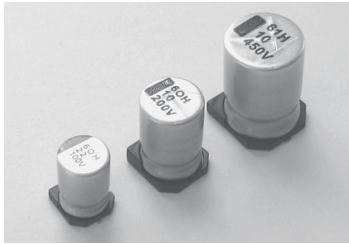


KH Series

High Reliability 高可靠品 适用于汽车电子装备 125℃ and 5000 hours Suitable for Automotive Equipment

- Operating temperature from -40 ~ +125℃
使用温度范围: -40 ~ +125℃
- Load life from 1000 hours to 5000 hours
负荷寿命: 1000小时至5000小时
- Lead-free reflow soldering is available subject to customer's request
无铅回流焊接可按照客户的要求

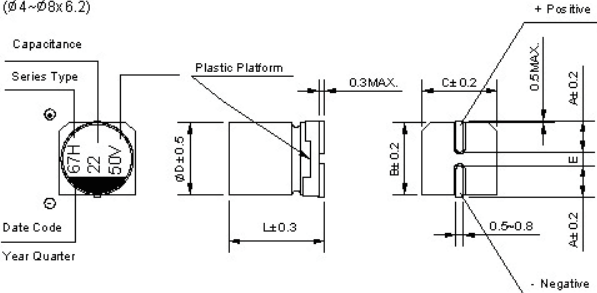


主要技术性能 Specification

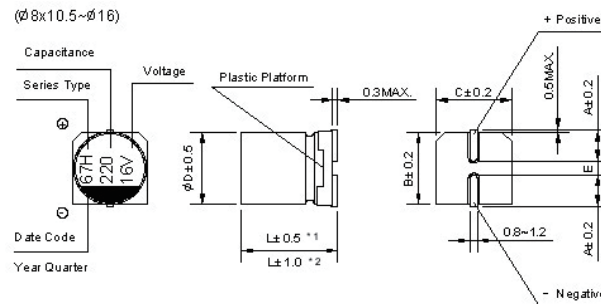
项目 Item	特性 Performance Characteristics																																																												
使用温度范围 Operating temperature rang	-40 ~ +125 C																																																												
额定电压范围 Rated voltage range	10 ~ 450 V																																																												
静电容量范围 Capacitance Range	3.3~2200 μF																																																												
静电容量允许偏差Capacitance Tolerance	±20% at 120 Hz, 20																																																												
漏电流 Leakage current	For 10V~100V,after 1 minutes's application of rated voltage,leakagecurrent is not more than 0.03CV or 4(μA),whichever is greater. For 160V~450V,after 2 minutes application of rated voltage,leakage current is not more than 0.04CV+100(μA) 10V~100V; 施加额定工作电压2分钟, LC≤0. 03CV或4 (μA),取较大值; 160V~450V; 施加额定工作电压2分钟, LC≤0. 04CV+100 (μA)																																																												
损耗角正切值 Tan δ	Measurement frequency 测试频率: 120Hz, Temperature 温度: 20℃ <table><tr><td colspan="2">Rated voltage(V.DC) 额定工作电压</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td><td>160~250</td><td>160~250</td></tr><tr><td>Tan δ</td><td>Φ6.3~Φ10</td><td>0.24</td><td>0.20</td><td>0.16</td><td>0.14</td><td>0.14</td><td>0.18</td><td>0.18</td><td>-</td><td>-</td></tr><tr><td>损耗角正切 (max)</td><td>Φ12.5~Φ16</td><td>0.22</td><td>0.18</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.14</td><td>0.10</td><td>0.20</td><td>0.24</td></tr></table>											Rated voltage(V.DC) 额定工作电压		10	16	25	35	50	63	100	160~250	160~250	Tan δ	Φ6.3~Φ10	0.24	0.20	0.16	0.14	0.14	0.18	0.18	-	-	损耗角正切 (max)	Φ12.5~Φ16	0.22	0.18	0.16	0.14	0.12	0.14	0.10	0.20	0.24																	
Rated voltage(V.DC) 额定工作电压		10	16	25	35	50	63	100	160~250	160~250																																																			
Tan δ	Φ6.3~Φ10	0.24	0.20	0.16	0.14	0.14	0.18	0.18	-	-																																																			
损耗角正切 (max)	Φ12.5~Φ16	0.22	0.18	0.16	0.14	0.12	0.14	0.10	0.20	0.24																																																			
低温特性 Stability at Low Temperature	Measurement frequency 测试频率: 120Hz <table><tr><td colspan="2">Rated voltage(V.DC) 额定工作电压</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td><td>160~250</td><td>160~250</td></tr><tr><td rowspan="4">Impedance ratio 阻抗比 XT/Z20(max)</td><td rowspan="2">Φ6.3~Φ10</td><td>Z(-25℃)/Z(-20℃)</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td></tr><tr><td>Z(-40℃)/Z(-20℃)</td><td>10</td><td>8</td><td>6</td><td>4</td><td>4</td><td>4</td><td>-</td><td>-</td></tr><tr><td rowspan="2">Φ12.5~Φ16</td><td>Z(-25℃)/Z(-20℃)</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>3</td><td>6</td></tr><tr><td>Z(-40℃)/Z(-20℃)</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>6</td><td>10</td></tr></table>											Rated voltage(V.DC) 额定工作电压		10	16	25	35	50	63	100	160~250	160~250	Impedance ratio 阻抗比 XT/Z20(max)	Φ6.3~Φ10	Z(-25℃)/Z(-20℃)	4	3	2	2	2	2	-	-	Z(-40℃)/Z(-20℃)	10	8	6	4	4	4	-	-	Φ12.5~Φ16	Z(-25℃)/Z(-20℃)	4	3	2	2	2	2	3	6	Z(-40℃)/Z(-20℃)	8	6	4	3	3	3	6	10
Rated voltage(V.DC) 额定工作电压		10	16	25	35	50	63	100	160~250	160~250																																																			
Impedance ratio 阻抗比 XT/Z20(max)	Φ6.3~Φ10	Z(-25℃)/Z(-20℃)	4	3	2	2	2	2	-	-																																																			
		Z(-40℃)/Z(-20℃)	10	8	6	4	4	4	-	-																																																			
	Φ12.5~Φ16	Z(-25℃)/Z(-20℃)	4	3	2	2	2	2	3	6																																																			
		Z(-40℃)/Z(-20℃)	8	6	4	3	3	3	6	10																																																			
高温负荷特性 Load Life	After 5000 hours application of rated voltage for Φ8×6.3,as well as 2000hours application of rated voltage for Φ12.5~Φ16(160-450V) at 125 C ,capacitors meet the characteristics requirements listed at right. 在155℃环境中施加额定工作电压5000小时于Φ12.5~Φ16 (10~100V), 2000小时于Φ8×10.5~Φ10 (10~100V), 1000小时于Φ8×6.2~Φ6.3, 以及施加额定工作电压2000小时于Φ12.5~Φ16 (160~450V) 后, 电容器的特性符合右表的要求。 <table><tr><td>Capacitance Change 静电容量变化率</td><td>Within ±30% of the initial value 初始值±10%以内</td></tr><tr><td>Tan δ 损耗角正切</td><td>300% or less of the initial specified value 不大于规范值的300%</td></tr><tr><td>Leakage Current 漏电流</td><td>Initial specified value or less不大于规范值</td></tr></table>											Capacitance Change 静电容量变化率	Within ±30% of the initial value 初始值±10%以内	Tan δ 损耗角正切	300% or less of the initial specified value 不大于规范值的300%	Leakage Current 漏电流	Initial specified value or less不大于规范值																																												
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Leakage Current 漏电流	Initial specified value or less不大于规范值																																																												
高温储存特性 Shelf Life	After leaving capacitors under no load at 125℃ for 1000 hours, they meet the specified value for load life characteristics listed above. 在125℃环境中无负荷放置1000小时后, 电容器的特性符合高温负荷特性中所列的规定值。																																																												
耐焊接热特性 Resistance to Soldering Heat	After reflow soldering and restored at room temperature, they meet the characteristics requirements listed at right. 经过回流焊并冷却至室温后, 电容器的特性符合右表的要求。 <table><tr><td>Capacitance Change 静电容量变化率</td><td>Within ±10% of the initial value 初始值±10%以内</td></tr><tr><td>Tan δ 损耗角正切</td><td>Initial specified value or less不大于规范值</td></tr><tr><td>Leakage Current 漏电流</td><td>Initial specified value or less不大于规范值</td></tr></table>											Capacitance Change 静电容量变化率	Within ±10% of the initial value 初始值±10%以内	Tan δ 损耗角正切	Initial specified value or less不大于规范值	Leakage Current 漏电流	Initial specified value or less不大于规范值																																												
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Leakage Current 漏电流	Initial specified value or less不大于规范值																																																												
适用标准 Applicable Standards	JIS C-5141 and JIS C-5102																																																												

外形图及尺寸图 Case size table

(Φ4~Φ8×6.2)



KH Series

*1 [$L \pm 0.5$] is applicable to $\Phi 8 \times 10.5 \sim \Phi 10$;*2 [$L \pm 1.0$] is applicable to $\Phi 12.5 \sim \Phi 16$.

Re: Date code and series type — 1st digit for Year; 2nd digit for Quarter, 4 quarter codes in one year are 1, 4, 7, 0; 3rd character for Series; KH Series = H.

DXL	$\Phi 6.3 \times 5.8 / 7.7$	$\Phi 8 \times 6.2$	$\Phi 8 \times 10.5$	$\Phi 10 \times 10.5 / 13.5$	$\Phi 12.5 \times 13.5 / 16$	$\Phi 16 \times 16.5 / 21.5$
A	2.4	3.3	2.9	3.2	4.7	5.5
B	6.6	8.3	8.3	10.3	13.0	17.0
C	6.6	8.3	8.3	10.3	13.0	17.0
E ± 0.2	2.2	2.2	3.1	4.4	4.4	6.7
L	5.8 / 7.7	6.2	10.5	10.5 / 13.5	13.5 / 16	16.5 / 21.5

■ 规格尺寸及最大允许纹波电流及ESR值 Standard size Maximum permissible ripple current&ESR

WV电压		10				16				25			
容量 Cap(uF)		1A				1C				1E			
33	330									6.3×5.8	3.3	66	45
47	470					6.3×5.8	3.3	66	43	6.3×7.7 (8×6.2)	2.3 (2.3)	46 (46)	68 (68)
100	101	6.3×7.7 (8×6.2)	2.3 (2.3)	46 (46)	72 (72)	8×10.5	1.0	20	115	8×10.5	1.0	20	126
220	221	8×10.5	1.0	20	136	10×10.5	0.7	13.4	175	10×10.5	0.7	13.4	211
330	331	10×10.5	0.7	13.4	188	10×10.5	0.5	9.5	280	12.5×13.5 (10.5×13.5)	0.14 (0.5)	2.1 (9.5)	750 (270)
470	471	10×13.5	0.5	9.5	300	12.5×13.5	0.14	2.1	750	12.5×13.5	0.14	2.1	750
680	681					16×16.5 (12.5×13.5)	0.10 (0.14)	1.5 (2.1)	1000 (750)	16×16.5 16×21.5	0.10 0.10	1.5 1.5	1000 1200
1000	102	12.5×16 (12.5×13.5)	0.11 (0.14)	1.5 (2.1)	900 (750)	16×21.5	0.10	1.5	1200	16×21.5	0.10	1.5	1200
2200	222	16×16.5 (16×21.5)	0.10 0.10	1.5 1.5	1000 1200	16×21.5	0.10	1.5	1200	Case Size	ESR(Ω) 20℃	ESR(Ω) -40℃	Ripples Current

WV电压		35				50			
容量 Cap(uF)		1A				1H			
10	100	6.3×5.8	3.3	66	38	6.3×7.7 (6.3×5.8)	2.3 (3.3)	46 (66)	50 (38)
22	220	6.3×5.8	3.3	66	39	6.3×7.7 (8×6.2)	2.3 (2.3)	46 (46)	50 (50)
33	330	6.3×7.7 (8×6.2)	2.3 (2.3)	46 (46)	62 (62)	8×10.5	1.0	20	83
47	470	8×10.5	1.0	20	92	10×10.5	0.7	13.4	111
100	101	10×10.5	0.7	13.4	151	12.5×13.5	0.23	3.5	550
220	221	12.5×13.5 (10×13.5)	0.14 (0.5)	2.1 (9.5)	750 (260)	16×16.5 (12.5×13.5)	0.15 (0.23)	2.3 (3.5)	850 (550)
330	331	12.5×13.5	0.14	2.1	750	16×16.5 (12.5×16)	0.15 (0.18)	2.3 (2.7)	850 (700)
470	471	16×16.5 (12.5×16)	0.10 (0.11)	1.5 (1.5)	1000 (900)	16×21.5	0.15	2.3	920
680	681	16.5×21.5	0.10	1.5	1200	Case Size	ESR(Ω) 20℃	ESR(Ω) -40℃	Ripples Current

Ripple Current (mA ms) at 125℃ 100kHz

KH Series

■ 规格尺寸及最大允许纹波电流及ESR值 Standard size Maximum permissible ripple current&ESR

WV 电压 容量 Cap(uF)		63				100			
		1J				2A			
10	100	6.3×7.7 (8×6.2)	2.3 3.3	115 (115)	42 (42)	8×10.5	1.00	50	53
22	220	8×10.5	1.0	50	56	10×10.5	0.70	35	63
33	330	10×10.5	0.7	35	77	10×13.5	0.45	22.5	130
47	470	10×13.5	0.45	22.5	150	12.5×13.5	0.33	16.5	450
68	680					12.5×16	0.26	13	550
100	101	12.5×13.5	0.25	12.5	500	16×16.5	0.24	12	650
220	221	12.5×16	0.20	10	600				
330	331	16×16.5	0.18	9	820	Case Size	ESR(Ω) 20℃	ESR(Ω) -40℃	Ripples Current
470	471	16.5×21.5	0.11	5.5	1100				

Ripple Current (mA ms) at 125℃ 100kHz

■ 规格尺寸及最大允许纹波电流 Standard size Maximum permissible ripple current

WV 电压 容量 Cap(uF)		160	200	250	400	450
		2C	2D	2E	2G	2W
3.3	3R3					12.5×16 65
4.7	4R7				12.5×13.5 70	16×21.5 85
6.8	6R8				16×16.5 100	
10	100	12.5×13.5 100	12.5×13.5 100	12.5×16 110	16×21.5 140	
22	220	16×16.5 180	16×16.5 180	16×21.5 205		
33	330	16×21.5 245	16×21.5 250			Case Size Ripples Current

Ripple Current (mA ms) at 125℃ 100kHz

■ 纹波电流频率补偿系数 (10~100V) Standard size Maximum permissible ripple current

Frequency Capacitance(uF)	50Hz	120Hz	1kHz	10kHz	100kHz~
10~100	0.35	0.40	0.75	0.90	1.00
220~470	0.35	0.50	0.85	0.94	1.00
680~2200	0.40	0.60	0.85	0.95	1.00

■ 纹波电流频率补偿系数 (10~100V) Standard size Maximum permissible ripple current

Frequency	50Hz	120Hz	300Hz	1kHz	10kHz	100kHz~
Coefficient	0.75	1.00	1.25	1.50	1.75	1.80

KH Parts List (1)

Size	Part No.	R.V. (V.DC)	Cap. (μF)	Tangent of Loss Angle ($\tan \delta$)	Leakage Current (μA)	ESR (Ω) (20°C, 100kHz)	ESR (Ω) (-40°C, 100kHz)	Ripple Current (mA rms.) (100kHz, 125°C)
D × L				max.	max.	max.	max.	max.
6.3×7.7	10kH101MLC6.3×7.7EC	10	100	0.24	30.0	2.3	46.0	72
8×6.2	10kH101MLC8×6.2EC	10	100	0.24	30.0	2.3	46.0	72
8×10.5	10kH221MLC8×6.2EC	10	220	0.24	66.0	1.0	20.0	136
10×10.5	10kH331MLC10×10.5EC	10	330	0.24	99.0	0.7	13.4	188
10×13.5	10kH471MLC10×13.5EC	10	470	0.24	141.0	0.5	9.5	300
12.5×13.5	10kH102MLC12.5×13.5EC	10	1000	0.22	300.0	0.14	2.1	750
12.5×16	10kH102MLC12.5×16EC	10	1000	0.22	300.0	0.11	1.5	900
16×16.5	10kH222MLC16×16.5EC	10	2200	0.22	660.0	0.10	1.5	1000
16×21.5	10kH222MLC16×21.5EC	10	2200	0.22	660.0	0.10	1.5	1200
6.3×5.8	16kH470MLC6.3×5.8EC	16	47	0.20	22.6	3.3	66.0	43
8×10.5	16kH101MLC8×10.5EC	16	100	0.20	48.0	1.0	20.0	115
10×10.5	16kH221MLC10×10.5EC	16	220	0.20	105.6	0.7	13.4	175
10×13.5	16kH331MLC10×13.5EC	16	330	0.20	158.4	0.5	9.5	280
12.5×13.5	10kH471MLC12.5×13.5EC	16	470	0.18	225.6	0.14	2.1	750
16×16.5	16kH681MLC16×16.5EC	16	680	0.18	326.4	0.14	2.1	750
12.5×13.5	16kH681MLC12.5×13.5EC	16	680	0.18	326.4	0.10	1.5	1000
16×21.5	16kH102MLC16×21.5EC	16	1000	0.18	480.0	0.10	1.5	1200
16×21.5	16kH222MLC16×21.5EC	16	2200	0.18	1056.0	0.10	1.5	1200
6.3×5.8	25kH330MLC6.3×5.8EC	25	33	0.16	24.8	3.3	66.0	45
6.3×7.7	25kH470MLC6.3×7.7EC	25	47	0.16	35.3	2.3	46.0	68
8×6.2	25kH470MLC8×6.2EC	25	47	0.16	35.3	2.3	46.0	68
8×10.5	25kH101MLC8×10.5EC	25	100	0.16	75.0	1.0	20.0	126
10×10.5	25kH221MLC10×10.5EC	25	220	0.16	165.0	0.7	13.4	211
10×13.5	25kH331MLC10×13.5EC	25	330	0.16	247.5	0.50	9.5	270
12.5×13.5	25kH331MLC12.5×13.5EC	25	330	0.16	247.5	0.14	2.1	750
12.5×13.5	25kH471MLC12.5×13.5EC	25	470	0.16	325.5	0.14	2.1	750
16×16.5	25kH681MLC16×16.5EC	25	680	0.16	510.0	0.10	1.5	1000
16×21.5	25kH681MLC16×21.5EC	25	680	0.16	510.0	0.10	1.5	1200
16×21.5	25kH102MLC16×21.5EC	25	1000	0.16	750.0	0.10	1.5	1200
6.3×5.8	35kH100MLC6.3×5.8EC	35	10	0.14	10.5	3.3	66.0	38
6.3×5.8	35kH220MLC6.3×5.8EC	35	22	0.14	23.1	3.3	66.0	39
6.3×7.7	35kH330MLC6.3×7.7EC	35	33	0.14	34.7	2.3	46.0	62
8×6.2	35kH330MLC8×6.2EC	35	33	0.14	34.7	2.3	46.0	62
8×10.5	35kH470MLC8×10.5EC	35	47	0.14	49.4	1.0	20.0	92
10×10.5	35kH101MLC10×10.5EC	35	100	0.14	105.0	0.7	13.4	151
10×13.5	35kH221MLC10×13.5EC	35	220	0.14	247.5	0.50	9.5	260
12.5×13.5	35kH221MLC12.5×13.5EC	35	220	0.14	247.5	0.14	2.1	750
12.5×13.5	35kH331MLC12.5×13.5EC	35	330	0.14	231.0	0.14	2.1	750
16×16.5	35kH471MLC16×16.5EC	35	470	0.14	346.5	0.11	1.5	900
16×21.5	35kH471MLC16×21.5EC	35	470	0.14	493.5	0.10	1.5	1000
16×21.5	35kH681MLC16×21.5EC	35	680	0.14	714.0	0.10	1.5	1200
6.3×5.8	50kH100MLC6.3×5.8EC	50	10	0.14	15.0	3.3	66.0	38
6.3×7.7	50kH100MLC6.3×7.7EC	50	10	0.14	15.0	2.3	46.0	50

KH Parts List (2)

Size	Part No.	R.V. (V.DC)	Cap. (μF)	Tangent of Loss Angle ($\tan \delta$)	Leakage Current (μA)	ESR (Ω) (20°C, 100kHz)	ESR (Ω) (-40°C, 100kHz)	Ripple Current (mA rms.) (100kHz, 125°C)
D × L				max.	max.	max.	max.	max.
6.3×7.7	50kH220MLC6.3×7.7EC	50	22	0.14	33.0	2.3	46.0	50
8×6.2	50kH220MLC8×6.2EC	50	22	0.14	33.0	2.3	46.0	50
8×10.5	50kH330MLC8×10.5EC	50	33	0.14	49.5	1.0	20.0	83
10×10.5	50kH470MLC10×10.5EC	50	47	0.14	70.5	0.7	13.4	111
12.5×13.5	50kH101MLC12.5×13.5EC	50	100	0.12	150.0	0.23	3.5	550
12.5×13.5	50kH221MLC12.5×13.5EC	50	220	0.12	300.0	0.23	3.5	550
16×16.5	50kH221MLC16×16.5EC	50	220	0.12	300.0	0.15	2.3	850
12.5×16	50kH331MLC12.5×16EC	50	330	0.12	495.0	0.18	2.7	700
16×16.5	50kH331MLC16×16.5EC	50	330	0.12	495.0	0.15	2.3	850
16×21.5	50kH471MLC16×21.5EC	50	470	0.12	705.0	0.15	2.3	920
6.3×7.7	63kH100MLC8×10.5EC	63	10	0.18	18.9	2.3	115.0	42
8×6.2	63kH100MLC10×10.5EC	63	10	0.18	18.9	2.3	115.0	42
8×10.5	63kH220MLC10×13.5EC	63	22	0.18	41.6	1.0	50.0	56
10×10.5	63kH330MLC12.5×13.5EC	63	33	0.18	62.4	0.7	35.0	77
10×13.5	63kH470MLC16×16.5EC	63	47	0.18	88.8	0.45	22.5	150
12.5×13.5	63kH101MLC12.5×13.5EC	63	100	0.14	189.0	0.25	12.5	500
12.5×16	63kH221MLC16×21.5EC	63	220	0.14	415.8	0.20	10.0	600
16×16.5	63kH331MLC16×21.5EC	63	330	0.14	623.7	0.18	9.0	820
16×21.5	63kH471MLC16×21.5EC	63	470	0.14	888.3	0.11	5.5	1100
8×10.5	100kH100MLC8×10.5EC	100	10	0.18	30	1.00	50.0	53
10×10.2	100kH220MLC10×10.2EC	100	22	0.18	66	0.70	35.0	63
10×13.5	25kH330MLC10×13.5EC	100	33	0.18	99.0	0.45	22.5	130
12.5×13.5	25kH470MLC12.5×13.5EC	100	47	0.10	141.0	0.33	16.5	450
12.5×16	25kH680MLC12.5×16EC	100	68	0.10	204.5	0.26	13.0	550
16×16.5	25kH101MLC16×16.5EC	100	100	0.10	300.5	0.24	12.0	650

KH Parts List (3)

Size	Part No.	R.V. (V.DC)	Cap. (μF)	Tangent of Loss Angle ($\tan \delta$)	Leakage Current (μA)	Ripple Current (mA rms.) (100kHz, 125°C)
D × L				max.	max.	max.
12.5×13.5	160kH101MLC12.5×13.5EC	160	10	0.20	164	100
16×16.5	160kH220MLC16×16.5EC	160	22	0.20	241	180
16×21.5	160kH330MLC16×21.5EC	160	33	0.20	311	245
12.5×13.5	200kH100MLC12.5×13.5EC	200	10	0.20	180	100
16×16.5	200kH220MLC16×16.5EC	200	22	0.20	276	180
16×21.5	200kH330MLC16×21.5EC	200	33	0.20	364	245
12.5×16	250kH100MLC12.5×16EC	250	10	0.20	200	110
16×21.5	250kH220MLC16×21.5EC	250	22	0.20	320	205
12.5×13.5	400kH4R7MLC12.5×13.5EC	400	4.7	0.24	175	70
16×16.5	400kH6R8MLC16×16.5EC	400	6.8	0.24	209	100
16×21.5	400kH100MLC16×21.5EC	400	10	0.24	260	140
12.5×16	450kH3R3MLC12.5×16EC	450	3.3	0.24	159	65
16×16.5	450kH4R7MLC16×16.5EC	450	4.7	0.24	185	85