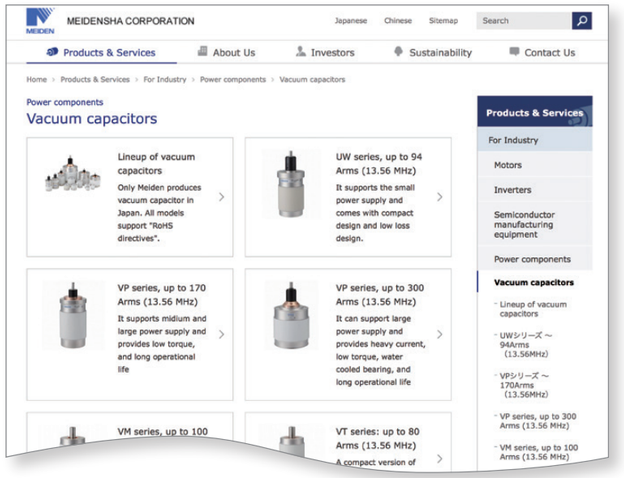
Meidensha.com: An Introduction to our Vacuum Capacitors

For more information, please visit our website:

https://www.meidensha.com/products/industry/prod_03/prod_03_08/index.html



MEIDENSHA CORPORATION

ThinkPark Tower, 2-1-1, Osaki, Shinagawa-ku, Tokyo, 141-6029 Japan

www.meidensha.com

Safety Precautions

Prior to using our products, please read through the relevant instruction manuals and related materials.

In the case of applications in facilities where fatal injuries are anticipated as a result of product failure, malfunction, and/or misoperation, or where the occurrence of serious losses is predicted, it is recommended to take adequate measures separately by installing, for example, proper safety devices.

Agents and distributors for our products

In regard to queries about these products, please contact the Industrial Component Business Unit specified below.

● Vacuum Device Sales Section Industrial Component Business Unit : ThinkPark Tower 2-1-1 Osaki, Shinagawa-ku, Tokyo 141-6029 Japan
Phone: +81-3-6420-7679, FAX: +81-3-5745-3058

■ Due to our commitment to continually improving the function and performance of our products, specifications are subject to change without prior notice.
■ The nameplates for marking the product types and logos shown in this catalog may differ from the actual ones.

VEGETABLE OIL INK

BA80-3116L As of Mar.,2022
2022-3ME(1.175V)0.8L

Vacuum Capacitors

MEIDEN
Quality connecting the next

MADE IN JAPAN
RoHS compliant

Supporting solutions for issues customers face with environmental consideration and high quality.

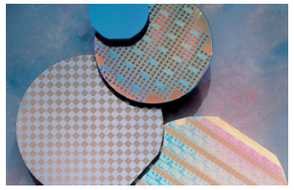
Reliable Vacuum Technology Since 1968

MEIDEN has been developing and manufacturing highly reliable vacuum capacitors since 1994, utilizing vacuum technology and know-how we have accumulated through the development and manufacture of vacuum circuit breakers for over half a century. There are two methods of manufacturing vacuum devices: constant air exhaustion using a vacuum pump and the vacuum sealing at the manufacturing stage. MEIDEN vacuum capacitors are manufactured using the vacuum sealing method and are designed to maintain the vacuum state for a long period of time.

Production location

Our vacuum capacitors are all manufactured at Meiden Numazu Works.

Main Applications



Semiconductor Manufacturing Equipment

Vacuum capacitors (VCs) are an integral part of semiconductor manufacturing processes. VCs are used in the impedance matching networks which enable physical vapor deposition (PVD), chemical vapor deposition (CVD) and etching.

Liquid Crystal Display (LCD) Panel Manufacturing Equipment

VCs are a key component of the impedance matching networks of the radio frequency (RF) generators used to manipulate high-current plasma in order to manufacture LCD panels, such as flat screen TVs.

Photovoltaic Cell Manufacturing Equipment

LCD technology is used for the manufacture of photovoltaic power generating panels (solar cells). Here too, VCs are incorporated in the impedance matching network of RF generators for plasma generation.

Broadcasting

VCs 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.

Medical Care and Measuring Devices

Vacuum capacitors are used in chemical composition analysis and magnetic resonance imaging (MRI).

Research

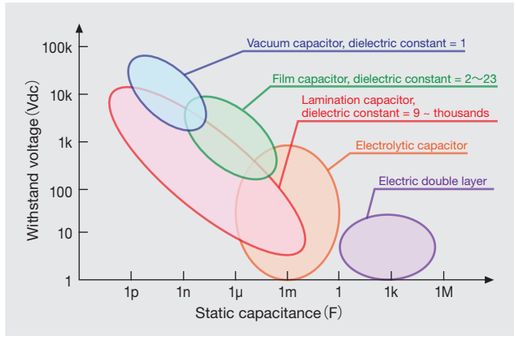
Vacuum capacitors are used in particle accelerators and other fundamental science research facilities.

Wireless charging

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

Features

Vacuum capacitors (VCs) have a significantly lower Equivalent Series Resistance (ESR) than other technologies. Using high vacuum as the dielectric results in high current and voltage ratings, coupled with low losses, especially when compared to alternative forms of dielectrics. We offer five series of VCs, ranging in capacitance from 1 pF to 6000 pF, with peak voltage tolerance ranging from 3 kVp to 40 kVp. Vacuum capacitors are the optimal choice where high voltage, high current and high frequencies intersect.

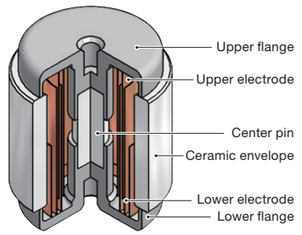


Structure

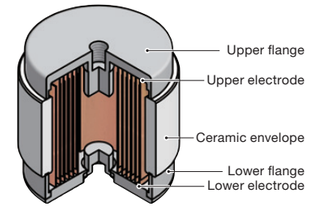
Variable vacuum capacitors incorporate movable plate electrodes. The plates move in relation to each other within the vacuum, using precision screw actuators, which provide excellent accuracy and repeatability. The bellows contains the vacuum, allowing motion without the use of seals. Since the bellows also carry current, we have engineered our VCs with a variety of internal structures to choose from, including long-lasting stainless steel bellows or double bellows, to accommodate any current handling and life cycle needs in the industry. This technology is also used in our high-power vacuum contactors and interrupters, which are used in utility power systems, bullet trains and other high-power infrastructure projects.

Fixed Type

FS • FC Series Compact type

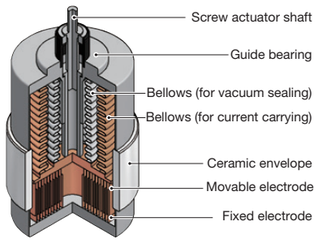


FH Series Large current type

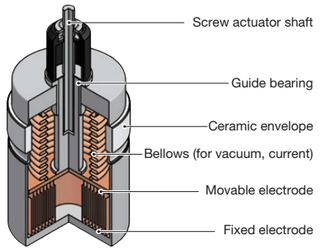


Variable Type

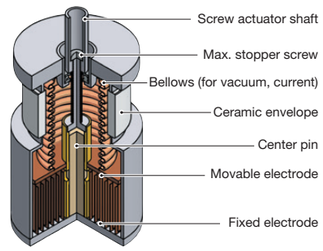
VP Series Double bellows



UW Series Low-loss high-strength bellows



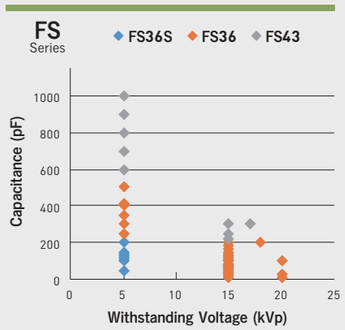
VM Series The first model

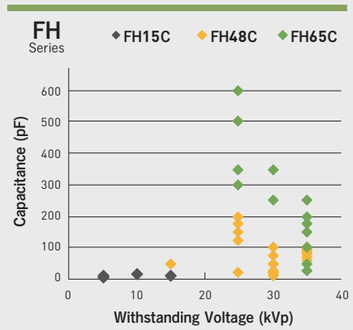


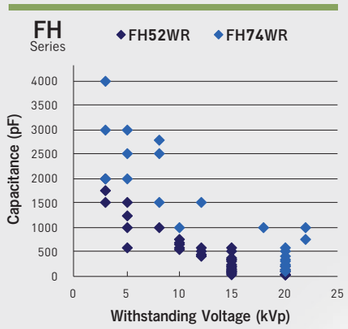
Fixed Vacuum Capacitors

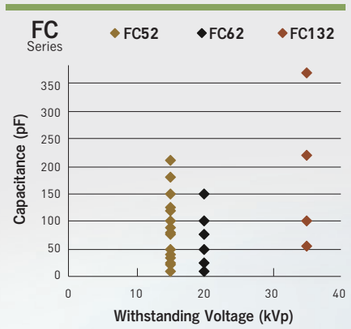
Trimmable vacuum capacitors

Withstand Voltage vs Capacitance









FS Series — up to 50 Arms (13.56 MHz)

Designed for low-power applications

Features

- **Compact design**
- **Stainless steel electrodes facilitate high voltage tolerance in a compact form.**
- **Robust internal construction**

Type

Type		Part Number		Capacitance (pF)※3	Voltage (kVp)※1 RF Working	Voltage (kVp)※1 Peak Test	Current (Arms) 13.56MHz	Current (Arms) 40MHz	Current (Arms) 60MHz	Mounting Dimensions (mm)	Weight (kg)	Options (Mounting kit)
FS36S		SCF-51S	※2	100	3	5	18	38	34	L30 × ϕ36	~0.5	—
		SCF-51.1S	※2	110	3	5	19	38	34			
		SCF-51.2S	※2	120	3	5	21	38	34			
		SCF-51.3S	※2	130	3	5	23	38	34			
		SCF-51.4S	※2	140	3	5	25	38	34			
		SCF-51.5S	※2	150	3	5	27	38	34			
		SCF-52S	※2	200	3	5	36	38	34			
FS36		SCF-150.1Z	※2	10	9	15	5	15	23	L43 × ϕ36	~0.6	—
	NEW	SCF-200.1Z	※2	10	12	20	7	21	31			
		SCF-150.2Z	※2	20	9	15	10	31	34			
		SCF-150.25Z	※2	25	9	15	13	38	34			
		SCF-200.3Z	※2	30	12	20	21	38	34			
		SCF-150.33Z	※2	33	9	15	17	38	34			
		SCF-150.4Z	※2	40	9	15	21	38	34			
		SCF-150.5Z	※2	50	9	15	27	38	34			
	NEW	SCF-150.6Z	※2	60	9	15	32	38	34			
	NEW	SCF-200.6Z	※2	60	12	20	43	38	34			
		SCF-150.75Z	※2	75	9	15	40	38	34			
		SCF-150.8Z	※2	80	9	15	43	38	34			
		SCF-150.84Z	※2	84	9	15	45	38	34			
		SCF-150.9Z	※2	90	9	15	48	38	34			
		SCF-151Z	※4	100	9	15	50	38	34			
	NEW	SCF-151.1Z	※4	110	9	15	50	38	34			
	NEW	SCF-151.15Z	※4	115	9	15	50	38	34			
		SCF-151.2Z	※4	120	9	15	50	38	34			
		SCF-151.3Z	※4	130	9	15	50	38	34			
		SCF-151.4Z	※4	140	9	15	50	38	34			
		SCF-151.5Z	※4	150	9	15	50	38	34			
		SCF-151.8Z	※4	180	9	15	50	38	34			
		SCF-152Z	※4	200	9	15	50	38	34			
		SCF-52.5Z	※2	250	3	5	45	38	34			
		SCF-102.5Z	※4	250	6	10	50	38	34			
		SCF-53Z	※4	300	3	5	50	38	34			
		SCF-103Z	※4	300	6	10	50	38	34			
		SCF-53.5Z	※4	350	3	5	50	38	34			
		SCF-103.5Z	※4	350	6	10	50	38	34			
		SCF-54Z	※4	400	3	5	50	38	34			
		SCF-104Z	※4	400	6	10	50	38	34			
		SCF-55Z	※4	500	3	5	50	38	34			
		SCF-105Z	※4	500	6	10	50	38	34			
FS43		SCF-152.2	※4	220	9	15	50	38	34	L43 × ϕ43	~0.8	—
		SCF-152.5	※4	250	9	15	50	38	34			
		SCF-153	※4	300	9	15	50	38	34			
	NEW	SCF-173	※4	300	10.2	17	50	38	34			
		SCF-56	※4	600	3	5	50	38	34			
		SCF-57	※4	700	3	5	50	38	34			
		SCF-58	※4	800	3	5	50	38	34			
		SCF-59	※4	900	3	5	50	38	34			
		SCF-510	※4	1000	3	5	50	38	34			

※1 : The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※2 : Max current values assume base sink/convection cooling.
※3 : Capacitance tolerance: below 50 pF : ±10 %, above 50 pF : ±5 %
※4 : Water cooling adds 50W thermal capacity.

FC Series

up to 100 Arms (13.56 MHz)

Designed for medium-power applications

Features

- **High-current copper electrode**
- **Robust internal construction**

FC52　FC52A　FC62

FC Series Product Types

SCF-□□□□□CA

Fixed Vacuum Capacitors　①　②　③

①: Peak test voltage (kV)

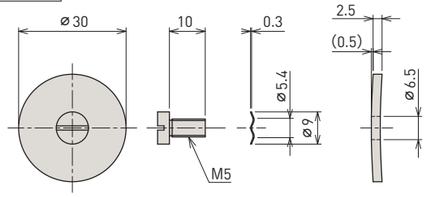
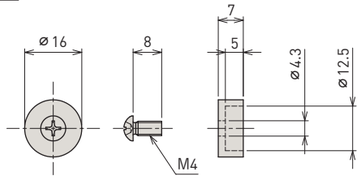
②: Capacitance (x100pF)

③: Symbol (Series)

C　Flat mounting surface
CA　With centering structure

Optional

- **Mounting kit**
  Screws and washer sets commonly used in installation

Applicable models	FC52、FC62	FC52A
Mounting kit	IK-0 	IK-2 

Type

Type	Part Number	Capacitance (pF) ※3	Voltage (kVp) ※1		Current (Arms)			Mounting Dimensions (mm)	Weight (kg)	Options (Mounting kit)
			RF Working	Peak Test	13.56MHz	40MHz	60MHz			
FC52	**SCF-150.5C** ※2	50	9	15	27	79	89	L48 × ϕ52.4	～0.4	IK-0
	SCF-151C ※2	100	9	15	54	99	89			
	SCF-151.5C ※2	150	9	15	81	99	89			
	SCF-152C ※2	200	9	15	108	99	89			
FC52A	**SCF-150.5CA** ※2	50	9	15	27	61	55	L52 × ϕ52.4	～0.6	IK-2
	SCF-150.8CA ※2	80	9	15	43	61	55			
	SCF-150.9CA ※2	90	9	15	48	61	55			
	SCF-151CA ※2	100	9	15	54	61	55			
	SCF-151.2CA ※2	120	9	15	65	61	55			
	SCF-151.5CA ※2	150	9	15	80	61	55			
	SCF-151.8CA ※2	180	9	15	80	61	55			
	SCF-152.1CA ※2	210	9	15	80	61	55			
FC62	**SCF-200.1C** ※2	9	12	20	6	19	28	L50 × ϕ62.4	～0.8	IK-0
	SCF-200.5C ※2	50	12	20	36	76	68			
	SCF-200.75C ※2	75	12	20	54	76	68			
	SCF-201C ※2	100	12	20	72	76	68			
	SCF-201.5C ※4	150	12	20	100	76	68			

※1: The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※2: Max current values assume base sink/convection cooling.
※3: Capacitance tolerance: below 50 pF : ±10 %, above 50 pF : ±5 %
※4: Water cooling adds 50W thermal capacity.

TC Series

High voltage and High frequency tolerance

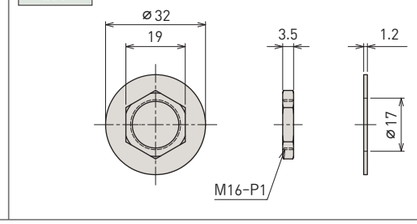
TC48

Features

- **Fine-tuning Option (Trimmer Capacitors)**
  The capacitance can be adjusted by few picofarads
- **Can be adjusting after installation**

Optional

- **Mounting kit**
  Screws and washer sets commonly used in installation

Applicable models	TC48
Mounting kit	IK-9 

Type

Type		Part Number	Capacitance (pF)		Voltage (kVp) ※1		Current (Arms)			Mounting Dimensions (mm)			Weight (kg)	Options (Mounting kit)
			Min.	Max	RF Working	Peak Test	13.56MHz	40MHz	60MHz	Total Length	Mounting Length	Diameter		
TC48	NEW	**SCT-300.2H48C** ※4	8	20	18	30	21	63	78	72	62	48	～0.5	IK-9
	NEW	**SCT-300.3H48C** ※4	25	35	18	30	37	86	78					
	NEW	**SCT-210.4H48C** ※4	35	45	12.6	21	34	86	78					

※1: The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※4: Water cooling adds 50W thermal capacity.

FH Series　up to 172 Arms (13.56 MHz)

Designed for high power applications

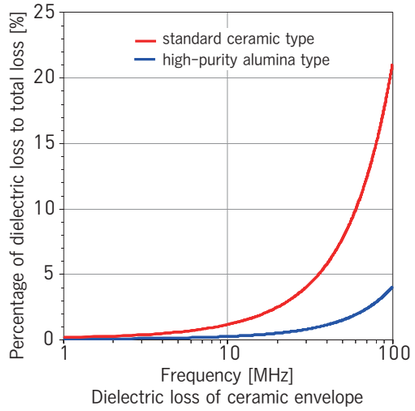
Features

● High voltage tolerance

We offer a variety of different capacitors covering peak test voltages of 25 kVp, 30 kVp, and 35 kVp

FH48C　FH52WR　FH65C

Low-Loss with High-Purity Alumina Ceramic



Dielectric loss of ceramic envelope

Dielectric losses of ceramic envelope

Vacuum capacitor has resistance losses and dielectric as heat losses.

High purity alumina ceramics exhibit reduced low dielectric losses and is recommended for applications requiring higher power at frequencies over 40MHz.

Standard Ceramic Type (FH52WR)　High Purity Alumina Ceramic Type (FHA52WR)

FH Series Product Types

SCF-□□□□□H□□WR

Fixed Vacuum Capacitors　①　②　③　④　⑤

①: Peak test voltage (kV)

②: Capacitance (x100pF)

③: Design identification symbol
- **H**　Alumina Al2O3 94～98%
- **HA**　Alumina Al2O3 98%～ (Apply FH52 only)

④Diameter (mm)

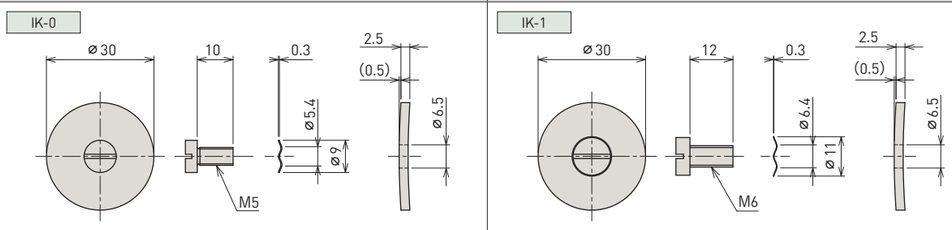
⑤: Symbol (Series)
- **C**　Copper ring electrode
- **WR**　Copper spiral electrode

Optional

● Mounting kit

Screws and washer sets commonly used in installation. Installation kits are sold separately.

Applicable models	FH48C	FH52WR、FHA52WR、FH65C、FH74WR
Mounting kit	IK-0	IK-1



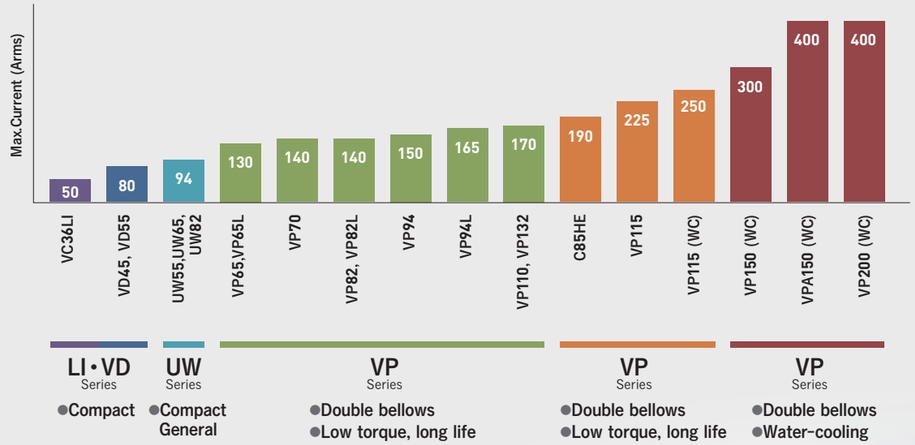
Type

Type		SCF-300.25H48C	Capacitance (pF) ※3	Voltage (kVp) ※1		Current (Arms)			Mounting Dimensions (mm)	Weight (kg)	Options (Mounting kit)
				RF Working	Peak Test	13.56MHz	40MHz	60MHz			
FH48C	NEW	SCF-300.1H48C ※2	10	18	30	10	31	47	L 73 × ϕ48	～0.5	IK-0
	NEW	SCF-300.2H48C ※2	20	18	30	21	63	95			
		SCF-300.25H48C ※2	25	18	30	27	79	99			
		SCF-300.5H48C ※2	50	18	30	54	110	99			
	NEW	SCF-350.5H48C ※2	50	21	35	63	110	99			
		SCF-300.75H48C ※2	75	18	30	81	110	99			
	NEW	SCF-350.9H48C ※2	90	21	35	113	110	99			
		SCF-301H48C ※2	100	18	30	108	110	99			
		SCF-351H48C ※2	100	21	35	126	110	99			
		SCF-251.25H48C ※2	125	15	25	112	110	99			
		SCF-251.5H48C ※2	150	15	25	135	110	99			
	NEW	SCF-301.5H48C ※4	150	18	30	145	110	99			
		SCF-251.75H48C ※4	175	15	25	145	110	99			
		SCF-252H48C ※4	200	15	25	145	110	99			
FHA52WR	NEW	SCF-200.56HA52WR ※2	56	12	20	40	99	89	L52 × ϕ52.4	～0.6	IK-1
	NEW	SCF-200.62HA52WR ※2	62	12	20	44	99	89			
FH52WR		SCF-151H52WR ※2	100	9	15	54	99	89	L52 × ϕ52.4	～0.6	IK-1
		SCF-201H52WR ※2	100	12	20	72	99	89			
		SCF-151.5H52WR ※2	150	9	15	81	99	89			
		SCF-152H52WR ※2	200	9	15	108	99	89			
		SCF-202H52WR ※4	200	12	20	130	99	89			
		SCF-152.1H52WR ※2	210	9	15	113	99	89			
		SCF-152.5H52WR ※4	250	9	15	130	99	89			
		SCF-153H52WR ※4	300	9	15	130	99	89			
		SCF-153.5H52WR ※4	350	9	15	130	99	89			
		SCF-153.7H52WR ※4	370	9	15	130	99	89			
		SCF-124H52WR ※4	400	7.2	12	130	99	89			
		SCF-124.5H52WR ※4	450	7.2	12	130	99	89			
		SCF-125H52WR ※4	500	7.2	12	130	99	89			
		SCF-155H52WR ※4	500	9	15	130	99	89			
		SCF-105.5H52WR ※4	550	6	10	130	99	89			
		SCF-56H52WR ※2	600	3	5	108	99	89			
		SCF-106H52WR ※4	600	6	10	130	99	89			
		SCF-126H52WR ※4	600	7.2	12	130	99	89			
		SCF-106.5H52WR ※4	650	6	10	130	99	89			
		SCF-107H52WR ※4	700	6	10	130	99	89			
		SCF-107.5H52WR ※4	750	6	10	130	99	89			
		SCF-510H52WR ※4	1000	3	5	130	99	89			
		SCF-810H52WR ※4	1000	4.8	8	130	99	89			
		SCF-512.5H52WR ※4	1250	3	5	130	99	89			
		SCF-315H52WR ※4	1500	1.8	3	130	99	89			
		SCF-515H52WR ※4	1500	3	5	130	99	89			
		SCF-317.5H52WR ※4	1750	1.8	3	130	99	89			
		SCF-320H52WR ※4	2000	1.8	3	130	99	89			
FH65C		SCF-350.25H65C ※2	25	21	35	31	93	118	L 87 × ϕ65	～0.8	IK-1
		SCF-350.5H65C ※2	50	21	35	63	131	118			
		SCF-351H65C ※2	100	21	35	126	131	118			
		SCF-351.5H65C ※4	150	21	35	172	131	118			
		SCF-351.75H65C ※4	175	21	35	172	131	118			
		SCF-352H65C ※4	200	21	35	172	131	118			
		SCF-352.5H65C ※4	250	21	35	172	131	118			
		SCF-253H65C ※4	300	15	25	172	131	118			
		SCF-253.5H65C ※4	350	15	25	172	131	118			
FH74WR	NEW	SCF-205H74WR ※4	500	12	20	140	106	96	L 52 × ϕ74	～0.8	IK-1
	NEW	SCF-157.5H74WR ※4	750	9	15	140	106	96			
		SCF-1010H74WR ※4	1000	6	10	140	106	96			
		SCF-520H74WR ※4	2000	3	5	121	92	83			
		SCF-530H74WR ※4	3000	3	5	121	92	83			
	NEW	SCF-340H74WR ※4	4000	1.8	3	121	92	83			

※1: The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※2: Max current values assume base sink/convection cooling.
※3: Capacitance tolerance: below 50 pF : ±10 %, above 50 pF : ±5 %
※4: Water cooling adds 50W thermal capacity.

Variable Vacuum Capacitors

Maximum current and series



LI・VD Series
- Compact

UW Series
- Compact
- General

VP Series
- Double bellows
- Low torque, long life

VP Series
- Double bellows
- Low torque, long life

VP Series
- Double bellows
- Water-cooling

VC-36LI Series — up to 50 Arms (13.56MHz)

Designed for low-power applications

Features

- **Compact design**

36LID

Motor Specifications

Item	VC-36LID
Torque	≦0.15Nm (≦15Ncm)
Turns	11.1 (±0.5) Turns
Motor axis diameter	ϕ5mm

Type

Type	Part Number	Capacitance (pF)		Voltage (kVp) ※1		Current (Arms)			Mounting Dimensions (mm)			Weight (kg)	Options (Mounting kit)
		Min.	Max	RF Working	Peak Test	13.56MHz	40MHz	60MHz	Total Length	Mounting Length	Diameter		
VC-36LI	**SCV-50.5C36LID** ※4	6	50	3	5	9	6	6	90.6	72.1	ϕ36	～0.3	IK-7

※1 : The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※4 : Water cooling adds 30W thermal capacity.

VD Series — up to 80 Arms (13.56MHz)

Designed for low-power applications

Features

- **Compact design**

VD55 VD45

Motor Specifications

Item	VD
Torque	≦0.15Nm (≦15Ncm)
Turns	10 (±0.5) Turns
Motor axis diameter	ϕ5mm

Type

Type	Part Number	Capacitance (pF)		Voltage (kVp) ※1		Current (Arms)			Mounting Dimensions (mm)			Weight (kg)	Options (Mounting kit)
		Min.	Max	RF Working	Peak Test	13.56MHz	40MHz	60MHz	Total Length	Mounting Length	Diameter		
VD45	**SCV-56.5D45W** ※4	15	650	3	5	70	53	48	115	96.5	ϕ45	～0.4	IK-6
VD55	**SCV-154.5D55W** ※4	45	450	9	15	80	61	55	115	96.5	ϕ55	～0.6	—
	SCV-55D55W ※4	35	500	3	5	40	30	27					
	SCV-85D55W ※4	35	500	4.8	8	80	61	55					
	SCV-110D55W ※4	40	1000	0.6	1	36	30	27					
	SCV-410D55W ※4	40	1000	2.4	4	80	61	55					
	SCV-115D55W ※4	45	1500	0.6	1	40	30	27					
	SCV-315D55W ※4	45	1500	1.8	3	80	61	55					

※1 : The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※4 : Water cooling adds 30W thermal capacity.

UW Series　up to 94 Arms (13.56MHz)

Designed for low-power applications

UW55　UW65

Features

- **Low-loss / high-strength bellows**
  Copper-coated stainless steel increases current-handling capability.
- **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) coating extends life and reduces friction
- **Ball screw actuators**
  Meiden has adopted ball screws for variable capacitors to overcome overload conditions such as high speed/ high acceleration reverse matching, same range continuous operation, micro-motion and hunting oscillation. They provide vastly superior life expectancy, exhibiting near-zero friction for high-speed and high acceleration / deceleration functions.
  The UW series is available with small ball screw profiles to meet size constraints and extend life.

UW Series Product Types

SCV-□□□□□H□□UW-□ (□)

Variable Vacuum Capacitors　①　②　③　④　⑤　⑥　⑦

①: Peak test voltage (kV)

②: Capacitance
(x100pF)

③: Design identification symbol
H Alumina Al2O3 94～98%
FH Minimum non-linear region (2 turns)
HA For high frequencies Alumina Al2O3 98%～ Non-linear region (4 turns)

④: Diameter (mm)

⑤: Symbol (Series)
UW Flat mounting surface
UWA Fixed side 4-point mounting
UWD Fixed side 4-point mounting

⑥: Types of screw
Blank Standard (No coating)
-C DLC coating
-B3 Ball screw

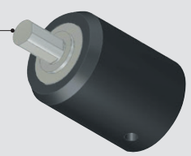
⑦: Types of shaft (Options)
Blank Standard
(xx) See options

⑥: Types of screw

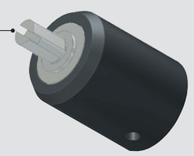
-B3
ϕ12.7mm
Round Hole

⑦: Types of shaft (Options)

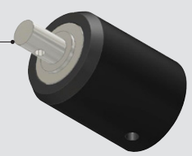
Blank Standard
ϕ6.35mm
Two flat



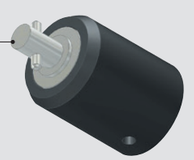
(S6)
ϕ6.35mm
Two flat + slit



(S8)
ϕ6.35mm
Round Hole
Pin hole



(S17)
ϕ6.35mm
Round Hole
With pin



Motor Specifications

Item	UW-C	UW-B (Ball Screw)
Torque	≦0.18Nm (≦18Ncm)	≦0.15Nm (≦15Ncm)
Turns	10.5 (±0.2) Turns	9.5 ($^{+0.2}_{0}$) Turns
Motor axis diameter	ϕ6.35mm	ϕ12.7mm

Type

Type	Part Number		Capacitance (pF) Min.	Capacitance (pF) Max	Voltage (kVp) ※1 RF Working	Voltage (kVp) ※1 Peak Test	Current (Arms) 13.56MHz	Current (Arms) 40MHz	Current (Arms) 60MHz	Mounting Dimensions (mm) Total Length	Mounting Dimensions (mm) Mounting Length	Mounting Dimensions (mm) Diameter	Weight (kg)	Options
UW55	SCV-150.6HA55UW-C	※4	3	60	9	15	32	71	64	133.5	90.6	ϕ55	～0.7	-B3
	SCV-150.75HA55UW-C	※4	5	75	9	15	40	71	64					
	SCV-150.5H55UW-C	※4	6	50	9	15	27	71	64					
	SCV-151H55UW-C	※4	10	100	9	15	72	71	64					
	SCV-151.5FH55UW-C	※4	7	150	9	15	81	71	64					
	SCV-152.5H55UW-C	※4	25	250	9	15	94	71	64					
	SCV-83.5FH55UW-C	※4	7	350	4.8	8	94	71	64					
	SCV-55FH55UW-C	※4	7	500	3	5	90	71	64					
	SCV-85H55UW-C	※4	35	500	4.8	8	94	71	64					
	SCV-310H55UW-C	※4	35	1000	1.8	3	94	71	64					
	SCV-510H55UW-C	※4	35	1000	3	5	94	71	64					
	SCV-415H55UW-C	※4	150	1500	2.4	4	94	71	64					
UW65	SCV-125H65UW-C	※4	50	500	7.2	12	94	71	64	133.5	90.6	ϕ65	～0.9	-B3
	SCV-155H65UW-C	※4	50	500	9	15	94	71	64					
	SCV-810H65UW-C	※4	100	1000	4.8	8	94	71	64					
	SCV-1010H65UW-C	※4	100	1000	6	10	94	71	64					
	SCV-415H65UW-C	※4	150	1500	2.4	4	94	71	64					
	SCV-515H65UW-C	※4	150	1500	3	5	94	71	64					
	SCV-320H65UW-C	※4	200	2000	1.8	3	94	71	64					
UW82	SCV-158FH82UW-C	※4	50	800	9	15	94	71	64	133.5	90.6	ϕ82	～1.3	-B3
	SCV-1014H82UW-C	※4	140	1400	6	10	94	71	64					
	SCV-815H82UW-C	※4	150	1500	4.8	8	94	71	64					

※1: The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※4: Water cooling adds 30W thermal capacity.

VC-82HE • 85HE Series

up to 225 Arms (13.56MHz)

Designed for medium-power applications

Features

- **Double bellows with special copper alloy**
  Designed for high current applications, double bellows system provides highest current capacity and extended durability while exhibiting low actuation torque
- **Reinforced actuator screw system**
  Coated with long-life diamond-like carbon (DLC)

Optional

- **Ball screw actuators**

C82HE

VC-82HE-B Optional Ball Screw

C82HE-B3

Motor Specifications

Item	SCV-103.3C82HEW -AADG-J	SCV-202C82HE -AAFG-B	SCV-250.8C82HE -AADG-F	SCV-251C82HE-B3 (Ball Screw)	SCVW-252.5C85HE
Torque	≦0.18Nm(≦18Ncm)	≦0.18Nm(≦18Ncm)	≦0.18Nm(≦18Ncm)	≦0.15Nm(≦15Ncm)	≦0.18Nm(≦18Ncm)
Turns	12(±0.2)Turns	10.5(±0.2)Turns	13.5(±0.2)Turns	8(+0.5/-0)Turns	10.3(±0.2)Turns
Motor axis diameter	ϕ12.7mm	ϕ12.7mm	ϕ12.7mm	ϕ12.7mm	ϕ6.35mm

Type

Type		Part Number	Capacitance (pF)		Voltage (kVp) ※1		Current (Arms)			Mounting Dimensions (mm)			Weight (kg)	Options
			Min.	Max	RF Working	Peak Test	13.56MHz	40MHz	60MHz	Total Length	Mounting Length	Diameter		
VC-82HE		SCV-250.8C82HE-AADG-F ※4	10	80	15	25	72	106	96	132	101	ϕ82	~1.5	-B3
		SCV-251C82HE-B3 ※4	12	100	15	25	90	106	96					
		SCV-202C82HE-AAFG-B ※4	12	200	12	20	140	106	96					
		SCV-103.3C82HEW-AADG-J ※4	30	330	6	10	119	106	96					
VC-85HE	NEW	SCVW-252.5C85HE ※6	12	250	15	25	225	171	155	141	101	ϕ85	1.7	—

※1 : The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※4 : Water cooling adds 30W thermal capacity.
※6 : Max current values assume water cooling. (vacuum capacitor + water-cooled flange.)

VP Series

up to 170 Arms (13.56 MHz)

Designed for medium/ high-power applications

Features

- **Double bellows with special copper alloy**
  Designed for high current applications, the dual bellows system provides the highest current capacity and extended durability while exhibiting low actuation torque.
- **Reinforced actuator screw system**
  Coated with long-life diamond-like carbon (DLC)

VP65 VP94L VP110

Optional

- **Ball screw actuators**

VH-B Optional Ball Screw

VH65-B2

VP Series Product Types

SCV-□□□□□P□□L-□ (□)

Vacuum Variable Capacitors ① ② ③ ④ ⑤ ⑥ ⑦

①: Peak test voltage (kV)

②: Capacitance
(x100pF)

③: Symbol (Series)
P Normal current
PA Large current
H VH-B Series

④: Diameter (mm)

⑤: Design identification symbol
Blank Concentric electrodes
Minimum non-linear region (1.5 turns)
L Mounting length95mm
(115 mm for normal specifications)
W Swirl electrode
DW Minimum non-linear region (2.8 turns)
FW Minimum non-linear region (5.5 turns)

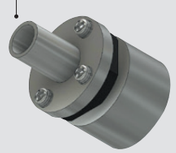
⑥: Types of screw
Blank Standard (DLC coating)
-B2 Ball Screw (VH-B Series)
-B4 Ball Screw
(VP150, VP200 types)

⑦: Types of shaft (Options)
Blank Two flat + slit
(xx) See options

⑥: Types of screw

-B2 VH-B Series

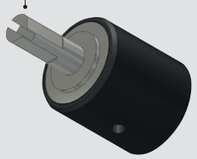
ϕ12.7mm
Round Hole



⑦: Types of shaft (Options)

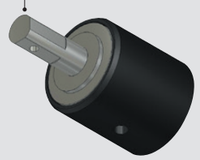
Blank

ϕ6.35mm
Two flat + slit



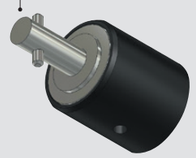
(S15)

ϕ6.35mm
Two flat + Pin hole



(S17)

ϕ6.35mm
Round Hole
With pin



Motor Specifications

Item	Other than VP82L,VP94L	VP82L・VP94L	Other than VP82L-B,VP94L-B (Ball Screw)	VP82L-B,VP94L-B (Ball Screw)
Torque	≦0.18Nm(≦18Ncm)	≦0.18Nm(≦18Ncm)	≦0.12Nm(≦12Ncm)	≦0.12Nm(≦12Ncm)
Turns	14.3(±0.2)Turns	10.8(±0.2)Turns	14(±0.5)Turns	10.5(±0.5)Turns
Motor axis diameter	φ6.35mm	φ6.35mm	φ12.7mm	φ12.7mm

Type

Type	Part Number	Capacitance (pF) Min.	Capacitance (pF) Max	Voltage (kVp) ※1 RF Working	Voltage (kVp) ※1 Peak Test	Current (Arms) 13.56MHz	Current (Arms) 40MHz	Current (Arms) 60MHz	Mounting Dimensions (mm) Total Length	Mounting Dimensions (mm) Mounting Length	Mounting Dimensions (mm) Diameter	Weight (kg)	Options
VP65	SCV-151P65 ※2	10	100	9	15	54	99	89	154	115	φ65	～1.3	-B2 AWF-6 AWM-6
	SCV-201P65 ※2	10	100	12	20	72	99	89					
	SCV-152P65C ※2	5.5	200	9	15	108	99	89					
	SCV-202P65 ※2	15	200	12	20	130	99	89					
	SCV-152.5P65 ※2	15	250	9	15	130	99	89					
	SCV-202.5P65 ※2	15	250	12	20	130	99	89					
	SCV-7.55P65FW ※2	6	500	4.5	7.5	130	99	89					
	SCV-125P65DW ※2	10	500	7.2	12	130	99	89					
	SCV-310P65FW ※2	6	1000	1.8	3	108	99	89					
	SCV-410P65W ※2	20	1000	2.4	4	130	98	89					
	SCV-510P65W ※2	20	1000	3	5	130	99	89					
	SCV-810P65W ※2	20	1000	4.8	8	130	99	89					
	SCV-315P65DW ※2	10	1500	1.8	3	130	99	89					
VP70	SCV-155P70W ※2	15	500	9	15	140	106	96	154	115	φ70	～1.5	-B2 AWF-6 AWM-6
	SCV-128P70W ※2	20	800	7.2	12	140	106	96					
	SCV-515P70W ※2	35	1500	3	5	140	106	96					
VP70L	NEW SCV-49.5P70LW ※2	12	950	2.4	4	130	99	89	125	95	φ70	～1.2	
	NEW SCV-85P70LW ※2	10	500	4.8	8	130	99	89					
VP82	SCV-252P82 ※2	20	200	15	25	140	106	96	154	115	φ82	～1.9	-B2 AWM-4 AWM-5
	SCV-155P82W ※2	20	500	9	15	140	106	96					
	SCV-205P82W ※2	20	500	12	20	140	106	96					
	SCV-1010P82W ※2	25	1000	6	10	140	106	96					
	SCV-515P82W ※2	25	1500	3	5	140	106	96					
	SCV-520P82W ※2	25	2000	3	5	140	106	96					
VPA82	SCV-302PA82 ※2	22	200	18	30	170	129	117	152	112	φ82	1.8	
VP82L	SCV-200.5P82L ※2	12	50	12	20	36	106	96	125	95	φ82	～1.6	
	SCV-250.8P82L ※2	11	80	15	25	72	106	96					
	SCV-201P82L ※2	12	100	12	20	72	106	96					
	SCV-251P82L ※2	12	100	15	25	90	106	96					
	SCV-201.5P82L ※2	12	150	12	20	108	106	96					
	SCV-202P82L ※2	12	200	12	20	140	106	96					
	SCV-202.2P82L ※2	12	220	12	20	140	106	96					
	SCV-103.5P82LW ※2	15	350	6	10	126	106	96					
	SCV-84P82LW ※2	15	400	4.8	8	115	106	96					
VP94	SCV-202.5P94 ※2	25	250	12	20	150	114	103	154	115	φ94	～2.1	
	SCV-205P94 ※2	25	500	12	20	150	114	103					
	SCV-158P94DW ※2	50	800	9	15	150	114	103					
	SCV-815P94 ※2	30	1500	4.8	8	150	114	103					
	SCV-520P94W ※2	30	2000	3	5	150	114	103					
	SCV-523P94W ※2	45	2300	3	5	150	114	103					
VP94L	SCV-251P94L ※2	14	100	15	25	90	125	113	125	95	φ94	～1.8	
	SCV-271P94L ※2	14	100	16.2	27	97	125	113					
	SCV-202.2P94L ※2	14	220	12	20	159	125	113					
	SCV-153.5P94L ※2	15	350	9	15	165	125	113					

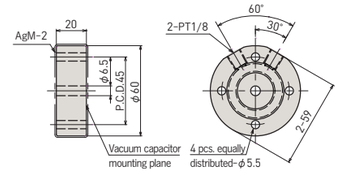
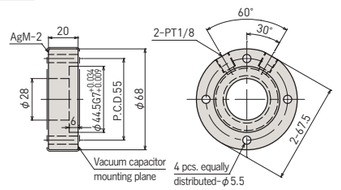
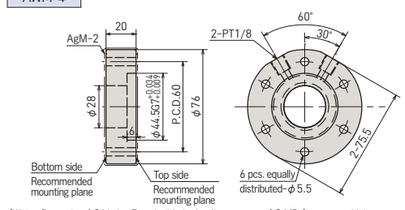
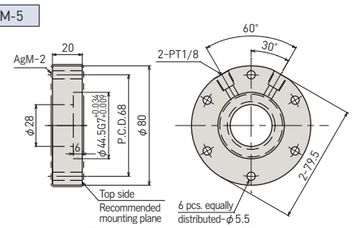
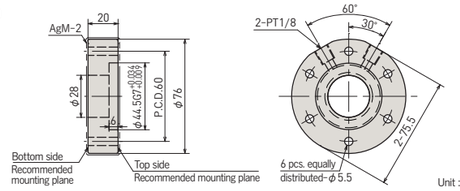
※1 : The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※2 : Max current values assume base sink/convection cooling.

Type

Type	Part Number	Capacitance (pF) Min.	Capacitance (pF) Max	Voltage (kVp) ※1 RF Working	Voltage (kVp) ※1 Peak Test	Current (Arms) 13.56MHz	Current (Arms) 40MHz	Current (Arms) 60MHz	Mounting Dimensions (mm) Total Length	Mounting Dimensions (mm) Mounting Length	Mounting Dimensions (mm) Diameter	Weight (kg)	Options (Types of screw and water-cooling flanges)
VP110	SCV-301P110 ※2	20	100	18	30	108	129	117	154	115	φ110	～2.8	-B2 AWM-4
	SCV-201.5P110C ※2	11	150	12	20	108	129	117					
	SCV-251.5P110C ※2	11	150	15	25	135	129	117					
	SCV-302P110 ※2	25	200	18	30	170	129	117					
	SCV-202.5P110C ※2	13	245	12	20	170	129	117					
	SCV-252.5P110C ※2	13	245	15	25	170	129	117					
	SCV-253.5P110 ※2	35	350	15	25	170	129	117					
	SCV-205P110 ※2	40	500	12	20	170	129	117					
	SCV-255P110 ※2	40	500	15	25	170	129	117					
	SCV-158P110FW ※2	15	800	9	15	170	129	117					
	SCV-209P110W ※2	50	900	12	20	170	129	117					
	SCV-1510P110W ※2	40	1000	9	15	170	129	117					
	NEW SCV-2210P110W ※2	40	1000	13.2	22	170	129	117					
	SCV-1015P110W ※2	40	1500	6	10	170	129	117					
	SCV-520P110 ※2	40	2000	3	5	170	129	117					
	SCV-820P110W ※2	40	2000	4.8	8	170	129	117					
	SCV-325P110FW ※2	15	2500	1.8	3	170	129	117					
	SCV-340P110W ※2	45	4000	1.8	3	170	129	117					
	SCV-540P110W ※2	45	4000	3	5	170	129	117					
VP132	SCV-2015P132W ※2	60	1500	12	20	170	129	117	154	115	φ132	～3.8	-B2
	SCV-1022P132W ※2	80	2200	6	10	170	129	117					

※1 : The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※2 : Max current values assume base sink/convection cooling.

● Water-cooling flanges

Types	Bottom Side	Top Side (Actuator Side)
VP65 VP70	AWF-6  (Water flow rate : 1.0 l/min., Permissible hydraulic pressure : 1.0 MPa) Unit : mm	AWM-6  (Water flow rate : 1.0 l/min., Permissible hydraulic pressure : 1.0 MPa) Unit : mm
VP82 VP82L VP94L	AWM-4  (Water flow rate : 1.0 l/min., Permissible hydraulic pressure : 1.0 MPa) Unit : mm	AWM-5  (Water flow rate : 1.0 l/min., Permissible hydraulic pressure : 1.0 MPa) Unit : mm
VP94 VP110 VP132	AWM-4 (Top and bottom sides in common)  (Water flow rate : 1.0 l/min., Permissible hydraulic pressure : 1.0 MPa)	Unit : mm

VP Series — 250 Arms (13.56 MHz)

Designed for high withstand voltage and high current

Features

- **Double bellows with special copper alloy**
  Designed for high current applications, the dual bellows system provides the highest current capacity and extended durability while exhibiting low actuation torque.
- **Reinforced actuator screw system**
  Coated with long-life diamond-like carbon (DLC)

VP115

Motor Specifications

Item	SCV-401PB115H-B3	SCVW-352.5PC115H
Torque	≦0.12Nm (≦12Ncm)	≦0.18Nm (≦18Ncm)
Turns	7.8 (±0.4) Turns	10.3 (±0.2) Turns
Motor axis diameter	ϕ12.7mm	ϕ6.35mm

Type

Type		Part Number	Capacitance (pF) Min.	Capacitance (pF) Max	Voltage (kVp) ※1 RF Working voltage	Voltage (kVp) ※1 Peak Test voltage	Current (Arms) 13.56MHz	Current (Arms) 40MHz	Current (Arms) 60MHz	Mounting Dimensions (mm) Total Length	Mounting Dimensions (mm) Mounting Length	Mounting Dimensions (mm) Diameter	Weight (kg)	Options
VP115	NEW	SCV-401PB115H-B3 ※4	14	90	24	40	130	156	141	175	135	ϕ115	3.5	—
	NEW	SCVW-352.5PC115H ※6	40	250	21	35	250	190	172	154	125	ϕ115	3.9	-B3

※1 : The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※4 : Water cooling adds 30W thermal capacity.
※6 : The maximum allowable current value is for a 100W thermal cooling environment. (The body is standard and water-cooling.)

VP Series — up to 400 Arms (13.56 MHz)

Designed for high-power applications

Features

- **Internal water-cooling bellows/ actuator structure, large aperture/ high-current copper alloy bellows**
- **Low losses**
- **Reinforced actuator screw system**
  Coated with long-life diamond-like carbon (DLC)

VPA150

VP150

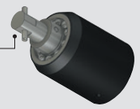
VP200

Motor Specifications

Item	VP150、VPA150、VP200
Torque	≦0.70Nm (≦70Ncm)
Turns	16.6 (±0.2) Turns
Motor axis diameter	ϕ12.7mm

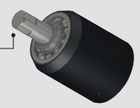
Types of screw

-B4
ϕ12.7mm
Round Hole
With pin

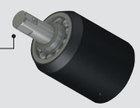


Types of shaft (Options)

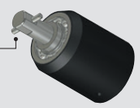
Blank
ϕ12.7mm
Two flat



(S13)
ϕ12.7mm
Two flat +
Pin hole



(S19)
ϕ12.7mm
Round Hole
With pin



Type

Type		Part Number	Capacitance (pF) Min.	Capacitance (pF) Max	Voltage (kVp) ※1 RF Working	Voltage (kVp) ※1 Peak Test	Current (Arms) 13.56MHz	Current (Arms) 40MHz	Current (Arms) 60MHz	Mounting Dimensions (mm) Total Length	Mounting Dimensions (mm) Mounting Length	Mounting Dimensions (mm) Diameter	Weight (kg)	Options
VP150	NEW	SCV-403.5P150 ※6	20	350	24	40	300	228	206	265	165	ϕ150	～7.7	-B4
		SCV-405P150 ※6	40	500	24	40	300	228	206					
		SCV-2010P150W ※6	50	1000	12	20	300	228	206					
		SCV-1525P150W ※6	40	2500	9	15	300	228	206					
VPA150		SCV-1525PA150W ※6	40	2500	9	15	400	305	275	265	165	ϕ150	7.7	-B4
VP200		SCV-555P200 ※6	40	500	33	55	400	305	275	265	165	ϕ200	13.1	-B4
	NEW	SCV-2020P200 ※6	1000	2000	12	20	400	305	275					

※1 : The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※6 : The maximum allowable current value is for a 700W thermal cooling environment. (The body is standard and water-cooling.)

VM Series — up to 100 Arms (13.56 MHz)

For repair.

Features

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

Type1

Type2

Type3

Motor Specifications

Item	Type1-4	Type5-6
Torque	≦0.245Nm (≦24.5Ncm)	≦0.196Nm (≦19.6Ncm)
Turns	12 (±1.0) Turns	5.5 (±0.5) Turns
Motor axis diameter	ϕ12.7mm	ϕ12.7mm

Type

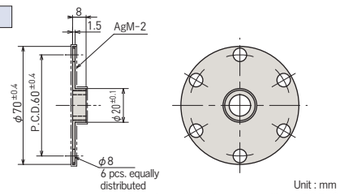
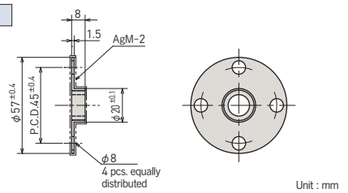
Type	Part Number	Capacitance (pF) Min.	Capacitance (pF) Max	Voltage (kVp) ※1 RF Working	Voltage (kVp) ※1 Peak Test	Current (Arms) 13.56MHz	Current (Arms) 40MHz	Current (Arms) 60MHz	Mounting Dimensions (mm) Total Length	Mounting Dimensions (mm) Mounting Length	Mounting Dimensions (mm) Diameter	Weight (kg)	Options (Guide bearings and water-cooling flanges)
VM-Type1	SCV-150.5 ※4	10	50	9	15	27	76	68	140	115	ϕ60.4	1.0	SJ-2 AWF-2 AWM-2
	SCV-151 ※4	10	100	9	15	54	76	68					
	SCV-152 ※4	12	200	9	15	100	76	68					
	SCV-155G ※4	25	500	9	15	90	68	62					
VM-Type2	SCV-152.5 ※4	30	250	9	15	100	76	68	140	115	ϕ62.4	1.0	SJ-2 AWF-2 AWM-2
	SCV-55 ※4	30	500	3	5	100	76	68					
	SCV-7.55 ※4	30	500	4.5	7.5	100	76	68					
VM-Type3	SCV-205G ※4	50	500	12	20	90	68	62	140	115	ϕ73	～1.4	SJ-1 AWF-1 AWM-1
	SCV-155M ※4	50	500	9	15	100	76	68					
	SCV-1010G ※4	50	1000	6	10	90	68	62					
	SCV-510M ※4	50	1000	3	5	100	76	68					
	SCV-1014G ※4	90	1400	6	10	90	68	62					
	SCV-514M ※4	90	1400	3	5	100	76	68					
VM-Type4	SCV-204 ※4	80	450	12	20	100	76	68	140	115	ϕ89	～1.9	SJ-1 AWF-1 AWM-1
	SCV-1010 ※4	80	1000	6	10	100	76	68					
	SCV-520M ※4	85	2000	3	5	100	76	68					

※1 : The unit of "Voltage (kVp)" is "0-peak" not "peak-peak".
※4 : Water cooling adds 30W thermal capacity.

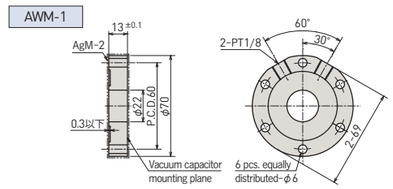
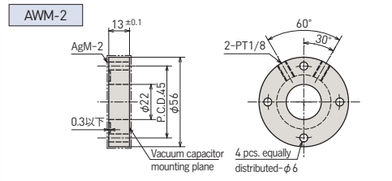
Options

Guide bearing

Guide bearings increase 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	SJ-1  Unit : mm (Remarks)applicable for screw position of P.C.D.60
SCV-55、SCV-7.55、SCV-151、SCV-152、SCV-152.5、SCV-155G	SJ-2  Unit : mm (Remarks)applicable for screw position of P.C.D.45

Water-cooled flanges

Part Number	Top Side (Actuator Side)
SCV-510M、SCV-514M、SCV-155M、SCV-520M、SCV-1010、SCV-204、SCV-1010G、SCV-1014G、SCV-205G	AWM-1  (Water flow rate : 1.0 l/min., Permissible hydraulic pressure : 0.5 MPa) Unit : mm
SCV-55、SCV-7.55、SCV-151、SCV-152、SCV-152.5、SCV-155G	AWM-2  (Water flow rate : 1.0 l/min., Permissible hydraulic pressure : 0.5 MPa) Unit : mm

Motorized Vacuum Capacitors

Ease of setting capacitance means high capacitance accuracy.

Motorized Vacuum Capacitors

Product Description

All the control systems necessary for capacitance control of variable vacuum capacitors have been modularized. Complex impedance matching network control is achieved with simple serial commands.
This is the optimal product for incorporating into high-frequency plasma matching networks and RF power supply circuits.

Features

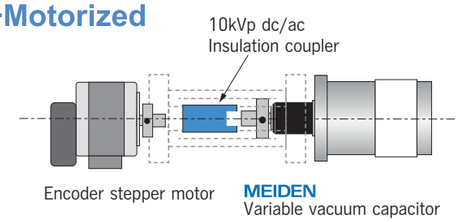
●Easy to introduce

The capacitance of the variable vacuum capacitor can be easily set by serial communication. Origin seeking is also performed automatically.Cumbersome motor control is not required, so development resources can be focused on high-frequency circuit design and matching programming. resources can be focused on high-frequency circuit design and matching programming.

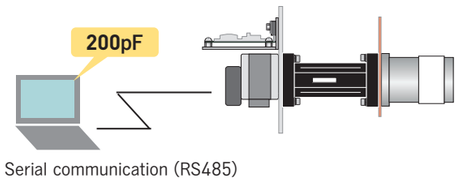
●Highly reliable

The order to detect accidental motor step-out, a weak point of stepper motors, and automatically restore the motor to accurate capacitance, an optical encoder is employed to constantly monitor the stepper motor operation.
The connection between motor and variable vacuum capacitor has many conditions to be considered, such as structural robustness, high voltage tolerance, alignment accuracy, and heat resistance. That makes it a place where troubles often occur. Therefore, we have developed a strong outer shell (insulation tube) and a flexible insulation coupler to achieve the ideal connection.
For motor operation, the motor drive speed was set to 240 rpm, giving priority to reliability. Minimum capacitance to maximum capacitance can be set to approx. 3 seconds (UW series). During acceleration and deceleration, acceleration is optimally controlled to minimize stress on the vacuum capacitor.

+Motorized



+Auto variable capacitor

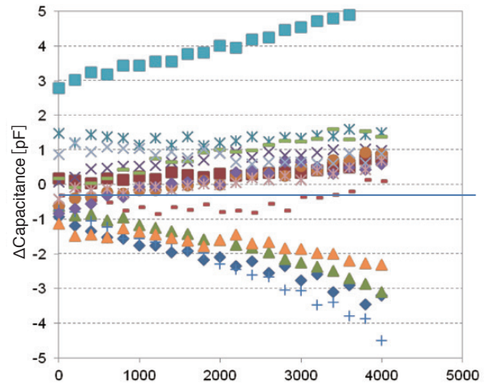


●Highly accurate

The capacitance setting accuracy of a typical variable capacitor is about ±5% (due to the mechanical accuracy of the capacitor).Capacitance is measured for all auto-tuning vacuum capacitors, and the capacitance setting command is calibrated before shipment. Therefore, a capacitance setting accuracy of about ± 0.5% (typical value) can be achieved.

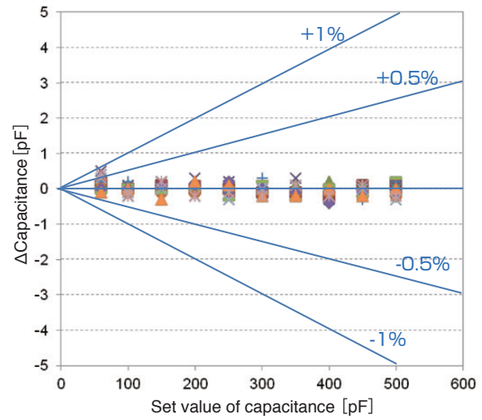
(1) Mechanical setting accuracy

Example of measurement of screw-turn position and capacitance error for SCV-125H65UW
(Measurement of variation where N=14 units)



(2) Auto-tuning

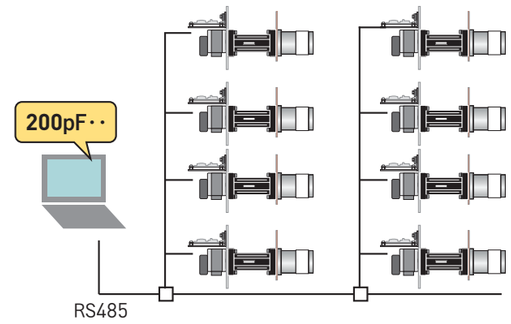
Capacitance tolerance for auto-tuning vacuum capacitors



●Network building

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

+Network Build a network of vacuum capacitors (up to 16 units)



●Fast communication

A high-speed, high-efficiency industrial network system can be built thanks to EtherCAT support.

+EtherCAT Real-time communication

●Common Specifications

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

Power supply	DC 24V(1A)
Drive system	Stepper motor with absolute encoder
Motor speed	240 rpm (max. 360 rpm)
Motor resolution	400 steps per revolution
Coupler withstand voltage	10kVp(AC)
Interface	RS485/EtherCAT (Select one)
Communication speed	9600bps(RS485)
Capacitance setting accuracy	±0.5% ※Typical value

●EtherCAT is a registered trademark of Beckhoff Automation GmbH.

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).

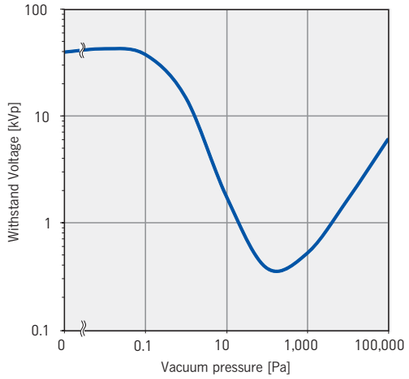


Figure 1.

(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 behavior. 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. ② Exhibited withstand voltage characteristics after conditioning during production HASS/ conditioning. ③ display post conditioning withstand voltage. Please note that instant discharge may occur after reaching ② and ③ by conditioning.

Conditioned peak voltage tolerance degrades over time.

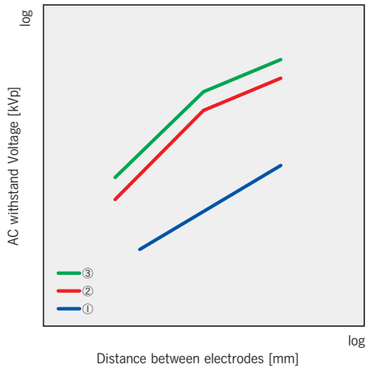


Figure 2.

2. Peak Test Voltage

This refers to a limit value of dielectric breakdown voltage between electrodes (Figure 3.①). Before shipment, MEIDEN tests vacuum capacitors to confirm that no dielectric breakdown occurs when the rated voltage is applied for the specified time (one minute).

3. RF Working Voltage

This refers to the rated voltage which can be applied continuously. The RF working voltage is set at 60 % of the peak test voltage (Figure 3.②). An instant discharge can occur even below than RF working voltage.

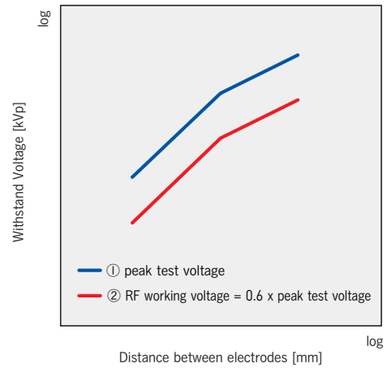


Figure 3

※In case DC voltage is superimposed on the RF voltage, it is recommended that the RF voltage + DC voltage be no more than 80% of the RF operating voltage, and the DC voltage be no more than the rms value of the RF operating voltage.

4. Maximum Allowable Current

(1) Maximum Permissible Current

Maximum allowable current is continuous current which may not exceed permissible surface temperature (silver plating: 125℃ , without silver plating: 80℃) when the ambient temperature is 25 ℃ . The maximum allowable current is limited by electrical heating. Especially, at higher frequencies, the maximum allowable current decreases with a greater loss due to skin effect. It is defined within the following three ranges. The cooling condition differs by series, so please confirm the specifications separately.

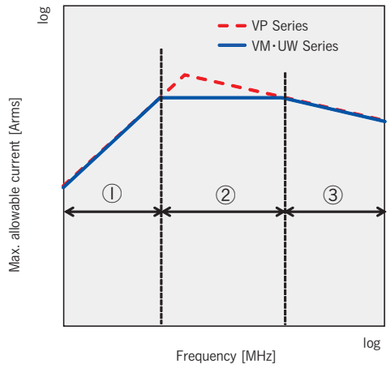


Figure 4

① Range limited by RF working voltage: $I=2\pi fCV_{RFrms}$
(f: frequency, c: capacitance, V_{RFrms}: rms value of RF working voltage)

② Range limited by the maximum allowable temperature: $I=I_{RF}$ (I_{RF}: RF allowable current)
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: $I = I_{RF} (f_{RF}/f)^{1/4}$
I_{RF}: RF allowable current, (f_{RF}: 13.56 MHz)

(2) Derating by Temperature

Maximum Allowable Current is detemined by the allowable surface temperature of vacuum capacitor, therefore if the ambient temperature is higher, the allowable current is derated and lower.

$$I(Ta) = Imax\sqrt{\frac{Tmax\text{-}Ta}{Tmax\text{-}25}}$$

Ta	Ambient Temperature
Tmax	Allowable Surface Temperature
I (Ta)	Allowable Current
Imax	Max. Allowable Current

The below table illustrates the derating of allowable current when the allowable surface temperature is 125˚C .

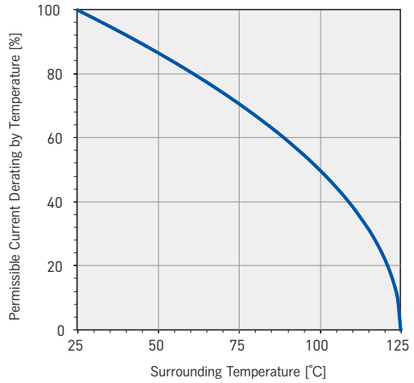


Figure 5

(3) Max. Allowable Current and Cooling

Maximum allowable current of respective types against cooling capacity is shown below.

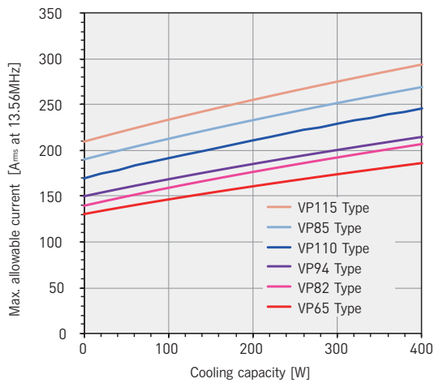


Figure 6

※MEIDEN standard cooling capacity of water-cooled flange is 100 W each and a maximum of 200 W (water-cooled flange on both bottom and top sides) for one vacuum capacitor

5. DC Leakage Current

The expected value for DC leakage current is "less than 10 μA" when 60 % of the peak test voltage is applied in DC. It shall be measured at the maximum capacitance position. The measured value varies according to storage duration and energization.

6. Capacitance tolerance and adjustment

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

(2) Variable vacuum capacitors can be adjusted to any capacitance within the specified range by turning the actuator screw shaft. Capacitance decreases when the shaft is rotated clockwise, and increases when the shaft is rotated counterclockwise. When performing home search, use the mechanical stop on the smallest capacity side.Repeated hard collisions with the mechanical stop may impair the screw. The UW, VP, VC-82HE and VC-85HE series do not incorporate maximum capacitance end-stops. If the screw shaft is turned beyond the maximum position, the shaft will become pushed up, which may damage the capacitor or ambient equipment. The allowable collision torque at the minimum capacitance end-stop is as follows:

Series・Option	Allowable bumping torque
VD,VC-36LI,UW,VC-82HE,VC-85HE,VP	0.4Nm
UW-B,VH-B,VC-82HE-B	0.18Nm

※High frequency of hard stops at high speed may damage the screw.

7. Equivalent Circuit

Figure 7 shows equivalent circuit of a vacuum capacitor. "C" is capacitance. Other circuit elements are parasitic in a vacuum capacitor.

The equivalent series resistance (ESR) of vacuum capacitors is generally several mΩ to dozens of mΩ. The equivalent series inductance (ESL) determines self-resonance frequency and Cs. ESL of vacuum capacitor is generally several nH to dozens of nH. The parasitic capacitance (Cp) of the ceramic envelope and The equivalent parasitic resistance (EPR) combine to represent leakage current. Cp and EPR have small influence and thus can be ignored when using of vacuum capacitor.

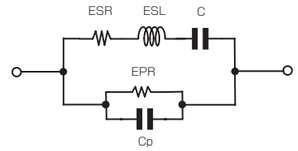


Figure 7 Equivalent circuit of vacuum capacitor

8. Self-resonance Frequency and ESL

Figure 8 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: f0 is calculated with the following formula using ESL and Cs:

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

Technical Information (Operational Precautions and Characteristic Explanations)

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

$$f_l = \frac{1}{2\pi\sqrt{(ESL + L_c)Cs}}$$

In case of ESL << L_c, L_c dominates.

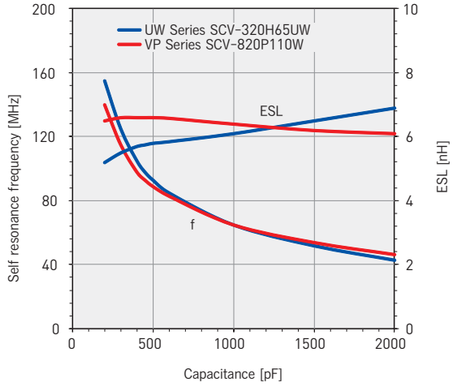


Figure 8

9. ESR of Vacuum Capacitor

Figure 9 shows ESR-Frequency characteristics of the UW and VP series.
The VP series, using double bellows, achieves an extremely low ESR. In case due to variable vacuum capacitors, the primary ESR factor is resistance by the skin effect of the 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 Ploss [W] of ESR. High-frequency current carried is Irf [A_{rms}], and connection resistance to the circuit current source as Resistance Current (R_c). 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.

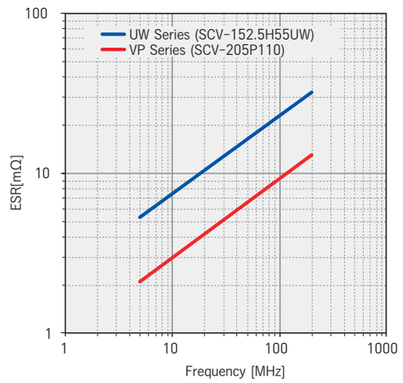


Figure 9

10. Torque

The 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, lead etc.)
(5) Frictional force of the sliding part
(combination of the shaft, the bolt and the lubricant agent)
Figure 10 shows initial characteristics at 30 rpm at standard rotating position and torque. Note the torque shown is negative for the VH-B/UW-B option in the CCW (counterclockwise) direction. This means that the screw will turn without the application of external force.
The screw actuator shaft can be turned at will, according to wear condition. To stop the shaft from turning, use the turning stopper mechanism.

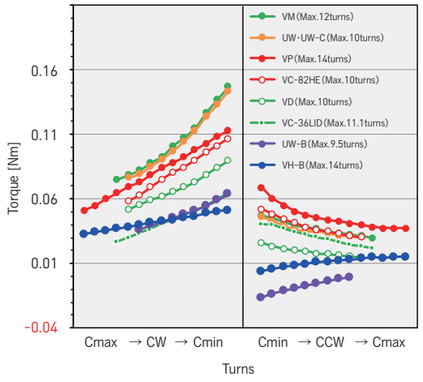


Figure 10

11. Life Expectancy

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

(1) Bellows

The bellows' life cycles, depicted below, are greatly affected by the working range and temperature.

※0.5 % fracture data

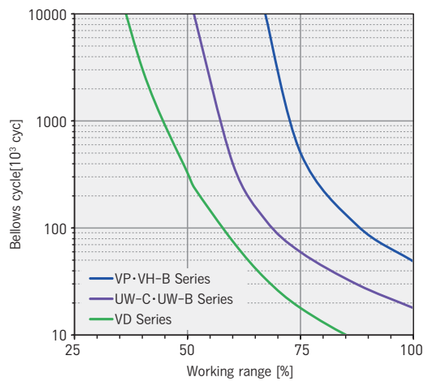


Figure 11

※The graph above shows the life (approximate) based on the test results.

The bellows' life cycles are affected by temperature shown as below. The expected bellows temperature is 300 ℃, at the maximum allowable current, when the surface temperature is 125 ℃.

※0.5 % fracture data

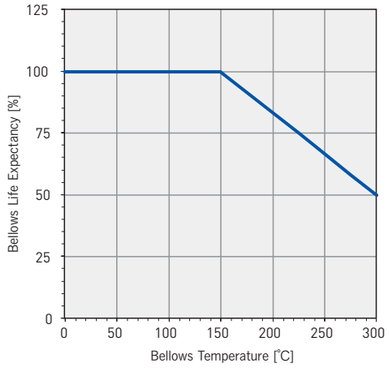


Figure 12

※The graph above shows the life (approximate) based on the test results.

(2) Screw system

The capacitance adjustment screw life is determined by the total number of turns and that of reverse turns, (one turn each way represents a two-turn cycle), each of which is greatly affected by temperature and reverse turn acceleration. The working turns of respective types are depicted below:

Screw life by total turns (million turns)

VH-B option	UW-B option	VP Series	UW-C Type	VM Series	VD Series
7000	5000	3500	2500	1200	1200

Test condition: (Turn speed: 600 rpm, acceleration: 4.5 rpm/ms Temperature: 25℃ Humidity: 40～85%RH)

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

Screw life is affected by working condition, especially by temperature and acceleration, depicted below:

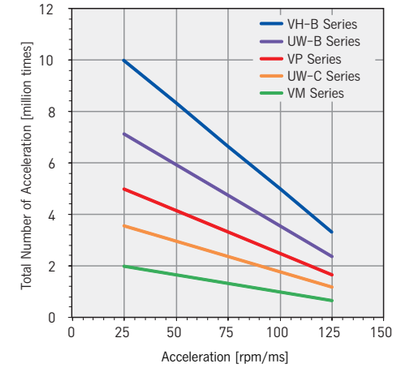


Figure 13

NOTE ①

Engineer the 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. If the following conditions are exceeded, VH-B (ball screw option) is recommended.

- High acceleration (greater than 30 rpm/ms)
- Dither (less than several degrees)
- High-speed (greater than 600 rpm)
- The number of or speed of collisions against the stopper on the minimum capacitance end is large

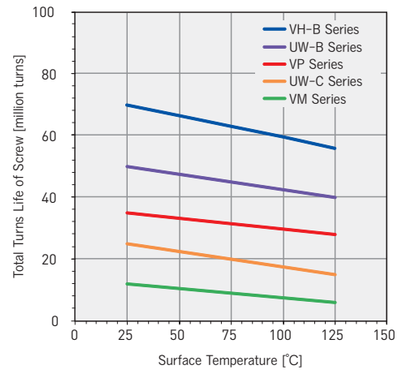


Figure 14

※The graph above shows the life (approximate) based on the test results.

NOTE ②

Other than for DLC coating types, 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.

(3) Life of Variable Vacuum Capacitor

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

VH, VP series

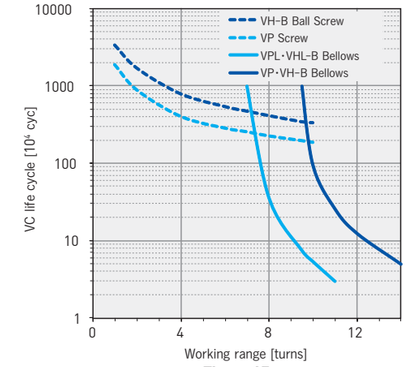


Figure 15

※The graph above shows the life (approximate) based on the test results.

VM, UW series

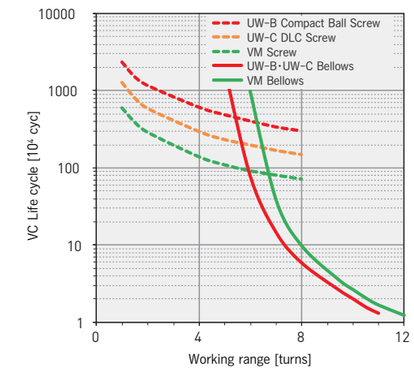


Figure 16

※The graph above shows the life (approximate) based on the test results.

⚠ Handling Precautions

1. Transportation and Storage

(1) Vacuum capacitors are structurally sensitive to external shocks. The capacitors are designed to withstand impact accelerations up to 294 m/s^2 and vibration up to 98 m/s^2. Care should be taken not to drop, bang or expose the part to shock exceeding what would normally be considered safe for a standard filament light bulb.
(2) Vacuum capacitors should be shipped and stored in a vertical position. As shipped from the factory, VM, VD series variable vacuum capacitors should be shipped with their capacitance set to the maximum position, with the others set to the minimum position.
(3) Please contact MEIDEN immediately should there be any abnormal appearance of the capacitor upon delivery. In this case, please keep the capacitor's packaging for return shipping.
(4) When stored for over four months, the vacuum capacitor withstand voltage should be confirmed prior to use.
(5) After storing the vacuum capacitor for several months, infrequently , verdigris appears on the vacuum capacitor, but there is no effect on the electrical and mechanical properties.
(6) The storage environment should be between 10~40˚C with a relative humidity (non-condensing) of between 40~85%.

2. Before Mounting Vacuum Capacitors

(1) Vacuum capacitors are structurally sensitive to external shocks. Prior to installation, the capacitance and withstand voltage should be re-tested and the capacitor checked for external damage.
(2) Fingerprints and other contamination can cause flashovers of the ceramics. Wipe the ceramic with cloth (dry, or soaked in alcohol). DO NOT USE solvents containing chlorine (e.g.; trichloroethane).
(3) Inspect all attached components and structures for contamination and clean as above.

3. Mounting Vacuum Capacitors

(1) When installing capacitors be sure not to apply tangential load greater than 1225Ncm. 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 on the capacitance adjustment shaft. When using an inflexible coupling, a central misalignment of up to 0.2 mm is permissible in most models. A greater misalignment may result in dramatically shortened life expectancy and irregular rotation. In case a belt or gear is used to connect the vacuum capacitor and motor, a mechanism such as a bearing shall be applied to prevent lateral load.
(3) When an optional guide bearing is used for VM series, it is delivered attached to the capacitors with two screws (diagonal 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, be aware that misalignment of a maximum of ±1mm may exist between the capacitance adjustment screw and the fixed side mounting screw taps.
(5) Use torque settings less than the maximum specs of each screw types. On the bottom and top sides, it is 242 Ncm for the M6 type, 147 Ncm for the M5 type, and 71.6 Ncm for the M4 type. If the screw is turned using force, it will damage the screw parts, or vacuum capacitor by putting stress on the flange.

4. Using Vacuum Capacitors

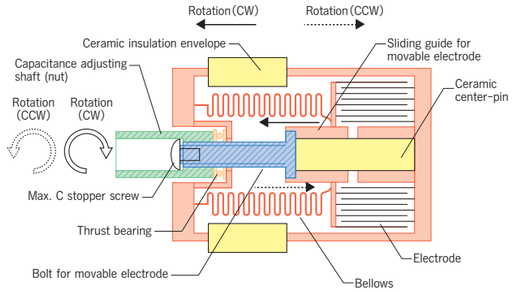
(1) The maximum allowable vibration level of the capacitors is 98m/s^2. Greater vibration levels will damage the capacitors.
(2) Should the surface temperature of the capacitor exceeds 125˚C, an abnormally high current may result. Water-cooling flanges should be considered in high heat/high-power applications.
(3) Metal objects near the sides of the VC may result in flashover. Sufficient insulation distance shall be maintained between metal object and the VC.
(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 become discolored, or in some cases the properties or life of the capacitors may be affected.
(5) Do not over rotate the actuator CCW after reaching the maximum capacitance position (as in positioning). Especially for the UW, VP series, the shaft may become pushed up and damage the capacitor or Ambient equipment.
(6) Should a variable vacuum capacitor be used under high temperatures (over 75˚C), or if the capacitance is left unchanged, the actuator torque may increase above specifications because of lubricant excretion due to vacuum or gravity-induced pressure. To distribute the lubricant, it is recommended that the capacitance adjustment screw be rotated across the entire capacitance range once every 200 hours.

5. Using VM, 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 noises 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 expectancy or performance.

6. Using VM Series

(1) VM Series are variable vacuum capacitors with a center guide pin structure. Capacitance decreases with clockwise rotation of the shaft and can be adjusted to the minimum capacitance in the end-stop position. Likewise, capacitance increases with 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 due to misalignment.
(3) Usage examples
Usage example①
Adjust the position of the motor and vacuum capacitor manually during installation without creating a positioning mechanism. If any abnormal noise or shaft disconnection occurs, re-install the vacuum capacitor and repeat the adjustment until the problem disappears. It is necessary to provide room for adjustment of the vacuum capacitor position, select a type of coupling that allows for eccentricity and angular misalignment, and make the coupling loose.
Usage example②
Add a part to align the center between the vacuum capacitor and the motor, and make a fitting shape between the vacuum capacitor and the part and also between the part and the motor. Furthermore, use a coupling with a structure that allows the deviation to be released to connect the vacuum capacitor to the motor shaft.

7. Withstand Voltage Test

(1) Depending on the withstand voltage tester, qualified vacuum capacitors may also be judged as failing. Please contact us for individualized testing methods. As general test procedure, refer (2)-(5).
(2) Before conducting the withstand voltage test, check visually if there is any dirt or condensation on the ceramic envelope. If there is, wipe with a dry cloth or a cloth soaked in alcohol and dry completely.
(3) Put in a current limit resistor (about 500kΩ is recommended) in series, not to damage the vacuum capacitor by the flashover current caused by the withstand voltage test.
(4) Set the current limit of withstand voltage tester to maximum.
(5) Refer following procedure for AC withstand voltage test(50/60 Hz).
【Upon delivery】
① Discharge the vacuum capacitor by shorting the two electrodes.
② Check that the capacitor has not shorted. If it is a variable capacitor, be sure to check it at its maximum capacitance setting.
③ Increase the voltage gradually from 0 to 60% of the peak test voltage of the capacitor. (Continue for one minute). During the voltage increase, an instant discharge can be allowable.
④ After reaching to 60 % of peak test voltage, hold the voltage for 1 minute. If no arcing or instant discharge is observed, the capacitor has passed the test.
⑤After that, gradually increase the voltage to 60 to 100% of the peak test voltage over a period of 1 to 2 minutes. A small rupture or vibration noise due to arcing or instantaneous arcing may be generated during the voltage increase, but this is acceptable.
⑥After the peak test voltage is reached, apply voltage for 1 minute and confirm that no arcing or instantaneous arcing occurs. Up to 10 instantaneous arcing are acceptable. If no arcing or instantaneous arcing occurs continuously for 1 minute after that, the capacitor is considered to be functioning normally.
【Stored over 4 months or before use】
Ⅰ Discharge the vacuum capacitor by shorting the two electrodes.
② Check that the capacitor is not short.(If it is variable capacitor, set the capacitor to the maximum capacitance position.)
③ Increase the applied voltage gradually from 0 to 60% of the peak test voltage of the capacitor. (Continue for one minute). Rapid voltage increase may cause flashover or instant discharge.
④ After reaching 60 % of peak test voltage, continue to apply this level of voltage for one minute. If no more than one flashover or instant discharge occurs, the capacitor is functioning normally.
⑤After the peak test voltage is reached, apply voltage for 1 minute and confirm that no flashover or instantaneous flashover occurs. Up to 15 instantaneous flashovers are acceptable. If no flashover or instantaneous flashover occurs after that continuously for one minute, the capacitor is considered to be functioning normally.
(6) Withstand voltage test is recommended every 4 to 6 month during storage.
(7) After holding stock over 1 year, in case the voltage cannot be increased to the peak test voltage, conditioning work is required at our factory. In such cases, please contact us. (Any related costs shall be born by the customer.)

8. Warranty

(1) The warranty period is 12 months after shipping from the MEIDEN factory.
(2) Warranty Conditions
①Within the warranty period, if any defect or failure is found on MEIDEN products, we will replace or fix the returned vacuum capactor free of charge. The replacement work shall be the responsibility of the customer. In the following cases, MEIDEN products shall not be covered under warranty.
・Any defect or failure which is caused by use under conditions which are not mentioned in the catalog, technical documents, specification sheet or data sheet.
・Any defect or failure which is caused by not following "Handling Precautions" written in the catalog.
・Any defect or failure which is not predictable by science or existing technology level at the time of proposal.
・Any defect or failure due to use under conditions which MEIDEN has not warranted.
②Warranty is limited by (2)-①, and any claims of liability for damages beyond MEIDEN's products (THE DAMAGES OF CUSTOMER'S PRODUCT OR EQUIPMENT, LOSS OF PROFITS, BUSINESS INTERRUPTION, OR LOSS OF BUSINESS, INCURRED BY THE OTHER PARTY) are excluded.
(3) Our product is designed and manufactured as a general-purpose product for general industries, and the specific conditions of use with relation to your products, facility system, using environment etc. are not taken into consideration. Please evaluate in advance and use our product in your responsibly under all circumstances.

9. Product Investigation

(1) If any product investigation is required regarding defects or failure, please contact us. In any such case, costs related to transportation shall be born by customer. The followings are investigation items
・Fixed Vacuum Capacitor
General :
Shipping Test, X-ray etc.
Disassemble :
Visual check for electrodes
・Variable Variable Capacitor
General :
Shipping Test, X-ray etc.
Disassemble :
Visual check for electrodes and screws.

(2) The standard investigation period is 10 business days after the receipt of the actual product. A sales representative will inform you of the investigation report submission date.
(3) After receipt of the report, please inform us of how you would like us to handle the investigated product. If not informed, we will dispose it after six months of storage.
(4) If the investigated product is not covered under warranty conditions mentioned above, MEDIEN has right to charge an investigation fee.

10. 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

Capacitance (pF)	Type	Part Number	Voltage (kVp)		Current (Arms)			Mounting Dimensions (mm)		Weight (kg)	Options
			RF Working	Peak Test	13.56MHz	40MHz	60MHz	Total Length (Mounting Length)	Diameter		
3	FH15CA	**SCF-50.03H15CA**	3	5	＜1	1	2	66	ϕ15.5	0.06	
3	FH19CA	**SCF-150.03H19C**	9	15	1	4	6	60	ϕ19	0.1	
8.5	FH15CA	**SCF-50.09H15CA**	3	5	1	2	2	66	ϕ15.5	0.06	
9	FC62	**SCF-200.1C**	12	20	6	19	28	50	ϕ62.4	0.8	IK-0
10	FS36	**SCF-150.1Z**	9	15	5	15	23	43	ϕ36	0.6	
10	FH15CA	**SCF-150.1H15CA**	9	15	3	2	2	66	ϕ15.5	0.06	
10	FS36	**SCF-200.1Z**	12	20	7	21	31	43	ϕ36	0.6	
10	FH48C	**SCF-300.1H48C**	18	30	10	31	47	73	ϕ48	0.5	IK-0
15	FH15CA	**SCF-100.15H15CA**	6	10	3	2	2	66	ϕ15.5	0.06	
20	FH15CA	**SCF-50.2H15CA**	3	5	3	2	2	66	ϕ15.5	0.06	
20	FS36	**SCF-150.2Z**	9	15	10	31	34	43	ϕ36	0.6	
20	FH48C	**SCF-300.2H48C**	18	30	21	63	95	73	ϕ48	0.5	IK-0
25	FS36	**SCF-150.25Z**	9	15	13	38	34	43	ϕ36	0.6	
25	FH48C	**SCF-300.25H48C**	18	30	27	79	99	73	ϕ48	0.5	IK-0
25	FH65C	**SCF-350.25H65C**	21	35	31	93	118	87	ϕ65	0.8	IK-1
30	FS36	**SCF-200.3Z**	12	20	21	38	34	43	ϕ36	0.6	
33	FS36	**SCF-150.33Z**	9	15	17	38	34	43	ϕ36	0.6	
40	FS36	**SCF-150.4Z**	9	15	21	38	34	43	ϕ36	0.6	
50	FC52	**SCF-150.5C**	9	15	27	79	89	48	ϕ52.4	0.4	IK-0
50	FC52A	**SCF-150.5CA**	9	15	27	61	55	52	ϕ52.4	0.6	IK-2
50	FS36	**SCF-150.5Z**	9	15	27	38	34	43	ϕ36	0.6	
50	FC62	**SCF-200.5C**	12	20	36	76	68	50	ϕ62.4	0.8	IK-0
50	FH48C	**SCF-300.5H48C**	18	30	54	110	99	73	ϕ48	0.5	IK-0
50	FH48C	**SCF-350.5H48C**	21	35	63	110	99	73	ϕ48	0.5	IK-0
50	FH65C	**SCF-350.5H65C**	21	35	63	131	118	87	ϕ65	0.8	IK-1
56	FH52WR	**SCF-200.56HA52WR**	12	20	40	99	89	52	ϕ52.4	0.6	IK-1
60	FS36	**SCF-150.6Z**	9	15	32	38	34	43	ϕ36	0.6	
60	FS36	**SCF-200.6Z**	12	20	43	38	34	43	ϕ36	0.6	
62	FH52WR	**SCF-200.62HA52WR**	12	20	44	99	89	52	ϕ52.4	0.6	IK-1
75	FS36	**SCF-150.75Z**	9	15	40	38	34	43	ϕ36	0.6	
75	FC62	**SCF-200.75C**	12	20	54	76	68	50	ϕ62.4	0.8	IK-0
75	FH48C	**SCF-300.75H48C**	18	30	81	110	99	73	ϕ48	0.5	IK-0
80	FC52A	**SCF-150.8CA**	9	15	43	61	55	52	ϕ52.4	0.6	IK-2
80	FS36	**SCF-150.8Z**	9	15	43	38	34	43	ϕ36	0.6	
84	FS36	**SCF-150.84Z**	9	15	45	38	34	43	ϕ36	0.6	
90	FC52A	**SCF-150.9CA**	9	15	48	61	55	52	ϕ52.4	0.6	IK-2
90	FS36	**SCF-150.9Z**	9	15	48	38	34	43	ϕ36	0.6	
90	FH48C	**SCF-350.9H48C**	21	35	113	110	99	73	ϕ48	0.5	IK-0
100	FS36S	**SCF-51S**	3	5	18	38	34	30	ϕ36	0.5	
100	FC52	**SCF-151C**	9	15	54	99	89	48	ϕ52.4	0.4	IK-0
100	FC52A	**SCF-151CA**	9	15	54	61	55	52	ϕ52.4	0.6	IK-2
100	FS36	**SCF-151Z**	9	15	50	38	34	43	ϕ36	0.6	
100	FH52WR	**SCF-151H52WR**	9	15	54	99	89	52	ϕ52.4	0.6	IK-1
100	FC62	**SCF-201C**	12	20	72	76	68	50	ϕ62.4	0.8	IK-0
100	FH52WR	**SCF-201H52WR**	12	20	72	99	89	52	ϕ52.4	0.6	IK-1
100	FH48C	**SCF-301H48C**	18	30	108	110	99	73	ϕ48	0.5	IK-0
100	FH48C	**SCF-351H48C**	21	35	126	110	99	73	ϕ48	0.5	IK-0
100	FH65C	**SCF-351H65C**	21	35	126	131	118	87	ϕ65	0.8	IK-1
102		**SCF-351K**	21	35	129	114	103	75	ϕ128	3.3	
110	FS36S	**SCF-51.1S**	3	5	19	38	34	30	ϕ36	0.5	
110	FS36	**SCF-151.1Z**	9	15	50	38	34	43	ϕ36	0.6	
115	FS36	**SCF-151.15Z**	9	15	50	38	34	43	ϕ36	0.6	
120	FS36S	**SCF-51.2S**	3	5	21	38	34	30	ϕ36	0.5	
120	FC52A	**SCF-151.2CA**	9	15	65	61	55	52	ϕ52.4	0.6	IK-2
120	FS36	**SCF-151.2Z**	9	15	50	38	34	43	ϕ36	0.6	
125	FH48C	**SCF-251.25H48C**	15	25	112	110	99	73	ϕ48	0.5	IK-0
130	FS36S	**SCF-51.3S**	3	5	23	38	34	30	ϕ36	0.5	
130	FS36	**SCF-151.3Z**	9	15	50	38	34	43	ϕ36	0.6	
140	FS36S	**SCF-51.4S**	3	5	25	38	34	30	ϕ36	0.5	
140	FS36	**SCF-151.4Z**	9	15	50	38	34	43	ϕ36	0.6	
150	FS36S	**SCF-51.5S**	3	5	27	38	34	30	ϕ36	0.5	
150	FC52	**SCF-151.5C**	9	15	81	99	89	48	ϕ52.4	0.4	IK-0
150	FC52A	**SCF-151.5CA**	9	15	80	61	55	52	ϕ52.4	0.6	IK-2
150	FH52WR	**SCF-151.5H52WR**	9	15	81	99	89	52	ϕ52.4	0.6	IK-1
150	FS36	**SCF-151.5Z**	9	15	50	38	34	43	ϕ36	0.6	
150	FC62	**SCF-201.5C**	12	20	100	76	68	50	ϕ62.4	0.8	IK-0
150	FH48C	**SCF-251.5H48C**	15	25	135	110	99	73	ϕ48	0.5	IK-0
150	FH48C	**SCF-301.5H48C**	18	30	145	110	99	73	ϕ48	0.5	IK-0
150	FH65C	**SCF-351.5H65C**	21	35	172	131	118	87	ϕ65	0.8	IK-1

Capacitance (pF)	Type	Part Number	Voltage (kVp)		Current (Arms)			Mounting Dimensions (mm)		Weight (kg)	Options
			RF Working	Peak Test	13.56MHz	40MHz	60MHz	Total Length (Mounting Length)	Diameter		
175	FH48C	**SCF-251.75H48C**	15	25	145	110	99	73	ϕ48	0.5	IK-0
175	FH65C	**SCF-351.75H65C**	21	35	172	131	118	87	ϕ65	0.8	IK-1
180	FC52A	**SCF-151.8CA**	9	15	80	61	55	52	ϕ52.4	0.6	IK-2
180	FS36	**SCF-151.8Z**	9	15	50	38	34	43	ϕ36	0.6	
200	FS36S	**SCF-52S**	3	5	36	38	34	30	ϕ36	0.5	
200	FC52	**SCF-152C**	9	15	108	99	89	48	ϕ52.4	0.4	IK-0
200	FH52WR	**SCF-152H52WR**	9	15	108	99	89	52	ϕ52.4	0.6	IK-1
200	FS36	**SCF-152Z**	9	15	50	38	34	43	ϕ36	0.6	
200	FH52WR	**SCF-202H52WR**	12	20	130	99	89	52	ϕ52.4	0.6	IK-1
200	FH48C	**SCF-252H48C**	15	25	145	110	99	73	ϕ48	0.5	IK-0
200	FH65C	**SCF-352H65C**	21	35	172	131	118	87	ϕ65	0.8	IK-1
210	FC52A	**SCF-152.1CA**	9	15	80	61	55	52	ϕ52.4	0.6	IK-2
210	FH52WR	**SCF-152.1H52WR**	9	15	113	99	89	52	ϕ52.4	0.6	IK-1
220	FS43	**SCF-152.2**	9	15	50	38	34	43	ϕ43	0.8	
220		**SCF-352.2K**	21	35	150	114	103	75	ϕ128	3.3	
250	FS36	**SCF-52.5Z**	3	5	45	38	34	43	ϕ36	0.6	
250	FS36	**SCF-102.5Z**	6	10	50	38	34	43	ϕ36	0.6	
250	FS43	**SCF-152.5**	9	15	50	38	34	43	ϕ43	0.8	
250	FH52WR	**SCF-152.5H52WR**	9	15	130	99	89	52	ϕ52.4	0.6	IK-1
250	FH65C	**SCF-352.5H65C**	21	35	172	131	118	87	ϕ65	0.8	IK-1
300	FS36	**SCF-53Z**	3	5	50	38	34	43	ϕ36	0.6	
300	FS36	**SCF-103Z**	6	10	50	38	34	43	ϕ36	0.6	
300	FS43	**SCF-153**	9	15	50	38	34	43	ϕ43	0.8	
300	FH52WR	**SCF-153H52WR**	9	15	130	99	89	52	ϕ52.4	0.6	IK-1
300	FS43	**SCF-173**	10.2	17	50	38	34	43	ϕ43	0.8	
300	FH65C	**SCF-253H65C**	15	25	172	131	118	87	ϕ65	0.9	IK-1
350	FS36	**SCF-53.5Z**	3	5	50	38	34	43	ϕ36	0.6	
350	FS36	**SCF-103.5Z**	6	10	50	38	34	43	ϕ36	0.6	
350	FH52WR	**SCF-153.5H52WR**	9	15	130	99	89	52	ϕ52.4	0.6	IK-1
350	FH65C	**SCF-253.5H65C**	15	25	172	131	118	87	ϕ65	0.9	IK-1
368		**SCF-353.7K**	21	35	150	114	103	75	ϕ128	3.3	
370	FH52WR	**SCF-153.7H52WR**	9	15	130	99	89	52	ϕ52.4	0.6	IK-1
400	FS36	**SCF-54Z**	3	5	50	38	34	43	ϕ36	0.6	
400	FS36	**SCF-104Z**	6	10	50	38	34	43	ϕ36	0.6	
400	FH52WR	**SCF-124H52WR**	7.2	12	130	99	89	52	ϕ52.4	0.6	IK-1
450	FH52WR	**SCF-124.5H52WR**	7.2	12	130	99	89	52	ϕ52.4	0.6	IK-1
500	FS36	**SCF-55Z**	3	5	50	38	34	43	ϕ36	0.6	
500	FS36	**SCF-105Z**	6	10	50	38	34	43	ϕ36	0.6	
500	FH52WR	**SCF-125H52WR**	7.2	12	130	99	89	52	ϕ52.4	0.6	IK-1
500	FH52WR	**SCF-155H52WR**	9	15	130	99	89	52	ϕ52.4	0.6	IK-1
500	FH74WR	**SCF-205H74WR**	12	20	140	106	96	52	ϕ74	0.8	IK-1
550	FH52WR	**SCF-105.5H52WR**	6	10	130	99	89	52	ϕ52.4	0.6	IK-1
600	FH52WR	**SCF-56H52WR**	3	5	108	99	89	52	ϕ52.4	0.6	IK-1
600	FS43	**SCF-56**	3	5	50	38	34	43	ϕ43	0.8	
600	FH52WR	**SCF-106H52WR**	6	10	130	99	89	52	ϕ52.4	0.6	IK-1
600	FH52WR	**SCF-126H52WR**	7.2	12	130	99	89	52	ϕ52.4	0.6	IK-1
650	FH52WR	**SCF-106.5H52WR**	6	10	130	99	89	52	ϕ52.4	0.6	IK-1
700	FS43	**SCF-57**	3	5	50	38	34	43	ϕ43	0.8	
700	FH52WR	**SCF-107H52WR**	6	10	130	99	89	52	ϕ52.4	0.6	IK-1
750	FH52WR	**SCF-107.5H52WR**	6	10	130	99	89	52	ϕ52.4	0.6	IK-1
750	FH74WR	**SCF-157.5H74WR**	9	15	140	106	96	52	ϕ74	0.8	IK-1
800	FS43	**SCF-58**	3	5	50	38	34	43	ϕ43	0.8	
900	FS43	**SCF-59**	3	5	50	38	34	43	ϕ43	0.8	
1000	FH52WR	**SCF-510H52WR**	3	5	130	99	89	52	ϕ52.4	0.6	IK-1
1000	FS43	**SCF-510**	3	5	50	38	34	43	ϕ43	0.8	
1000	FH52WR	**SCF-810H52WR**	4.8	8	130	99	89	52	ϕ52.4	0.6	IK-1
1000	FH74WR	**SCF-1010H74WR**	6	10	140	106	96	52	ϕ74	0.8	IK-1
1250	FH52WR	**SCF-512.5H52WR**	3	5	130	99	89	52	ϕ52.4	0.6	IK-1
1500	FH52WR	**SCF-315H52WR**	1.8	3	130	99	89	52	ϕ52.4	0.6	IK-1
1500	FH52WR	**SCF-515H52WR**	3	5	130	99	89	52	ϕ52.4	0.6	IK-1
1750	FH52WR	**SCF-317.5H52WR**	1.8	3	130	99	89	52	ϕ52.4	0.6	IK-1
2000	FH52WR	**SCF-320H52WR**	1.8	3	130	99	89	52	ϕ52.4	0.6	IK-1
2000	FH74WR	**SCF-520H74WR**	3	5	121	92	83	52	ϕ74	0.8	IK-1
3000	FH74WR	**SCF-530H74WR**	3	5	121	92	83	52	ϕ74	0.9	IK-1
4000	FH74WR	**SCF-340H74WR**	1.8	3	121	92	83	52	ϕ74	1.0	IK-1

Variable Vacuum Capacitors

Capacitance Min	Capacitance Max	Type	Part Number	Voltage (kVp) RF Working	Voltage (kVp) Peak Test	Current (Arms) 13.56 MHz	Current (Arms) 40 MHz	Current (Arms) 60 MHz	Tuner Turns	Turner Operating Torque (Nm)	Mounting dimensions (mm) Total Length	Mounting dimensions (mm) Mounting Length	Mounting dimensions (mm) Outer Diameter	Weight (kg)	Options Guide Screw	Options Water-cooled Fixed Side	Options Water-cooled Moving Side	Options Ball Screw	Options -NP (Low Current)
6	50	VC-36LI	**SCV-50.5C36LID**	3	5	9	6	6	11.1±0.5	0.15	90.6	72.1	ϕ36	0.3					
10	50	VM-Type1	**SCV-150.5**	9	15	27	76	68	12±1	0.245	140	115	ϕ60.4	1.0					
12	50	VP82L	**SCV-200.5P82L**	12	20	36	106	96	10.8±0.2	0.18	125	95	ϕ82	1.6		AWM-4	AWM-5	○	
3	60	UWA55	**SCV-150.6HA55UW-C**	9	15	32	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7					
5	75	UWA55	**SCV-150.75HA55UW-C**	9	15	40	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7					
10	80	VC-82HE	**SCV-250.8C82HE-AADG-F**	15	25	72	106	96	14±0.5	0.18	132	101	ϕ82	1.5				○	
11	80	VP82L	**SCV-250.8P82L**	15	25	72	106	96	10.8±0.2	0.18	125	95	ϕ82	1.6		AWM-4	AWM-5	○	
14	90	VP115	**SCV-401PB115H-B3**	24	40	130	156	141	7.8±0.2	0.18	175	135	ϕ115	3.5				○	
10	100	UW55	**SCV-151H55UW-C**	9	15	54	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7				○	○
10	100	VP65	**SCV-151P65**	9	15	54	99	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
10	100	VM-Type1	**SCV-151**	9	15	54	76	68	12±1	0.245	140	115	ϕ60.4	1.0	SJ-2	AWF-2	AWM-2		
10	100	VP65	**SCV-201P65**	12	20	72	99	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
12	100	VP82L	**SCV-201P82L**	12	20	72	106	96	10.8±0.2	0.18	125	95	ϕ82	1.6		AWM-4	AWM-5	○	
12	100	VP82L	**SCV-251P82L**	15	25	90	106	96	10.8±0.2	0.18	125	95	ϕ82	1.6		AWM-4	AWM-5	○	
12	100	VC-82HE	**SCV-251C82HE-B3**	15	25	90	106	96	7.8～8.3	0.15	132	101	ϕ82	1.5				○	
14	100	VP94L	**SCV-251P94L**	15	25	90	125	113	10.8±0.2	0.18	125	95	ϕ94	1.8		AWM-4	AWM-5	○	
14	100	VP94L	**SCV-271P94L**	16.2	27	97	125	113	10.8±0.2	0.18	125	95	ϕ94	1.8					
20	100	VP110	**SCV-301P110**	18	30	108	129	117	14.3±0.2	0.18	154	115	ϕ110	2.6		AWM-4	AWM-4	○	
7	150	UW55	**SCV-151.5FH55UW-C**	9	15	81	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7				○	
11	150	VP110	**SCV-201.5P110C**	12	20	108	129	117	14.3±0.2	0.18	154	115	ϕ110	2.6		AWM-4	AWM-4	○	
11	150	VP110	**SCV-251.5P110C**	15	25	135	129	117	14.3±0.2	0.18	154	115	ϕ110	2.6		AWM-4	AWM-4	○	
12	150	VP82L	**SCV-201.5P82L**	12	20	108	106	96	10.8±0.2	0.18	125	95	ϕ82	1.6		AWM-4	AWM-5	○	
5.5	200	VP65	**SCV-152P65C**	9	15	108	99	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
12	200	VM-Type1	**SCV-152**	9	15	100	76	68	12±1	0.245	140	115	ϕ60.4	1.0	SJ-2	AWF-2	AWM-2		
12	200	VP82L	**SCV-202P82L**	12	20	140	106	96	10.8±0.2	0.18	125	95	ϕ82	1.6		AWM-4	AWM-5	○	
12	200	VC-82HE	**SCV-202C82HE-AAFG-B**	12	20	140	106	96	10.5±0.5	0.18	132	101	ϕ82	1.5				○	
15	200	VP65	**SCV-202P65**	12	20	130	99	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
20	200	VP82	**SCV-252P82**	15	25	140	106	96	14.3±0.2	0.18	154	115	ϕ82	1.8		AWM-4	AWM-5	○	
22	200	VPA82	**SCV-302PA82**	18	30	170	129	117	12.6±0.6	0.18	152	112	ϕ82	1.8		AWM-4	AWM-5	○	
25	200	VP110	**SCV-302P110**	18	30	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.6		AWM-4	AWM-4	○	
12	220	VP82L	**SCV-202.2P82L**	12	20	140	106	96	10.8±0.2	0.18	125	95	ϕ82	1.6		AWM-4	AWM-5	○	
14	220	VP94L	**SCV-202.2P94L**	12	20	159	125	113	10.8±0.2	0.18	125	95	ϕ94	1.8		AWM-4	AWM-5	○	
13	245	VP110	**SCV-202.5P110C**	12	20	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.6		AWM-4	AWM-4	○	
13	245	VP110	**SCV-252.5P110C**	15	25	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.6		AWM-4	AWM-4	○	
12	250	VC-85HE	**SCVW-252.5C85HE**	15	25	225	171	155	10.5±0.2	0.18	141	101	ϕ85	1.7					
15	250	VP65	**SCV-152.5P65**	9	15	130	99	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
15	250	VP65	**SCV-202.5P65**	12	20	130	99	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
25	250	UW55	**SCV-152.5H55UW-C**	9	15	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7				○	○
25	250	VP94	**SCV-202.5P94**	12	20	150	114	103	14.3±0.2	0.18	154	115	ϕ94	2.1		AWM-4	AWM-4	○	
30	250	VM-Type2	**SCV-152.5**	9	15	100	76	68	12±1	0.245	140	115	ϕ62.4	1.0	SJ-2	AWF-2	AWM-2		
30	330	VC-82HE	**SCV-103.3C82HEW-AADG-J**	6	10	119	106	96	12±0.5	0.18	132	101	ϕ82	1.5				○	
7	350	UW55	**SCV-83.5FH55UW-C**	4.8	8	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7				○	
15	350	VP82L	**SCV-103.5P82LW**	6	10	126	106	96	10.8±0.2	0.18	125	95	ϕ82	1.6		AWM-4	AWM-5	○	
15	350	VP94L	**SCV-153.5P94L**	9	15	165	125	113	10.8±0.2	0.18	125	95	ϕ94	1.8		AWM-4	AWM-5	○	
20	350	VP150	**SCV-403.5P150**	24	40	300	228	206	16.6±0.2	0.7	265	165	ϕ150	6.8					
35	350	VP110	**SCV-253.5P110**	15	25	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.6		AWM-4	AWM-4	○	
40	350	VP115	**SCVW-352.5PC115H**	21	35	205	156	141	10.3±0.2	0.18	154	125	ϕ115	3.9				○	
15	400	VP82L	**SCV-84P82LW**	4.8	8	115	106	96	10.8±0.2	0.18	125	95	ϕ82	1.6		AWM-4	AWM-5	○	
45	450	VD55	**SCV-154.5D55W**	9	15	80	61	55	10±0.5	0.15	115	96.5	ϕ55	0.6					
80	450	VM-Type4	**SCV-204**	12	20	100	76	68	12±1	0.245	140	115	ϕ89	1.8					
6	500	VP65	**SCV-7.55P65FW**	4.5	7.5	130	99	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
6	500	VP65	**SCV-105P65FW**	6	10	130	99	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
7	500	UW55	**SCV-55FH55UW-C**	3	5	90	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7				○	
10	500	VP70L	**SCV-85P70LW**	4.8	8	130	99	89	10.7±0.2	0.18	125	95	ϕ70	1.2					
10	500	VP65	**SCV-125P65DW**	7.2	12	130	99	89	14.3±0.2	0.18	154	115	ϕ65	1.3		AWF-6	AWM-6	○	
15	500	VP70	**SCV-155P70W**	9	15	140	106	96	14.3±0.2	0.18	154	115	ϕ70	1.3		AWF-6	AWM-6	○	
20	500	VP82	**SCV-155P82W**	9	15	140	106	96	14.3±0.2	0.18	154	115	ϕ82	1.8		AWM-4	AWM-5	○	
20	500	VP82	**SCV-205P82W**	12	20	140	106	96	14.3±0.2	0.18	154	115	ϕ82	1.9		AWM-4	AWM-5	○	
25	500	VM-Type1	**SCV-155G**	9	15	90	68	62	12±1	0.245	140	115	ϕ60.4	1.0	SJ-2	AWF-2	AWM-2		
25	500	VP94	**SCV-205P94**	12	20	150	114	103	14.3±0.2	0.18	154	115	ϕ94	2.1		AWM-4	AWM-4	○	
30	500	VM-Type2	**SCV-55**	3	5	100	76	68	12±1	0.245	140	115	ϕ62.4	1.0	SJ-2	AWF-2	AWM-2		
30	500	VM-Type2	**SCV-7.55**	4.5	7.5	100	76	68	12±1	0.245	140	115	ϕ62.4	1.0	SJ-2	AWF-2	AWM-2		

Capacitance Min	Capacitance Max	Type	Part Number	Voltage (kVp) RF Working	Voltage (kVp) Peak Test	Current (Arms) 13.56 MHz	Current (Arms) 40 MHz	Current (Arms) 60 MHz	Tuner Turns	Turner Operating Torque (Nm)	Mounting dimensions (mm) Total Length	Mounting dimensions (mm) Mounting Length	Mounting dimensions (mm) Outer Diameter	Weight (kg)	Options Guide Screw	Options Water-cooled Fixed Side	Options Water-cooled Moving Side	Options Ball Screw	Options -NP (Low Current)
35	500	VD55	**SCV-55D55W**	3	5	40	30	27	10±0.5	0.15	115	96.5	ϕ55	0.6					
35	500	VD55	**SCV-85D55W**	4.8	8	80	61	55	10±0.5	0.15	115	96.5	ϕ55	0.6					
35	500	UW55	**SCV-85H55UW-C**	4.8	8	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7				○	○
40	500	VP110	**SCV-205P110**	12	20	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.6		AWM-4	AWM-4	○	
40	500	VP110	**SCV-255P110**	15	25	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.6		AWM-4	AWM-4	○	
40	500	VP150	**SCV-405P150**	24	40	300	228	206	16.6±0.2	0.7	265	165	ϕ150	6.6					
40	500	VP200	**SCV-555P200**	33	55	400	305	275	16.6±0.2	0.7	265	165	ϕ200	7.7					
50	500	UW65	**SCV-125H65UW-C**	7.2	12	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ65	0.9				○	○
50	500	UW65	**SCV-155H65UW-C**	9	15	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ65	0.9				○	
50	500	VM-Type3	**SCV-155M**	9	15	100	76	68	12±1	0.245	140	115	ϕ73	1.3	SJ-1	AWF-1	AWM-1		
50	500	VM-Type3	**SCV-205G**	12	20	90	68	62	12±1	0.245	140	115	ϕ73	1.3	SJ-1	AWF-1	AWM-1		
15	650	VD45	**SCV-56.5D45W**	3	5	70	53	48	10±0.5→9.5±0.xx	0.15	115	96.5	ϕ45	0.4					
15	800	VP110	**SCV-158P110FW**	9	15	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.8		AWM-4	AWM-4	○	
20	800	VP70	**SCV-128P70W**	7.2	12	140	106	96	14.3±0.2	0.18	154	115	ϕ70	1.3		AWF-6	AWM-6	○	
50	800	UW82	**SCV-158FH82UW-C**	9	15	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ82	1.3				○	
50	800	VP94	**SCV-158P94DW**	9	15	150	114	103	14.3±0.2	0.18	154	115	ϕ94	2.1		AWM-4	AWM-4	○	
50	900	VP110	**SCV-209P110W**	12	20	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.8		AWM-4	AWM-4	○	
12	950	VP70L	**SCV-49.5P70LW**	2.4	4	130	99	89	10.7±0.2	0.18	125	95	ϕ70	1.2					
6	1000	VP65	**SCV-310P65FW**	1.8	3	108	99	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
20	1000	VP65	**SCV-410P65W**	2.4	4	130	98	89	14.3±0.2	0.18	154	115	ϕ65	1.2		AWF-6	AWM-6	○	
20	1000	VP65	**SCV-510P65W**	3	5	130	99	89	14.3±0.2	0.18	154	115	ϕ65	1.3		AWF-6	AWM-6	○	
20	1000	VP65	**SCV-810P65W**	4.8	8	130	99	89	14.3±0.2	0.18	154	115	ϕ65	1.3		AWF-6	AWM-6	○	
25	1000	VP82	**SCV-1010P82W**	6	10	140	106	96	14.3±0.2	0.18	154	115	ϕ82	1.8		AWM-4	AWM-5	○	
35	1000	UW55	**SCV-310H55UW-C**	1.8	3	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7				○	○
35	1000	UW55	**SCV-510H55UW-C**	3	5	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7				○	
40	1000	VD55	**SCV-110D55W**	0.6	1	36	30	27	10±0.5	0.15	115	96.5	ϕ55	0.6					
40	1000	VD55	**SCV-410D55W**	2.4	4	80	61	55	10±0.5	0.15	115	96.5	ϕ55	0.6					
40	1000	VP110	**SCV-1510P110W**	9	15	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.8		AWM-4	AWM-4	○	
40	1000	VP110	**SCV-2210P110W**	13.2	22	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.8					
50	1000	VM-Type3	**SCV-510M**	3	5	100	76	68	12±1	0.245	140	115	ϕ73	1.4	SJ-1	AWF-1	AWM-1		
50	1000	VM-Type3	**SCV-1010G**	6	10	90	68	62	12±1	0.245	140	115	ϕ73	1.4	SJ-1	AWF-1	AWM-1		
50	1000	VP150	**SCV-2010P150W**	12	20	300	228	206	16.6±0.2	0.7	265	165	ϕ150	7.7					
80	1000	VM-Type4	**SCV-1010**	6	10	100	76	68	12±1	0.245	140	115	ϕ89	1.8					
100	1000	UW65	**SCV-810H65UW-C**	4.8	8	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ65	0.9				○	
100	1000	UW65	**SCV-1010H65UW-C**	6	10	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ65	0.9				○	
90	1400	VM-Type3	**SCV-514M**	3	5	100	76	68	12±1	0.245	140	115	ϕ73	1.4	SJ-1	AWF-1	AWM-1		
90	1400	VM-Type3	**SCV-1014G**	6	10	90	68	62	12±1	0.245	140	115	ϕ73	1.4	SJ-1	AWF-1	AWM-1		
140	1400	UW82	**SCV-1014H82UW-C**	6	10	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ82	1.3				○	
10	1500	VP65	**SCV-315P65DW**	1.8	3	130	99	89	14.3±0.2	0.18	154	115	ϕ65	1.3		AWF-6	AWM-6	○	
25	1500	VP82	**SCV-515P82W**	3	5	140	106	96	14.3±0.2	0.18	154	115	ϕ82	1.8		AWM-4	AWM-5	○	
30	1500	VP94	**SCV-815P94**	4.8	8	150	114	103	14.3±0.2	0.18	154	115	ϕ94	2.1		AWM-4	AWM-4	○	
35	1500	VP70	**SCV-515P70W**	3	5	140	106	96	14.3±0.2	0.18	154	115	ϕ70	1.5		AWF-6	AWM-6	○	
40	1500	VP110	**SCV-1015P110W**	6	10	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.8		AWM-4	AWM-4	○	
45	1500	VD55	**SCV-115D55W**	0.6	1	40	30	27	10±0.5	0.15	115	96.5	ϕ55	0.6					
45	1500	VD55	**SCV-315D55W**	1.8	3	80	61	55	10±0.5	0.15	115	96.5	ϕ55	0.6					
60	1500	VP132	**SCV-2015P132W**	12	20	170	129	117	14.3±0.2	0.18	154	115	ϕ132	3.8		AWM-4	AWM-4	○	
150	1500	UW65	**SCV-415H65UW-C**	2.4	4	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ65	0.9				○	○
150	1500	UW55	**SCV-415H55UW-C**	2.4	4	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ55	0.7					
150	1500	UW65	**SCV-515H65UW-C**	3	5	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ65	0.9				○	
150	1500	UW82	**SCV-815H82UW-C**	4.8	8	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ82	1.3				○	
25	2000	VP82	**SCV-520P82W**	3	5	140	106	96	14.3±0.2	0.18	154	115	ϕ82	1.9		AWM-4	AWM-5	○	
30	2000	VP94	**SCV-520P94W**	3	5	150	114	103	14.3±0.2	0.18	154	115	ϕ94	2.1		AWM-4	AWM-4	○	
40	2000	VP110	**SCV-520P110**	3	5	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.9		AWM-4	AWM-4	○	
40	2000	VP110	**SCV-820P110W**	4.8	8	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.9		AWM-4	AWM-4	○	
85	2000	VM-Type4	**SCV-520M**	3	5	100	76	68	12±1	0.245	140	115	ϕ89	1.9	SJ-1	AWF-1	AWM-1		
200	2000	UW65	**SCV-320H65UW-C**	1.8	3	94	71	64	10.5±0.2	0.18	133.5	90.6	ϕ65	0.9				○	
1000	2000	VP200	**SCV-2020P200**	12	20	400	305	275	13.3±0.5	0.7	265	165	ϕ200	13.1					
80	2200	VP132	**SCV-1022P132W**	6	10	170	129	117	14.3±0.2	0.18	154	115	ϕ132	3.8					
45	2300	VP94	**SCV-523P94W**	3	5	150	114	103	14.3±0.2	0.18	154	115	ϕ94	2.3		AWM-4	AWM-4	○	
15	2500	VP110	**SCV-325P110FW**	1.8	3	170	129	117	14.3±0.2	0.18	154	115	ϕ110	2.9		AWM-4	AWM-4	○	
40	2500	VP150	**SCV-1525P150W**	9	15	300	228	206	16.6±0.2	0.7	265	165	ϕ150	7.7					
40	2500	VPA150	**SCV-1525PA150W**	9	15	400	305	275	16.6±0.2	0.7	265	165	ϕ150	7.7					
45	4000	VP110	**SCV-340P110W**	1.8	3	170	129	117	14.3±0.2	0.18	154	115	ϕ110	3.0		AWM-4	AWM-4	○	