

# 规格承认书

送认日期：2019/8/30

客户名称：

铝电解电容器

产品名称：

ALUMINUM ELECTROLYTIC CAPACITOR SPECIFICATIONS

型号规格：

明细如下表

序号 NO.	客户料号 P/N	产品型号规格	外形尺寸D×L	规格书编号	寿命(h)
				SPEC.NO.	
1		EHLH472V400F12MT 400V4.7μF	8*12	HEAO-02	8000
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					

			承认厂商 CUSTOMER APPROVED
拟制	审核	批准	会签 APPROVER BY:  承认章：
陈曦	莫胜辉	李建平	

# HGS 型铝电解电容器规格书

## HGS Aluminum Electrolytic Capacitors

编 号SPEC.NO.: HEAO 06  
版 本: 1.0  
日 期DATE:

### ■ 特点

- 105℃ 6000 小时保证品。 6000 hours at 105℃.
- 专为电子节能灯、镇流器、LED驱动设计制造，耐高纹波，耐高温，特长寿命。 High ripple current tolerance type.

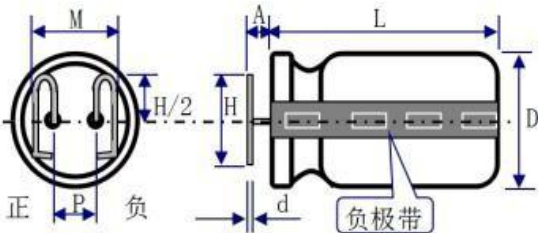
### ■ 技术规范 Specifications

项 目 Item		特 性 Characteristics
使用温度范围 Operating temperature range		-25℃ ~ +105℃
额定电压 Rated working voltage range		400 V
标称容量Nominal Capacitan		4.7 μ F
静电容量允许范围 Capacitance tolerance		M: -10% ~ +20% (25℃120Hz)
漏 电 流 Leakage current (μ A)		施加额定电压2分钟後的电流值 After 2minutes with rated working voltage applied $I \leq 18.8 \mu A$
损耗角正切Dissipation Factor		$\tan \delta \leq 0.08$ (25℃ 120Hz)
耐 久 性 Loadlife test	试 验 条 件 Test condition	在105℃下施加直流电压叠加额定纹波电流 60 mA (100KHZ) 小时 DC voltage plus ripple current 60 mA (100KHZ) value applied for hr at 105℃
	电容量变化率 Capacitance change	DC/C≤初始测量值的±20% ≤±20% of the initial value
	损耗角正切 Dissipation Factor	在规定值200%以下 ≤200% of the initial specified value
	漏 电 流 Leakage current	施加额定电压2分钟後的电流值 After 2minutes with rated working voltage applied $I \leq 18.8 \mu A$
高温贮存 Shelf life test	试 验 条 件 Test condition	电容器在105℃下贮存1000小时 The capacitor are then stored with no voltage applied at a temperature of 105±2℃ for 1000 +48,-0 hours.
	电容量变化率 Capacitance change	DC/C≤初始测量值的±10% ≤±10% of the initial value
	损耗角正切 Dissipation Factor	在规定值200%以下 ≤200% of the initial specified value
	漏 电 流 Leakage current	施加额定电压2分钟後的电流值 After 2minutes with rated working voltage applied $I \leq 37.6 \mu A$
浪涌电压 Surge voltage	试 验 条 件 Test condition	循环次数: 1000次, 温度: 15℃~35℃, 充电电压 450 V, 充电持续时间: 30S, 放电持续 时间: 5min 30s
		(1) Surge voltage application: 1000times charging for 30±5 second .with a period of 5min 30s.
		(2)Test temperature: 15-35℃; Rated working voltage range: 450 V
	电容量变化率 Capacitance	DC/C≤初始测量值的±15% ≤±15% οφ της ινιτιαλ παλυε
	损耗角正切 Dissipation Factor	≤ 0.15
	漏 电 流 Leakage current	施加额定电压2分钟後的电流值 After 2minutes with rated working voltage applied $I \leq 18.8 \mu A$
高低温特性 Low Temperature Stability		$Z_{-25^{\circ}C} / Z_{20^{\circ}C} \leq 6$

### ■ 试验方法TEST METHOD

参照国标GB2693-2001

### ■ 外形尺寸及包装 Case Size and Packing Quantity



### ● 外形尺寸:D×L 单位:mm

ΦD+0.5	8
L+2.0	12
P±0.5	3.5
d±0.04	0.6
Amax	2.0
M±0.5	7
H±0.5	5

# HGS 型铝电解电容器规格书

## HGS Aluminum Electrolytic Capacitors

编 号SPEC.NO.: HEAO-A06

版 本: 1.0

日 期DATE: 2017-07-20

### 1. 概述 SCOPE

本承认书规定了HLH（105℃宽温度，长寿命）系列径向引出铝电解电容器的技术规范。This specification covers “CD11GAM series” 105 °C Long Life Assurance miniature single-ended aluminum electrolytic capacitors.

### 2. 参考标准APPLICABLE SPECIFICATION

本承认书参考 GB2693-86 制定。

CHINA GB2693-86 Characteristics as specified in this specification .

### 3. 工作温度范围OPERATING TEMPERATURE RANGE

工作温度范围是电容器在施加额定工作电压条件下，可以长期可靠工作的环境温度范围。

-25℃~+105℃（160~450V）

Operating temperature range is the range of ambient temperature at which the capacitor can be operated continuously at rated voltage.

-25℃~+105℃（160~450V）

### 4. 测试环境CHARACTERISTICS

如果没有其他规定，标准的测试、检验环境条件如下所示：

环境温度：15 至 35℃

相对湿度：45 至 85%

大气压力：86kpa 至 106kpa

如果对测试结果有异议，可以在以下条件测试：

环境温度：25±2℃

相对湿度：60 至 70%

大气压力：86kpa 至 106kpa

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests are as follows.

Ambient temperature : 15 to 35℃

Relative humidity : 45 to 85%

Air pressure : 86kpa to 106kpa

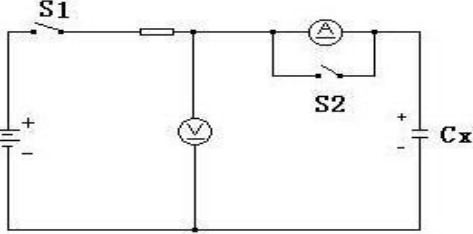
If there may be doubt on the results, measurements shall be made within the following limits.

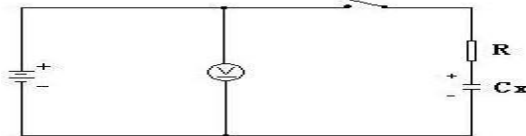
Ambient temperature : 25±2℃

Relative humidity : 60 to 70%

Air pressure : 86kpa to 106kpa

#### 4.1 电气特性 ELECTRICAL CHARACTERISTICS

序号 NO	项目 Item	测试方法 Test method	性能 Performance
4.1.1	额定工作电压 Rated voltage		DC160~450V
4.1.2	电容量 Capacitance	测试频率: 120Hz 测试电路: 串联等效 测试电压: 0.5Vrms 以下 Measuring frequency: 120Hz Measuring circuit: Series equivalent circuit Measuring voltage: 0.5Vrms or less +1.5 to 2.0 VDC	1~1000μ F 容量偏差: +20% -10% Capacitance tolerance: +20%-10%
4.1.3	损失角正切值 Dissipation Factor	测试条件与 4.1.2 电容量测试相同 Testing condition are the same as 4.1.2 for capacitance	不大于表 1 所示 Not more than the value given in table 1.
4.1.4	漏电流 Leakage current	在电容器两端施加额定工作电压, 并串联 1000±100Ω 电阻, 在施加电压 2 分钟后, 测 量漏电流。 测试电路如下图: The rated voltage shall be applied across the capacitor and its protective resistor which shall be 1000 ± 100 Ω . The leakage current shall then be measured after an electrification period of 2 min.. Measurement circuit  Rs: Protective resistor(1000±100Ω ) DC ammeter DC voltmeter S <sub>1</sub> :Switch S <sub>2</sub> :Protective switch for an ammeter	• 2 分钟后 $I \leq 0.01CV + 25(\mu A)$ B I: 漏电流 (μ A) C: 容量 (μ F) V: 额定工作电压 (V) .After 2 min. $I \leq 0.01CV + 25(\mu A)$ B. I: Leakage current(μ A) C: Capacitance(μ F) V: Rated voltage(V)

4.1.5	温度特性 Temperature Characteristic	<table><tr><th>阶段</th><th>温度</th><th>时间</th></tr><tr><td>1</td><td>20±2℃</td><td>1.5h</td></tr><tr><td>2</td><td><math>-25_{-3}^{+0}</math>℃</td><td>2h</td></tr><tr><td>3</td><td>20±2℃</td><td>0.25h</td></tr><tr><td>4</td><td><math>105_{-0}^{+3}</math>℃</td><td>2h</td></tr></table> <p>阶段 1: 测量容量和阻抗 ( z  20℃ 120Hz)</p> <p>阶段 2: 电容器恒温贮存 2 小时, 在热平衡状态测阻抗 ( z -25, 120Hz)</p> <p>阶段 4: 电容器恒温贮存 2 小时, 在热平衡状态测电容量</p> <p>Step 1:Capacitance and impedance shall be measured. ( z  20℃ 120Hz)</p> <p>Step 2:After the capacitor being stored for 2 hours, impedance shall be made at thermal stability. ( z -25, 120Hz)</p> <p>Step 4:After the capacitor being stored for 105 °C 2 hours, capacitance shall be measured. The measurement shall be made at thermal stability</p>	阶段	温度	时间	1	20±2℃	1.5h	2	$-25_{-3}^{+0}$ ℃	2h	3	20±2℃	0.25h	4	$105_{-0}^{+3}$ ℃	2h	<p>阶段 2: 阻抗值与阶段 1 阻抗值相比, 不大于表 1 要求。</p> <p>阶段 4: 容量变化应在初值的 ±20% 范围内</p> <p>Step 2:Impedance ratio Ratio to the value at step 1 ,shall be not more than the value given table-1</p> <p>Step4:Variation of capacitance Within ±20% of the value at Step 1.</p>
阶段	温度	时间																
1	20±2℃	1.5h																
2	$-25_{-3}^{+0}$ ℃	2h																
3	20±2℃	0.25h																
4	$105_{-0}^{+3}$ ℃	2h																
4.1.6	耐浪涌电压 Surge Test	<p>充电 30±5 秒, 放电 5.5±0.5 分钟作为一个周期, 共进行 1000 次。</p> <p>测试温度: 15℃-35℃</p> <p>然后在标准大气条件下放置达到热稳定, 测试各参数</p> <p>Voltage application: 1000 times of charging for 30 ± 5 sec., with a period of 5.5±0.5 min..</p> <p>Test temperature: 15℃-35℃</p> <p>And the capacitor shall be stored under standard atmospheric conditions to obtain thermal stability, after which measurements shall be made.</p> <p>Test circuit</p> <div></div> <p>Note :This requirement is applicable only to instantaneous over voltage which may be applied to terminals of capacitor, therefore, not applicable to such over voltages as often applied.</p>	<p>容量: 不低于试验前的 80%。损耗角正切值不大于 200%的表 1 规定值。</p> <p>漏电流: 达到 4.1.4 要求</p> <p>Capacitance: Not less than 80% of the value before test.</p> <p>Dissipation factor: Not more 200% of the specified value in Table-1.</p> <p>Leakage current: To satisfy No.4.1.4</p>															

## 4.2 机械特性 MECHANICAL PERFORMANCE

序号 NO	项目 Item	测试方法 Test method	特性 Performance
4.2.1	可焊性 Solder ability	<p>依据 JIS C 0050 进行试验</p> <p>焊锡温度: 245±5℃</p> <p>浸入时间: 2.5±0.5 秒</p> <p>To comply with JIS C 0050</p> <p>Temperature or solder: 245±5℃</p> <p>Dipping time: 2.5±0.5sec.</p> <p>This specification shall be met after the capacitors are stored under standard atmospheric conditions for 6 months.</p>	<p>浸入焊锡的引线表面积约 3/4 以上应附著新锡</p> <p>At least 3/4 of circumferential surface of the dipping portion of termination shall be covered with new solder.</p>

#### 4.3 耐久性测试 ENDURANCE PERFORMANCE

序号 NO	项目 Item	测试方法 Test method	特性 Performance
4.3.1	耐焊接热 Resistance to soldering heat	<p>焊槽法: 焊锡温度: <math>260 \pm 5^{\circ}\text{C}</math> 浸入时间: <math>10 \pm 1</math> 秒 电路板: 1.6mm</p> <p>Solder bath method Solder temperature: <math>260 \pm 5^{\circ}\text{C}</math> Immersion time: <math>10 \pm 1</math> sec. Printed wiring board: 1.6mm</p>	<p>容量变化: 在初始值 <math>\pm 10\%</math> 范围内 损失角正切值: 满足表 1 要求 漏电流: 满足 4.1.4 要求 外观: 无异状</p> <p>Variation of capacitance: Within <math>\pm 10\%</math> of the value before test. Dissipation factor: To satisfy Table 1. Leakage current: To satisfy No.4.1.4 Appearance: No remarkable abnormality.</p>
4.3.2	稳态湿热 Resistance to damp heat (steady state)	<p>依据 JIS C 5023 进行试验 试验温度: <math>40 \pm 2^{\circ}\text{C}</math> 试验时间: <math>240 \pm 8</math> h 相对湿度: 90~95% 试验后, 电容器在标准大气条件下 1~2 小时, 然后测试参数 To comply with JIS C 5023 Test temperature: <math>40 \pm 2^{\circ}\text{C}</math> Test time: <math>240 \pm 8</math> h Relative humidity: 90~95% After completion of test, the capacitor shall be subjected to standard atmospheric conditions for 1 to 2 hours, after which measurements shall be made.</p>	<p>容量变化: 在初始值 <math>\pm 10\%</math> 范围内 损失角正切值: 满足表 1 要求 漏电流: 满足 4.1.4 要求 外观: 无异状</p> <p>Variation of capacitance: Within <math>\pm 10\%</math> of the value before test. Dissipation factor: To satisfy Table 1. Leakage current: To satisfy No.4.1.4 Appearance: No remarkable abnormality.</p>
4.3.3	高温负荷试验 Load Life Test	<p>试验温度: <math>105 \pm 2^{\circ}\text{C}</math> 试验时间: <math>^{+48}_{-0}</math> h</p> <p>Test temperature: <math>105 \pm 2^{\circ}\text{C}</math> Test time: <math>^{+48}_{-0}</math> h</p>	<p>容量变化: 在初始值 <math>\pm 25\%</math> 范围内 损耗角正切值: 不超过表 1 所列规定值的 200% 漏电流: 满足 4.1.4 需求 外观: 无异状</p> <p>Variation of capacitance: Within <math>\pm 25\%</math> of the value before test. Dissipation factor: Not more than 200% of the specified value in Table 1. Leakage current: To satisfy No.4.1.4 Appearance: No remarkable abnormality.</p>

序号 NO	项目 Item	测试方法 Test method	特性 Performance
4.3.4	高温贮存试验 Shelf Life Test	<p>在 <math>105 \pm 2^\circ\text{C}</math> 环境下无负荷贮存 <math>1000 \pm 0 \text{ h}</math></p> <p>The capacitors are then stored with no voltage applied at a temperature of <math>105 \pm 2^\circ\text{C}</math> for <math>1000 \pm 0 \text{ h}</math></p>	<p>容量变化：初始值 <math>\pm 20\%</math> 范围内。损耗角正切值：不超过表 1 所列规定值的 200%</p> <p>漏电流：满足 4.1.4 需求</p> <p>外观：无异状</p> <p>Variation of capacitance: Within <math>\pm 20\%</math> of the value before test.</p> <p>Dissipation factor: Not more than 200% of the specified value in Table 1.</p> <p>Leakage current: To satisfy No. 4.1.4</p> <p>Appearance : No remarkable abnormality.</p>
4.3.5	防爆试验 Safety Vent	<p>在电容器两极施加反向工作电压，其中通过的电流应不大于 1 A，在测试时防爆装置应能在 30 分钟内动作。</p> <p>DC. Application test</p> <p>The capacitor shall be subjected to a reverse DC. voltage equal to the rated DC. voltage.</p> <p>The current flowing through the capacitor shall be limited to 1A. If the vent does operate with the voltage applied for 30 minutes, the test is considered to be passed.</p>	<p>上述过程中应无引线、铝箔等散射，无火花产生。</p> <p>The vent device is actuated under the test conditions, thereby preventing terminals, metal pieces, etc., of the capacitor from scattering due to burst, the case from separating from the seal packing, or the capacitor from producing flame.</p>

表 1 (TABLE 1)

额定工作电压 Rated voltage (v)	浪涌电压 Surge voltage (v)	损失角正切值 Dissipation factor	阻抗比 -25°C/ z 20°C
160	200	0.08	3
200	250	0.08	3
250	300	0.08	3
350	400	0.08	6
400	450	0.08	6
450	500	0.08	6

\*3 当容量值大于  $1000\mu\text{F}$  时，每增加  $1000\mu\text{F}$ ，DF 值加 2%

For capacitance of more than  $1000\mu\text{F}$ , add 2% for every increase of  $1000\mu\text{F}$ .

## 5. 标记 MARKING

### 5.1 在电容器体上应注明如下内容：

- (1) 生产厂商商标
- (2) 工作电压
- (3) 电容量
- (4) 负极标志
- (5) 上限工作温度

The following items shall be marked indelibly on the capacitor.

- (1) Manufacture's name or trade mark.
- (2) Rated voltage
- (3) Capacitance
- (4) Polarity of the terminals
- (5) Maximum operating temperature

## 6、温度因子及频率因子 Temperature coefficient And Frequency coefficient

Temperature Coefficient							Frequency Coefficient			
TEMP(°C)	+40	+55	+65	+75	+80	+105	120	1K	10k	≥100 K
Coefficient	2.41	2.41	2.12	2.0	1.70	1.00	0.50	0.80	0.90	1.00

## 7、标准尺寸及纹波电流 Standard Size Permissible Ripple Current

Ripple Current (mA r.m.s./105,120Hz) Impedance(Ω)Max(20°C,100KHz)

电压(V)	160		200		250	
容量(μ F)	尺寸D ×L(mm)	纹波电流(mArms /105°C,100kHz)	尺寸 ×L(mm)	纹波电流(mArms /105°C,100kHz)	尺寸D ×L(mm)	纹波电流(mArms /105°C,100kHz)
4.7	6.3×12	63	6.3×12	75	6.3×12	81
	8×12	80	8×12	95	8×12	102
5.6	8×12	84	8×12	98	8×12	105
6.8	8×12	96	8×12	110	8×12	115
8.2	8×12	110	8×16	120	8×16	120
10	8×12	206	8×16	244	8×16	210
15	8×16	250	8×20	268	8×20	367
22	8×20	400	10×16	400	10×16	430
33	10×20	450	10×20	450	13×20	535
47	10×20	500	13×20	610	13×20	627
68	13×20	630	13×25	700	16×25	720
100	13×25	720	16×25	800	16×30	880
150	16×25	850	16×30	900		

电压(v)	350		400		450	
容量(μ F)	尺寸D ×L(mm)	纹波电流(mArms /105°C,100kHz)	尺寸 ×L(mm)	纹波电流(mArms /105°C,100kHz)	尺寸D ×L(mm)	纹波电流(mArms /105°C,100kHz)
2.2			6.3×12	85	8×16	115
			8×12	90		
3.3	8×12	110	8×10	88	8×16	128
			8×12	92		
4.7	8×16	120	8×10	92	8×20	140
			8×12	95		
5.6	8×16	150	8×10	115	10×16	158
			8×16	124		
6.8	8×20	175	8×16	136	10×20	200
			10×13	170		
8.2	8×20	189	10×20	230	10×20	220
10	10×16	230	10×20	280	10×20	250
15	10×20	310	13×20	320	13×20	320
22	13×20	410	13×25	450	13×25	450
33	13×25	530	16×25	550	16×25	550
47	16×20	570	16×30	670	16×30	670
68	18×20	726	18×30	800	18×30	800

## 8. 其它说明

### 8.1 铝电解电容器使用注意事项 IMPORTANT INFORMATION ON THE APPLICATION OF ALUMINUM ELECTROLYTIC CAPACITORS

(1). 直流铝电解电容器应按正确的极性使用 DC electrolytic capacitors are polarized  
当直流铝电解电容器按反极性接入电路时, 电容器会导致电子线路短路, 由此产生的电流会引致电容器损坏。若电路中有可能在负引线施加正极电压, 请选无极性产品。

When reverse voltage is applied on DC electrolytic capacitor, the capacitor will becomes short circuited please use no polarized capacitors in the circuit be damage due to abnormal current flows through the capacitors since the circuit where the positive voltage may be applied to the cathode terminal.

(2). 在额定工作电压以下作用 Use capacitor within rated voltage

当电容器上所施加电压高于额定工作电压时, 电容器的漏电流将上升, 其电气特性将在短时期内劣化直至损坏。请注意电压峰值勿超出额定工作电压。

When capacitor is used at higher voltage than the rated voltage, leakage current increases, characteristics drastically deteriorate and damage in a short period may occur as a result. Please take extra caution that the peak voltage should not exceed the rated voltage.

(3). 作快速充放电使用 Charge and discharge application.

当常规电容器被用作快速充电用途。其使用寿命可能会因为容量下降, 温度急剧上升等而缩减

When aluminum electrolytic capacitors for general purpose are employed in rapid charge and discharge application, its life expectancy may be short end by capacitance decrease, heat rise, etc.

(4). 电容器贮存 Store the capacitor.

当铝电解电容器作了长期贮存后, 其漏电流通常升高, 贮存温度愈高, 漏电流上升愈快。因此应注意贮存环境的选择, 在电容器上施加电压后, 漏电流值将不断下降, 在铝电解电容器的漏电流值上升对电路有不良影响的, 请在使用前充电处理。

Increased leakage current is common in aluminum capacitors which have been stored for long period of time. The Higher the storage temperature, the higher the leakage current increase, therefore please take precautions concerning the storage location. The leakage current decreases gradually as voltage is applied to the capacitor. In cases where increased leakage current causes problems in the circuit, apply voltage(aging) before using.

(5). 施加纹波电流应小于额定值 Ripple current applied to capacitor should not exceed the rated value.

施加纹波电流超过额定值后, 会导致电容器体过热, 容量下降, 寿命缩短。所施加纹波电压的峰值应小于额定工作电压。

Excessive heat will reduce capacitance and result in shortened life of capacitor if ripple currents exceeding the specified rated value are applied. The peak value of the ripple voltage should be less than the rated voltage.

(6). 使用环境温度 Ambient temperature.

铝电解电容器的使用寿命会受到环境温度的影响。据科学统计, 使用环境温度下降 10℃其使用寿命增加 1 倍。

Life of the aluminum electrolytic capacitor is affected by the ambient temperature. It is generally stated, that life doubles for each 10℃ decrease in temperature.

(7). 引出线强度 Lead stress

当拉力施加到电容器引出线, 该拉力将作用于电容器内部, 这将导致电容器内部短路, 开路或漏电流上升。在电容器焊装到电路板, 请勿强烈摇动电容器。

When a strong force is applied to the lead wires or terminals, stress is put on the internal connections. This may result in short circuit, open circuit or increased leakage current. It is not advisable to bend or handle a capacitor after it has been soldered to the PC board.

(8). 焊接过程耐热性 Heat resistance at the soldering process

铝电解电容器装至电路板进行浸焊或波焊时, 其塑料套管可能因焊接时间过长、温度过高而发生破裂或二次收缩。

In the dip soldering process of PC board with aluminum electrolytic capacitors mounted, secondary shrinkage or crack of PVC sleeve may be observed when solder temperature is too high or dipping time is too long.

(9). 电路板的安装孔孔距及安装位置 Hole pitch and position of PC board.

电路板安装孔的设计应与产品说明书的引线脚距相一致，如果将电容器强行插入孔距不配套的电路板，那么会有应力作用于引出线，这将导致短路或漏电流上升。

A PC board must be designed so its hole pitch coincides with the lead pitch(lead spacing) of the capacitor specified by the catalog or specifications. when a capacitors is forcibly inserted into an unmatched hole pitch, a stress is put on the leads This could result in a short circuit or increased leakage current.

## 8.2 符合 RoHS EU/RoHS

本产品（包括所有构件）完全符合欧盟 RoHS 要求，即 6 种有害物质的最大含量均不超过如下要求：

We product is according to the standard of ROHS , it means the max capacitance of six harmful material not over the following request

Cd（镉）- 100PPM

Pb（铅）-1000PPM

Hg（汞）-1000PPM

Cr<sup>+6</sup>（6 价铬）-1000PPM

PBBs（多溴联苯）-1000PPM

PBDEs（多溴联苯醚）-1000PPM



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