

## Availability of the large diameter Funnel MCP/MCP plates from Hamamatsu

After a series of E-mail exchange with the Hamamatsu US representative, Columbine Robinson <[crobinson@hamamatsu.com](mailto:crobinson@hamamatsu.com)> we have acquired a following information:

In the F1942 MCP series (87mm OD) the only Funnel type MCP available now is  
**F1942-016F** (Channel dia.:12 $\mu$ m, Bias angle:20deg., L/d:60, OAR:90%).

In the 3-stage configuration (Z-stack) Hamamatsu can offer following types as 2<sup>nd</sup> and 3<sup>rd</sup> stages of MSP (however, only 2<sup>nd</sup> and 3<sup>rd</sup> stages will be resistance matched)

- a) **F1942-015-Y006** (Channel dia.:12 $\mu$ m, Bias angle:20deg., L/d:80, OAR:70%)
- b) **F1942-015** (Channel dia.:12 $\mu$ m, Bias angle: 8deg., L/d:60, OAR:57%)
- c) **F1942-04** (Channel dia.: 25 $\mu$ m, Bias angle: 8deg., L/d:40, OAR:57%)

For resistance matching of all three stages Hamamatsu can offer only F1942-016K as 2<sup>nd</sup> and 3<sup>rd</sup> stages

- d) **F1942-016K** (Channel dia.:12 $\mu$ m, Bias angle:20deg., L/d:60, OAR:57%)

She also left the following remark:

"Since funnel MCP and MCP other than F1942-015, F1942-04 are detection quality type and it has possibility that these types are not suitable for your operation though it depends on the application. Our experience on coupling MCPs with different channel diameter MCP and different bias angle was used only for TOF-MS ION detector.

The ION detector is operated by only pulse output and we do not have experience on the generation of the failure due to the coupling. Unfortunately we do not have the experience on using different channels and bias angles on the phosphor screen output type."

**Comment:** Detection quality of funnel MCP **F1942-016F** means that gain across the MCP aperture may change significantly (did not find quantitative data). If we won't have enough gain then we can lost some events in trigger flow, which is unacceptable. For this reason I would not recommend **F1942-04** as 2<sup>nd</sup> and 3<sup>rd</sup> stages because of lower gain (L/d:40) of these MCP.

### Specifications for F1942-015

Plate diameter (mm)	86.7+0.1-0.4
Electrode diameter (mm)	84.7+0.3-0
Effective area diameter (mm)	78.0 $\pm$ 0.5
Plate thickness (mm)	0.72 $\pm$ 0.03
Bias angle (°)	8 $\pm$ 1
Center to center spacing ( $\mu$ m)	15 max.
Channel diameter ( $\mu$ m) approx.	12
OAR (%)	57 min.
Electrode material	Inconel
Electrode resistance ( $\Omega$ )	200 max.
Electrode penetration (d)	(Input side) 0.5 $\pm$ 0.2 (Output side) 1.0 $\pm$ 0.5
Operating voltage (kV)	1.2 max.
Gain	1.0 $\times$ 10 <sup>4</sup> min. (Vmcp=1.2kV)
Strip current ( $\mu$ A)	20 to 200 (Vmcp=1kV)
Resistance (M $\Omega$ ) ※ for reference	5 to 50 (Vmcp=1kV)
Uniformity	=(Vmcp=0.6-0.9kV)
Multi-to-multi deviation	$\pm$ 10%
Multi boundary deviation	-15%, +10%

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Center to center spacing (μm)	15 max.
Channel diameter (μm) approx.	12
OAR (%)	57 min.
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Electrode penetration (d)	(Input side) 0.5±0.2 (Output side) 1.0±0.5
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Strip current (μA)	20 to 200 (Vmcp=1kV)
Resistance (MΩ) ※ for reference	5 to 50 (Vmcp=1kV)
Uniformity	(Vmcp=0.6-0.9kV)
Multi-to-multi deviation	±10%
Multi boundary deviation	-15%, +10%

### Specifications for F1942-016K (detection quality)

Plate diameter (mm)	86.7+0.1/-0.4
Electrode diameter (mm)	84.7+0.3/-0
Effective area diameter (mm)	78.0±0.5
Plate thickness (mm)	0.72±0.03
Bias angle (°)	20±1
Center to center spacing (μm)	15 max.
Channel diameter (μm) approx.	12
OAR (%)	57 min.
Electrode material	Inconel
Electrode resistance (Ω)	200 max.
Electrode penetration (d)	(Input side) 0.5±0.2 (Output side) 1.0±0.5
Operating voltage (kV)	1.2 max.
Gain	1.0×10 <sup>4</sup> min. (Vmcp=1.2kV)
Strip current (μA)	20 to 200 (Vmcp=1kV)
Resistance (MΩ) ※ for reference	5 to 50 (Vmcp=1kV)

### Specifications for F1942-016F (detection quality)

Plate diameter (mm)	86.7+0.1/-0.4
Electrode diameter (mm)	84.7+0.3/-0
Effective area diameter (mm)	78.0±0.5
Plate thickness (mm)	0.72±0.03
Bias angle (°)	20 ±1
Center to center spacing (μm)	15 max.
Channel diameter (μm) approx.	12
OAR (%)	(Input side) 90 min. w/funnel (Output side) 57 min.
Electrode material	Inconel
Electrode resistance (Ω)	200 max.
Electrode penetration (d)	(Input side) 0.5±0.2 (Output side) 1.0±0.5
Operating voltage (kV)	1.2 max.
Gain	1.0×10 <sup>4</sup> min. (Vmcp=1.2kV)
Strip current (μA)	20 to 200 (Vmcp=1kV)
Resistance (MΩ) ※ for reference	5 to 50 (Vmcp=1kV)