March 2014

Mn-Zn

Ferrite Cores for Switching Power Supplies

RM series

⚠ REMINDERS FOR USING THESE PRODUCTS

Please be sure to read this manual thoroughly before using the products.

The products listed on this catalog are intended for use in general electronic equipment (AV equipment, telecommunications equipment, home appliances, amusement equipment, computer equipment, personal equipment, office equipment, measurement equipment, industrial robots) under a normal operation and use condition.

The products are not designed or warranted to meet the requirements of the applications listed below, whose performance and/or quality require a more stringent level of safety or reliability, or whose failure, malfunction or trouble could cause serious damage to society, person or property.

When using the products for specific purposes, please first make confirmations in areas such as safety, reliability, and quality.

Please understand that we are not in a position to be held responsible for any damage or the like caused by any use exceeding the range or conditions of this specification sheet or by any use in the specific applications.

(1) Aerospace/Aviation equipment
(2) Transportation equipment (electric trains, ships, etc.)
(3) Medical equipment
(4) Power-generation control equipment
(5) Atomic energy-related equipment
(6) Seabed equipment
(7) Transportation control equipment
(8) Public information-processing equipment
(9) Military equipment
(10) Electric heating apparatus, burning equipment
(11) Disaster prevention/crime prevention equipment
(12) Safety equipment
(13) Other applications that are not considered general-purpose applications

When using this product in general-purpose standard applications, you are kindly requested to take into consideration securing protection circuit/equipment or providing backup circuits, etc to ensure higher safety.

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Ferrite Cores for Switching Power Supplies

Product compatible with RoHS directive
Halogen-free

Overview of the RM Series

■FEATURES

The RM Cores has a shape that is suited to high density mounting, it possesses good shielding qualities,being laid out so that the lead groove does not create an obstruction, and enables the creation of small, high performance transformers and coils.

■APPLICATION

Tranformers and coils for Switched-mode power supplies (High Mounting Density, Low Profile)

■PART NUMBER CONSTRUCTION

PC47	RM4	Z	-	1	2
Material	**Size of RM core**	**AL-value (Z: without air gap)**		**Type**	**Number of lead slot**
PC47	RM4				
	RM5				
	RM6				
	RM8				
	RM10				
	RM12				
	RM14				

■RANGE OF USE AND STORAGE TEMPERATURE

| Temperature range	
Operating temperature (°C)	**Storage temperature (°C)**
−30 to +105	−30 to +85

○RoHS Directive Compliant Product: See the following for more details related to RoHS Directive compliant products. http://www.tdk.co.jp/rohs/

○Halogen-free: Indicates that Cl content is less than 900ppm, Br content is less than 900ppm, and that the total Cl and Br content is less than 1500ppm.

• All specifications are subject to change without notice.

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Mn-Zn **RM Cores**

■SHAPES AND DIMENSIONS

Fig. 1	Fig. 2	Fig. 3		
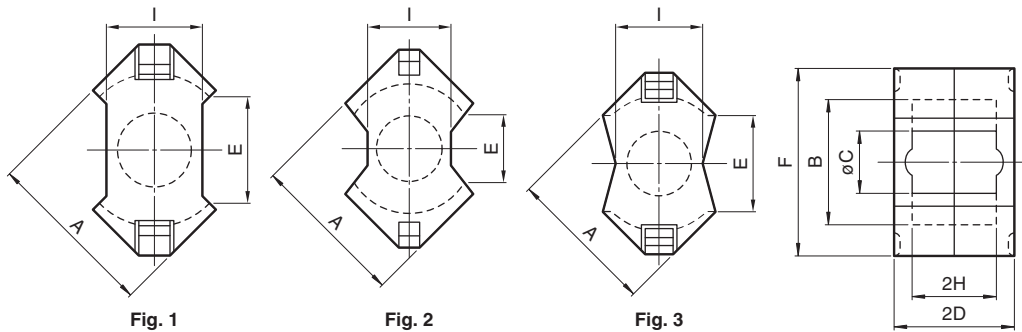
PC47	RM6	Z	-	1	2
Material	Size of RM core	A$_L$-value		Type	Number of lead slot

Part No.	Core	Dimensions (mm)							
		A	B	øC	2D	E min.	F	2H	I
PC47RM4Z-12	Fig.1	9.63±0.18	8.15±0.2	3.8±0.1	10.4±0.1	5.8	10.8±0.2	7.2±0.2	4.45±0.15
PC47RM5Z-12	Fig.1	12.05±0.25	10.4±0.2	4.8±0.1	10.4±0.1	6.0	14.3±0.3	6.5±0.2	6.6±0.2
PC47RM6Z-12	Fig.3	14.4±0.3	12.65±0.25	6.3±0.1	12.4±0.1	8.4	17.6±0.3	8.2±0.2	8.0±0.2
PC47RM8Z-12	Fig.2	19.35±0.35	17.3±0.3	8.4±0.15	16.4±0.1	9.8	22.75±0.45	11.0±0.2	10.8±0.2
PC47RM10Z-12	Fig.2	24.15±0.55	21.65±0.45	10.7±0.2	18.6±0.1	11.3	27.85±0.65	12.7±0.3	13.25±0.25
PC47RM12Z-12	Fig.2	29.25±0.55	25.5±0.5	12.6±0.2	23.5±0.1	12.9	36.75±0.65	17.1±0.3	16.0±0.3
PC47RM14Z-12	Fig.1	34.2±0.5	29.5±0.5	14.75±0.25	28.8±0.2	17.0	41.6±0.6	21.1±0.3	18.7±0.3

Part No.	Effective parameter					Electrical characteristics		
	Core factor	Effective cross-sectional area	Effective magnetic path length	Effective core volume	Weigh	A$_L$-value		Core loss
	C_1(mm^{-1})	Ae(mm^2)	ℓ e(mm)	Ve(mm^3)	(g)	(nH/N^2) 1kHz 0.5mA 100Ts		(W) max. 100kHz 200mT 100°C
						Without air gap	With air gap	
PC47RM4Z-12	1.62	14.0	22.7	318	1.7	680 min.	63±3% 100±3% 160±3%	0.11
PC47RM5Z-12	0.940	23.7	22.4	530	3.0	1250 min.	63±3% 100±3% 160±3%	0.17
PC47RM6Z-12	0.781	36.6	28.6	1050	5.5	2450±25%	100±3% 160±3% 250±3%	0.38
PC47RM8Z-12	0.594	64.0	38.0	2430	13	1950 min.	100±3% 160±3% 250±3%	0.91
PC47RM10Z-12	0.450	98.0	44.0	4310	23	4850±25%	160±3% 250±3% 400±3%	1.70
PC47RM12Z-12	0.406	140	56.9	7970	42	4150 min.	160±3% 250±3% 400±3%	3.00
PC47RM14Z-12	0.393	178	70.0	12500	70	4600 min.	160±3% 250±3% 400±3%	4.60

• All specifications are subject to change without notice.

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Mn-Zn RM series   Part No.: PC47RM4Z-12

■ SHAPES AND DIMENSIONS

4.45±0.15
90°
5.8−0
9.63±0.18

10.4±0.1
7.2±0.2
10.8±0.2
8.15±0.2
ø3.8±0.1

Dimensions in mm
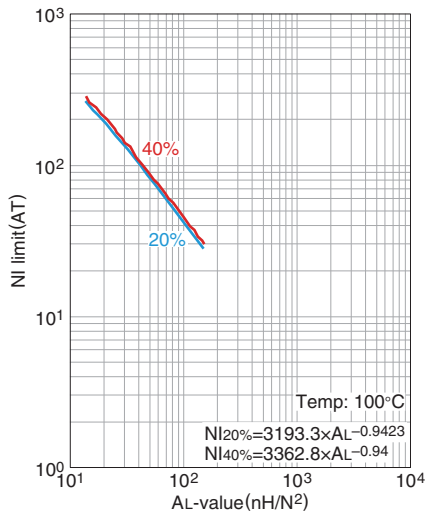
Based on JIS C 2516, IEC Publication 60431 and DIN 41980.

| Effective parameter								Electrical characteristics		
Core factor	Effective magnetic path length	Effective cross-sectional area	Effective core volume	Cross-sectional center pole area	Minimum cross-sectional center pole are	Cross-sectional winding area of core	Weigh	A_L-value *		Core loss
C_1	ℓe	Ae	Ve	Acp	Acp min.	Acw				
(mm⁻¹)	(mm)	(mm²)	(mm³)	(mm²)	(mm²)	(mm²)	(g/set)	(nH/N²)		(W)max.
								1kHz 0.5mA	100kHz 200mT	100kHz 200mT 100°C
1.62	22.7	14.0	318	11.3	10.7	15.6	1.7	680 min.	1650 min.	0.11

* Coil：ø0.18 2UEW 100Ts
○ Calculated output power (forward converter mode): 8.4W (100kHz)

NI limit vs. A_L-value（Typ.）

NI limit(AT)

Temp: 100°C
$NI_{20\%}=3193.3 \times A_L^{-0.9423}$
$NI_{40\%}=3362.8 \times A_L^{-0.94}$

A_L-value(nH/N²)

The 20% and 40% graph shows when a 20% and 40% drop from the initial A_L-value has been made due to the DC superimposition.

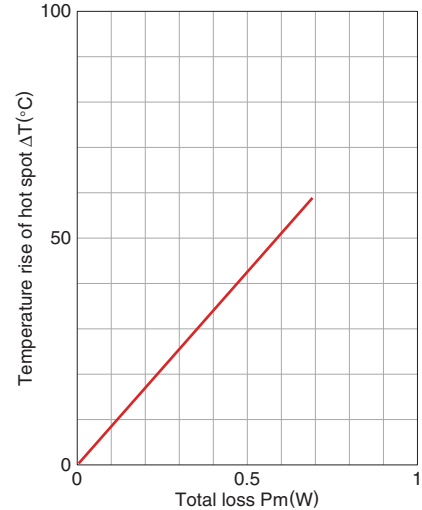### A_L-value vs. Air gap length（Typ.）

A_L-value(nH/N²)

Center pole gap

$A_L=23.117 \times lg^{-0.7681}$

Air gap length(mm)
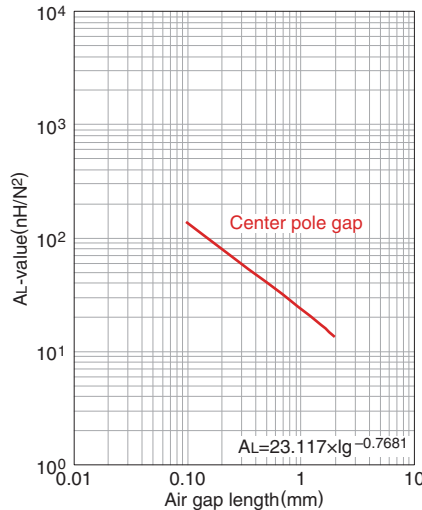
Measuring conditions
• Coil：ø0.18 2UEW 100Ts
• Frequency：1kHz
• Current level：0.5mA
• Ambient temperature：25°C

Temperature rise vs. Total loss（Typ.）

Temperature rise of hot spot ΔT(°C)

Total loss Pm(W)

Measuring conditions
• Room space: approx. 400x300x 300cm
• Ambient temperature：25°C
• Humidity：45(%)RH.

Measuring point
Core
Coil

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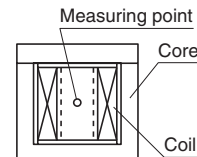
Mn-Zn RM series   Part No.: PC47RM5Z-12

■ SHAPES AND DIMENSIONS

6.6±0.2
90°
6.0₋0
12.05±0.25

10.4±0.1
6.5±0.2
14.3±0.3
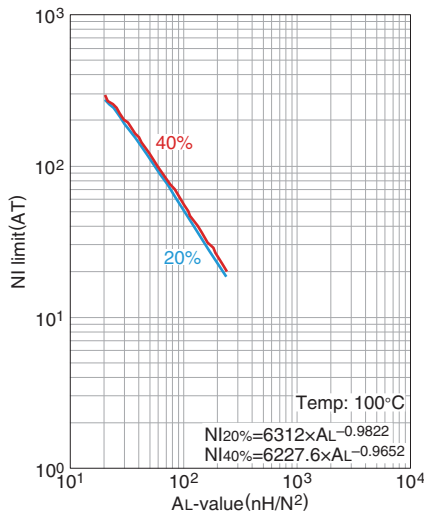10.4±0.2
ø4.8±0.1

Dimensions in mm

Based on JIS C 2516, IEC Publication 60431 and DIN 41980.

Effective parameter								Electrical characteristics			
Core factor	Effective magnetic path length	Effective cross-sectional area	Effective core volume	Cross-sectional center pole area	Minimum cross-sectional center pole are	Cross-sectional winding area of core	Weigh	A$_L$-value *		Core loss	
C_1	ℓe	Ae	Ve	Acp	Acp min.	Acw					
(mm^{-1})	(mm)	(mm^2)	(mm^3)	(mm^2)	(mm^2)	(mm^2)	(g/set)	(nH/N^2)		(W)max.	
								1kHz 0.5mA	100kHz 200mT	100kHz 200mT 100°C	
0.940	22.4	23.7	530	18.1	17.3	18.2	3.0	1250 min.	3340 min.	0.17	

* Coil：ø0.2 2UEW 100Ts
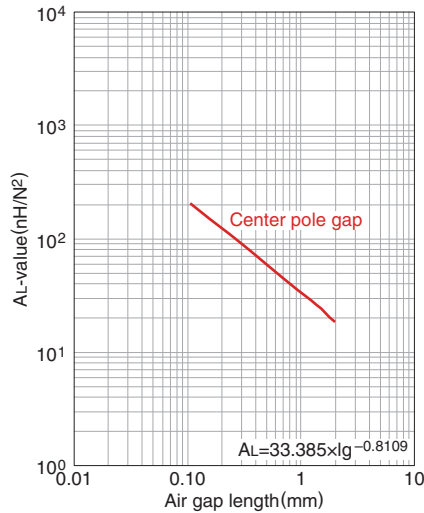○ Calculated output power (forward converter mode): 20.3W (100kHz)

NI limit vs. A$_L$-value（Typ.）

Temp: 100°C

$NI_{20\%}=6312\times A_L^{-0.9822}$
$NI_{40\%}=6227.6\times A_L^{-0.9652}$
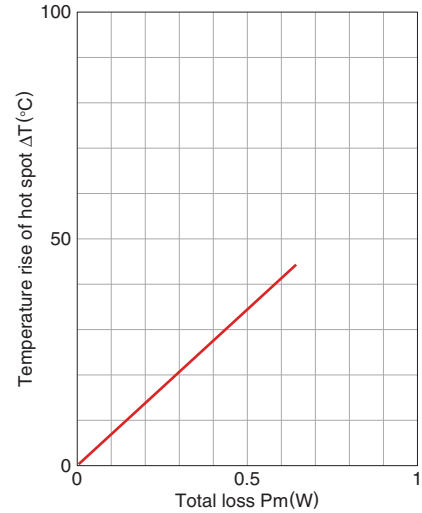
40%
20%

NI limit(AT)
A$_L$-value(nH/N^2)

The 20% and 40% graph shows when a 20% and 40% drop from the initial A$_L$-value has been made due to the DC superimposition.

A$_L$-value vs. Air gap length（Typ.）

Center pole gap

$A_L=33.385\times lg^{-0.8109}$

A$_L$-value(nH/N^2)
Air gap length(mm)

Measuring conditions
• Coil：ø0.2 2UEW 100Ts
• Frequency：1kHz
• Current level：0.5mA
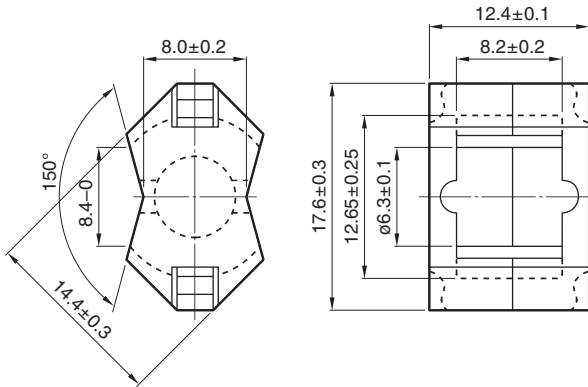• Ambient temperature：25°C

Temperature rise vs. Total loss（Typ.）

Temperature rise of hot spot ΔT(°C)
Total loss Pm(W)

Measuring conditions
• Room space: approx. 400x300x 300cm
• Ambient temperature：25°C
• Humidity：45(%)RH.

Measuring point
Core
Coil

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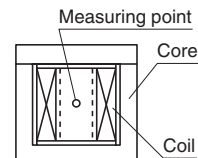
Mn-Zn RM series   Part No.: PC47RM6Z-12

■ SHAPES AND DIMENSIONS

12.4±0.1
8.2±0.2
8.0±0.2
150°
8.4−0
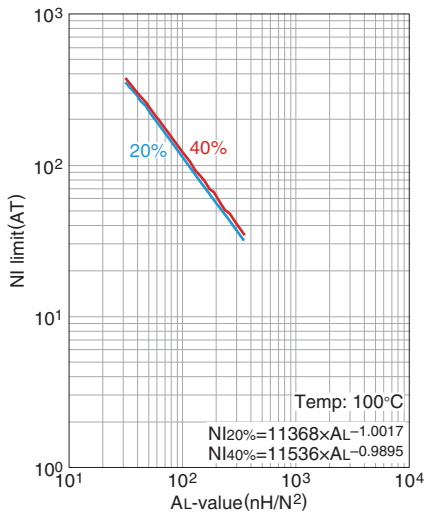17.6±0.3
12.65±0.25
ø6.3±0.1
14.4±0.3

Dimensions in mm

Based on JIS C 2516, IEC Publication 60431 and DIN 41980.

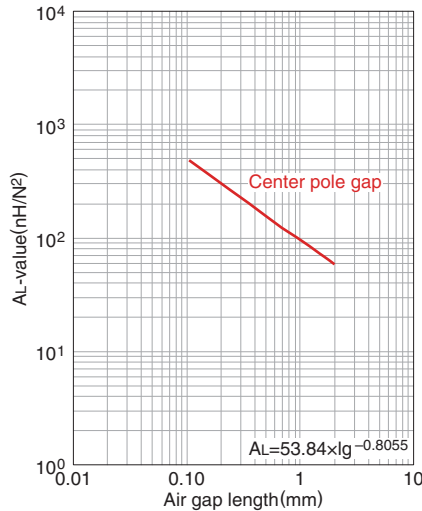| Effective parameter								Electrical characteristics			
Core factor	Effective magnetic path length	Effective cross-sectional area	Effective core volume	Cross-sectional center pole area	Minimum cross-sectional center pole are	Cross-sectional winding area of core	Weigh	A_L-value *		Core loss	
C_1	ℓe	Ae	Ve	Acp	Acp min.	Acw					
(mm^{-1})	(mm)	(mm^2)	(mm^3)	(mm^2)	(mm^2)	(mm^2)	(g/set)	(nH/N^2)		(W)max.	
								1kHz 0.5mA	100kHz 200mT	100kHz 200mT 100°C	
0.781	28.6	36.6	1050	31.2	30.2	26.0	5.5	2450±25%	4030 min.	0.38	

* Coil：ø0.26 2UEW 100Ts
○ Calculated output power (forward converter mode): 36.2W (100kHz)

NI limit vs. A_L-value（Typ.）

10^3
10^2
10^1
10^0
NI limit(AT)
20% 40%
10^1 10^2 10^3 10^4
A_L-value(nH/N^2)
Temp: 100°C
$NI_{20\%}=11368\times A_L^{-1.0017}$
$NI_{40\%}=11536\times A_L^{-0.9895}$

The 20% and 40% graph shows when a 20% and 40% drop from the initial A_L-value has been made due to the DC superimposition.
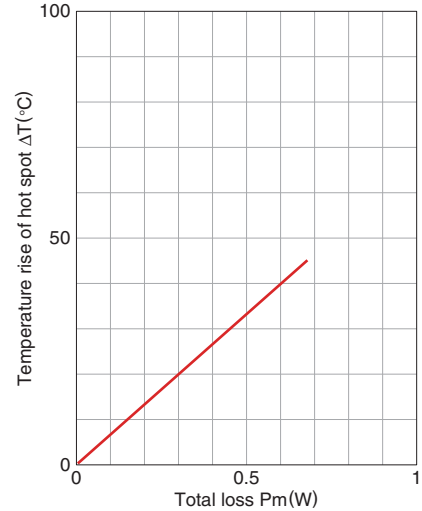
A_L-value vs. Air gap length（Typ.）

10^4
10^3
10^2
10^1
10^0
A_L-value(nH/N^2)
Center pole gap
0.01 0.10 1 10
Air gap length(mm)
$A_L=53.84\times lg^{-0.8055}$

Measuring conditions
• Coil：ø0.26 2UEW 100Ts
• Frequency：1kHz
• Current level：0.5mA
• Ambient temperature：25°C

Temperature rise vs. Total loss（Typ.）

100
50
0
Temperature rise of hot spot ΔT(°C)
0 0.5 1
Total loss Pm(W)

Measuring conditions
• Room space: approx. 400x300x 300cm
• Ambient temperature：25°C
• Humidity：45(%)RH.

Measuring point
Core
Coil

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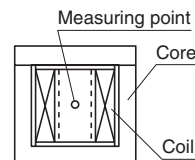
Mn-Zn RM series   Part No.: PC47RM8Z-12

■ SHAPES AND DIMENSIONS

10.8±0.2
5.1±0.1
90°
9.8−0
4.0
ø8.4±0.15
19.35±0.35

16.4±0.1
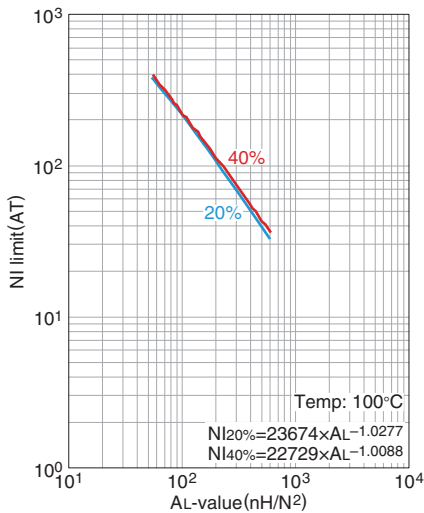11.0±0.2
22.75±0.45
17.3±0.3

Dimensions in mm

Based on JIS C 2516, IEC Publication 60431 and DIN 41980.

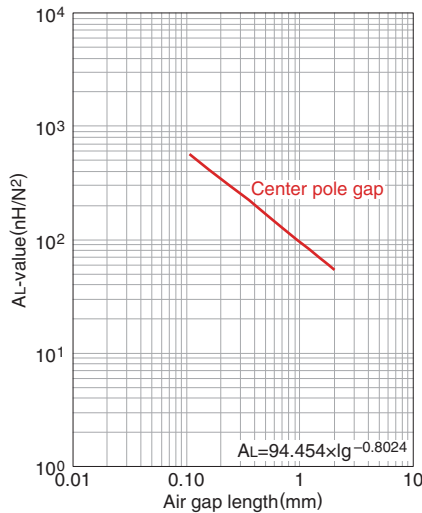| Effective parameter								Electrical characteristics			
Core factor	Effective magnetic path length	Effective cross-sectional area	Effective core volume	Cross-sectional center pole area	Minimum cross-sectional center pole are	Cross-sectional winding area of core	Weigh	A_L-value *		Core loss	
C_1	ℓe	Ae	Ve	Acp	Acp min.	Acw					
(mm^{-1})	(mm)	(mm^2)	(mm^3)	(mm^2)	(mm^2)	(mm^2)	(g/set)	(nH/N^2)		(W)max.	
								1kHz 0.5mA	100kHz 200mT	100kHz 200mT 100°C	
0.594	38.0	64.0	2430	55.4	53.5	48.9	13	1950 min.	5290 min.	0.91	

* Coil：ø0.4 2UEW 100Ts
○ Calculated output power (forward converter mode): 92.4W (100kHz)

NI limit vs. A_L-value（Typ.）

40%
20%
Temp: 100°C
$NI_{20\%}=23674 \times A_L^{-1.0277}$
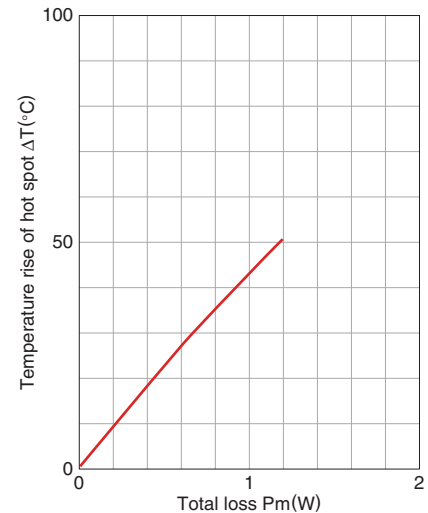$NI_{40\%}=22729 \times A_L^{-1.0088}$
NI limit(AT)
A_L-value(nH/N^2)

The 20% and 40% graph shows when a 20% and 40% drop from the initial A_L-value has been made due to the DC superimposition.
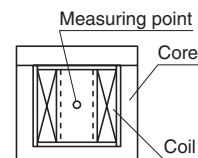
A_L-value vs. Air gap length（Typ.）

Center pole gap
$A_L=94.454 \times lg^{-0.8024}$
A_L-value(nH/N^2)
Air gap length(mm)

Measuring conditions
• Coil：ø0.4 2UEW 100Ts
• Frequency：1kHz
• Current level：0.5mA
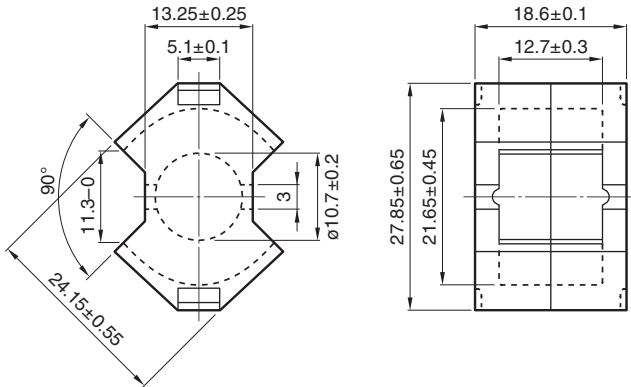• Ambient temperature：25°C

Temperature rise vs. Total loss（Typ.）

Temperature rise of hot spot ΔT(°C)
Total loss Pm(W)

Measuring conditions
• Room space: approx. 400x300x 300cm
• Ambient temperature：25°C
• Humidity：45(%)RH.

Measuring point
Core
Coil

• All specifications are subject to change without notice.

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Mn-Zn RM series   Part No.: PC47RM10Z-12

■ SHAPES AND DIMENSIONS

13.25±0.25
5.1±0.1
90°
11.3−0
3
ø10.7±0.2
24.15±0.55

18.6±0.1
12.7±0.3
27.85±0.65
21.65±0.45

Dimensions in mm

Based on JIS C 2516, IEC Publication 60431 and DIN 41980.

| Effective parameter								Electrical characteristics			
Core factor	Effective magnetic path length	Effective cross-sectional area	Effective core volume	Cross-sectional center pole area	Minimum cross-sectional center pole are	Cross-sectional winding area of core	Weigh	A_L-value *		Core loss	
C_1	ℓe	Ae	Ve	Acp	Acp min.	Acw		(nH/N^2)		(W)max.	
(mm^{-1})	(mm)	(mm^2)	(mm^3)	(mm^2)	(mm^2)	(mm^2)	(g/set)	1kHz 0.5mA	100kHz 200mT	100kHz 200mT 100°C	
0.450	44.0	98.0	4310	89.9	86.6	69.5	23	4850±25%	7000 min.	1.70	

* Coil：ø0.4 2UEW 100Ts
○ Calculated output power (forward converter mode): 177.8W (100kHz)

NI limit vs. A_L-value（Typ.）
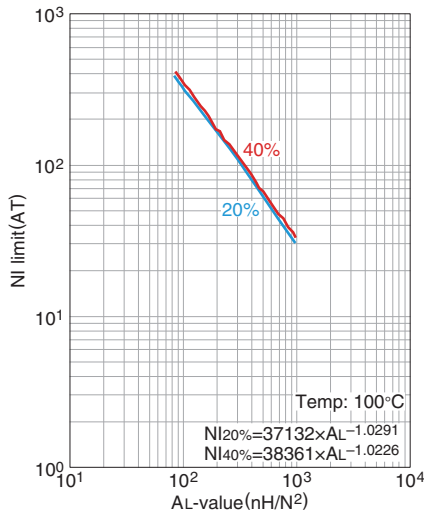
Temp: 100°C
$NI_{20\%}=37132×A_L^{-1.0291}$
$NI_{40\%}=38361×A_L^{-1.0226}$

The 20% and 40% graph shows when a 20% and 40% drop from the initial A_L-value has been made due to the DC superimposition.

A_L-value vs. Air gap length（Typ.）
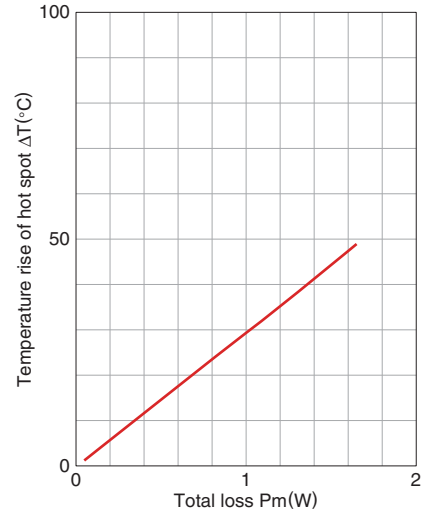

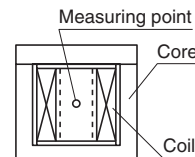Center pole gap

$A_L=142.53×lg^{-0.8091}$
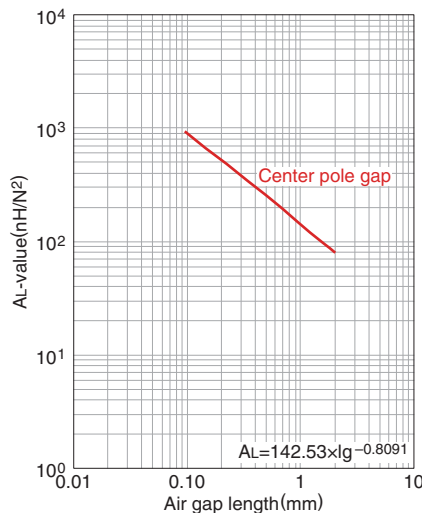
Measuring conditions
• Coil：ø0.4 2UEW 100Ts
• Frequency：1kHz
• Current level：0.5mA
• Ambient temperature：25°C

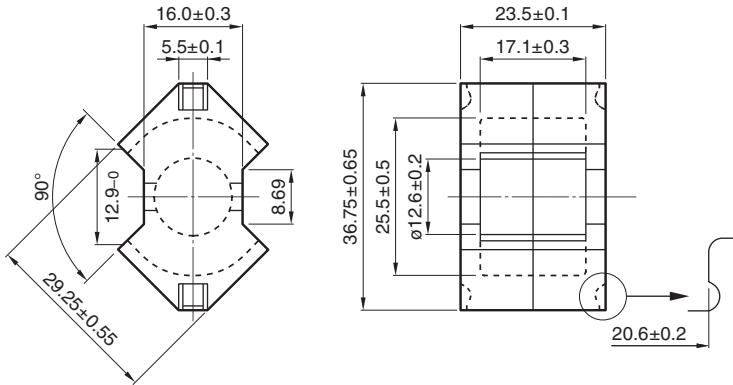### Temperature rise vs. Total loss（Typ.）

Measuring conditions
• Room space: approx. 400x300x 300cm
• Ambient temperature：25°C
• Humidity：45(%)RH.

Measuring point
Core
Coil

• All specifications are subject to change without notice.

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Mn-Zn RM series   Part No.: PC47RM12Z-12

■ SHAPES AND DIMENSIONS

16.0±0.3
5.5±0.1
90°
12.9−0
8.69
29.25±0.55

23.5±0.1
17.1±0.3
36.75±0.65
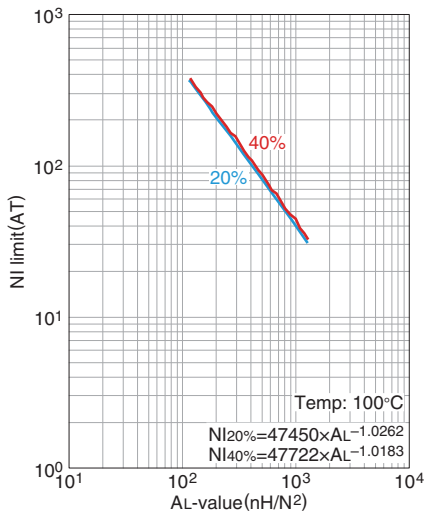25.5±0.5
ø12.6±0.2
20.6±0.2

Dimensions in mm

Based on JIS C 2516, IEC Publication 60431.

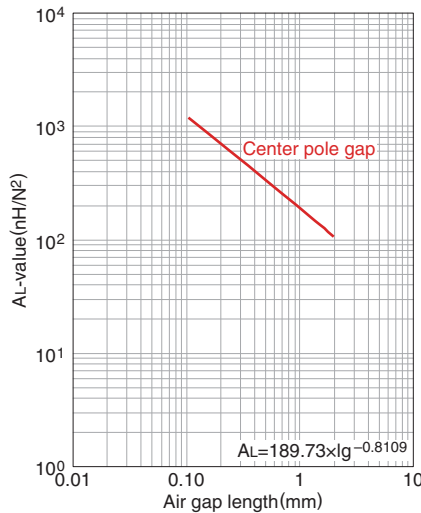| Effective parameter								Electrical characteristics		
Core factor	Effective magnetic path length	Effective cross-sectional area	Effective core volume	Cross-sectional center pole area	Minimum cross-sectional center pole are	Cross-sectional winding area of core	Weigh	A_L-value *		Core loss
C_1	ℓe	Ae	Ve	Acp	Acp min.	Acw				
(mm^{-1})	(mm)	(mm^2)	(mm^3)	(mm^2)	(mm^2)	(mm^2)	(g/set)	(nH/N^2)		(W)max.
								1kHz 0.5mA	100kHz 200mT	100kHz 200mT 100°C
0.406	56.9	140	7960	125	121	110	42	4150 min.	9290 min.	3.00

* Coil : ø0.4 2UEW 100Ts
○ Calculated output power (forward converter mode): 466.2W (100kHz)

NI limit vs. A_L-value (Typ.)

NI limit(AT)
A_L-value(nH/N^2)
40%
20%
Temp: 100°C
$NI_{20\%} = 47450 \times A_L^{-1.0262}$
$NI_{40\%} = 47722 \times A_L^{-1.0183}$

The 20% and 40% graph shows when a 20% and 40% drop from the initial A_L-value has been made due to the DC superimposition.
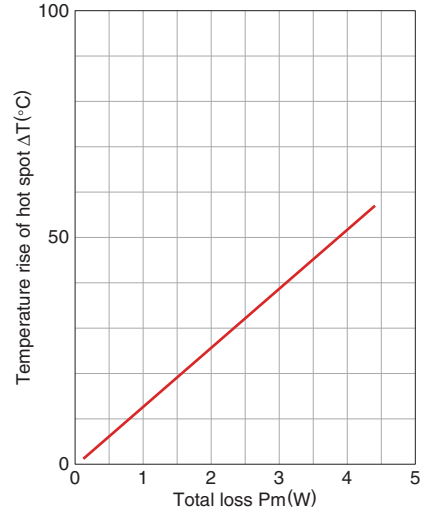
A_L-value vs. Air gap length (Typ.)

A_L-value(nH/N^2)
Air gap length(mm)
Center pole gap
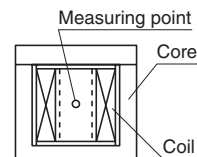$A_L = 189.73 \times lg^{-0.8109}$

Measuring conditions
• Coil : ø0.4 2UEW 100Ts
• Frequency : 1kHz
• Current level : 0.5mA
• Ambient temperature : 25°C
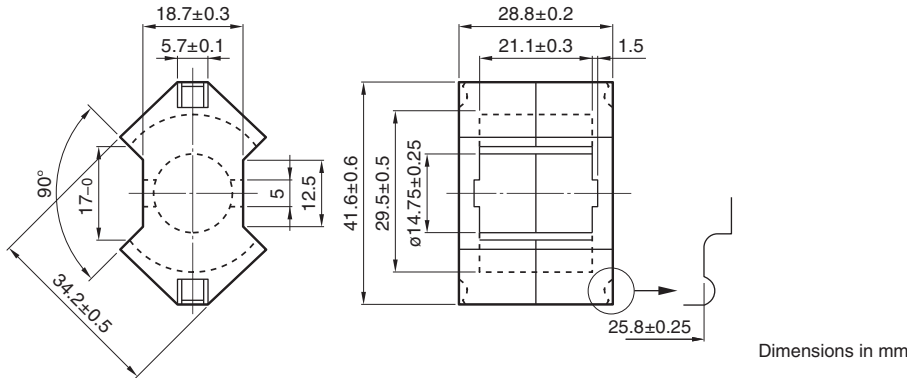
Temperature rise vs. Total loss (Typ.)

Temperature rise of hot spot ΔT(°C)
Total loss Pm(W)

Measuring conditions
• Room space: approx. 400x300x 300cm
• Ambient temperature : 25°C
• Humidity : 45(%)RH.

Measuring point
Core
Coil

• All specifications are subject to change without notice.

FERRITES

⚡TDK

Mn-Zn RM series　Part No.: PC47RM14Z-12

■ SHAPES AND DIMENSIONS

18.7±0.3
5.7±0.1
90°
17−0
5
12.5
34.2±0.5

28.8±0.2
21.1±0.3　1.5
41.6±0.6
29.5±0.5
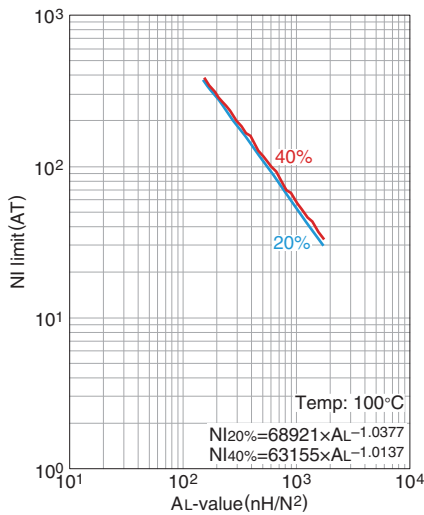ø14.75±0.25
25.8±0.25

Dimensions in mm

Based on JIS C 2516, IEC Publication 60431 and DIN 41980.

Effective parameter								Electrical characteristics			
Core factor C_1 (mm^{-1})	Effective magnetic path length ℓe (mm)	Effective cross-sectional area Ae (mm^2)	Effective core volume Ve (mm^3)	Cross-sectional center pole area Acp (mm^2)	Minimum cross-sectional center pole are Acp min. (mm^2)	Cross-sectional winding area of core Acw (mm^2)	Weigh (g/set)	A_L-value * (nH/N^2) 1kHz 0.5mA	100kHz 200mT	Core loss (W)max. 100kHz 200mT 100°C	
0.393	70.0	178	12500	171	165	155	70	4600 min.	9590 min.	4.60	

* Coil：ø0.4 2UEW 100Ts

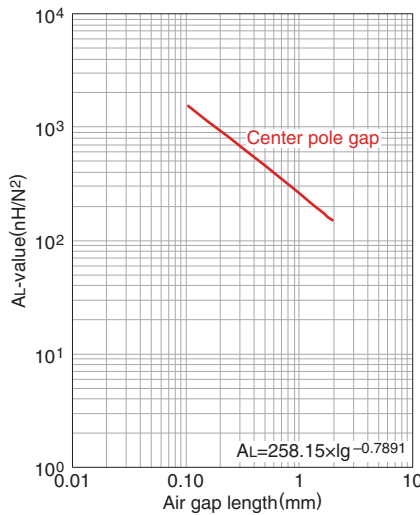○ Calculated output power (forward converter mode): 462.6W (100kHz)

NI limit vs. A_L-value（Typ.）

NI limit(AT)

10^3
10^2
10^1
10^0

40%
20%

Temp: 100°C
$NI_{20\%}=68921 \times A_L^{-1.0377}$
$NI_{40\%}=63155 \times A_L^{-1.0137}$

10^1　10^2　10^3　10^4
A_L-value(nH/N^2)

The 20% and 40% graph shows when a 20% and 40% drop from the initial A_L-value has been made due to the DC superimposition.

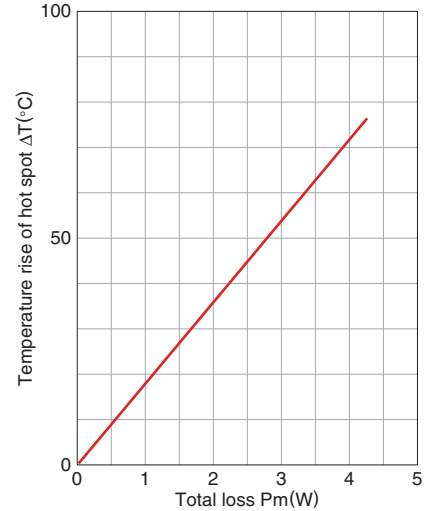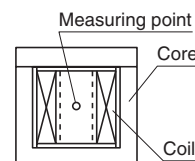### A_L-value vs. Air gap length（Typ.）

A_L-value(nH/N^2)

10^4
10^3
10^2
10^1
10^0

Center pole gap

$A_L=258.15 \times lg^{-0.7891}$

0.01　0.10　1　10
Air gap length(mm)

Measuring conditions
• Coil：ø0.4 2UEW 100Ts
• Frequency：1kHz
• Current level：0.5mA
• Ambient temperature：25°C

Temperature rise vs. Total loss（Typ.）

Temperature rise of hot spot ΔT(°C)

100
50
0

0　1　2　3　4　5
Total loss Pm(W)

Measuring conditions
• Room space: approx. 400x300x 300cm
• Ambient temperature：25°C
• Humidity：45(%)RH.

Measuring point
Core
Coil

• All specifications are subject to change without notice.