F43 Series Metallized Polypropylene Film, 160 VAC/250 VDC, 200 VAC/400 VDC, 220 VAC/630 VDC and Class X2, 275 VAC

Overview

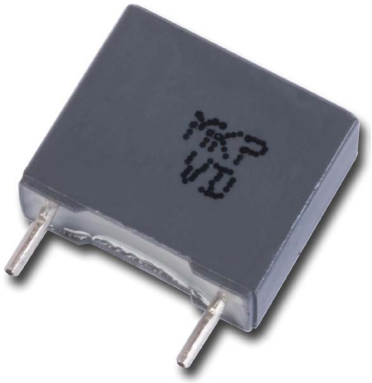
The F43 Series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Applications

Typical applications include worldwide use in contact protection, contact interference suppression and transient suppression.

Benefits

- Approvals (for 275 VAC only): ENEC, UL
- Rated voltage: 160 VAC/250 VDC, 200 VAC/400 VDC, 220 VAC/630 VDC, and Class X2, 275 VAC
- Capacitance range: 0.01 – 1.0 µF
- Lead spacing: 15.0 – 27.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 55/100/56, IEC 60068–1 and 40/100/56 (275 VAC), IEC 60068–1
- Tape and reel packaging in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range: -55˚C to +100˚C and -40˚C to +100˚C (275 VAC)



Part Number System

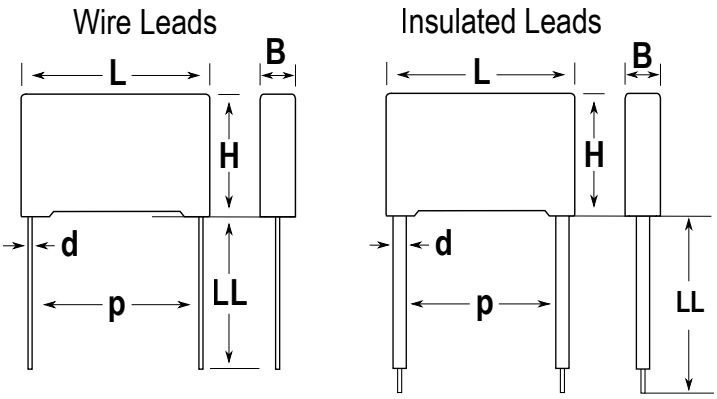
F	43	K	N	3100	XX	01	M
Capacitor Class	Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
Legacy PN: F New KEMET PN: Omit this character	RC Snubber, Metallized Polypropylene	I = 160 M = 200 P = 220 K = 275 (X2)	I = 15.0 N = 22.5 R = 27.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	Contact KEMET for packaging availability and details	00, 01, 04 (Standard)	K = ±10% M = ±20%

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Ordering Options Table

Lead Type	Lead Length (mm)	Lead and Packaging Code
Wire leads	up to 30	Contact KEMET for availability and details
Insulated wire leads	up to 30	
Flexible cable leads	up to 270	

Dimensions – Millimeters



p		B		H		L		d	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
15.0	+/-0.4	7.5	Maximum	14.5	Maximum	18.0	Maximum	0.6	+/-0.05
15.0	+/-0.4	8.5	Maximum	14.5	Maximum	18.0	Maximum	0.8	+/-0.05
15.0	+/-0.4	10.0	Maximum	16.0	Maximum	18.0	Maximum	0.6	+/-0.05
22.5	+/-0.4	6.0	Maximum	15.0	Maximum	26.5	Maximum	0.8	+/-0.05
22.5	+/-0.4	7.0	Maximum	16.0	Maximum	26.5	Maximum	0.6(1)	+/-0.05
22.5	+/-0.4	8.5	Maximum	17.0	Maximum	26.5	Maximum	0.6(1)	+/-0.05
22.5	+/-0.4	10.0	Maximum	18.5	Maximum	26.5	Maximum	0.8	+/-0.05
22.5	+/-0.4	10.0	Maximum	20.0	Maximum	26.5	Maximum	0.6	+/-0.05
22.5	+/-0.4	11.0	Maximum	20.0	Maximum	26.5	Maximum	0.6(1)	+/-0.05
27.5	+/-0.4	11.0	Maximum	20.0	Maximum	32.0	Maximum	0.8	+/-0.05
27.5	+/-0.4	13.0	Maximum	22.0	Maximum	32.0	Maximum	0.8	+/-0.05
27.5	+/-0.4	18.0	Maximum	33.0	Maximum	32.0	Maximum	0.8	+/-0.05
Note: See Ordering Options Table for lead length (LL) options.									

(1) d = 0.8 when capacitance ≥ 0.25 µF.

Performance Characteristics

Rated Voltage	160 VAC/250 VDC, 200 VAC/400 VDC, 220 VAC/630 VDC, & Class X2, 275 VAC	
Capacitance Range	0.01 – 1.0 µF	
Capacitance Tolerance	±20%, ±10%	
Temperature Range	-55°C to +100°C, -40°C to +100°C (275 VAC)	
Climatic Category	55/100/56, 40/100/56 (275 VAC)	
Approvals	ENEC, UL	
Dissipation Factor	Maximum Values at +23°C	
	Frequency	tanδ
	1 kHz	0.1%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 1.6 V_R, 4.3 V_R for 275 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable in such case for any failures.	
Insulation Resistance	Minimum Value Between Terminals	
	C ≤ 0.33 µF	≥ 10,000 MΩ
	C > 0.33 µF	≥ 3,000 MΩ • µF
In DC Applications	Recommended voltage ≤ 800 VDC	

Environmental Test Data

Test	IEC Publication	Procedure
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 500 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s^2
Solderability	IEC 60068–2–20 Test Ta	Wetting time d or d > 0.8 < 1.5 seconds
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Specification	File Number
	EN/IEC 60384–14	CA08.00032
	UL 60384–14 and CAN/CSA–E60384–14	E97797

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

VAC	VDC	Capacitance Value (µF)	Max Dimensions in mm			Lead Spacing (p)	Available E12[3] Resistor Values (Ω)	New KEMET Part Number	Legacy Part Number
			B	H	L				
160	250	0.25	8.5	14.5	18.0	15.0	10–100	43II3250(1)01(2)	F43II3250(1)01(2)
160	250	0.33	6.0	15.0	26.5	22.5	10–100	43IN3330(1)01(2)	F43IN3330(1)01(2)
160	250	0.47	8.5	17.0	26.5	22.5	10–100	43IN3470(1)01(2)	F43IN3470(1)01(2)
160	250	0.5	8.5	17.0	26.5	22.5	10–100	43IN3500(1)01(2)	F43IN3500(1)01(2)
160	250	1	10.0	18.5	26.5	22.5	10–22	43IN4100(1)01(2)	F43IN4100(1)01(2)
200	400	0.25	7.0	16.0	26.5	22.5	10–100	43MN3250(1)01(2)	F43MN3250(1)01(2)
200	400	0.5	10.0	18.5	26.5	22.5	10–100	43MN3500(1)01(2)	F43MN3500(1)01(2)
200	400	1	13.0	22.0	32.0	27.5	10–22	43MR4100(1)01(2)	F43MR4100(1)01(2)
220	630	0.022	7.5	14.5	18.0	15.0	10–1000	43PI2220(1)01(2)	F43PI2220(1)01(2)
220	630	0.1	7.0	16.0	26.5	22.5	10–1000	43PN3100(1)01(2)	F43PN3100(1)01(2)
220	630	0.25	11.0	20.0	26.5	22.5	10–100	43PN3250(1)01(2)	F43PN3250(1)01(2)
220	630	0.5	13.0	22.0	32.0	27.5	10–100	43PR3500(1)01(2)	F43PR3500(1)01(2)
275 (X2)		0.01	7.5	14.5	18.0	15.0	10–1000	43KI2100(1)01(2)	F43KI2100(1)01(2)
275 (X2)		0.015	7.5	14.5	18.0	15.0	10–1000	43KI2150(1)01(2)	F43KI2150(1)01(2)
275 (X2)		0.022	7.5	14.5	18.0	15.0	10–1000	43KI2220(1)01(2)	F43KI2220(1)01(2)
275 (X2)		0.033	7.5	14.5	18.0	15.0	10–1000	43KI2330(1)01(2)	F43KI2330(1)01(2)
275 (X2)		0.047	7.5	14.5	18.0	15.0	10–1000	43KI2470(1)01(2)	F43KI2470(1)01(2)
275 (X2)		0.068	10.0	16.0	18.0	15.0	10–1000	43KI2680(1)01(2)	F43KI2680(1)01(2)
275 (X2)		0.1	8.5	17.0	26.5	22.5	10–1000	43KN3100(1)01(2)	F43KN3100(1)01(2)
275 (X2)		0.15	10.0	20.0	26.5	22.5	10–470	43KN3150(1)01(2)	F43KN3150(1)01(2)
275 (X2)		0.22	11.0	20.0	26.5	22.5	10–470	43KN3220(1)01(2)	F43KN3220(1)01(2)
275 (X2)		0.25	11.0	20.0	32.0	27.5	10–100	43KR3250(1)01(2)	F43KR3250(1)01(2)
275 (X2)		0.33	11.0	20.0	32.0	27.5	10–100	43KR3330(1)01(2)	F43KR3330(1)01(2)
275 (X2)		0.47	13.0	22.0	32.0	27.5	10–100	43KR3470(1)01(2)	F43KR3470(1)01(2)
275 (X2)		0.5	13.0	22.0	32.0	27.5	10–100	43KR3500(1)01(2)	F43KR3500(1)01(2)
275 (X2)		0.68	18.0	33.0	32.0	27.5	10–100	43KR3680(1)01(2)	F43KR3680(1)01(2)
275 (X2)		1	18.0	33.0	32.0	27.5	10–22	43KR4100(1)01(2)	F43KR4100(1)01(2)
VAC	**VDC**	**Capacitance Value (µF)**	**B (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (p)**	**Available E12[3] Resistor Values (Ω)**	**New KEMET Part Number**	**Legacy Part Number**

(1) Lead and packaging code. Contact KEMET for availability and details.
(2) M = ±20%, K = ±10%.
[3] *E12 values are multiples of 10 in the following range: 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82. The standard resistance tolerance is 10%.*

Soldering Process

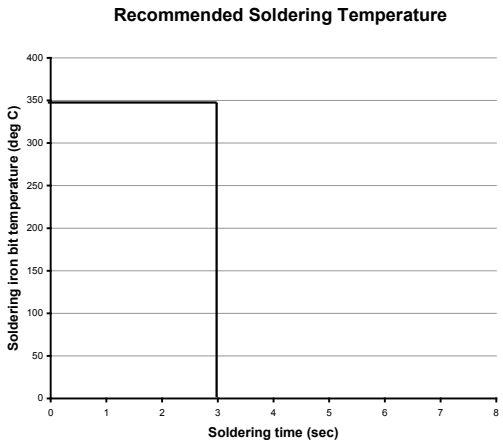
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

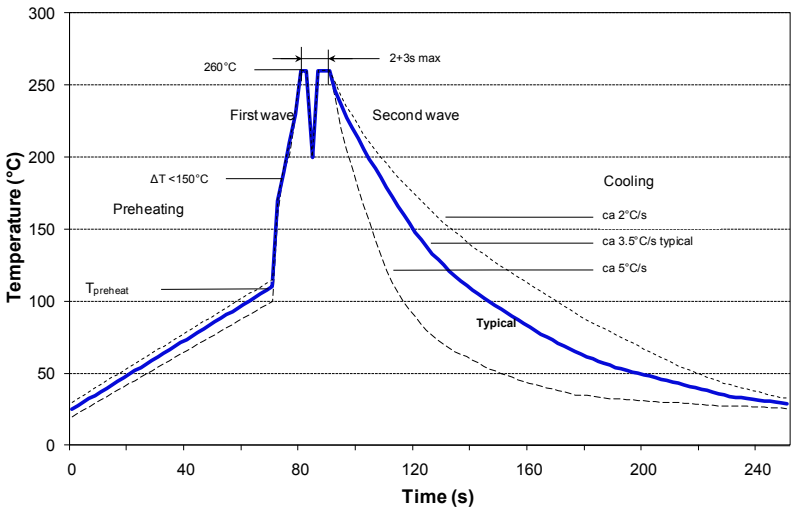
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont'd

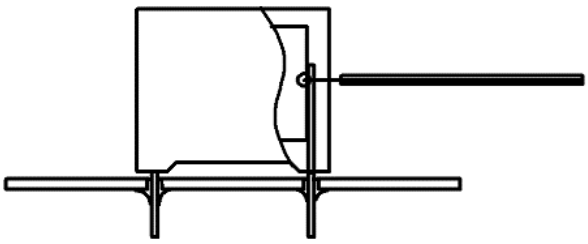
Wave Soldering Recommendations cont'd

1. The table indicates the maximum set-up temperature of the soldering process
Figure 1

Dielectric Film Material	Maximum Preheat Temperature			Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 10 mm	Capacitor Pitch = 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	130°C	270°C	270°C
Polypropylene	100°C	110°C	130°C	260°C	270°C
Paper	130°C	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Marking

- KEMET's logo
- Series
- Capacitance
- Rated resistance
- Rated voltage
- Capacitor class
- Approval marks
- IEC climatic category
- Passive flammability class
- Manufacturing date code

Mounting

RC units are mounted in parallel with the contacts to be protected or in parallel with the inductive load (Fig. 1 and Fig. 2). RC units are generally mounted in parallel with the contacts to suppress radio interferences (Fig. 1).

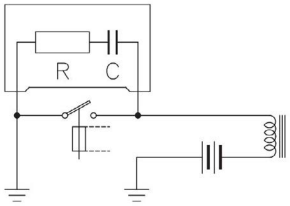


Fig. 1

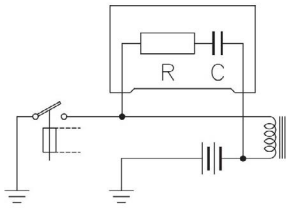
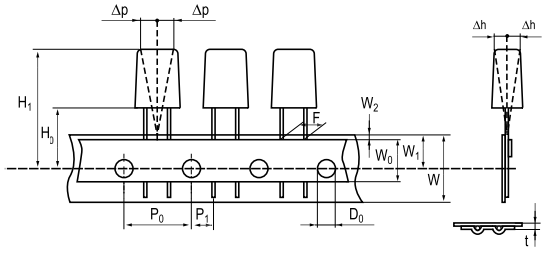


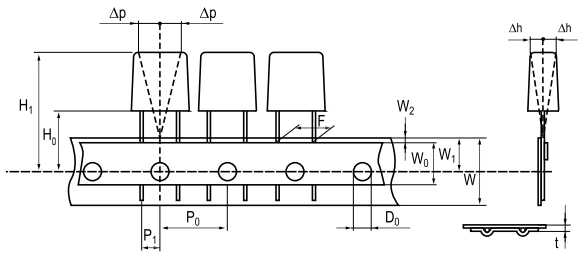
Fig. 2

Lead Taping & Packaging (IEC 60286–2)

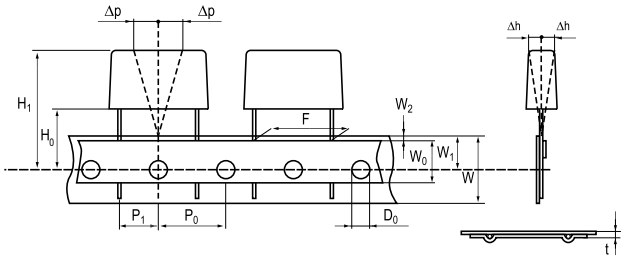
Lead Spacing 5 mm



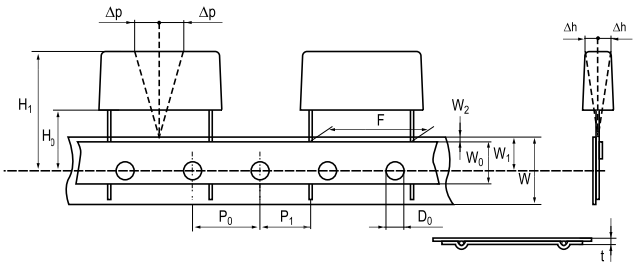
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

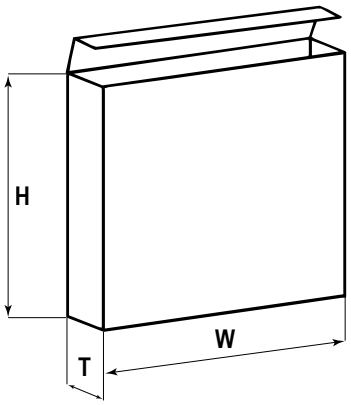
Dimensions in mm									Standard IEC 60286–2
Lead spacing	+6/-0.1	F	5	7.5	10	15	22.5	27.5	F
Carrier tape width	+1/-0.5	W	18	18	18	18	18	18	$18^{+1/-0.5}$
Hold-down tape width	Minimum	W_0	6	6	9	10	10	10	
Position of sprocket hole	+/-0.5	W_1	9	9	9	9	9	9	$9^{+0.75/-0.5}$
Distance between tapes	Maximum	W_2	3	3	3	3	3	3	3
Sprocket hole diameter	+/-0.2	D_0	4	4	4	4	4	4	4
Feed hole lead spacing	+/-0.2(1)	P_0(3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance lead – feed hole	+/-0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P1
Deviation tape – plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral deviation	+/-2	Δh	2	2	2	2	2	2	2
Total thickness	+/-0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket hole/cap body	+/-0.5	H_0(2)	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont'd

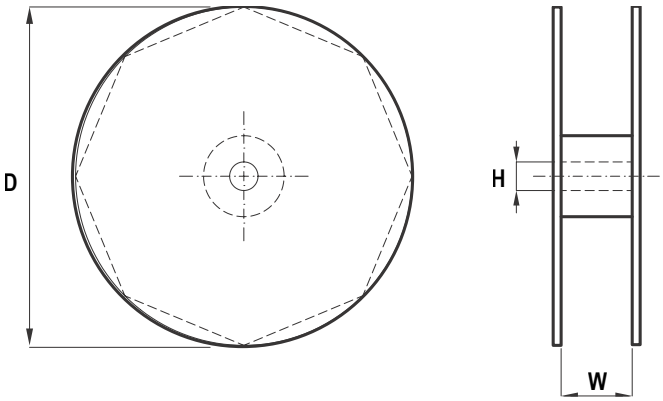
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
R4x, R4x+R, R7x, RSB	360	340	59
F5A, F5B, F5D			
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
R4x, R4x+R, R7x, RSB	355 500	30 25	55 (Max)
F5A, F5B, F5D			
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2000	M	January	1
2001	N	February	2
2002	P	March	3
2003	R	April	4
2004	S	May	5
2005	T	June	6
2006	U	July	7
2007	V	August	8
2008	W	September	9
2009	X	October	O
2010	A	November	N
2011	B	December	D
2012	C		
2013	D		
2014	E		
2015	F		
2016	H		
2017	J		
2018	K		
2019	L		
2020	M		

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Beijing, China
Tel: 86-10-5877-1075

Shanghai, China
Tel: 86-21-6447-0707

Seoul, South Korea
Tel: 82-2-6294-0550

Taipei, Taiwan
Tel: 886-2-27528585

Southeast Asia
Singapore
Tel: 65-6701-8033

Penang, Malaysia
Tel: 60-4-6430200

Bangalore, India
Tel: 91-806-53-76817

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Although all product–related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicted or that other measures may not be required.