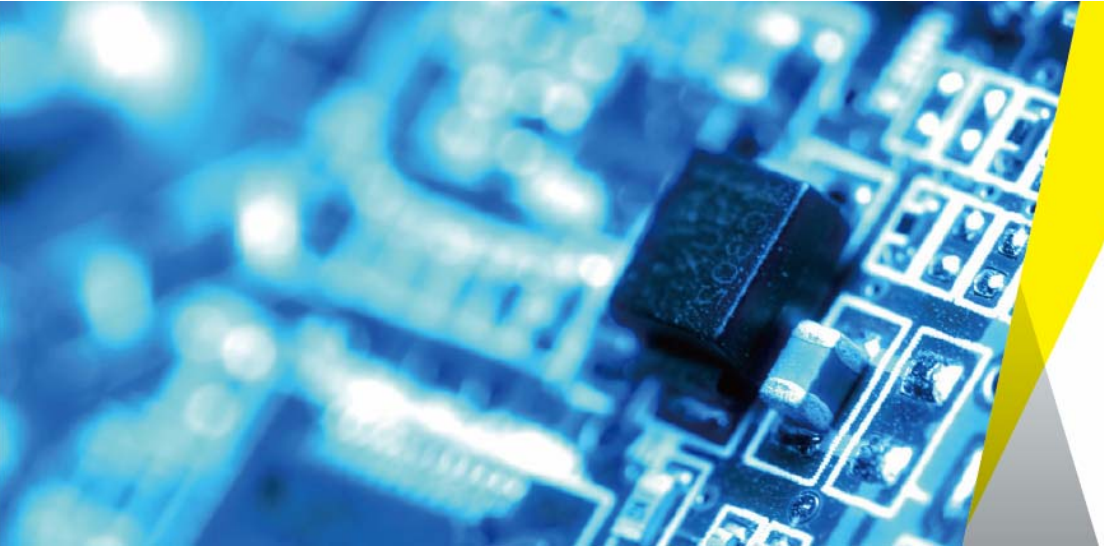

DATA SHEET

Product Name **Metal Oxide Film Fixed Resistors**

Part Name **MOR Series**

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Ticrom Technology (ShenZhen) Co., Ltd.
Aeon Technology Corporation

Brands ***RoyalOhm*** ***UniOhm***

1. Scope

1.1 This specification for approve relates Metal Oxide Film Fixed Resistors manufactured by UNI-ROYAL.
1.2 Excellent flame retardant coating
1.3 High stability even in bad environment
1.4 High purity ceramic core
1.5 Meet ELA-RC2655A requirements
1.6 High safety standard

2. Part No. System

The standard Part No. includes 14 digits with the following explanation:
2.1 Coated type, the 1st to 3rd digits are to indicate the product type and 4th digit is the special feature.
Example: MOR0=Metal Oxide Film Fixed Resistors
2.2 5th~6th digits:
2.2.1 This is to indicate the wattage or power rating. To dieting the size and the numbers,
The following codes are used; and please refer to the following chart for detail:
W=Normal Size; S=Small Size; U=Extra Small Size; "1"~"G"to denotes"1"~"16"as Hexadecimal:
1/16W~1/2W (＜1W)

Wattage	1/2	1/3	1/4	1/5	1/6	1/8	1/10	1/16
Normal Size	W2	W3	W4	W5	W6	W8	WA	WG
Small Size	S2	S3	S4	S5	S6	S8	SA	SG
Extra Small Size	U2	U3	U4	U5	U6	U8	UA	UG

1W~16W (≧1W)

Wattage	1	2	3	5	7	8	9	10	15
Normal Size	1W	2W	3W	5W	7W	8W	9W	AW	FW
Small Size	1S	2S	3S	5S	7S	8S	9S	AS	FS
Extra Small Size	1U	2U	3U	5U	7U	8U	9U	AU	FU

2.2.2 For power rating less than 1 watt, the 5th digit will be the letters W, S or U to represent the size required & the 6th digit will be a number or a letter code.
Example: WA=1/10W; U2=1/2W-SS.
2.2.3 For power of 1 watt to 16 watt, the 5th digit will be a number or a letter code and the 6th digit will be the letters of W, S or U.
Example: 2W=2W; 3S=3W-S
2.3 The 7th digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance.
F=±1% G=±2% J=±5% K= ±10%
2.4 The 8th to 11th digits is to denote the Resistance Value.
2.4.1 For the standard resistance values of E-24 series in 5%&10% tolerance, the 8th digit is "0",the 9th & 10th digits are to denote the significant figures of the resistance and the 11th digit is the number of zeros following;
For the standard resistance values of E-96 series in ≤2% tolerance, the 8th digit to the 10th digits is to denote the significant figures of the resistance and the 11th digit is the zeros following.
2.4.2 The following numbers and the letter codes are to be used to indicate the number of zeros in the 11th digit:
$0=10^0$ $1=10^1$ $2=10^2$ $3=10^3$ $4=10^4$ $5=10^5$
$6=10^6$ $J=10^{-1}$ $K=10^{-2}$ $L=10^{-3}$ $M=10^{-4}$
2.4.3 The 12th, 13th & 14th digits.
The 12th digit is to denote the Packaging Type with the following codes:
A=Tape/Box (Ammo pack) B=Bulk/Box T=Tape/Reel P=Tape/Box of PT-26 products
2.4.4 The 13th digit is normally to indicate the Packing Quantity of Tape/Box & Tape/Reel packaging types. Except for Chip products Bulk packing, this digit should be filled"0"or other products with Bulk/Box packing requirement. The following letter code and number is to be used for some packing quantities: A=500pcs B=2500pcs 1=1000pcs 2=2000pcs
2.4.5 For the FORMED type products, the 13th & 14th digits are used to denote the forming types of the product with the following letter codes:
MF=M-type with flattened lead wire MK= M-type with kinked lead wire
ML= M-type with normal lead wire MC= M-type with bending lead wire
F0= F-type F1= F1-type F2= F2-type F3= F3-type
2.4.6 For some items, the 14th digit alone can use to denote special features of additional information with the following codes:

0=NIL	P=Panasert type	1=Avisert type 1	2=Avisert type 2
3=Avisert type 3	8=PT-58mm	9=PT-64mm	7=Lead wire(H)38mm
A=PT-83mm	C=PT-73mm	D=PT-71mm	

3. Ordering Procedure

(Example: MO 2WS ±5% 100KΩ T/B-1000)

M O R 0 2 S J 0 1 0 4 A 1 0

Product Type:
MOR=Metal Oxide Film Fixed Resistors

Special Features:
0= Standard product
I= Non-inductive

Wattage:
Normal size:
W4=1/4W
W2=1/2W
1W=1W
2W=2W
3W=3W
5W=5W
7W=7W
8W=8W
9W=9W
Small size:
S2=1/2W-S
1S=1WS
2S=2WS
3S=3WS
5S=5WS

Tolerance:
G=±2%
J=±5%

Resistance Value:
±2% series:
The 1st to 3rd digits are for the significant figures of the resistance and 4th digit denotes number of zeros following.

Example:20KΩ:2002
±5% series:
The 1st digit will be "0"; the 2nd & 3rd digits are for the significant figures of the resistance and the 4th digit denotes number of zeros following
Example:20KΩ:0203
J=10^{-1}; K=10^{-2}; L=10^{-3}

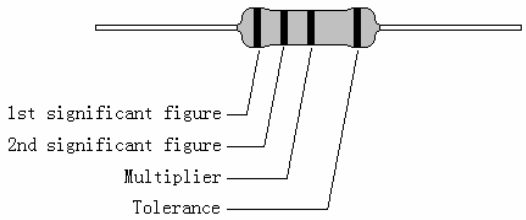
Packing Type:
A=Tape/Box;
T=Tape/Reel
B=Bulk/Box

Packing quantity:
1=1,000pcs
2=2,000pcs
3=3,000pcs
4=4,000pcs
5=5,000pcs
A=500pcs
B=2,500pcs
0=Bulk/Box

Additional Information:
0=NIL
P=Panasert type
1=Avisert type 1
2=Avisert type 2
3=Avisert type 3
8=PT-58mm
9=PT-64mm
7=Lead wire(H)38mm
A=PT-83mm
C=PT-73mm
D=PT-71mm

4. Marking

Resistors shall be marked with color coding
Colors shall be in accordance with JIS C 0802

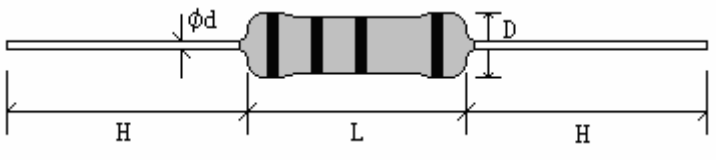


4.1 Label:
Label shall be marked with following items:
(1) Type and style
(2) Nominal resistance
(3) Resistance tolerance
(4) Quantity
(5) Lot number
(6) PPM

Example:

METAL OXIDE FILM FIXED RESISTORS	
WATT: 2WS	VAL:100KΩ
Q'TY: 1,000	TOL: 5%
LOT: 4021548	PPM:

5. Ratings & Dimension

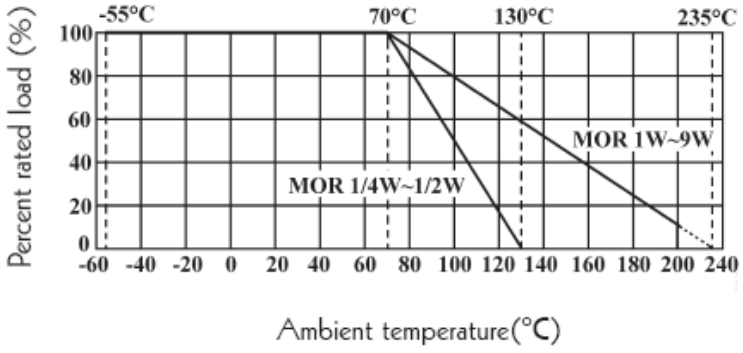


Type	Dimension(mm)					Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance	Resistance Range
	D	L	d ±0.05	H ±3	PT					
MO1/4W	2.2±0.5	6.5±1.0	0.54	28	52	250V	400V	250V	±2%、±5%	0.1Ω~470KΩ
MO1/2WS	2.2±0.5	6.5±1.0	0.54	28	52	250V	400V	250V	±2%、±5%	0.1Ω~470KΩ
MO1/2W	3.0±0.6	9.5±1.0	0.54	28	52	250V	400V	250V	±2%、±5%	0.1Ω~560KΩ
MO1WS	3.5±0.6	9.5±1.0	0.54	28	52	350V	600V	350V	±2%、±5%	0.1Ω~560KΩ
MO1W	4.5±0.6	11.5±1.0	0.70	25	52	350V	600V	350V	±2%、±5%	0.1Ω~560KΩ
MO2WS	4.5±0.6	11.5±1.0	0.70	25	52	350V	600V	350V	±2%、±5%	0.1Ω~560KΩ
MO2W	5.0±0.6	15.5±1.0	0.70	28	64	350V	600V	350V	±2%、±5%	0.1Ω~560KΩ
MO3WS	5.0±0.6	15.5±1.0	0.70	28	64	350V	600V	350V	±2%、±5%	0.1Ω~560KΩ
MO3W	6.0±0.6	17.5±1.0	0.75	28	64	500V	800V	500V	±2%、±5%	0.1Ω~560KΩ
MO5WS	6.0±0.6	17.5±1.0	0.75	28	64	500V	800V	500V	±2%、±5%	0.1Ω~560KΩ
MO5W	8.0±0.6	24.5±1.0	0.75	38	90	750V	1000V	750V	±2%、±5%	0.1Ω~680KΩ
MO7W	8.0±0.6	29.5±1.0	0.75	38	B/B	750V	1000V	750V	±2%、±5%	20Ω~150KΩ
MO8W	8.0±0.6	39.5±1.0	0.75	38	B/B	750V	1000V	750V	±2%、±5%	30Ω~200KΩ
MO9W	8.0±0.6	52.5±1.0	0.75	38	B/B	750V	1000V	750V	±2%、±5%	50Ω~200KΩ

6. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55℃ to 70℃. For temperature in excess of 70℃, the load shall be derate as shown in figure 1

Figure1



6.1 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

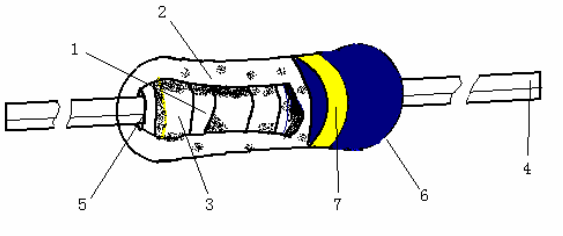
$RCWV = \sqrt{P \times R}$

Where: RCWV = rated continuous working voltage (VOLT.)

P = power rating (WATT.) R= nominal resistance (OHM)

The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is less.

7. Structure



No.	Name	Material
1	Basic body	Rod type ceramics
2	Resistor	Metal Oxide Film
3	End cap	Steel (Tin plated iron surface)
4	Lead wire	Tin solder coated copper wire
5	Joint	By welding
6	Coating	Insulated resin Color: Gray (Normal size) Sea blue (Small size)
7	Color code	Epoxy resin

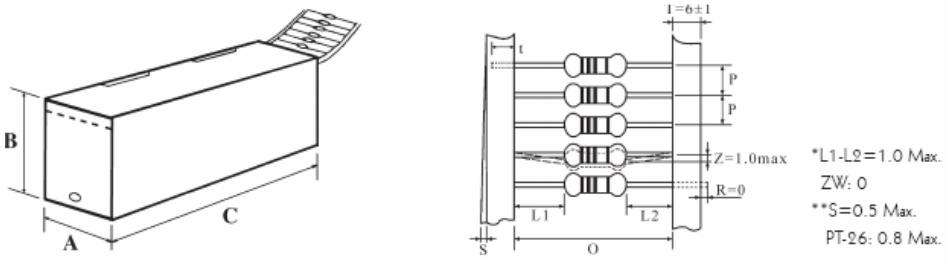
8. Performance Specification

Characteristic	Limits	Test Method (GB/T5729&JIS-C-5201&IEC60115)
Temperature Coefficient	**1/4W 1/2WS** ≦100KΩ: ±350PPM/℃ 100KΩ<R≦470KΩ: 0～-700PPM/℃ **1/2W、1WS:** ≦120KΩ: ±350PPM/℃ 120KΩ<R≦560KΩ 0～-700PPM/℃ **1W、 2W、 2WS、3W、3WS、5WS** ≦150KΩ: ±350PPM/℃ 150KΩ<R≦560KΩ 0～-700PPM/℃ **5W** ≦180KΩ: ±350PPM/℃ 180KΩ<R≦680KΩ 0～-700PPM/℃ **7W、8W、9W:** ±350PPM/℃	4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) $\frac{R_3-R_1}{R_1(t_3-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance Value at room temperature （t_1）; R_2: Resistance Value at upper limit temperature ± 2℃（t_2） R_3 : Resistance Value at lower limit temperature ± 3℃（t_3） Test pattern： Room temperature：（t_1） Upper limit temperature：（t_2） Lower limit temperature ：（t_3）
Short-time overload	Resistance change rate is: ±(1%+0.05Ω)Max for normal size. ±(2%+0.05Ω)Max for small size. With no evidence of mechanical damage.	4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds.
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down.	4.7 Resistors shall be clamped in the trough of a 90°metallic V-block and shall be tested at AC potential respectively specified in the above list for 60-70 seconds.
Pulse overload	Resistance change rate is: ±(2%+0.05Ω)Max for normal size. ±(5%+0.05Ω)Max for small size. With no evidence of mechanical damage.	4.28 Resistance change after 10,000 cycles (1 second “ON ”, 25 seconds “OFF ”) at 4 times RCWV.

Terminal strength	No evidence of mechanical damage	4.16 Direct load: Resistance to a 2.5Kg direct load for 10 seconds in the direction of the longitudinal axis of the terminal leads. Twist test: Terminal leads shall be bent through 90°at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations.
Resistance to soldering heat	Resistance change rate is: ±(1%+0.05Ω) Max. With no evidence of mechanical damage	4.18 Permanent resistance change when leads immersed to a point 2.0-2.5mm from the body in 260℃±5℃ solder for 10±1 seconds.
Solderability	95% coverage Min.	4.17 The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes. Test temp. Of solder:245℃±3℃ Dwell time in solder: 2~3seconds.
Resistance to solvent	No deterioration of protective coatings & markings	4.29 Specimens shall be immersed in a bath of alcohol completely for 3 min. With ultrasonic
Rapid change of temperature	＜100KΩ: ±(5%+0.05Ω) MAX ≧100KΩ: ±(10%+0.05Ω) MAX	4.19 30 min at lower limit temperature and 30 min at upper limit temperature，5 cycles.
Humidity (steady state)	Resistance change rate is: ±(2%+0.05Ω) Max. With no evidence of mechanical damage	4.24 temporary resistance change after a 240 hours exposure in a humidity test chamber controlled at 40℃ ± 2℃ and 90 to 95% relative humidity.
Load life in humidity	＜100KΩ: ±(5%+0.05Ω) MAX ≧100KΩ: ±(10%+0.05Ω) MAX	7.9 resistance change after 1,000 hours (1.5 hours “ON”,0.5 hour “OFF”) at RCWV in a humidity test chamber controlled at 40℃ ±2℃ and 90 to 95% relative humidity.
Load life	＜100KΩ: ±(5%+0.05Ω) MAX ≧100KΩ: ±(10%+0.05Ω) MAX	4.25.1 permanent resistance change after 1,000 hours operating at RCWV with duty cycle of 1.5 hours “ON”, 0.5 hour “OFF” at 70℃±2℃ ambient.
Flame retardant	Resistor insulation is self-extinguishing within 10 seconds after externally applied flame is removed.	7.12 The burner is placed remote fro, resistor ignited and adjusted to produce a blue flame 38mm in height and a top of flame 127mm above the top of burner tube. Resistor is supported from its lead at 45° from the horizontal so that the lower end of resistor is the top of blue flame. The test flame is placed to remain for 15 seconds and removed for 15 seconds. The operation is to be repeated until resistor has been subjected to 5 application of test flame.
Low Temperature Storage	＜100KΩ: ±(5%+0.05Ω) MAX ≧100KΩ: ±(10%+0.05Ω) MAX	4.23.4 Lower limit temperature，for 2H.
High Temperature Exposure	＜100KΩ: ±(5%+0.05Ω) MAX ≧100KΩ: ±(10%+0.05Ω) MAX	4.23.2 Upper limit temperature ，for 16H

9. Packing of Surface Mount Resistors

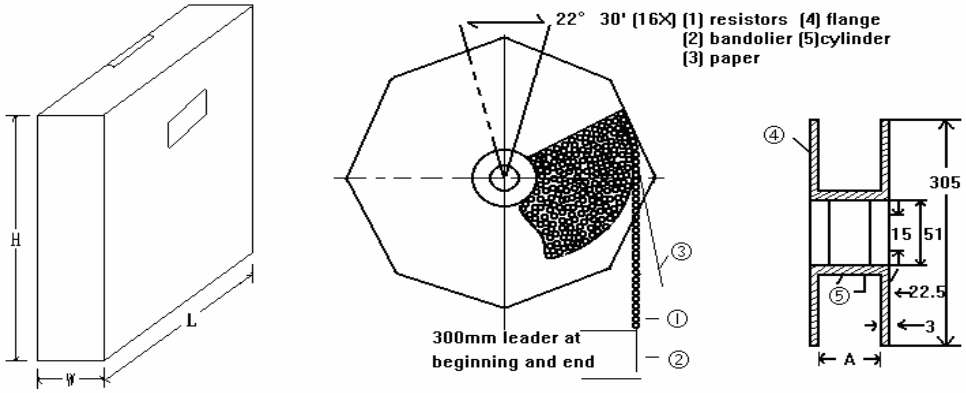
9.1 Tapes in Box Packing



Dimension of T/B (mm)

Part No.	O	P	A±5	B±5	C±5	Qty/Box
MO 1/4W	52±1	5±0.3	75	116	255	5,000pcs
MO 1/2WS	52±1	5±0.3	75	116	255	5,000pcs
MO 1/2W	52±1	5±0.3	75	45	255	1,000pcs
MO 1WS	52±1	5±0.3	75	70	255	1,000pcs
MO 1W	52±1	5±0.3	86	82	255	1,000pcs
MO 2WS	52±1	5±0.3	86	82	255	1,000pcs
MO 2W	64±5	10±0.5	90	119	255	1,000pcs
MO 3WS	64±5	10±0.5	90	119	255	1,000pcs
MO 3W	64±5	10±0.5	90	88	255	500pcs
MO 5WS	64±5	10±0.5	90	88	255	500pcs
MO 5W	90±5	10±0.5	115	124	500	500pcs

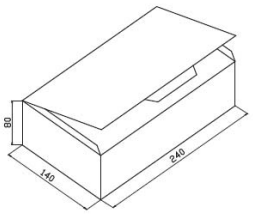
9.2 Tapes in Reel Packing

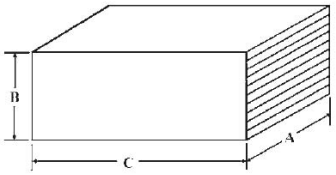


Dimension of Reel (mm)

Part No.	O	A	W±5	H±5	L±5	Qty/Box
MO 1/4W	52±1	73±2	85	295	293	5,000pcs
MO 1/2WS	52±1	73±2	85	295	293	5,000pcs
MO 1/2W	52±1	73±2	85	295	293	2,500pcs
MO 1WS	52±1	73±2	85	295	293	2,500pcs
MO 1W	52±1	73±2	85	295	293	2,500pcs
MO 2WS	52±1	73±2	85	295	293	2,500pcs
MO 2W	64±5	80±5	95	295	293	1,000pcs
MO 3WS	64±5	80±5	95	295	293	1,000pcs
MO 3W	64±5	80±5	95	295	293	1,000pcs
MO 5WS	64±5	80±5	95	295	293	1,000pcs
MO 5W	90±5	115±5	121	310	310	700pcs

9.3 Bulk in Box Packing





Dimension of Box (mm)

Part No.	A±5	B±5	C±5	Qty. of Bag/Box
MO 1/4W	140	80	240	500/10,000pcs
MO 1/2WS	140	80	240	500/10,000pcs
MO 1/2W	140	80	240	250/5,000pcs
MO 1WS	140	80	240	250/5,000pcs
MO 1W	140	80	240	100/2,500pcs
MO 2WS	140	80	240	100/2,500pcs
MO 2W	140	80	240	100/1,500pcs
MO 3WS	140	80	240	100/1,500pcs
MO 3W	140	80	240	100/1,000pcs
MO 5WS	140	80	240	100/1,000pcs
MO 5W	140	80	240	25/400pcs
MO 7W	140	80	240	25/300pcs
MO 8W	140	80	240	25/200pcs
MO 9W	140	80	240	25/200pcs

10. Note

10.1 UNI-ROYAL recommend the storage condition temperature: 15℃~35℃, humidity :25%~75%.
(Put condition for individual product)
Even under UNI-ROYAL recommended storage condition, solderability of products over 1 year old. (Put condition for each product) may be degraded.

10.2 Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.
Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

10.3 Product performance and soldered connections may deteriorate if the products are stored in the following places:
a. Storage in high Electrostatic
b. Storage in direct sunshine、rain and snow or condensation
c. Where the products are exposed to sea winds or corrosive gases, including Cl_2, H_2S_3 NH_3, SO_2, NO_2.

11. Record

Version	Description of amendment	Page	Date	Amended by	Checked by
1	First issue of this specification	1~8	Mar.20, 2018	Chen Haiyan	Chen Nana