

MEIDEN

Vacuum Capacitors



MEIDEN, supplier of advanced
vacuum component technologies

Empower for new days



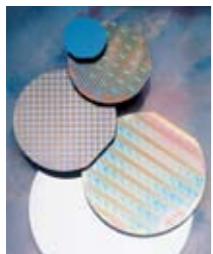
Reliable Vacuum Technology Since 1968

MEIDEN developed high precision vacuum technology almost 50 years ago.

Advances in processes, equipment and materials have

continued unabated as we seek the highest expression of this unique technology.

Main applications



Semiconductor Manufacturing Equipment

RF generators are used in semiconductor manufacturing processes of physical vapor deposition (PVD), chemical vapor deposition (CVD), and etching, with vacuum capacitors used in the impedance matching network.



Photovoltaic Power Generating Panel Manufacturing Equipment

The LCD technology is used for photovoltaic power generating panel manufacturing. Vacuum capacitors are incorporated in the impedance matching network of RF generators for plasma generation.



Liquid Crystal Display (LCD) Panel Manufacturing Equipment

High-current plasma with radio frequency(RF) generators is used to manufacture the LCD panels-- thin-model, big-screen televisions for example--with vacuum capacitors inside the impedance matching network.



Medical Care and Measuring Devices

Vacuum capacitors are used in chemical ingredients analyzers and magnetic resonance imaging(MRI).



Broadcasting

Vacuum capacitors are used in communications equipment, transmission systems for short and medium wave broadcasting, aircraft antenna tuners used in harsh environments, and various mobile communications equipment.

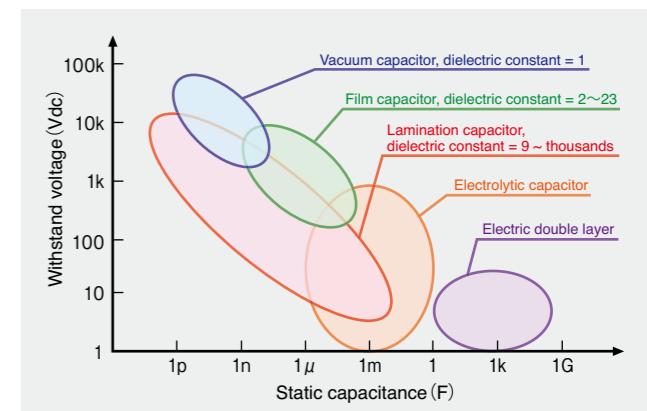


Wireless charging

Vacuum capacitors are used in wireless charging research facilities of electric vehicles and plug-in hybrid vehicles.

Features

Equivalent Series Resistance (ESR) vacuum capacitors exhibit extremely low. Maximum current at radio frequencies (1 M to 700 MHz) is very high and temperature stability is excellent. The dielectric constant of a VC is 1, it has no dielectric vice due to polarization or permitivity. Dielectric loss is also the lowest compared to other dielectric materials. Capacitance ranges from 1pF to 6,000 pF are available with peak voltage tolerance of 3 kVp to 40 kVp due to advanced metallurgy and the excellent dielectric properties of vacuum insulation. Vacuum capacitors are pinnacle choices where high voltage, high current and high frequencies intersect.

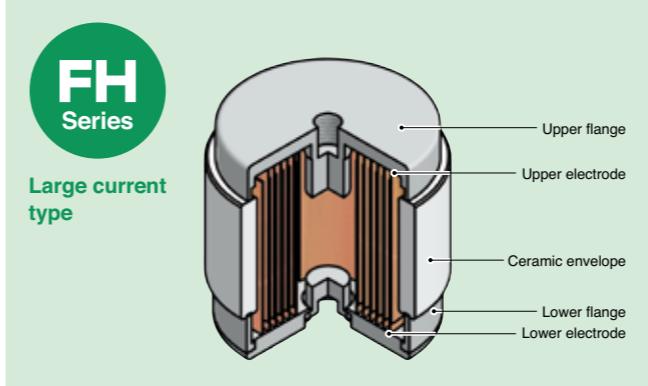


Inner Structure

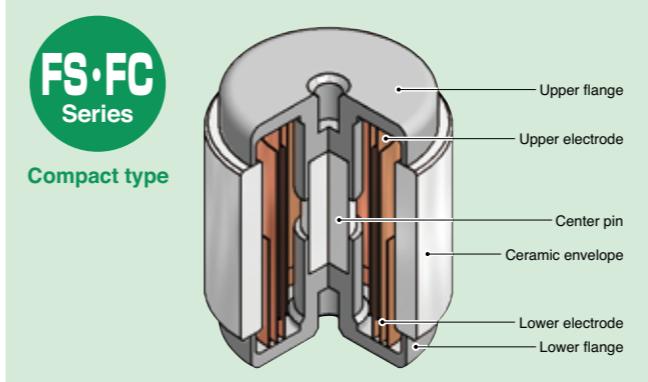
Variable vacuum capacitors incorporate movable plate electrodes. The plates move in relation to each other within the vacuum bottle via precision screw actuators providing excellent accuracy and repeatability. The bellows contains the vacuum allowing motion without the use of seals. Since the bellows also carry current, several options exist from high life stainless steel to double bellows (one copper and one stainless) to provide any current handling and life cycle needs in the industry. This technology is also used in our high power vacuum contactors and interrupters used in utility power systems, bullet trains and other high power infrastructure assignments.

Fixed type

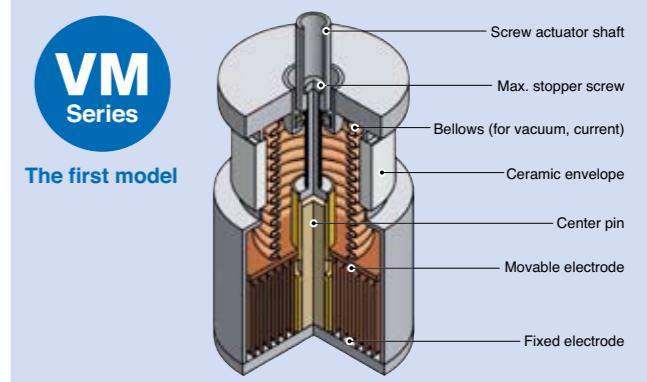
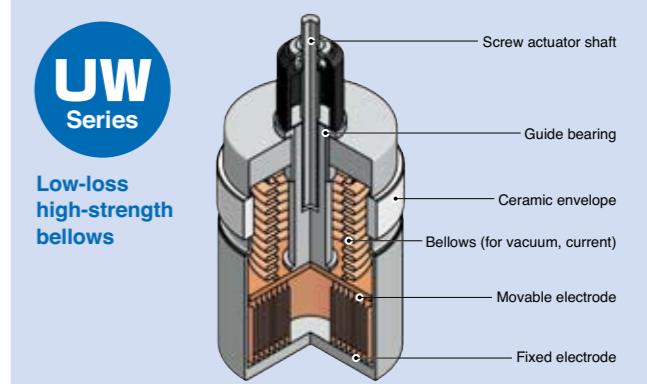
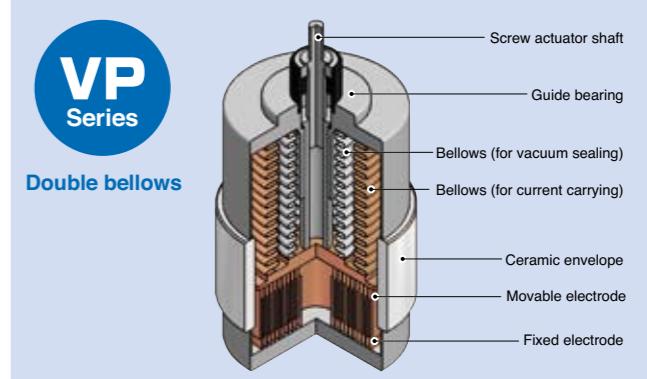
FH Series Large current type



FS·FC Series Compact type



Variable type



■ Product types

SC	-	□□	□	□	□
V:Variable F:Fixed	Peak test voltage	Capacitance ($\times 100$ pF)	Symbol (Series)	Diameter, Type	

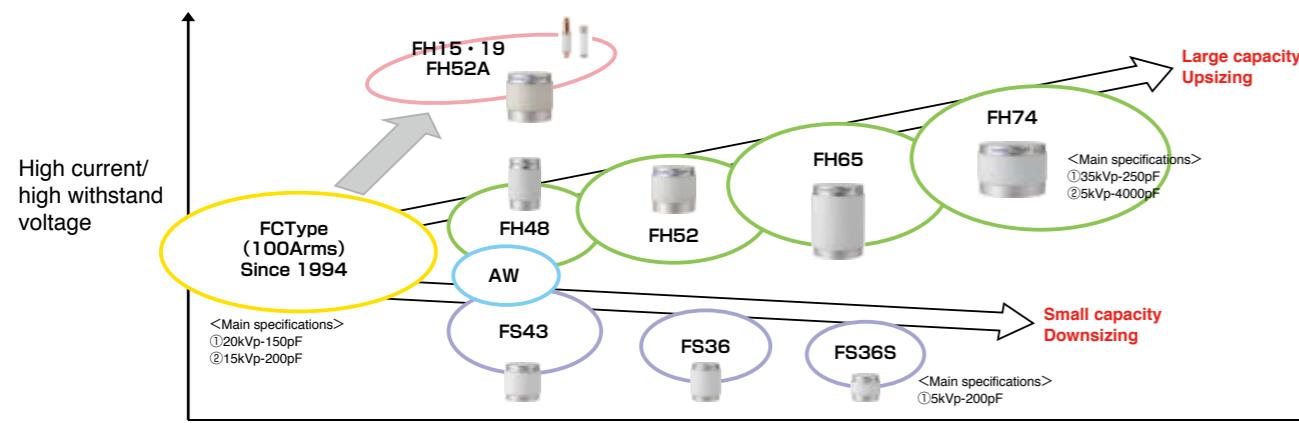
Example) SCV-125P65DW
Variable type, peak test voltage of 12 kVp, capacitance of 500 pF, diameter of 65mm

■ Customization

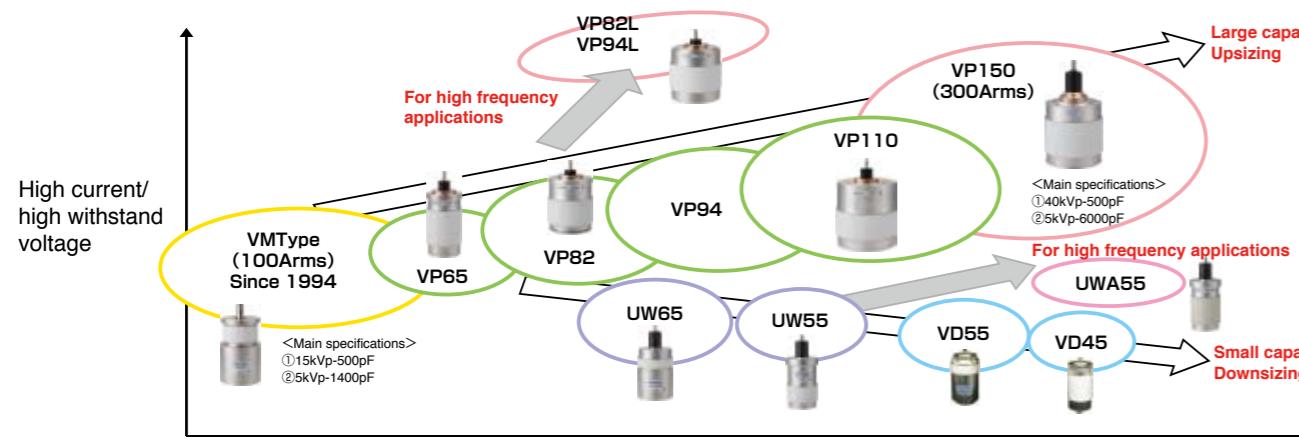
MEIDEN builds a variety of vacuum capacitors to meet the most rigorous specifications. We can accommodate the most demanding technical needs. Please contact us to discuss special needs component applications, this catalog is a subset of our full product portfolio.

Product lineups

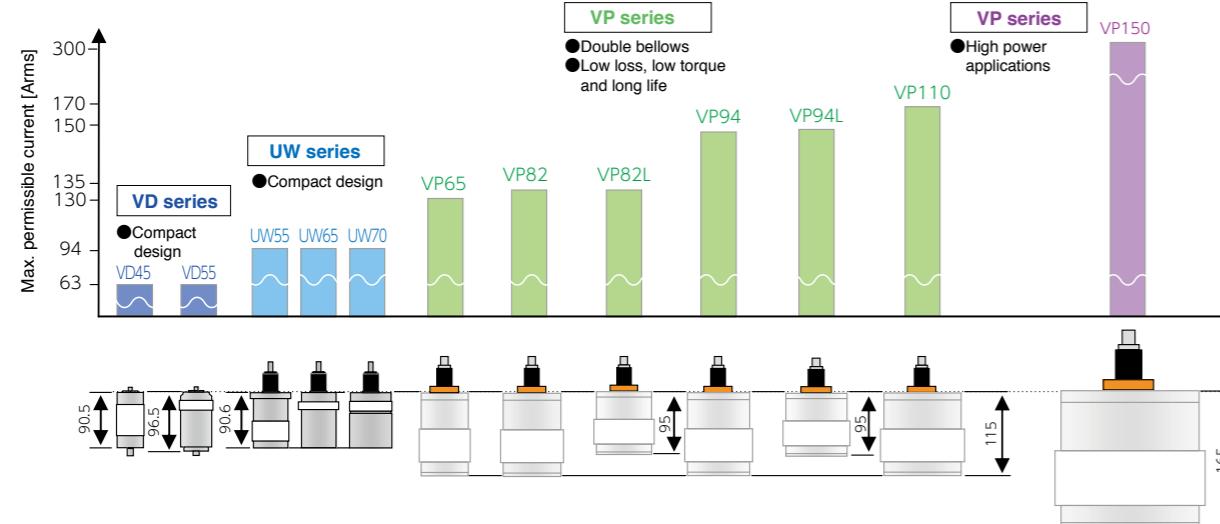
■ Fixed Vacuum Capacitors



■ Variable Vacuum Capacitors



■ Outer diameter of UW/VP series



Fixed Vacuum Capacitors

FS Series up to 50 Arms P5

AW Series up to 70 Arms P6

FC Series up to 100 Arms P6

FH Series up to 172 Arms P7

FS Series up to 50 Arms (13.56 MHz)

Designed for low power applications

■ Features

Stainless electrodes achieve miniaturization and high voltage tolerance

● Compact design

● Robust internal construction



* Part numbers in blue are standard and preferred.

Type	Part number	Capacitance ^{*6} pF	Voltage kVp		Current Arms			Mounting dimensions mm	Weight kg
			RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
FS36S	SCF-51S ^{*4}	100	3	5	18	38	34	L30 × φ36	~0.2
	SCF-51.1S ^{*4}	110	3	5	19	38	34		
	SCF-51.2S ^{*4}	120	3	5	21	38	34		
	SCF-51.3S ^{*4}	130	3	5	23	38	34		
	SCF-51.4S ^{*4}	140	3	5	25	38	34		
	SCF-51.5S ^{*4}	150	3	5	27	38	34		
	SCF-52S ^{*4}	200	3	5	36	38	34		
	SCF-150.1Z ^{*4}	10	9	15	5	15	23		
FS36	SCF-150.2Z ^{*4}	20	9	15	10	31	34	L43 × φ36	~0.2
	SCF-150.25Z ^{*4}	25	9	15	13	38	34		
	SCF-200.3Z ^{*4}	30	12	20	21	38	34		
	SCF-150.33Z ^{*4}	33	9	15	17	38	34		
	SCF-150.4Z ^{*4}	40	9	15	21	38	34		
	SCF-150.5Z ^{*4}	50	9	15	27	38	34		
	SCF-150.75Z ^{*4}	75	9	15	40	38	34		
	SCF-150.8Z ^{*4}	80	9	15	43	38	34		
	SCF-150.84Z ^{*4}	84	9	15	45	38	34		
	SCF-150.9Z ^{*4}	90	9	15	48	38	34		
	SCF-151Z ^{*8}	100	9	15	50	38	34		
	SCF-151.2Z ^{*8}	120	9	15	50	38	34		
	SCF-151.3Z ^{*8}	130	9	15	50	38	34		
	SCF-151.4Z ^{*8}	140	9	15	50	38	34		
	SCF-151.5Z ^{*8}	150	9	15	50	38	34		
	SCF-151.8Z ^{*8}	180	9	15	50	38	34		
	SCF-152Z ^{*8}	200	9	15	50	38	34		
	SCF-52.5Z ^{*8}	250	3	5	45	38	34		
	SCF-102.5Z ^{*8}	250	6	10	50	38	34		
	SCF-53Z ^{*8}	300	3	5	50	38	34		
	SCF-103Z ^{*8}	300	6	10	50	38	34		
	SCF-53.5Z ^{*8}	350	3	5	50	38	34		
	SCF-103.5Z ^{*8}	350	6	10	50	38	34		
	SCF-54Z ^{*8}	400	3	5	50	38	34		
	SCF-104Z ^{*8}	400	6	10	50	38	34		
	SCF-55Z ^{*8}	500	3	5	50	38	34		
	SCF-105Z ^{*8}	500	6	10	50	38	34		
FS43	SCF-152.2 ^{*8}	220	9	15	50	38	34	L43 × φ43	~0.3
	SCF-152.5 ^{*8}	250	9	15	50	38	34		
	SCF-153 ^{*8}	300	9	15	50	38	34		
	SCF-56 ^{*8}	600	3	5	50	38	34		
	SCF-57 ^{*8}	700	3	5	50	38	34		
	SCF-58 ^{*8}	800	3	5	50	38	34		
	SCF-59 ^{*8}	900	3	5	50	38	34		
	SCF-510 ^{*8}	1000	3	5	50	38	34		

*4: The maximum allowable current is under convection cooling.

*6: Capacitance tolerance: below 50 pF : ±10 %, over 50 pF : ±5 %

*8: The maximum allowable current is under 50 W water cooling.

For detailed information refer to the individual data sheet on our website at <http://vacuum-capacitors.meidensha.co.jp/en>.

AW Series up to 70 Arms (13.56 MHz)

Designed for medium power applications

■ Features

● Robust internal construction



Type	Part number	Capacitance ^{*6} pF	Voltage kVp		Current Arms			Mounting dimensions mm	Weight kg
			RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
AW	SCF-153AW ^{New}	300	9	15	70	53	48	L48 × φ45	~0.3
	SCF-124AW ^{New}	400	7.2	12	70	53	48		
	SCF-106AW ^{New}	600	6	10	70	53	48		
	SCF-810AW ^{New}	1000	4.8	8	70	53	48		
	SCF-515AW ^{New}	1500	3	5	70	53	48		

*4: The maximum allowable current is under convection cooling.

*6: Capacitance tolerance: below 50 pF : ±10 %, over 50 pF : ±5 %

*8: The maximum allowable current is under 50 W water cooling.

For detailed information refer to the individual data sheet on our website at <http://vacuum-capacitors.meidensha.co.jp/en>.

FC Series up to 100 Arms (13.56 MHz)

Designed for medium power applications

■ Features

● Copper electrode

High current copper electrodes

● Robust internal construction



Type	Part number	Capacitance ^{*6} pF	Voltage kVp		Current Arms			Mounting dimensions mm	Weight kg
			RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
FC52	SCF-150.5C ^{*4}	50	9	15</td					

FH Series up to 172 Arms (13.56 MHz)

Designed for high power applications

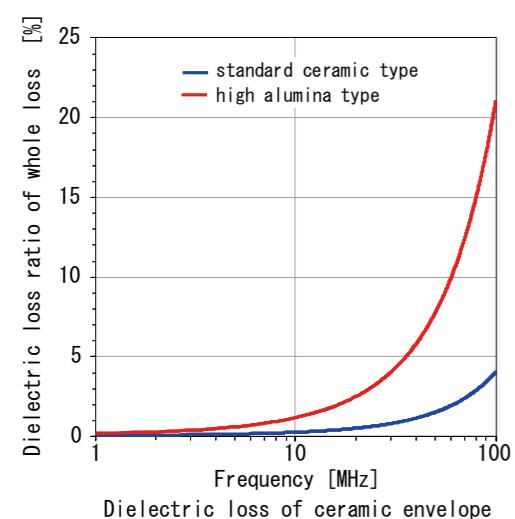
■ Features

● High voltage tolerance

Variety of different capacitors covering peak test voltages of 25 kVp, 30 kVp, and 35 kVp



■ Low loss with high purity alumina ceramic



Dielectric loss of ceramic envelope

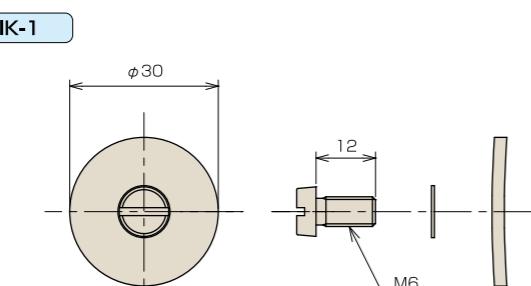
Heat loss in vacuum capacitors is largely due to skin effect. Dielectric loss at high frequencies generates heat and should be considered. High purity alumina ceramics exhibit reduced low dielectric losses and is recommended for applications requiring higher power at frequencies over 40MHz.

■ Option

● Mounting kit

Screws and washer sets commonly used in installation

Applicable models	Mounting kit
FH52WR	IK-1
FH65C	
FH74WR	



* Part numbers in **■** are standard and preferred.

Type	Part number	Capacitance ^{*6} pF	Voltage kVp		Current Arms			Mounting dimensions mm	Weight kg
			RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
FH48C	SCF-300.25H48C ^{*4}	25	18	30	27	79	99	L73 × φ48	~0.5
	SCF-300.5H48C ^{*4}	50	18	30	54	110	99		
	SCF-300.75H48C ^{*4}	75	18	30	81	110	99		
	SCF-301H48C ^{*8}	100	18	30	108	110	99		
	SCF-351H48C ^{*8}	100	21	35	126	110	99		
	SCF-251.25H48C ^{*8}	125	15	25	112	110	99		
	SCF-251.5H48C ^{*8}	150	15	25	135	110	99		
	SCF-251.75H48C ^{*8}	175	15	25	145	110	99		
	SCF-252H48C ^{*8}	200	15	25	145	110	99		
FH52WR	SCF-151H52WR ^{*8}	100 ^{*7}	9	15	54	99	89	L52 × φ52.4	~0.6
	SCF-201H52WR ^{*8}	100	12	20	72	99	89		
	SCF-151.5H52WR ^{*8}	150 ^{*7}	9	15	81	99	89		
	SCF-152H52WR ^{*8}	200 ^{*7}	9	15	108	99	89		
	SCF-202H52WR ^{*8}	200	12	20	130	99	89		
	SCF-152.1H52WR ^{*8}	210	9	15	113	99	89		
	SCF-152.5H52WR ^{*8}	250 ^{*7}	9	15	130	99	89		
	SCF-153H52WR ^{*8}	300 ^{*7}	9	15	130	99	89		
	SCF-153.5H52WR ^{*8}	350	9	15	130	99	89		
	SCF-153.7H52WR ^{*8}	370	9	15	130	99	89		
	SCF-124H52WR ^{*8}	400	7.2	12	130	99	89		
	SCF-124.5H52WR ^{*8}	450	7.2	12	130	99	89		
	SCF-125H52WR ^{*8}	500 ^{*7}	7.2	12	130	99	89		
	SCF-105.5H52WR ^{*8}	550	6	10	130	99	89		
	SCF-56H52WR ^{*8}	600	3	5	108	99	89		
	SCF-106H52WR ^{*8}	600	6	10	130	99	89		
	SCF-106.5H52WR ^{*8}	650	6	10	130	99	89		
	SCF-107H52WR ^{*8}	700	6	10	130	99	89		
	SCF-107.5H52WR ^{*8}	750	6	10	130	99	89		
	SCF-510H52WR ^{*8}	1000 ^{*7}	3	5	130	99	89		
	SCF-810H52WR ^{*8}	1000	4.8	8	130	99	89		
	SCF-512.5H52WR ^{*8}	1250	3	5	130	99	89		
	SCF-315H52WR ^{*8}	1500	1.8	3	130	99	89		
	SCF-515H52WR ^{*8}	1500	3	5	130	99	89		
	SCF-317.5H52WR ^{*8}	1750	1.8	3	130	99	89		
	SCF-320H52WR ^{*8}	2000	1.8	3	130	99	89		
FHA52WR	SCF-151HA52WR ^{*8}	100 ^{*7}	9	15	54	99	89	L52 × φ52.4	~0.6
	SCF-151.5HA52WR ^{*8}	150 ^{*7}	9	15	81	99	89		
	SCF-152HA52WR ^{*8}	200 ^{*7}	9	15	108	99	89		
	SCF-153HA52WR ^{*8}	300 ^{*7}	9	15	130	99	89		
	SCF-125HA52WR ^{*8}	500 ^{*7}	7.2	12	130	99	89		
	SCF-510HA52WR ^{*8}	1000 ^{*7}	3	5	130	99	89		
FH65C	SCF-350.25H65C ^{*4}	25	21	35	31	93	118	L87 × φ65	~0.9
	SCF-350.5H65C ^{*4}	50	21	35	63	131	118		
	SCF-351H65C ^{*8}	100	21	35	126	131	118		
	SCF-351.5H65C ^{*8}	150	21	35	172	131	118		
	SCF-351.75H65C ^{*8}	175	21	35	172	131	118		
	SCF-352H65C ^{*8}	200	21	35	172	131	118		
	SCF-352.5H65C ^{*8}	250	21	35	172	131	118		
	New SCF-253.5H65C	350	15	25	172	131	118		
	New SCF-253H65C	300	15	25	172	131	118		
	New SCF-1010H74WR	1000	6	10	140	106	96		
FH74WR	New SCF-520H74WR	2000	3	5	121	92	83	L52 × φ74	~1.0
	New SCF-530H74WR	3000	3	5	121	92	83		
	New SCF-540H74WR	4000	3	5	121	92	83		

*4: The maximum allowable current is under convection cooling.

*6: Capacitance tolerance: below 50 pF : ±10 %, over 50 pF : ±5 %

*7: We can accommodate high capacitance tolerance (±3% or below) requirements.

*8: The maximum allowable current is under 50 W water cooling.

For detailed information refer to the individual data sheet on our website at <http://vacuum-capacitors.meidensha.co.jp/en>.



Variable Vacuum capacitors

VD Series up to 80 ArmsP10

UW Series up to 94 ArmsP11

C82HE Series up to 132 ArmsP13

VP Series up to 300 ArmsP14

VM/VT Series up to 100 ArmsP17

VD Series up to 80 Arms (13.56 MHz)

Desinged for low power applications

■ Features

- Compact design
- Shortened mounting length



Type	Part number	Capacitance pF		Voltage kVp		Current ^{*1} Arms			Mounting dimensions mm	Weight kg
		Min.	Max.	RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
VD45	New SCV-56.5D45W	15	650	3	5	70	53	48	L115 × φ45	0.4
	New SCV-55D55W	35	500	3	5	40	30	27		
	New SCV-85D55W	35	500	4.8	8	80	61	55		
	New SCV-110D55W	40	1000	0.6	1	36	30	27		
	New SCV-410D55W	40	1000	2.4	4	80	61	55		
	New SCV-115D55W	45	1500	0.6	1	40	30	27		
	New SCV-315D55W	45	1500	1.8	3	80	61	55		

*1: The maximum allowable current is under 30 W conduction cooling.

For detailed information refer to the individual data sheet on our website at <http://vacuum-capacitors.meidensha.co.jp/en>

UW Series up to 94 Arms (at 13.56 MHz)

Desinged for low power applications

■ Features

● Low-loss / high-strength bellows

copper coating stainless increases current handling

● Wide tuning range

Capacitance from 3 pF to 2,000 pF

● High purity alumina ceramics

Low loss ceramics (UWA55 type)

● High durability screw actuator technology

Diamond Like Carbon (DLC) extended life coating reduces friction



■ Options

● Ball screw actuators

Ball screw actuators represent the pinnacle of actuator screw technology. They provide vastly superior life expectancy exhibiting near zero friction for high speed, high acceleration/deceleration duty. Ball screws are especially suited for dither and other tortuous motion applications.

UW series are available with small ball screw profiles to meet size constraints.

● Shaft and drive connection profiles

We support flat (D shaped), slit, pin drive and other coupling configurations.

UW-C shaft option number

SCV - □□□ H □□ UW-C (**)



※ Please contact your sales representative for shaft configuration ordering specifics.

Example) SCV-125H65UW-C(S1)

Option Number	Shape	Drawing
None	Two flat + slit (standard)	
S1	Round	
S6	Slit	

※ Part numbers in blue are standard and preferred.

Type	Part number	Capacitance pF		Voltage kVp		Current ^{*1} Arms			Mounting dimensions mm	Weight kg
		Min.	Max.	RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
UWA55	SCV-150.6HA55UW-C	3	60	9	15	32	71	64	L133.5 × φ55	~0.7
	SCV-150.75HA55UW-C	5	75	9	15	40	71	64		
UW55	SCV-200.5FH55UW-C	6	50	12	20	36	71	64	L133.5 × φ55	~0.7
	SCV-151H55UW-C ^{**}	10	100	9	15	54	71	64		
	SCV-201H55UW-C	10	100	12	20	72	71	64		
	SCV-151.5FH55UW-C	7	150	9	15	81	71	64		
	SCV-152.5H55UW-C ^{**}	25	250	9	15	94	71	64		
	SCV-83.5FH55UW-C	7	350	4.8	8	94	71	64		
	SCV-55FH55UW-C	7	500	3	5	90	71	64		
	SCV-85H55UW-C ^{**}	35	500	4.8	8	94	71	64		
	SCV-310H55UW-C ^{**}	35	1000	1.8	3	94	71	64		
	SCV-510H55UW-C	35	1000	3	5	94	71	64		
UW65	SCV-415H55UW-C	150	1500	2.4	4	94	71	64	L133.5 × φ65	~0.9
	SCV-125H65UW-C ^{**3}	50	500	7.2	12	94	71	64		
	SCV-155H65UW-C	50	500	9	15	94	71	64		
	SCV-810H65UW-C	100	1000	4.8	8	94	71	64		
	SCV-1010H65UW-C	100	1000	6	10	94	71	64		
	SCV-415H65UW-C ^{**3}	150	1500	2.4	4	94	71	64		
	SCV-515H65UW-C	150	1500	3	5	94	71	64		
UW70	SCV-320H65UW-C	200	2000	1.8	3	94	71	64	L133.5 × φ70	~1.0
	SCV-320H70UW-C	200	2000	1.8	3	94	71	64		
※ 1: The maximum allowable current is under 30 W conduction cooling. ※ 2: UW-NP type is available. ※ 3: UW-B type is available.										

For detailed information refer to the individual data sheet on our website at <http://vacuum-capacitors.meidensha.co.jp/en>

C82HE Series up to 132 Arms (at 13.56 MHz)

Designed for medium power applications

■ Features

- Double bellows with special copper alloy

Designed for high current applications, dual bellows system provides highest current capacity and extended durability while exhibiting low actuation torque

- Reinforced actuator screw system

Long life Diamond Like Carbon (DLC) coated



■ Options

- Ball screw actuators



Type	Part number	Capacitance pF		Voltage kVp		Current ^{*1} Arms			Mounting dimensions mm	Weight kg
		Min.	Max.	RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
CE82HE	New SCV-103.3C82HEW-AADG-J	30	330	6	10	119	106	96	L132 × φ82	1.5
	New SCV-202C82HE-AAFG-B	12	200	12	20	140	106	96		
	New SCV-250.8C82HE-AADG-F	10	80	15	25	72	106	96		
	New SCV-251C82HE-B3	12	100	15	25	90	106	96		

*1: The maximum allowable current is under 30 W conduction cooling.

For detailed information refer to the individual data sheet on our website at <http://vacuum-capacitors.meidensha.co.jp/en>

VP Series up to 170 Arms (at 13.56 MHz)

Designed for medium/high power applications

■ Features

- Double bellows with special copper alloy

Designed for high current applications, dual bellows system provides highest current capacity and extended durability while exhibiting low actuation torque

- Reinforced actuator screw system

Long life Diamond Like Carbon (DLC) coated



■ Options

- Ball screw actuators



■ Water-cooled flanges

Types	fixed side	moving side
VP65	AWF-6 Vacuum capacitor mounting plane 4 pcs. equally distributed -φ5.5 (Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 1.0 Mpa) Unit:mm	AWM-6 Vacuum capacitor mounting plane 4 pcs. equally distributed -φ5.5 (Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 1.0 Mpa) Unit:mm
VP82 VP82L VP94L	AWM-4 Fixed side Recommended mounting plane Moving side Recommended mounting plane 6 pcs. equally distributed -φ5.5 (Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 1.0 Mpa) Unit:mm	AWM-4 Fixed side Recommended mounting plane Moving side Recommended mounting plane 6 pcs. equally distributed -φ5.5 (Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 1.0 Mpa) Unit:mm
VP94 VP110	AWM-4 (Fixed and moving sides in common) Fixed side Recommended mounting plane Moving side Recommended mounting plane 6 pcs. equally distributed -φ5.5 (Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 1.0 Mpa) Unit:mm	 Fixed side Recommended mounting plane Moving side Recommended mounting plane 6 pcs. equally distributed -φ5.5 (Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 1.0 Mpa) Unit:mm

VP Series up to 170 Arms (13.56 MHz)

* Part numbers in blue are standard and preferred.

Type	Part number	Capacitance pF		Voltage kVp		Current ^{*4} Arms			Mounting dimensions mm	Weight kg
		Min.	Max.	RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
VP65	SCV-151P65	10	100	9	15	54	99	89	L154 × φ65	~1.2
	SCV-201P65	10	100	12	20	72	99	89		
	SCV-152P65C	5.5	200	9	15	108	99	89		
	SCV-202P65	15	200	12	20	130	99	89		
	SCV-152.5P65	15	250	9	15	130	99	89		
	SCV-202.5P65	15	250	12	20	130	99	89		
	SCV-104P65FW	6	400	6	10	130	99	89		
	SCV-124P65FW	6	400	7.2	12	130	99	89		
	SCV-7.55P65FW	6	500	4.5	7.5	130	99	89		
	SCV-105P65FW	6	500	6	10	130	99	89		
	SCV-125P65DW	10	500	7.2	12	130	99	89		
	SCV-155P65DW	10	500	9	15	130	99	89		
	SCV-310P65FW	6	1000	1.8	3	108	99	89		
	SCV-410P65FW	6	1000	2.4	4	130	99	89		
	SCV-510P65W	20	1000	3	5	130	99	89		
	SCV-810P65W	20	1000	4.8	8	130	99	89		
	SCV-315P65DW	10	1500	1.8	3	130	99	89		
	SCV-415P65DW	10	1500	2.4	4	130	99	89		
VP70	New SCV-155P70W	15	500	9	15	140	106	96	L154 × φ70	~1.5
	New SCV-515P70W	35	1500	3	5	140	106	96		
VP82	SCV-202P82	20	200	12	20	140	106	96	L154 × φ82	~1.9
	SCV-155P82W	20	500	9	15	140	106	96		
	SCV-1010P82W	25	1000	6	10	140	106	96		
	SCV-515P82W	25	1500	3	5	140	106	96		
	SCV-520P82W	25	2000	3	5	140	106	96		
VP82L	SCV-200.5P82L	12	50	12	20	36	106	96	L125 × φ82	~1.6
	SCV-250.8P82L	11	80	15	25	72	106	96		
	SCV-201P82L	12	100	12	20	72	106	96		
	SCV-251P82L	12	100	15	25	90	106	96		
	SCV-201.5P82L	12	150	12	20	108	106	96		
	SCV-202P82L	12	200	12	20	140	106	96		
	SCV-202.2P82L	12	220	12	20	140	106	96		
	SCV-103.5P82LW	15	350	6	10	126	106	96		
	SCV-84P82LW	15	400	4.8	8	115	106	96		
VP94	SCV-202.5P94	25	250	12	20	150	114	103	L154 × φ94	~2.3
	SCV-155P94	25	500	9	15	150	114	103		
	SCV-515P94	30	1500	3	5	150	114	103		
	SCV-520P94W	30	2000	3	5	150	114	103		
	SCV-523P94W	45	2300	3	5	150	114	103		
VP94L	SCV-251P94L	14	100	15	25	90	125	113	L125 × φ94	~1.8
	SCV-202.2P94L	14	220	12	20	159	125	113		
	SCV-153.5P94LW	15	350	9	15	165	125	113		

*4: The maximum allowable current is under convection cooling.

For detailed information refer to the individual data sheet on our website at <http://vacuum-capacitors.meidensha.co.jp/en>

* Part numbers in blue are standard and preferred.

Type	Part number	Capacitance pF		Voltage kVp		Current ^{*4} Arms			Mounting dimensions mm	Weight kg
		Min.	Max.	RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
VP110	SCV-350.3P110	8	30	21	35	37	111	117	L154 × φ110	~3.0
	SCV-351P110	20	100	21	35	126	129	117		
	SCV-201.5P110C	11	150	12	20	108	129	117		
	SCV-251.5P110C	11	150	15	25	135	129	117		
	SCV-302P110	25	200	18	30	170	129	117		
	SCV-202.5P110C	13	245	12	20	170	129	117		
	SCV-252.5P110C	13	245	15	25	170	129	117		
	SCV-253.5P110	35	350	15	25	170	129	117		
	SCV-205P110	40	500	12	20	170	129	117		
	SCV-255P110	40	500	15	25	170	129	117		
	SCV-158P110FW	15	800	9	15	170	129	117		
	SCV-1510P110W	40	1000	9	15	170	129	117		
	SCV-1015P110W	40	1500	6	10	170	129	117		
	SCV-520P110W	40	2000	3	5	170	129	117		
	SCV-820P110W	40	2000	4.8	8	170	129	117		
	SCV-325P110FW	15	2500	1.8	3	170	129	117		
	SCV-340P110W	45	4000	1.8	3	170	129	117		

*4: The maximum allowable current is under convection cooling.



VP Series (VP150 type) up to 300 Arms (13.56 MHz)

Designed for high power applications

■ Features

- Internal water cooling

VM / VT Series up to 100 Arms (13.56 MHz)



■ Features

- Low loss / high-strength bellows
- High-strength / special screw drive
- Robust internal construction

■ Options

- Guide bearing

Guide bearing increases radial load tolerance of the actuator system

Part number	Guide Bearing
SCV-510M, SCV-514M, SCV-155M, SCV-520M, SCV-1010, SCV-204, SCV-1010G, SCV-1014G, SCV-205G	<p>SJ-1</p> <p>(Remarks)applicable for screw position of P.C.D.60</p> <p>Unit:mm</p>
SCV-55, SCV-7.55, SCV-151, SCV-152, SCV-152.5, SCV-155G	<p>SJ-2</p> <p>(Remarks)applicable for screw position of P.C.D.45</p> <p>Unit:mm</p>

● Water-cooled flanges

Part number	fixed side	moving side
SCV-510M, SCV-514M, SCV-155M, SCV-520M, SCV-1010, SCV-204, SCV-1010G, SCV-1014G, SCV-205G	<p>AWF-1</p> <p>(Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 0.2 Mpa)</p> <p>Unit:mm</p>	<p>AWM-1</p> <p>(Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 0.5 Mpa)</p> <p>Unit:mm</p>
SCV-55, SCV-7.55, SCV-151, SCV-152, SCV-152.5, SCV-155G	<p>AWF-2</p> <p>(Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 0.2 Mpa)</p> <p>Unit:mm</p>	<p>AWM-2</p> <p>(Water flow rate: 1.0 l/min., Permissible hydraulic pressure: 0.5 Mpa)</p> <p>Unit:mm</p>

VM Series

Type	Part number	Capacitance pF		Voltage kVp		Current ^{*1} Arms			Mounting dimensions mm	Weight kg
		Min.	Max.	RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
VM	SCV-150.5	10	50	9	15	27	76	68	L140 × φ60.4	1.0
	SCV-151	10	100	9	15	54	76	68		
	SCV-152	12	200	9	15	100	76	68		
	SCV-155G	25	500	9	15	90	68	62		
	SCV-152.5	30	250	9	15	100	76	68	L140 × φ62.4	1.0
	SCV-7.55	30	500	4.5	7.5	100	76	68		
	SCV-55	30	500	3	5	90	76	68		
	SCV-155M	50	500	9	15	90	68	62		
	SCV-510M	50	1000	3	5	90	68	62	L140 × φ73	1.3
	SCV-514M	90	1400	3	5	90	68	62		
	SCV-205G	50	500	12	20	100	76	68		
	SCV-1010G	50	1000	6	10	100	76	68		
	SCV-1014G	90	1400	6	10	100	76	68	L140 × φ89	1.4
	SCV-204	80	450	12	20	100	76	68		
	SCV-1010	80	1000	6	10	100	76	68		
	SCV-520M	85	2000	3	5	100	76	68		
	SCV-201.7G	45	170	12	20	90	68	62	L100 × φ63	0.8
	SCV-104G	60	450	6	10	90	68	62		
	SCV-300.2G	6	20	18	30	21	63	62		
	SCV-250.3G	6	30	15	25	27	68	62		
	SCV-250.8G	10	80	15	25	72	68	62	L100 × φ60.4	0.5

*1:The maximum allowable current is under 30 W conduction cooling.

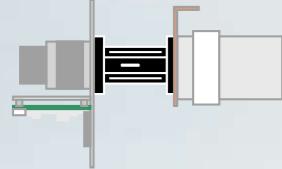
VT Series

Type	Part number	Capacitance pF		Voltage kVp		Current ^{*1} Arms			Mounting dimensions mm	Weight kg
		Min.	Max.	RF working	Peak test	13.56 MHz	40 MHz	60 MHz		
VT	SCV-151GT	20	100	9	15	54	61	55	L130 × φ52.4	0.7
	SCV-152.5GT	25	250	9	15	80	61	55		
	SCV-155GT	70	500	9	15	80	61	55		
	SCV-510GT	70	1000	9	15	80	61	55		
	SCV-515GT	70	1500	3	5	80	61	55	L130 × φ60	0.9
	SCV-150.75GTB	5	75	9	15	40	61	55		
	SCV-53GTB	10	330	3	5	59	61	55	L107 × φ53	0.8

*1:The maximum allowable current is under 30 W conduction cooling.

Auto Tuning Vacuum Capacitors

Intelligent Capacitor Project



All of MEIDEN variable vacuum capacitors can be auto tuning.

■ Product description

Auto tuning vacuum capacitors include highest quality long life stepper motors with encoders, coupling adapters and controller electronics. These devices come with an instruction set manual for simple integration into process controllers with built in command sets for step actuation, calls for decimal capacitance, position interrogation and much more.

The devices auto initialize at system startup and come with a factory position to C curve maps.

In multiple device installations your system does not need to initialize or waste wafers due to a missed stepper step. Each device will auto-recover in real time and actuate to the requested value even after years of service.

The controllers are equipped for RS232C and RS485 and can be chain configured up to 4 and 16 devices, respectively.

Please contact us about EtherCAT compatibility.

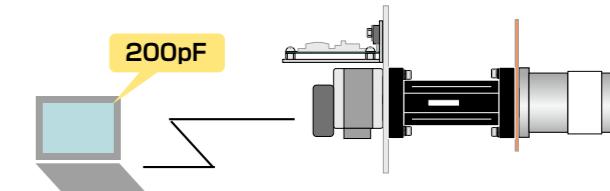
■ Features

● High voltage tolerance and reliability

Robust composite insulation tube and 10kVp coupler meet composite requirements concerning structural robustness, high withstand voltage, alignment accuracy, and heat resistance.

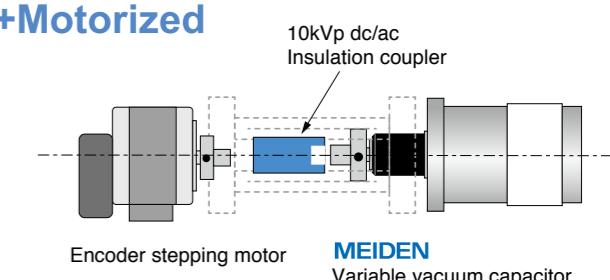


+Auto variable capacitor



Serial communication (RS485)

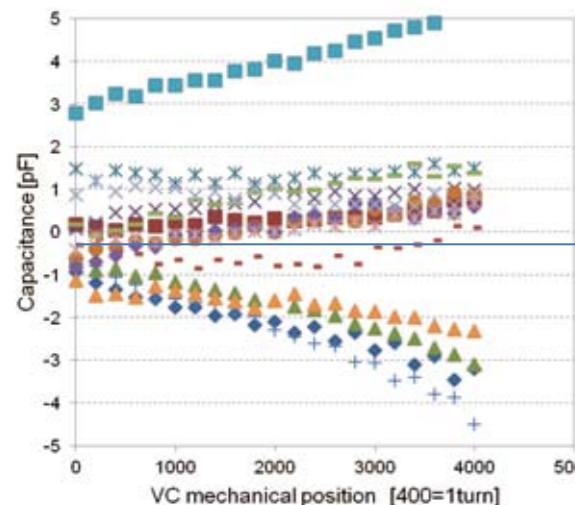
+Motorized



Auto Tuning Vacuum Capacitors

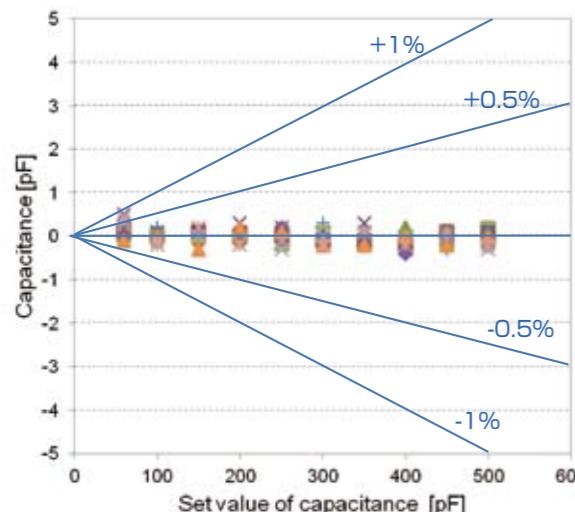
● High precision

MEIDEN HASS procedures measure capacitance of and calibrates every auto tuning vacuum capacitor before shipment, optimizing capacitance tolerance up to $\pm 0.5\%$.



(1) Mechanical tuning precision

Screw turn position and capacitance tolerance for SCV-125H65UW (N=14)



(2) Auto tuning

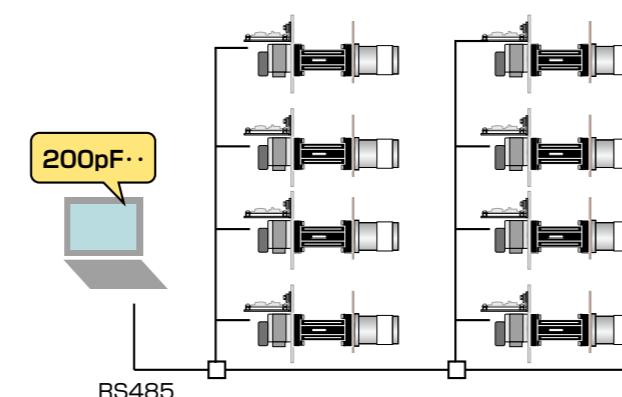
Capacitance tolerance for auto tuning vacuum capacitor

● Network building

You can build a network of motorized vacuum capacitors (RS485: up to 16 units, RS232C: up to 4 units) with one serial line from one controller and control their respective capacitances.

+Network

Network building of vacuum capacitors (up to 16 units)



Insulation Slit Coupler

● Recommended coupler for variable vacuum capacitor (option)

Insulation slit coupler minimizes misalignment with the motor axis. Misalignment can cause premature failure. See "Handling Precautions" (Page 26) for mounting variable vacuum capacitors.

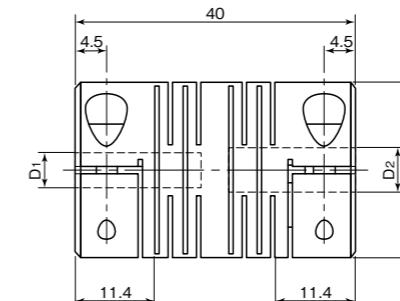
Regular torque N·cm	Maximum torque N·cm	Permissible eccentricity mm	Permissible declination °	Permissible dielectric voltage kVp	Permissible dielectric breakdown voltage kVp	Screw tightening torque N·cm
130	260	0.3	1.2°	10	30	60

Coupler material : PEEK

Screw material : SUSXM7

Mass : 23 g

Combustibility (UL94) : V-0



Shaft diameter	D2	
	6.35	12.7
D1	5	◎ ○
	6.35	○ ○
	8	○ ○

◎ : Standard stock
○ : BTO

Part number : MSXP-25C-W40-5-6.35-SP3 (Made by NBK)

● Common Specifications

See below for common specifications of serial communications and motor control:

Power	DC 24 V (1 A)
Motor speed	240 rpm (Max.360 rpm)
Motor resolution	400 step / turn
Coupler withstand voltage	10 kVp (AC)
Interface	RS485 (RS232C is also available)
Communication speed	9600 bps

Technical Information (Operational Precautions and Characteristic Explanations)

1. Withstand Voltage

Withstand voltage is determined by the following three factors:

- (1) Degree of vacuum
- (2) Distance between electrodes (gap)
- (3) Electrode conditioning

(1) Degree of vacuum

Withstand voltage remains constant if degree of vacuum is less than 0.1 Pa (See Figure 1).

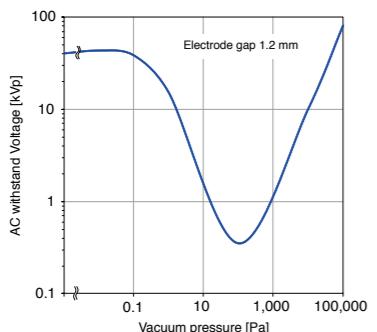


Figure 1. Vacuum pressure-Withstand Voltage characteristics

(2) Distance between electrodes

Withstand voltage is proportional to the distance between electrodes (gap).

(3) Electrode conditioning

Figure 2 shows "distance between electrodes-withstand voltage" characteristics. It is not possible to obtain high withstand voltage like characteristics ① (before conditioning) by simply placing electrodes in vacuum. High withstand voltage requires conditioning, which is to apply high working voltage and repeat low current flashover multiple times performed in our HASS testing. Characteristics ② exhibit withstand voltage after conditioning during production/processing range. Characteristics ③ display post conditioning withstand voltage. Please note that instant discharge may occur after reaching characteristics ② and ③ by conditioning.

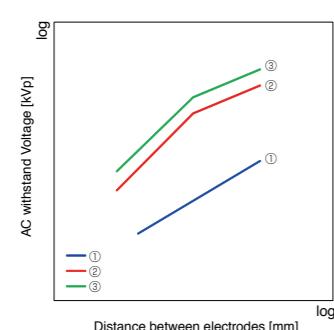


Figure 2. Distance between electrodes-withstand voltage characteristics

2. Peak Test Voltage

This refers to a limit value of dielectric breakdown voltage between electrodes (Figure 3. ①). At the time of shipment, MEIDEN tests vacuum capacitors to confirm that no dielectric breakdown occurs when the rated voltage is applied for the specified time (1 minute).

3. RF Working Voltage

This refers to the rated voltage capable of being applied continuously. The RF working voltage is set at 60 % of the peak test voltage (Figure 3. ②).

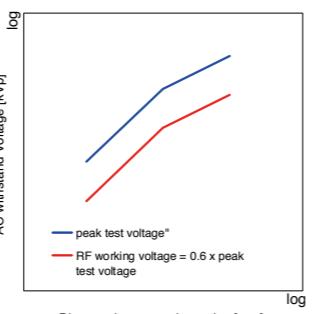
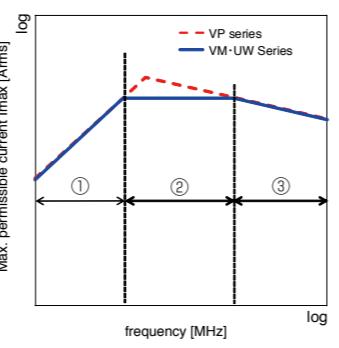


Figure 3. Distance between electrodes-withstand voltage characteristics

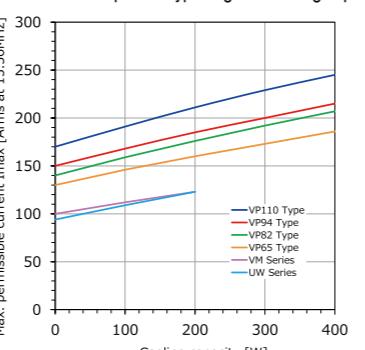
4. Maximum Permissible Current

This is the maximum rated current capable of being carried continuously. At higher frequencies, the maximum permissible current decreases with a greater loss due to the skin effect. The maximum rated current is defined as follows:

- ① Range limited by RF working voltage $I = 2\pi f C V_{RF\text{rms}}$ (f : frequency, C : capacitance, $V_{RF\text{rms}}$: rms value of RF working voltage)
- ② Range limited by the maximum permissible temperature ($I = I_{RF}$)
Because copper coated bellows are adopted in the VM / VT / UW series capacitors, there are some limits that exist within this range. This does not apply to the VH series capacitors in which special copper bellows for current carrying are adopted.
- ③ Range limited by the skin effect
 $I \propto 1/f^{1/4}$ current inversely proportional to the 0.25th power of frequency
 $I = I_{RF}(f_{RF}/f)^{1/4} I_{RF}$: RF permissible current, f_{RF} : 13.56 MHz



(Maximum permissible current with cooling)
Maximum permissible current of respective types against cooling capacity is shown below.



*MEIDEN standard cooling capacity of water-cooled flange is 100 W each and maximum of 200 W (water-cooled flange on both fixed and moving sides) for one vacuum capacitor

Figure 5

5. Capacitance tolerance and adjustment

(1) Capacitance tolerance for fixed vacuum capacitors: under 50 pF: $\pm 10\%$, over 50 pF: $\pm 5\%$. The higher tolerance version is available for some of them. Capacitance linearity for variable vacuum capacitors: under 50 pF: $\pm 10\%$, over 50 pF: $\pm 5\%$.

(2) Variable vacuum capacitors can be adjusted to any capacitance within the specified range by turning the actuator screw shaft. Capacitance decreases with rightward (clockwise) rotation of the shaft and can be adjusted to the minimum capacitance in the end-stop position. Although two capacitance range end-stops are incorporated into every variable vacuum capacitor, the motor should not collide with the maximum capacitance end-stop unless specified. Repeated hard collisions with the end stop may impair the screw. Some UW series do not incorporate maximum capacitance end-stops unless specified. The permissible collision torque at the minimum capacitance end-stop is as follows:

UW series : 0.4 N·m	VP series : 0.4 N·m
VM series : 0.4 N·m	VT series : 0.4 N·m

*High hard stop frequency at high speed may impair the screw.

6. Equivalent Circuit of Vacuum Capacitor

Figure 6 shows equivalent circuit of vacuum capacitor. C_s is capacitance. Other circuit elements are parasitic in vacuum capacitor. Equivalent Series Resistance (ESR) of vacuum capacitors is generally several mΩ~dozens of mΩ. Equivalent Series Inductance (ESL) determines Self-Resonance frequency and C_s . ESL of vacuum capacitors is generally several nH~dozens of nH. Parasitic Capacitance (C_p) of the ceramic envelope and Equivalent Parasitic Resistance (EPR) combine to represent leakage current. C_p and EPR have small influence and thus can be ignored when in use of vacuum capacitor.

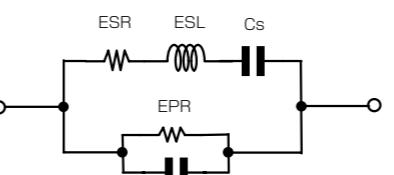


Figure 6 Equivalent circuit of vacuum capacitor

7. Self-resonance Frequency and ESL

Figure 7 shows capacitance characteristics of ESL and self-resonance frequency for UW and VP series.

VP series double bellows exhibits low ESL. UW series single bellows (for compact size), reduces ESL by exhibiting larger aperture bellows than MEIDEN standard models. Self-resonance frequency of vacuum capacitors: f_0 is calculated from the following formula using ESL and C_s :

$$f_0 = \frac{1}{2\pi\sqrt{ESL C_s}}$$

Resonance frequency f_L of circuit of vacuum capacitor is calculated from the following formula using external circuit inductance L_c :

$$f_L = \frac{1}{2\pi\sqrt{(ESL + L_c)C_s}}$$

In case of $ESL \ll L_c$, L_c controls.

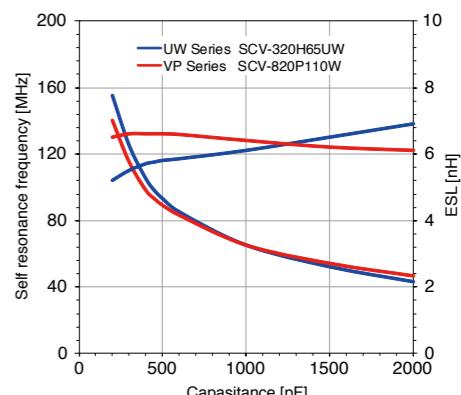


Figure 7 Self-resonance frequency and ESL

8. ESR of Vacuum Capacitor

Figure 8 shows ESR-Frequency characteristics of UW and VP series. VP series double bellows achieves extremely low ESR. In case of variable vacuum capacitors, the primary ESR factor is resistance by the skin effect of bellows. Therefore, ESR is dependent on frequency. MEIDEN provides ESR at 13.56 MHz. For your use at f [MHz], please calculate ESR_f according to the following formula (which is applied for $f > 13.56$ MHz).

$$ESR_f = ESR \sqrt{\frac{f}{13.56}}$$

Heat generation within vacuum capacitors is due primarily to resistance loss P_{loss} [W] of ESR. When high frequency current carried is I_{rf} [Arms] and connection resistance to the circuit current source as Resistance Current (RC). R_c heat can be approximately derived from the following formula:

$$P_{loss} = (ESR_f + R_c) (I_{rf})^2$$

R_c is dependent on installation issues, but is approximately 2~10 mΩ.

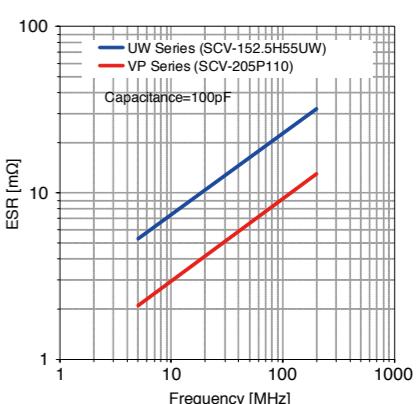


Figure 8 Frequency characteristics of ESR

9. Torque

Torque of variable vacuum capacitors is primarily determined by (1)~(5):

- (1) Vacuum differential pressure
- (2) Spring force of bellows
- (3) Weight of moving-side electrode part
- (4) Screw efficiency (diameter, reed etc.)
- (5) Frictional force of the sliding part
(combination of shaft and bolt and lubricant agent)

Figure 9 shows initial characteristics at 30 rpm on standard rotating position and torque.

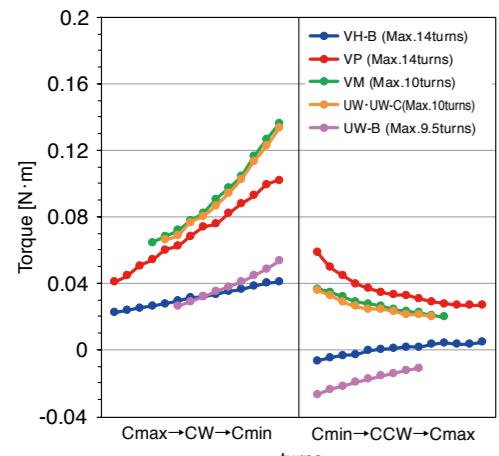


Figure 9

10. Life

The life expectancy of variable vacuum capacitors is primarily determined by: (1) and (2):

- (1) Bellows
- (2) Screw system

(1) Bellows

Bellows life, shown below, is greatly affected by the working range and temperature.

*0.5% fracture data

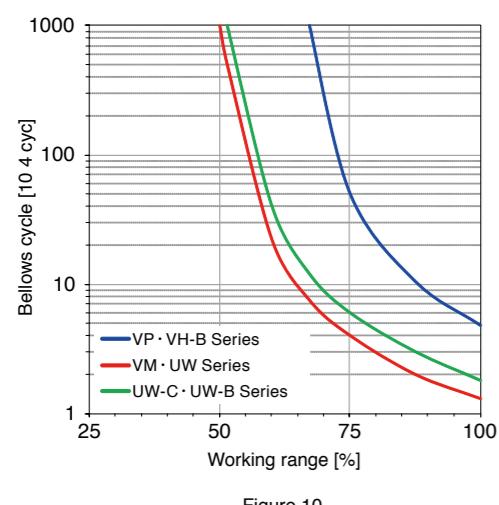


Figure 10

(2) Screw system

The capacitance adjustment screw life is determined by the total number of turns and that of reverse turns, (1 turn each way represents a 2 turn cycle), each of which is greatly affected by temperature and reverse turn acceleration. The working turns of respective types are shown as follows.

Screw life by total turns (million turns)				
VH-B option	UW-B option	VP Series	UW-C Type	VM Series
70	50	35	25	12

(Turn speed: 600 rpm, acceleration: 4.5 rpm/ms at 25 °C)

- *VH-B: ball screw option
- UW-B: ball screw option
- UW-C: special coated screw type

(3) Life of Variable Vacuum Capacitor

As per (1) and (2), the variable vacuum capacitor life is shown below:

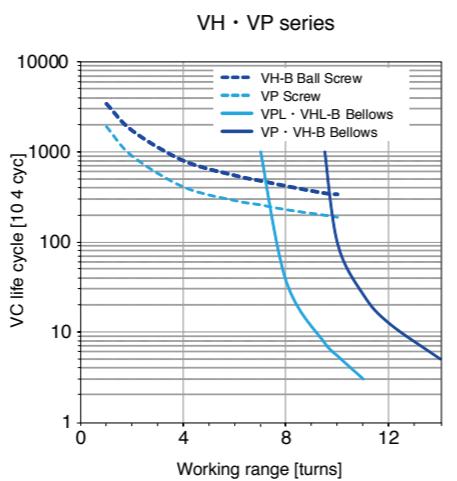


Figure 11

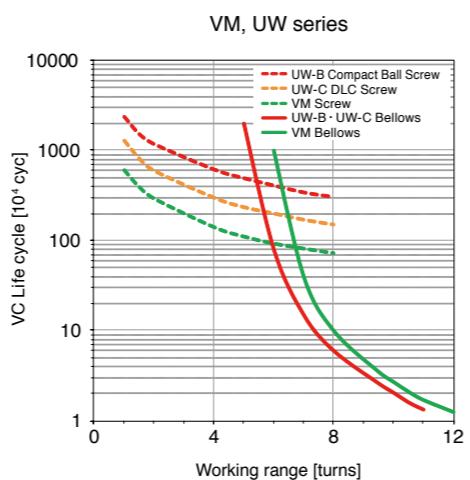


Figure 12

NOTE ①

Engineer capacitor range such that it does not exceed the total number of turns. Exceeding any/all of the conditions below may result in exponential decrease in life expectancy.

- High acceleration (greater than 30 rpm/ms)
- Dither (less than several degrees)
- High speed (greater than 600 rpm)

NOTE ②

Re-greasing is recommended after every 200,000 cycles (re-greasing: applying a coating of grease uniformly over the entire screw surface). The entire working range must be re-greased or life and/or performance may be reduced. However, re-greasing is not necessary for DLC coating type capacitors.

⚠ Handling Precautions

1. Before Use

- (1) Meiden Vacuum Capacitors are packed for shipping in engineered containers to protect them from during transport. However, an extreme external shocks may damage the internal functions of the capacitors. For this reason, it is best to check the capacitance of each device and withstand voltage values before installation. The capacitors are designed to withstand impact accelerations up to 294 m/s². Always handle VC carefully. Minor drops or careless handling may inflict surprisingly high accelerations resulting in internal damage.
- (2) Finger prints and other contamination can cause flashovers of the ceramics, wipe the ceramic with cloth (dry or wet with alcohol). DO NOT USE solvents containing chlorine (e.g.; trichloroethane).
- (3) Inspect all attaching components and structure for contamination and clean as above.
- (4) Please contact us immediately if evidence of external damage or witness marks is detected on any VC.

2. Mounting Vacuum Capacitors

- (1) When installing capacitors be vigilant about applying bending stress greater than 1225 N·cm. In particular when supporting VVC on both fixed and moving sides, mounting fittings on either side should be made of a soft material and/or flexible structure in order to protect the capacitors from bending due to thermal expansion and/or external stresses.
- (2) In motorized applications, use a flexible coupling to prevent the lateral load to the capacitance adjustment shaft. When using an inflexible coupling, a central misalignment of up to 0.2mm is permissible in most models. A greater misalignment may result dramatically shortened life expectancy and irregular rotation.
- (3) When an optional guide bearing (optional) is used for VM series, it is delivered attached to the capacitors with two screws (diagonally to each other) in an optimal position of alignment. DO NOT loosen or remove the bearing assembly.
- (4) Should you elect to devise your own guide bearing, use a methodology on the premise that misalignment of a maximum of ±1mm may exist between the capacitance adjustment screw and the M5 mounting screw taps.
- (5) Use torque settings less than the maximum specs of the M6 screw taps on the fixed and moving sides is 242N·cm, that of the M5 is 147N·cm, and that of the M4 is 71.6N·cm.

3. Using Vacuum Capacitors

- (1) The maximum allowable vibration level of the capacitors is 98m/s². Greater vibration levels will damage the capacitors.
- (2) When the surface temperature of the capacitor exceeds 125°C, an abnormally high current may result. Water-cooling flanges should be considered in high heat/high power applications.
- (3) Metal objects near the sides of the VC ceramic envelope cause changes in the tuned value of the circuit and may result in flashover of the ceramic envelope.
- (4) Do not use the capacitors in environments where corrosive gases (particularly sulfur and chlorine) or dust may exist. The surface of the capacitors may give rise to discoloration, or in some cases the properties of the capacitors may be affected.

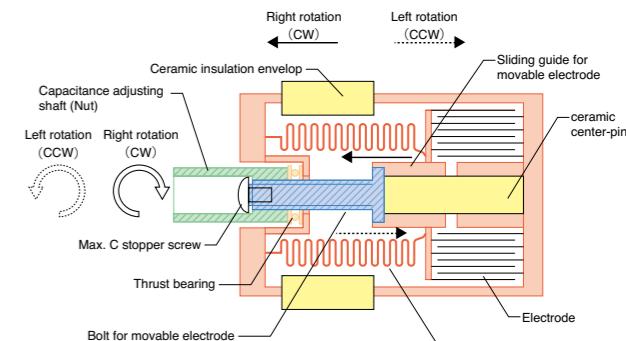
- (5) Do not over rotate the actuator CCW after reaching the maximum capacitance position (as in positioning). In case the capacitance adjusting shaft and screw are loosened, it is possible that the screw life may decrease due to application of excessive strong pressure to the nut and screw.

4. Using VM, VT, FC and FS Series

- (1) A small thump or tick may accompany and end stop collision by the ceramic center pin (internal component of the cap). Orientation can affect minor noises made by the pin. These noise should be of no consequence.
- (2) A squeaky sound may be generated when the ceramic center pin slides in its guide. There are no problems created by the noise. Different rotation speeds may cause sound to change in pitch and loudness, there is no effect on life or performance.

5. Using VM Series

- (1) VM Series are variable vacuum capacitors with a center guide pin structure. Capacitance decreases with rightward (clockwise) rotation of the shaft and can be adjusted to the minimum capacitance in the end-stop position. Likewise, capacitance increases with leftward (counterclockwise) rotation and can be adjusted to the maximum capacitance in the end-stop position.



- (2) If the capacitor is misaligned with an actuating motor, noise may occur and/or the actuator shaft may be pulled out. Such problems are caused by the lateral stress to the center pin for misalignment.

6. Technical Information

- (1) This catalog contains only a portion of the technical information available. MEIDEN publishes technical data sheets to provide the dimensional outlines (drawings), frequency-current characteristics, and tuner turns-capacitance characteristics of all vacuum capacitors.
- (2) In your consideration of purchasing MEIDEN Vacuum Capacitors, please contact your sales representative for current data sheets as they do change over time and we reserve the right to update them as needed.

Fixed Vacuum Capacitors

Type	Part number	Cmin - Cmax pF	Capacitance tolerance				Voltage kVp			Current Arms			Mounting dimensions		Weight kg	Option
			±10%	±5%	±2%	±1%	RF working	Peak test	13.56MHz	40MHz	60MHz	Total Length (Mounting length) mm	Diameter mm			
	SCF-50.03H15CA	3	○				3	5	0	1	2	66	φ15.5	0.1		
	SCF-50.09H15CA	8.5	○				3	5	1	2	2	66	φ15.5	0.1		
FC62	SCF-200.1C	9	○				12	20	6	19	28	50	φ62.4	0.8		
○	FS36	SCF-150.1Z	10	○			9	15	5	15	23	43	φ36	0.6		
	FS36	SCF-150.2Z	20	○			9	15	10	31	34	43	φ36	0.6		
	FS36	SCF-150.25Z	25	○			9	15	13	38	34	43	φ36	0.6		
	FH48C	SCF-300.25H48C	25	○			18	30	27	79	99	73	φ48	0.5	IK-1	
	FH65C	SCF-350.25H65C	25		○		21	35	31	93	118	87	φ65	0.8	IK-1	
	FS36	SCF-200.3Z	30	○			12	20	21	38	34	43	φ36	0.6		
	FS36	SCF-150.33Z	33	○			9	15	17	38	34	43	φ36	0.6		
	FS36	SCF-150.4Z	40	○			9	15	21	38	34	43	φ36	0.6		
	FC52	SCF-150.5C	50		○		9	15	27	79	89	48	φ52.4	0.4		
	FC52A	SCF-150.5CA	50		○		9	15	27	61	55	52	φ52.4	0.6		
○	FS36	SCF-150.5Z	50		○		9	15	27	38	34	43	φ36	0.6		
	FC62	SCF-200.5C	50		○		12	20	36	76	68	50	φ62.4	0.8		
	FH48C	SCF-300.5H48C	50		○		18	30	54	110	99	73	φ48	0.5	IK-1	
	FH65C	SCF-350.5H65C	50		○		21	35	63	131	118	87	φ65	0.8	IK-1	
	FS36	SCF-150.75Z	75	○			9	15	40	38	34	43	φ36	0.6		
	FC62	SCF-200.75C	75	○			12	20	54	76	68	50	φ62.4	0.8		
	FH48C	SCF-300.75H48C	75	○			18	30	81	110	99	73	φ48	0.5	IK-1	
	FC52A	SCF-150.8CA	80	○			9	15	43	61	55	52	φ52.4	0.6		
	FS36	SCF-150.8Z	80	○			9	15	43	38	34	43	φ36	0.6		
	FS36	SCF-150.84Z	84	○			9	15	45	38	34	43	φ36	0.6		
	FC52A	SCF-150.9CA	90	○			9	15	48	61	55	52	φ52.4	0.6		
	FS36	SCF-150.9Z	90	○			9	15	48	38	34	43	φ36	0.6		
○	FS36S	SCF-51S	100	○			3	5	18	38	34	30	φ36	0.5		
○	FS36	SCF-151Z	100	○			9	15	50	38	34	43	φ36	0.6		
	FC52	SCF-151C	100	○			9	15	54	99	89	48	φ52.4	0.4		
	FC52A	SCF-151CA	100	○			9	15	54	61	55	52	φ52.4	0.6		
	FH52WR	SCF-151H52WR	100	○	○	○	9	15	54	99	89	52	φ52.4	0.6	IK-1	
	FHA52WR	SCF-151H52WR	100	○			9	15	54	99	89	52	φ52.4	0.6	IK-1	
	FC62	SCF-201C	100	○			12	20	72	76	68	50	φ62.4	0.8		
	FH52WR	SCF-201H52WR	100	○	○	○	12	20	72	99	89	52	φ52.4	0.6	IK-1	
○	FH48C	SCF-301H48C	100	○			18	30	108	110	99	73	φ48	0.5	IK-1	
	FH48C	SCF-351H48C	100	○			21	35	126	110	99	73	φ48	0.5	IK-1	
○	FH65C	SCF-351H65C	100	○	○	○	21	35	126	131	118	87	φ65	0.8	IK-1	
	SCF-351K	102	○				21	35	129	114	103	75	φ128	3.3		
	FS36S	SCF-51.1S	110	○			3	5	19	38	34	30	φ36	0.5		
	FS36S	SCF-51.2S	120	○			3	5	21	38	34	30	φ36	0.5		
	FS36	SCF-151.2Z	120	○			9	15	50	38	34	43	φ36	0.6		
	FC52A	SCF-151.2CA	120	○			9	15	65	61	55	52	φ52.4	0.6		
	FH48C	SCF-251.25H48C	125	○			15	25	112	110	99	73	φ48	0.5	IK-1	
	FS36S	SCF-51.3S	130	○			3	5	23	38	34	30	φ36	0.5		
	FS36	SCF-151.3Z	130	○			9	15	50	38	34	43	φ36	0.6		
	FS36S	SCF-51.4S	140	○			3	5	25	38	34	30	φ36	0.5		
	FS36	SCF-151.4Z	140	○			9	15	50	38	34	43	φ36	0.6		
○	FS36S	SCF-51.5S	150	○			3	5	27	38	34	30	φ36	0.5		
	FS36	SCF-151.5Z	150	○			9	15	50	38	34	43	φ36	0.6		
	FC52A	SCF-151.5CA	150	○			9	15	80	61	55	52	φ52.4	0.6		
	FH48C	SCF-251.25H48C	150	○			15	25	135	110	99	73	φ48	0.5	IK-1	
	FS36S	SCF-51.6S	150	○			3	5	27	38	34	30	φ36	0.5		
	FS36	SCF-151.6Z	150	○			9	15	50	38	34	43	φ36	0.6		
○	FS36S	SCF-51.7S	150	○			3	5	27	38	34	30	φ36	0.5		
	FS36	SCF-151.7Z	150	○			9	15	80	61	55	52	φ52.4	0.6		
	FC52	SCF-151.5C	150	○			9	15	81	99	89	48	φ52.4	0.4		
	FH52WR	SCF-151.5H52WR	150	○	○	○	9	15	81	99	89	52	φ52.4	0.6	IK-1	
	FHA52WR	SCF-151.5H52WR	150	○			9	15	81	99	89	52	φ52.4	0.6	IK-1	
	FC62	SCF-201.5C	1													

Variable Vacuum Capacitors

Type	Part number	Cmin - Cmax pF		Capacitance tolerance		Voltage kVp		Current Arms			Tuner turns	Tuner operating torque N·cm	Mounting dimensions			Weight kg	Option				
		Min	Max	±10%	±5%	RF working	Peak test	135MHz	40MHz	60MHz			Total length mm	Mounting length mm	Outer diameter mm		Water-cooled	Ball screw	NP	Guide screw	Fixed side
VM	SCV-300.2G	6	20	○	○	18	30	21	63	62	5.5±0.5	19.6	100	80	φ60.4	0.8					
VM	SCV-250.3G	6	30	○	○	15	25	27	68	62	5.5±0.5	19.6	100	80	φ60.4	0.8					
VP110	SCV-350.3P110	8	30	○	○	21	35	37	111	117	14.5±0.5	18	154	115	φ110	2.6	AWM-4	AWM-4	○		
VM	SCV-150.5	10	50	○	○	9	15	27	76	68	12±1	24.5	140	115	φ60.4	1.0					
UW55	SCV-200.5FH55UW-C	6	50	○	○	12	20	36	71	64	10.5±0.5	18	133.5	90.6	φ55	0.7					
VP82L	SCV-200.5P82L	12	50	○	○	12	20	36	106	96	10.5±0.5	18	125	95	φ82	1.6	AWM-4	AWM-5	○		
UWA55	SCV-150.6HA55UW-C	3	60	○	○	9	15	32	71	64	10.5±0.5	18	133.5	90.6	φ55	0.7					
VT	SCV-150.75GTB	5	75	○	○	9	15	40	61	55	6±1	17.6	107	85	φ53	0.8					
UWA55	SCV-150.75HA55UW-C	5	75	○	○	9	15	40	71	64	10.5±0.5	18	133.5	90.6	φ55	0.7					
VM	SCV-250.8G	10	80	○	○	15	25	72	68	62	5.5±0.5	19.6	100	80	φ60.4	0.5					
C82HE	SCV-250.8C82HE-AADG-F	10	80	○	○	15	25	72	106	96	14±0.5	18	132	101	φ82	1.5					
VP82L	SCV-250.8P82L	11	80	○	○	15	25	72	106	96	10.5±0.5	18	125	95	φ82	1.6	AWM-4	AWM-5	○		
VT	SCV-151.1GT	20	100	○	○	9	15	54	61	55	10.5±0.5	19.6	130	108	φ52.4	0.7					
○ UW55	SCV-151H55UW-C	10	100	○	○	9	15	54	71	64	10.5±0.5	18	133.5	90.6	φ55	0.7		○ ○			
VM	SCV-151	10	100	○	○	9	15	54	76	68	12±1	24.5	140	115	φ60.4	1.0	SJ-2	AWF-2	AWM-2		
VP65	SCV-151P65	10	100	○	○	9	15	54	99	89	14.5±0.5	18	154	115	φ65	1.2	AWF-6	AWM-6	○		
UW55	SCV-201H55UW-C	10	100	○	○	12	20	72	71	64	10.5±0.5	18	133.5	90.6	φ55	0.7					
VP65	SCV-201P65	10	100	○	○	12	20	72	99	89	14.5±0.5	18	154	115	φ65	1.2	AWF-6	AWM-6	○		
VP82L	SCV-201P82L	12	100	○	○	12	20	72	106	96	10.5±0.5	18	125	95	φ82	1.6	AWM-4	AWM-5	○		
C82HE	SCV-251C82HE-B3	12	100	○	○	15	25	90	106	96	7.8~8.3	15	132	101	φ82	1.5					
VP82L	SCV-251P82L	12	100	○	○	15	25	90	106	96	10.5±0.5	18	125	95	φ82	1.6	AWM-4	AWM-5	○		
VP94L	SCV-251P94L	14	100	○	○	15	25	90	125	113	10.5±0.5	18	125	95	φ94	1.8	AWM-4	AWM-5	○		
VP110	SCV-351P110	20	100	○	○	21	35	126	129	117	14.5±0.5	18	154	115	φ110	2.6	AWM-4	AWM-4	○		
	SCV-81.25C36LI	8	125	○	○	4.8	8	36	27	24	15.5±0.5	15	106.5	66	φ36	0.3					
UW55	SCV-151.5FH55UW-C	7	150	○	○	9	15	81	71	64	10.5±0.5	18	133.5	90.6	φ55	0.7					
VP82L	SCV-201.5P82L	12	150	○	○	12	20	108	106	96	10.5±0.5	18	125	95	φ82	1.6	AWM-4	AWM-5	○		
VP110	SCV-201.5P110C	11	150	○	○	12	20	108	129	117	14.5±0.5	18	154	115	φ110	2.6	AWM-4	AWM-4	○		
VP110	SCV-251.5P110C	11	150	○	○	15	25	135	129	117	14.5±0.5	18	154	115	φ110	2.6	AWM-4	AWM-4	○		
VM	SCV-201.7G	45	170	○	○	12	20	90	68	62	5.5±0.5	19.6	106	80	φ63	0.8					
VM	SCV-152	12	200	○	○	9	15	100	76	68	12±1	24.5	140	115	φ60.4	1.0	SJ-2	AWF-2	AWM-2		
VP65	SCV-152P65C	5.5	200	○	○	9	15	108	99	89	14.5±0.5	18	154	115	φ65	1.2	AWF-6	AWM-6	○		
VP65	SCV-202P65	15	200	○	○	12	20	130	99	89	14.5±0.5	18	154	115	φ65	1.2	AWF-6	AWM-6	○		
C82HE	SCV-202C82HE-AAFG-B	12	200	○	○	12	20	140	106	96	10.5±0.5	18	132	101	φ82	1.5					
VP82	SCV-202P82	20	200	○	○	12	20	140	106	96	14.5±0.5	18	154	115	φ82	1.8	AWM-4	AWM-5	○		
VP82L	SCV-202P82L	12	200	○	○	12	20	140	106	96	10.5±0.5	18	125	95	φ82	1.6	AWM-4	AWM-5	○		
VP110	SCV-302P110	25	200	○	○	18	30	170	129	117	14.5±0.5	18	154	115	φ110	2.6	AWM-4	AWM-4	○		
VP82L	SCV-202.2P82L	12	220	○	○	12	20	140	106	96	10.5±0.5	18	125	95	φ82	1.6	AWM-4	AWM-5	○		
VP94L	SCV-202.2P94L	14	220	○	○	12	20	159	125	113	10.5±0.5	18	125	95	φ94	1.8	AWM-4	AWM-5	○		
VP110	SCV-202.5P110C	13	245	○	○	12	20	170	129	117	14.5±0.5	18	154	115	φ110	2.6	AWM-4	AWM-4	○		
VP110	SCV-252.5P110C	13	245	○	○	15	25	170	129	117	14										