



CDV

Phone (877) 632-4876



Operating instruction

Refrigerant Valves PS45

CDV..MVL..

for flammable and safety refrigerants

- One valve type for expansion, hot-gas and suction throttle applications
- Approved according to directive 94/9/EC (ATEX 95)
- Certificate: SEV 05 ATEX 0154X
- Four valve sizes with k_{vs} values from 0.25 to 6.3 m³/h
- Selectable standard interface DC 0/2...10 V or DC 0/4...20 mA
- Short positioning time (< 1 s)
- Closed when deenergized
- · Hermetically sealed towards outside
- Robust and maintenance-free

Use



Refrigerant valve CDV..MVL.. is a device of device group II, category 3G pursuant to Directive 94/9/EG (ATEX 95) Appendix, that can be used pursuant to Directive 99/92/EG (ATEX 137) in zone 2 as well as natural gas groups IIA, IIB, and IIC, that are a risk of explosion in the range for temperature classes T1 to T4 due to flammable materials.

Permissible ambient temperature is -25°C to +55°C.

Type summary

	Type reference		Bas	se valve ³⁾	DN	k_{vs} [m³/h]	k _{vs} reduced ¹⁾ [m ³ /h]	Δp _{max} [MPa]	Q₀ E [kW]	Q₀ H [kW]	Q₀ D [kW]	
	CDV.	MVL	мv	L661.15-0.4	15	0.40	0.25	[e]	47	9.2	1.7	
	CDV.	MVL	ΜV	L661.15-1.0	15	1.0	0.63		117	23	4,2	
	CDV.	CDVMVL		L661.20-2.5	20	2.5	1.6	2,5	293	57	10	
	CDVMVL		ΜV	L661.25-6.3	25	6.3	4.0		737	144	26	
	1) 2) 3)	k _{vs} and Q ₀ r on page 3 The data sh For ease of	refrig neet f use	eration capacity can be reduced to 63 % of nominal k _{vs} , refer to «kvs reduction» references for ease of understanding and reading to CDVMVL661 and understanding CDVMVL661 is used as term								
	$k_{vs} \\$	Nominal flo 100 kPa (1	w rat bar)	te of refrigerar to VDI / VDE	nt thro 2173	ugh the	fully open valve	(H ₁₀₀) at	a differer	itial pressu	ure of	
	$\begin{array}{l} Q_0 \ E \\ Q_0 \ E \\ Q_0 \ H \\ Refrigeration capacity in expansion applications \\ Q_0 \ D \\ Refrigeration capacity in hot-gas bypass applications \\ Q_0 \ D \\ Refrigeration capacity in suction throttle applications and $\Delta p = 0.5$ bar \\ Q_0 \\ With R407C at t_0 = 0 \ ^\circ C, t_c = 40 \ ^\circ C \end{array}$											
	The pressure drop across evaporator and condenser is assumed to be 0.3 bar each, and 1.6 bar upstream of the evaporator (e.g. spider). The capacities specified are based on superheating by 6 K and sub-cooling by 2 K.								bar			
Ordering	The	product ma	ay o	nly be orde	red a	s custo	mized device	varian	t (CDV).			
Example	Туре	e reference	;	Stock number		Description						
	CDV	′xxMVLyy		CDVMVL			Refrigerant	valve				
	хх уу	5-digit num Sequence i	ber o numb	created espectorer created for	ially fo r CDV	r a CDV V order	or					
Replacement electronics	Replacement electronics may be ordered as customized device variant (CDV).											
Revision numbers	See	overview,	pag	e 11.								
Function / mechanical desig	esign											
Features and benefits	 Four selectable standard signals for set and actual value DIL switch to reduce the k_{vs} value to 63 % of the nominal value Potentiometer for adjustment of minimum stroke for suction throttle applications Automatic stroke calibration Forced control input for "Valve closed" or "Valve fully open" LED for indicating the operating state 											
Control	The CDVMVL661 can be driven by Siemens or third-party controllers that deliver a DC 0/210 V or DC 0/420 mA output signal. For optimum control performance, we recommend a 4-wire connection between controller and valve. When operating on DC voltage, a 4-wire connection is mandatory ! The valve stroke is proportional to the control signal.											
Spring return function	The return spring causes the actuator to close the valves control path A \rightarrow AB on power failure or interruption of the control signal.							n				

Operator controls and indicators in the electronics housing



- 1 Connection terminals
- 2 LED for indication of operating state
- 3 Minimal stroke setting potentiometer Rv
- 4 Autocalibration
- 5 DIL switches for mode control

Configuration DIL switch

k_{vs} reduction

DIL switch	Function	ON / OFF	Description
	positioning signal V	ON	Current [mA]
4714 1	positioning signal f	OFF	Voltage [V] ¹⁾
	Positioning signal range Y	ON	DC 210 V, 420 mA
2	and U	OFF	DC 010 V, 020 mA ¹⁾
	Desition foodback signal L	ON	Current [mA]
3	Position reedback signal o	OFF	Voltage [V] ¹⁾
	Nominal flow rato k	ON	63 %
19124 4	Nominal now fate K _{vs}	OFF	100 % ¹⁾
¹⁾ Eastery actting			

Factory setting



Minimum opening with minimum stroke setting



When k_{vs} reduction (DIL switch 4 in position on) the stroke will be limited to 63 % mechanical stroke. 63 % of full stroke then corresponds to an input / output signal of 10 V. If, in addition, the stroke is limited to 80 %, for example, the minimum stroke will be 0.63 x 0.8 = 0.50 of full stroke.

In the case of the suction throttle valve, it is essential that a minimum stroke limit be maintained to ensure compressor cooling and efficient oil return. This can be achieved with a reinjection valve, a bypass line across the valve, or a guaranteed minimum opening of the valve. The minimum stroke can be defined via the controller and control signal Y, or it can be set directly with potentiometer Rv.

The **factory setting** is zero (mechanical stop in counterclockwise direction, CCW). The minimum stroke can be set by turning the potentiometer Rv clockwise to a maximum of 80 % $k_{\rm vs}$.

Attention 🛆

Under no circumstances must potentiometer Rv be used to limit the stroke on expansion applications. It must be possible to close the valve fully.

Forced control input ZC



Signal priority

1. Forced control input ZC

2. Positioning signal Y and/or minimal stroke setting potentiometer Rv

Calibration

The printed circuit board of the CDV..MVL661.. has a slot to facilitate calibration. To calibrate, insert a screwdriver in the slot so that the contacts inside are connected. As a result, the valve will first be fully closed and then fully opened. Calibration matches the electronics to the valve mechanism. During calibration, the green LED flashes for about 10 seconds; refer to "

Indication of operating state " (page 4).

CDV..MVL661.. refrigerant valves are supplied fully calibrated.

When is calibration
required?After replacement of the electronics, when the red LED is lit, or when the valve (valve
seat) is leaking.

Indication of operating state

LED	State		Function	Comment, action
Green	Steady on		Operation	Automatic mode; everything ok
	Flashing		Calibration in progress	Wait until calibration is terminated (LED stops flashing)
Red	Steady on		Calibration error	Start stroke calibration again (short-circuit contacts via slot in PCB) Replace electronics
	Flashing		Mains fault	Check mains power supply (e.g. outside the frequency or voltage range)
Both	Off	0	No power supply Faulty electronics	Check mains power supply, check wiring Replace electronics

4/12

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Connection type ¹⁾	The 4-wire connection should always be given preference!						
		S _{NA}	P _{MED}	I _F	Wire	cross-section [I	mm²]
	Product number	[VA]	[W]	[A]	1.5 max.	2.5 cable length L	4.0 ²⁾
4-wire connection	CDVMVL661	22	12	1.64 A	65	110	160
3-wire connection	CDVMVL661	22	12	1.64 A	20	35	50
Engineering notes	 S_{NA} = nominal apparent power for selecting the transformer P_{med} = typical power consumption I_F = required slow fuse L = max. cable length; with 4-wire connections, the max. permissible length of the separate 1.5 mr copper positioning signal wire is 200 m ¹⁾ All information at AC 24 V ²⁾ With 4 mm² electrical wiring reduce wiring cross-section for connection inside valve to 2.5 mm². 						
	Depending on the ap instructions and fit a etc.).	oplicati ppropr	on, it ma iate safe	y be necessa ty devices (e.	ry to observe g. pressostat	e additional ir s, full motor	nstallation protection,
Warning 🖄	In order not to damage the seal inside the valve insert, the plant must be vented on the low-pressure side after the pressure test has been made (valve port AB), or the valve must be fully open during the pressure test and during venting (power supply connected and positioning signal at maximum or forced opening by $G \rightarrow ZC$).						
Expansion application	To prevent formation refrigerant in the fluid fluid pipe must be gr making the connecti	n of flas d pipe reater t ons to	sh gas or may not han the r the valve	n expansion a exceed 1 m/s nominal size o e.	applications, t s. To assure t of the valve, t	the velocity o his, the diam using reducir	f the leter of the lg pieces for
Engineering notes	 p [kPa] Δp_{FL} Inlet zone a) The differential p pressure Δp_{FL}. 	4 Dressur	e over re	3 - - - - - - - - - - - - -	h [kJ/kg] be less than	1 = eva 2 = com 3 = con 4 = exp half the diffe	porator npressor denser ansion valves
	b) The inlet path beMust be straig	etweee ght for	n diamet at least (er reduction a 600 mm	and expansio	n valve inlet	

May not contain any valves

A filter / dryer must be mounted upstream of the expansion valve. It is not approved for use with ammonia (NH3, R717).

The valve is supplied complete with mounting instructions.

HVAC Products

Ex,

II 3G

The valve should be mounted and commissioned by qualified staff. The same applies to the replacement electronics and the configuration of the controller.



Comply with requirements per EN 60079-14 for use / installation. Note additional installation notes depending on application and use the appropriate safety elements (e.g. pressure control, motor full protection).



- The refrigerant valves can be mounted in any orientation, but upright mounting is preferable.
- Arrange the pipework in such a way that the valve is not located at a low point in the plant where oil can collect.
- The pipes should be fitted in such a way that the alignment does not distort the valve connections. Fix the valve body so that that it cannot vibrate. Vibration can lead to burst connection pipes.
- Before soldering the pipes, ensure that the direction of flow through the valve is correct.
- The pipes must be soldered with care. To avoid dirt and the formation of scale (oxide), inert gas is recommended for soldering.
- The flame should be large enough to ensure that the junction heats up quickly and the valve does not get too hot.
 - The flame should be directed away from the valve.
 - During soldering, cool the valve with a wet cloth, for example, to ensure that it does not become too hot.
 - Port B must be sealed off when a 2-port valve (AB → A) is used.
 - The valve body and the connected pipework should be lagged.
- The actuator must not be lagged.

Connection terminals





Exceeding rated voltage	Measures must be undertaken outside field devices (refrigerant valve CDVMVL661) to prevent temporary faults from exceeding more than 40 % of rated voltage (transient protection).					
Maintenance notes						
	The refrigerant valve is maintenance-free.					
Valve repair	The valve can not be repaired. It has to be replaced as a complete unit.					
Replacement electronics	Should the valve electronics prove faulty, the electronics module can easily be replaced. Replacement electronics are ordered as customized device variant (CDV). Mounting Instruction is included.					
Caution 🛆	Always disconnect power before fitting or removing the electronics module.					
	After replacing the electronics module, calibration must be triggered in order to optimally match the electronics to the valve (refer to "Calibration", page 4).					
Caution 🛆	Under operating conditions within the limits defined by the application data, the actuator will become hot, but this does not represent a burn risk. Always maintain the minimum clearance specified, refer to "Dimensions", page 11.					
Disposal	The actuator must not be disposed of together with domestic waste. This applies in particular to the PCB.					
X	Legislation may demand special handling of certain components, or it may be sensible from an ecological point of view					
∕ ⊢ 0∖	Current local legislation must be observed.					
Warranty						
	Application-specific technical data must be observed.					

If specified limits are not observed, Siemens Switzerland Ltd / CPS Products will not assume any responsibility.

Technical data

Functional actuator data			
Power supply	Extra low-voltag	e only (SELV, PELV)	
AC 24	V Operating volta	ge	AC 24 V ± 20 %
	Rated voltage to	o EN 60730	AC 24 V
	Frequency		4565 Hz
	Typical power c	onsumption P _{med}	12 W
		Standby	< 2 W (valve closed)
	Apparent power	r S _{NA}	22 VA (for selecting the transformer)
	Required fuse		1.6…4 A (slow)
DC 24	V Operating volta	ge	
	Rated voltage to	o EN 60730	DC 2030 V
	Current draw		0.5 A / 2 A (max.)
Signal inputs	Positioning sign	al Y	DC 0/210 V or DC 0/420 mA
	Impedance	DC 0/210 V	100 kΩ // 5nF
		DC 0/420 mA	240 Ω // 5nF
	Forced control i	nput ZC	
	Impedance		22 kΩ
	close valve	(ZC connected to G0)	< AC 1 V; < DC 0.8 V
	open valve	(ZC connected to G)	> AC 6 V; > DC 5 V
	no function	(ZC not wired)	positioning signal Y active
Signal outputs	Position feedba	ck signal U Voltage	DC 0/210 V; load resistance \geq 500 Ω
		Current	DC 0/420 mA; load resoistance \leq 500 Ω
	Stroke detect	ction	Inductive
	Nonlinearity		Accuracy ± 3 % full scale
Positioning time	Positioning time)	<1s
Electrical connections	Cable entry gla	nds	3 x Ø 17 mm (for M16)
	Min. wire cross-	section	0.75 mm ²
	Max. cable leng	th	See «Connection type», page 5
Functional valve data	Permissible ope	erating pressure	4.5 MPa (45 bar) "
	Differential pres	sure Δp_{max}	2.5 MPa (25 bar)
	Valve character	istics (Hub, k _v)	linear to VDI / VDE 2173
	Leakage rate (ir	nternally across seat)	max. 0.002 % k _{vs} respectively
			max. 1 Nl/h Gas at $\Delta p = 400$ kPa (4 bar)
			Shut/off function, like solenoid normally closed
			(NC) function
	External seal		nermetically sealed (fully welded,
	Demosie eikle mee	dia	no static or dynamic seals)
	Permissible me	dia	For common safety reingerants (R22, R134a,
			R404A, R407C, R410A, R507 usw.) sowie
			$R/44$ (CO_2).
	Modium tompor	aturo	Not suitable for animonia (R/T)
	Stroke recelutio		-40120 C, max. 140 C for 10 mm
	<u>Stroke resolutio</u>	ΠΔΠ/Π ₁₀₀	Typically 2 %
	Mode of operati	on	modulating
	Position when a	leeneraized	Control path $A \rightarrow AB$ closed
		leenergized	$\frac{1}{2}$
Dimensions and weight	Onentation		refer to "Dimensions", page 11
Materials	Valve body		Steel / CrNi steel
matchalo	Seat niston		CrNi stool / brass
	Sealing disk		DTEE
Pine connections	Slooves		internally soldered. CrNi steel
	SIEEVES		internally solucieu, CINI Steel

CE-conformity	
EMC-directive	2004/108/EC
Immunity	EN 61000-6-2:[2005] Industrial ³⁾
AC: Emission	EN 61000-6-3:[2007] Residential
Electrical safety	EN 60730-1
Protection class	Class III as per EN 60730
Degree of pollution	Degree 2 as per EN 60730
Housing protection	
Upright to horizontal	IP65 to EN 60529 ²⁾
Vibration ^₅)	EN 60068-2-6
	5 g acceleration, 10150 Hz, 2,5 h
	(5 g horizontal, max. 2 g upright)
Environmental compatibility	ISO 14001 (Environment)
	ISO 9001 (Quality)
	SN 36350 (Environmentally compatible
	products)
	RL 2002/95/EG (RoHS)
Directive potentially explosive	94/9/EC (ATEX 95)
atmosphere	
ATEX approval certificate	II 3G EEx nAC IIC T4
Pressure Equipment Directive	PED 97/23/EC
Pressure Accessories	as per article 1, section 2.1.4
Fluid group 1	without CE-marking as per article 3, section 3
	(sound engineering practice)

¹⁾ To EN 12284 tested with 1,43 x operating pressure at 65 bar

²⁾ At 45 °C < T_{amb} < 55 °C and 80 °C < T_{med} < 120 °C the valve must be installed on its side to avoid shortening the service life of the valve electronics
 Comply with special conditions on page 5 and requirements per EN 60079-14 when using in

⁴⁾ Transformer 160 VA (e.g. Siemens 4AM 3842-4TN00-0EA0)

⁵⁾ In conjunction with severely vibrating plant, use only highly flexible stranded wires

General	
ambient	conditions

	Operation	Transport	Storage
	EN 60721-3-3	EN 60721-3-2	EN 60721-3-1
Environmental conditions	Class 3K6	Class 2K3	Class 1K3
Temperature	-2555 °C	-2570 °C	-545 °C
Humidity	10100 % r.h.	< 95 % r.h.	595 % r.h.

Dimensions in mm



Type reference	DN	D [inch]	L [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	T [mm]	M [kg]
MVL661.15-0.4	15	5/8	140	44	36	113	160	103	4.4
MVL661.15-1.0	15	5/8	140	44	36	113	160	103	4.4
MVL661.20-2.5	20	7/8	150	41	41	119	160	103	4.5
MVL661.25-6.3	25	1 1/8	160	40	47	126	160	103	4.6

DN Nominal size

D Pipe connections [inch], inside dimensions

T Depth

M Weight including packaging [kg]

ATEX Marking



Siemens Switzerland Ltd., CH-6301 Zug Type MVL661.. Year of construction: 200x II 3G EEx nAC IIC T4 SEV 05 ATEX 0154X

! Observe operating instruction

Revision numbers

Туре	Valid from rev. no.
MVL661.15-0.4	C
MVL661.15-1.0	C
MVL661.20-2.5	D
MVL661.25-6.3	C

12/12

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Refrigerant Valves PS45

Subject to change