

ABB PCD Control Protection Curves

Note on Applying Protection Curves:

This document gives the **control response time** for all curves available in the PCD. The device interrupting times must be **added** to all curves to obtain maximum clearing time, per the following Table 1:

Table 1. Device Interrupting Times

Product	Maximum Interrupting Time
ABB VR-3S	2.5 cycles (40 ms)
ABB ESVA Recloser	3.0 cycles (48 ms)
ABB Type R & R Mag Breaker	3.0 cycles (48 ms)

ANSI Curves

The ANSI curves for PCD are defined by the following equations and table of coefficients:

$$\text{Trip Time} = \left(\frac{A}{M^P - 1} + B \right) \times \left(\frac{14n - 5}{9} \right)$$

$$\text{Reset Time} = \left(\frac{D}{1 - EM} \right) \times \left(\frac{14n - 5}{9} \right)$$

where $M = \left(\frac{I_{INPUT}}{I_{PICKUP}} \right)$

and I_{PICKUP} is the PCD minimum trip setting.

Table 2. ANSI Curves

ANSI Curve	Value of Constants					
	A	B	C	P	D	E
Extremely Inverse	6.407	0.025	1	2.0	3	0.998
Very Inverse	2.855	0.0712	1	2.0	1.346	0.998
Inverse	0.0086	0.0185	1	0.02	0.46	0.998
Short Time Inverse	0.00172	0.0037	1	0.02	0.092	0.998
Short Time Extremely Inverse	1.281	0.005	1	2.0	0.6	0.998
Definite Time	-	-	-	-	-	-
Long Time Extremely Inverse	64.07	0.250	1	2.0	30	0.998
Long Time Very Inverse	28.55	0.712	1	2.0	13.46	0.998
Long Time Inverse	0.086	0.185	1	0.02	4.6	0.998
Standard Instantaneous	-	-	-	-	-	-
Inverse Instantaneous	-	-	-	-	-	-

PCD has the option for using the above formula for reset time or to set the reset time to instantaneous. By default, PCD is set to instantaneous reset time.

Figure 1. ANSI Definite Time Curve

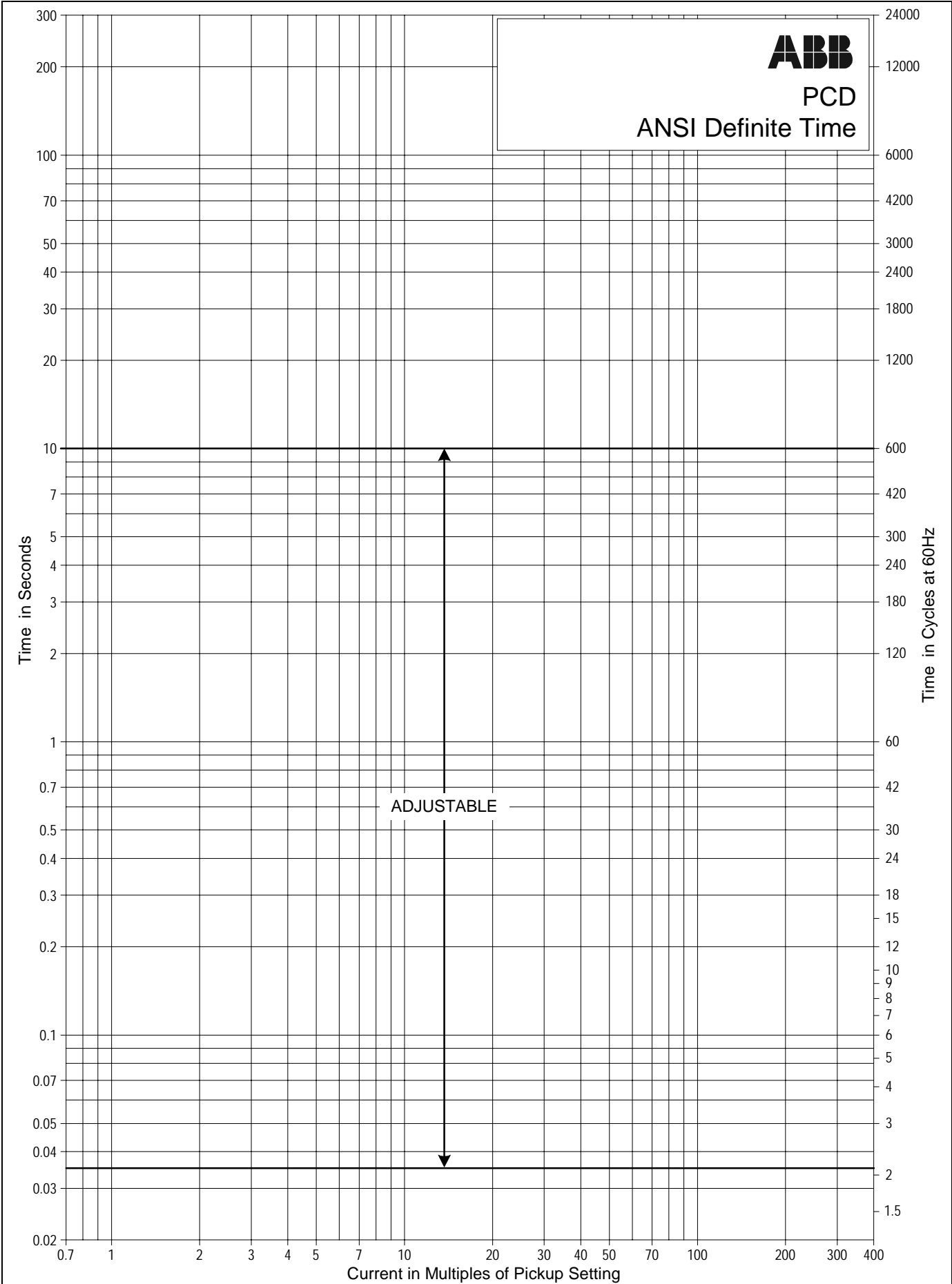


Figure 2. ANSI Extremely Inverse Curve

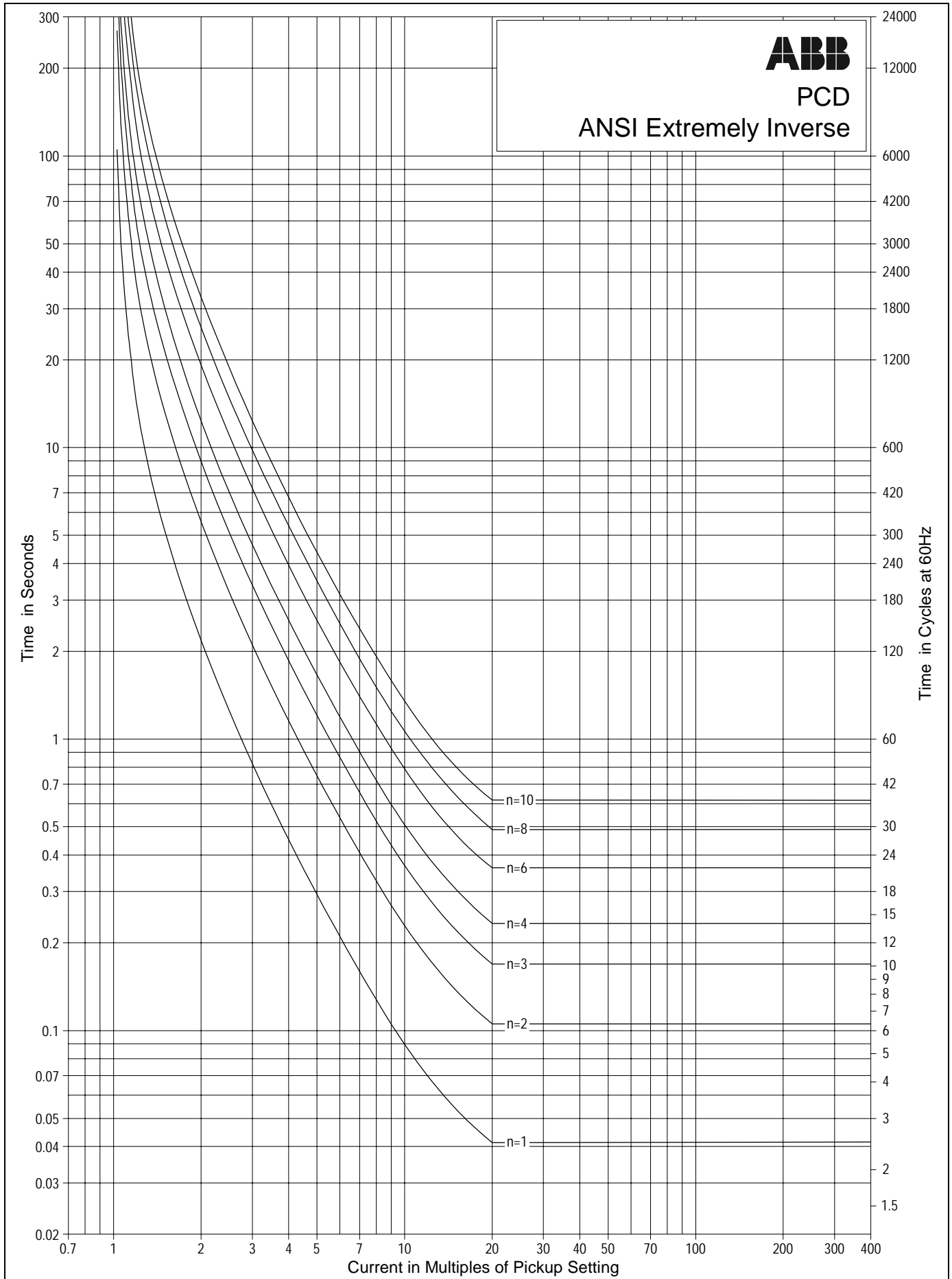


Figure 3. ANSI Inverse Curve

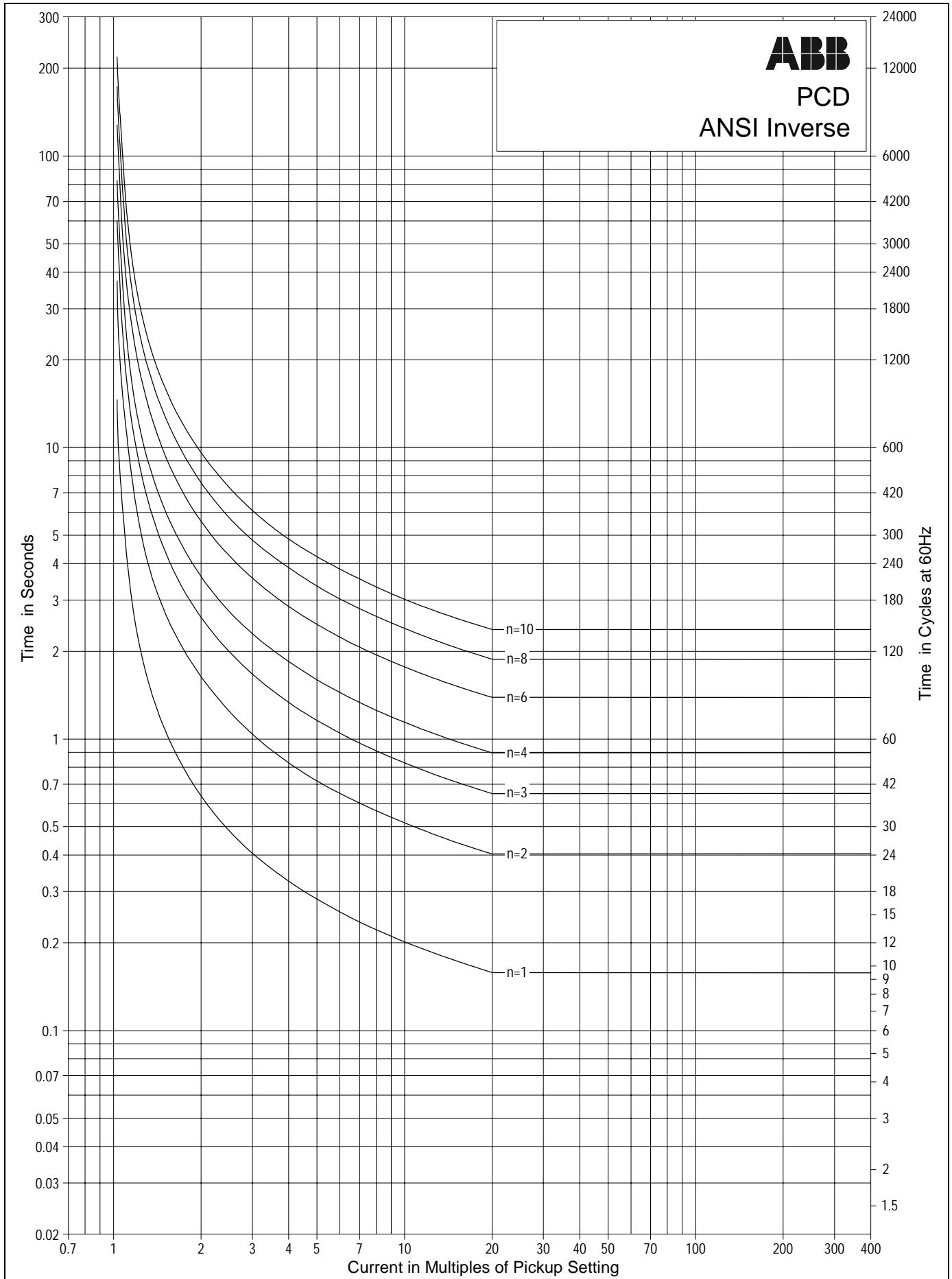


Figure 4. ANSI Inverse Instantaneous Curve

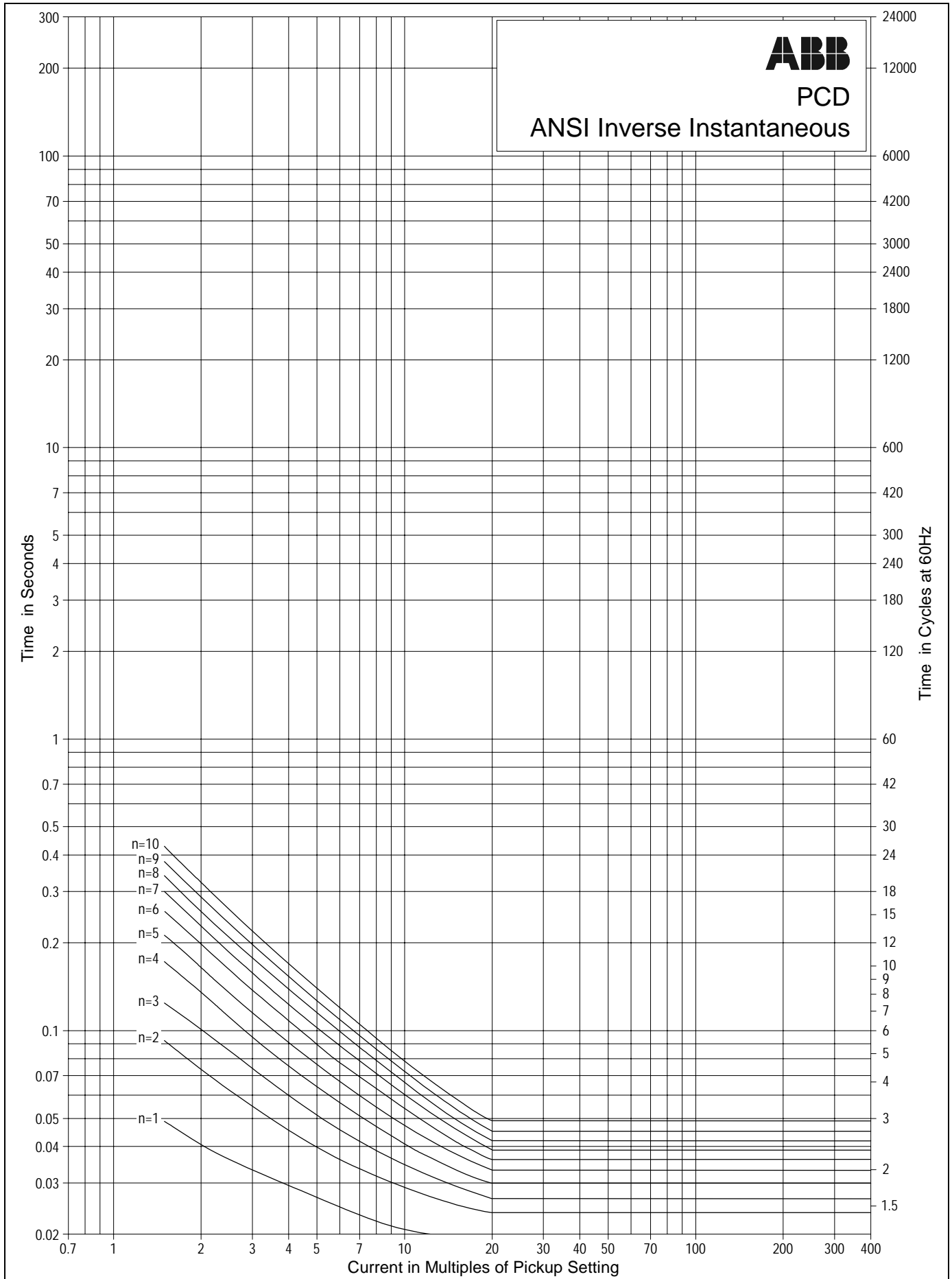


Figure 5. ANSI Long Time Extremely Inverse Curve

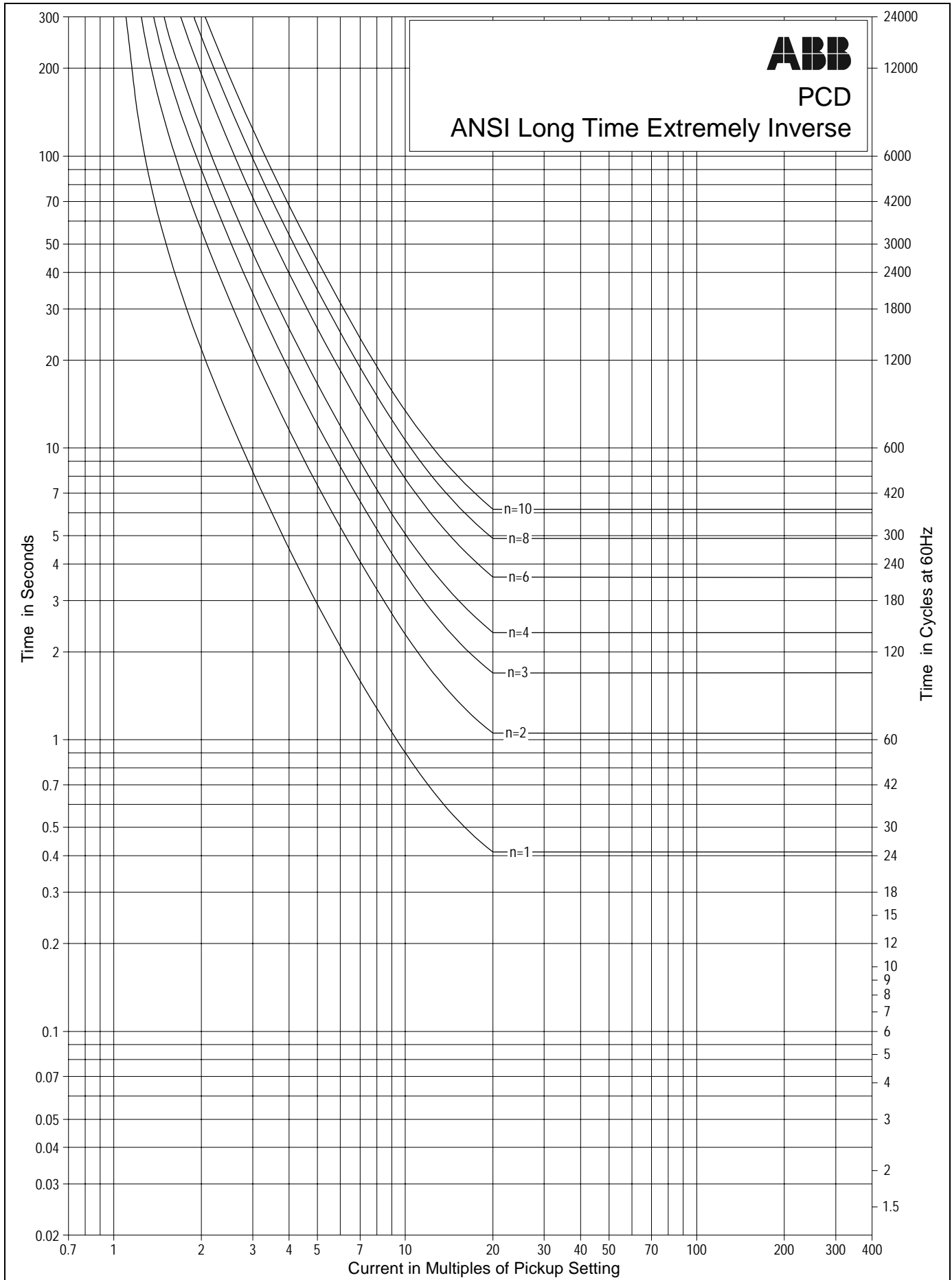


Figure 6. ANSI Long Time Inverse Curve

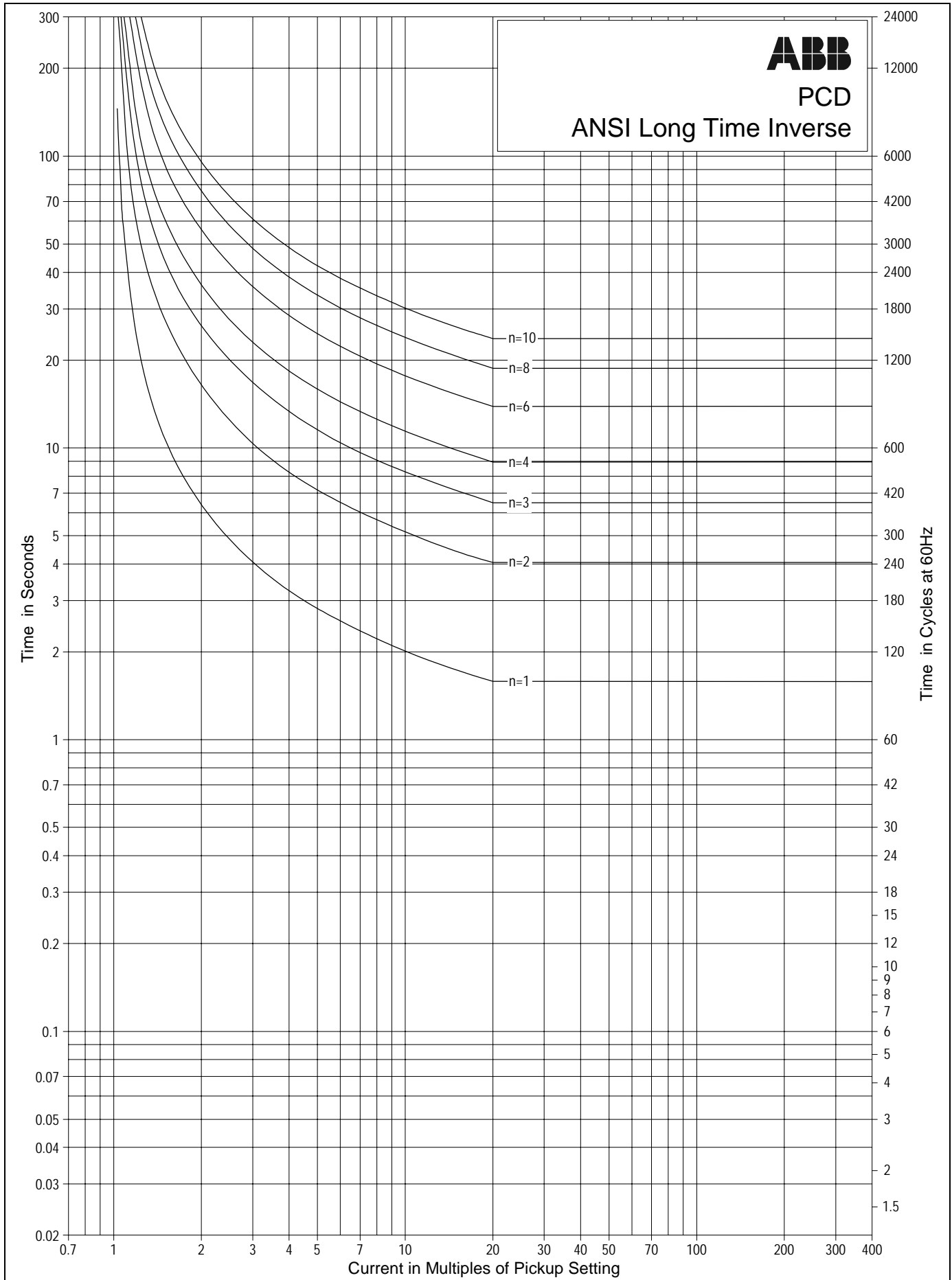


Figure 7. ANSI Long Time Very Inverse Curve

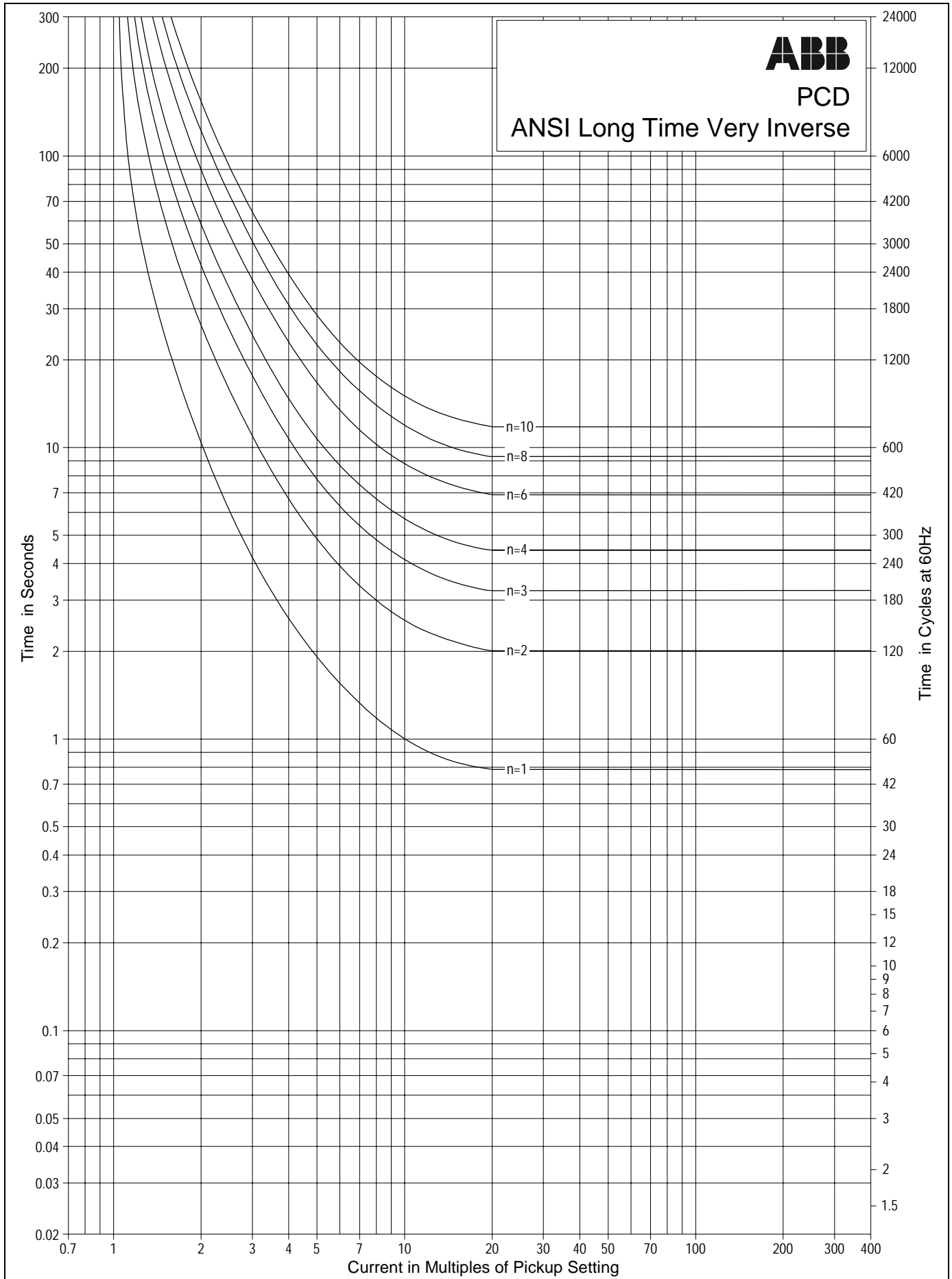


Figure 8. ANSI Short Time Extremely Inverse Curve

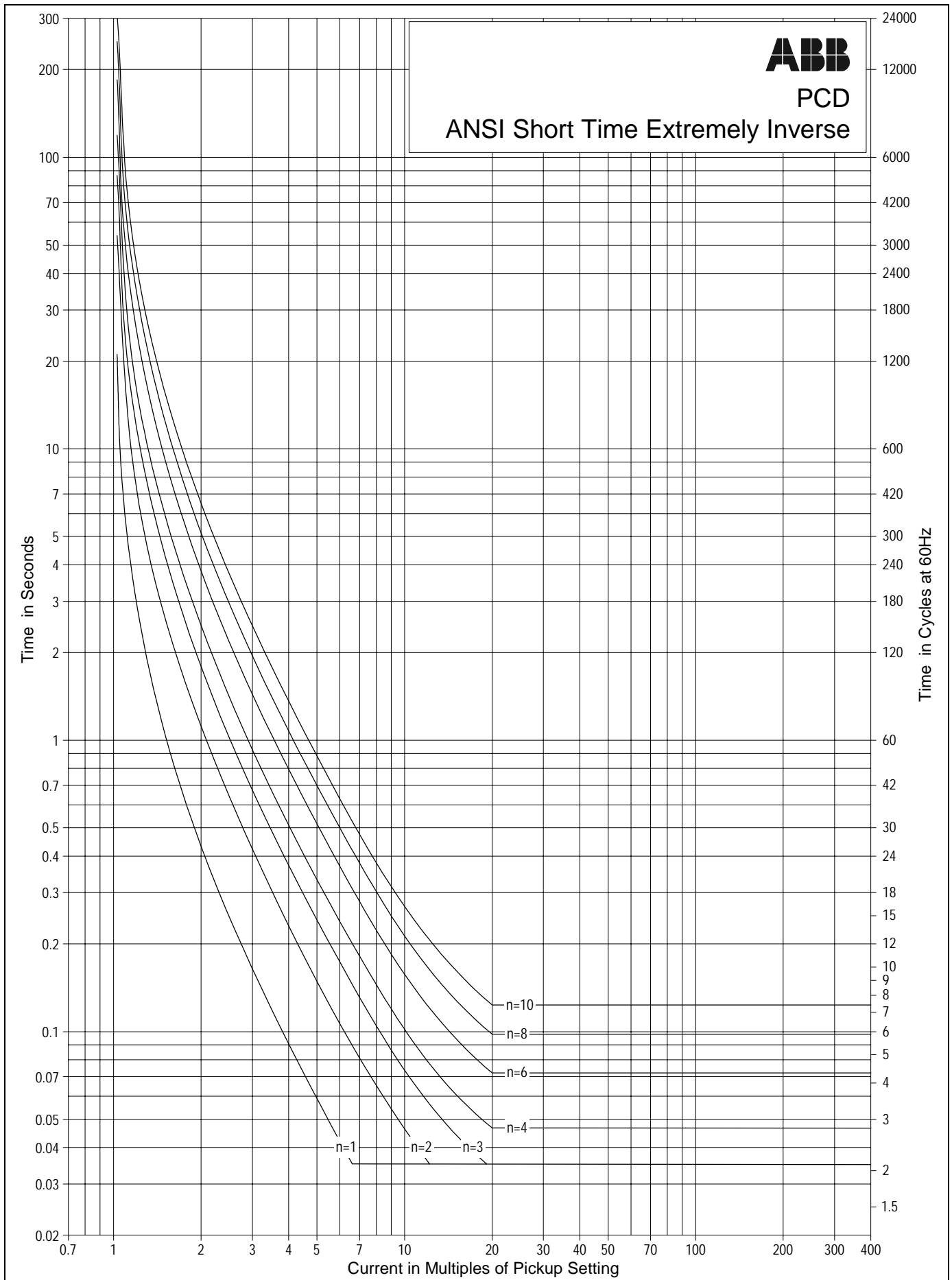


Figure 9. ANSI Short Time Inverse Curve

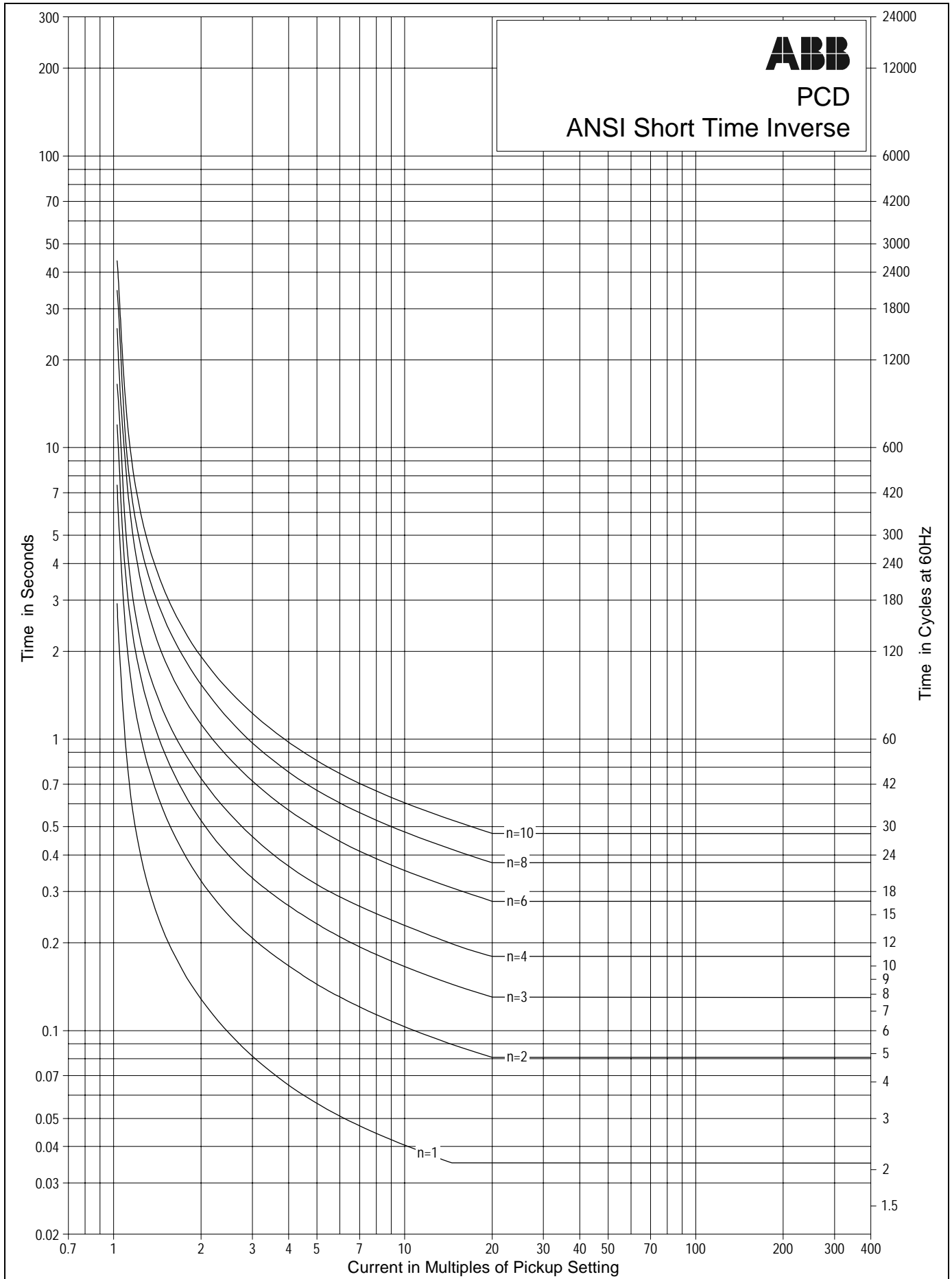


Figure 10. ANSI Standard Instantaneous Curve

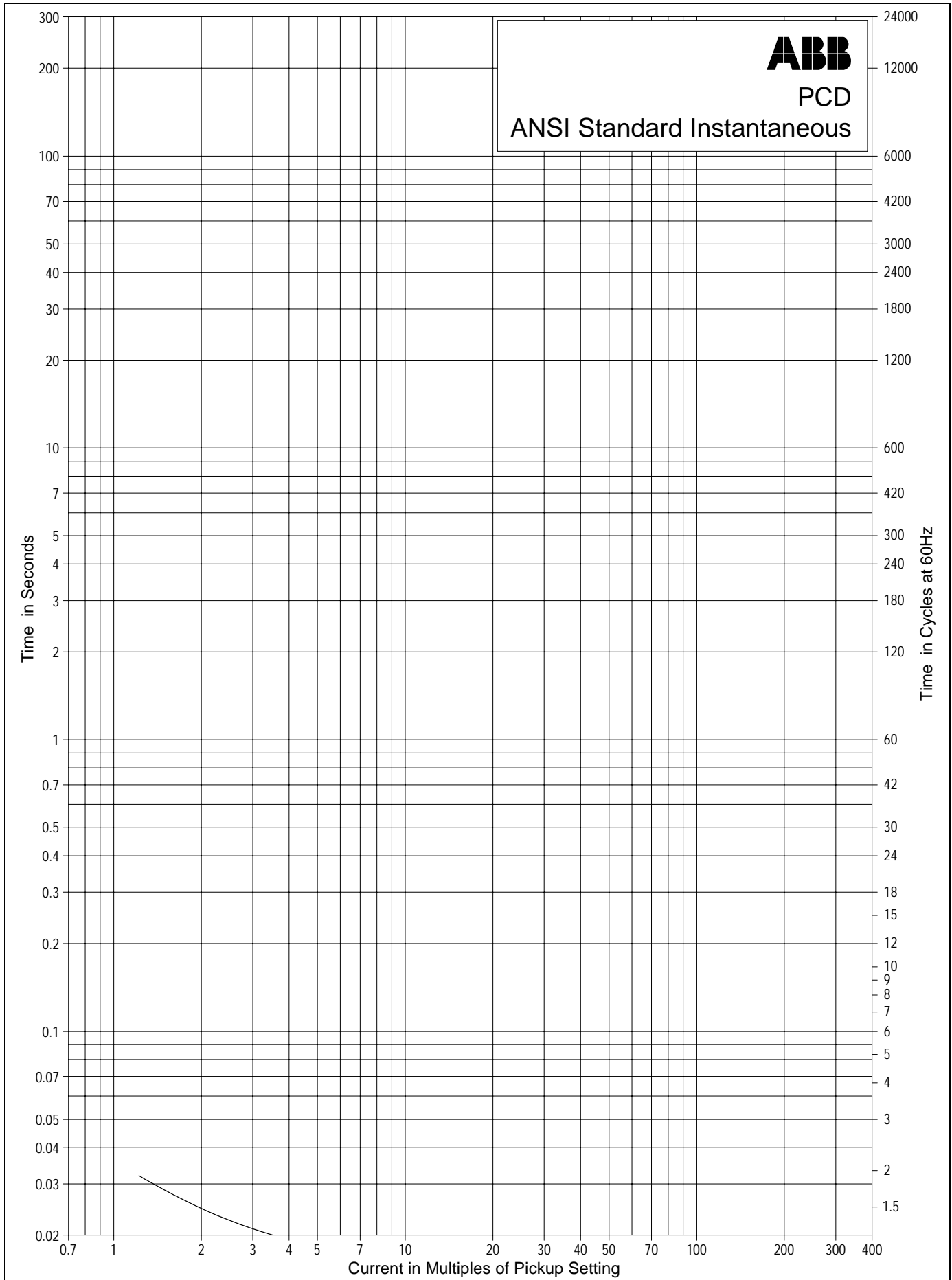
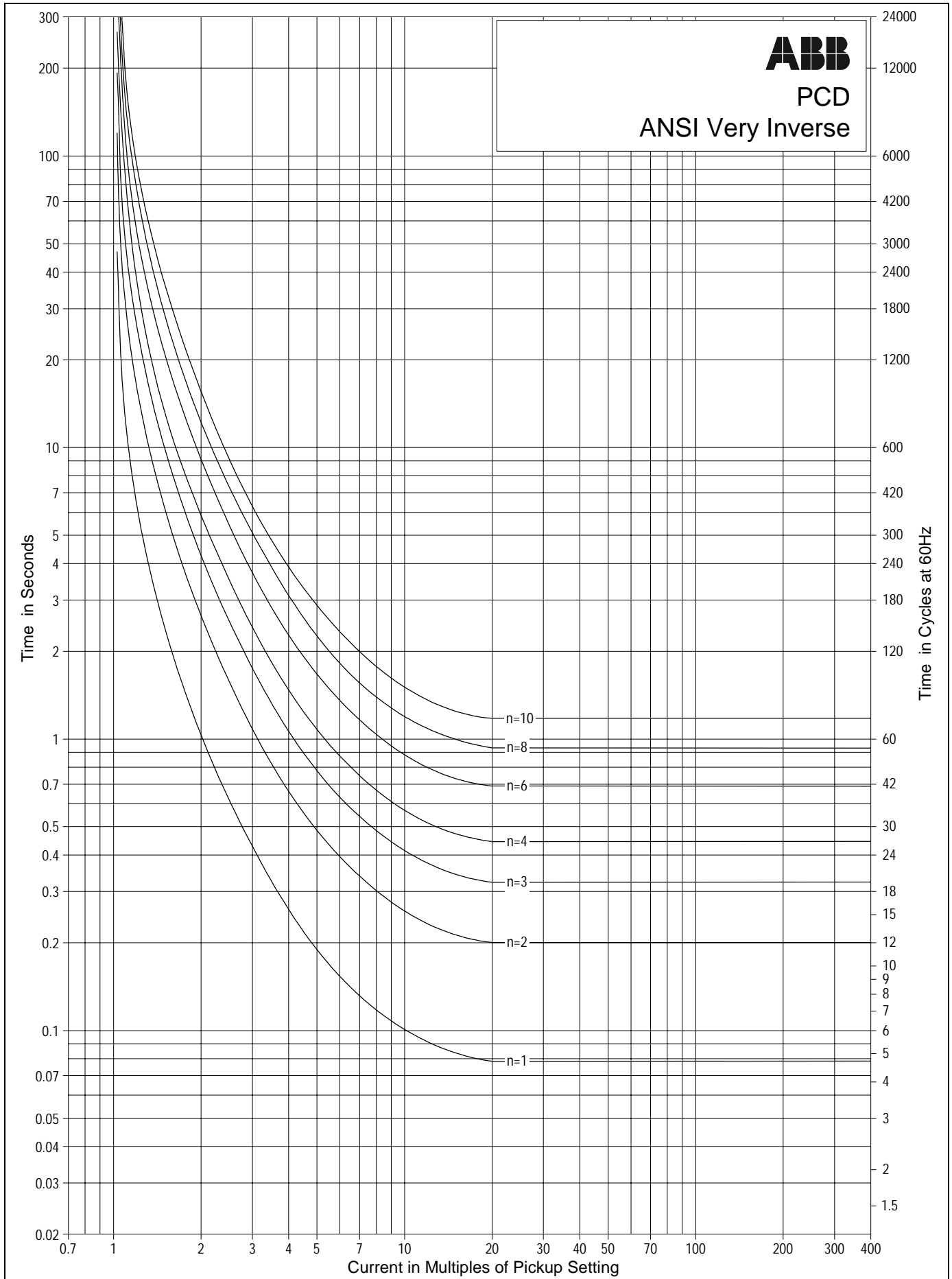


Figure 11. ANSI Very Inverse Curve



IEC Curves

The IEC curves that follow are defined by the following equation and table of coefficients.

$$\text{Trip Time} = \left(\frac{K}{M^P} \right) - 1 \times (\text{TimeDial})$$

$$\text{where } M = \left(\frac{I_{INPUT}}{I_{PICKUP}} \right)$$

and I_{PICKUP} is the PCD setting.

The reset time for all IEC curves in PCD is instantaneous.

Table 3. IEC Curves

IEC Curve	K	P
Extremely Inverse	80.0	2.0
Very Inverse	13.5	1.0
Inverse	0.14	0.02
Long Time Inverse ⁵	120.0	1.0
Definite Time	-	-

Figure 12. IEC Extremely Inverse Curve

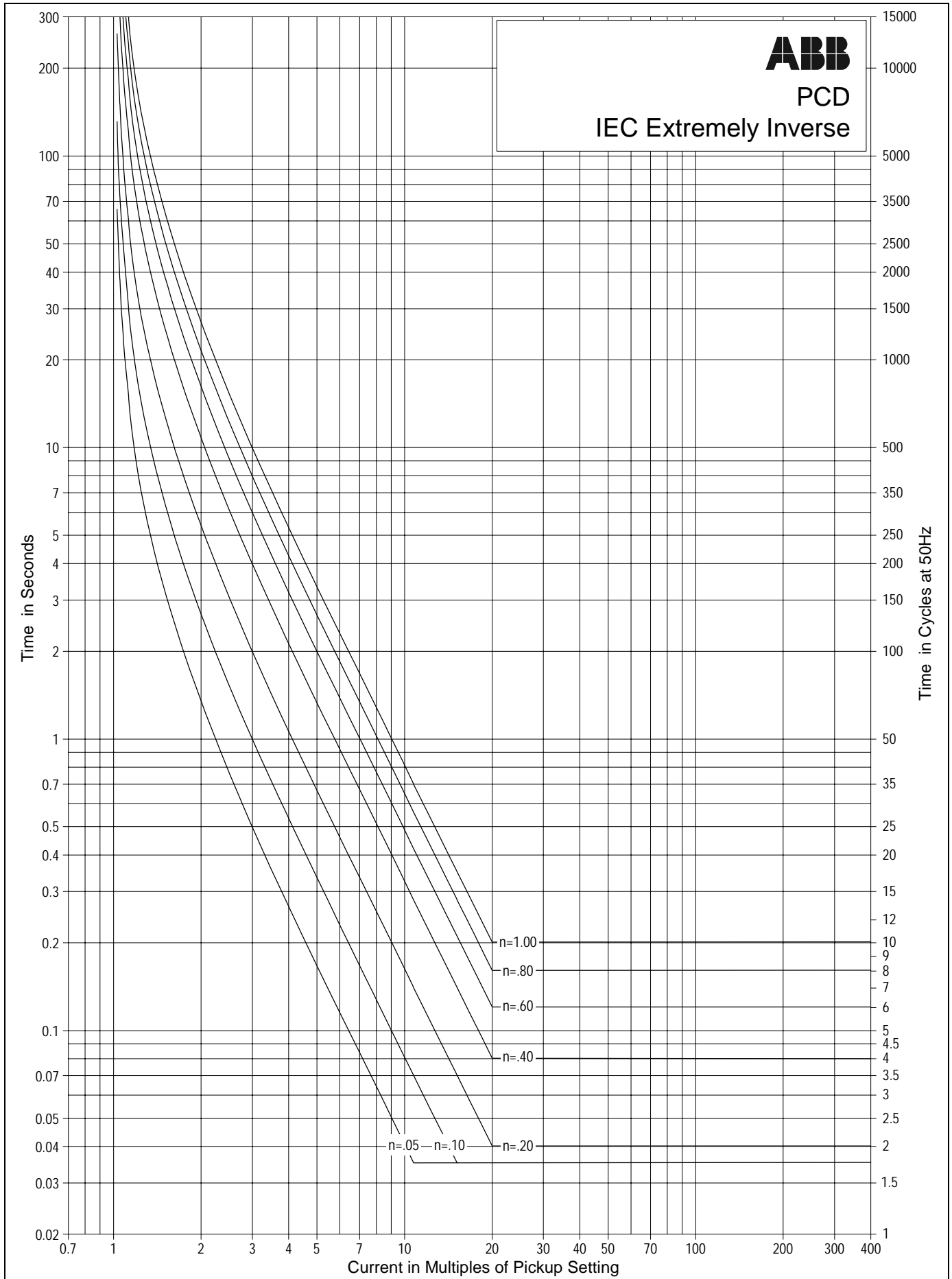


Figure 13. IEC Very Inverse Curve

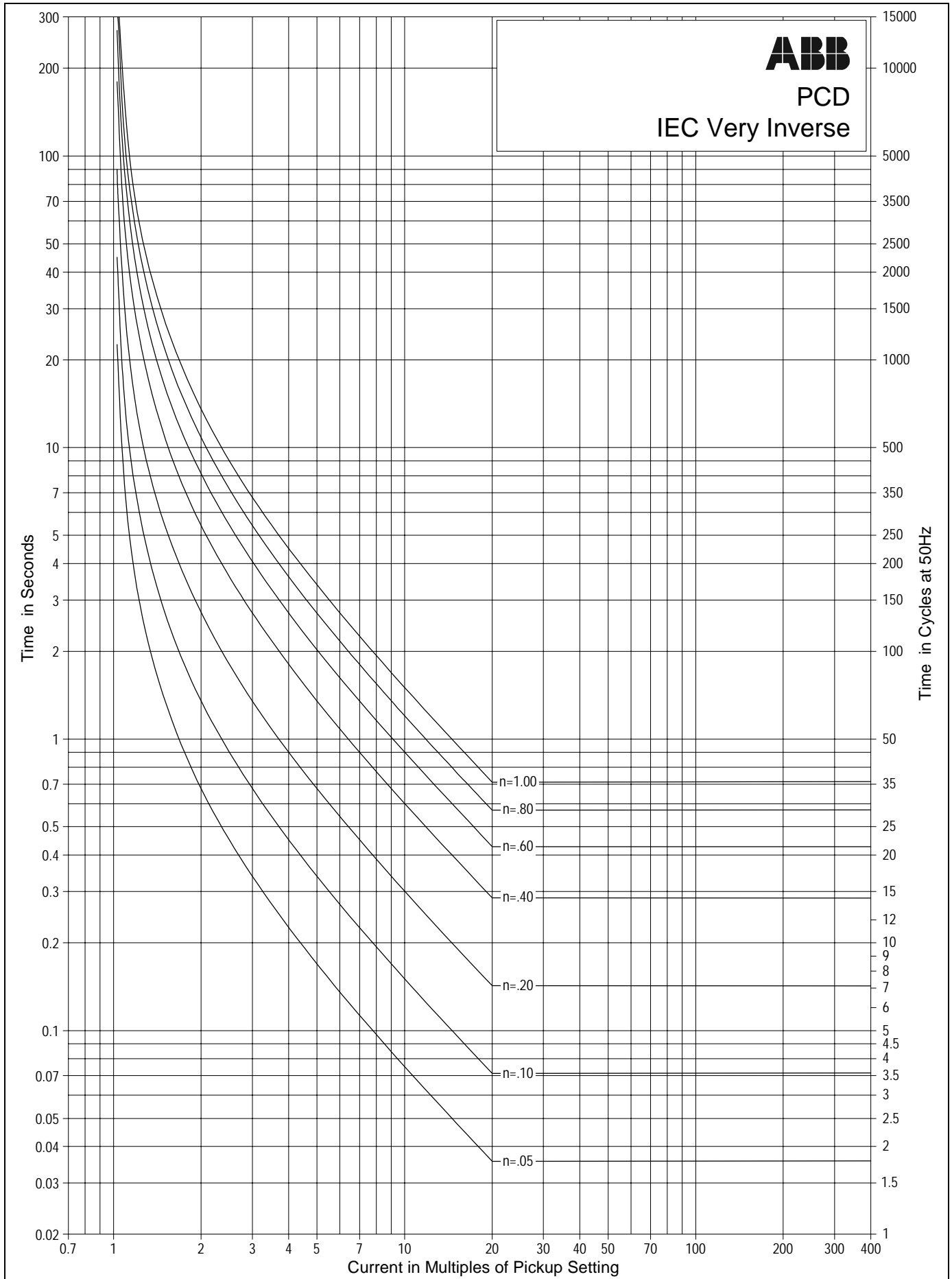


Figure 14. IEC Inverse Curve

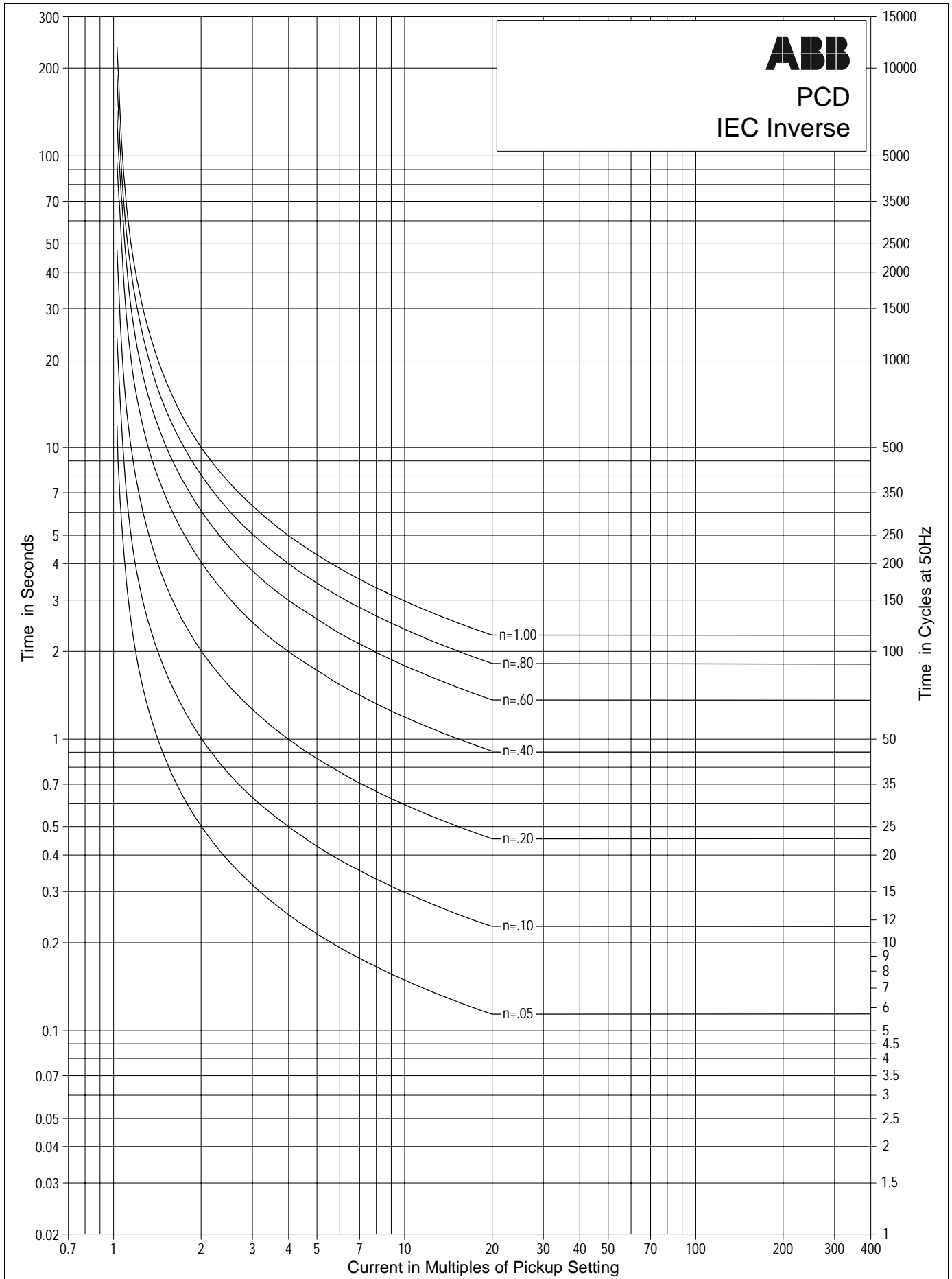


Figure 15. IEC Long Time Inverse Curve

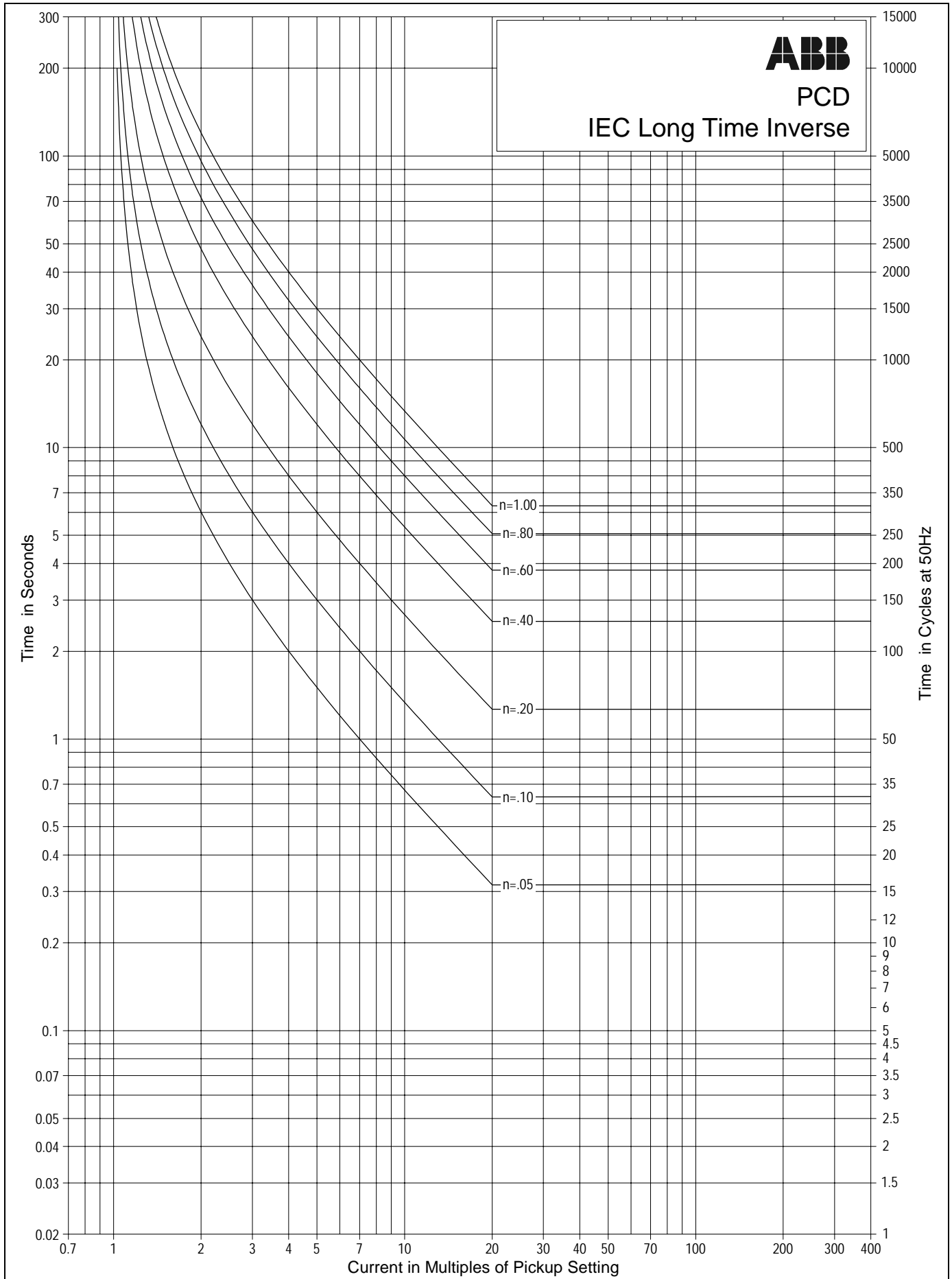
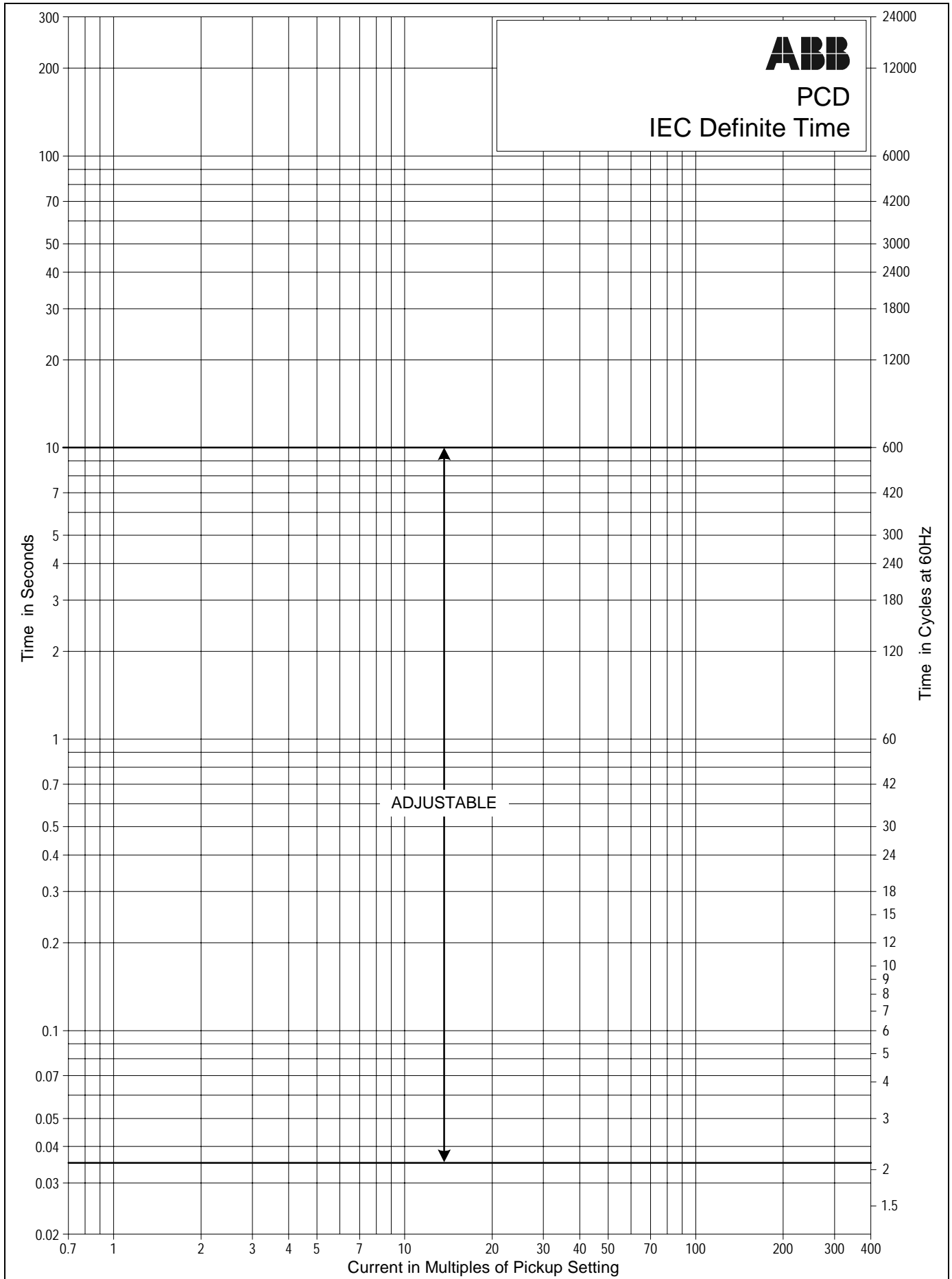


Figure 16. IEC Definite Time Curve



Recloser Curves

Table 4 gives the entire set of recloser curves. Of these curves several are defined by the following equation and coefficients given in the table. The remaining curves listed which do not have coefficients and were created with point data. The reset time of all recloser curves is instantaneous.

$$\text{TripTime} = \left(\frac{A}{M^p - 1} + B \right) \times \text{time dial}$$

Table 4. Recloser Curves

Recloser Curve	Value of Constants			
	A	B	C	P
1 (102)	Point to point data			
2 (135)	11.4161	0.488986	0.239257	1.84911
3 (140)	13.5457	0.992904	0.379882	1.76391
4 (106)	Point to point data			
5 (114)	Point to point data			
6 (136)	Point to point data			
7 (152)	Point to point data			
8 (113)	1.68546	0.158114	0.436523	1.78873
8+ (111)	1.42732	-0.003704	0.366699	1.70112
8*	1.42302	-0.007846	0.442626	1.42529
9 (131)	2.75978	5.10647	0.614258	1.0353
11 (141)	21.6149	10.6768	-0.67185	2.69489
13 (142)	Point to point data			
14 (119)	Point to point data			
15 (112)	Point to point data			
16 (139)	Point to point data			
17 (103)	Point to point data			
18 (151)	Point to point data			
A (101)	Point to point data			
B (117)	4.22886	0.008933	0.319885	1.7822
C (133)	8.76047	0.029977	0.380004	1.80788
D (116)	5.23168	0.000462	0.17205	2.17125
E (132)	10.7656	0.004284	0.249969	2.18261
F (163)	Point to point data			
G (121)	Point to point data			
H (122)	Point to point data			
J (164)	Point to point data			
K-Ground (165)	Point to point data			
K-Phase (162)	11.9847	-0.000324	0.688477	2.01174
L (107)	Point to point data			
M (118)	Point to point data			
N (104)	0.285625	-0.071079	0.464202	0.911551
P (115)	Point to point data			
R (105)	0.001015	-0.13381	0.998848	0.00227
T (161)	Point to point data			
V (137)	Point to point data			
W (138)	15.4628	0.056438	0.345703	1.6209
Y (120)	Point to point data			
Z (134)	Point to point data			

Figure 18. Recloser Curve 2 (135)

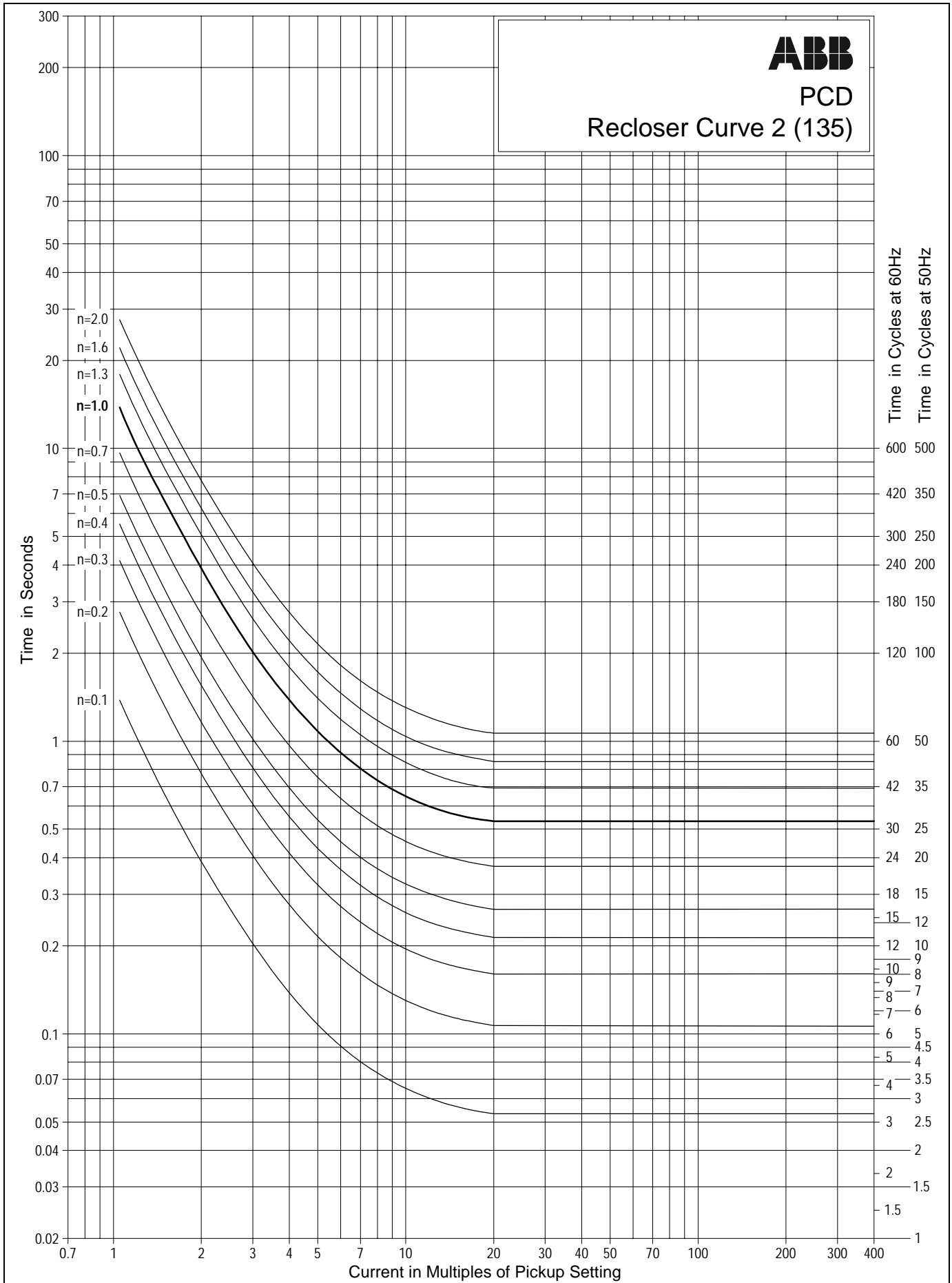


Figure 19. Recloser Curve 3 (140)

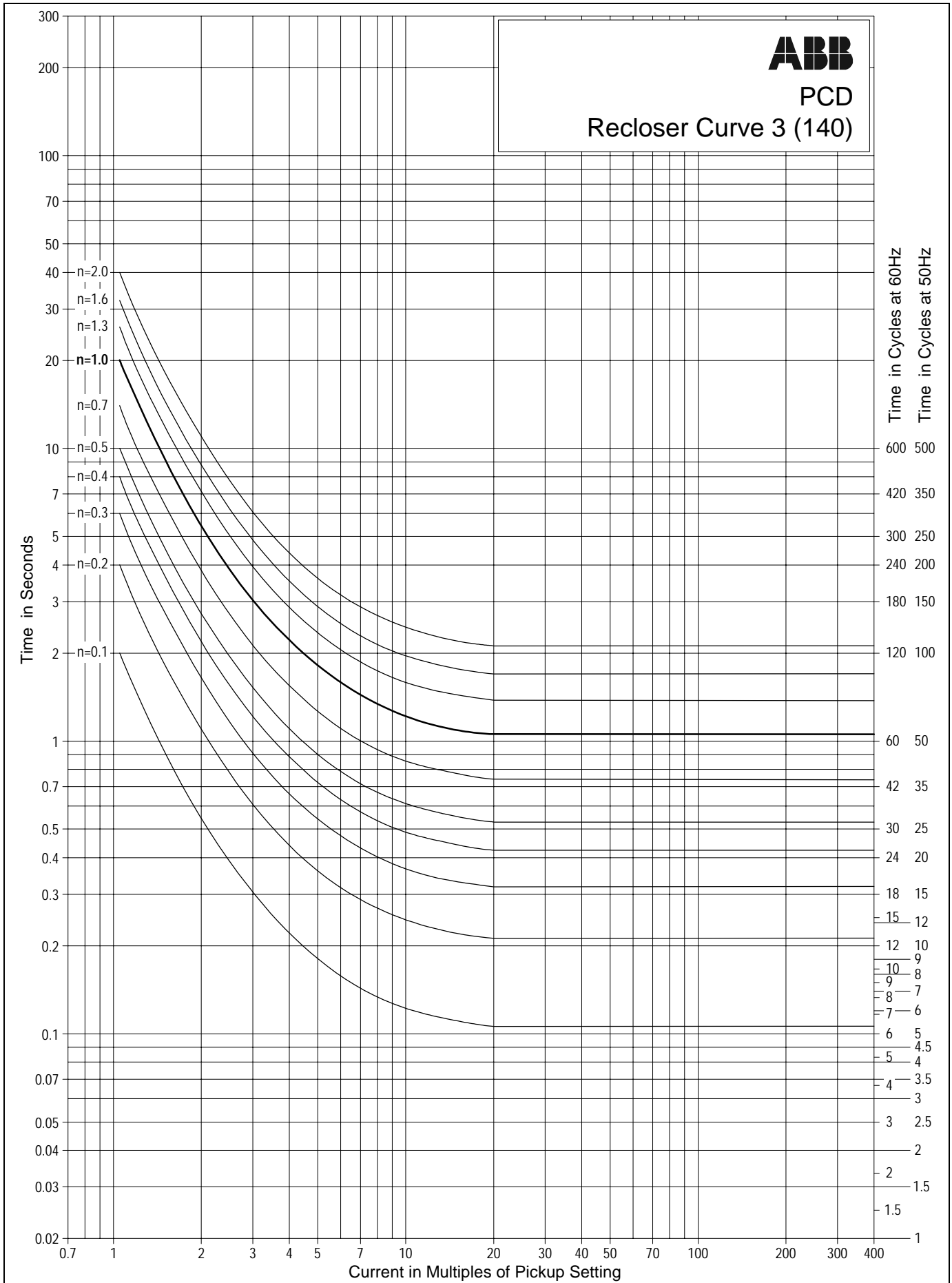


Figure 20. Recloser Curve 4 (106)

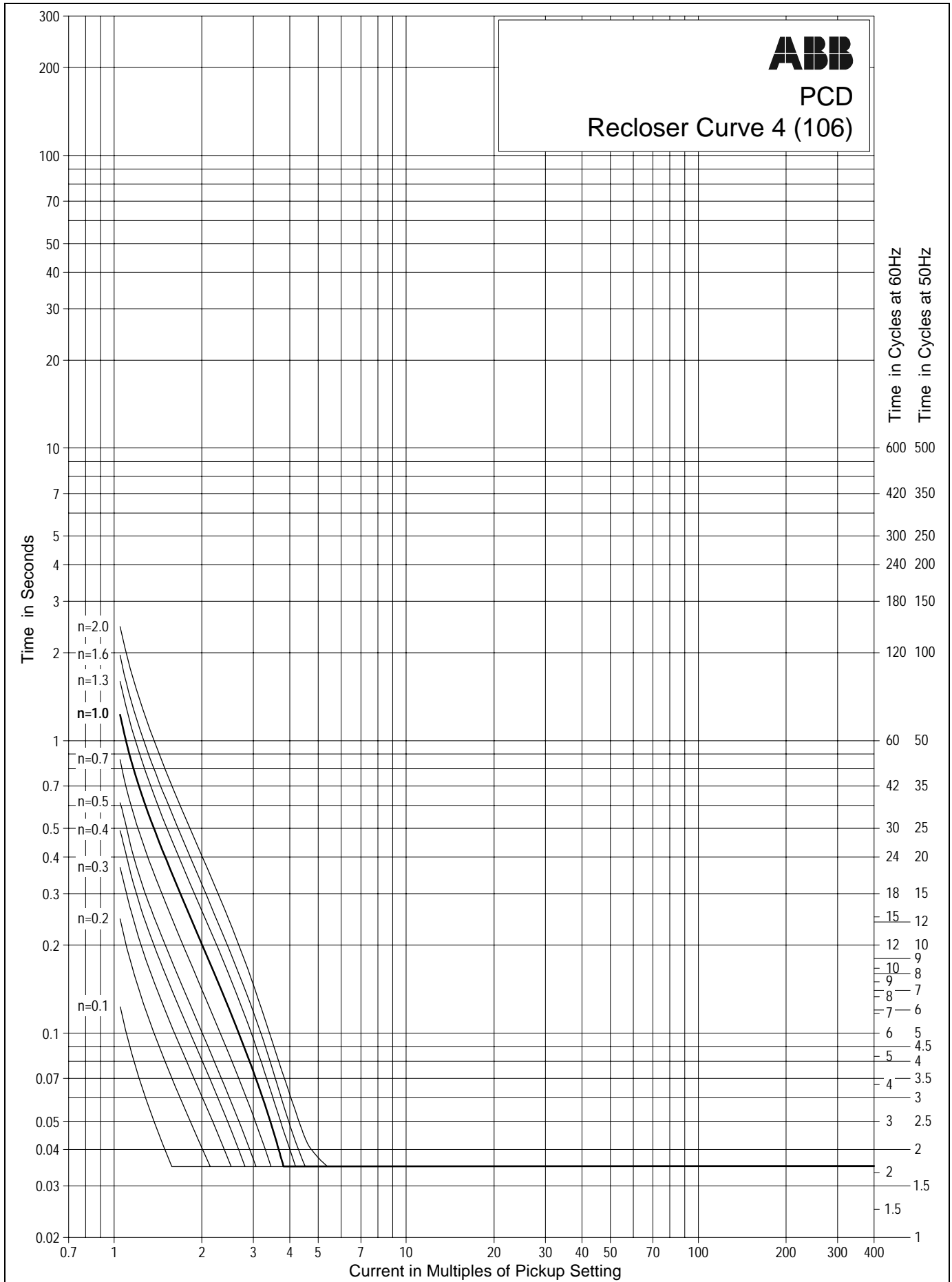


Figure 21. Recloser Curve 5 (114)

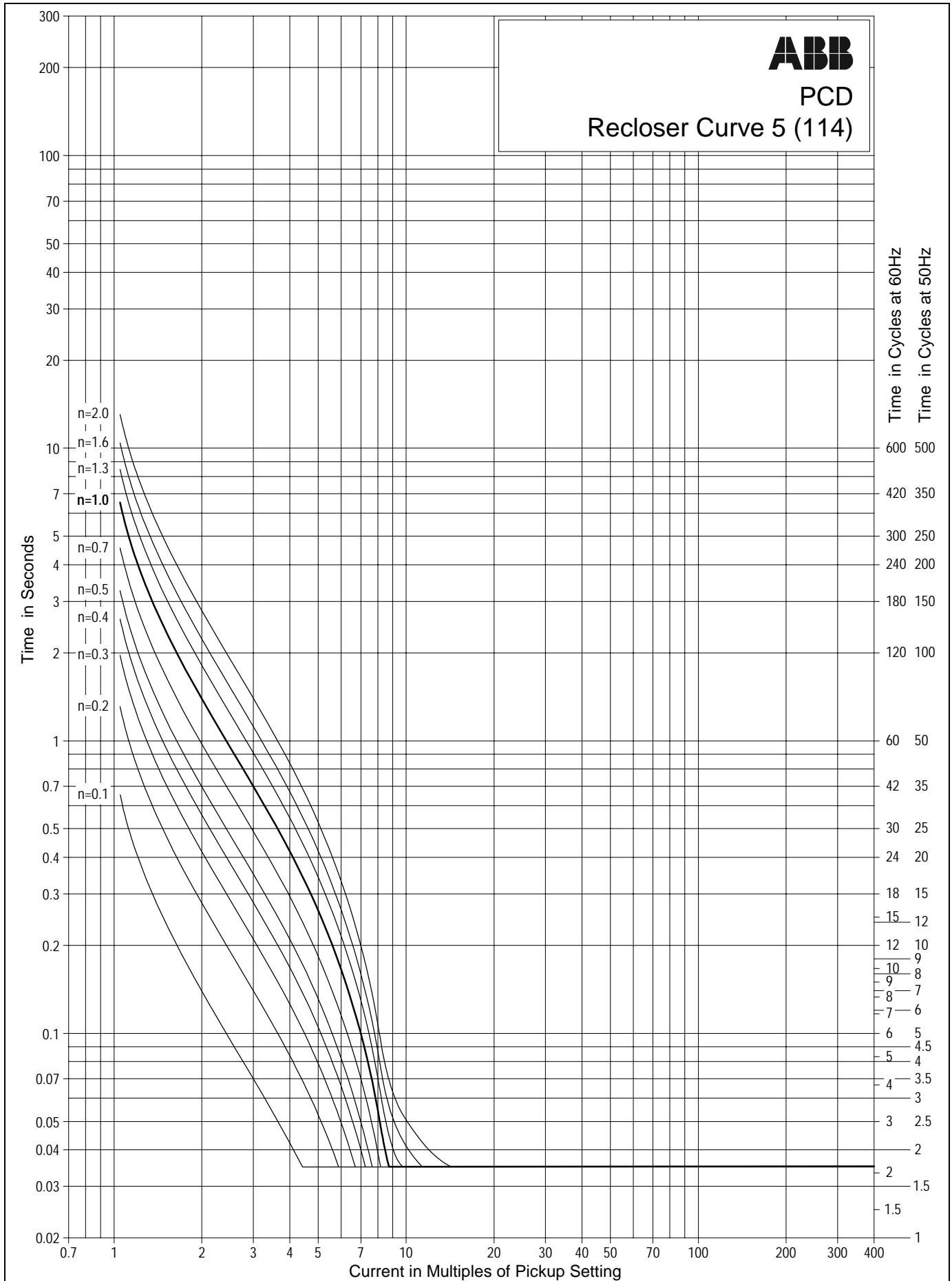


Figure 22. Recloser Curve 6 (136)

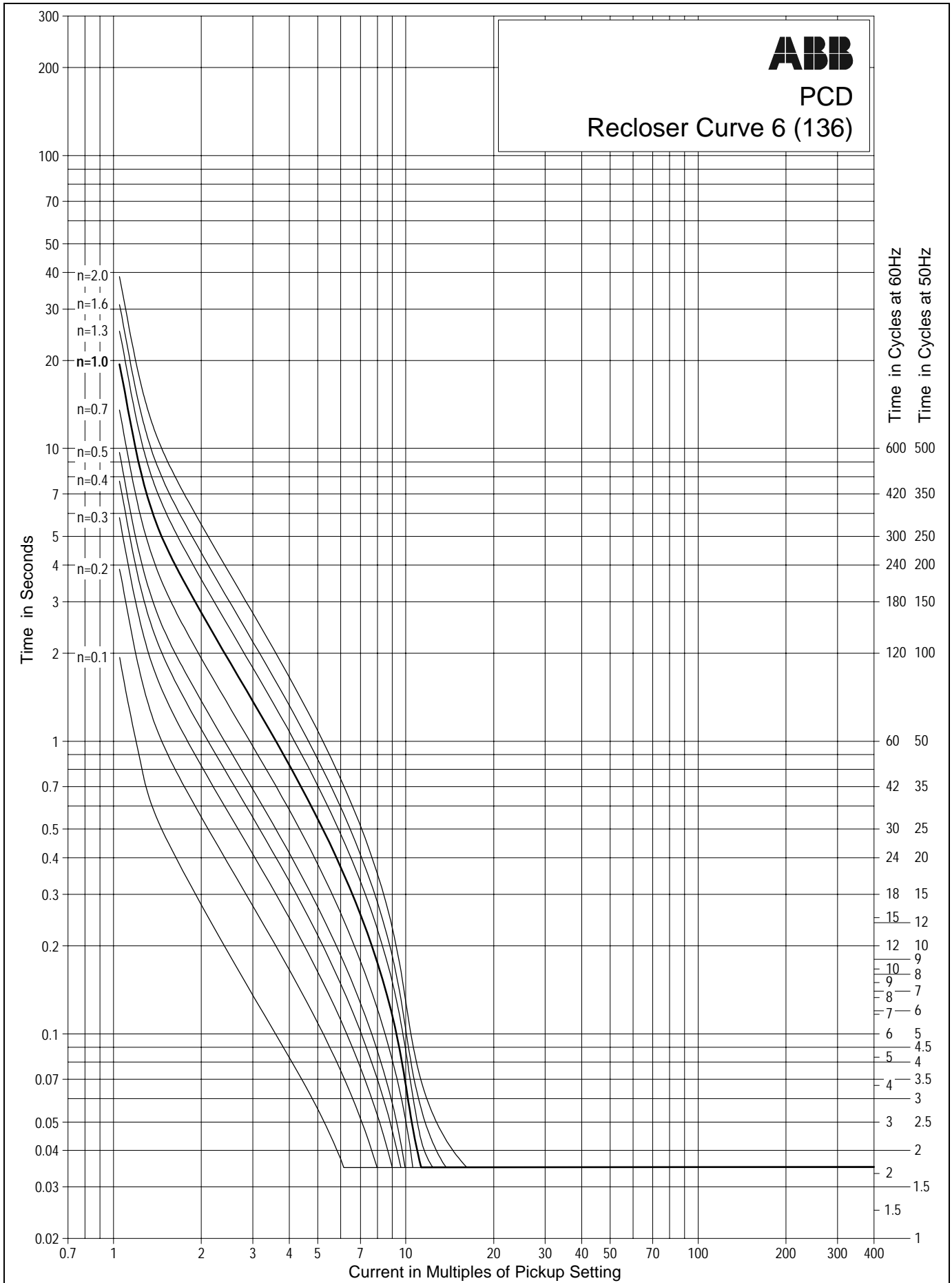


Figure 23. Recloser Curve 7 (152)

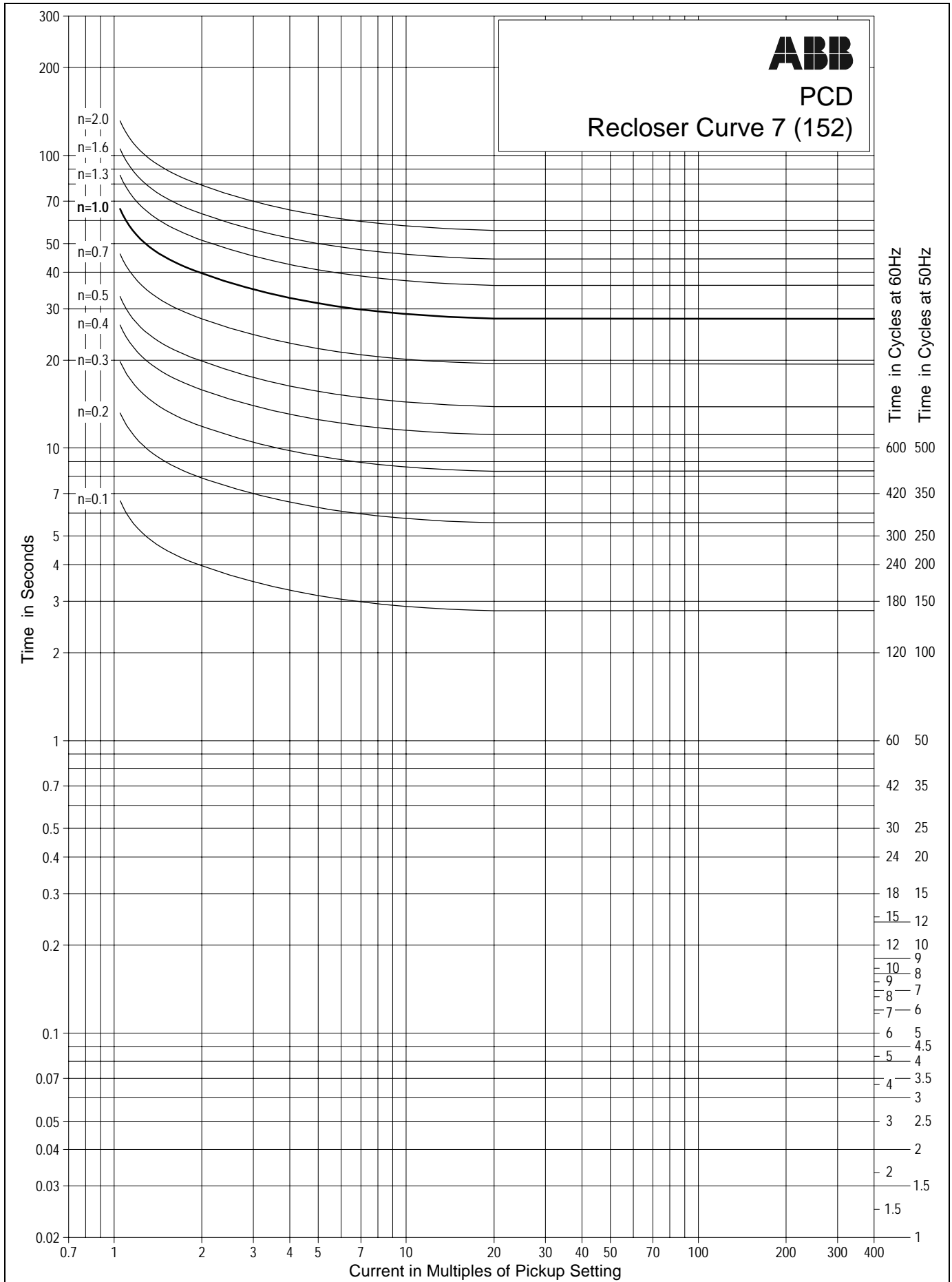


Figure 24. Recloser Curve 8 (113)

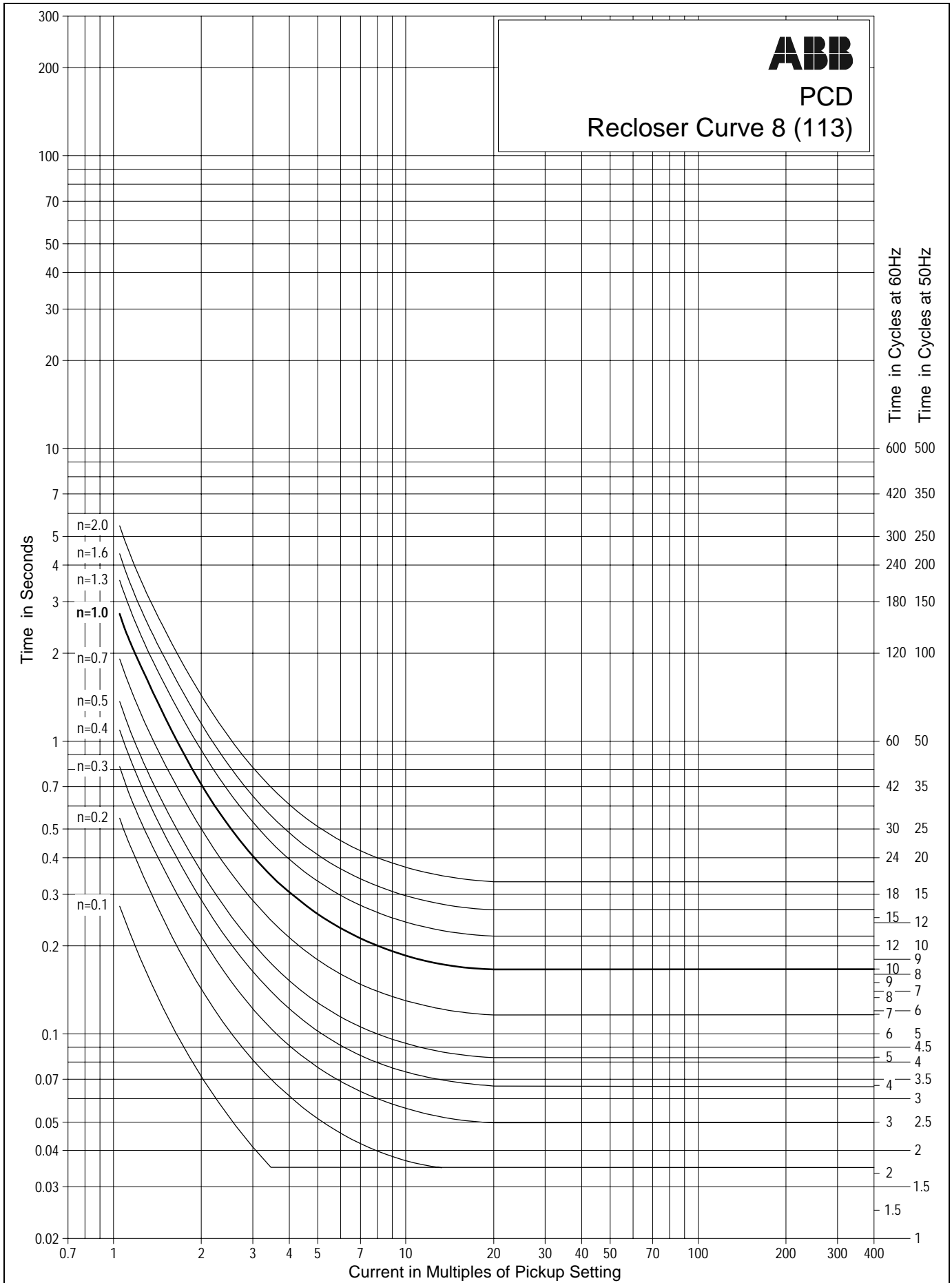


Figure 26. Recloser Curve 8*

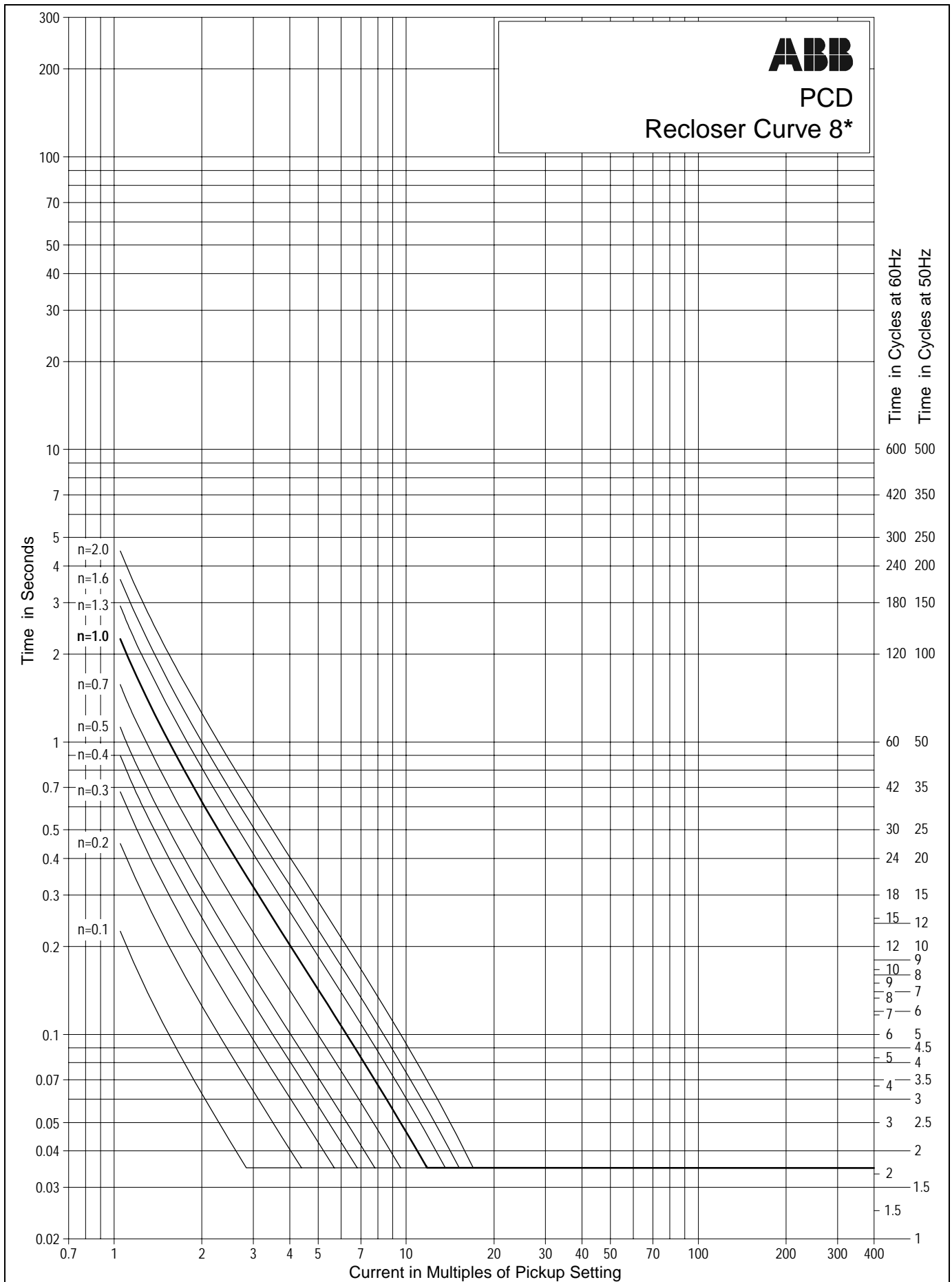


Figure 27. Recloser Curve 9 (131)

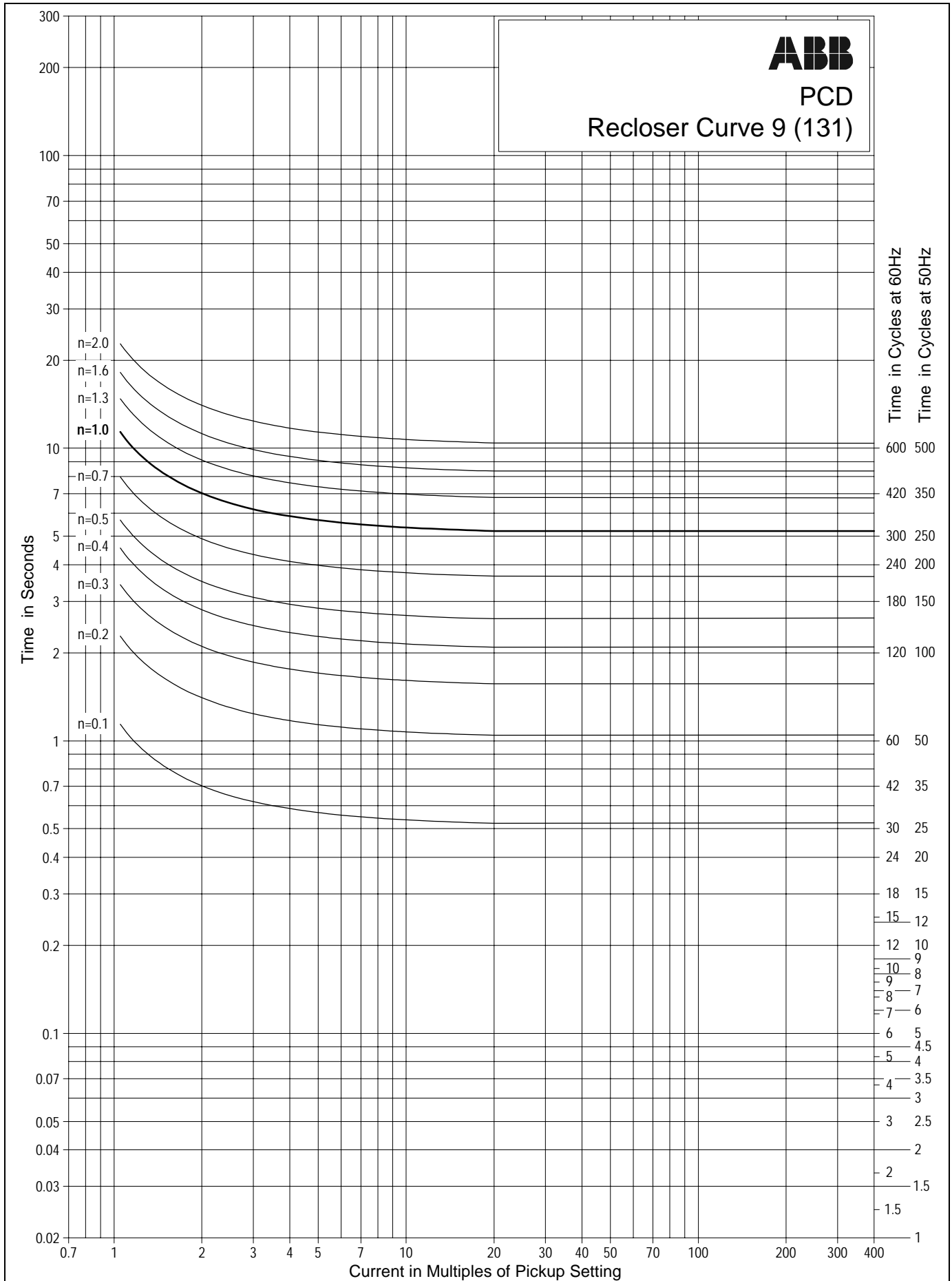


Figure 28. Recloser Curve 11 (141)

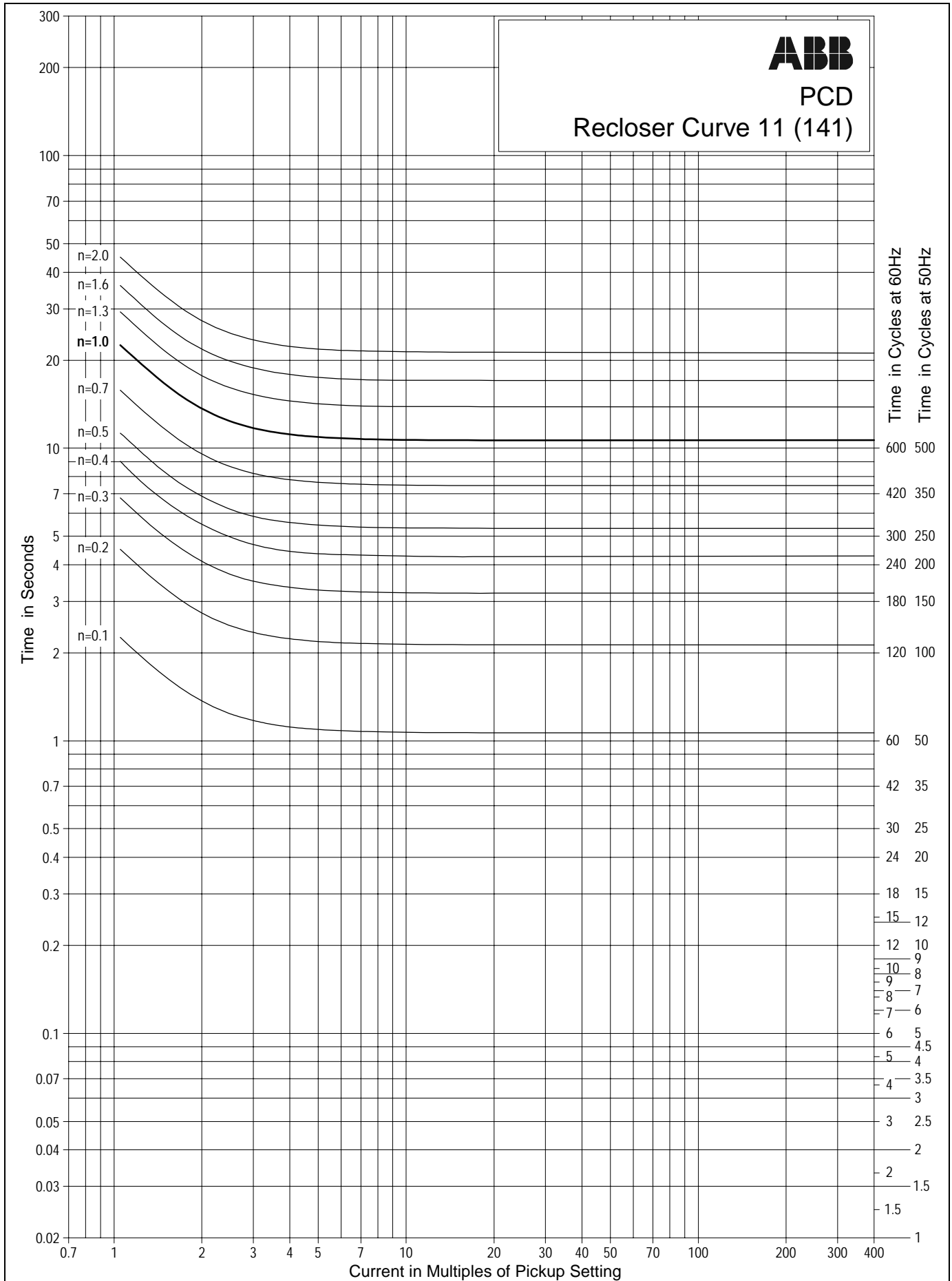


Figure 29. Recloser Curve 13 (142)

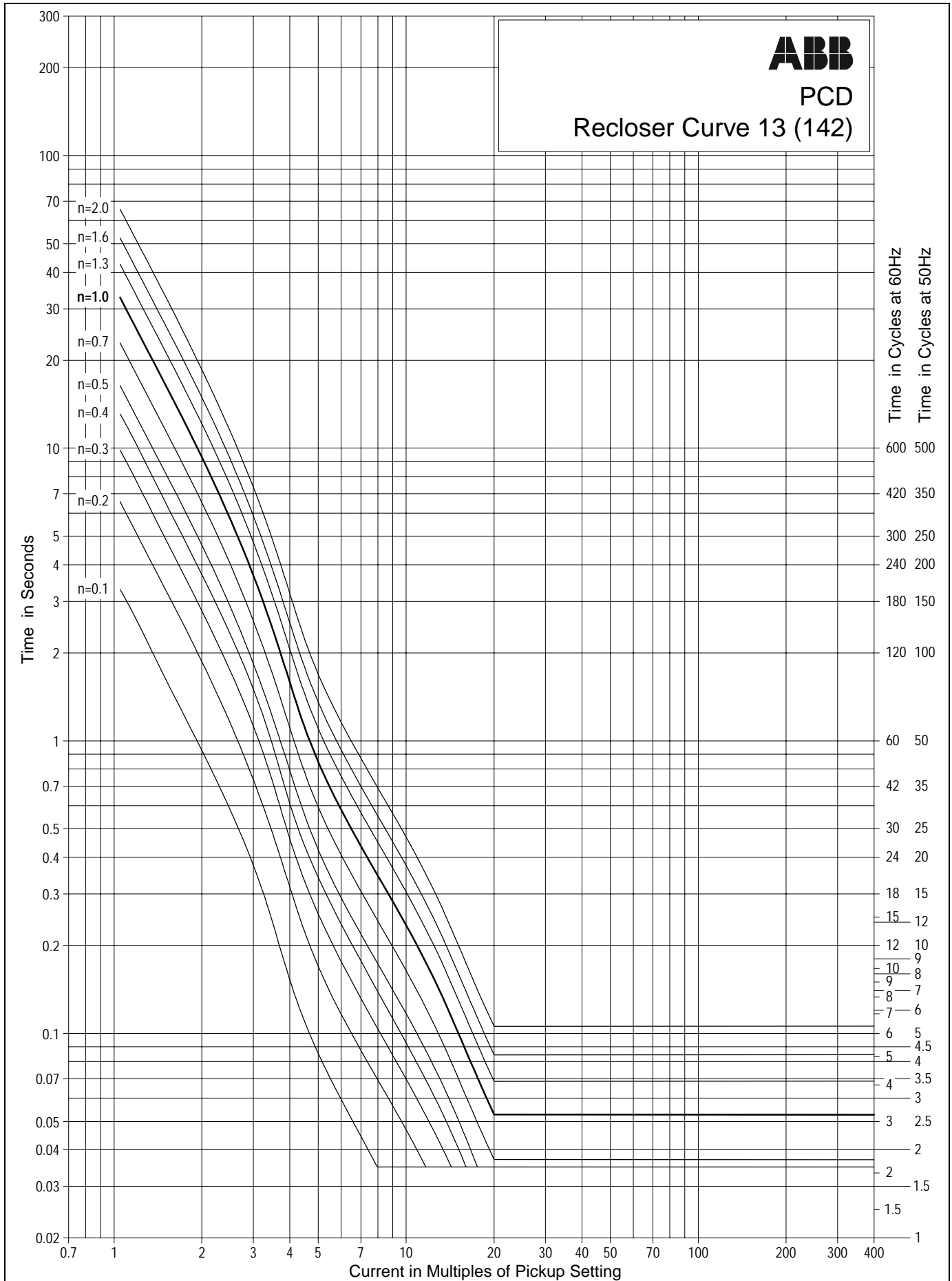


Figure 30. Recloser Curve 14 (119)

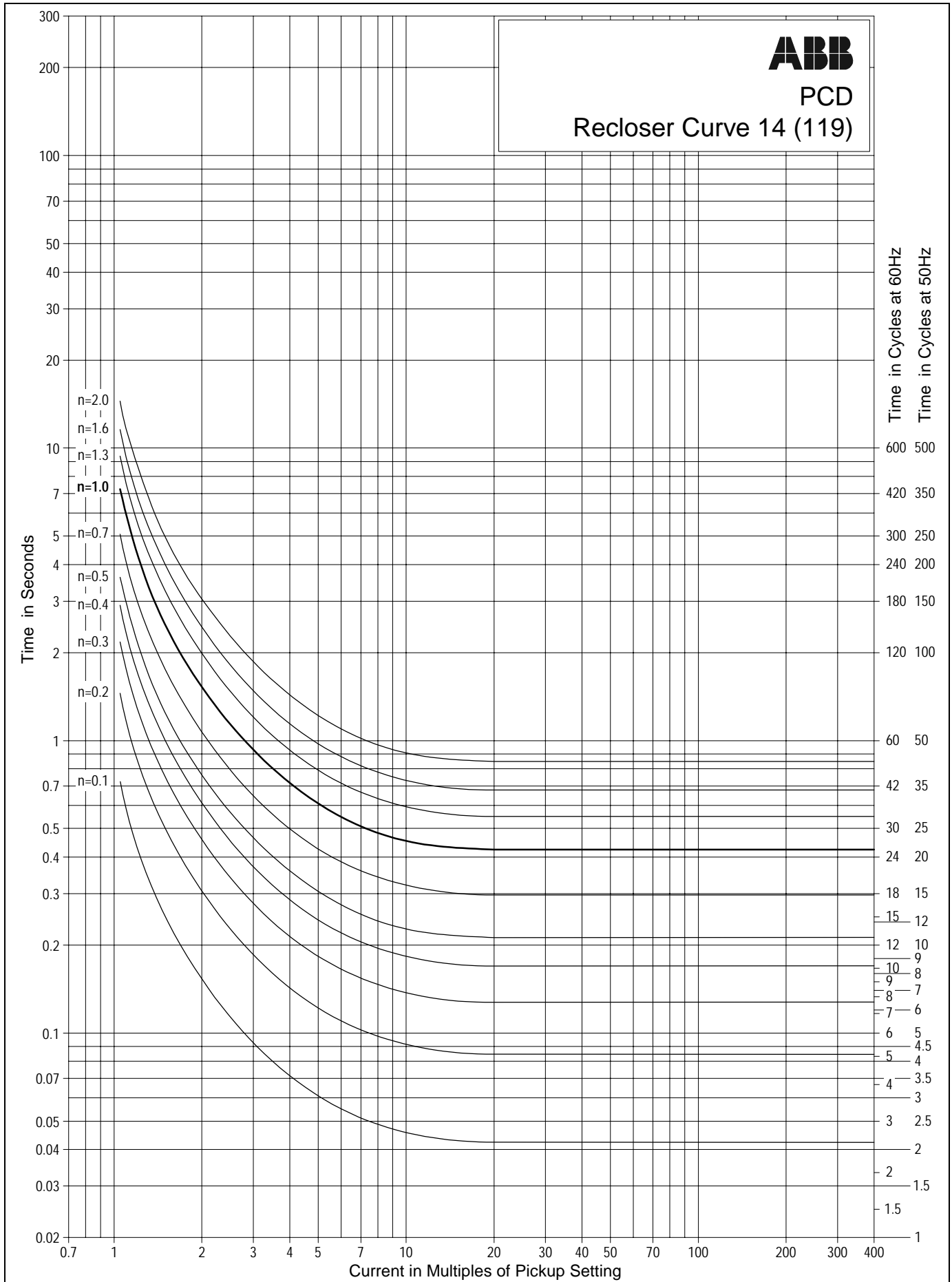


Figure 32. Recloser Curve 16 (139)

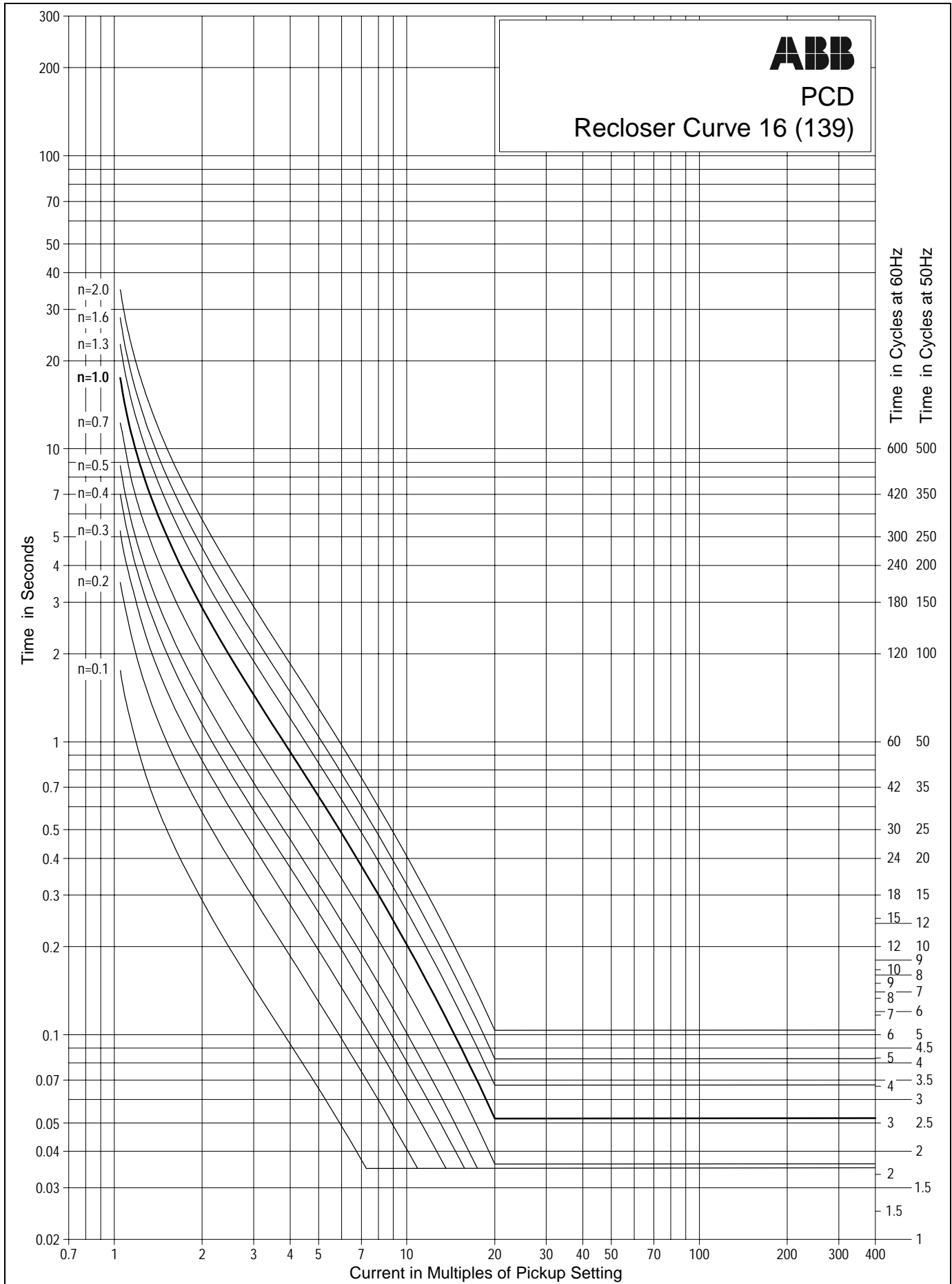


Figure 33. Recloser Curve 17 (103)

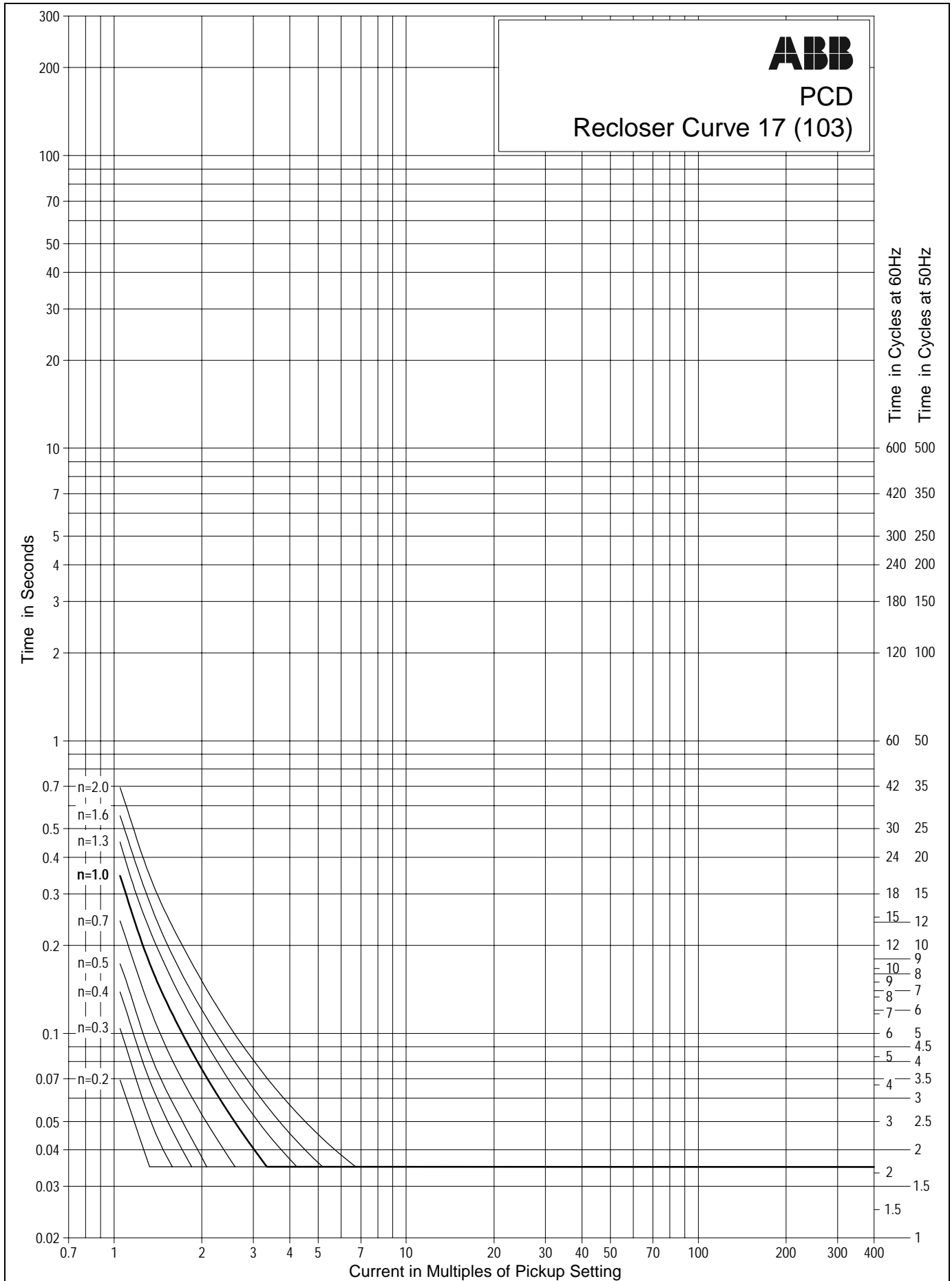


Figure 34. Recloser Curve 18 (151)

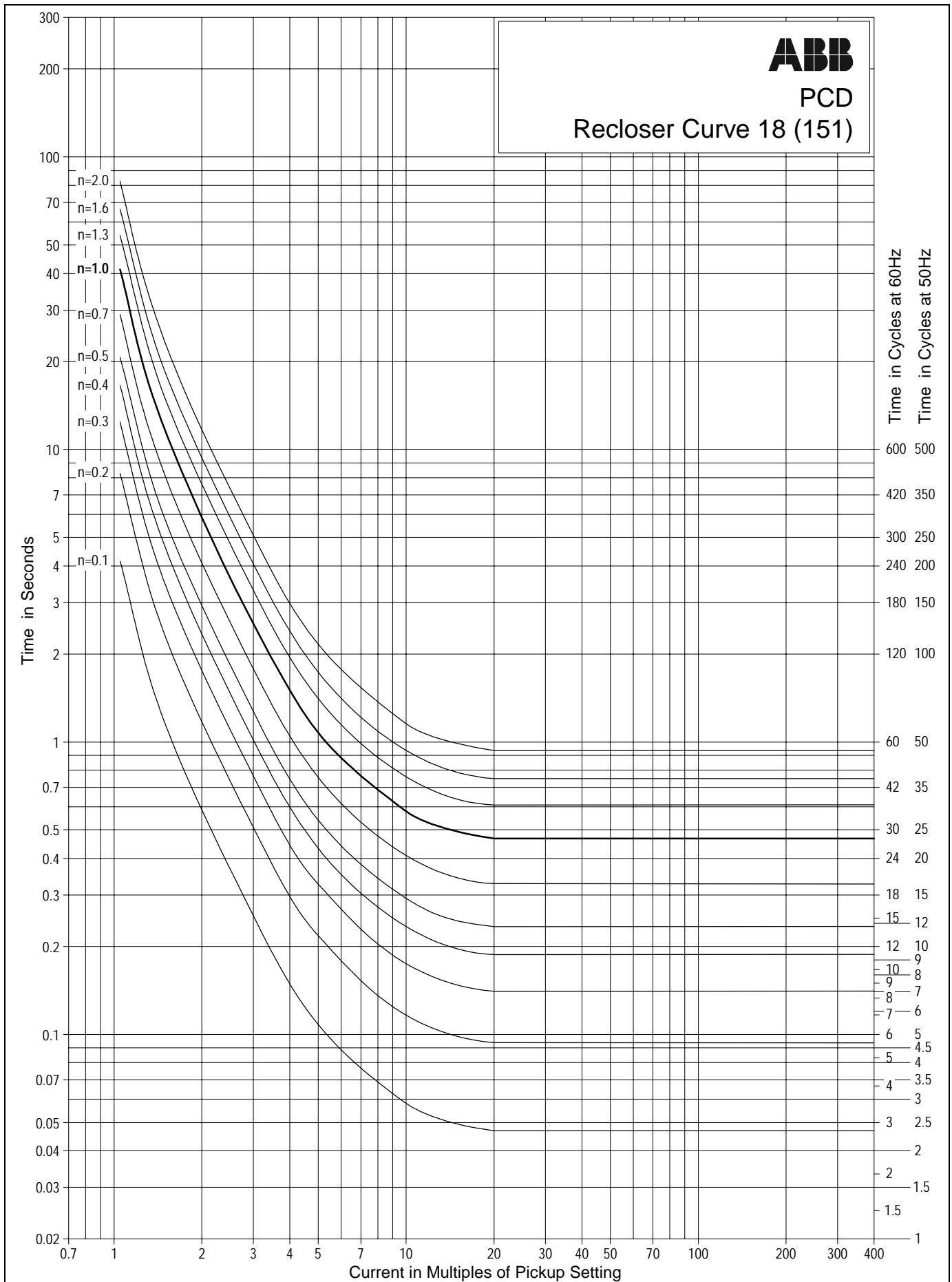


Figure 35. Recloser Curve A (101)

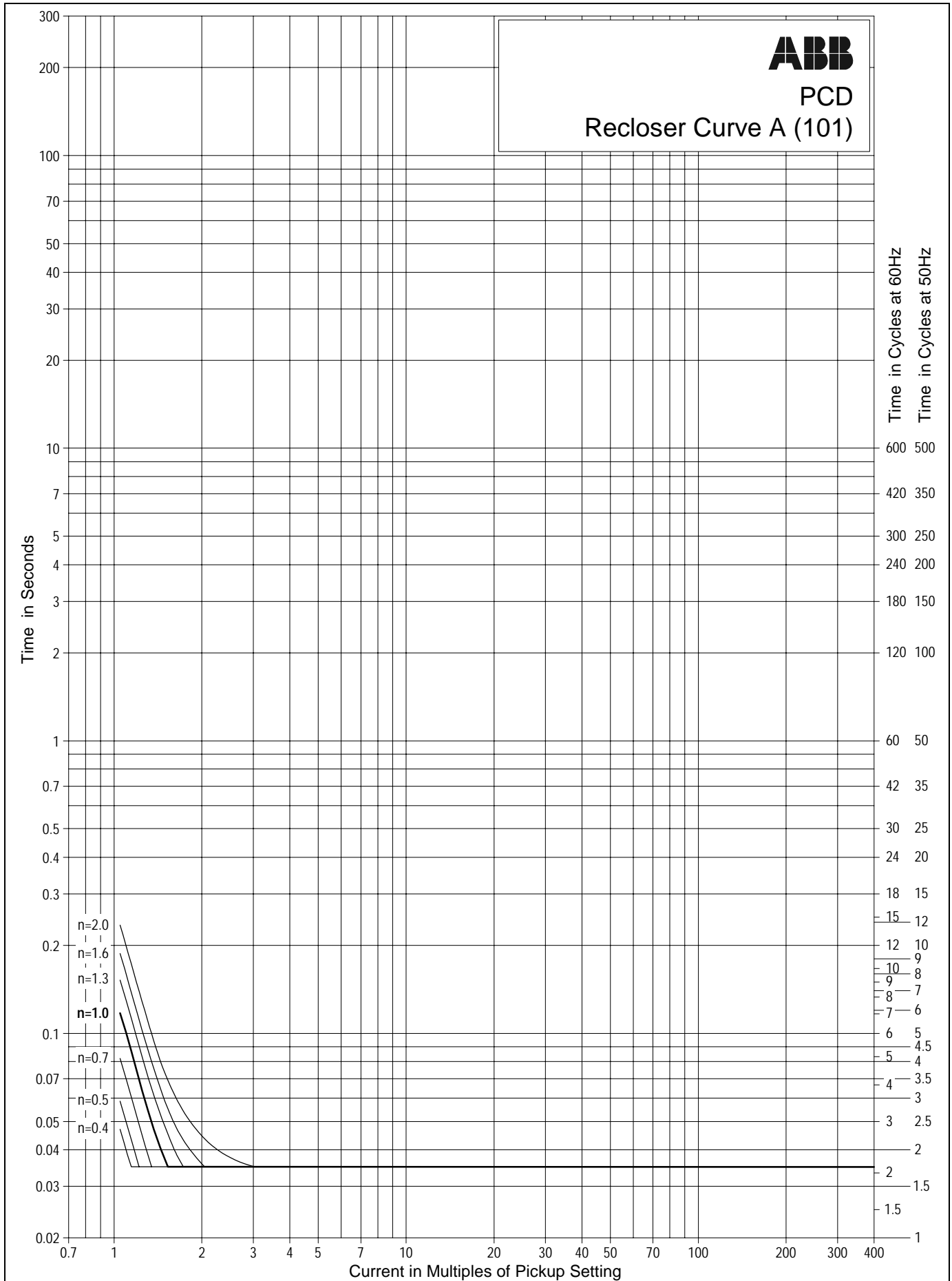


Figure 37. Recloser Curve C (133)

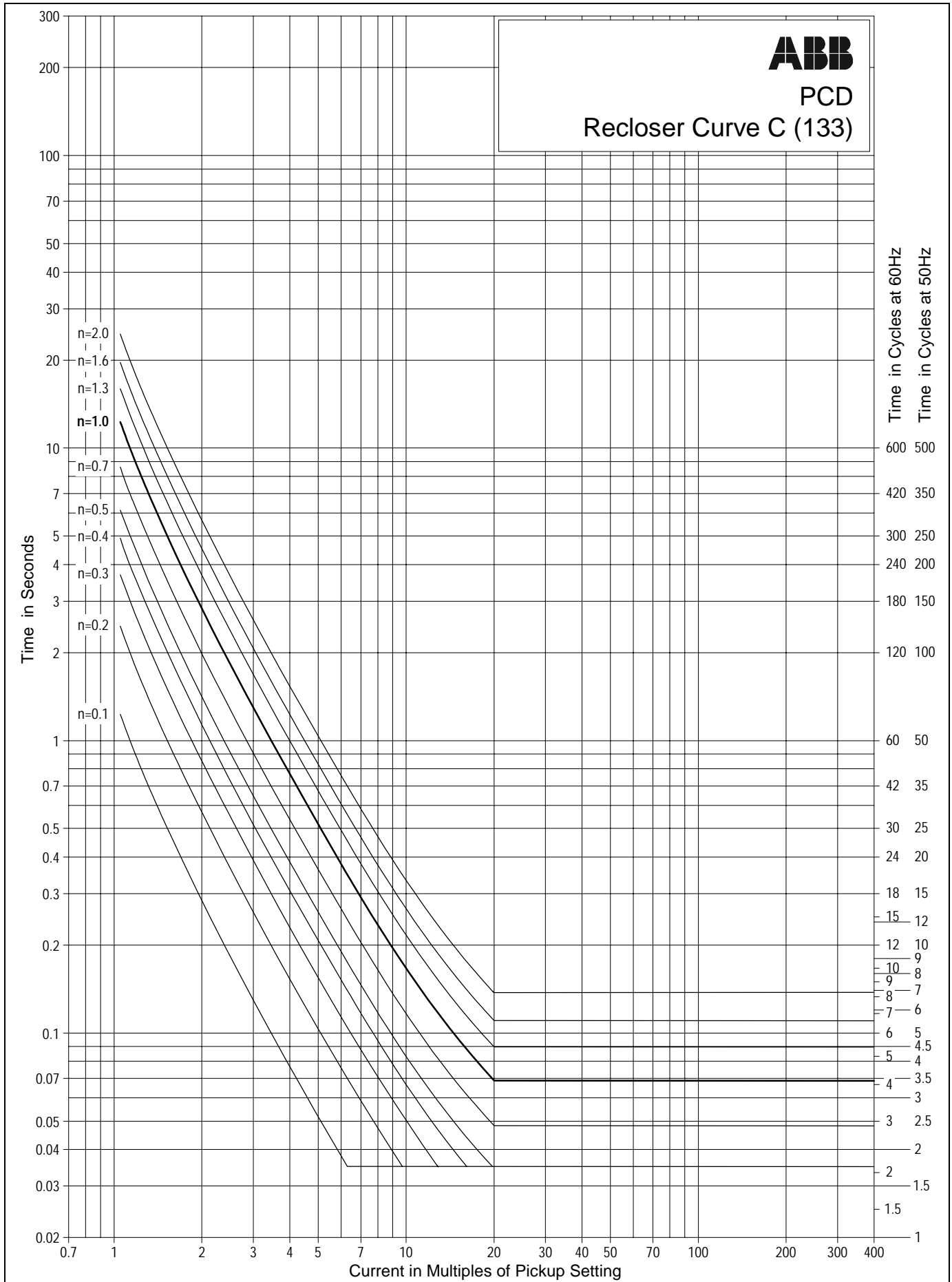


Figure 39. Recloser Curve E (132)

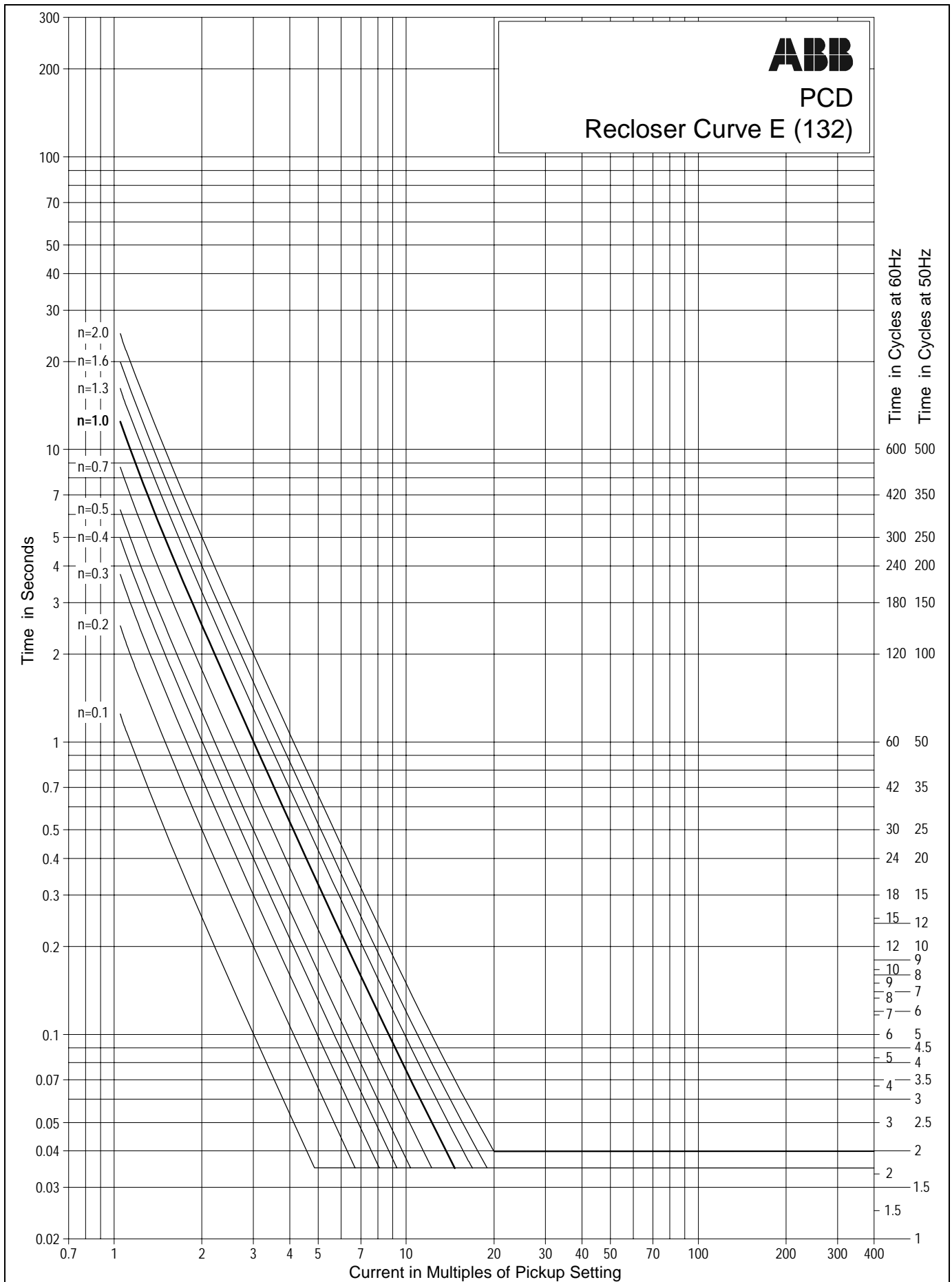


Figure 40. Recloser Curve F (163)

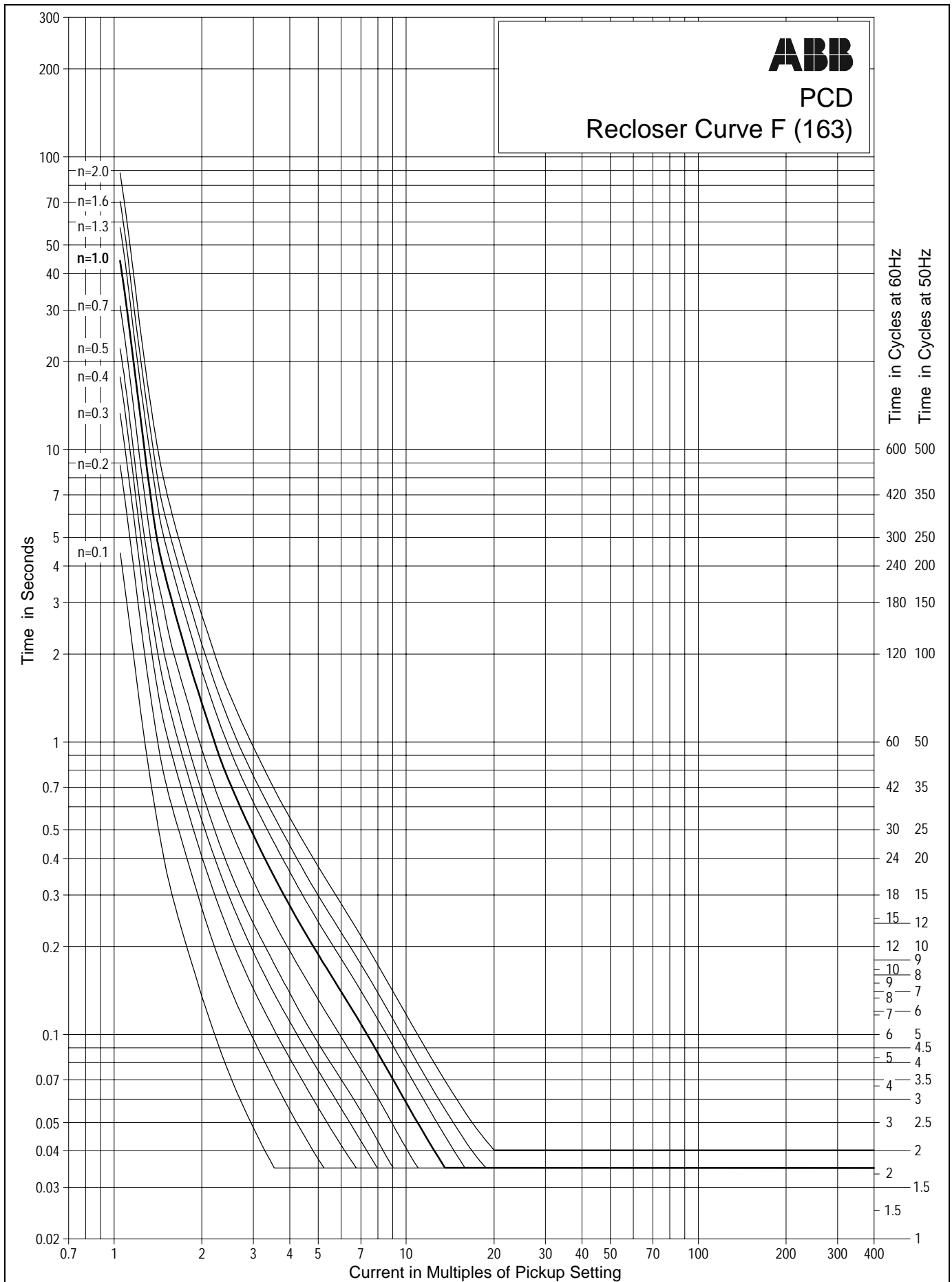


Figure 42. Recloser Curve H (122)

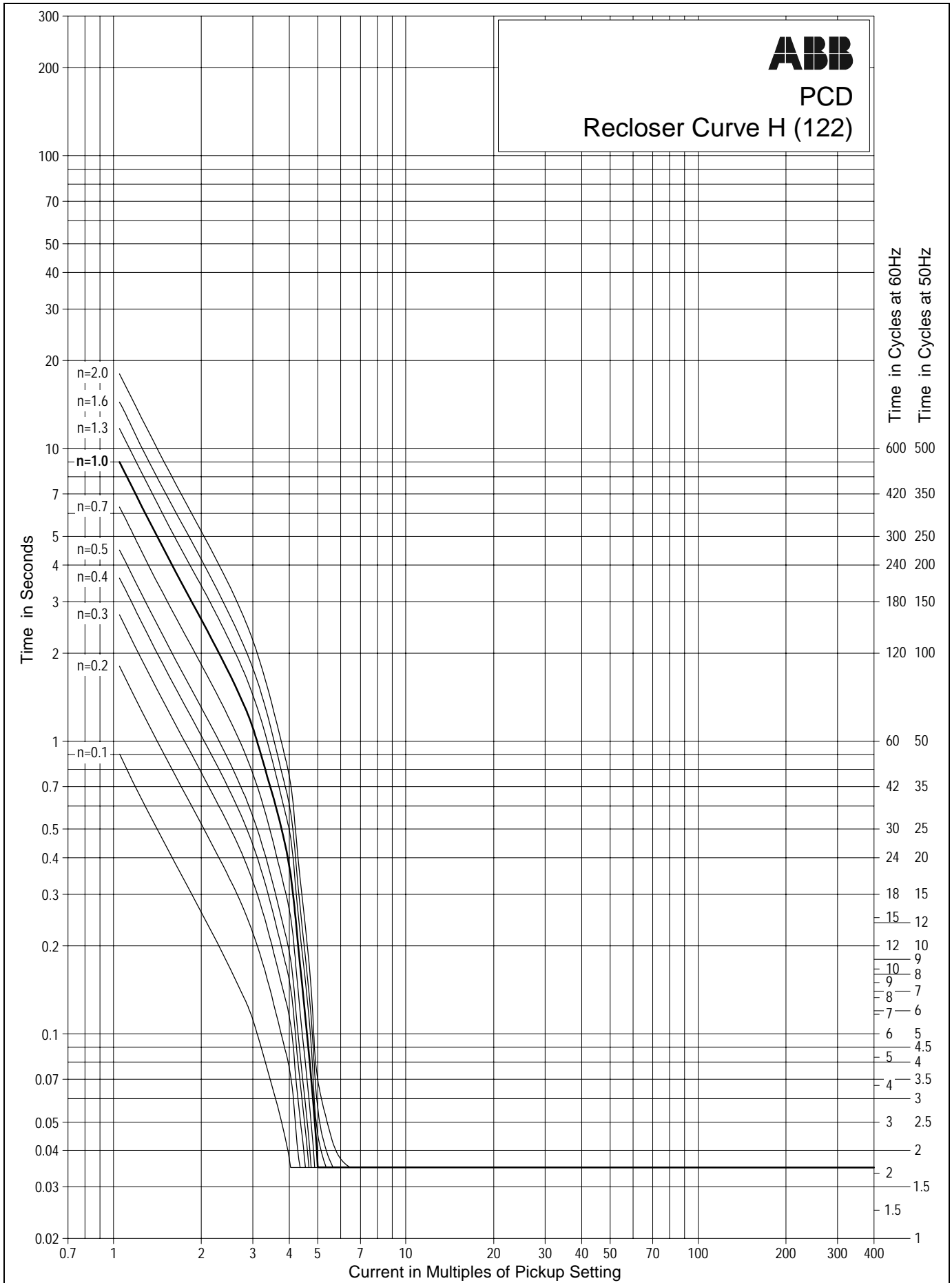


Figure 43. Recloser Curve J (164)

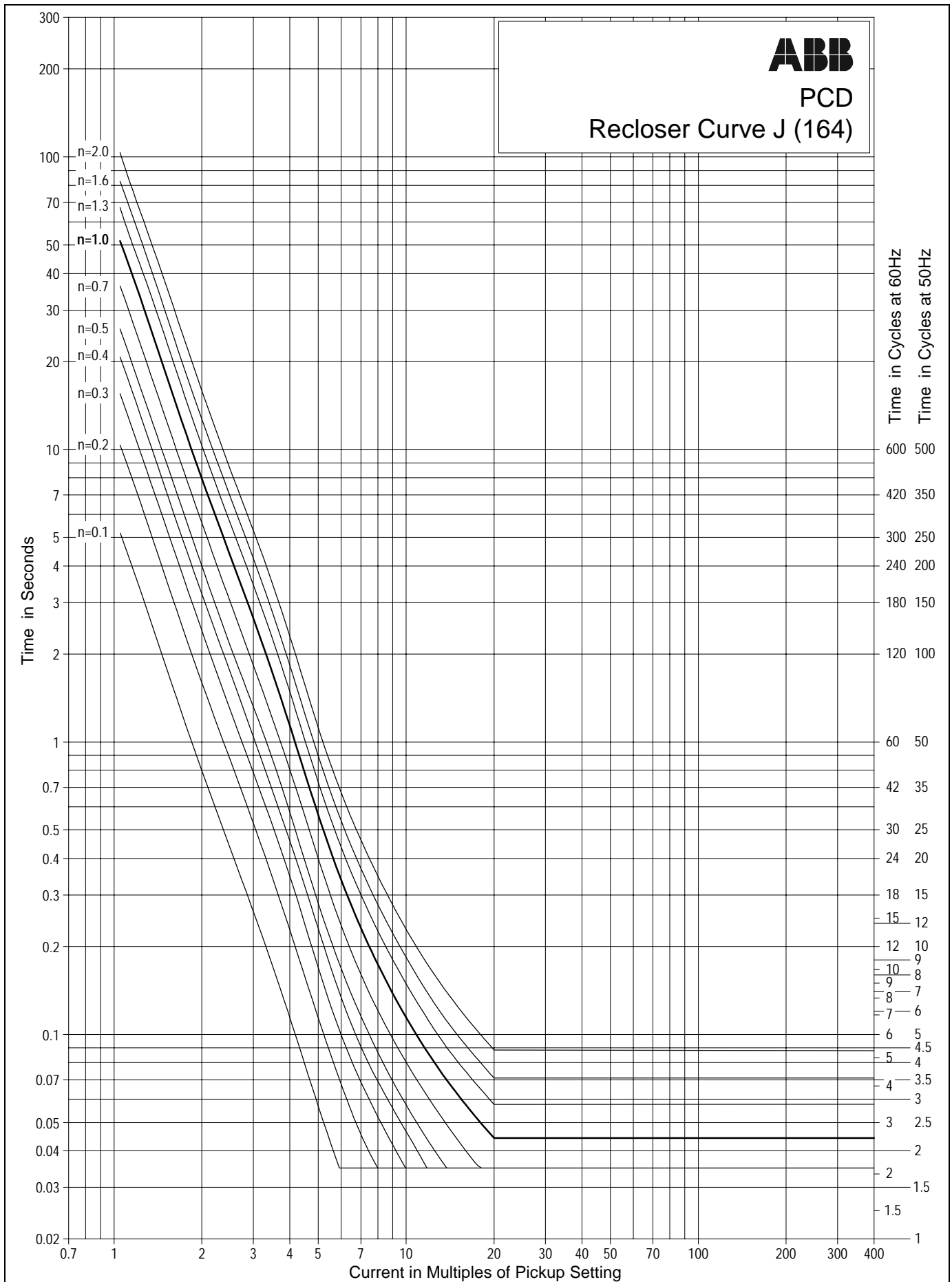


Figure 44. Recloser Curve K-Ground (165)

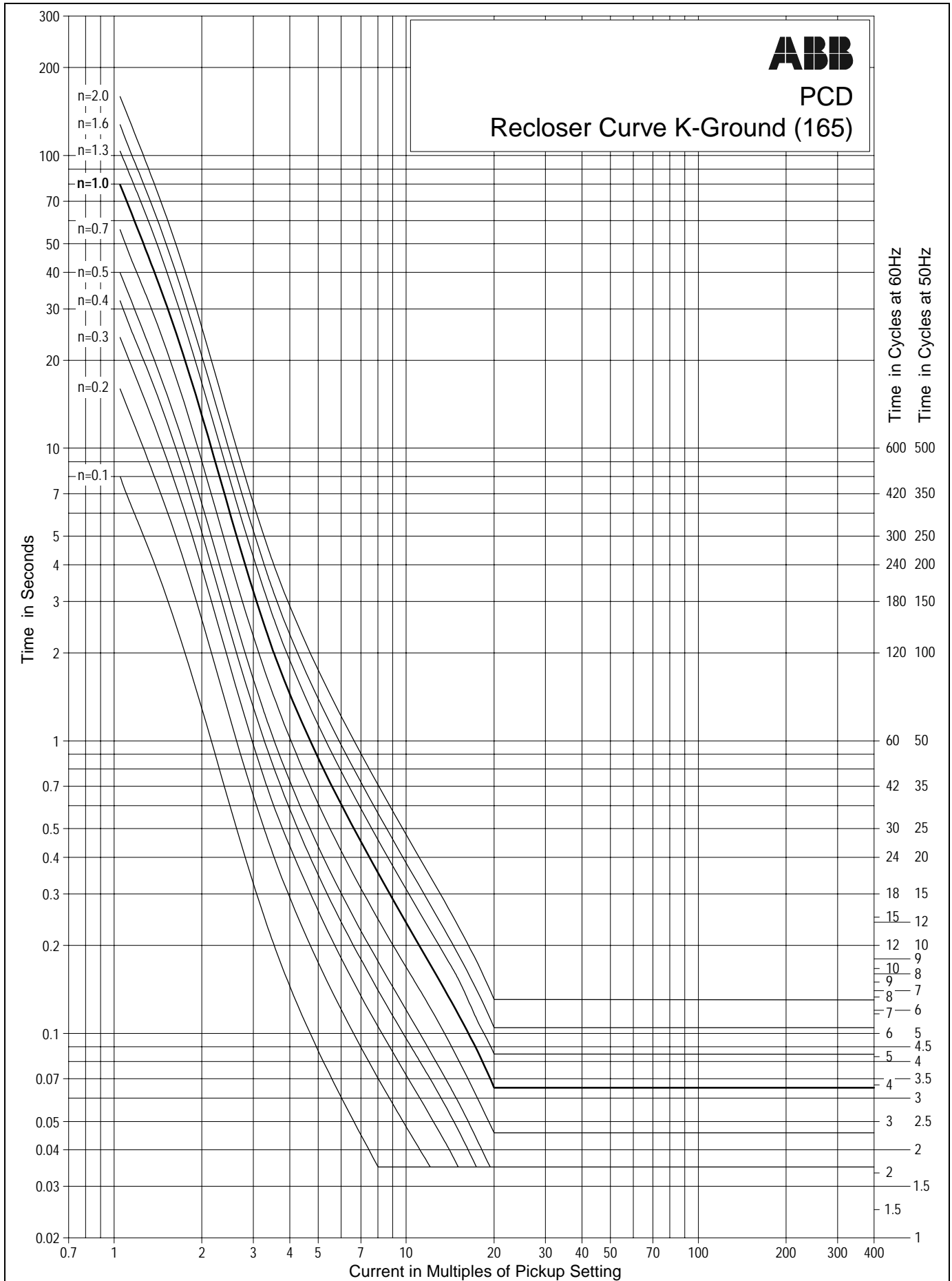


Figure 45. Recloser Curve K-Phase (162)

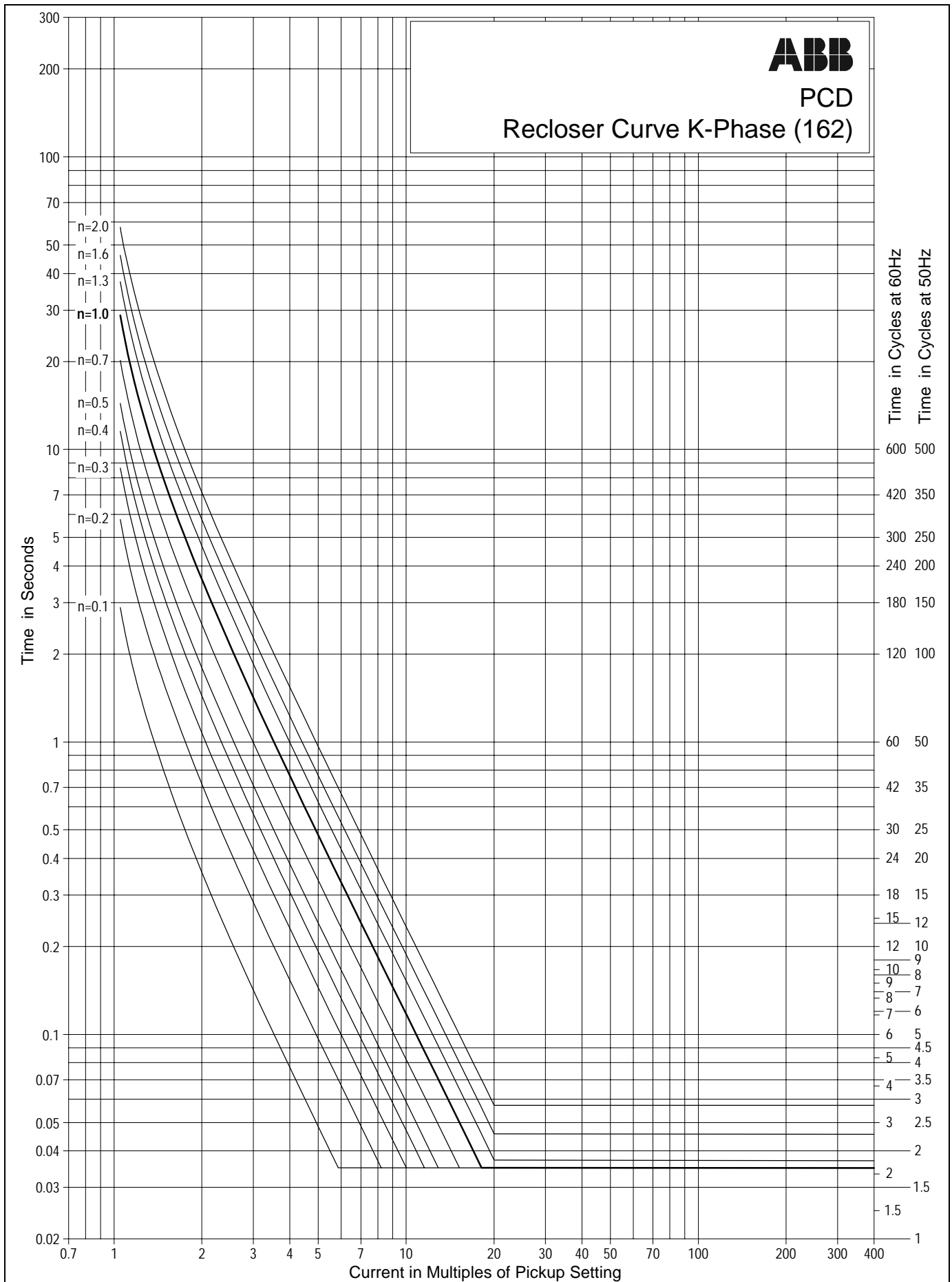


Figure 46. Recloser Curve L (107)

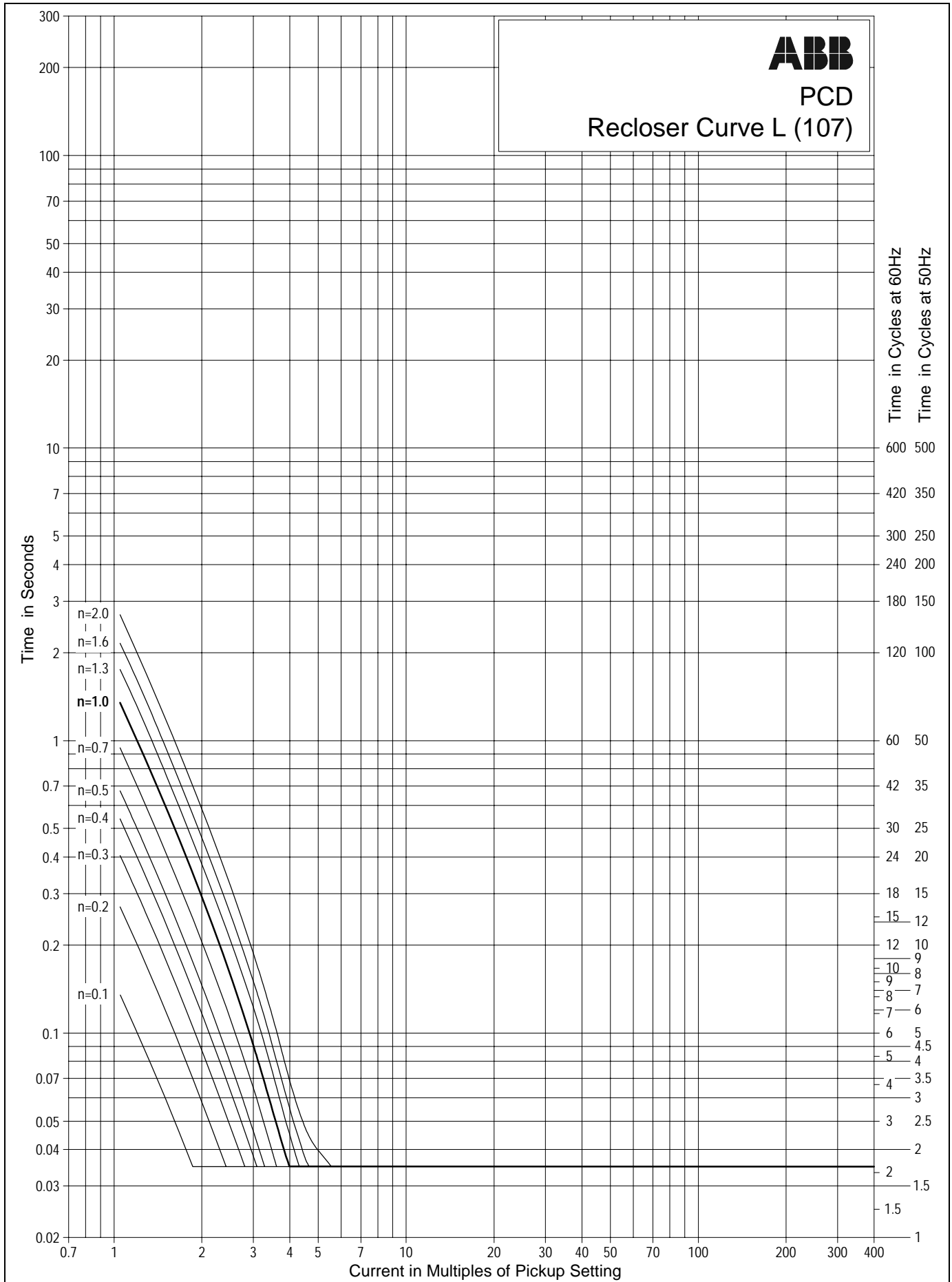


Figure 47. Recloser Curve M (118)

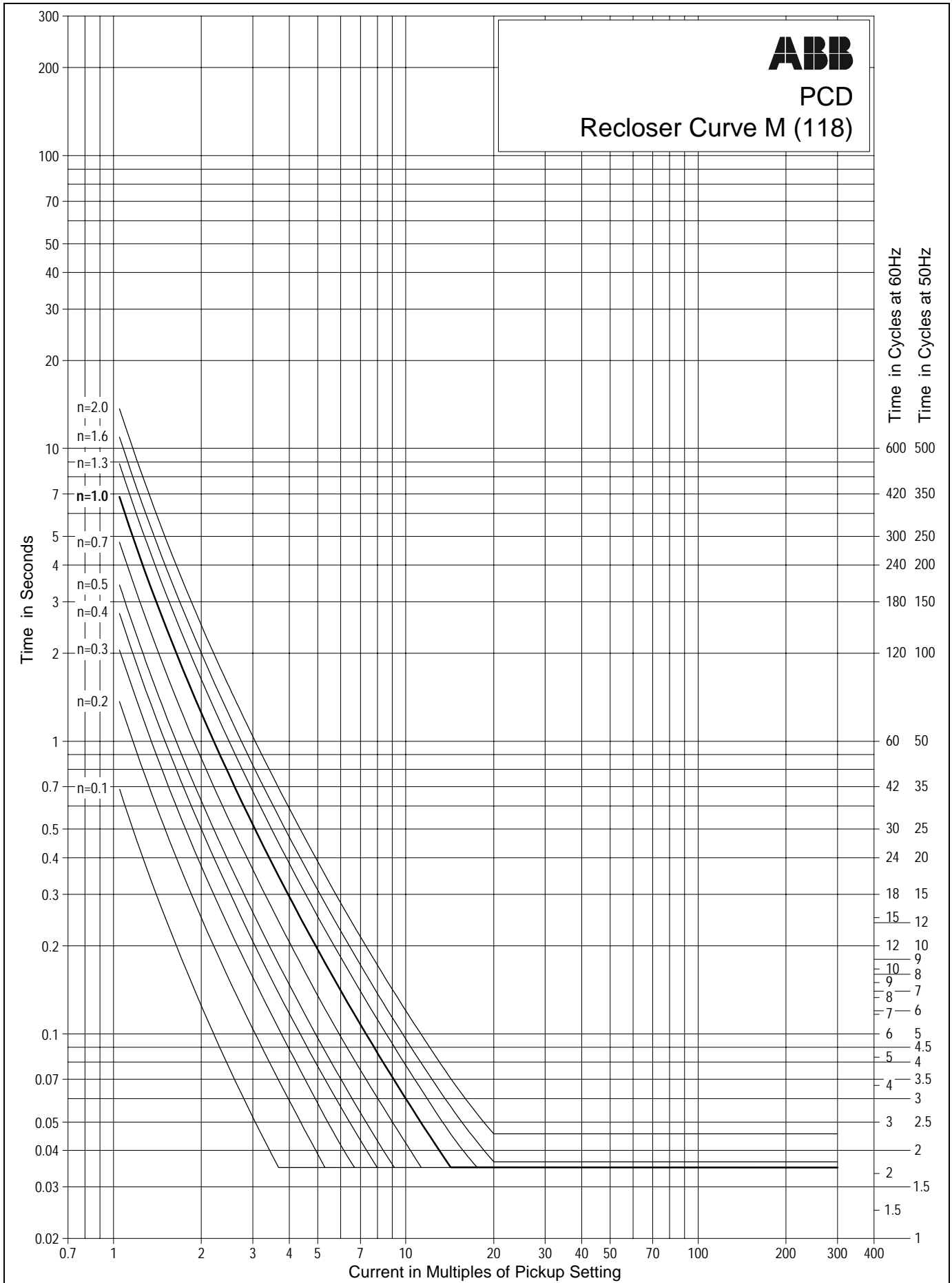


Figure 48. Recloser Curve N (104)

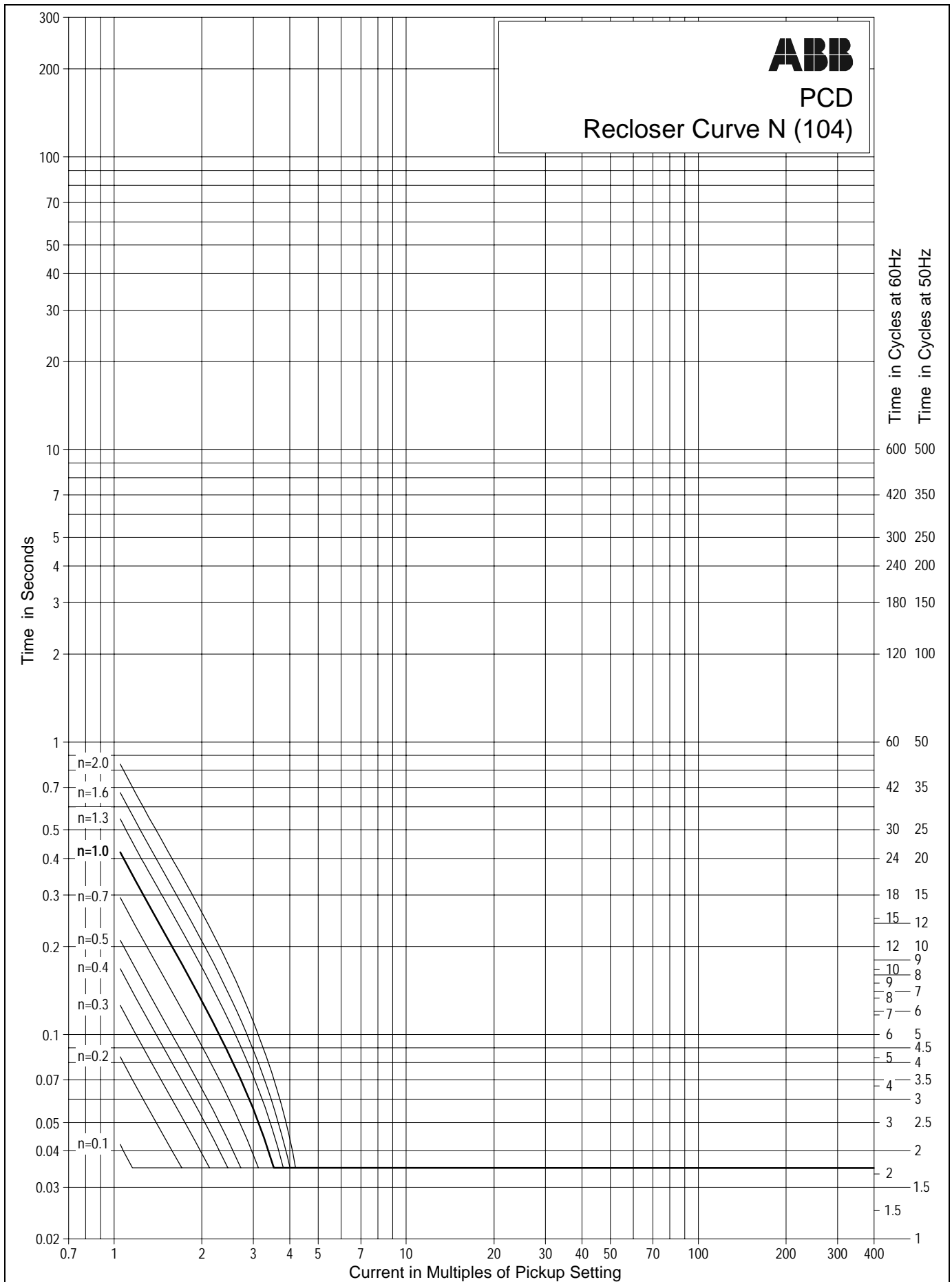


Figure 49. Recloser Curve P (115)

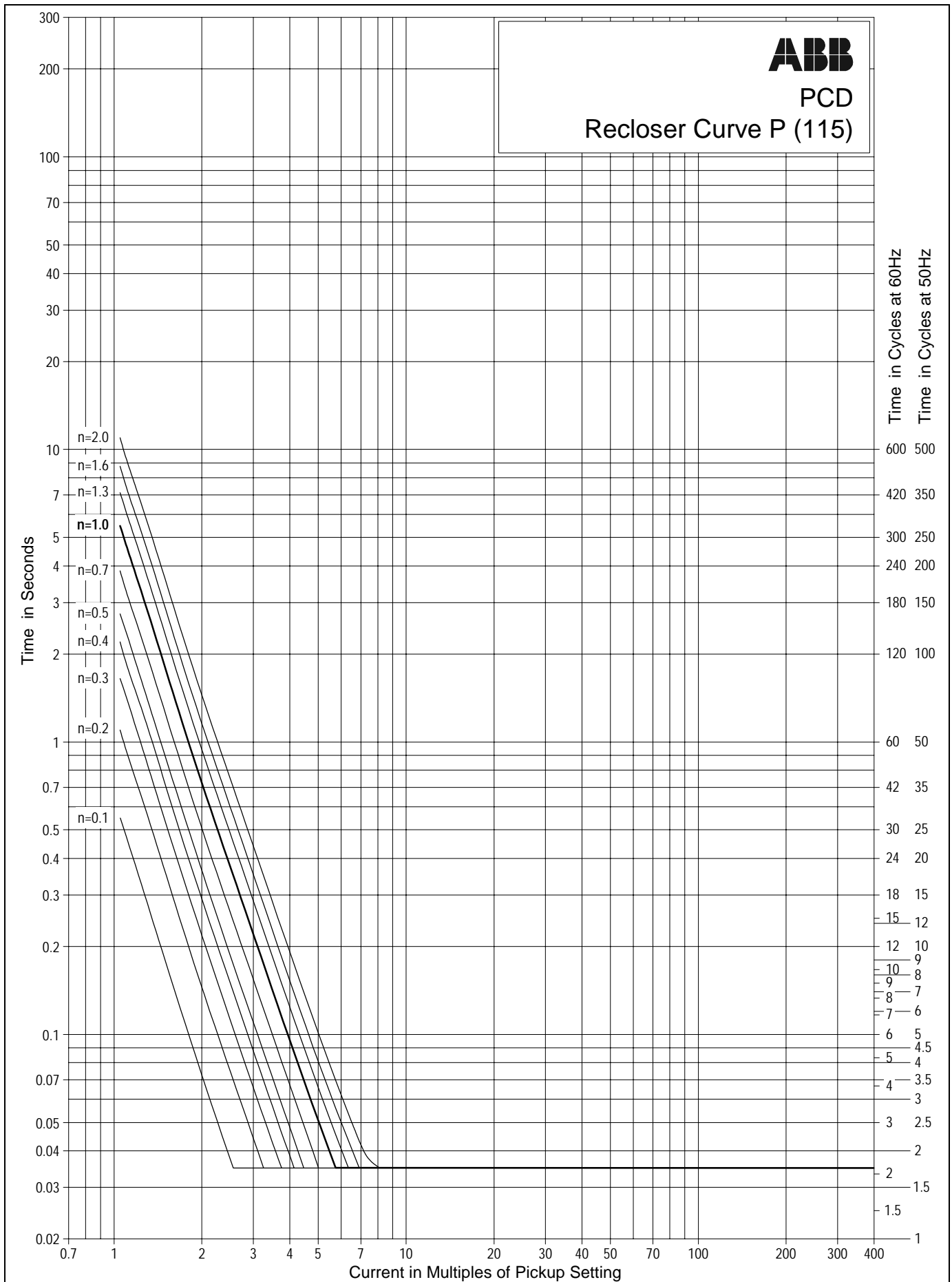


Figure 50. Recloser Curve R (105)

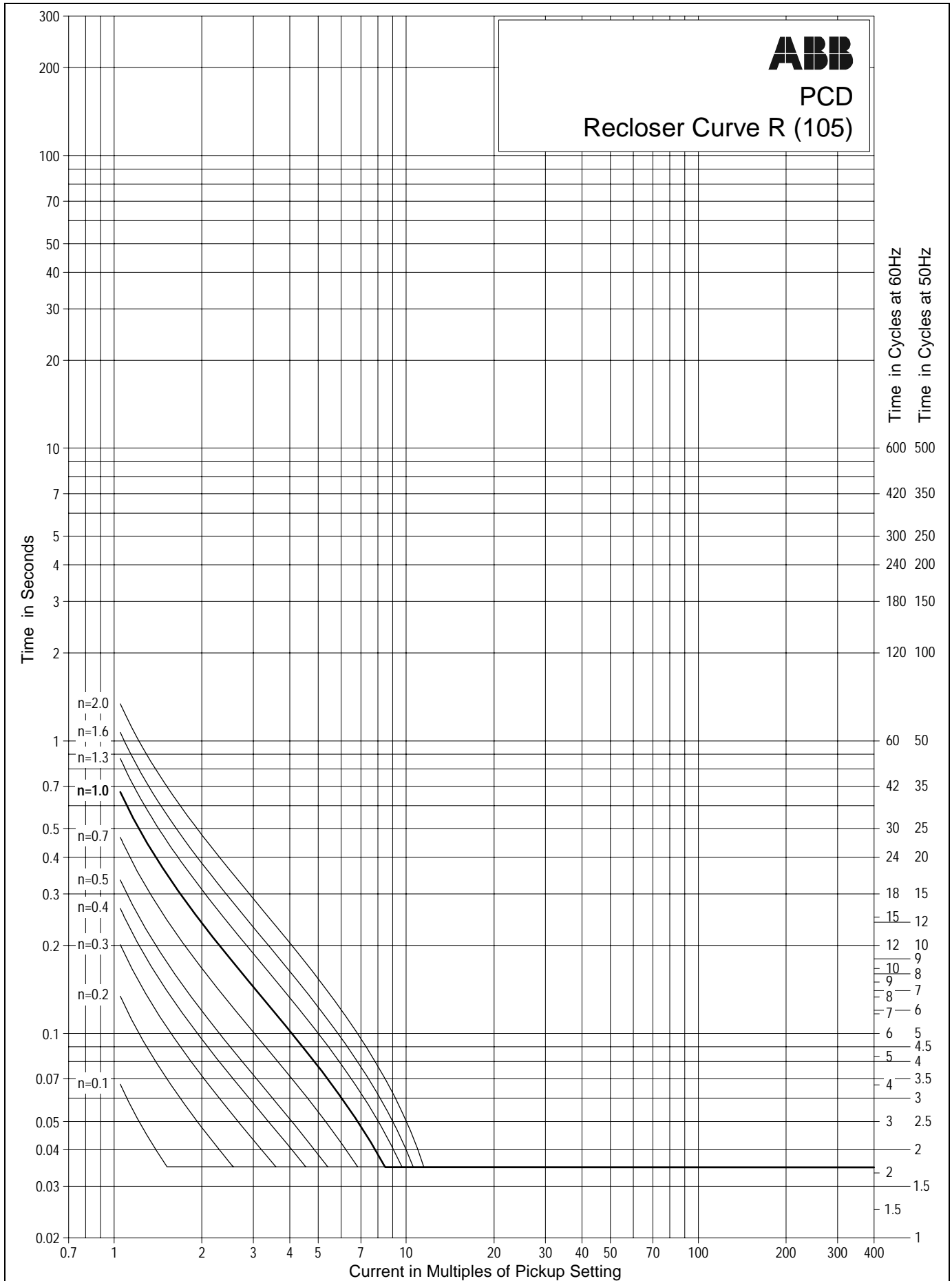


Figure 51. Recloser Curve T (161)

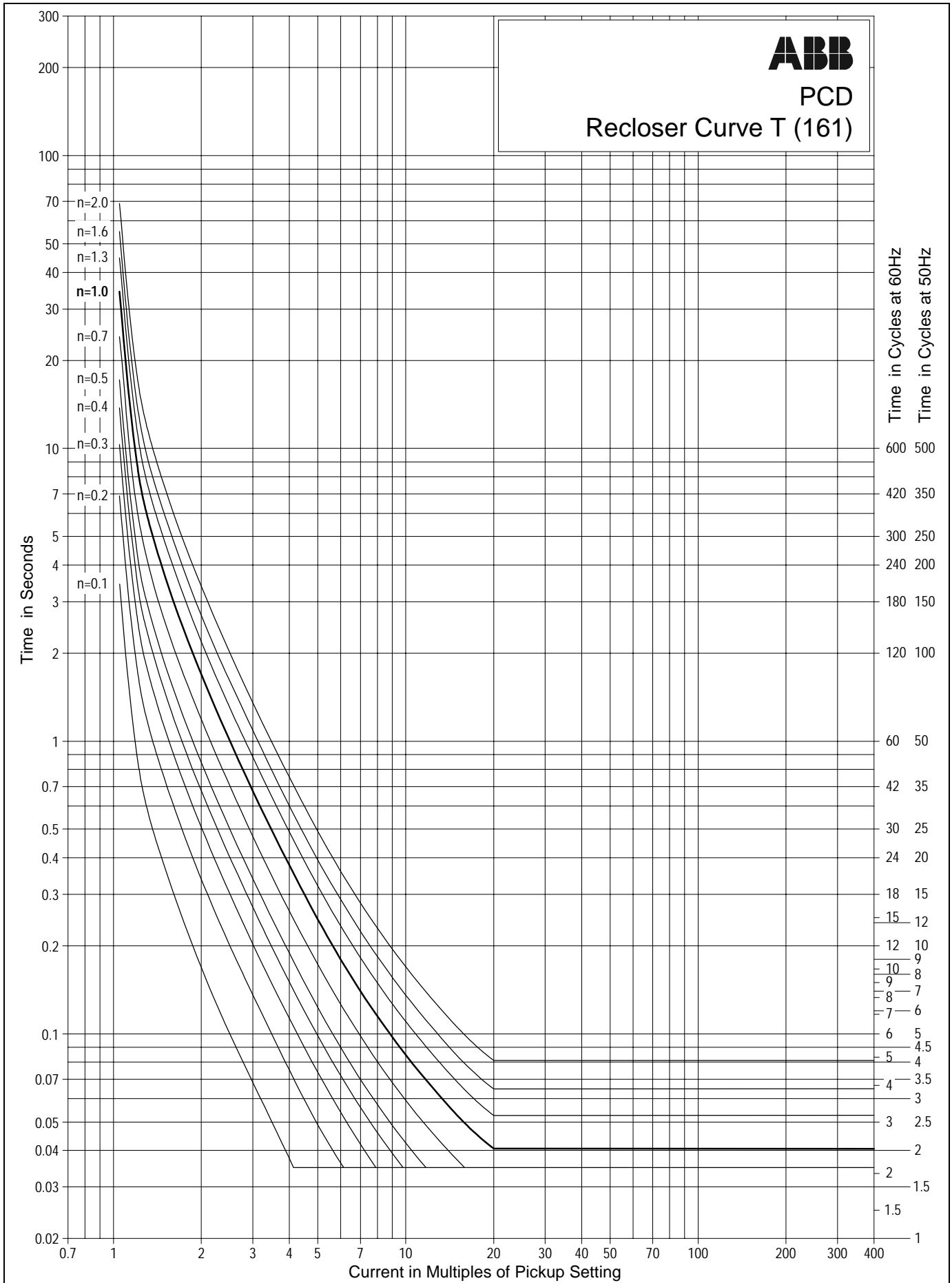


Figure 52. Recloser Curve V (137)

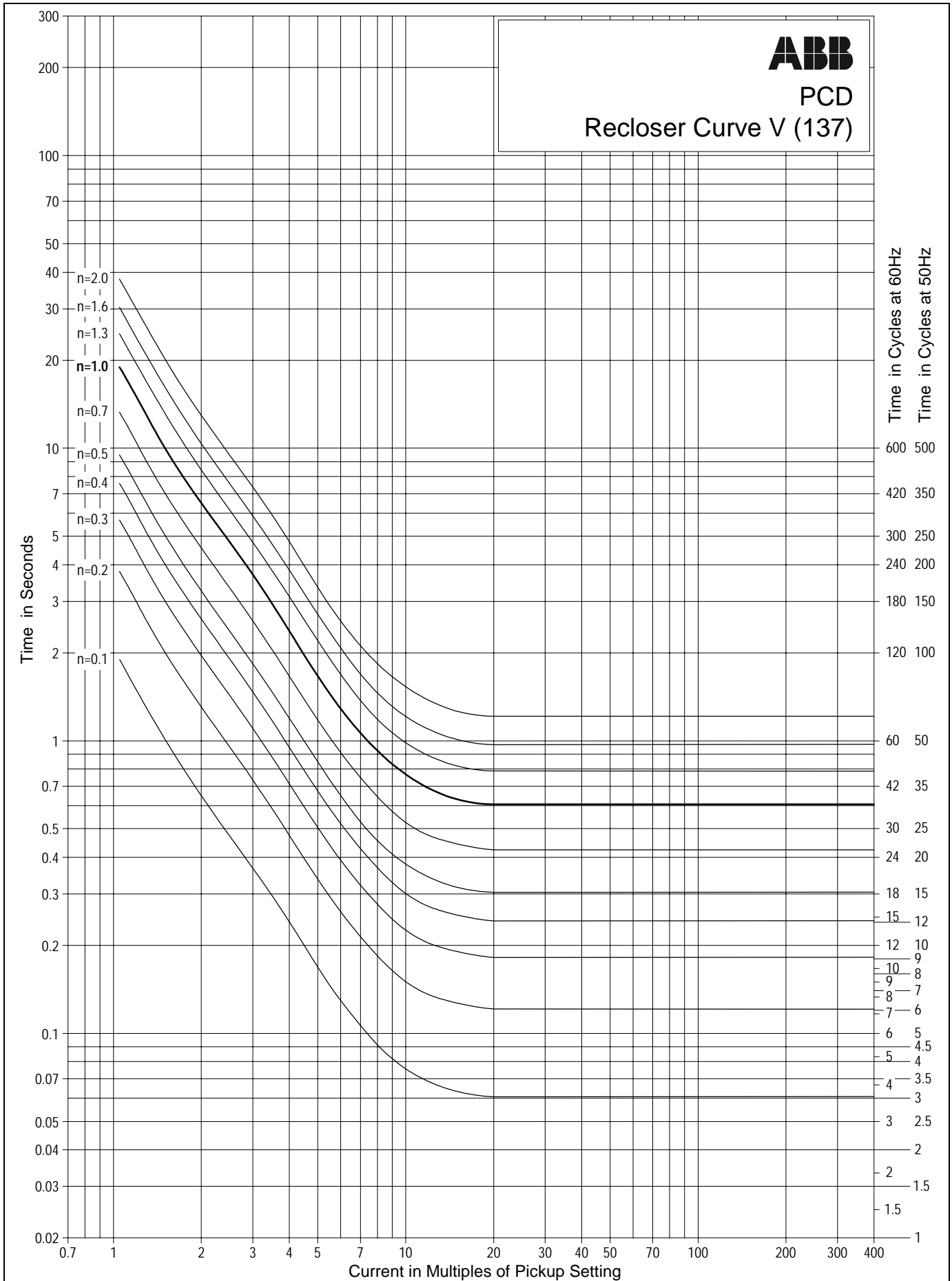


Figure 53. Recloser Curve W (138)

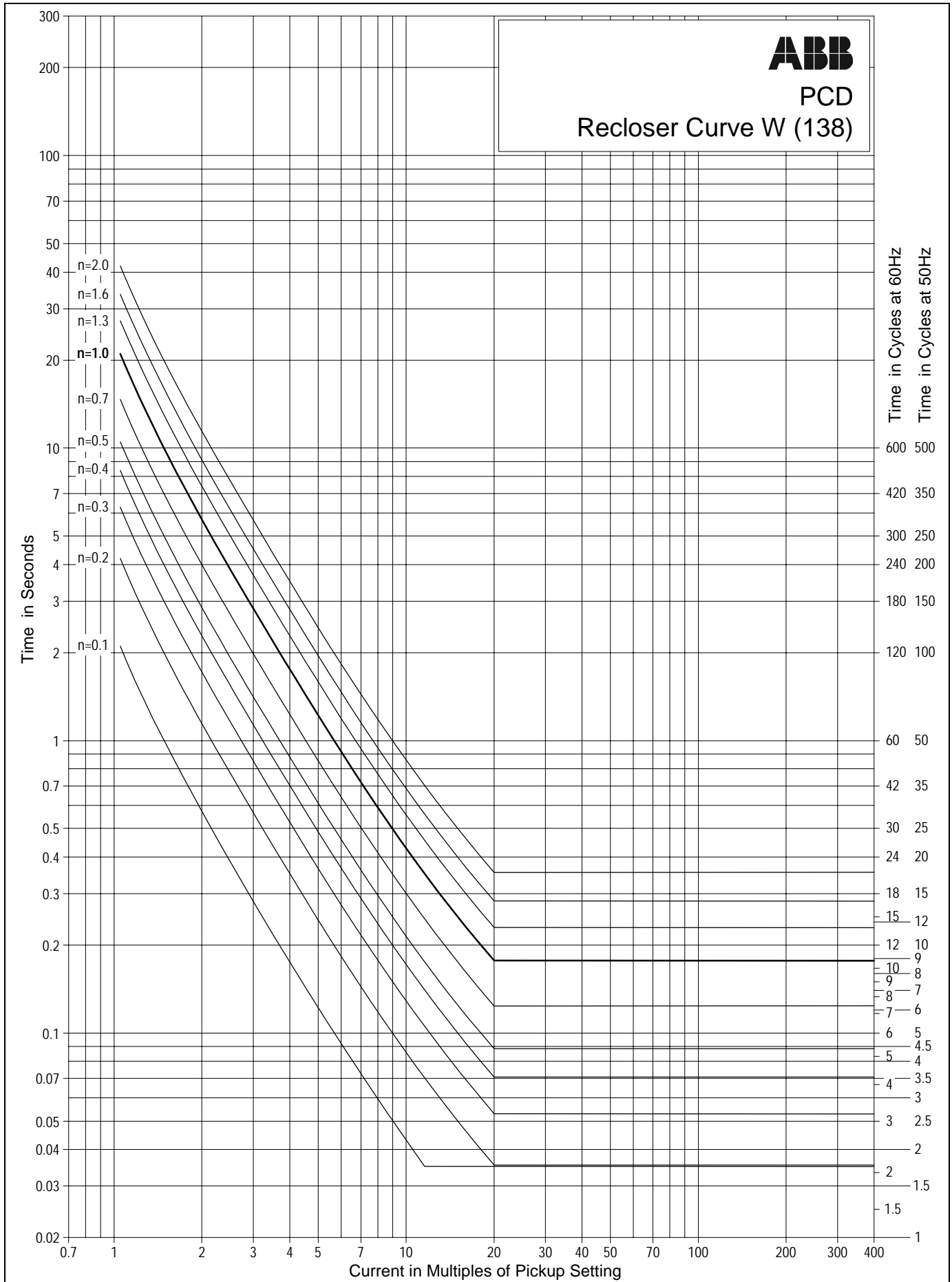


Figure 54. Recloser Curve Y (120)

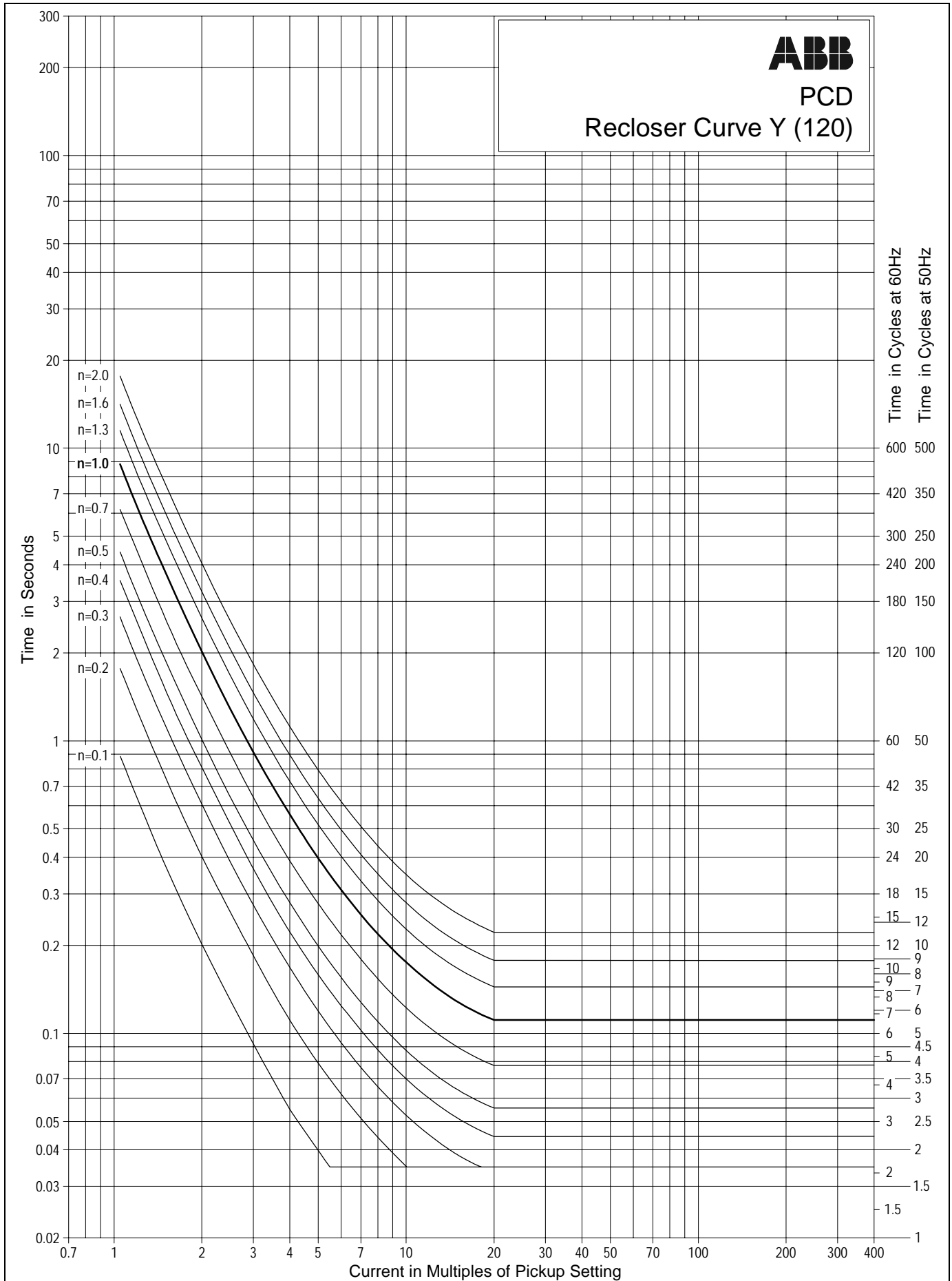


Figure 55. Recloser Curve Z (134)

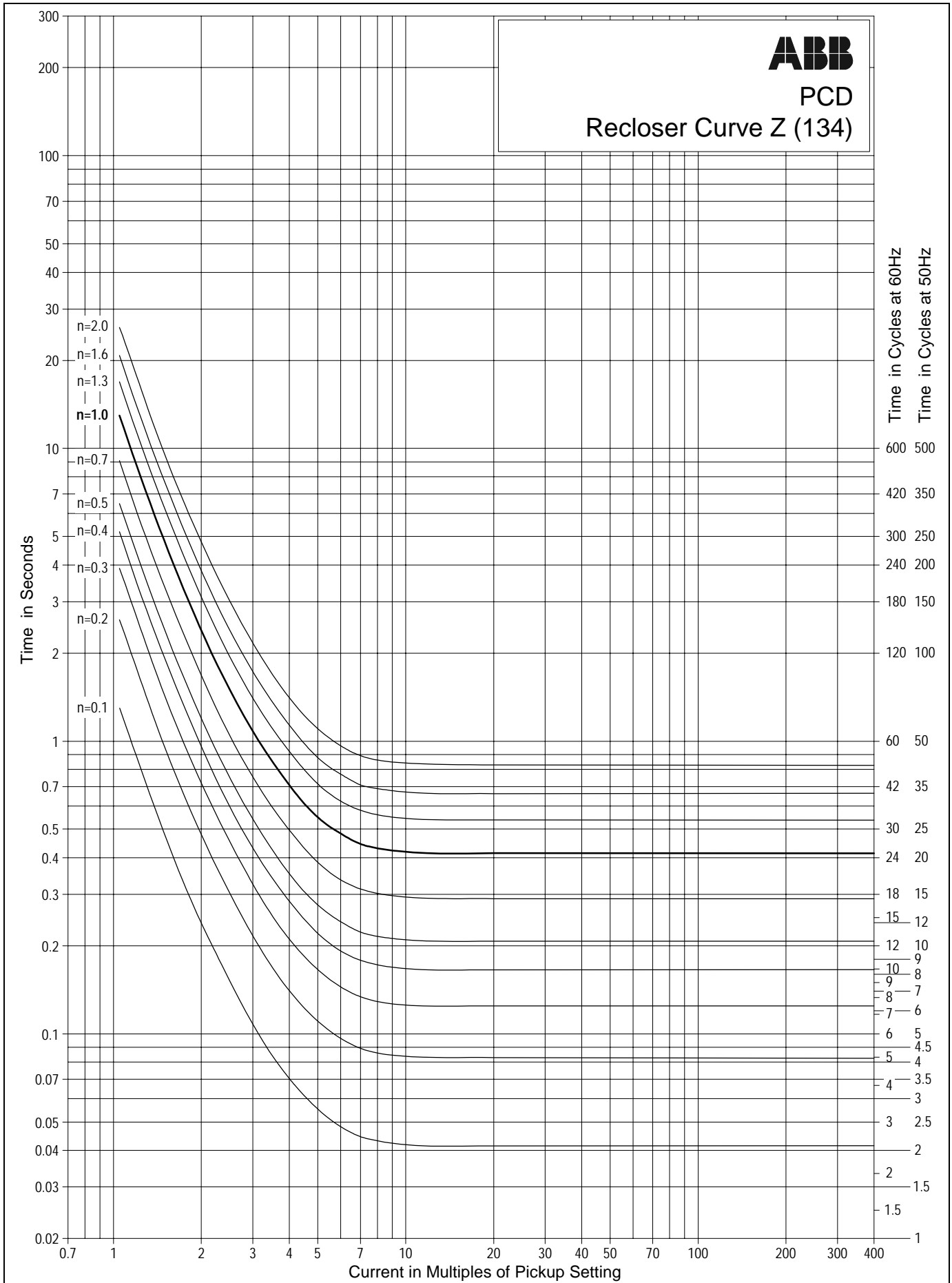




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