

Led by experience. Driven by curiosity.

Vacuum Capacitors

Combining expertise and technology



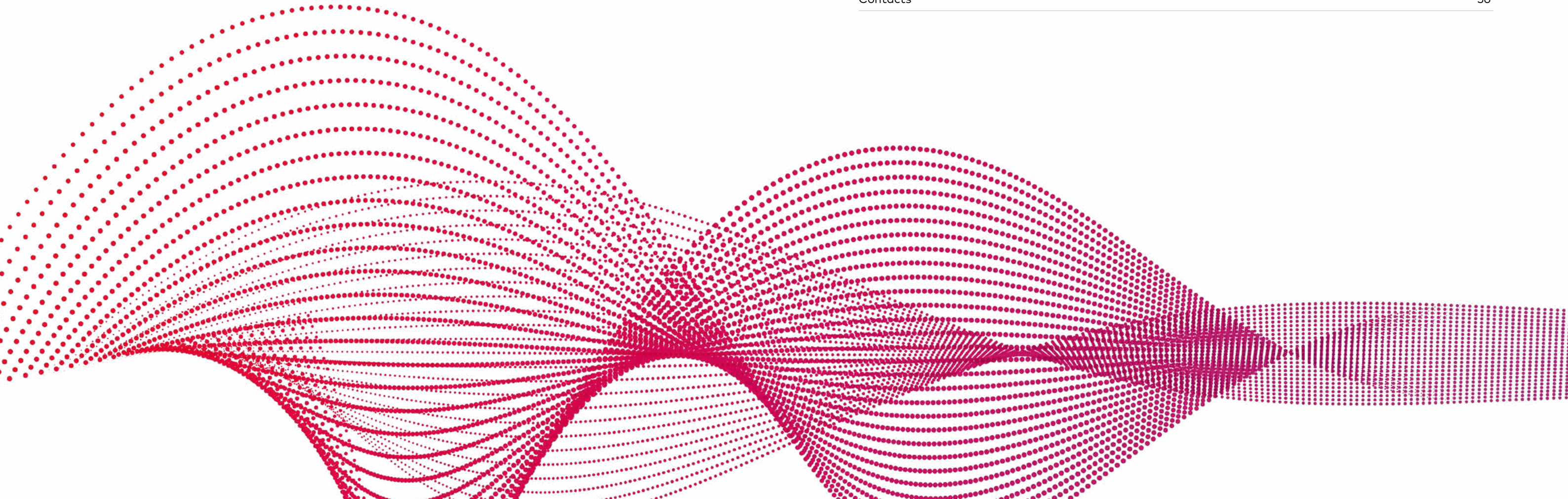
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pct



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We empower new technologies

Comet is a leading expert in RF power delivery and a global innovation partner of RF related businesses for 60 years. Our products have earned a global reputation for quality and reliability over a broad variety of applications.

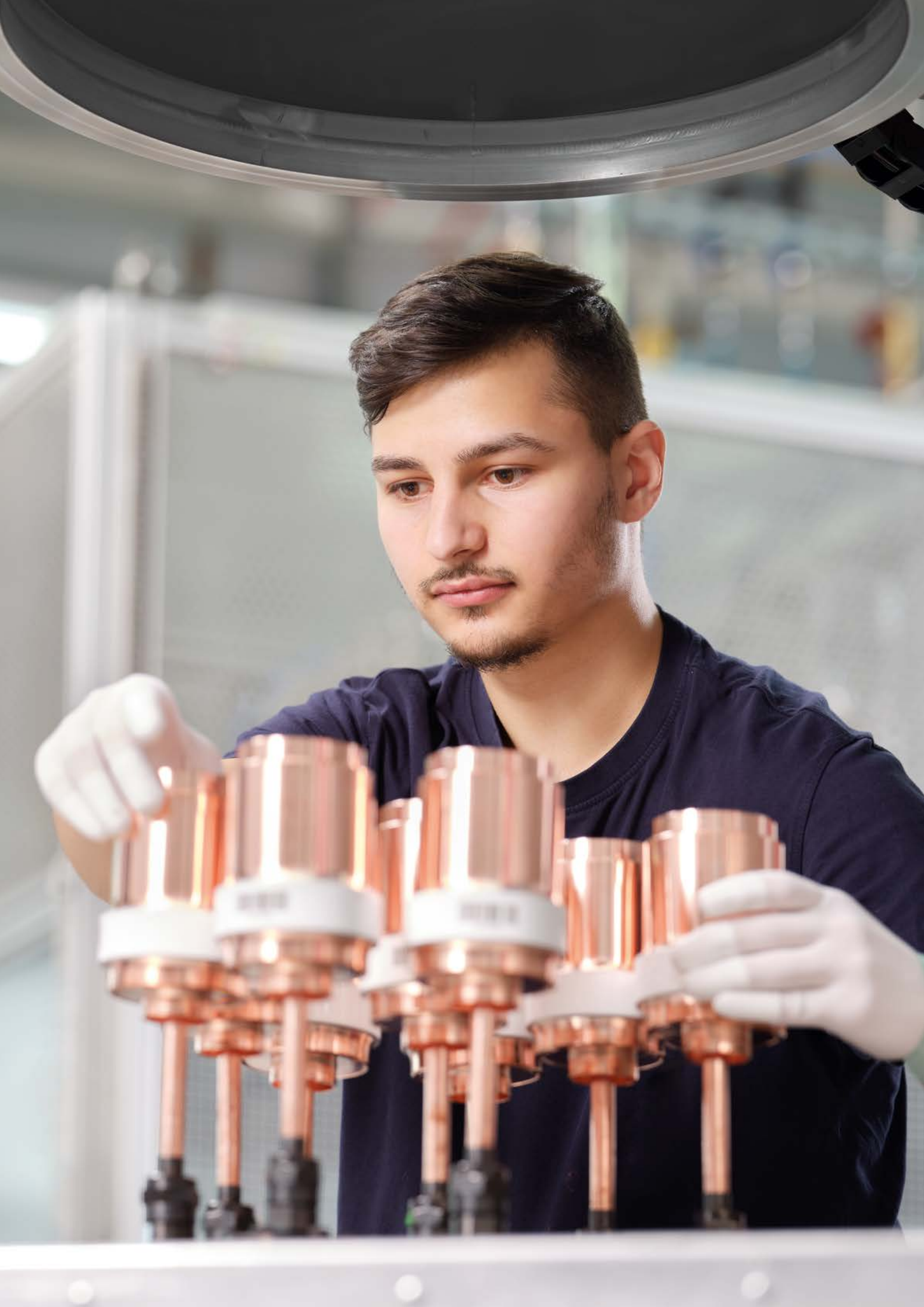
By exploring the mysteries of plasma behavior Comet is contributing to the evolution of the semiconductor industry. With the goal to provide our customers with the most precise tools, we engineer and manufacture the most advanced RF power systems and diagnostic tools to master plasma processes.

Comet's profound know-how in RF circuit modeling and design has its origin in the development of Vacuum Capacitors. A broad range of capacitors for all needs guarantees you highest performance, repeatability and reliability of your tools. Besides that, the unique modular and customized design allows a high degree of flexibility in production and guarantees the delivery of special types on short notice. Comet Vacuum Capacitors are exclusively used to improve the performance of our Impedance Matching Networks.

In this catalog you will learn more about the broadest selection of capacitance, power, voltage and drive systems in the market. Our experts will gladly support you in finding the right solution for your specific needs.

**"We create solutions
that respond both to
today's trends and
tomorrow's needs."**





Advanced technologies

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XtraVolt Vacuum Capacitors

Recommended for frequencies below 4 MHz

High power density in processing modules is a requirement of many RF matchbox designers. With the XtraVolt low frequency Vacuum Capacitor product range, Comet meets these needs with higher voltage capability compared to standard products. This enables up to 60% RF power density increase, while keeping the same form factor.

With the XtraVolt series – recommended for frequencies below 4 MHz – you benefit from increased power density by more than 40% in the same envelope.

The XtraVolt technology is applicable to most of the existing capacitor series.

Increase your capacitor voltage

- Boost your RF Matching network
- Achieve more without compromising on size

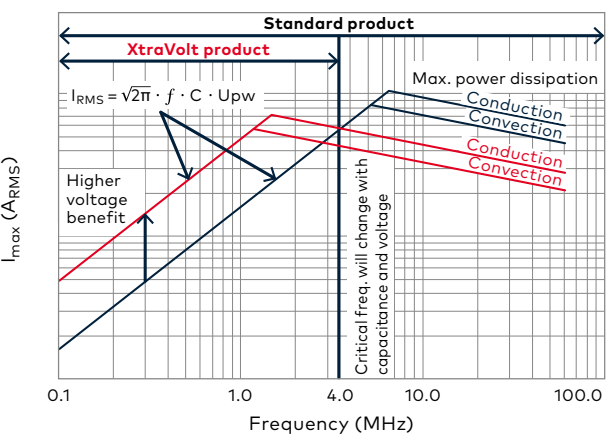
XtraVolt highlights

- Compact and well-designed RF Impedance Matching Network helps tool builders utilize efficiently the limited space.
- With XtraVolt we optimize space utilization, by offering 20% to 60% increased voltage in the same compact size of our standard Vacuum Capacitor portfolio.
- Increase your RF power density by upgrading your Vacuum Capacitor to XtraVolt.

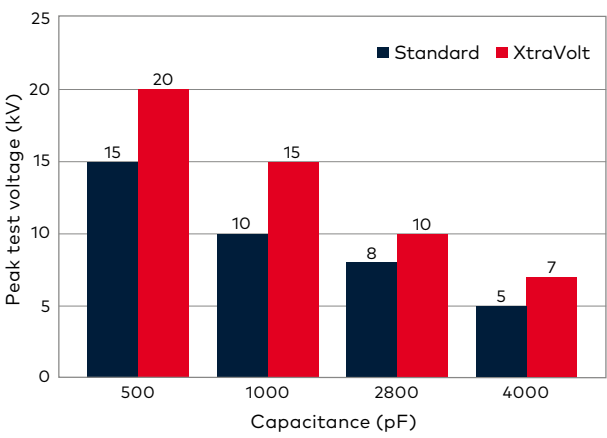
Recommended applications

- Surface treatment
- Ion beam processing
- Chemical vapor deposition (CVD)

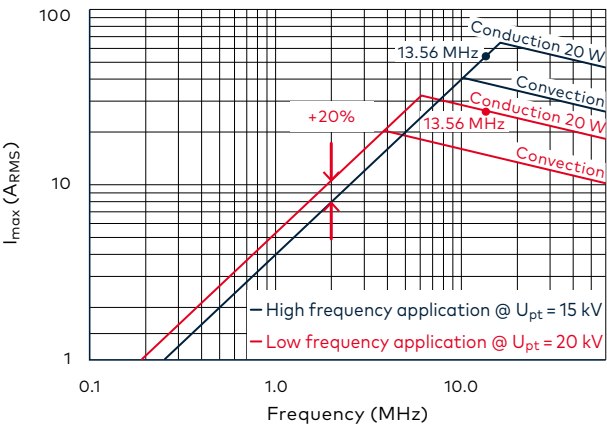
XtraVolt product range versus standard product range



Comparison of XtraVolt and standard types for Mini-Cap 75 mm dia.



Current curve of a XtraVolt Mini-Cap



High current, compact Vacuum Capacitors

With hybrid-cooling technology

Semiconductor industry is going through a big transformation requiring high current density processing modules. In order to meet this challenge, Comet has introduced a new high current, compact Vacuum Capacitor.

Combining the most useful features of Comet's Vacuum Capacitors, along with a new special cooling technology, allows the use of high current in a compact size Vacuum Capacitor.

Comet hybrid-cooling technology has been developed as an extension of the well-known Hexa-Con product range. The first hybrid-cooled, small size Vacuum Capacitor series enables the use of higher power while keeping the same footprint, resulting in lower cost of ownership. When comparing diameter versus power density, the Hexa-Con series with hybrid-cooling technology is best in class.

Hybrid-cooling technology can be applied to any series on demand and further tailored to your needs.

Features

- Hybrid-cooling technology
- High power design
- 40% higher current than standard product
- Small form factor
- Ultra Life drive system

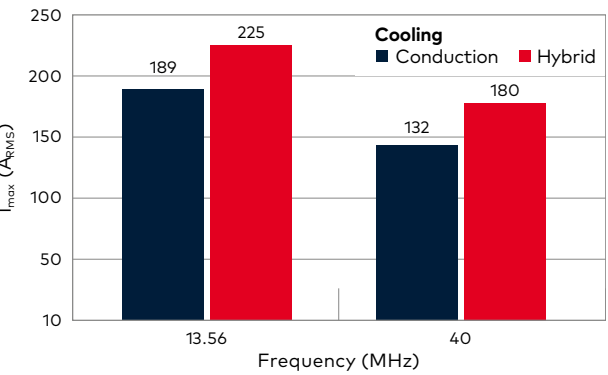
Benefits

- Long lifetime
- Low torque
- More than 40% power increase
- Efficient use of matchbox space



Hexa-Con with hybrid-cooling technology

Comparison of cooling types (Hexa-Con series)



Ultra Life Vacuum Capacitor Drive Systems

High-speed drive system for ultra-long life Vacuum Capacitors

Increase the reliability and useful lifetime of your Impedance Matching Network with the best choice of Vacuum Capacitors along with the latest drive system technology.

The expected lifetime of a Vacuum Capacitor is determined by the drive system and bellow design. Comet's field proven bellows have been recognized as the leading designs for RF stability and lifetime. With the introduction of Ultra Life, the drive system components now last at least three times longer.

Avoid system breakdowns

Friction in the drive system may cause particle formation, increased torque, leading to sticktion and finally result in failure.

Comet Ultra Life drive systems enhance the lifespan of Vacuum Capacitors and therefore, Impedance Matching Networks, by at least threefold compared to current products. Comet improvements ensure trouble free operation and lifetime up to 100 million turns.

Benefits

- Designed for 600 and 1200 RPM for fast match tuning
- Lifetime up to 100 million turns and higher
- RoHS compliant
- Available for most Comet Vacuum Capacitors
- Customized types available



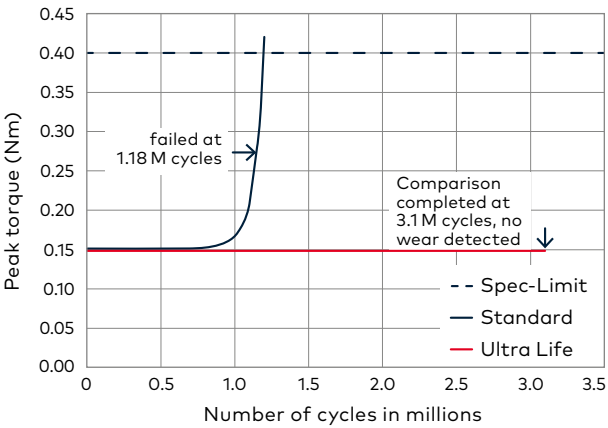
Extend the lifetime up to factor 10

The interface letter no. 4 indicates the lead screw feature.

Example:

- CVHE-200AC/15-AAAB-A1 Standard product
5 - 10 million turns
- CVHE-200AC/15-AAAD-A1 Ultra Life Drive system
50 - 100 million turns
- CVUN-1000AC/5-BAJA Standard product
5 - 10 million turns
- CVUN-1000AC/5-BAJL Ultra Life Drive system
50 - 100 million turns

Drive system lifetime comparison Hexa-Con series



Expected lifetime in million turns

	Lead screw A-coated	Lead screw B-coated	Ultra Life			
Lead screw feature	A	B	C	D	K	L
Uni-Con	5 – 10					50 – 100
Uni-Select					30 – 60	50 – 100
Power-Con	3 – 6	5 – 10	25 – 50			25 – 50
Hexa-Con	3 – 6	5 – 10	25 – 50	50 – 100		
Tetra-Con	3 – 6	5 – 10	25 – 50	50 – 100		
Maxi-Con	2 – 4		10 – 20			
Hiper-Con		2 – 4		20 – 40		
Supra-Con				20 – 40		

Other series and configurations on request

Series overview

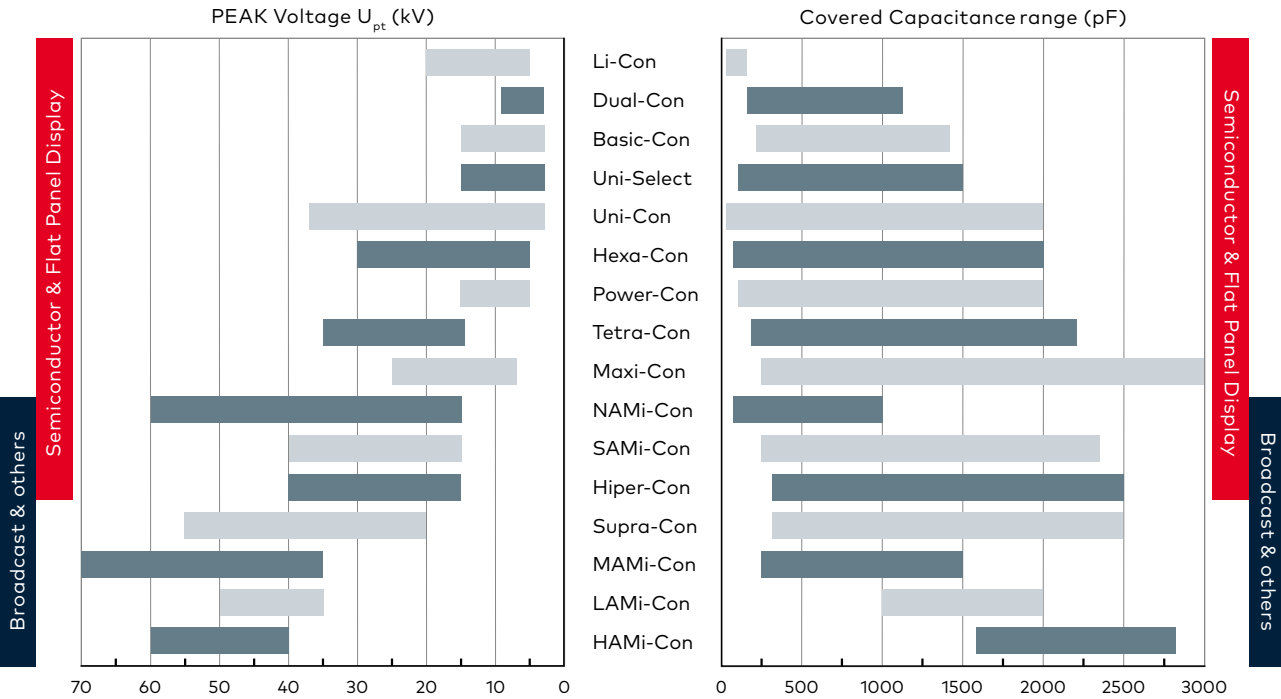
Variable Vacuum Capacitors

The graph below classifies all Comet Variable Vacuum Capacitors series according to two technical key features:

- peak test voltage (kV)
- covered capacitance range (pF)

The Comet Variable Vacuum Capacitors series are listed with increasing envelope. In consequence the main usage is indicated with side bars.

Examples	pF	kV
Li-Con	30 - 125	8 - 20
Basic-Con	170 - 1400	4 - 15
Maxi-Con	250 - 3000	8 - 25
Supra-Con	350 - 2500	20 - 55



Variable Vacuum Capacitors

Li-Con	14
Dual-Con	15
Basic-Con	16
Uni-Select	17
Uni-Con	18
Hexa-Con	19
Power-Con	20
Tetra-Con	21
Maxi-Con	22
NAMi-Con	23
Hiper-Con	24
Supra-Con	25
SAMi-Con	26
MAMi-Con	27
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Li-Con

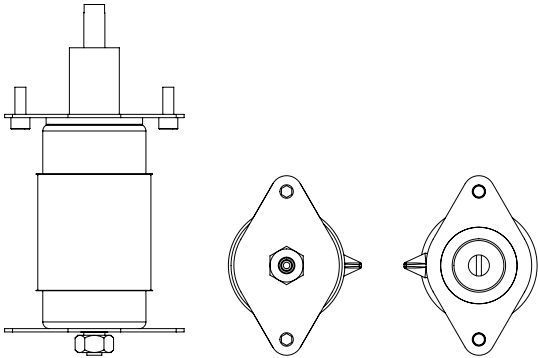
Smallest size

- Smallest size and rugged design
- Very high self-resonant frequency
- Low C_{min} values and low torque
- High voltage relative to small size
- Integrated flanges for easy installation
- Antimagnetic lead screws for special applications



Technical Specifications

Capacitance C _{max} range	30 – 125 pF
U _{pt} range	5 – 20 kV
max. current I _{RMS} at 13.56 MHz	13 – 36 A _{RMS}
Inductance	≤ 8 nH
Diameter	35 mm
Height	105 – 127 mm
Cooling system	Convection
RoHS conform	Available



Product Overview

Capacitance		Voltage	I _{max} at 13.56 MHz	Inductance at C _{max}	Cooling
C _{min} (pF)	C _{max} (pF)	U _{pt} (kV)	(A _{RMS})	(nH)	System
3	30	15	16	≤ 7	Convection
5	125	8	36	≤ 8	Convection

Dual-Con

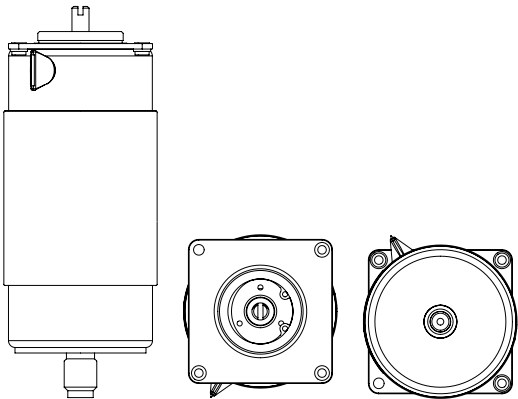
Rugged

- Designed for high vibration and shock applications
- Rugged double bearing construction
- Compact design and reduced height
- Wide tuning range up to 125:1 from C_{max} to C_{min}
- Long lifetime due to optimized drive system
- Standardized 42 mm quadratic mounting flange
- Used in small matching units for semiconductor applications and aviation tuners



Technical Specifications

Capacitance C _{max} range	125 – 1200 pF
U _{pt} range	3 – 8 kV
max. current I _{RMS} at 13.56 MHz	36 – 65 A _{RMS}
Inductance	≤ 8 nH
Diameter	46 mm
Height	114 – 158 mm
Cooling system	Convection
RoHS conform	Available



Product Overview

Capacitance		Voltage	I _{max} at 13.56 MHz	Inductance at C _{max}	Cooling
C _{min} (pF)	C _{max} (pF)	U _{pt} (kV)	(A _{RMS})	(nH)	System
5	125	8	36	≤ 7	Convection
6	500	5	63	≤ 7	Convection
30	650	8	63	≤ 8	Convection
8	1000	3	65	≤ 8	Convection
50	1200	5	64	≤ 7	Convection

Basic-Con

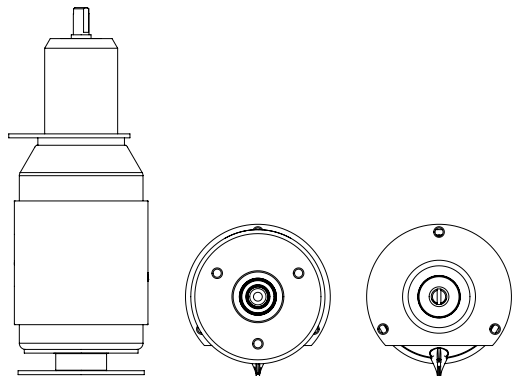
Wide tuning range

- Designed for various semiconductor applications
- Popular and widely used
- Compact and cost effective design
- Wide tuning range up to 175:1 from C_{max} to C_{min}
- Available with integrated flanges and flange mount
- Low torque allows for high tuning speed



Technical Specifications

Capacitance C _{max} range	170 – 1400 pF
U _{pt} range	3 – 15 kV
max. current I _{RMS} at 13.56 MHz	55 – 64 A _{RMS}
Inductance	≤ 11 nH
Diameter	55 mm
Height	103 – 150 mm
Cooling system	Convection
RoHS conform	Available



Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
5	170	15	64	≤ 9	Convection
5	250	15	57	≤ 8	Convection
5	500	8	57	≤ 9	Convection
8	1400	4	57	≤ 8	Convection

Uni-Select

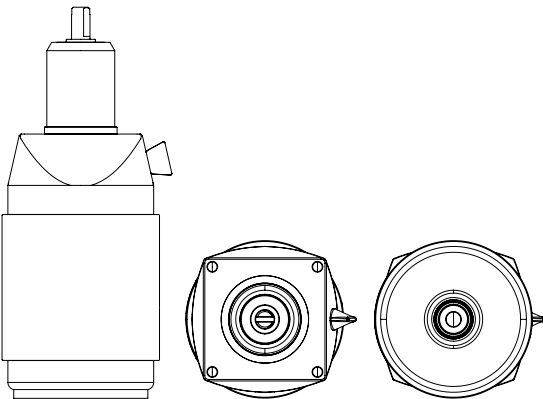
For low to medium power

- Designed for low power and general industrial applications
- Standardized 42 mm quadratic mounting flange
- Optimized drive system for fast tuning
- Fully RoHS compliant
- Available as a motorized and non-motorized Vacuum Capacitor
- Ultra Life feature applicable for selected types



Technical Specifications

Capacitance C _{max} range	100 – 1500 pF
U _{pt} range	3 – 15 kV
max. current I _{RMS} at 13.56 MHz	54 – 57 A _{RMS}
Inductance	≤ 9 nH
Diameter	55 mm
Height	134 mm
Cooling system	Convection
RoHS conform	Yes



Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
10	100	15	54	≤ 6	Convection
50	500	8	57	≤ 9	Convection
100	1000	5	57	≤ 8	Convection
150	1500	3	57	≤ 8	Convection

Uni-Con

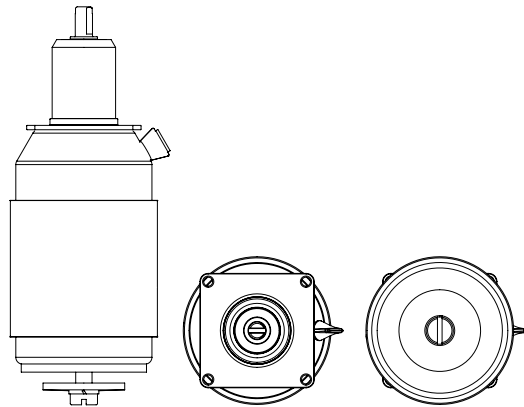
The semiconductor standard

- Designed for typical semiconductor applications
- Optimized bellows design for high power operations
- Optimized drive system for fast tuning
- High current capability relative to small size
- Interchangeable due to uniform size
- Standardized 42 mm quadratic mounting flange
- Available as a motorized and non-motorized Vacuum Capacitor
- Ultra Life feature applicable for selected types



Technical Specifications

Capacitance C _{max} range	30 – 2000 pF
U _{pt} range	3 – 37 kV
max. current I _{RMS} at 13.56 MHz	16 – 107 A _{RMS}
Inductance	≤ 11 nH
Diameter	55, 64, 75 mm
Height	128 – 141 mm
Cooling system	Convection
RoHS conform	Available



Product Overview

Capacitance		Voltage	I _{max} at 13.56 MHz	Inductance at C _{max}	Cooling
C _{min} (pF)	C _{max} (pF)	U _{pt} (kV)	(A _{RMS})	(nH)	System
3	30	37	40	≤ 10	Convection
25	250	25	94	≤ 8	Convection
50	500	20	59	≤ 10	Convection
100	1000	5	89	≤ 9	Convection
150	1500	4	85	≤ 8	Convection
200	2000	3	86	≤ 9	Convection

Hexa-Con

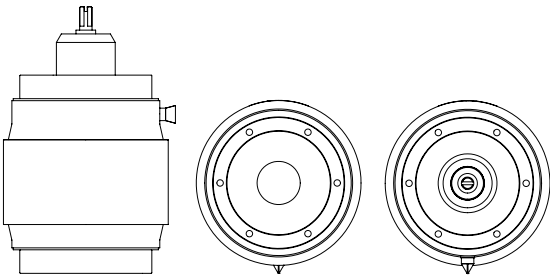
High frequency, long lifetime

- High currents due to optimized bellows even at high frequencies
- Available with water cooling
- Rugged construction
- Standardized six hole mounting flanges
- Mostly used for high power semiconductor applications
- Available as a motorized and non-motorized Vacuum Capacitor
- Ultra Life feature applicable



Technical Specifications

Capacitance C _{max} range	80 – 2000 pF
U _{pt} range	5 – 30 kV
max. current I _{RMS} at 13.56 MHz	28 – 225 A _{RMS}
Inductance	≤ 7 nH
Diameter	85 mm
Height	132 – 207 mm
Cooling system	Convection, Water, Hybrid
RoHS conform	Available



Product Overview

Capacitance		Voltage	I _{max} at 13.56 MHz	Inductance at C _{max}	Cooling
C _{min} (pF)	C _{max} (pF)	U _{pt} (kV)	(A _{RMS})	(nH)	System
9	80	25	72	≤ 5	Convection
25	200	30	170	≤ 7	Convection
50	500	15	152	≤ 6	Convection
60	2000	12	28	≤ 6	Convection
60	2000	9	132	≤ 7	Convection
Advanced technology					
7	250	25	225	≤ 5	Hybrid

Power-Con

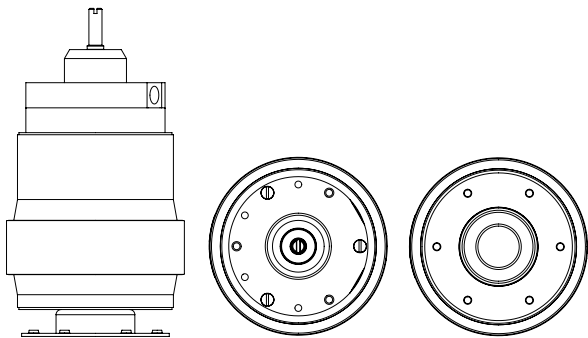
Powerful

- Designed for typical flat panel and high power semiconductor (LCD, FPD)
- Low inductance
- High current capability
- Available with water cooling
- Rugged construction
- Standardized six hole mounting flanges
- Available as a motorized and non-motorized Vacuum Capacitor
- Ultra Life feature applicable



Technical Specifications

Capacitance C _{max} range	100 – 2000 pF
U _{pt} range	5 – 15 kV
max. current I _{RMS} at 13.56 MHz	45 – 136 A _{RMS}
Inductance	≤ 7 nH
Diameter	88 mm
Height	114 – 189 mm
Cooling system	Convection, Water
RoHS conform	Available



Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
12	100	15	54	≤ 4	Convection
50	500	15	123	≤ 6	Convection
70	500	15	129	≤ 6	Water
300	2000	5	122	≤ 6	Convection
300	2000	5	131	≤ 6	Water

Tetra-Con

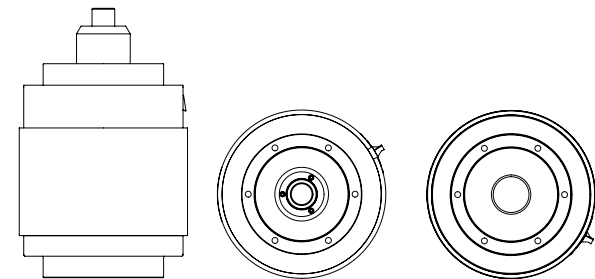
High capacitance and high voltage

- Wide capacitance range, up to 2200 pF available on demand
- Available with XtraVolt for high voltage application
- Standardized six hole mounting flanges
- Available as a motorized Vacuum Capacitor on demand
- Intermediate size between Hexa-Con and Maxi-Con series
- Ultra Life feature applicable



Technical Specifications

Capacitance C _{max} range	200 – 2200 pF
U _{pt} range	14 – 35 kV
max. current I _{RMS} at 13.56 MHz	196 A _{RMS}
Inductance	≤ 9 nH
Diameter	95 mm
Height	151 – 156 mm
Cooling system	Convection, Hybrid
RoHS conform	Yes



Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
25	200	35	196	≤ 9	Convection
10	250	30	196	≤ 9	Convection
600	2000	12	136	≤ 9	Convection

Maxi-Con

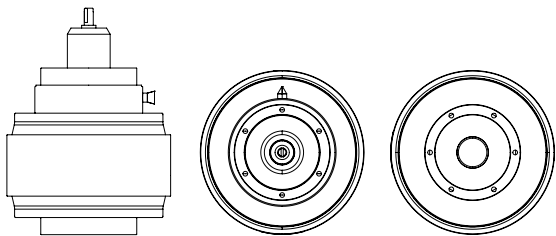
High capacitance and voltage

- Designed for applications over 20 kW
- High voltage and high current capability
- Typical frequency range between 2 MHz and 40 MHz
- Available with water cooling
- Standardized six hole mounting flanges
- Available as a motorized and non-motorized Vacuum Capacitor
- Ultra Life feature applicable



Technical Specifications

Capacitance C _{max} range	250 – 3000 pF
U _{pt} range	8 – 25 kV
max. current I _{RMS} at 13.56 MHz	123 – 182 A _{RMS}
Inductance	≤ 11 nH
Diameter	117 mm
Height	152 – 171 mm
Cooling system	Convection, Water, Hybrid
RoHS conform	Available



Product Overview

Capacitance		Voltage	I _{max} at 13.56 MHz	Inductance at C _{max}	Cooling
C _{min} (pF)	C _{max} (pF)	U _{pt} (kV)	(A _{RMS})	(nH)	System
20	250	25	175	≤ 6	Convection
50	500	25	170	≤ 7	Convection
50	500	25	182	≤ 7	Water
125	2000	8	156	≤ 11	Convection
200	2000	8	182	≤ 11	Water
300	3000	8	123	≤ 11	Convection

NAMi-Con

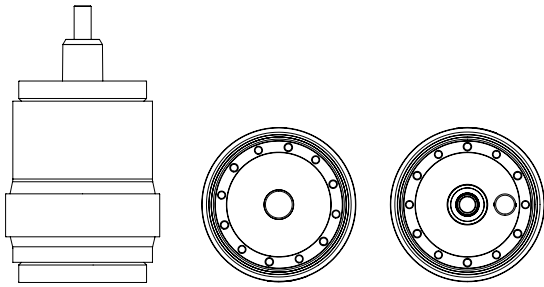
Broadcast applications

- Designed for typical AM/MW broadcast applications
- Mainly used in broadcast and communication transmitters from 2 to 20 kW
- Small size relative to high voltage
- High capacitance and high voltage values support a wide range of different applications like coastal transmitters, combiners, antenna networks and industrial RF generators



Technical Specifications

Capacitance C _{max} range	75 – 1000 pF
U _{pt} range	15 – 60 kV
max. current I _{RMS} at 13.56 MHz	78 – 80 A _{RMS}
Inductance	≤ 18 nH
Diameter	116 mm
Height	142 – 206 mm
Cooling system	Convection
RoHS conform	No



Product Overview

Capacitance		Voltage	I _{max} at 13.56 MHz	Inductance at C _{max}	Cooling
C _{min} (pF)	C _{max} (pF)	U _{pt} (kV)	(A _{RMS})	(nH)	System
10	75	60	78	≤ 17	Convection
15	750	15	79	≤ 18	Convection
15	1000	15	80	≤ 18	Convection

Hiper-Con

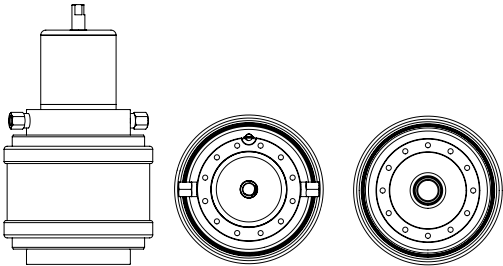
High voltage, high current

- Designed for high power applications over 50 kW
- High voltage and high current capabilities
- Highly efficient water cooling provides current capability up to 300 A_{RMS}
- Enhanced water cooling system allows industry water with pressure up to 6 bars
- Typical frequency range between 2 MHz and 40 MHz
- Standardized mounting flanges
- Long bellows lifetime
- Ultra Life feature applicable for selected types



Technical Specifications

Capacitance C _{max} range	350 – 2500 pF
U _{pt} range	15 – 40 kV
max. current I _{RMS} at 13.56 MHz	300 A _{RMS}
Inductance	≤ 15 nH
Diameter	143 mm
Height	255 mm
Cooling system	Water
RoHS conform	Available



Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
20	350	40	300	≤ 15	Water
50	500	40	300	≤ 15	Water
100	1000	20	300	≤ 15	Water
200	2500	15	300	≤ 15	Water

Supra-Con

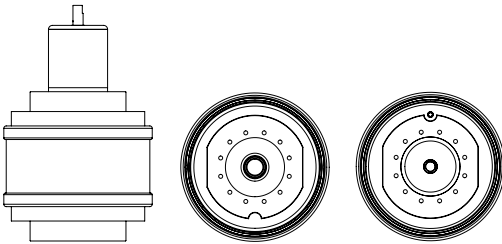
High power

- Designed for very high power applications in RF industries
- Patented triplex-water-cooling allows the use of industry water up to 6 bars without compromising the bellows
- Highly efficient water cooling provides current capability up to 443 A_{RMS}
- Wide tuning range from C_{max} to C_{min}
- Improved RoHS compliant drive system for long lifetime over 1 million cycles
- Ultra Life feature applicable for selected types



Technical Specifications

Capacitance C _{max} range	350 – 2500 pF
U _{pt} range	20 – 55 kV
max. current I _{RMS} at 13.56 MHz	443 A _{RMS}
Inductance	≤ 21 nH
Diameter	183 mm
Height	295 mm
Cooling system	Water
RoHS conform	Available



Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
20	350	55	443	≤ 18	Water
50	500	55	443	≤ 20	Water
250	2500	20	443	≤ 21	Water

SAMi-Con

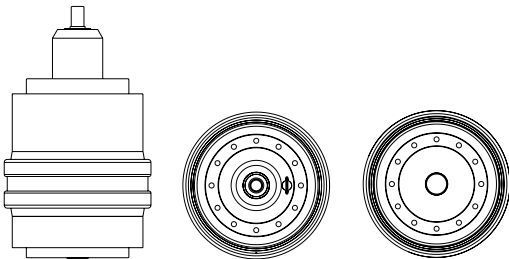
Broadcast applications

- Most popular capacitor in broadcast application
- Designed for typical AM/MW applications
- Used in transmitters from 10 kW to 50 kW
- Forced air cooling allows high current applications
- Compact design
- Available for applications like coastal transmitters, combiners, antenna networks and industrial RF generators



Technical Specifications

Capacitance C _{max} range	250 – 2300 pF
U _{pt} range	15 – 40 kV
max. current I _{RMS} at 13.56 MHz	106 – 138 A _{RMS}
Inductance	≤ 22 nH
Diameter	143 mm
Height	207 – 250 mm
Cooling system	Convection
RoHS conform	No



MAMi-Con

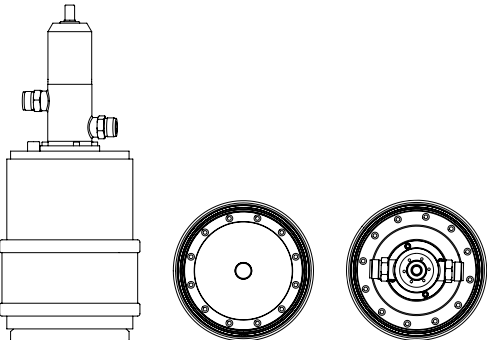
Broadcast applications

- Designed for typical MW/SW broadcast applications
- Widely used in broadcast transmitters from 100 kW to 500 kW
- High voltage relative to the capacitance level
- Forced air cooling or water cooling allows for higher current applications
- Wide range supports different applications like industrial generators, combiners and antenna networks



Technical Specifications

Capacitance C _{max} range	250 – 1500 pF
U _{pt} range	35 – 70 kV
max. current I _{RMS} at 13.56 MHz	136 – 832 A _{RMS}
Inductance	≤ 32 nH
Diameter	183 mm
Height	216 – 461 mm
Cooling system	Air, Convection, Water
RoHS conform	No



Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
15	250	40	138	≤ 13	Convection
25	450	40	138	≤ 15	Convection
30	1000	25	106	≤ 20	Convection
30	2000	15	106	≤ 21	Convection
50	2300	15	106	≤ 22	Convection

Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
10	250	50	420	≤ 24	Water
10	250	55	137	≤ 24	Convection
18	250	70	219	≤ 32	Air
30	650	55	137	≤ 24	Convection
30	650	55	238	≤ 25	Air
30	650	50	832	≤ 31	Water
35	1000	40	138	≤ 25	Convection
35	1000	40	211	≤ 25	Air
100	1500	40	136	≤ 32	Convection
100	1500	35	226	≤ 32	Air

LAMi-Con

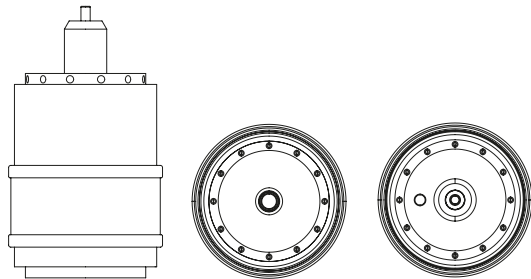
Broadcast applications

- Designed for SW broadcast applications
- Widely used in high power broadcast transmitters from 500 kW to 1000 kW
- Forced air cooling or highly efficient water cooling allow for very high current capability
- Wide tuning range from C_{max} to C_{min} up to 32.5:1 for different applications like wood drying and industrial generators



Technical Specifications

Capacitance C _{max} range	1000 – 2000 pF
U _{pt} range	35 – 50 kV
max. current I _{RMS} at 13.56 MHz	136 – 843 A _{RMS}
Inductance	≤ 39 nH
Diameter	208 mm
Height	372 – 640 mm
Cooling system	Air, Convection, Water
RoHS conform	No



Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
40	1000	50	221	≤ 39	Air
40	1000	50	136	≤ 39	Convection
100	1000	50	843	≤ 39	Water
40	1300	50	797	≤ 34	Water
100	1600	40	633	≤ 36	Water
100	2000	35	136	≤ 39	Convection
100	2000	35	211	≤ 39	Air

HAMi-Con

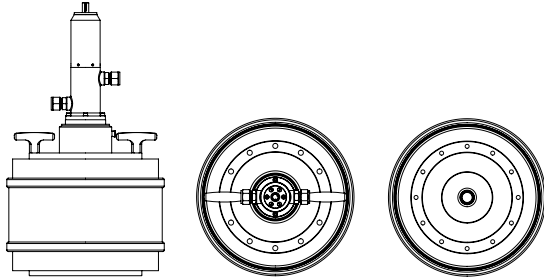
Broadcast applications

- Designed for highest power SW broadcast applications
- Used in broadcast transmitters or industrial generators up to 1000 kW
- Highly efficient water cooling provides current capability up to 870 A_{RMS}
- High capacitance relative to voltage
- High voltage and capacitance values for the most demanding applications



Technical Specifications

Capacitance C _{max} range	1600 – 2600 pF
U _{pt} range	40 – 60 kV
max. current I _{RMS} at 13.56 MHz	753 – 870 A _{RMS}
Inductance	≤ 44 nH
Diameter	308 mm
Height	504 – 609 mm
Cooling system	Water
RoHS conform	No



Product Overview

Capacitance		Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Inductance at C _{max} (nH)	Cooling System
C _{min} (pF)	C _{max} (pF)				
100	1600	60	870	≤ 44	Water
100	2050	50	753	≤ 43	Water
100	2600	40	812	≤ 43	Water

Series overview

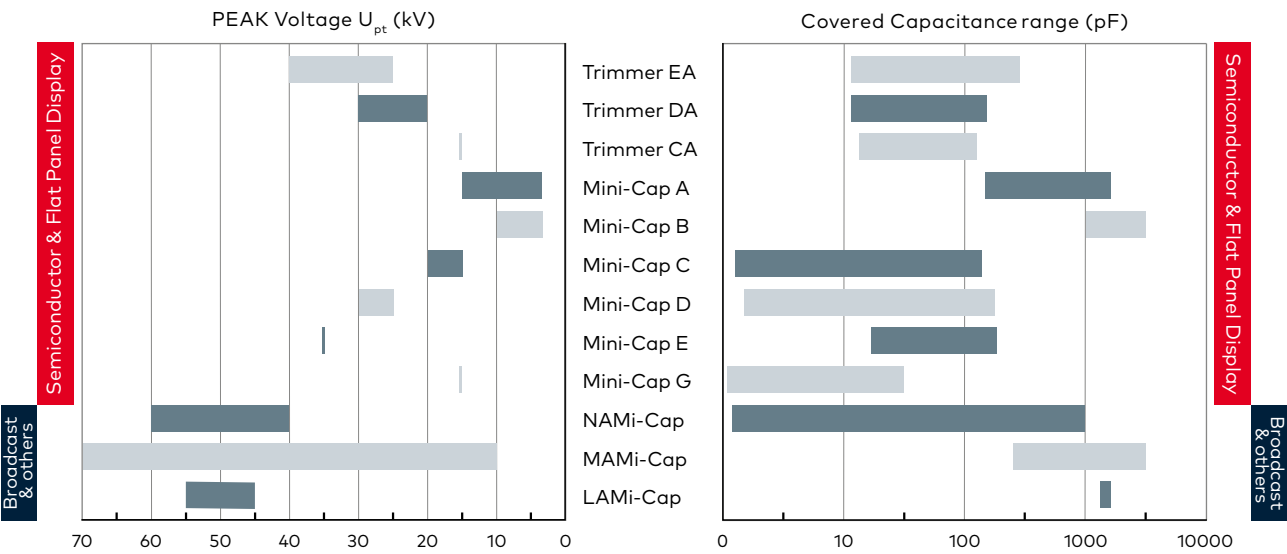
Fixed and Trimmer Vacuum Capacitors

The graph below classifies all Comet Fixed Vacuum Capacitors series and COMET Trimmer Capacitors according to two technical key features:

- peak test voltage (kV)
- covered capacitance range (pF)

The Comet Fixed Vacuum Capacitors and Trimmer Capacitors series are listed with increasing envelope. In consequence the main usage is indicated with side bars.

Examples	pF	kV
Mini-Cap A-Geometry	210 - 2000	3 - 15
Mini-Cap D-Geometry	20 - 225	25 - 30
Trimmer C-Geometry	12 - 120	15
Trimmer E-Geometry	12 - 440	25 - 40



Fixed Vacuum Capacitors

Mini-Cap	32
NAMi-Cap	34
MAMi-Cap	35
LAMi-Cap	36

Mini-Cap

Compact, covering wide range of capacitance and voltages

- High quality and reliable capacitor for both high and low current applications
- Low internal inductance for operation in excess of 100 MHz
- Very compact and uniform size
- Unique rugged and cost effective design
- Widely used in different applications like matching networks, DC blocking and RF sealing
- Delivered with mounting kit for easy installation



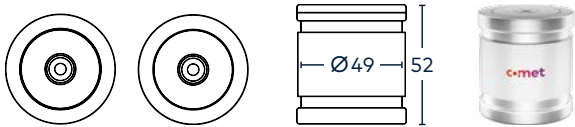
Technical Specifications

Capacitance C _{max} range	3 – 4000 pF
U _{pt} range	3 – 35 kV
max. current I _{RMS} at 13.56 MHz	7 – 164 A _{RMS}
Diameter	35, 48, 49, 64, 76 mm
Height	43 – 113 mm
Cooling system	Convection
RoHS conform	Yes

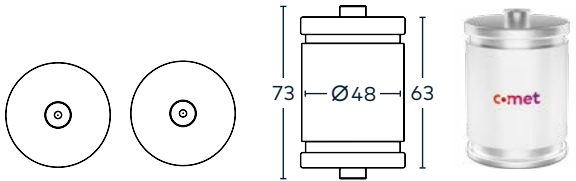
Product Overview

Capacitance C (pF)	Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Cooling System
10	20	7	Convection
20	20	14	Convection
50	35	63	Convection
100	35	126	Convection
150	25	135	Convection
200	35	164	Convection
250	35	155	Convection
300	15	130	Convection
350	15	132	Convection
400	15	128	Convection
500	12	126	Convection
750	10	116	Convection
1000	10	140	Convection
1500	3	106	Convection
2000	7	130	Convection
2500	8	128	Convection
4000	5	121	Convection

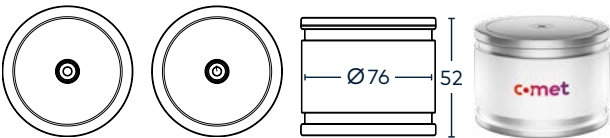
Outline A



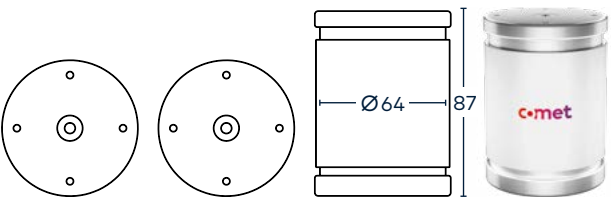
Outline D



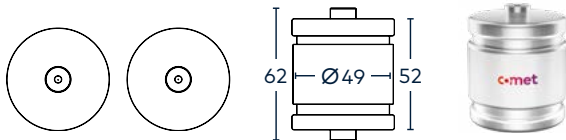
Outline B



Outline E



Outline C



Outline G



NAMi-Cap

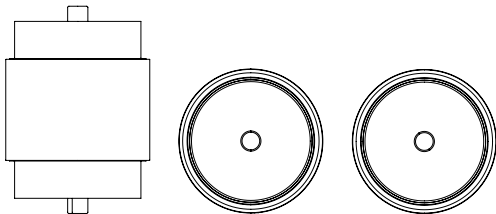
Broadcast applications

- Designed for typical AM/MW broadcast and industrial applications
- Small size relative to voltage level
- Wide range of capacitance and voltage
- Easy to install through a simple flange mounting system
- Wide variety of applications for broadcast and communication transmitters, antenna network systems, output-filters, coupling capacitors, industrial RF generators and nuclear research
- Low inductance results in high self-resonant frequency



Technical Specifications

Capacitance C _{max} range	125 – 1000 pF
U _{pt} range	40 – 60 kV
max. current I _{RMS} at 13.56 MHz	162 – 271 A _{RMS}
Diameter	116 mm
Height	137 – 230 mm
Cooling system	Convection
RoHS conform	Yes



Product Overview

Capacitance C (pF)	Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Cooling System
125	60	271	Convection
300	60	263	Convection
500	40	215	Convection
750	40	176	Convection
1000	40	162	Convection

MAMi-Cap

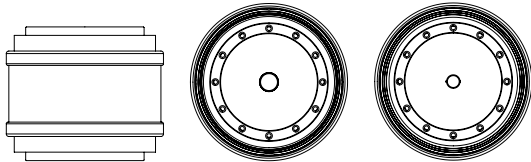
Broadcast applications

- Designed for typical MW/SW broadcast applications
- Widely used in transmitters from 100 kW to 1000 kW
- High capacitance values available for demanding applications
- Available with water cooling for higher current applications
- Low inductance results in high self-resonant frequency
- Ideal solution for high power applications



Technical Specifications

Capacitance C _{max} range	400 – 5000 pF
U _{pt} range	10 – 55 kV
max. current I _{RMS} at 13.56 MHz	227 – 464 A _{RMS}
Diameter	183 mm
Height	88 – 195 mm
Cooling system	Convection, Water
RoHS conform	Yes



Product Overview

Capacitance C (pF)	Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Cooling System
400	50	459	Water
750	50	320	Convection
1000	50	296	Convection
1200	55	464	Convection
1500	35	303	Convection
2000	40	259	Convection
2500	30	246	Convection
3000	35	236	Convection
5000	10	227	Convection

LAMi-Cap

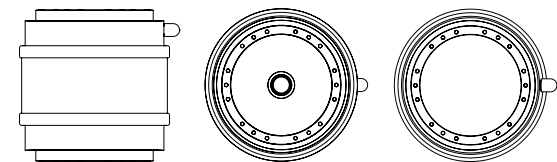
Broadcast applications

- Designed for high power MW/SW broadcast applications
- Used in transmitters from 500 kW to 1000 kW
- High voltage relative to capacitance – low inductance results in high self-resonant frequency



Technical Specifications

Capacitance C _{max} range	2000 pF
U _{pt} range	45 – 55 kV
max. current I _{RMS} at 13.56 MHz	283 A _{RMS}
Diameter	207 mm
Height	183, 212 mm
Cooling system	Convection
RoHS conform	Available



Product Overview

Capacitance C (pF)	Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Cooling System
2000	55	283	Convection
2000	45	282	Convection



Trimmer Vacuum Capacitors

Mini-Tune

40



Mini-Tune

Fine tuning precision

Trimmer capacitors are Vacuum Capacitors between fixed and variable, providing a solution to the demand for very accurate fixed capacitors. It is used where small adjustments are needed to meet an individual circuit tolerance or to compensate for slight differences per tool and tool "drift" over time. As the Mini-Tune series is a modified version of our Mini-Caps in the C-, D- and E-geometries, the same body sizes allow easy interchangeability with the corresponding standard Mini-Caps.

Benefits

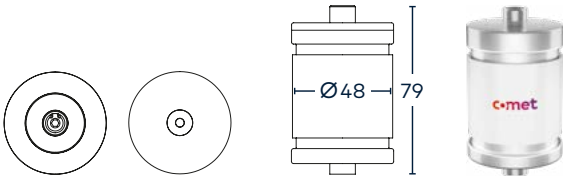
- Ability to compensate for small, but critical, impedance differences from match to match
- Compensate for tool "drift" over time
- Tool for fine tuning during design and development phase
- Usable for a very precise voltage divider
- Less expensive than an automatic solution

Features

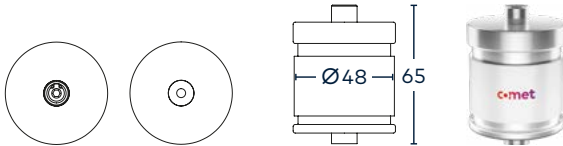
- Tunable with a no. 3 hex key
- Self-locking screw
- Exactly and precisely adjustable +/- 1.7 turns for +/- 5 pF
- Even trimmable after mounting in the match
- Other C-values available on request



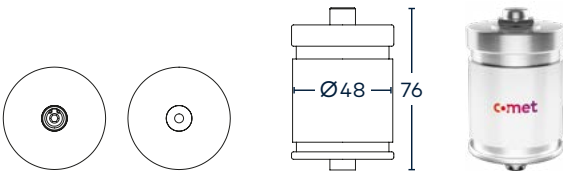
Outline A



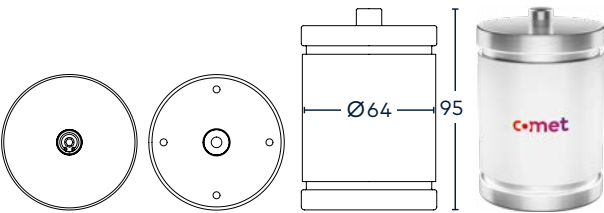
Outline C



Outline D



Outline E



Technical Specifications

Capacitance C _{max} range	12 – 440 pF
U _{pt} range	15 – 40 kV
max. current I _{RMS} at 13.56 MHz	14 – 175 A _{RMS}
Diameter	48, 64 mm
Height	65 – 95 mm
Cooling system	Convection
RoHS conform	Yes

Product Overview

Capacitance C (pF)	Voltage U _{pt} (kV)	I _{max} at 13.56 MHz (A _{RMS})	Cooling System
12	40	40	Convection
15	34	24	Convection
21	30	28	Convection
25	30	32	Convection
50	30	59	Convection
74	30	85	Convection
100	30	113	Convection
200	20	101	Convection
270	25	175	Convection
300	25	168	Convection
400	25	159	Convection
440	25	156	Convection

Motorized Vacuum Capacitors

Motorized Capacitors 44



Motorized Capacitors

Integrated drive solutions

Comet motorized capacitors offer the latest integrated drive technology for Vacuum Capacitors at the best price-performance ratio. Motorized capacitors ensure highest accuracy and simplify procurement with an easy-to-install subsystem.

Features

- One driver PCB for new Integrated Drives (ID-400 and ID-1200)
- Same communication Comet protocol RS232 and RS485
- Flexible baud rate between 9.600 and 115.200 Bd
- Connect up to 32 modules in RS485 mode
- Readout of full-step, micro-step and capacitance position
- Capacitance table with higher resolution on request

Benefits

- High accuracy and repeatability of capacity positioning
- High capacitance resolution (position control) to 0.01 pF
- Accurate alignment of variable vacuum capacitor and steppermotor and a durable, backlashfree coupling result in long, consistent lifetime
- Easy installation
- Low total cost of ownership
- Efficient use of matchbox space

High-level commands

Module can be controlled from a PC or a control board using high-level commands (RS232, RS485). The communication protocol allows the execution of the following commands:

- Precise motion control by setting full-step, micro-step or capacitance position
- Set idle and drive current, speed and slave address within allowed range
- Read out of actual full-step, micro-step and capacitance position
- Read out of characteristic capacitance curve (C-Curve)
- Read out of various parameters such as firmware version, serial number and all customer and factory limits
- Comprehensive RX responses (ACK, NAK):
 - ACK for all commands
 - ACK for "movement-started" resp. "movement completed"
 - NAK e.g. check-sum error, index out of range
- Baud rate can be set within 9.600 to 115.200 Bd
- Set user limits (C_{min} and C_{max}) within factory limits
- Store up to 10 user selectable positions

Product Overview

Capacitance*		Voltage U_{pt} (kV)	I_{max} at 13.56 MHz (A _{RMS})	Cooling System	ID-400	ID-1200
C_{min} (pF)	C_{max} (pF)					
10	100	20	72	Convection	•	
25	250	15	94	Convection	•	
50	500	12	94	Convection	•	
50	500	25	170	Convection		•
50	500	25	170	Water		•
100	1000	12	94	Convection	•	
150	1500	5	149	Convection		•
150	1500	4	85	Convection	•	
150	1500	8	182	Water		•
200	2000	3	86	Convection	•	
300	2000	5	122	Convection		•

* Other capacitances on request
Visit us online on pct.comet.tech for the full product portfolio and individual data sheets



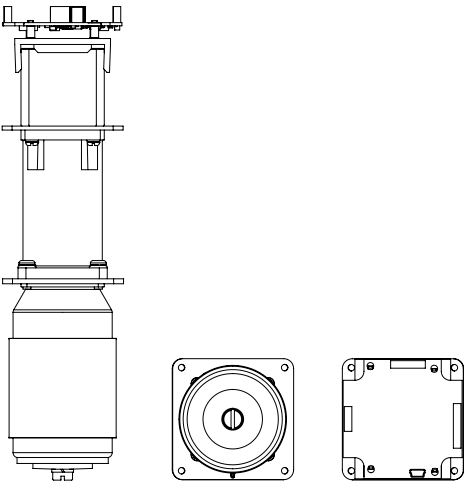
ID-400

Capacitor tuning

Using a stepper-motor, the capacitance of the variable capacitor can be tuned precisely between user selectable limits.

Technical Specifications

Capacitance C_{max} range	100 – 2000 pF
U_{pt} range	3 – 25 kV
max. current I_{RMS} at 13.56 MHz	72 – 170 A _{RMS}
Diameter	55 – 117 mm
Height	230 – 292 mm
Cooling system	Convection, Water
RoHS conform	Yes
Supply voltage	+24 VDC
Supply current	$I_p < 1.1$ A (ID-400)
	$I_p < 2.8$ A (ID-1200)
Full-step angle	1.8°
Motor speed	up to 600 rpm
Micro-stepping	16 micro-steps
Operating temperature	0 – +50°C
Available interfaces	RS232, RS485
Address range (RS485)	0x21 – 0x40
Baud rate	9.600 – 115.200 Bd



Capacitor series with integrated drive

Two sizes of integrated drive systems are available for different capacitor series. Here our recommendations:



ID-400
e.g. Uni-Con, Uni-Select

ID-1200
e.g. Power-Con, Hexa-Con, Tetra-Con, Maxi-Con



Customized solutions

If your required product solution is not within our standard portfolio, we have the expertise to design and manufacture Vacuum Capacitors that meet your specific needs. The unique modular and customized design allows a high degree of flexibility in production and guarantees the delivery of special types on short notice.

Vacuum Capacitors

Comet offers the broadest selection and ranges of capacitance, power voltage, and drive systems:

- Frequencies from DC to 200 MHz
- Power up to 1 MW
- Peak test voltage up to 100 kV
- Current up to 1200 A



Series overview

Variable Vacuum Capacitors

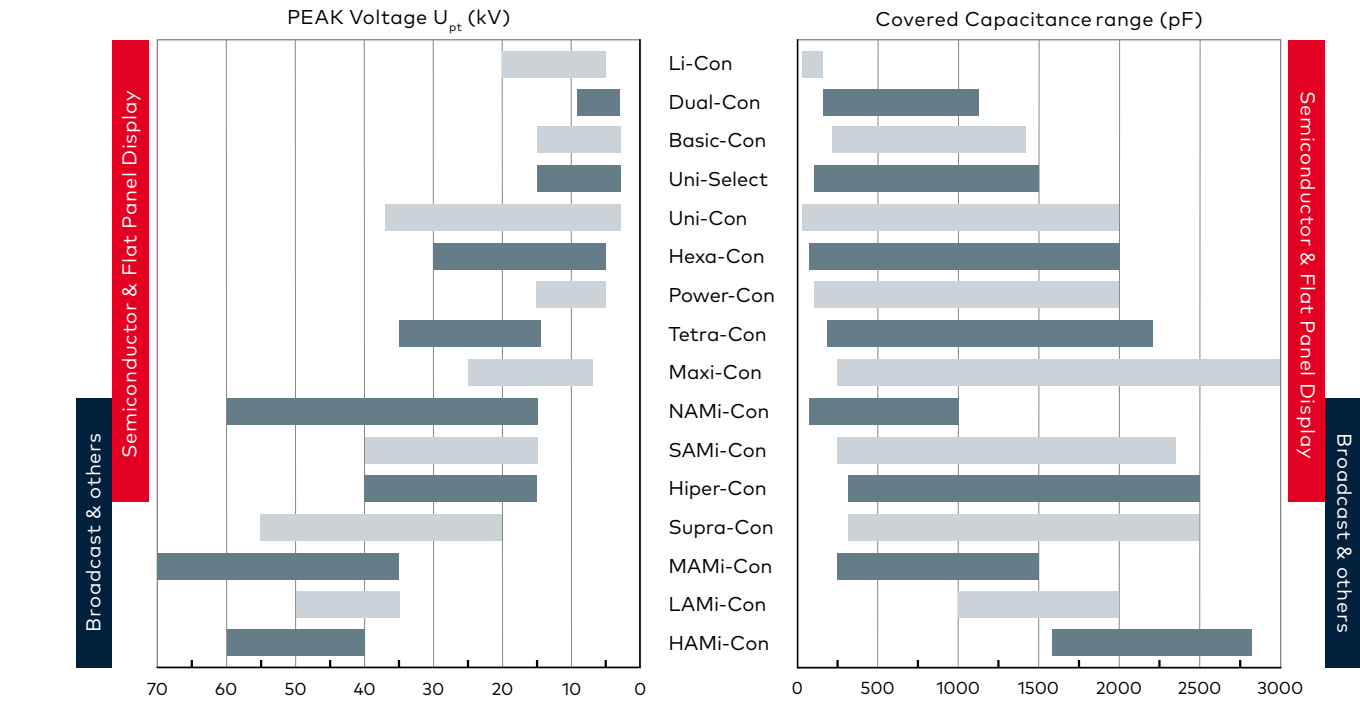
Each Vacuum Capacitor series has certain specifications which are almost the same for all members. The product overview provides the specifications of several series members.

Technical Specifications Example

Capacitance C_{max} range	80 – 2000 pF
U_{pt} range	9 – 30 kV
max. current I_{RMS} at 13.56 MHz	28 – 225 A _{RMS}
Inductance	≤ 7 nH
Diameter	85 mm
Height	132 – 207 mm
Cooling system	Convection, Water, Hybrid
RoHS conform	Available

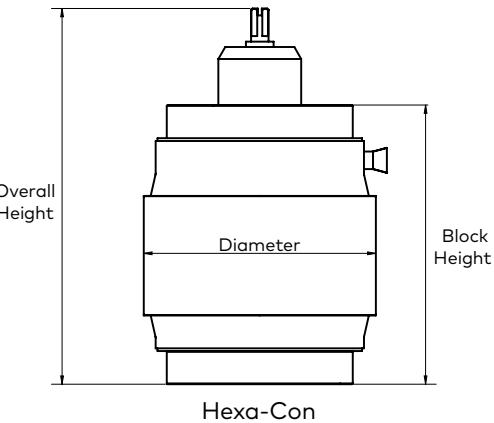
The graph below classifies all Comet Variable Vacuum Capacitors series according to two technical key features:

- peak test voltage (kV)
- covered capacitance range (pF)



Visit our website pct.comet.tech for full product portfolio and optional features.

The characteristics of a variable Vacuum Capacitor are determined by the size of the capacitor. The size is defined by the envelope diameter and height.



The Comet Variable Vacuum Capacitors series are listed with increasing envelope. In consequence the main usage is indicated with side bars.

Fixed and Trimmer Vacuum Capacitors

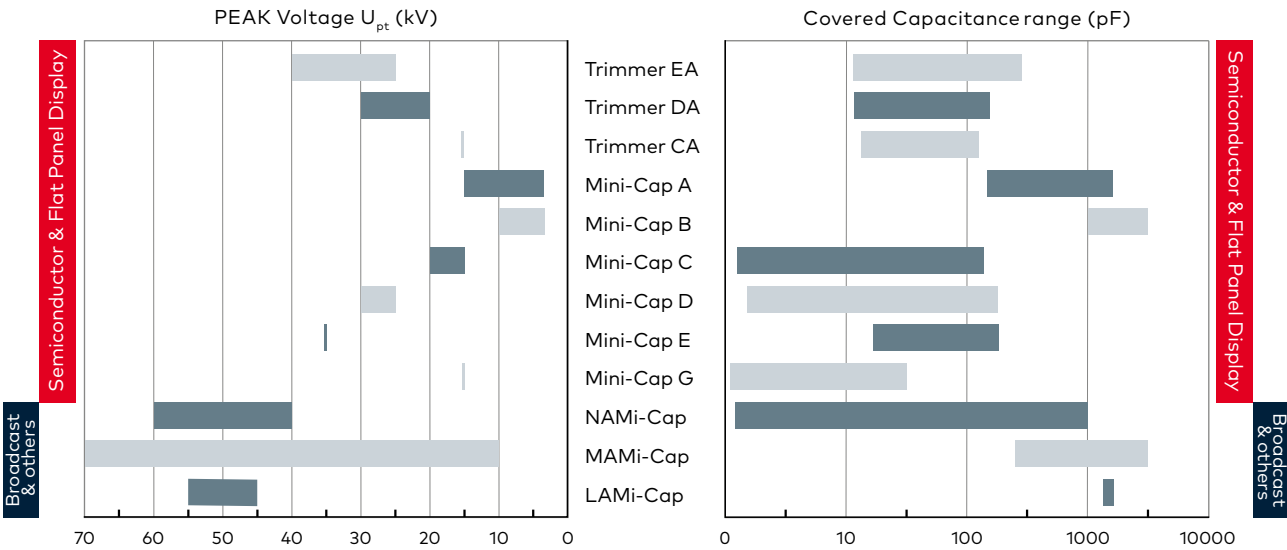
Fixed Vacuum Capacitor series include capacitors with different form factors. For example the Mini-Cap series has six different designs, therefore six different bodies (form factors).

The graph below classifies all Comet Fixed Vacuum Capacitors series and COMET Trimmer Capacitors according to two technical key features:

- peak test voltage (kV)
- covered capacitance range (pF)

Important is that all members of one fixed capacitor series are produced with the same production process and have in general the same ceramic envelope diameter.

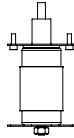
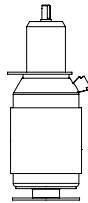
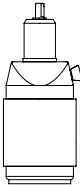
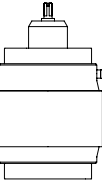
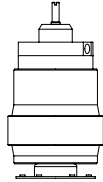
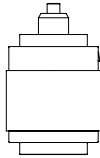
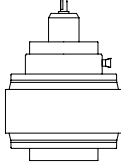
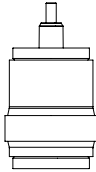
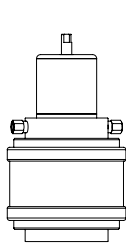
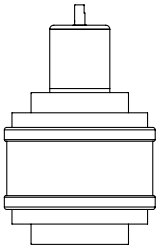
The Comet Fixed Vacuum Capacitors and Trimmer Capacitors series are listed with increasing envelope. In consequence the main usage is indicated with side bars.

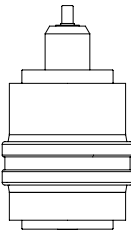
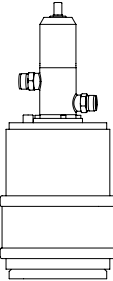
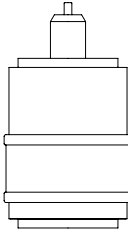
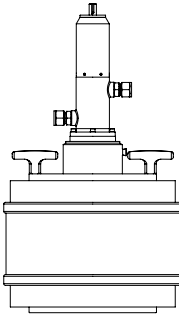
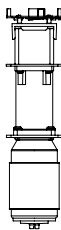
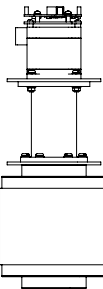
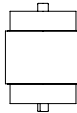
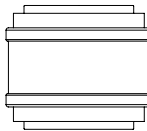
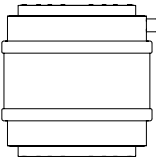


Product Overview – Example Hexa-Con series

Capacitance		Voltage	I_{max} at 13.56 MHz	Inductance at C_{max}	Cooling
C_{min} (pF)	C_{max} (pF)	U_{pt} (kV)	(A _{RMS})	(nH)	System
9	80	25	72	≤ 5	Convection
25	200	30	170	≤ 7	Convection
50	500	15	152	≤ 6	Convection
60	2000	12	28	≤ 6	Convection
60	2000	9	132	≤ 7	Convection
Advanced technology					
7	250	25	225	≤ 5	Hybrid

Series overview Vacuum Capacitors

Variable												
												
	Li-Con	Dual-Con	Basic-Con	Uni-Select*	Uni-Con*	Hexa-Con*	Power-Con*	Tetra-Con*	Maxi-Con*	NAMi-Con	Hiper-Con	Supra-Con
Capacitance C_{max} range	30 – 125 pF	125 – 1200 pF	170 – 1400 pF	100 – 1500 pF	30 – 2000 pF	80 – 2000 pF	100 – 2000 pF	200 – 2200 pF	250 – 3000 pF	75 – 1000 pF	350 – 2500 pF	350 – 2500 pF
U_{pt} range	5 – 20 kV	3 – 8 kV	3 – 15 kV	3 – 15 kV	3 – 37 kV	5 – 30 kV	5 – 15 kV	14 – 35 kV	8 – 25 kV	15 – 60 kV	15 – 40 kV	20 – 55 kV
max. current I_{RMS} at 13.56 MHz	13 – 36 A _{RMS}	36 – 65 A _{RMS}	55 – 64 A _{RMS}	54 – 57 A _{RMS}	16 – 107 A _{RMS}	28 – 225 A _{RMS}	45 – 136 A _{RMS}	196 A _{RMS}	123 – 182 A _{RMS}	78 – 80 A _{RMS}	300 A _{RMS}	443 A _{RMS}
Inductance	≤ 8 nH	≤ 8 nH	≤ 11 nH	≤ 9 nH	≤ 11 nH	≤ 7 nH	≤ 7 nH	≤ 9 nH	≤ 11 nH	≤ 18 nH	≤ 15 nH	≤ 21 nH
Diameter	35 mm	46 mm	55 mm	55 mm	55, 64, 75 mm	85 mm	88 mm	95 mm	117 mm	116 mm	143 mm	183 mm
Height	105 – 127 mm	114 – 158 mm	103 – 150 mm	134 mm	128 – 141 mm	132 – 207 mm	114 – 189 mm	151 – 156 mm	152 – 171 mm	142 – 206 mm	255 mm	295 mm
Cooling system	Convection	Convection	Convection	Convection	Convection	Conv., Water, Hybrid	Convec., Water	Convec., Hybrid	Convec., Water, Hybrid	Convection	Water	Water
RoHS conform	Available	Available	Available	Yes	Available	Available	Available	Yes	Available	No	Available	Available
Catalog page	14	15	16	17	18	19	20	21	22	23	24	25

Variable						Motorized	Motorized	Trimmer	Fixed			
												
	SAMI-Con	MAMI-Con	LAMi-Con	HAMi-Con	ID-400**		ID-1200**	Mini-Tune	Mini-Cap	NAMi-Cap	MAMI-Cap	LAMi-Cap
Capacitance C_{max} range	250 – 2300 pF	250 – 1500 pF	1000 – 2000 pF	1600 – 2600 pF	100 – 2000 pF		500 – 2000 pF	12 – 440 pF	3 – 4000 pF	125 – 1000 pF	400 – 5000 pF	2000 pF
U_{pt} range	15 – 40 kV	35 – 70 kV	35 – 50 kV	40 – 60 kV	3 – 20 kV		5 – 25 kV	15 – 40 kV	3 – 35 kV	40 – 60 kV	10 – 55 kV	45 – 55 kV
max. current I_{RMS} at 13.56 MHz	106 – 138 A _{RMS}	136 – 832 A _{RMS}	136 – 843 A _{RMS}	753 – 870 A _{RMS}	72 – 94 A _{RMS}		72 – 182 A _{RMS}	14 – 175 A _{RMS}	7 – 164 A _{RMS}	162 – 271 A _{RMS}	227 – 464 A _{RMS}	283 A _{RMS}
Inductance	≤ 22 nH	≤ 32 nH	≤ 39 nH	≤ 44 nH								
Diameter	143 mm	183 mm	208 mm	308 mm	55 – 75 mm		85 – 117 mm	48, 64 mm	35, 48, 49, 64, 76 mm	116 mm	183 mm	207 mm
Height	207 – 250 mm	216 – 461 mm	372 – 640 mm	504 – 609 mm	230 – 250 mm		279 – 292 mm	65 – 95 mm	43 – 113 mm	137 – 230 mm	88 – 195 mm	183, 212 mm
Cooling system	Convection	Air, Convec., Water	Air, Convec., Water	Water	Convection		Convection, Water	Convection	Convection	Convection	Convection, Water	Convection
RoHS conform	No	No	No	No	Yes		Yes	Yes	Yes	Yes	Yes	Available
Catalog page	26	27	28	29	44		44	40	32	34	35	36

* Also available with Integrated Drive

** Other capacitances on request

Comet products may be protected by patents in the United States and other countries. For detailed information please consult our website pct.comet.tech/patents

Service Bulletins

Our Service Bulletins contain recommendations and in-depth information on product applications and technical background.

Service Bulletins are available at Comet, your local representative or download them from our website pct.comet.tech/service-bulletins

General information	
SB-01	Introduction of Service Bulletins
SB-07	Serial number on Vacuum Capacitor and packaging
SB-08	Factory Acceptance Test report (FAT)
SB-10	Service request form
SB-24	Environmental improvement: airbag packaging for Vacuum Capacitors
SB-33	Analysis of failed Vacuum Capacitors
SB-52	Technical recommendations and general instructions for Vacuum Capacitors
SB-55	Type designation system for Vacuum and Gas Capacitors
SB-56	Vacuum Capacitor lifetime
Technical background information	
SB-04	Mechanical dimensions of Vacuum Capacitors
SB-06	Vacuum component fundamentals
SB-11	X-ray radiation experienced with Vacuum Capacitors
SB-12	Variable Vacuum Capacitors – an introduction to their design, rating and installation
SB-17	Measuring of self resonance frequency
SB-22	Various Vacuum Capacitor noises
SB-32	Optical sensor for Vacuum Capacitors
SB-42	Environmental and life cycle testing of the Comet CTMN series
SB-44	Current limits for Comet Vacuum Capacitors
Handling, installation, maintenance	
SB-13	Disposal of Vacuum Capacitors
SB-20	Barcode marking of Vacuum Capacitors
SB-25	Handling of Vacuum Capacitors
SB-27	Installation of Vacuum Capacitors
SB-28	Recommendations for storage, testing and maintenance of Vacuum Capacitors
SB-29	Mounting of Mini-Cap (CFMN) and Trimmer-Cap (CTMN) series
SB-35	Vacuum Capacitor refurbishment
SB-53	Mechanical shock and drop test of a variable Vacuum Capacitor
Capacitor series	
SB-16	Integral flange
Motorized Capacitors	
SB-60	Overview Integrated Drive
SB-63	Electrical installation of ID-400
SB-64	Electrical installation of ID-1200
SB-68	Software protocol interface RS-232
SB-69	Firmware Protocol (Universal-ID "UC4-FX")
SB-70	Firmware Protocol (Universal-ID "UC4-FA")
SB-72	Safety aspects Integrated Drive
Cooling system	
SB-05	Variable Capacitor water cooling
SB-21	Maintenance / repair of water chamber of water cooled variable Vacuum Capacitors
SB-26	Liquid cooling system and water purity requirements
SB-31	Drying of water cooled Vacuum Capacitors
Drive System	
SB-18	Self-lubricating system for air cooled Capacitors
SB-19	Improved drive system for high current variable Vacuum Capacitors
SB-47	Improved drive system for variable Vacuum Capacitors



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