

Air Cooled VSD Screw Chiller

MVSA Series



Nominal Capacity 246 to 1231 kW

Refrigerant: R134a



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Features

STRUCTURE

Multistack **MVS** series VSD screw chillers use high efficiency variable frequency screw compressors, falling film or flooded (optional) evaporators and cutting-edge MS One control system to achieve best energy efficiency ratio at both full load and part loads and reduce operating costs significantly. Multistack **MVSA** series Air Cooled VSD Screw Chiller play an important role in environmental protection and energy conservation.

Cooling capacity of each unit ranges from 246 kW to 1231 kW, which is ideal for applications in hotels, restaurants, movie theaters, shopping malls, office buildings, residential buildings, hospitals, etc. as well as industrial process refrigeration, such as plastic chemical and precision instrument industries.

Electronic expansion valve (EXV) is used for metering the supply of liquid refrigerant for the falling film or flooded evaporator. The packaged unit has already been factory-charged with refrigerant and factory-tested, requiring only pipelines and power-lines connections while eliminating complicated pump-down and refrigerant charge during field installation to ensure reliable operation of the equipment.

Multistack's new generation of MS One programmable control system not only provides the most powerful protection and control over the chiller, but also enables remote monitoring with its powerful communication function. The chillers are designed to be compact, space saving and installation cost saving. Multistack **MVSA** series Air cooled VSD screw chillers are packaged design. Main parts include screw refrigeration compressor, variable speed drive (VSD) on compressor, shell and tube condenser, falling film evaporator (optional flooded evaporator), filter drier, EXV and control system. To make sure consistent ex-factory performance, chillers have been pumped down, charged with refrigerant and lubrication oil and run-tested in the factory. Field works only remain water pipes installation and power lines connection.

VI Series VSD COMPRESSOR

Semi-hermetic screw refrigeration compressor has a motor and screw rotor installed in the same housing. The screw rotor is directly driven by the motor without any mechanical driving device, thus avoiding efficiency loss and reducing vibration and noise. This structure and directly driven design eliminate the use of shaft seal and avoid associated refrigerant and oil leakage as well as shaft seal change due to wear and tear.



With excellent volumetric efficiency and minimum clearance, the 5~6 tooth profile wound-rotor design has been patented in the U.S.A., Japan and China. Pressure ratio is adjustable based on actual operating conditions and operation loss can be reduced to achieve better capacity control range and more accurate temperature control. Motor and discharge temperature safeties, oil level control, oil heater, oil cooling and anti-slugging functions ensure reliable and stable operation of the compressor.

ELECTRICAL COMMUTATION (EC) AXIAL FAN

- Embedded in the Telligent variable frequency control
- Direct driven axial fan
- Aerodynamic-optimized, sickle-blade profile, patterned with serrated trailing edge and winglets on the blade outer edge for energy and noise-optimized operation
- Highly efficient external rotor motor with innovative bionic-blade
- Drive motor in external rotor principle, sealed in protection class IP54
- Version with integrated electronics (IP65)
- Fan over-temperature protection through active temperature management
- Thermal class THCL 155
- The motor efficiency class complies with IE4
- The permissible ambient temperature is -35°C to max. +70°C
- Maintenance free ball bearings sealed on both sides with long-term lubrication.



Advanced Refrigerant Control



EVDEVO driver and super capacitor module are integrated in pCO5+ without the need of solenoid valve. EXV is used to fast and precisely meter refrigerant flow to keep a stable evaporator leaving water temperature.

MODEL NUMBER DESIGNATION

MVS	А	070	E	А	R
1	2	3	4	5	6

- 1: Variable Speed Drive on Screw compressor
- 2: Cooling type:
 - A: Air cooled W: Water cooled
- 3: Model Number

4: Refrigerant E: R134a

5: Electrical Specifications A: 400V ± 10% / 50Hz/ 3 Phase B: 380V / 60Hz / 3 Phase C: 440-460V / 60Hz / 3 Phase

6: Blank for Standard R: Heat Recovery (Optional)

CAREL Control

Multistack **MVSA** series air cooled screw chillers use MS One control system. The control core is a programmable pCO⁵+ logic controller dedicated for HVAC products. The patent chip of pCO⁵+ takes advantage of ASIC technology to ensure flexibility of the control system. LCD touch screen provides operators, factory technicians and service personnel with current operation data of the chiller, faults, load history, start/stop history, etc.

TEMPERATURE CONTROL

MS One Control System compares the entering and leaving water temperature with its setpoint value to compute the capacity required and determine the compressor load. The inverter will adjust cooling capacity of the chiller based on the previous calculated value and keep the water temperature within set point.

COMPRESSOR BALANCE AND START / STOP RESTRICTION

MS One accumulates running hours of each compressor and hence establishes a working sequence to well balance the running hours of the two compressors of the chiller. Minimum non-running hours, minimum running hours, restart times limit and other settings allow the control of start and stop frequency of the compressor, which can improve its life span.

FAILSAFE

Control system can monitor the following faults. In the event of a compressor fault, the controller will close the faulty compressor. In the case of a system fault, the controller will close all compressors of the chiller bank.

Compressor Faults: High discharge pressure, low suction pressure, discharge temperature fault, compressor overload, inverter fault, motor faults, etc.

System Faults: Low chilled water flow, low condenser water flow, low leaving chilled water temperature, high leaving condenser water temperature, system pressure Fault, external interlock fault/protection, pump fault, cooling tower fault, etc.

REMOTE COMMUNICATION

MS One Control System is fitted with Ethernet, RS485, RS232 and USB ports to realize remote communication and integrated controls via connection between the Building Automation System (BAS) or Distributed Control System (DCS) and various protocols. These protocols can also work with DDC and other different types of controllers to build a control network.

PASSWORD

MS One has three levels of security access – User, Service and Factory. The three-level security accesses ensure that only authorized personnel can modify chiller control and protection settings to avoid any unwanted change that may result in chiller failure by an unauthorized person.

Physical Data R134a

	Model: MVSA	070	105	140	175	210	280	350		
Nominal Cooli	ng Capacity (kW)	246	369	492	615	738	985	1231		
Power Input (I	<w)< th=""><th>82.3</th><th>122.2</th><th>160.8</th><th>205.0</th><th>244.4</th><th>321.9</th><th>410.3</th></w)<>	82.3	122.2	160.8	205.0	244.4	321.9	410.3		
COP (w/w)		2.99	3.02	3.06	3.00	3.02	3.06	3.00		
IPLV (w/w)		5.52 5.62 5.71 5.77 5.85 5.95 5.89								
Control Syster	n	MS One Controller								
	Туре				VSD Screw					
Compressor	ompressor Number		1	1	2	2	2	2		
	Control Stages (%)	40 - 100	40 - 100	20 -100	20 -100	20 -100	20 -100	20 -100		
RLA (A)		138.9	138.9 205.3 270.8 345.8 410.7 541.7							
	Туре			S	hell & Tube					
	CH.W. Flow (m ³ /h)	42.3	63.3	84.6	105.8	126.6	169.2	211.7		
	Water Pressure Drop (kPa)	48.5	55.8	55.5	65.0	55.8	55.5	65.1		
Evaporator	Fouling Factor (m ² k/kW)				0.018					
	Max. Working Pressure (kPa) (Water Side)	1000								
	Passes	2								
	Water Connection Size	5	"	6"						
	Туре			Air Cooled Fi	n Tube Heat	Exchanger	•			
Condonsor	Number of fans	4	6	8	10	12	16	20		
Condensei	Power per Fan (kW)				1.715					
	RLA per fan (A)				2.65					
Shipping weig	ht (kg)	3000	3400	3800	4200	6800	7600	8400		
Operation wei	ght (kg)	3100	3500	3900	4300	7000	7800	8600		
Refrigerant					R134a					
Refrigerant ch	arge (kg)	70	105	140	175	210	280	350		
	L (mm)	3040	4340	5640	6940	8240	10840	13440		
Dimension	W (mm)				2200					
	H (mm)	2500								

Nominal Values base on:

Ambient Temp.	35°C
Chilled Water Entering Temp.	12°C
Chilled Water Leaving Temp.	7°C

Unit Performance

MVSA070

Ambient		Leaving Chilled Water Temperature (°C)												
Air Temp.	6		7	,	8		9		12		15			
°C	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI		
15	319.8	66.7	329.6	67.5	339.5	68.3	359.2	70.0	378.8	71.6	413.3	75.7		
20	305.0	73.2	314.9	74.1	324.7	75.7	344.4	78.2	359.2	77.4	388.7	79.8		
25	290.3	80.7	300.1	82.3	310.0	83.9	329.6	86.4	339.5	83.1	359.2	81.5		
30	275.5	88.9	285.4	90.5	290.3	89.7	310.0	93.8	319.8	90.5	334.6	85.6		
35	243.5	84.8	246.0	82.3	255.8	84.8	275.5	88.9	290.3	90.5	314.9	93.0		
40	226.3	91.4	231.2	91.4	241.1	94.6	255.8	96.3	260.8	92.2	270.6	87.2		

MVSA105

Ambient	Leaving Chilled Water Temperature (°C)											
Air Temp.	6		7		8		9		12		15	
°C	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI
15	479.7	99.0	494.5	100.2	509.2	101.4	538.7	103.9	568.3	106.3	619.9	112.4
20	457.6	108.8	472.3	110.0	487.1	112.4	516.6	116.1	538.7	114.9	583.0	118.5
25	435.4	119.8	450.2	122.2	464.9	124.6	494.5	128.3	509.2	123.4	538.7	121.0
30	413.3	132.0	428.0	134.4	435.4	133.2	464.9	139.3	479.7	134.4	501.8	127.1
35	365.3	125.9	369.0	122.2	383.8	125.9	413.3	132.0	435.4	134.4	472.3	138.1
40	339.5	135.6	346.9	135.6	361.6	140.5	383.8	143.0	391.1	136.9	405.9	129.5

MVSA140

Ambient	Leaving Chilled Water Temperature (°C)											
Air Temp.	6			7	8		9		12		15	
°C	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI
15	639.6	130.2	659.3	131.9	679.0	133.5	718.3	136.7	757.7	139.9	826.6	147.9
20	610.1	143.1	629.8	144.7	649.4	147.9	688.8	152.8	718.3	151.2	777.4	156.0
25	580.6	157.6	600.2	160.8	619.9	164.0	659.3	168.8	679.0	162.4	718.3	159.2
30	551.0	173.7	570.7	176.9	580.6	175.3	619.9	183.3	639.6	176.9	669.1	167.2
35	487.1	165.6	492.0	160.8	511.7	165.6	551.0	173.7	580.6	176.9	629.8	181.7
40	452.6	178.5	462.5	178.5	482.2	184.9	511.7	188.1	521.5	180.1	541.2	170.4

MVSA175

Ambient		Leaving Chilled Water Temperature (°C)											
Air Temp.	6 7			8		9		12		15			
°C	САР	PI	САР	PI	CAP	PI	САР	PI	САР	PI	CAP	PI	
15	799.5	166.1	824.1	168.1	848.7	170.2	897.9	174.3	947.1	178.4	1033.2	188.6	
20	762.6	182.5	787.2	184.5	811.8	188.6	861.0	194.8	897.9	192.7	971.7	198.9	
25	725.7	200.9	750.3	205.0	774.9	209.1	824.1	215.3	848.7	207.1	897.9	203.0	
30	688.8	221.4	713.4	225.5	725.7	223.5	774.9	233.7	799.5	225.5	836.4	213.2	
35	608.9	211.2	615.0	205.0	639.6	211.2	688.8	221.4	725.7	225.5	787.2	231.7	
40	565.8	227.6	578.1	227.6	602.7	235.8	639.6	239.9	651.9	229.6	676.5	217.3	

To be continued...

Unit Performance (cont'd)

MVSA210

Ambient		Leaving Chilled Water Temperature (°C)											
Air Temp.	6	i	7	7	8		9		12		15		
°C	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI	
15	959.4	198.0	988.9	200.4	1018.4	202.9	1077.5	207.7	1136.5	212.6	1239.8	224.8	
20	915.1	217.5	944.6	220.0	974.2	224.8	1033.2	232.2	1077.5	229.7	1166.0	237.1	
25	870.8	239.5	900.4	244.4	929.9	249.3	988.9	256.6	1018.4	246.8	1077.5	242.0	
30	826.6	264.0	856.1	268.8	870.8	266.4	929.9	278.6	959.4	268.8	1003.7	254.2	
35	730.6	251.7	738.0	244.4	767.5	251.7	826.6	264.0	870.8	268.8	944.6	276.2	
40	679.0	271.3	693.7	271.3	723.2	281.1	767.5	285.9	782.3	273.7	811.8	259.1	

MVSA280

Ambient		Leaving Chilled Water Temperature (°C)												
Air Temp.	6 7		8	8		9		2	15					
°C	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI		
15	1280.5	260.7	1319.9	264.0	1359.3	267.2	1438.1	273.6	1516.9	280.1	1654.8	296.1		
20	1221.4	286.5	1260.8	289.7	1300.2	296.1	1379.0	305.8	1438.1	302.6	1556.3	312.2		
25	1162.3	315.5	1201.7	321.9	1241.1	328.3	1319.9	338.0	1359.3	325.1	1438.1	318.7		
30	1103.2	347.7	1142.6	354.1	1162.3	350.9	1241.1	367.0	1280.5	354.1	1339.6	334.8		
35	975.2	331.6	985.0	321.9	1024.4	331.6	1103.2	347.7	1162.3	354.1	1260.8	363.7		
40	906.2	357.3	925.9	357.3	965.3	370.2	1024.4	376.6	1044.1	360.5	1083.5	341.2		

MVSA350

Ambient		Leaving Chilled Water Temperature (°C)											
Air Temp.	6 7		8	8		9		2	15				
°C	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI	САР	PI	
15	1600.3	332.3	1649.5	336.4	1698.8	340.5	1797.3	348.8	1895.7	357.0	2068.1	377.5	
20	1526.4	365.2	1575.7	369.3	1624.9	377.5	1723.4	389.8	1797.3	385.7	1945.0	398.0	
25	1452.6	402.1	1501.8	410.3	1551.1	418.5	1649.5	430.8	1698.8	414.4	1797.3	406.2	
30	1378.7	443.1	1428.0	451.3	1452.6	447.2	1551.1	467.7	1600.3	451.3	1674.2	426.7	
35	1218.7	422.6	1231.0	410.3	1280.2	422.6	1378.7	443.1	1452.6	451.3	1575.7	463.6	
40	1132.5	455.4	1157.1	455.4	1206.4	471.8	1280.2	480.1	1304.9	459.5	1354 .1	434.9	

CAP Cooling Capacity (kW)

Compressor Power input (kW)

Notes:

- This table is based on a 5°C difference in water temperature.
- Please contact your local Multistack Agent if you require performance data beyond the limits of the above table.

ΡΙ

- For low temperature applications (≤6°C) contact Multistack Ltd.
- Interpolation is permissible. Do not extrapolate.

Physical Dimensions











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FIELD WIRING DIAGRAM



Technical Notes:

- 1. Minimum cross section of control wires should be 1mm²;
- 2. All input terminals have been factory-bridged, which require removal of jumper blocks before use;
- 3. All input terminals are volt-free contacts;
- 4. Maximum current allowable for volt-free output contact is 5A (Resistive);
- 5. "—" for factory wiring and "--" for field wiring.

INSTALLATION & OPERATION

- 1. MULTISTACK variable speed screw chillers can be installed in places with enough ventilation and convenience for installation, such as rooftop, balcony or just on the ground, to keep good convection heat transfer If two or more chillers are installed with induced drafts facing one another, minimum 3 meters spacing is required between the induced drafts
- Distances between the flow switch and the upstream/downstream horizontal straight pipe should be at least 5 times pipe diameter to prevent damage on the chiller in the event of insufficient water flow. Flow switch is irreplaceable by differential pressure switch/transmitter on water headers; required setting of the flow switch: open when rated water flow ≤80%;
- 3. External pipes and valves shall have proper support so that their weights would not land on the chiller and guarantee good sealing of pipe connections.
- 4. Strainer should be installed in the inlet pipe. Strainer should be of stainless steel and sturdy enough in case that too much water pressure caused by partial blockage may damage the strainer.
- 5. After the temperature sensors are inserted to the sensor wells, grease lubricant should be applied into the sensor wells to protect temperature probes from being damaged by water accumulation inside the sensor well.
- 6. Prior to chiller operation, the whole piping system must be thoroughly cleaned and removed of mechanical impurities.
- 7. All piping components are to be supplied by the users.



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