. Min. base-load period =	Cycle time - max. overload period	Cycle time - max. overload period

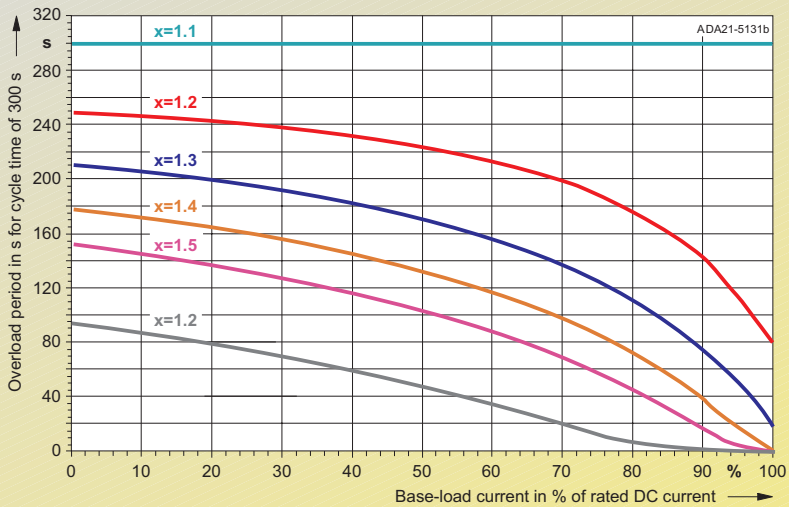
Table 3
Steps to solve basic task 2

Example for basic task 2

- Known quantities:
  – 30 A converter
  – Cycle time 140 s
  – Overload factor 1.15
  – Base-load current = 0.6 I_{rated} = 18 A
- Quantities to be found:
  – Max. overload period
  – Min. base-load period
- Solution:
  – Limit characteristic for 30 A converter
  – Overload factor 1.2
  – Base-load current = 60% I_{rated} ->
  – Overload period$_{300}$ = 127 s
  – Max. overload period = (140 s/300 s) x 127 s = 59 s
  – Min. base-load duty period = 140 s – 59 s = 81 s

Dynamic overload capability

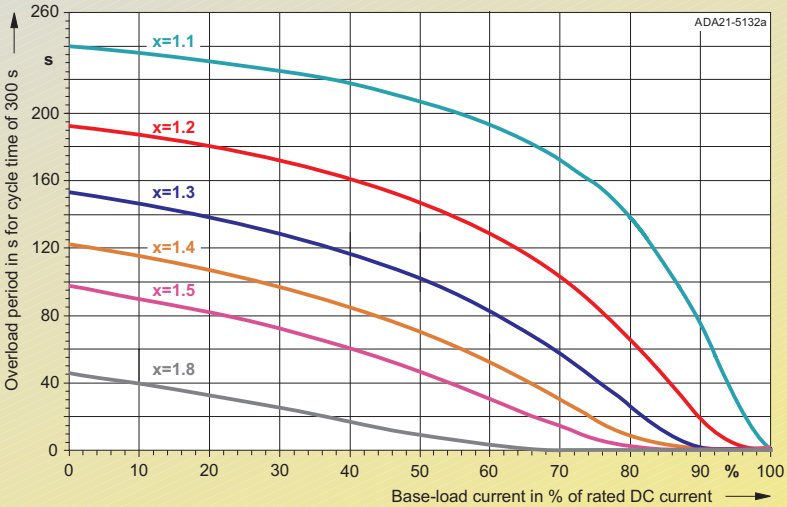
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	
x=1.2	1633
x=1.3	1112
x=1.4	833
x=1.5	651
x=1.8	382

t_{ab} (s) = 2281

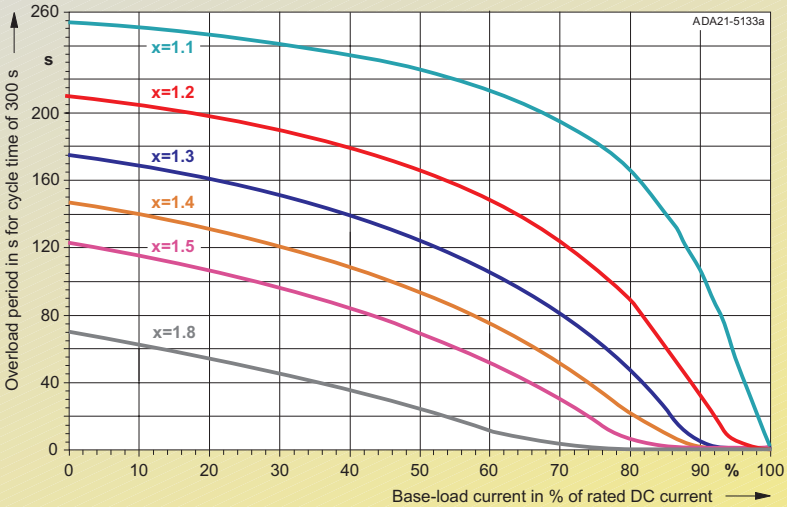
Fig. 5/2
6RA7013-6DV62 15 A/4Q/400 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	1439
x=1.2	906
x=1.3	631
x=1.4	456
x=1.5	333
x=1.8	123

t_{ab} (s) = 2169

Fig. 5/3
6RA7018-6DS22 30 A/1Q/400 V, 6RA7018-6FS22 30 A/1Q/460 V, 6RA7018-6DV62 30 A/4Q/400 V, 6RA7018-6FV62 30 A/4Q/460 V

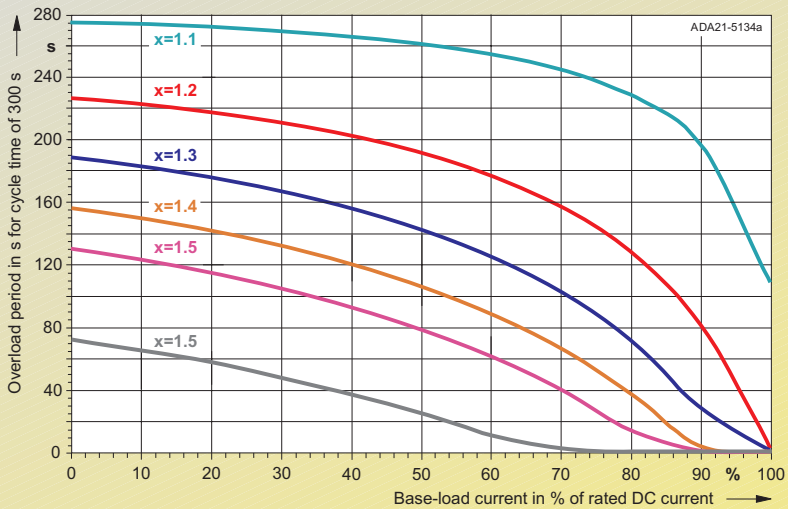


Overloading with x times rated DC current	t_{an} (s)
x=1.1	2071
x=1.2	1352
x=1.3	988
x=1.4	756
x=1.5	592
x=1.8	296

t_{ab} (s) = 2169

Fig. 5/4
6RA7025-6DS22 60 A/1Q/400 V, 6RA7025-6FS22 60 A/1Q/460 V, 6RA7025-6GS22 60 A/1Q/575 V

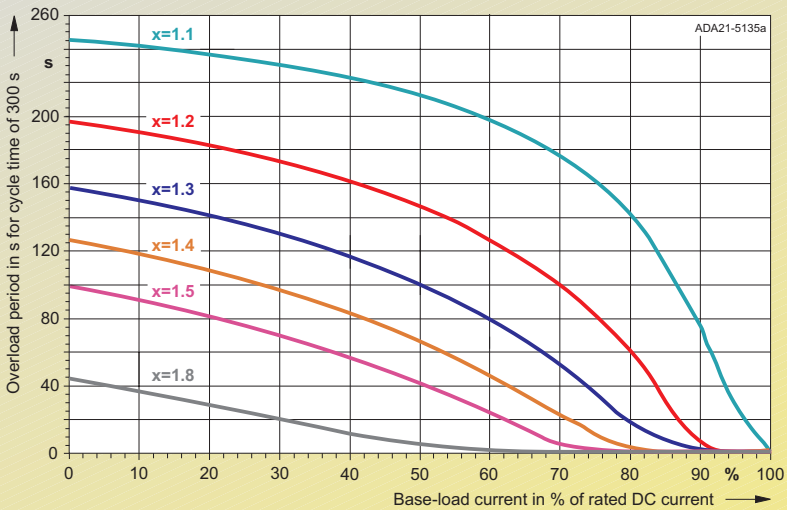
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	2535
x=1.2	1446
x=1.3	1016
x=1.4	761
x=1.5	587
x=1.8	283

t_{ab} (s) = 2522

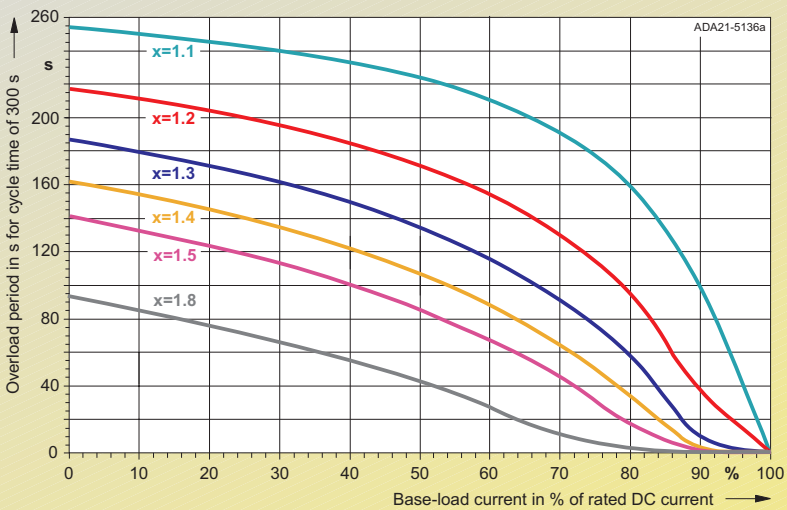
Fig. 5/5
6RA7025-6DV62 60 A/4Q/400 V, 6RA7025-6FV62 60 A/4Q/460 V, 6RA7025-6GV62 60 A/4Q/575 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	1879
x=1.2	1186
x=1.3	831
x=1.4	604
x=1.5	443
x=1.8	151

t_{ab} (s) = 2668

Fig. 5/6
6RA7028-6DS22 90 A/1Q/400 V, 6RA7028-6FS22 90 A/1Q/460 V



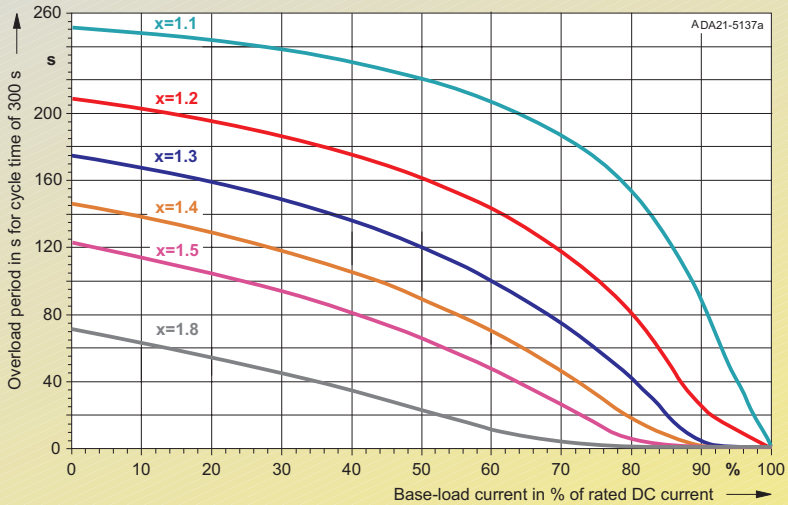
Overloading with x times rated DC current	t_{an} (s)
x=1.1	1911
x=1.2	1320
x=1.3	1007
x=1.4	804
x=1.5	659
x=1.8	391

t_{ab} (s) = 2658

Fig. 5/7
6RA7028-6DV62 90 A/4Q/400 V, 6RA7028-6FV62 90 A/4Q/460 V

Dynamic overload capability

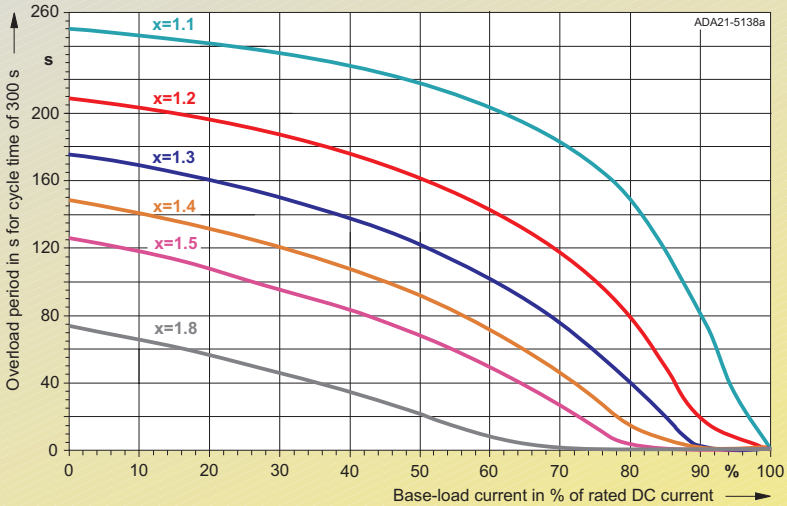
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	1994
x=1.2	1318
x=1.3	968
x=1.4	743
x=1.5	582
x=1.8	289

t_{ab} (s) = 3110

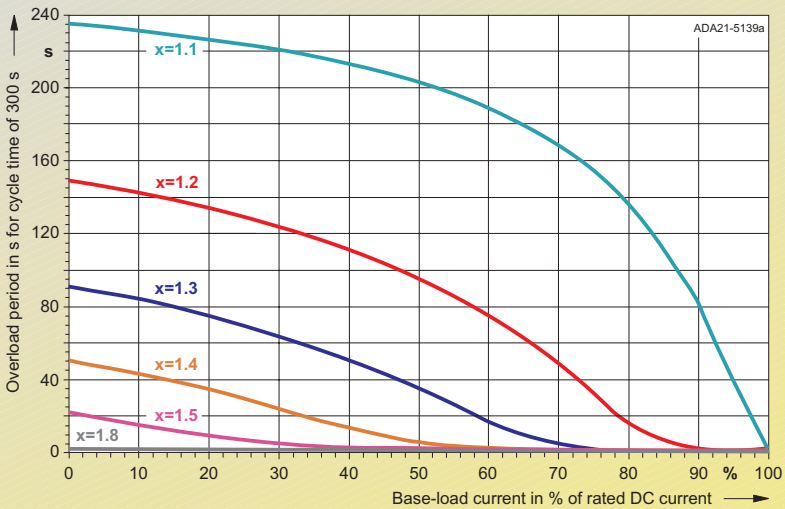
Fig. 5/8
6RA7031-6DS22 125 A/1Q/400 V, 6RA7031-6FS22 125 A/1Q/460 V, 6RA7031-6GS22 125 A/1Q/575 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	2160
x=1.2	1453
x=1.3	1079
x=1.4	836
x=1.5	662
x=1.8	344

t_{ab} (s) = 3112

Fig. 5/9
6RA7031-6DV62 125 A/4Q/400 V, 6RA7031-6FV62 125 A/4Q/460 V, 6RA7031-6GV62 125 A/4Q/575 V

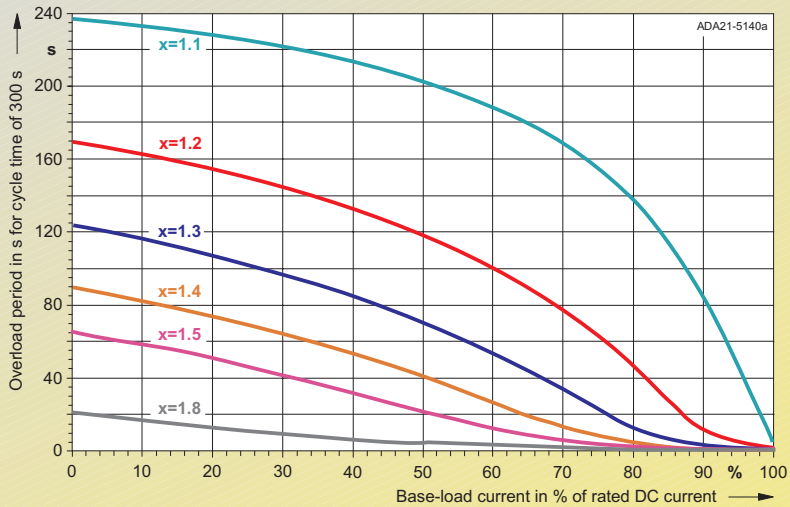


Overloading with x times rated DC current	t_{an} (s)
x=1.1	680.00
x=1.2	318.00
x=1.3	167.00
x=1.4	78.00
x=1.5	25.00
x=1.8	0.96

t_{ab} (s) = 766

Fig. 5/10
6RA7075-6DS22 210 A/1Q/400 V, 6RA7075-6FS22 210 A/1Q/460 V, 6RA7075-6GS22 210 A/1Q/575 V,

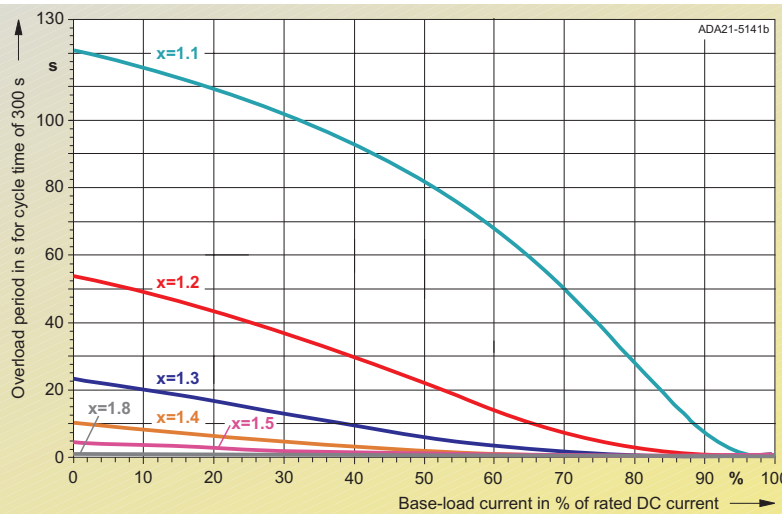
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	729
x=1.2	381
x=1.3	237
x=1.4	155
x=1.5	103
x=1.8	24

t_{ab} (s) = 840

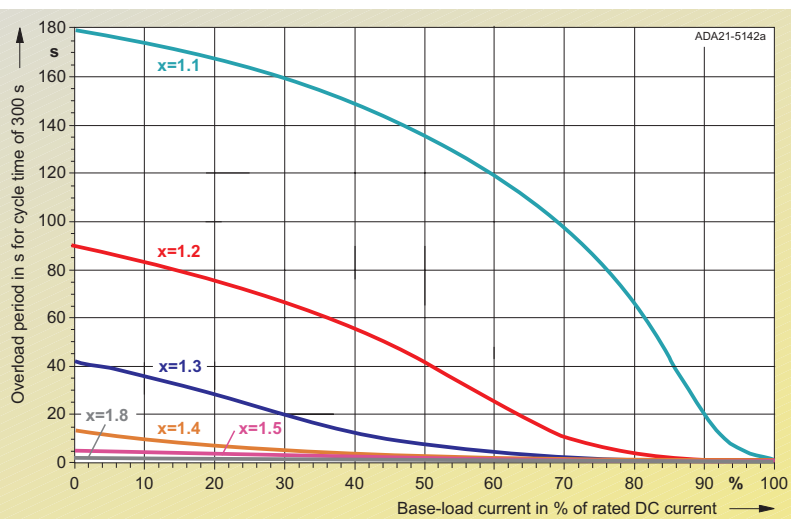
Fig. 5/11
6RA7078-6DS22 280 A/1Q/400 V, 6RA7078-6FS22 280 A/1Q/460 V, 6RA7078-6DV62 280 A/4Q/400 V, 6RA7078-6FV62 280 A/4Q/460 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	130.40
x=1.2	53.90
x=1.3	21.70
x=1.4	8.90
x=1.5	3.80
x=1.8	0.72

t_{ab} (s) = 198

Fig. 5/12
6RA7081-6DS22 400 A/1Q/400 V, 6RA7081-6GS22 400 A/1Q/575 V



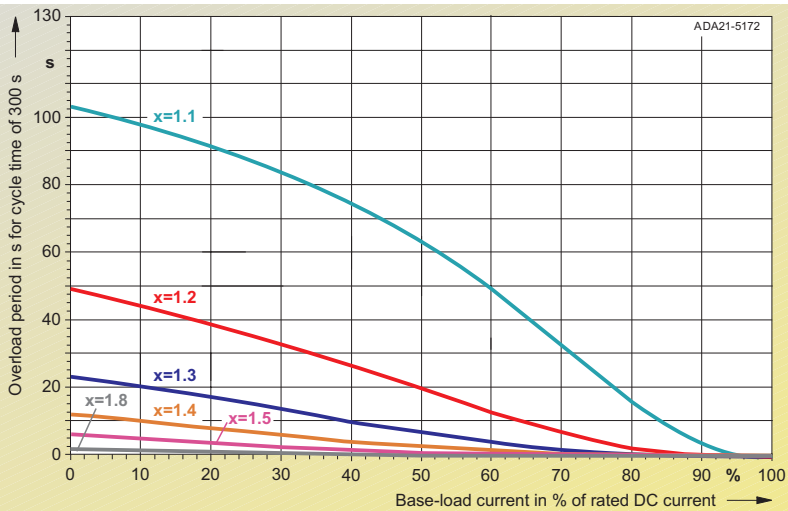
Overloading with x times rated DC current	t_{an} (s)
x=1.1	282.0
x=1.2	112.0
x=1.3	47.0
x=1.4	13.0
x=1.5	4.9
x=1.8	1.5

t_{ab} (s) = 338

Fig. 5/13
6RA7081-6DV62 400 A/4Q/400 V, 6RA7081-6GV62 400 A/4Q/575 V

Dynamic overload capability

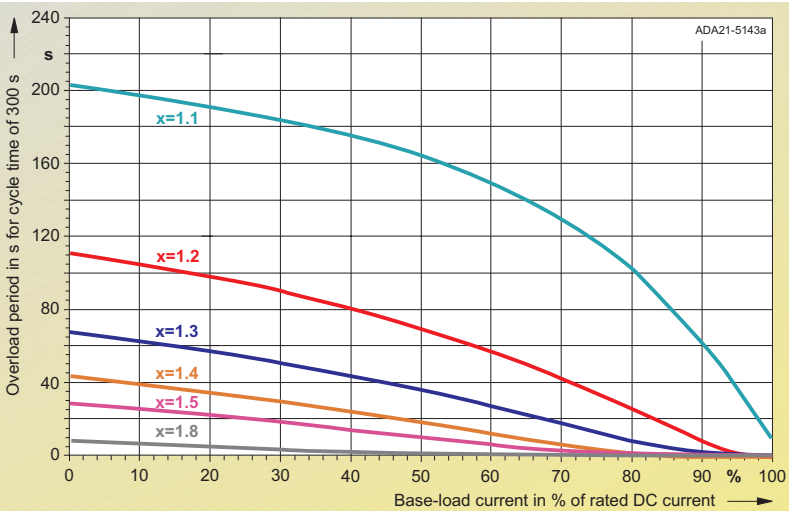
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	109.8
x=1.2	49.0
x=1.3	22.4
x=1.4	11.1
x=1.5	5.7
x=1.8	1.3

t_{ab} (s) = 206

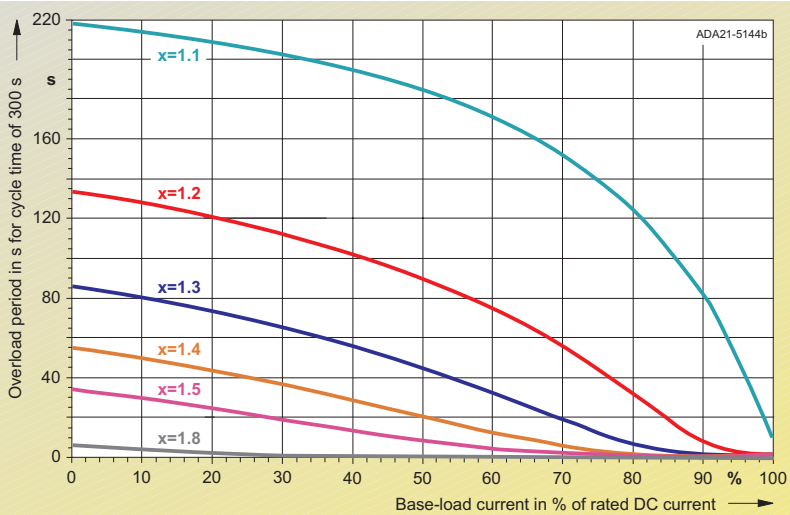
Fig. 5/14
6RA7082-6FS22 450 A/1Q/460 V, 6RA7082-6FV62 450 A/4Q/460 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	331.0
x=1.2	137.0
x=1.3	74.0
x=1.4	44.0
x=1.5	28.0
x=1.8	6.9

t_{ab} (s) = 381

Fig. 5/15
6RA7085-6DS22 600 A/1Q/400 V, 6RA7085-6FS22 600 A/1Q/460 V, 6RA7085-6GS22 600 A/1Q/575 V

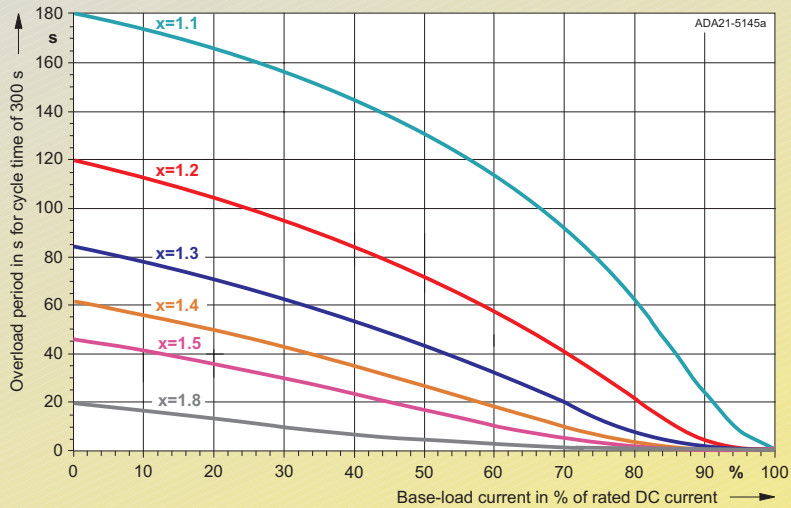


Overloading with x times rated DC current	t_{an} (s)
x=1.1	423.0
x=1.2	183.0
x=1.3	105.0
x=1.4	63.0
x=1.5	36.0
x=1.8	5.2

t_{ab} (s) = 452

Fig. 5/16
6RA7085-6DV62 600 A/4Q/400 V, 6RA7085-6FV62 600 A/4Q/460 V, 6RA7085-6GV62 600 A/4Q/575 V

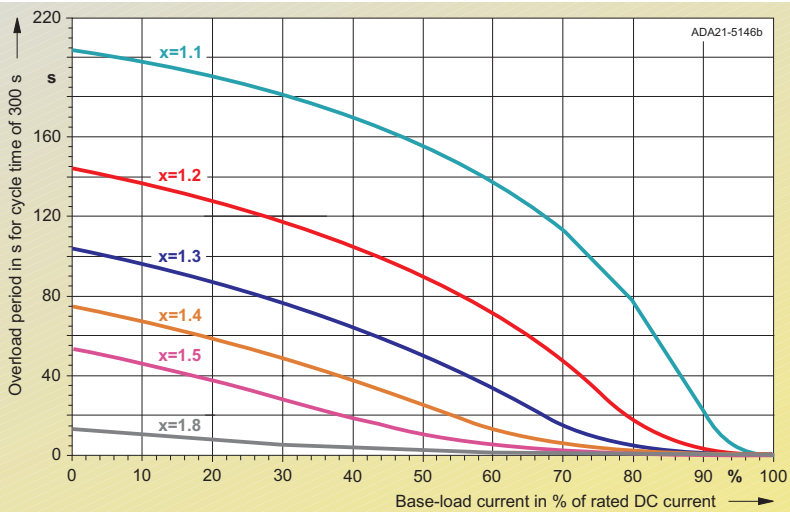
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	296
x=1.2	161
x=1.3	102
x=1.4	70
x=1.5	50
x=1.8	19

t_{ab} (s) = 516

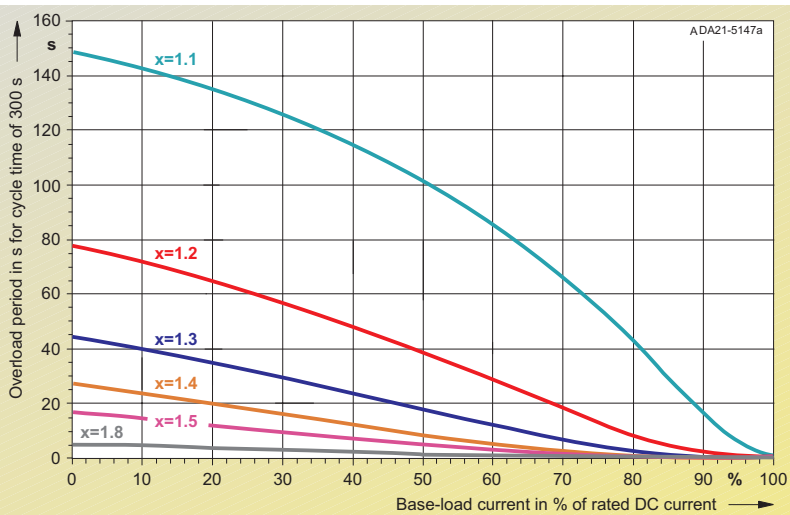
Fig. 5/17
6RA7087-6DS22 850 A/1Q/400 V, 6RA7087-6FS22 850 A/1Q/460 V, 6RA7087-6GS22 800 A/1Q/575 V, 6RA7086-6KS22 720 A/1Q/690 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	382.0
x=1.2	228.0
x=1.3	150.0
x=1.4	102.0
x=1.5	68.0
x=1.8	13.5

t_{ab} (s) = 582

Fig. 5/18
6RA7087-6DV62 850 A/4Q/400 V, 6RA7087-6FV62 850 A/4Q/460 V, 6RA7087-6GV62 850 A/4Q/575 V, 6RA7086-6KV62 760 A/4Q/690 V



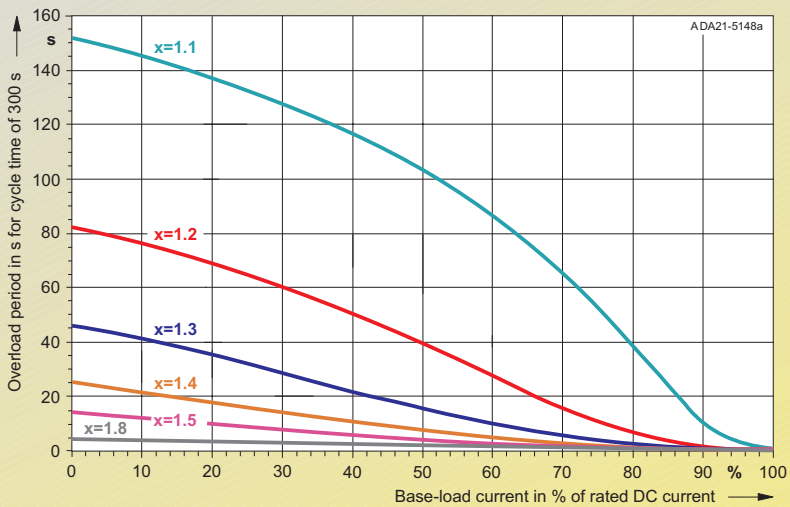
Overloading with x times rated DC current	t_{an} (s)
x=1.1	185.0
x=1.2	86.0
x=1.3	46.0
x=1.4	26.0
x=1.5	16.0
x=1.8	4.6

t_{ab} (s) = 296

Fig. 5/19
6RA7090-6GS22 1000 A/1Q/575 V, 6RA7088-6KS22 950 A/1Q/690 V, 6RA7088-6LS22 900 A/1Q/830 V

Dynamic overload capability

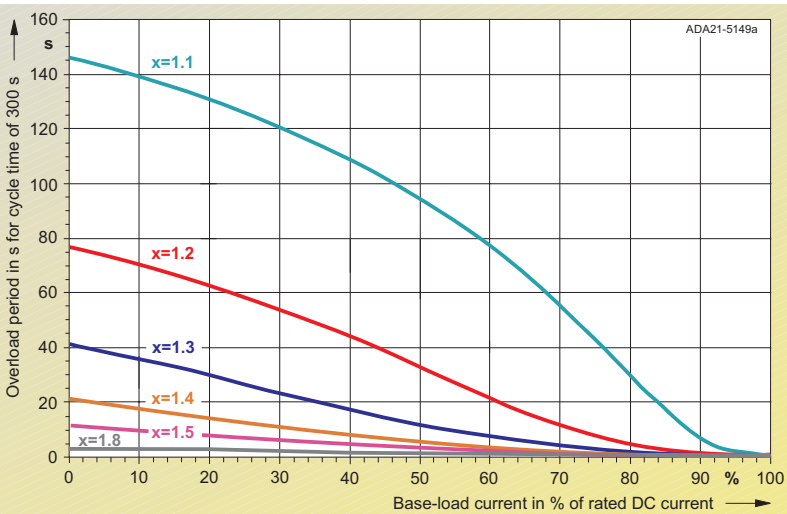
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	218.0
x=1.2	99.0
x=1.3	50.0
x=1.4	25.0
x=1.5	13.0
x=1.8	3.6

t_{ab} (s) = 373

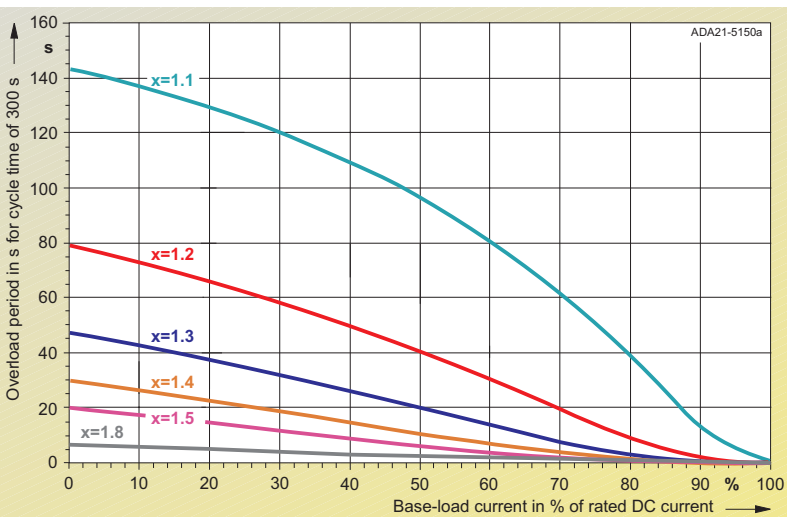
Fig. 5/20
6RA7090-6KV62 1000 A/4Q/690 V, 6RA7088-6LV62 950 A/4Q/830 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	208.0
x=1.2	91.0
x=1,3	43.6
x=1.4	20.5
x=1.5	10.5
x=1.8	2.9

t_{ab} (s) = 366

Fig. 5/21
6RA7090-6GV62 1100 A/4Q/575 V

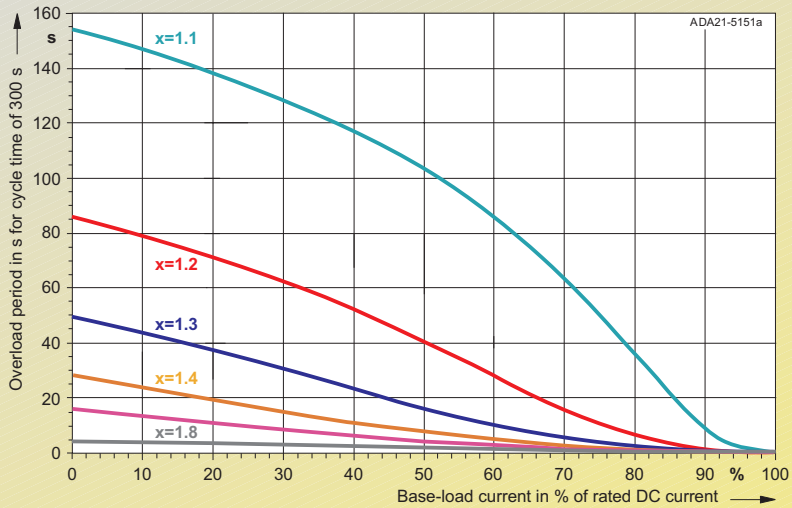


Overloading with x times rated DC current	t_{an} (s)
x=1.1	180
x=1.2	88
x=1.3	49
x=1.4	30
x=1.5	19
x=1.8	6

t_{ab} (s) = 312

Fig. 5/22
6RA7091-6DS22 1200 A/1Q/400 V, 6RA7091-6FS22 1200 A/1Q/460 V

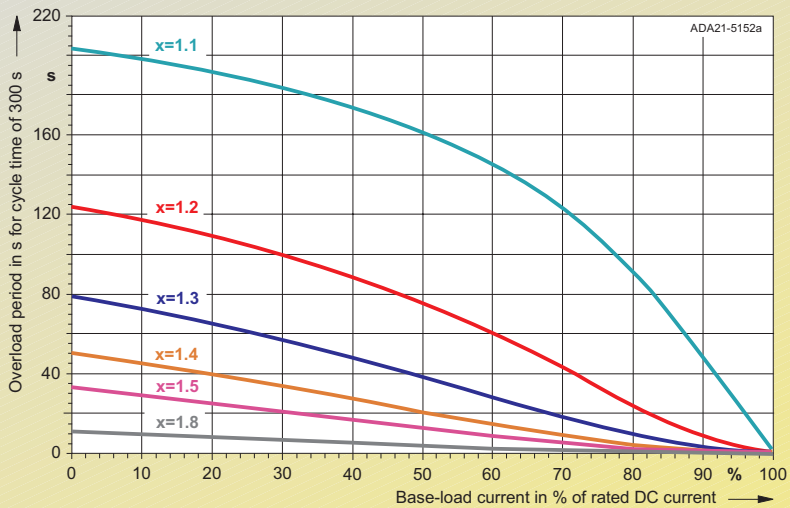
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	223
x=1.2	104
x=1.3	54
x=1.4	28
x=1.5	15
x=1.8	4

t_{ab} (s) = 383

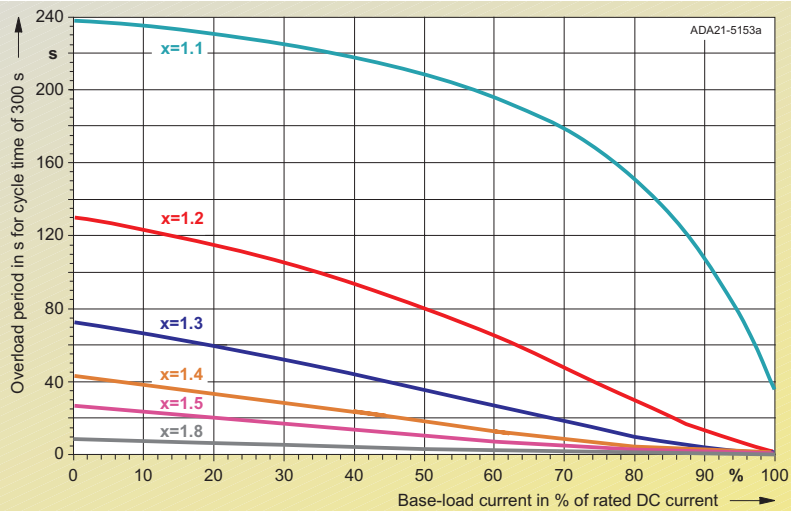
Fig. 5/23
6RA7091-6DV62 1200 A/4Q/400 V, 6RA7091-6FV62 1200 A/4Q/460 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	407
x=1.2	183
x=1.3	100
x=1.4	59
x=1.5	35
x=1.8	11

t_{ab} (s) = 565

Fig. 5/24
6RA7093-4KS22 1500 A/1Q/690 V, 6RA7093-4LS22 1500 A/1Q/830 V



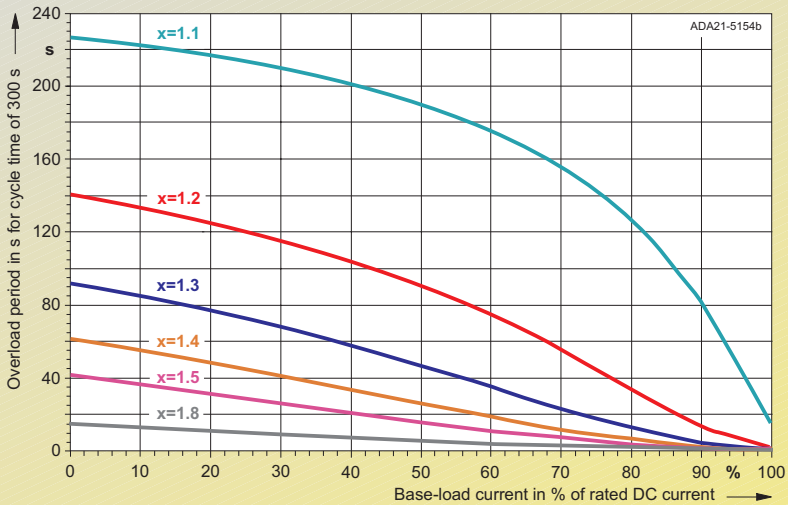
Overloading with x times rated DC current	t_{an} (s)
x=1.1	546.0
x=1.2	195.0
x=1.3	92.0
x=1.4	47.0
x=1.5	27.0
x=1.8	7.8

t_{ab} (s) = 480

Fig. 5/25
6RA7093-4KV62 1500 A/4Q/690 V, 6RA7093-4LV62 1500 A/4Q/830 V

Dynamic overload capability

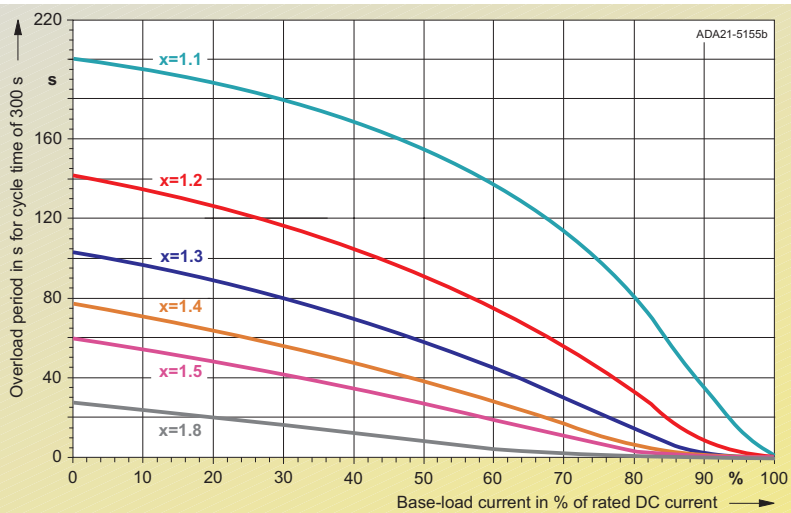
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	518.0
x=1.2	219.0
x=1.3	122.0
x=1.4	73.0
x=1.5	45.0
x=1.8	14.5

t_{ab} (s) = 548

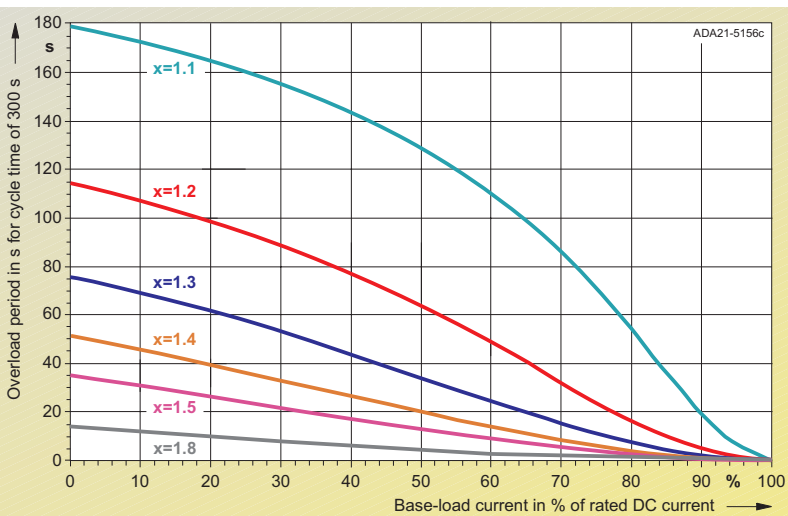
Fig. 5/26
6RA7093-4DS22 1600 A/1Q/400 V, 6RA7093-4GS22 1600 A/1Q/575 V, 6RA7093-4DV62 1600 A/4Q/400 V, 6RA7093-4GV62 1600 A/4Q/575 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	513.0
x=1.2	259.0
x=1.3	160.0
x=1.4	108.0
x=1.5	76.0
x=1.8	30.8

t_{ab} (s) = 1056

Fig. 5/27
6RA7095-4LS22 1900 A/1Q/830 V, 6RA7095-4LV62 1900 A/4Q/830 V

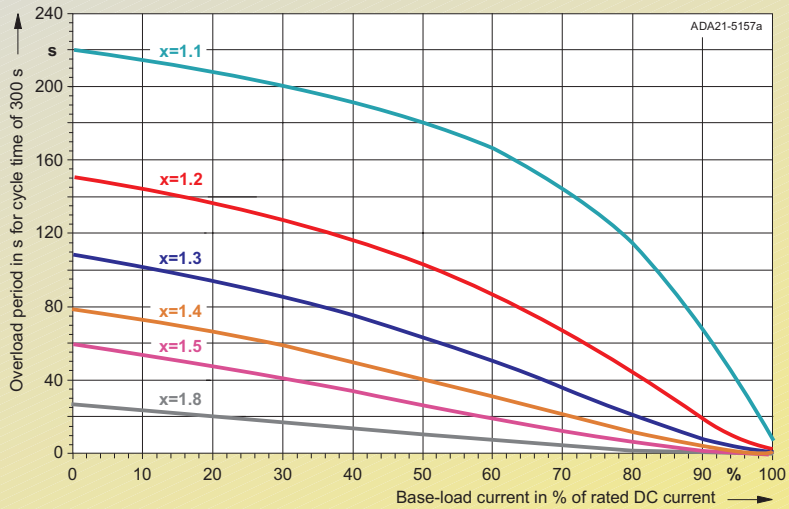


Overloading with x times rated DC current	t_{an} (s)
x=1.1	321.0
x=1.2	164.0
x=1.3	96.0
x=1.4	59.0
x=1.5	38.0
x=1.8	13.7

t_{ab} (s) = 600

Fig. 5/28
6RA7095-4DS22 2000 A/1Q/400 V, 6RA7095-4GS22 2000 A/1Q/575 V

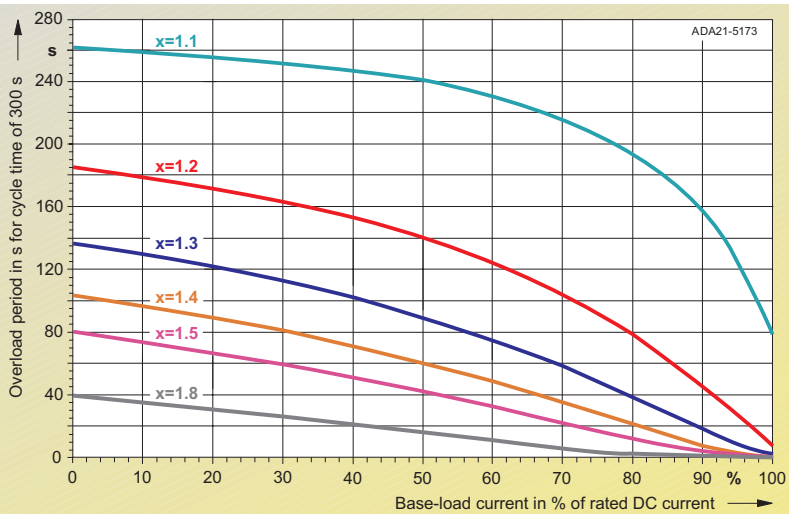
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	479.7
x=1.2	248.5
x=1.3	155.7
x=1.4	104.8
x=1.5	73.4
x=1.8	28.7

t_{ab} (s) = 663

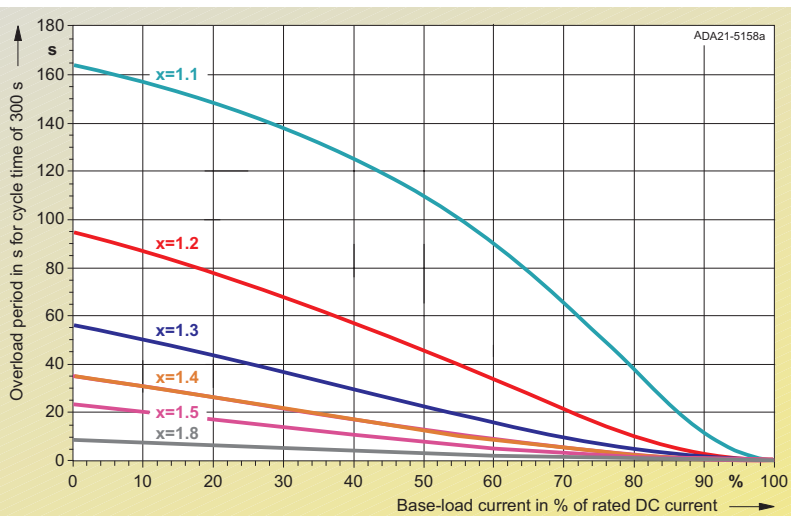
Fig. 5/29
6RA7095-4KS22 2000 A/1Q/690 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	1247.5
x=1.2	421.2
x=1.3	241.9
x=1.4	159.2
x=1.5	111.9
x=1.8	46.6

t_{ab} (s) = 1064

Fig. 5/30
6RA7095-4GS22 2000 A/1Q/575 V, 6RA7095-4GV62 2000 A/4Q/575 V



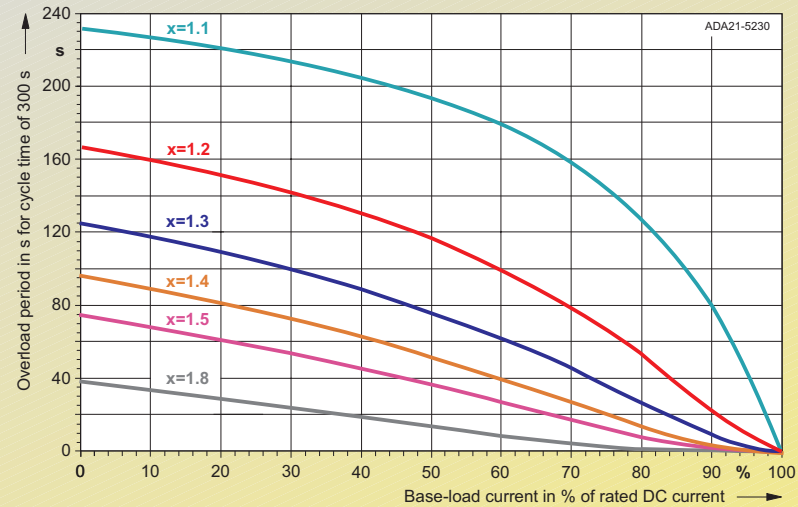
Overloading with x times rated DC current	t_{an} (s)
x=1.1	274
x=1.2	128
x=1.3	65
x=1.4	37
x=1.5	23
x=1.8	8

t_{ab} (s) = 493

Fig. 5/31
6RA7095-4DV62 2000 A/4Q/400 V, 6RA7095-4KV62 2000 A/4Q/690 V

Dynamic overload capability

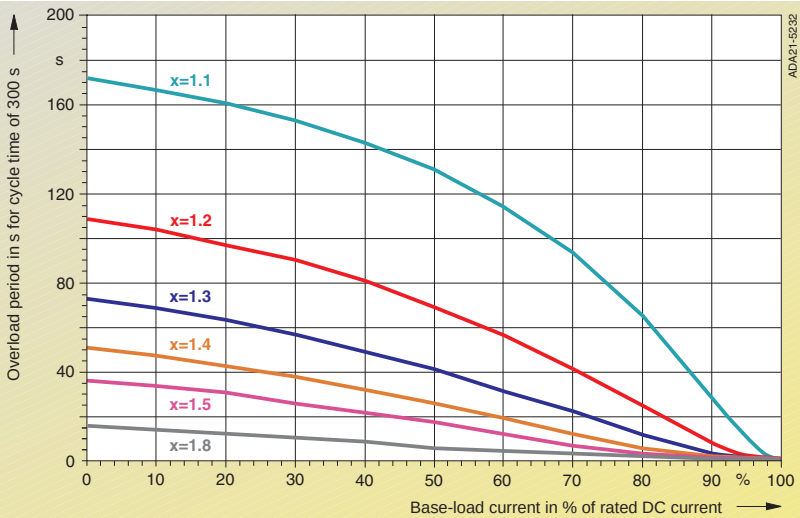
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	753
x=1.2	340
x=1.3	209
x=1.4	142
x=1.5	102
x=1.8	45

t_{ab} (s) = 985

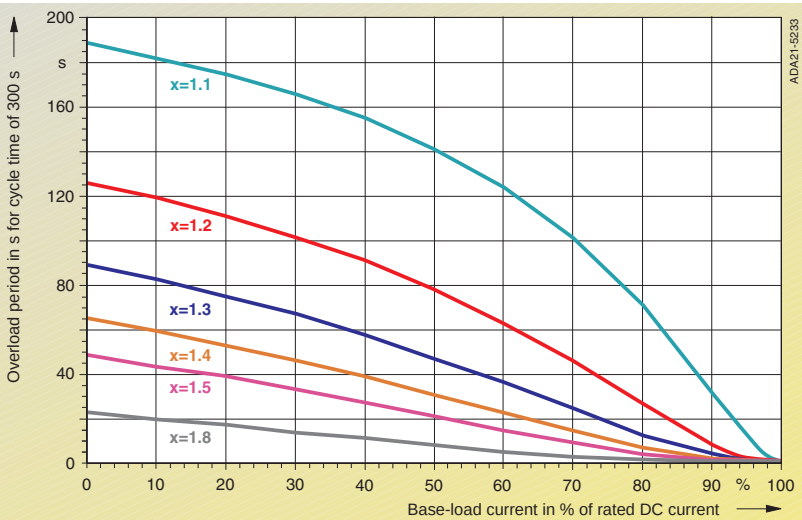
Fig. 5/32
6RA7096-4GS22 2200 A/1Q/575 V, 6RA7096-4GV62 2200 A/4Q/575 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	259
x=1.2	140
x=1.3	86
x=1.4	56
x=1.5	38
x=1.8	15

t_{ab} (s) = 465

Fig. 5/33
6RA7096-4MS22 2200 A/1Q/950 V, 6RA7096-4MV62 2200 A/4Q/950 V

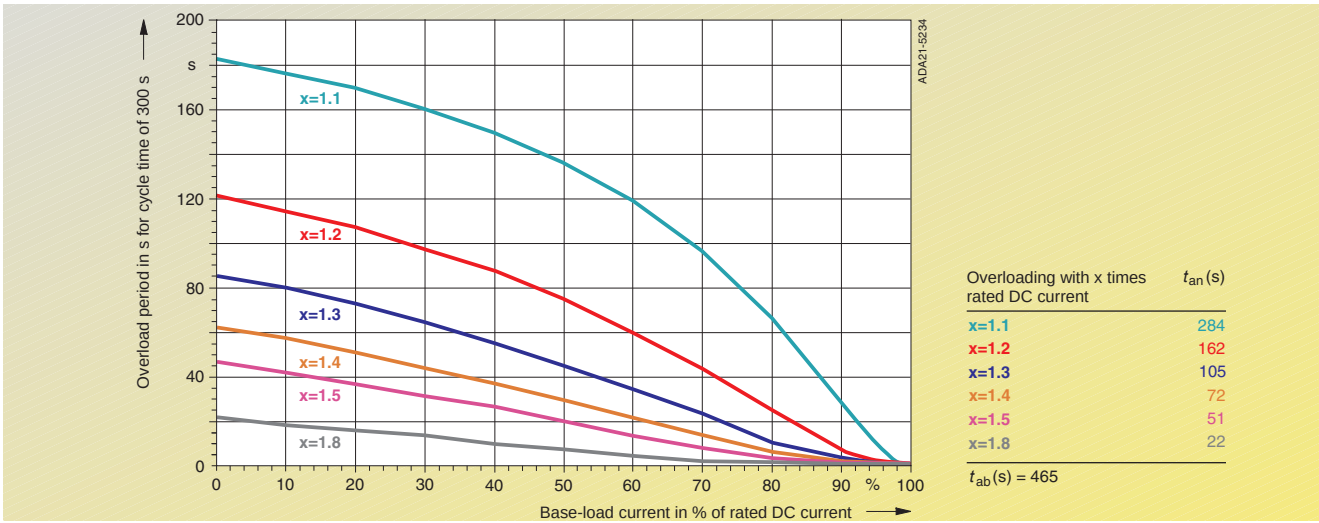


Overloading with x times rated DC current	t_{an} (s)
x=1.1	296
x=1.2	168
x=1.3	109
x=1.4	74
x=1.5	53
x=1.8	23

t_{ab} (s) = 465

Fig. 5/34
6RA7097-4KS22 2600 A/1Q/690 V, 6RA7097-4KV62 2600 A/4Q/690 V

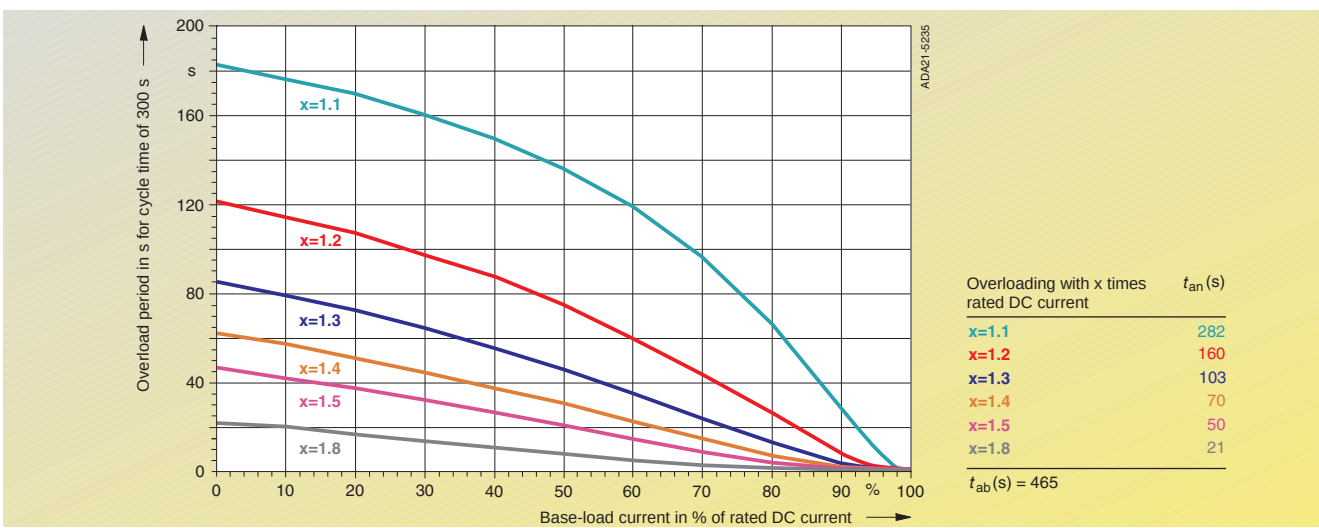
Calculation of dynamic overload capability



Overloading with x times rated DC current	t_{an} (s)
x=1.1	284
x=1.2	162
x=1.3	105
x=1.4	72
x=1.5	51
x=1.8	22

t_{ab} (s) = 465

Fig. 5/35
6RA7097-4GS22 2800 A/1Q/575 V, 6RA7097-4GV62 2800 A/4Q/575 V



Overloading with x times rated DC current	t_{an} (s)
x=1.1	282
x=1.2	160
x=1.3	103
x=1.4	70
x=1.5	50
x=1.8	21

t_{ab} (s) = 465

Fig. 5/36
6RA7098-4DS22 3000 A/1Q/400 V, 6RA7098-4DV62 3000 A/4Q/400 V