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# VC Valves Training

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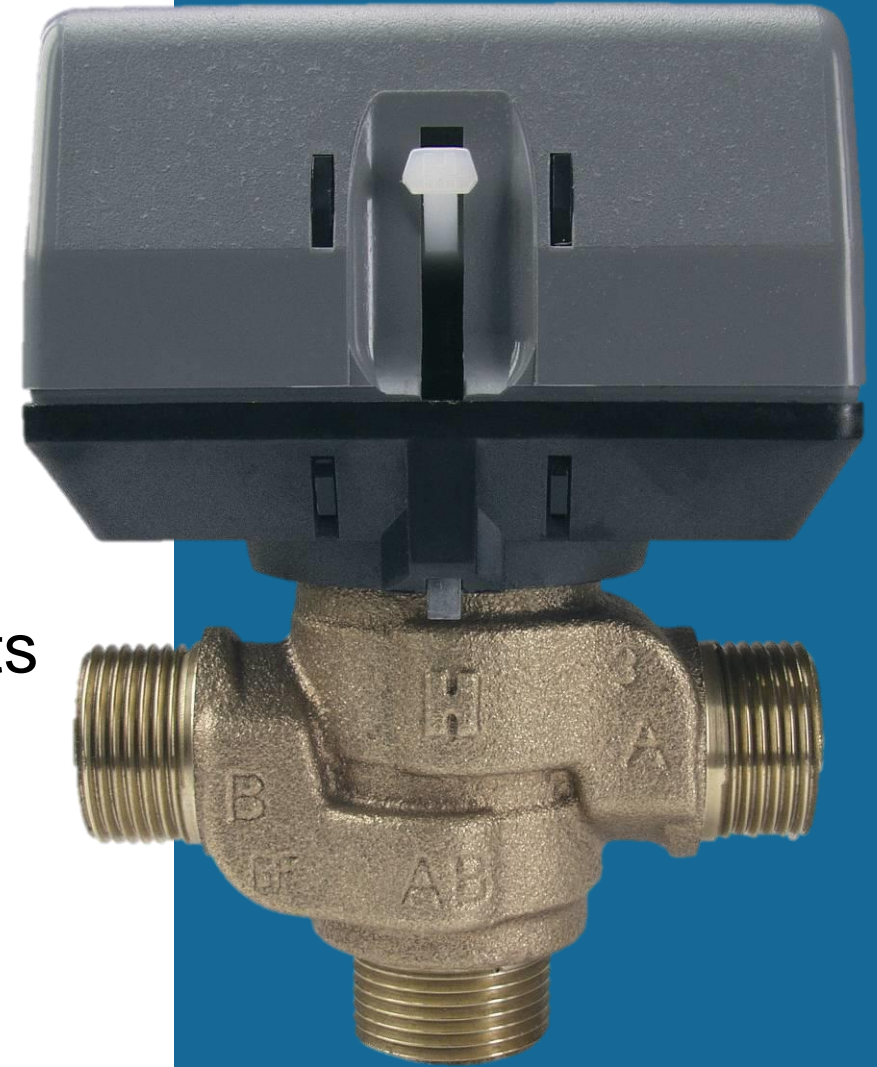


# Topics

- Technical data
- Basics & definitions  
VC valves & actuators  
More universal solutions
- How to wire to Honeywell Home thermostats
- V404x vs VC valves
- Flow rates & heat loads
- Sales ideas
- Product range
- Applications



Made in Hungary



# Technical data

- Medium: Water or water-glycol mixture (max. 50% glycol), VDI 2035, pH-value: 8...9.5
- Operating temperature **1...95°C, 120°C** short time
- Ambient temperature max. 65°C
- Operating pressure max. 20 bar
- Differential pressure **max. 4 bar**
- Actuator Voltage 24 V, 50 Hz (blue label) or 230 V, 50 Hz (red label)
- Actuator Power consumption 4 VA (when valve position changes)
- Auxiliary switch rating 1.0 A @ 250 V, 50-60 Hz (minimum 0.05 A @ 24 Vdc)
- **Runtime 7 seconds on/off** actuators, 120 seconds floating actuators
- Actuator electrical rating **IP20**
- Shipping temperature -40...65°C
- Humidity rating 5...95% RH (non-condensing)
- **Bubble tight**

# Basics – Valve Body types

2-way valve  
= 2-port valve  
= Zone valve  
= Control valve



OR

(if on/off cartridge)  
(if control cartridge)

3-way valve  
= 3-port valve  
= Changeover valve  
= Mixing/diverting valve

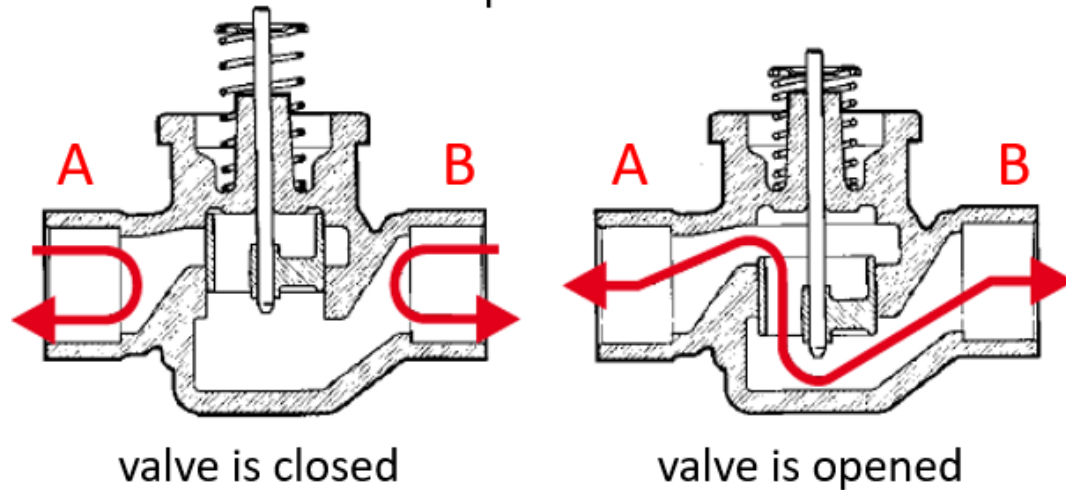


# Basics – Valve

## Valve positions

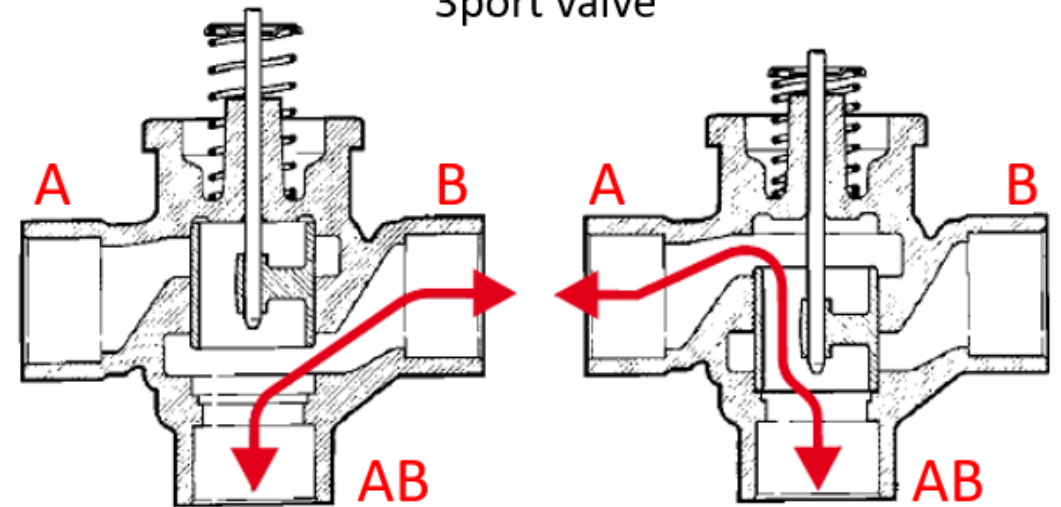
### 2-way valve

2port valve



### 3-way valve

3port valve

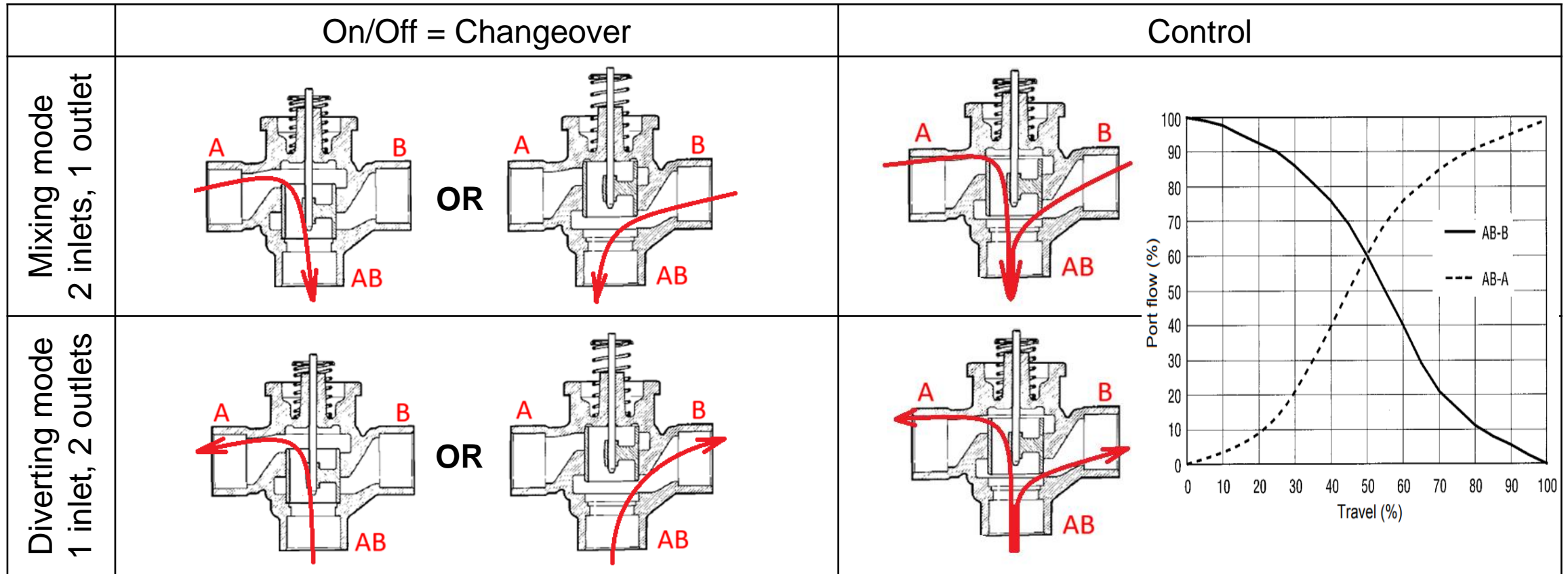


Flow direction is reversible, no matter which way water flows

**When stem is up A port is closed**

# Basics – Valve

## Valve operational modes on 3-way valve



# Basics – Valve Pipe connections

Internal threaded  
1/2" , 3/4" , 1"

OR

External threaded  
1/2" , 3/4" , 1"

OR

Compression  
22mm, 28mm

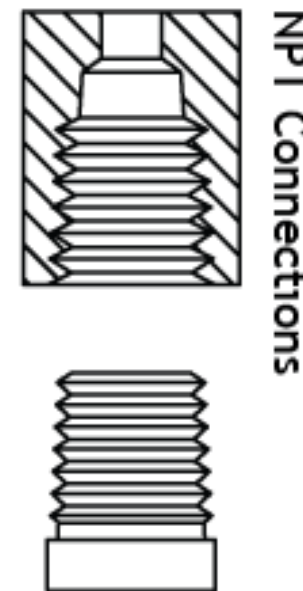
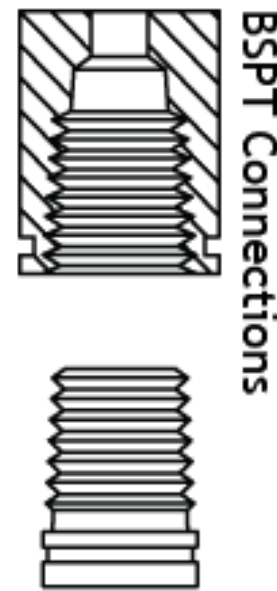
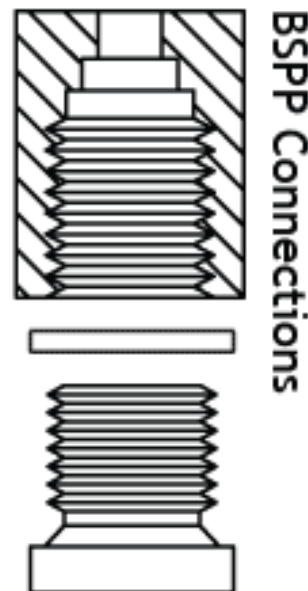
**BSPP**

**BSPT**

**NPT**

**BSPP**

**Use only BSPP versions**



# Basics – Valve

## Order number coding (most common versions)

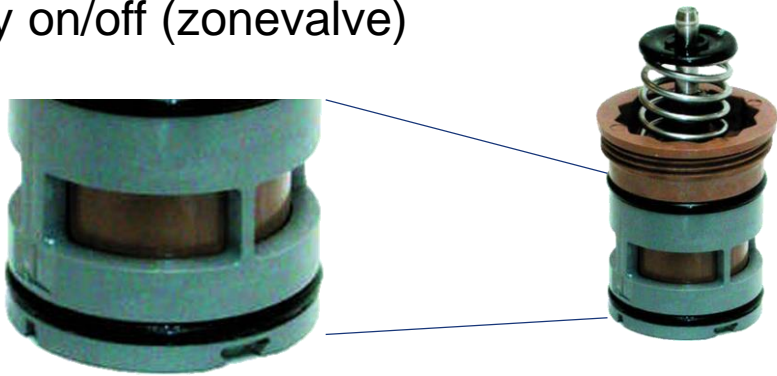

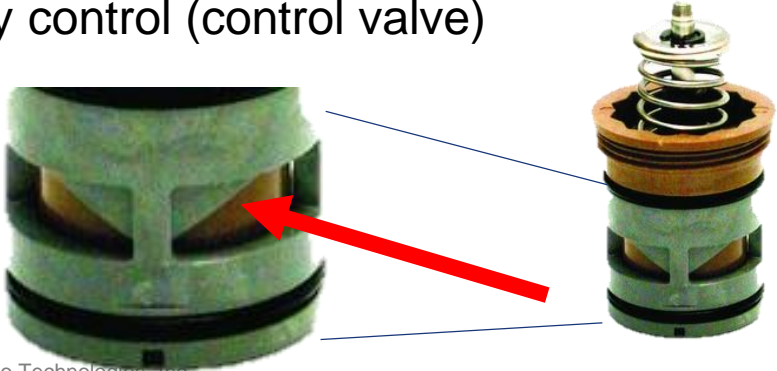

VC	Z	MG	6	000	/U
<b>VC</b> – Product family	<b>Z</b> – No actuator	<b>AF</b> – 1/2" internal threaded BSPP – 2-way <b>AJ</b> – 3/4" internal threaded BSPP – 2-way <b>AP</b> – 1" internal threaded BSPP – 2-way <b>AH</b> – 3/4" external threaded BSPP – 2-way <b>AQ</b> – 1" external threaded BSPP – 2-way <b>ME</b> – 1/2" internal threaded BSPP – 3-way <b>MH</b> – 3/4" internal threaded BSPP – 3-way <b>MP</b> – 1" internal threaded BSPP – 3-way <b>MG</b> – 3/4" external threaded BSPP – 3-way <b>MQ</b> – 1" external threaded BSPP – 3-way <b>AG</b> – 22mm – 2-way <b>AN</b> – 28mm – 2-way <b>MF</b> – 22mm – 3-way <b>MM</b> – 28mm – 3-way	<b>1</b> – 2-way <b>6</b> – 3-way	<b>000</b> – on/off <b>100</b> – control	<b>/U</b> – unit pack <b>/E</b> – bulk pack

Green highlighted: **Universal**

The control version is universal, as you can use on/off actuators and modulating actuators as well



# Basics – Valve Cartridge types

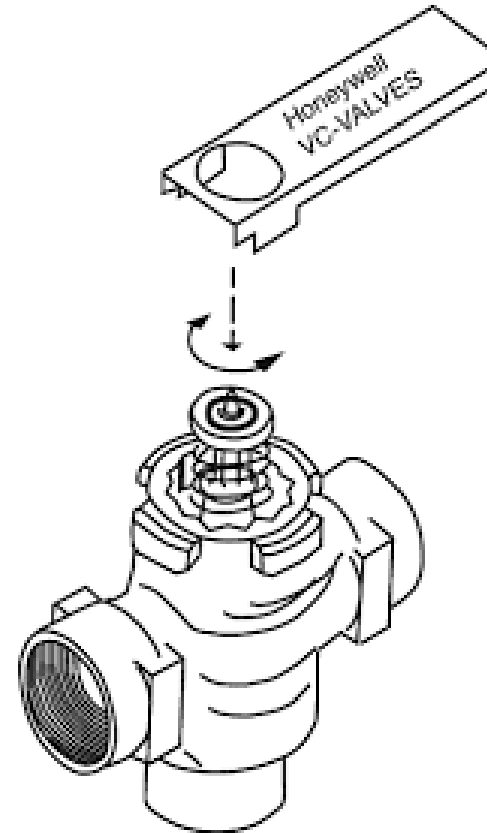
	2-way (2-port)	3-way (3-port)
on/off (open/close)	<p>2-way on/off (zone valve)</p> 	<p>3-way on/off (changeover valve)</p> 
Control <b>universal</b>	<p>2-way control (control valve)</p> 	<p>3-way control (mixing/diverting valve)</p> 

# Basics – Valve Cartridge order number coding

VC	ZZ	1	000	/U
<b>VC</b> – Product family	<b>Z</b> – No actuator <b>Z</b> – No valve body	<b>1</b> – 2-way <b>6</b> – 3-way	<b>000</b> – on/off <b>100</b> – control	<b>/U</b> – unit pack <b>/E</b> – bulk pack

## Cartridge is a spare part

On/off and Control versions are interchangeable  
2-way and 3-way cartridge are different, don't mix them!



**Cartridge remove tool**  
included in spare  
cartridge unit pack

Orderable separately  
SKU: **40007029-002/U**



# Basics – Actuator Versions

## Key selection parameters

### Power Supply

24 Vac  
or  
230 Vac

### Operation

On/off (7sec)  
or  
3-pt Floating control  
(120sec)  
or  
0-10V Modulating  
control (120sec)

### Auxiliary switch

Yes  
or  
No

### Electrical connection

Wired  
or  
Molex

### Control type

SPST (2 wire+com)  
or  
SPDT (3 wire)  
or  
2 relays of a controller (3 wire)

Green highlighted: **Universal**



MOLEX



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# Basics – Actuator

## Order number coding (most common versions)

### On/Off versions:

VC	4	0	1	3	ZZ	00	/U
<b>VC</b> – Product family	<b>2</b> – 24Vac SPDT <b>4</b> – 230Vac SPST <b>6</b> – 230Vac SPDT <b>8</b> – 24Vac SPST	<b>0</b> – No aux switch <b>6</b> – SPDT aux switch	<b>1</b> – on/off	<b>2</b> – Molex <b>3</b> – Wire	<b>Z</b> - No valve <b>Z</b> – No cartridge	<b>00</b> - standard	<b>/U</b> – unit pack <b>/E</b> – bulk pack

Green highlighted: **Universal** as you can control it with both SPST and SPDT thermostat, it also has auxiliary switch

### Control versions:

- VC6983ZZ11/U – 230Vac, Floating control, 120sec, 1m cable
- VC7931ZZ11/U – 24Vac, Modulating (0-10Vdc), 120sec, 1m cable

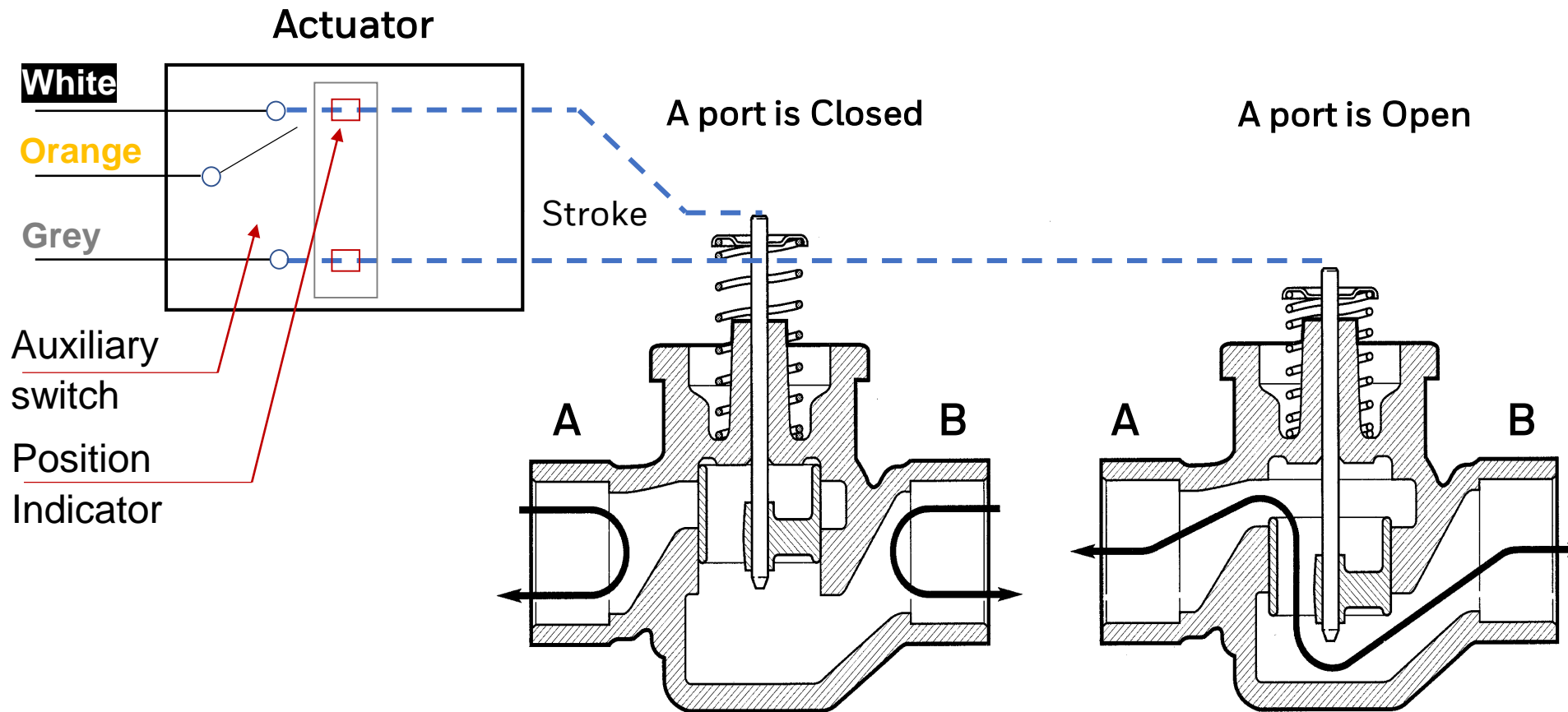
# Basics – Valves and actuator kits

## Order number coding (most common versions)

VC	4	0	1	3	MG	6	000	/U
	<b>2</b> - 24Vac SPDT <b>4</b> - 230Vac SPST <b>6</b> - 230Vac SPDT <b>8</b> - 24Vac SPST	<b>0</b> - No aux switch <b>6</b> - SPDT aux switch	<b>1</b> - on/off	<b>2</b> - Molex <b>3</b> - Wire	<b>AF</b> – 1/2" internal threaded BSPP – 2-way <b>AJ</b> – 3/4" internal threaded BSPP – 2-way <b>AP</b> – 1" internal threaded BSPP – 2-way <b>AH</b> – 3/4" external threaded BSPP – 2-way <b>AQ</b> – 1" external threaded BSPP – 2-way <b>ME</b> – 1/2" internal threaded BSPP – 3-way <b>MH</b> – 3/4" internal threaded BSPP – 3-way <b>MP</b> – 1" internal threaded BSPP – 3-way <b>MG</b> – 3/4" external threaded BSPP – 3-way <b>MQ</b> – 1" external threaded BSPP – 3-way <b>AG</b> – 22mm – 2-way <b>AN</b> – 28mm – 2-way <b>MF</b> – 22mm – 3-way <b>MM</b> – 28mm – 3-way	<b>1</b> - 2-way <b>6</b> - 3-way	<b>000</b> - on/off <b>100</b> - control	<b>/U</b> - unit pack

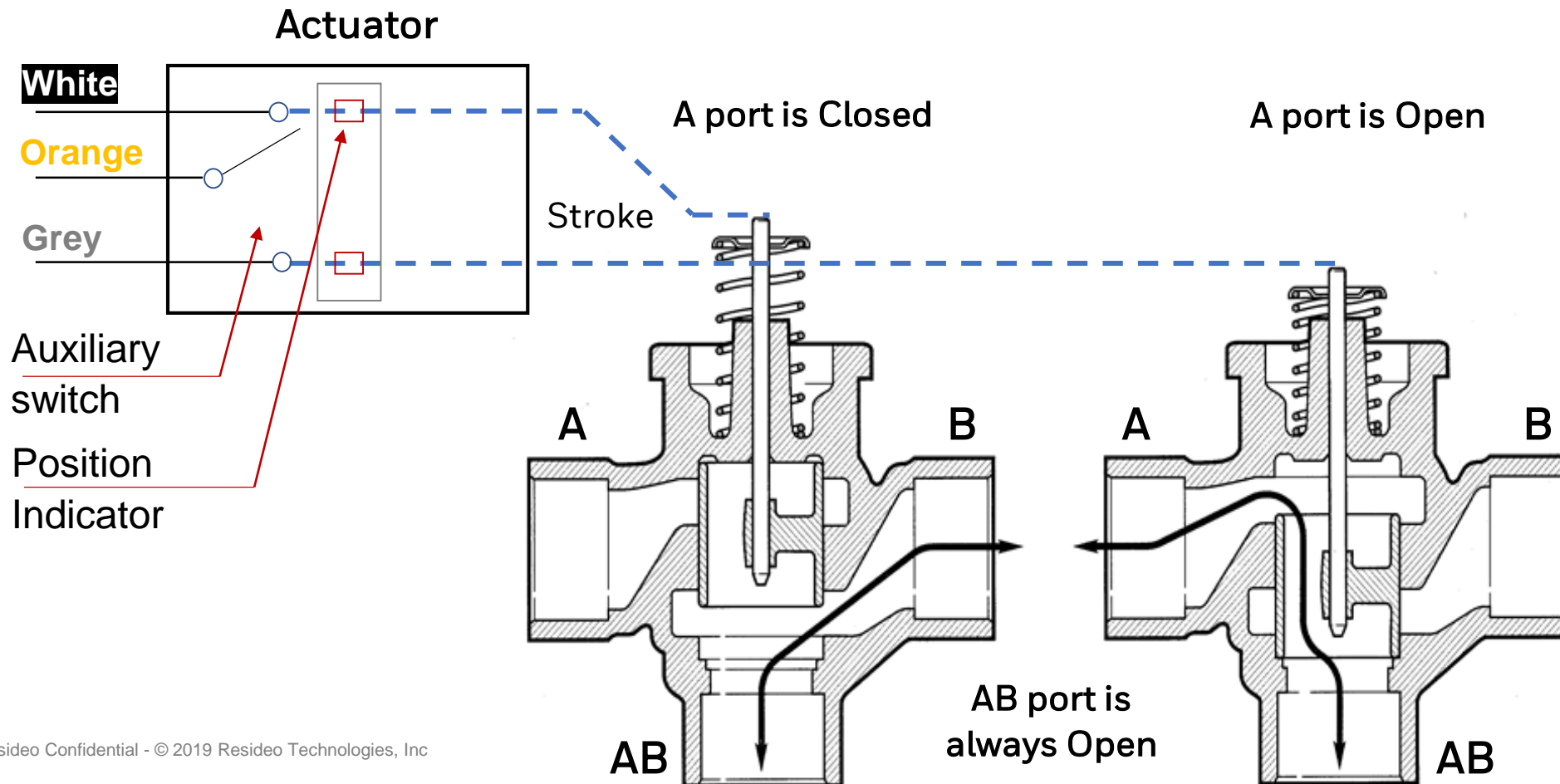
# Basics – Valves and actuator

## Positions – 2-way valve



# Basics – Valves and actuator

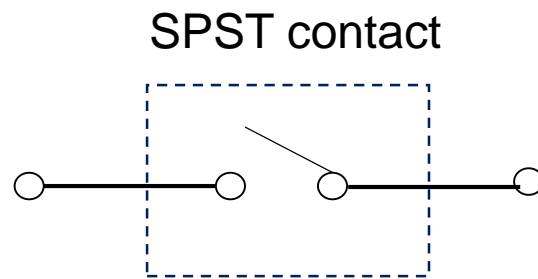
## Positions – 3-way valve



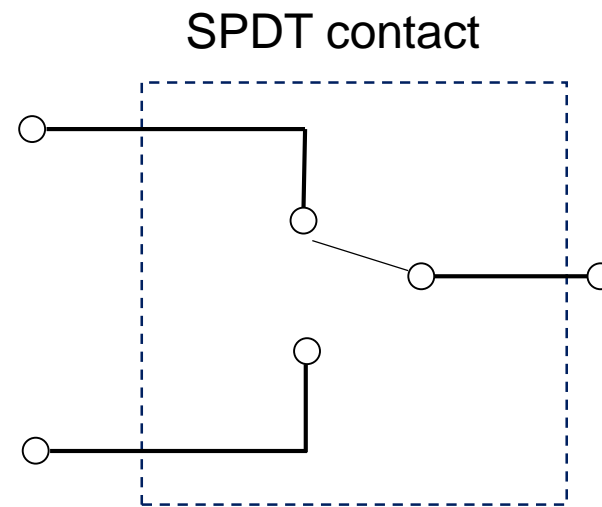
# Basics – Actuator

## SPST / SPDT

- SPST (single pole single throw)



- SPDT (single pole double throw)



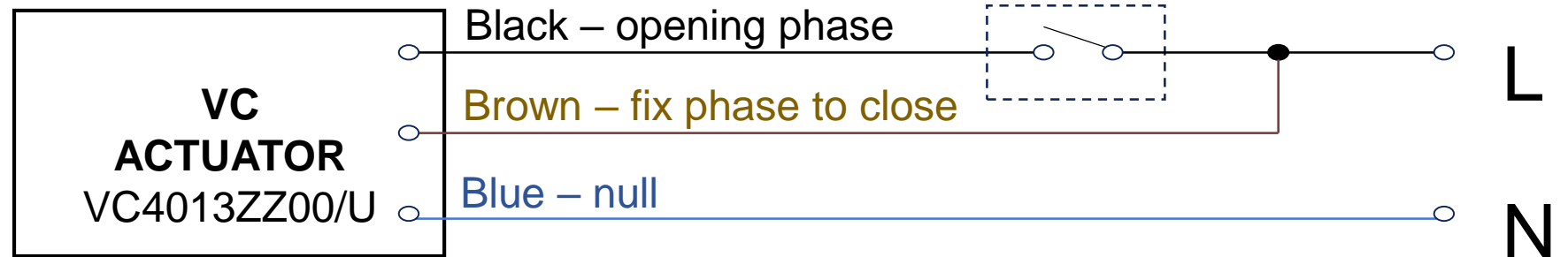
- Both are potential free contacts.  
If it is a thermostat the switching element moves on temperature change



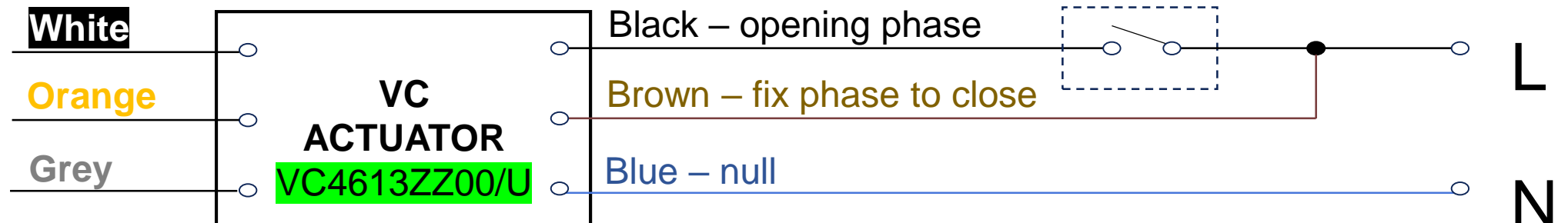
# Basics – Actuator

## SPST controlled actuator VC4xxx

Thermostat with **SPST** contact



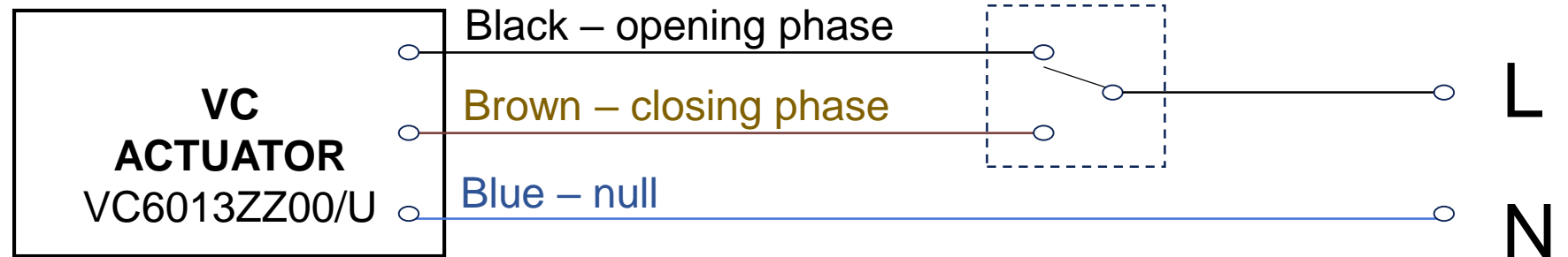
Thermostat with **SPST** contact



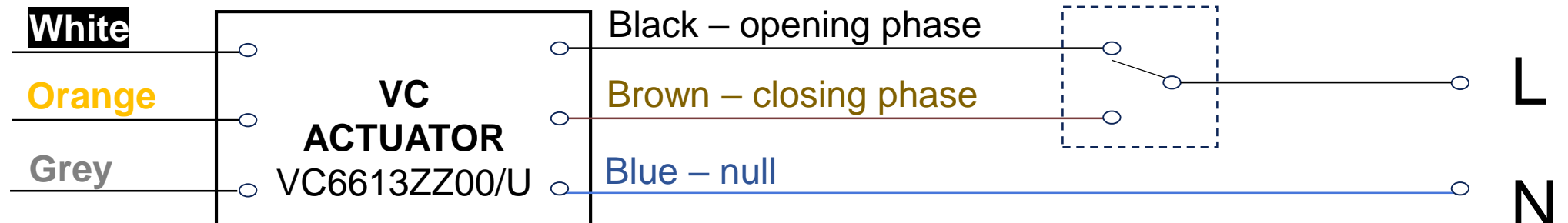
# Basics – Actuator

## SPDT controlled actuator VC6xxx

Thermostat with **SPDT** contact



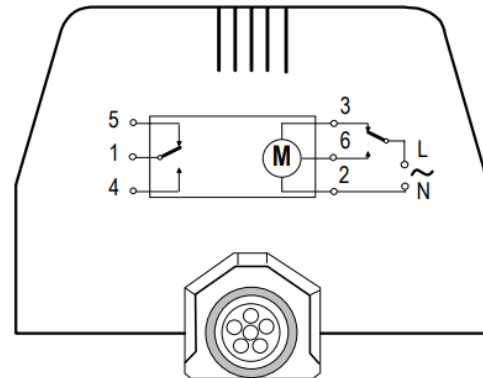
Thermostat with **SPDT** contact



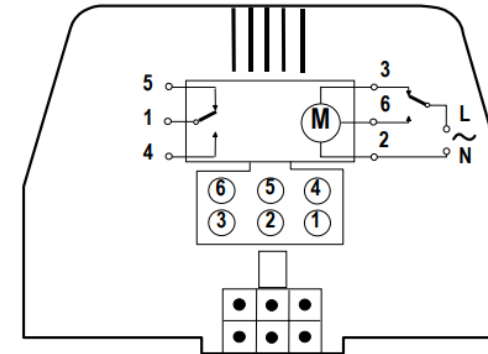
# Basics – Actuator

## Wires – Molex cross reference

Terminal	Cable models Wire Colour (See Fig. 7)	MOLEX™ models (See Fig. 8)	Action
Actuator	Brown	3	Closed
	Black	6	Open
	Blue	2	Common
Auxiliary switch (optional)	White	5	NC
	Orange	1	COM
	Grey	4	NO



**VC Actuator with 1 meter leadwire cable for SPDT Controller**



**VC Actuator with Molex™ connector for SPDT Controller**

# MOLEX cables with 1m wire

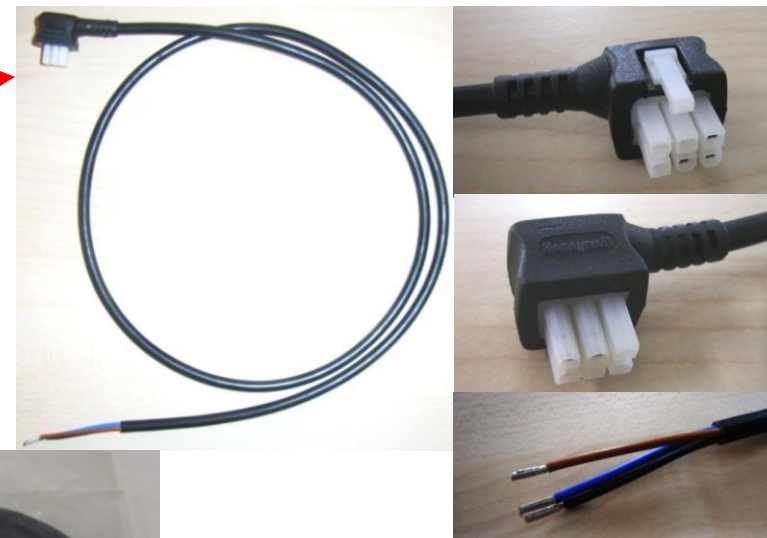
SKU:

40007035-005/U – 3 wires

there are 6 molex terminals, but only 3 wires – applicable for no aux switch versions only

40007182-101/U – 3 wires (Tradeline)

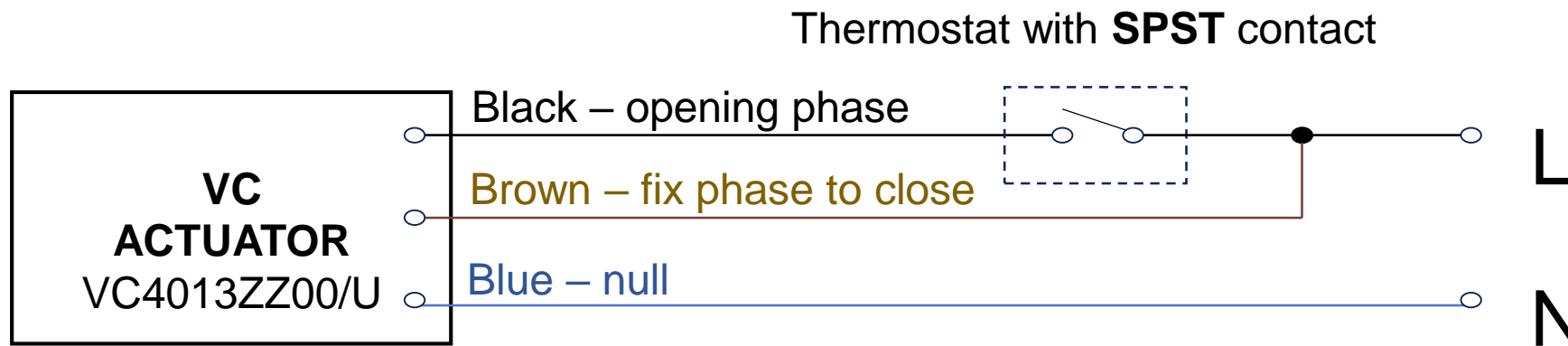
40007182-102/U – 6 wires (Tradeline)



# Basics – Actuators

## Why SPST actuator is more universal

- Controlled by an **SPST** (single pole single throw) switch

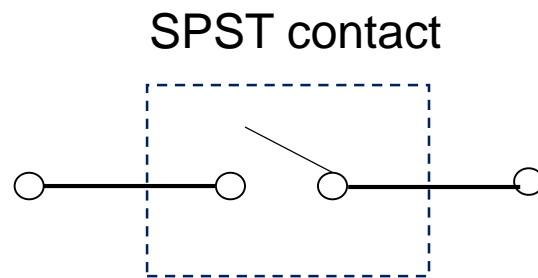


- SPST contact can be room thermostat, pipe thermostat, relay or electric switch

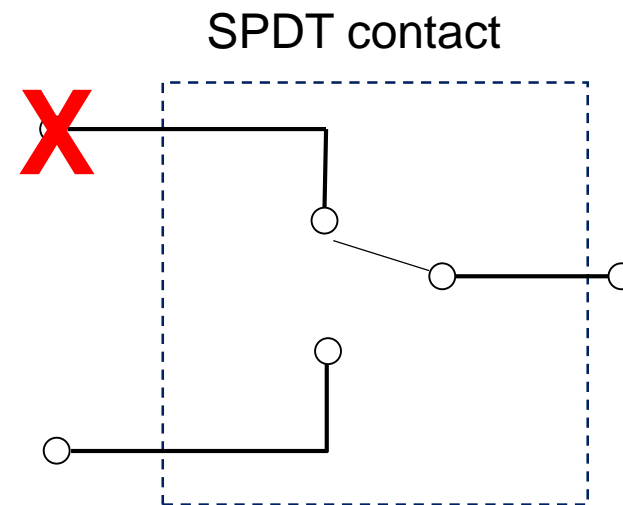
# Basics – Actuator

## Why SPST actuator is more universal

- SPST (single pole single throw)



- SPDT (single pole double throw)

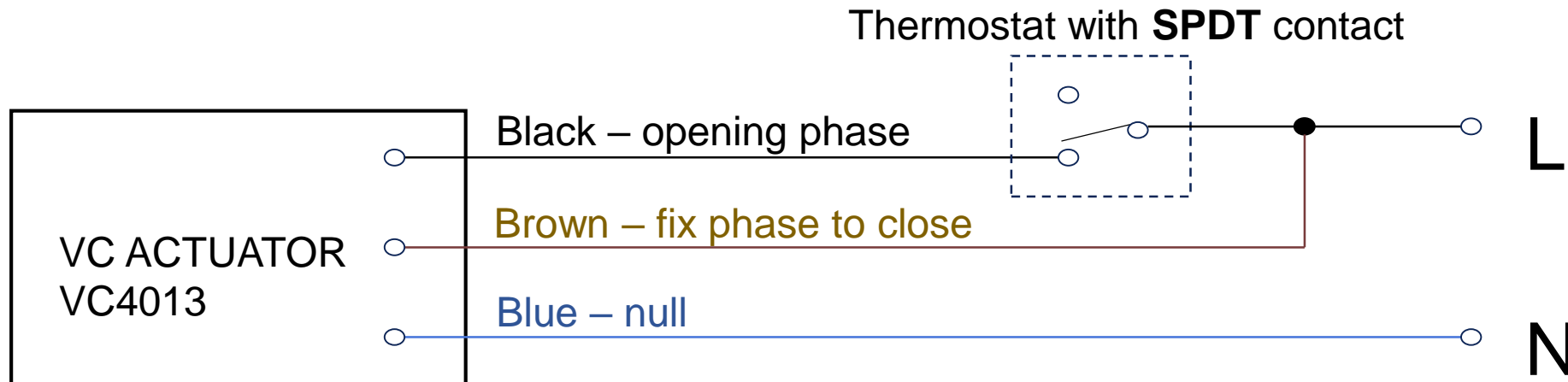


- If you do not use one throw of SPDT, then it works like SPST

# Basics – Actuators

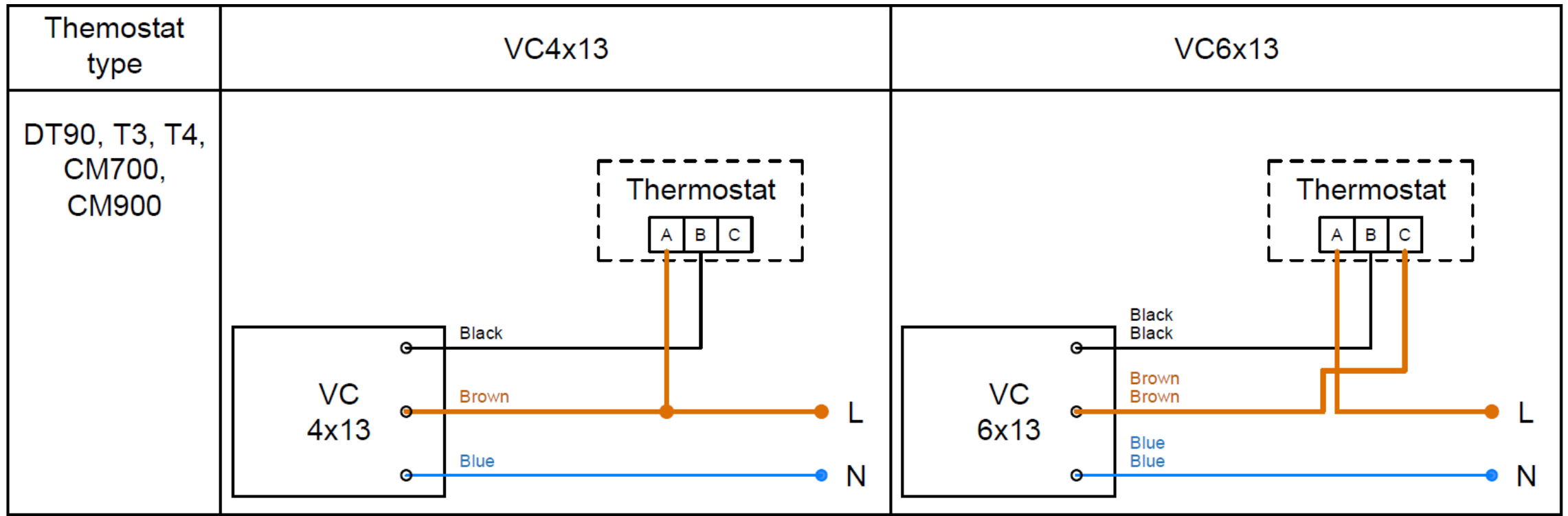
## Why SPST controlled actuator is more universal

- Controlled by an **SPDT** (single pole double throw) switch



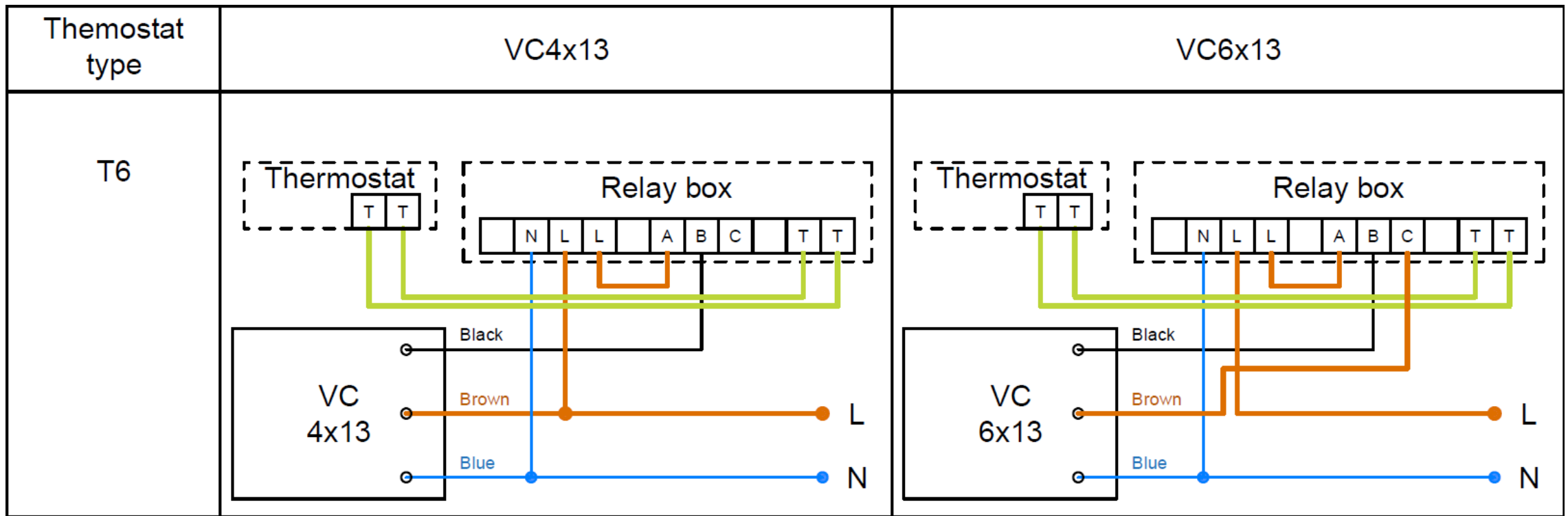
- SPST contact can be room thermostat, pipe thermostat, relay or electric switch

# How to wire to Honeywell Home thermostats

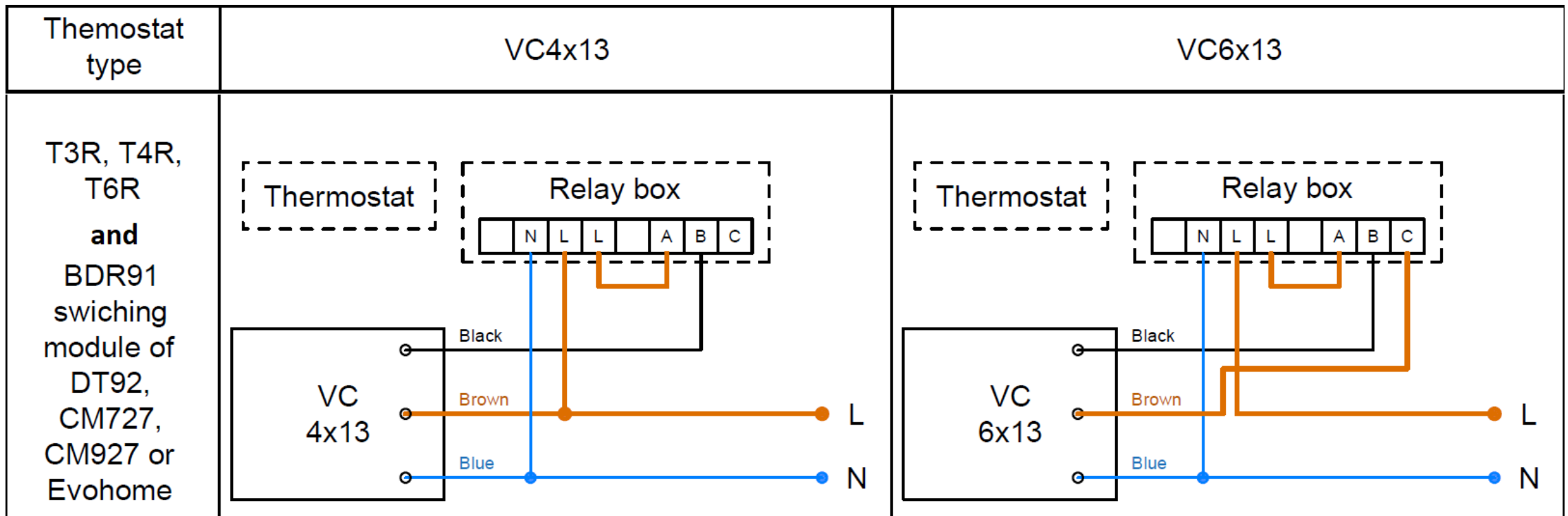




# How to wire to Honeywell Home thermostats



# How to wire to Honeywell Home thermostats



# V404x, VC valves comparison



**V4044**

## Flow rate (kvs)

1/2"	3,0 m <sup>3</sup> /h	3,4 m <sup>3</sup> /h
3/4"	6,0 m <sup>3</sup> /h	7,0 m <sup>3</sup> /h
1"	8,1 m <sup>3</sup> /h	7,7 m <sup>3</sup> /h

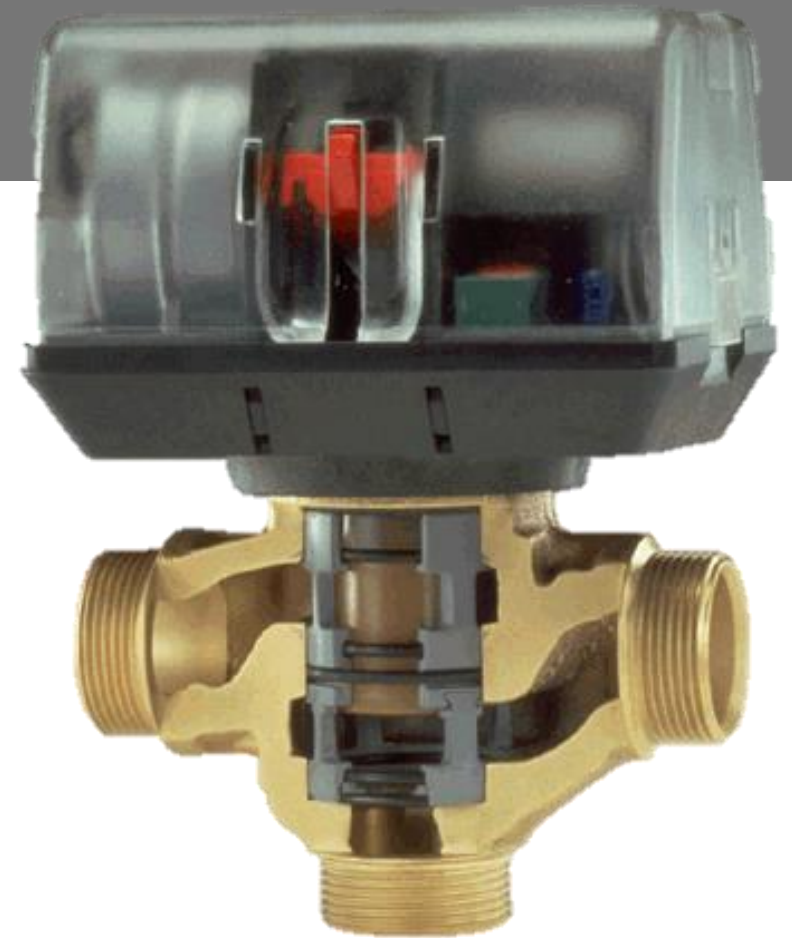
## Action on power loss

Spring return

No action

## Closing pressure

1/2"	1,4 bar	4 bar
3/4"	0,7 bar	4 bar
1"	0,55 bar	4 bar



**VCxxxxMx6000**

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# VC valves flow rates and related heat loads

$$Q = c \times \dot{m} \times \Delta T$$

$$Q \text{ [kW]} = 1,163 \times \text{kvs} \left[ \frac{\text{m}^3}{\text{h}} \right] \times \sqrt{\Delta p \text{ [bar]}} \times \Delta T \text{ [}^\circ\text{C]} \quad (1\text{bar} = 100\text{kPa})$$

## Heat loads in kW

		kvs [m <sup>3</sup> /h]		Δp=5kPa				Δp=10kPa				Δp=20kPa															
				ΔT=		ΔT=		ΔT=		ΔT=		ΔT=		ΔT=													
Cartridge	Size	2-way	3-way	5	10	15	20	5	10	15	20	5	10	15	20	5	10	15	20	5	10	15	20				
				2-way				3-way				2-way				3-way				2-way				3-way			
On/Off	1/2"	3,0	3,4	3,9	7,8	12	16	4,4	8,8	13	18	5,5	11	17	22	6,3	13	19	25	7,8	16	23	31	8,8	18	27	35
On/Off	3/4"	5,4	7,0	7	14	21	28	9,1	18	27	36	9,9	20	30	40	13	26	39	51	14	28	42	56	18	36	55	73
On/Off	1"	6,1	7,7	7,9	16	24	32	10	20	30	40	11	22	34	45	14	28	42	57	16	32	48	63	20	40	60	80
Control	1/2"	2,6	3,2	3,4	6,8	10	14	4,2	8,3	12	17	4,8	9,6	14	19	5,9	12	18	24	6,8	14	20	27	8,3	17	25	33
Control	3/4"	4,5	6,0	5,9	12	18	23	7,8	16	23	31	8,3	17	25	33	11	22	33	44	12	23	35	47	16	31	47	62
Control	1"	5,7	6,8	7,4	15	22	30	8,8	18	27	35	10	21	31	42	13	25	38	50	15	30	44	59	18	35	53	71

# VC valves flow rates vs heat load

- In case of on/off valves there is no specific pressure drop is given  
The lowest the best.

If you've chosen a  
1/2" 2-way valve  
for 15°C temperature drop  
but you need just 5kW

No worries, at such a low flow rate your  
pressure drop will be lower than 5kPa. That's even better.

- In case of control valves specified pressure drop to be met

**Heat loads in kW**

		kvs [m <sup>3</sup> /h]		Δp=5kPa							
Cartridge	Size	2-way	3-way	ΔT=				ΔT=			
				5	10	15	20	5	10	15	20
				2-way				3-way			
On/Off	1/2"	3,0	3,4	3,9	7,8	12	16	4,4	8,8	13	18
On/Off	3/4"	5,4	7,0	7	14	21	28	9,1	18	27	36
On/Off	1"	6,1	7,7	7,9	16	24	32	10	20	30	40

# Available products (unit packs and kits) on/off cartridge versions with all applicable actuators

		Actuator only	VC4012ZZ00/U	VC4013ZZ00/U	VC4612ZZ00/U	VC4613ZZ00/U	VC6012ZZ00/U	VC6013ZZ00/U	VC6612ZZ00/U	VC6613ZZ00/U
		Valve only	Available kits:							
2-way	int 1/2"	VCZAF1000/U		VC4013AF1000/U		VC4613AF1000/U	VC6012AF1000/U	VC6013AF1000/U		VC6613AF1000/U
	int 3/4"	VCZAJ1000/U		VC4013AJ1000/U		VC4613AJ1000/U	VC6012AJ1000/U	VC6013AJ1000/U		VC6613AJ1000/U
	int 1"	VCZAP1000/U		VC4013AP1000/U		VC4613AP1000/U	VC6012AP1000/U	VC6013AP1000/U		VC6613AP1000/U
	ext 3/4"	VCZAH1000/U	VC4012AH1000/U	VC4013AH1000/U		X	VC6012AH1000/U	VC6013AH1000/U		X
	ext 1"	VCZAQ1000/U		VC4013AQ1000/U		VC4613AQ1000/U		X		X
3-way	int 1/2"	VCZME6000/U	VC4012ME6000/U	VC4013ME6000/U		VC4613ME6000/U	VC6012ME6000/U	VC6013ME6000/U		VC6613ME6000/U
	int 3/4"	VCZMH6000/U	VC4012MH6000/U	VC4013MH6000/U	VC4612MH6000/U	VC4613MH6000/U		VC6013MH6000/U		VC6613MH6000/U
	int 1"	VCZMP6000/U	VC4012MP6000/U	VC4013MP6000/U		VC4613MP6000/U	VC6012MP6000/U	VC6013MP6000/U		VC6613MP6000/U
	ext 3/4"	VCZMG6000/U	VC4012MG6000/U	VC4013MG6000/U		VC4613MG6000/U	VC6012MG6000/U	VC6013MG6000/U		VC6613MG6000/U
	ext 1"	VCZMQ6000/U	VC4012MQ6000/U	VC4013MQ6000/U		VC4613MQ6000/U	VC6012MQ6000/U	VC6013MQ6000/U		VC6613MQ6000/U

- Only internal threaded have the full range of unit packs and kits with wired actuators
- List of kits to be double checked before quoting, some might be inactive in SAP

# Available products (unit packs) control cartridge versions with all applicable actuators

		Valve only
2-way	int 1/2"	VCZAF1100/U
	int 3/4"	VCZAJ1100/U
	int 1"	VCZAP1100/U
	ext 3/4"	VCZAH1100/U
	ext 1"	VCZAQ1100/U
3-way	int 1/2"	VCZME6100/U
	int 3/4"	VCZMH6100/U
	int 1"	VCZMP6100/U
	ext 3/4"	VCZMG6100/U
	ext 1"	VCZMQ6100/U

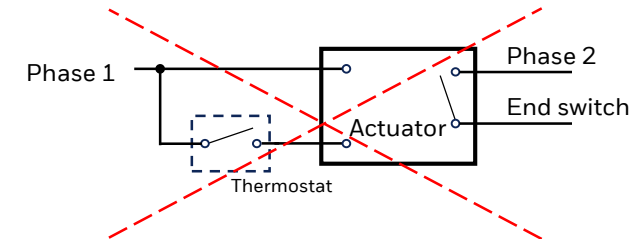
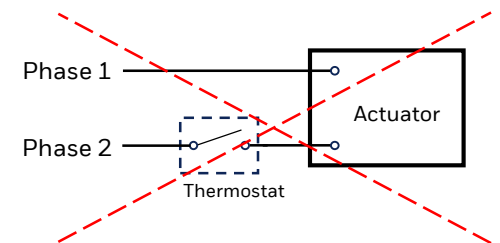
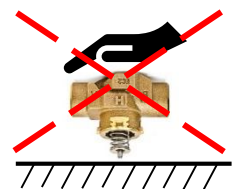
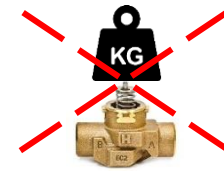
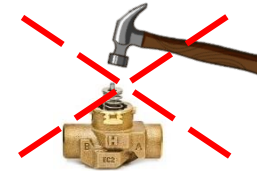
				Actuator only	
on/off	SPST	Molex		VC4012ZZ00/U	
		Wired		VC4013ZZ00/U	
	Molex	Auxiliary switch		VC4612ZZ00/U	
	Wired	Auxiliary switch		VC4613ZZ00/U	
control	SPDT	Molex		VC6012ZZ00/U	
		Wired		VC6013ZZ00/U	
	Molex	Auxiliary switch		VC6612ZZ00/U	
	Wired	Auxiliary switch		VC6613ZZ00/U	
		Wired	Auxiliary switch	230V 3-pt	VC6983ZZ11/U
		Wired	Auxiliary switch	24Vac 0-10Vdc	VC7931ZZ11/U

- Reduced, universal portfolio (12 SKUs):
  - 10 valves
  - + VC4613
  - + VC6983
- Only internal threaded most reduced, universal portfolio (8 SKUs):
  - 6 valves
  - + VC4613
  - + VC6983

• No kits available for control cartridge versions

# Be aware

- VC valves can stand 95°C maximum
  - No solar supply (solar panel outlet), no steam
- VC actuators has IP20 electrical protection
  - No outdoor, no wet environment
- No manual adjustment on valve stem
- Do not install actuators downwards or where water can drop into the actuator
- Do not use different phases on the actuator



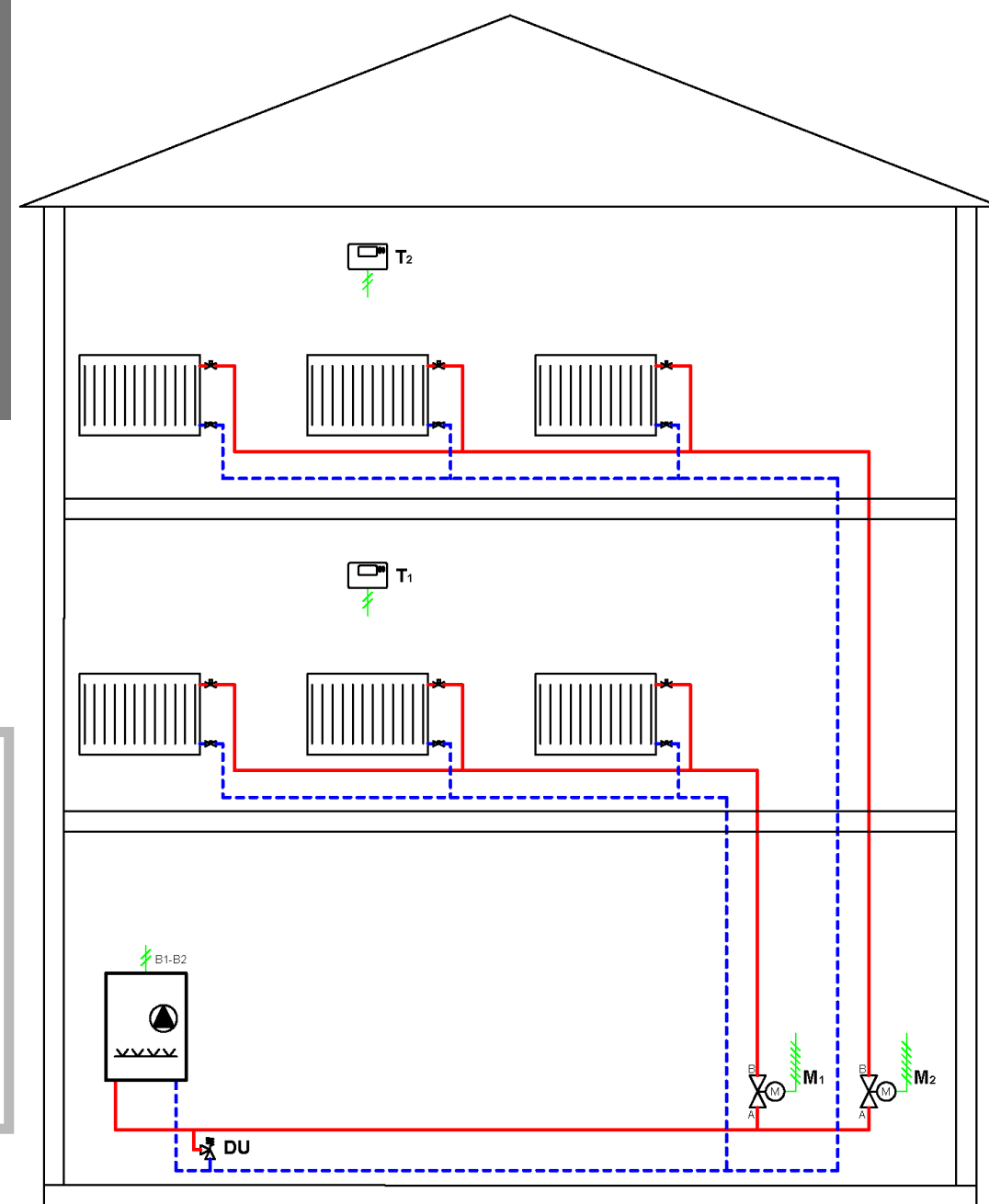
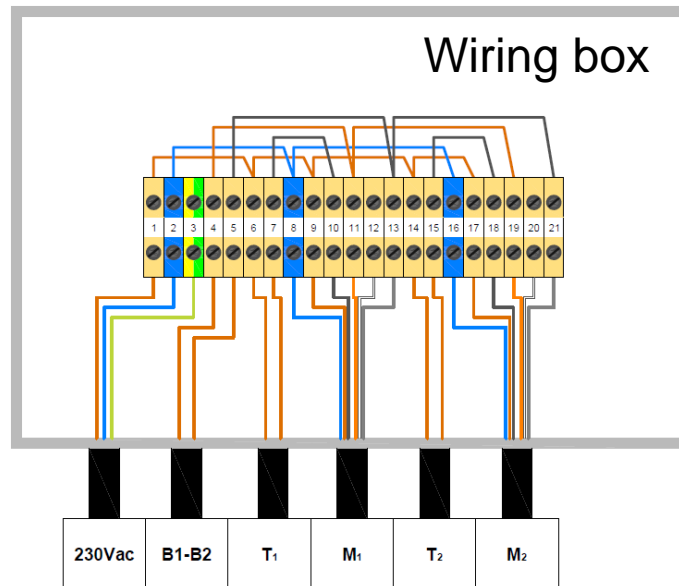
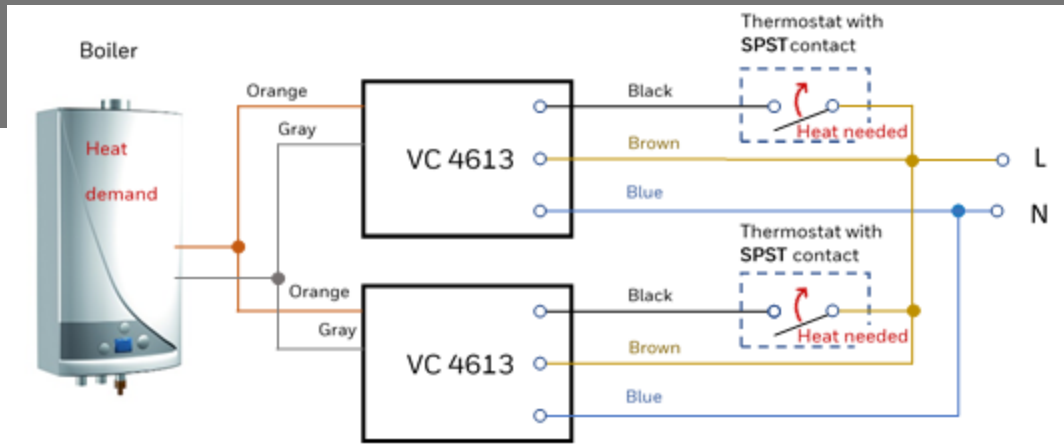


# Be aware

- On following slides some applications and ideas shown
- Plenty others can be identified by you or your customers
- These applications are just ideas, you may or may not use in your country. Please check them and consult local regulations and standards

# Applications

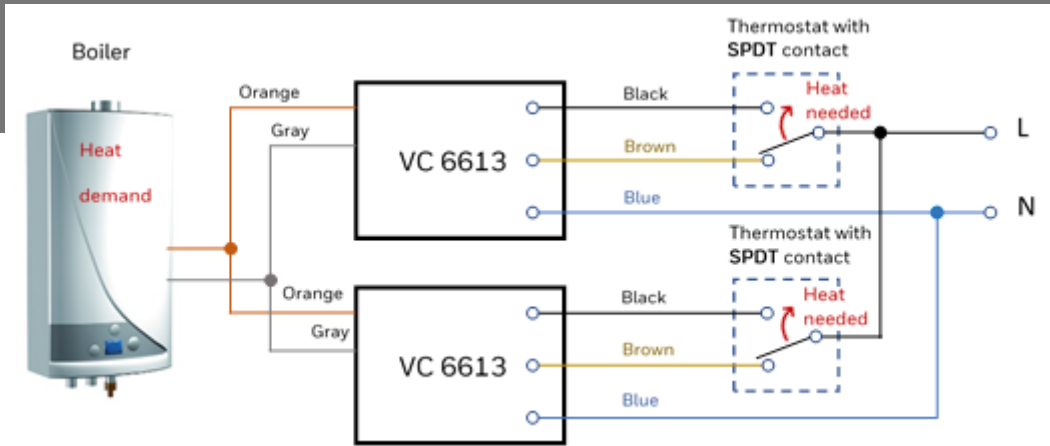
## Heating Zoning with (4613)



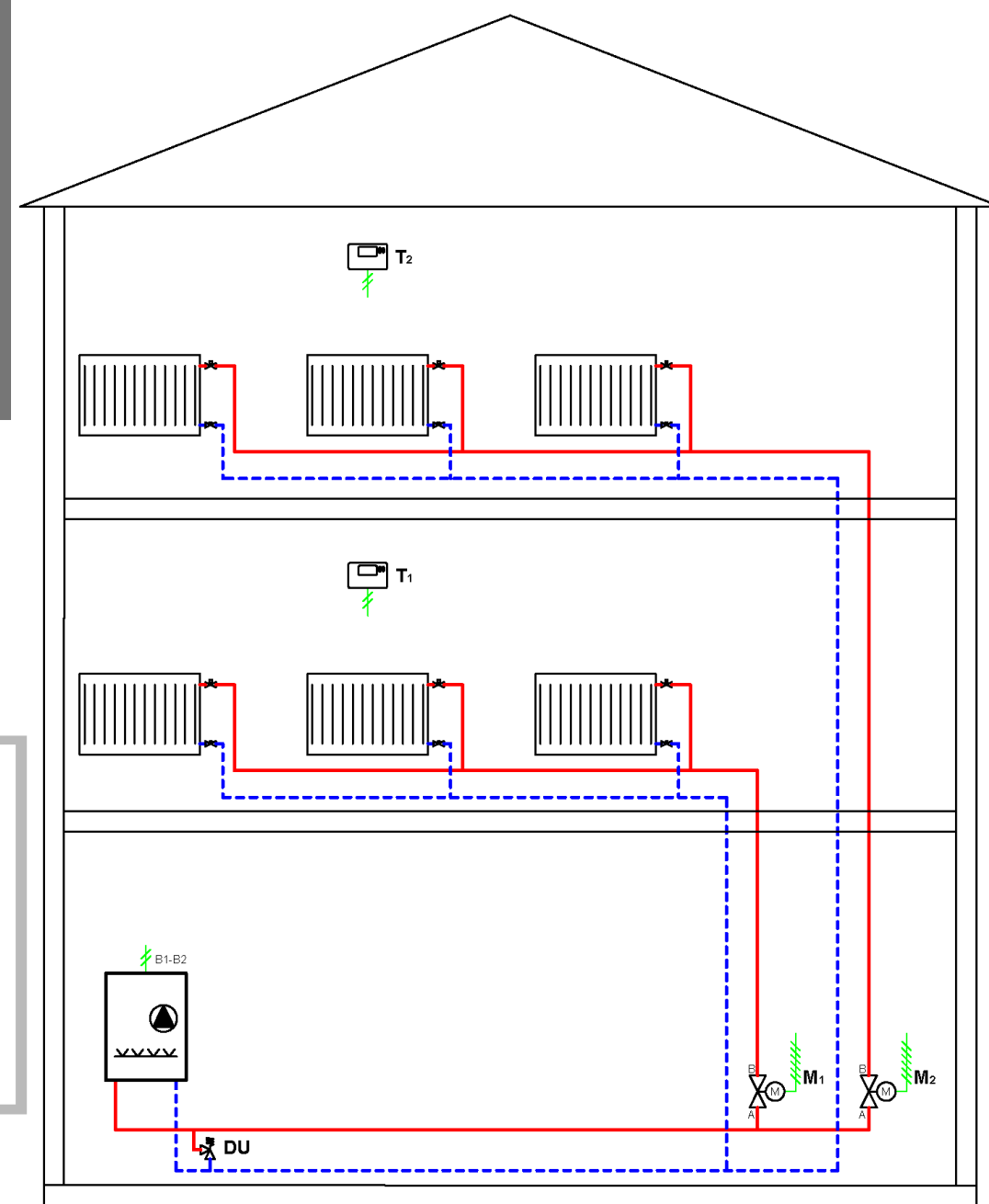
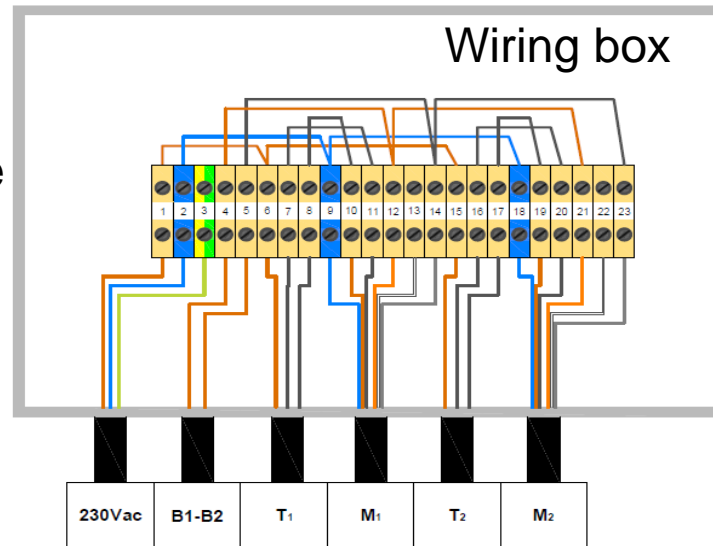
Simple chronotherms in zones  
 One 2-way VC valve in each zone  
 Both zones can start the boiler

# Applications

## Heating Zoning with (6613)

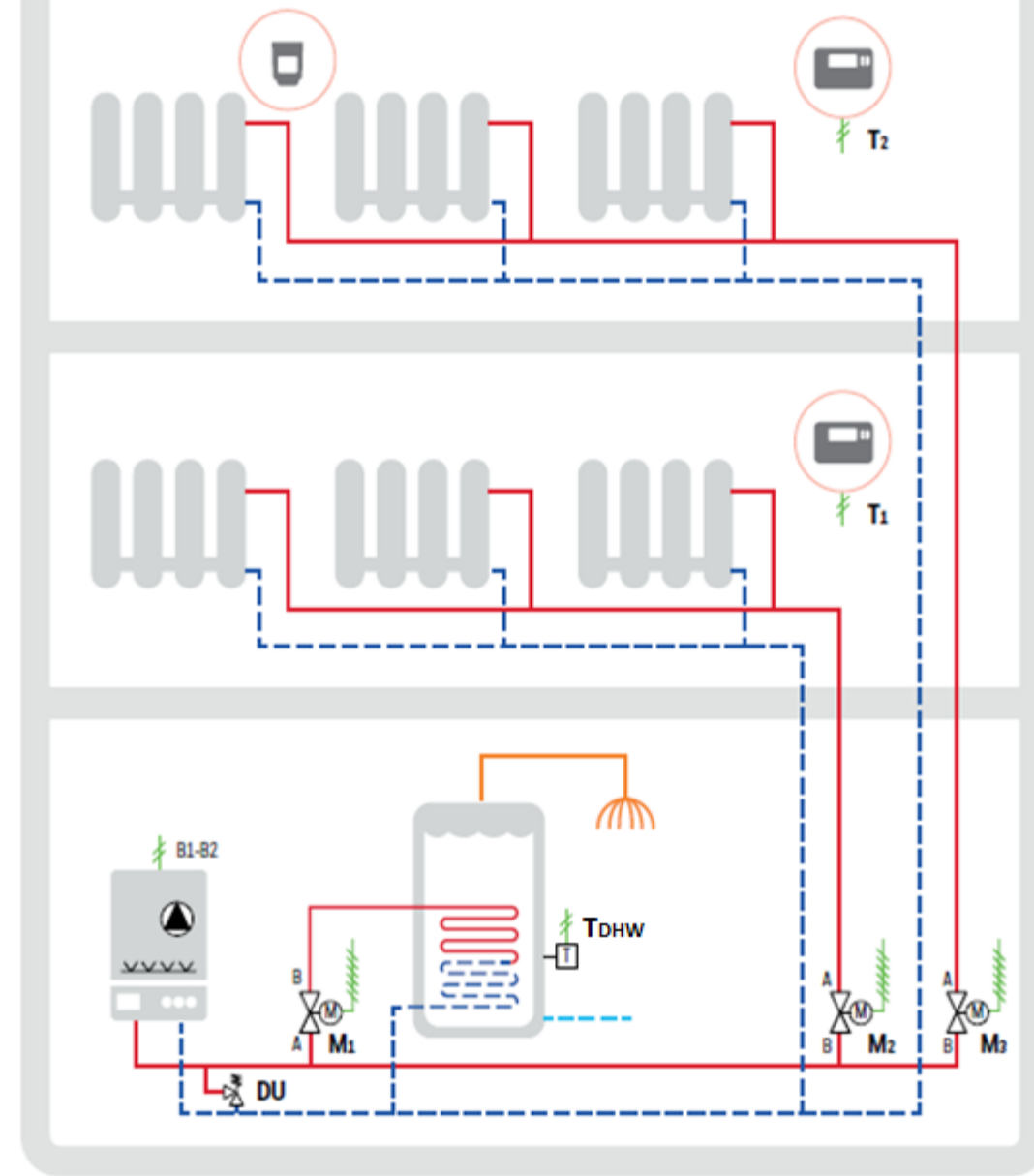
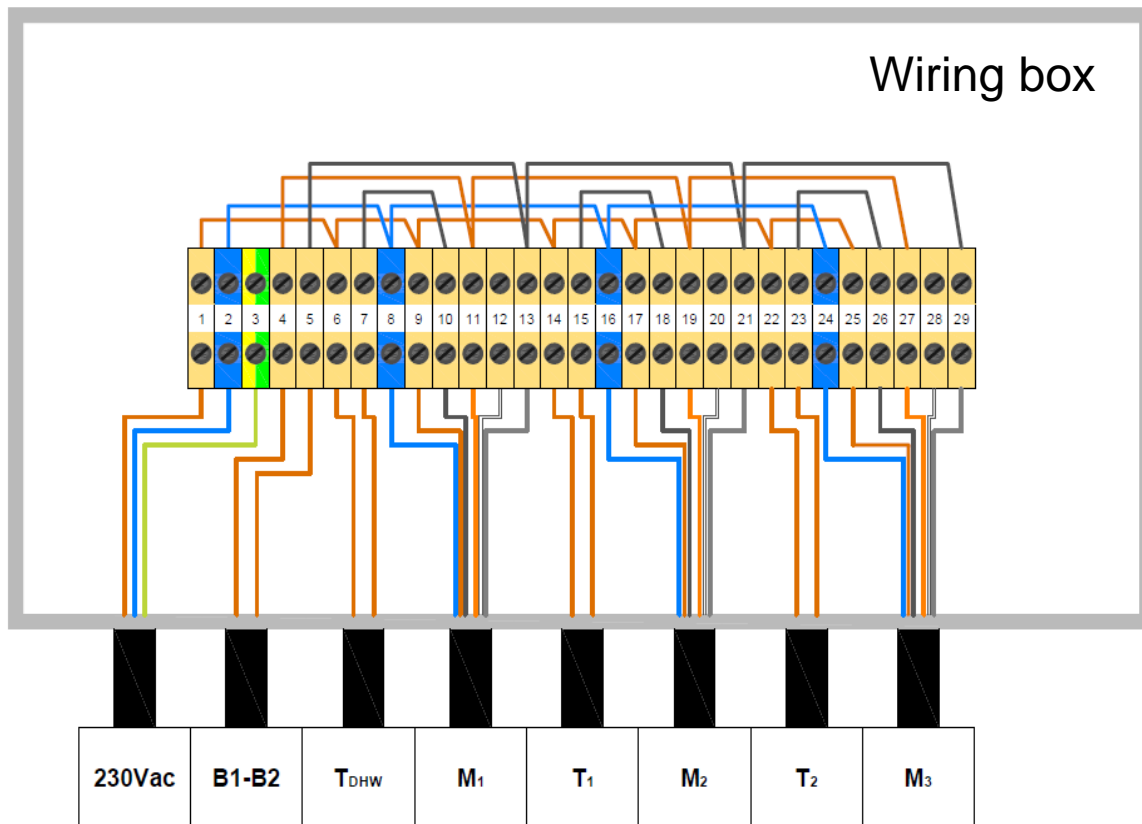


Simple chronotherms in zones  
 One 2-way VC valve in each zone  
 Both zones can start the boiler



# Applications

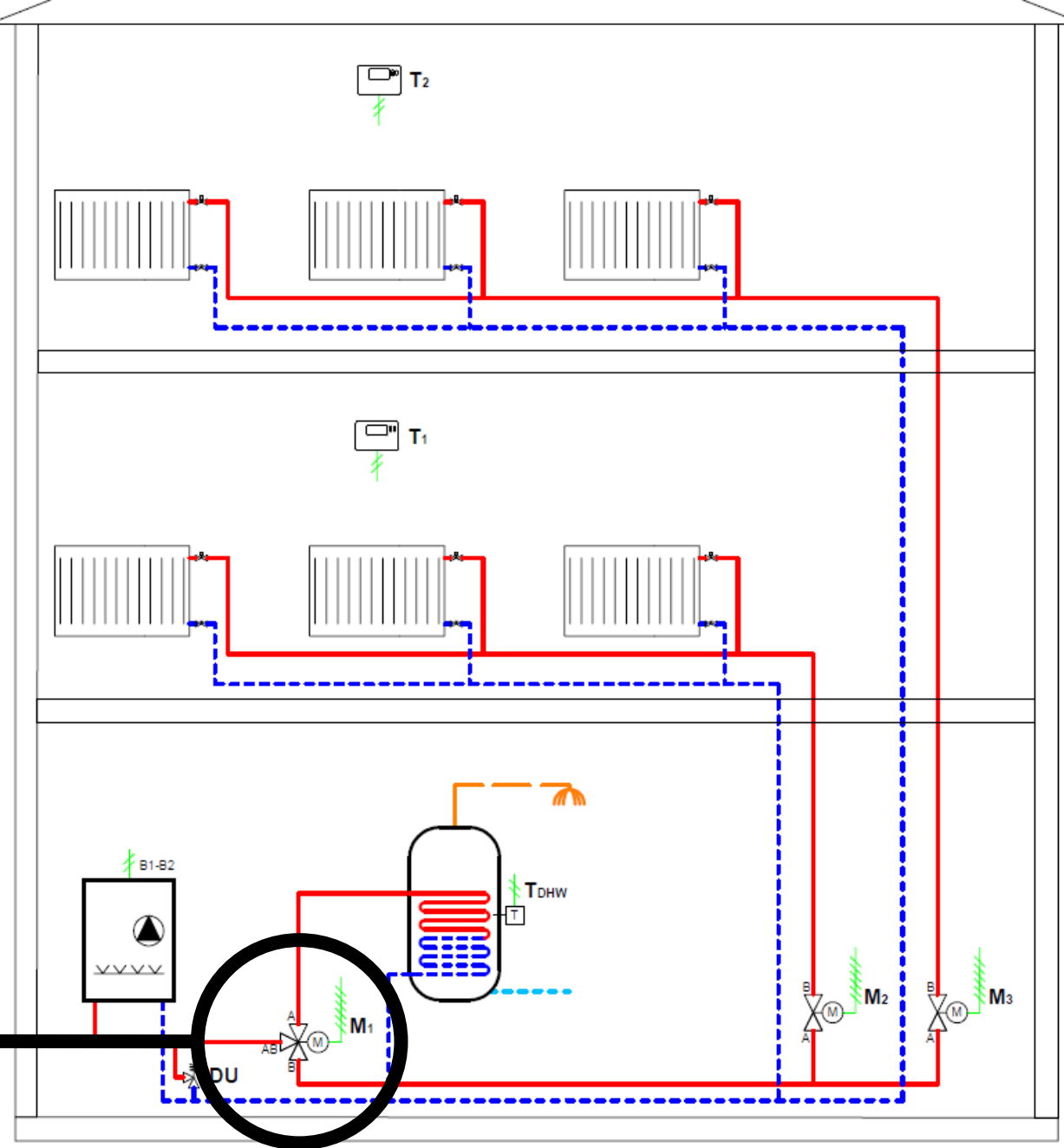
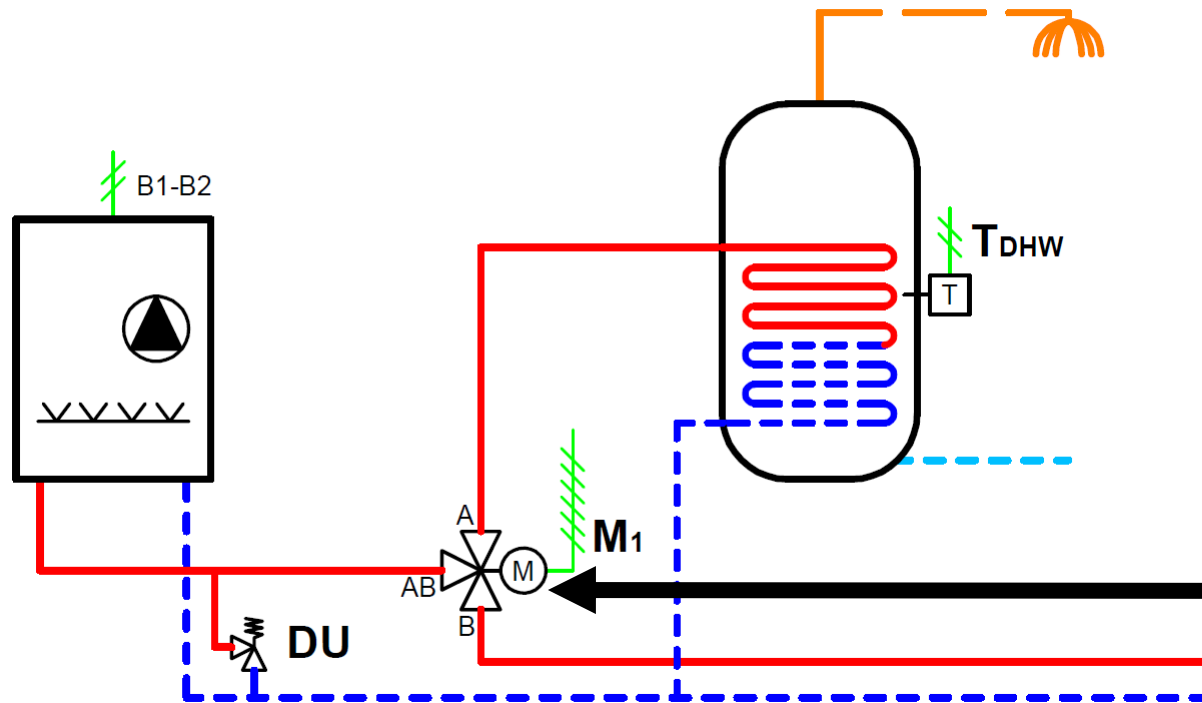
## Domestic hot water parallel control (4613)



# Applications

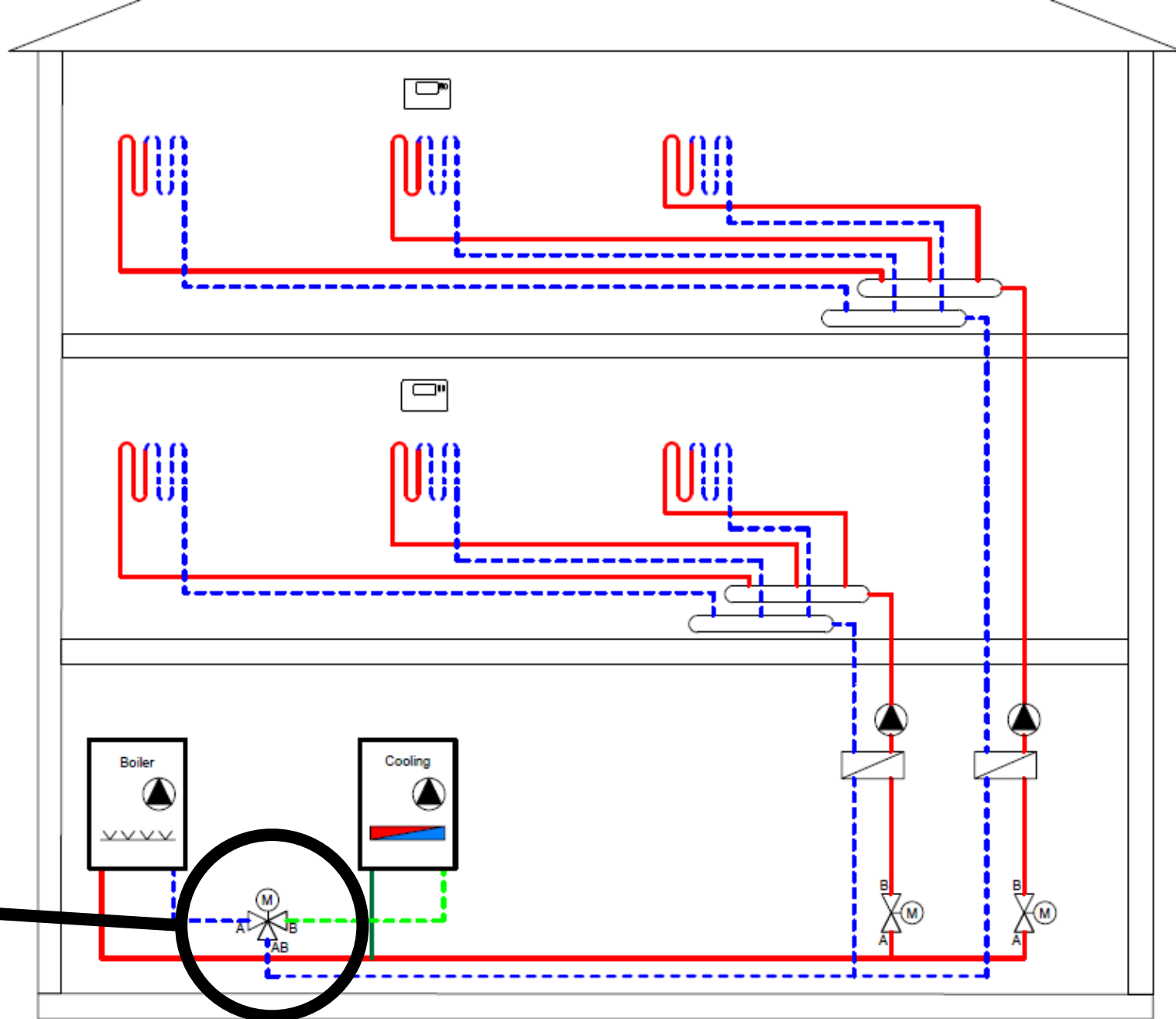
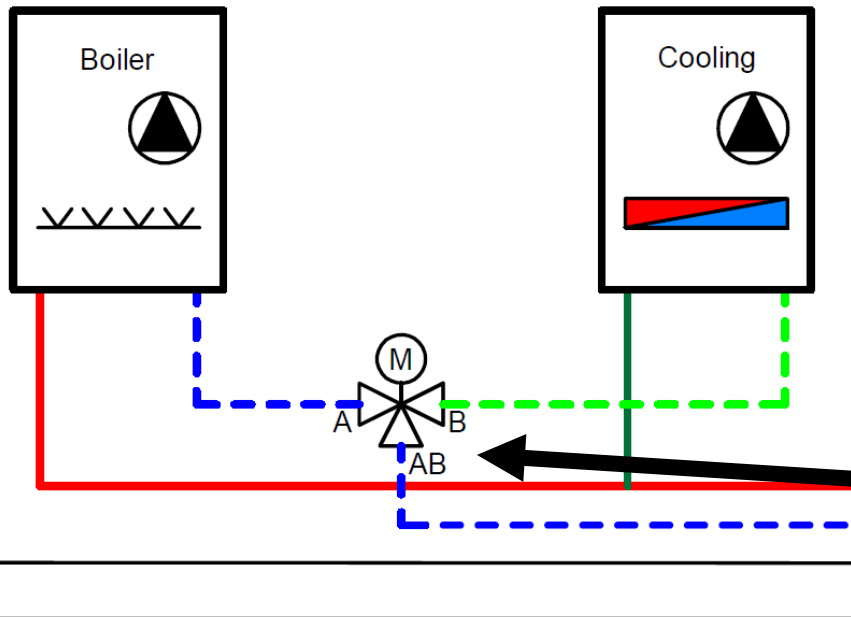
## Domestic hot water priority control

Changeover valve in diverting mode

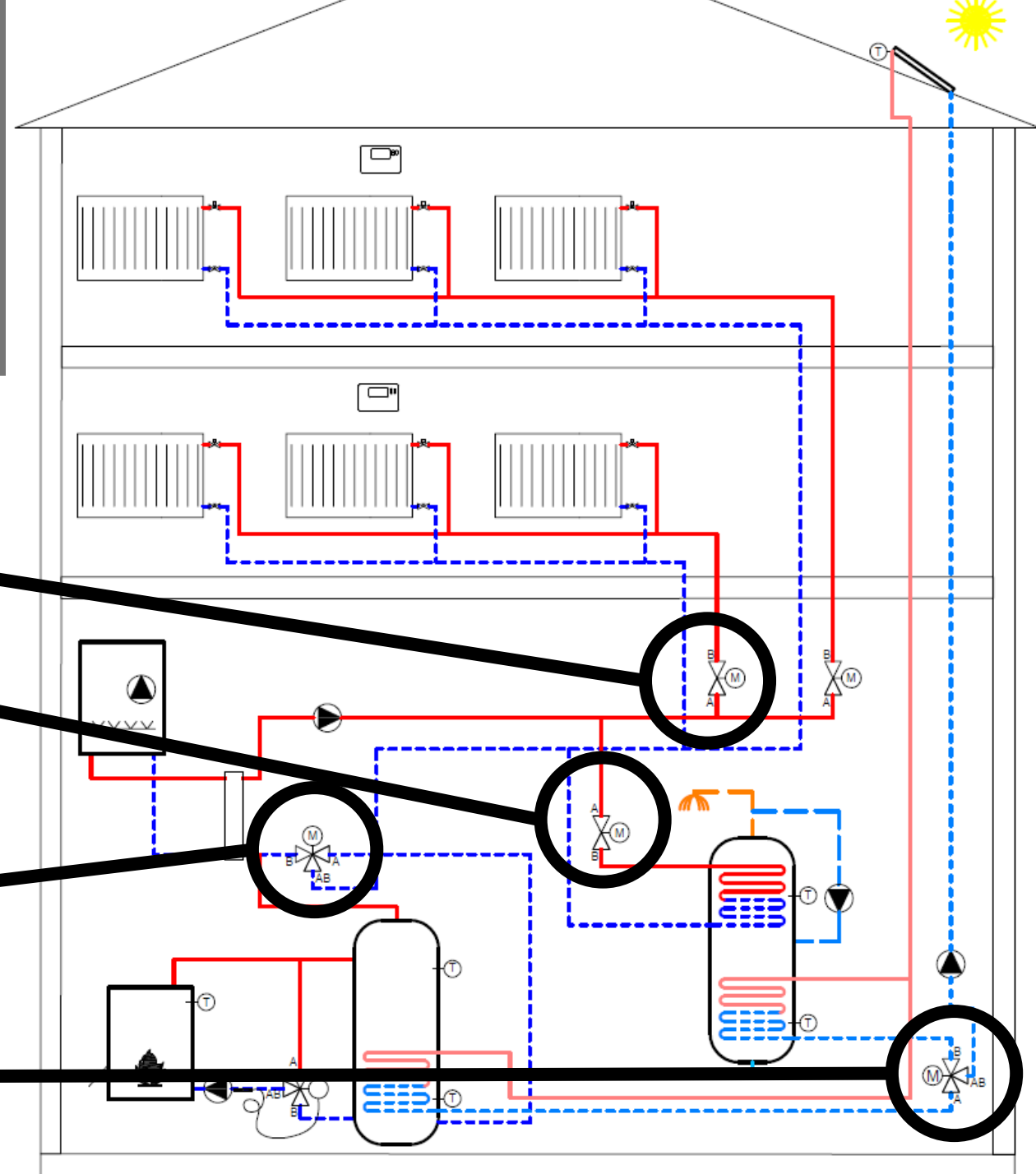


# Applications Heating/Cooling changeover

Changeover valve in mixing mode



# Applications some more ideas



# Applications some more ideas

Heating zone valve

DHW loading (parallel mode)

DHW loading / pool heating changeover

