

# Belimo Savings Estimator

## Investment costs for 4-pipe system

Version 0.DRAFT

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### Belimo Savings Estimator

#### Investment costs 4-pipe system

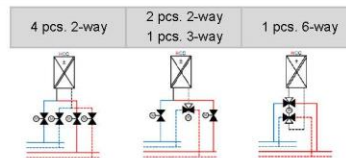


Project	Test building
Version	Pre-project #3
Creator	Christian Luchsinger
Processing date	21.03.2016

#### Calculation basis

Number of heat exchangers (Heating & Cooling)	50	pieces
Type of installation	New construction / one-time	
Average distance between control cabinet and junction box	25	meters
Cost of a 2-way valve including actuator (modulating)	36	EUR/piece
Cost of a 2-way valve including actuator (open-close)	32	EUR/piece
Cost of a 3-way valve including actuator	41	EUR/piece
Cost of a 6-way valve including actuator	165	EUR/piece
Cost of a physical data point	50	EUR/piece
Cable costs	0.19	EUR/meter
Cost of a junction box	9	EUR/piece
Hourly rate installation work	45	EUR/hour

#### Estimate of costs



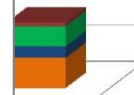
Number of valves per heat exchanger	4 Stk.	3 Stk.	1 Stk.
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<b>Overall costs of material and installation</b>	<b>EUR 32'465</b>	<b>EUR 25'506</b>	<b>EUR 18'019</b>
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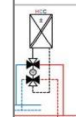
<b>Total material costs</b>	<b>EUR 19'550</b>	<b>EUR 15'213</b>	<b>EUR 11'438</b>
Costs of all valves and actuators	EUR 6'800	EUR 5'650	EUR 8'250
Total number of valves and actuators	200 pieces	150 pieces	50 pieces
Number of 2-way	200 pieces	100 pieces	0 pieces
Number of 3-way	0 pieces	50 pieces	0 pieces
Number of 6-way	0 pieces	0 pieces	50 pieces
Costs of data points, cable, junction boxes	EUR 12'750	EUR 9'563	EUR 3'188
Number of data points / junction boxes	200 pieces	150 pieces	50 pieces
Total cable length	5 kilometres	3.75 kilometres	1.25 kilometres
<b>Total installation costs</b>	<b>EUR 12'915</b>	<b>EUR 10'284</b>	<b>EUR 6'581</b>
Costs of valve installation	EUR 8'550	EUR 7'020	EUR 5'490
Effort valve installation	190 hours	156 hours	122 hours
Installation effort 2-way	190 hours	95 hours	0 hours
Installation effort 3-way	0 hours	61 hours	0 hours
Installation effort 6-way	0 hours	0 hours	122 hours
Costs of actuator installation	EUR 4'365	EUR 3'274	EUR 1'091
Effort installation actuator	14 hours	11 hours	3.5 hours
Effort installation of junction box	58 hours	44 hours	15 hours
Effort cable installation	25 hours	19 hours	6.3 hours

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able, junction boxes  
lation



1 pcs. 6-way



EUR 18'019

100%

no 6-way zone valve  
115: R3015-...-B2  
120: R3020-...-B2

endent on the accuracy of

been used:

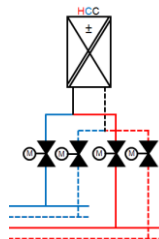
- Installation Actuator: 4.2 minutes per actuator
- Installation Junction box: 17.4 minutes per junction box
- Effort cable installation : 0.3 minutes per linear meter

Subject to modifications and amendments.

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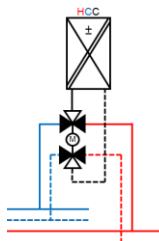
## 1 What is calculated?

It is well known that the demand for heating in today's buildings is often lower than it used to be, thanks to improved insulation and higher thermal loads (e.g. electronic devices). On the other hand, we also know that demand for cooling is on the rise. The equalisation of demand for heating and cooling allows a (combined) heat exchanger to be used for heating and cooling. The 4-pipe system is ideal for the hydraulic supply.



**Fig.1** Combined heat exchanger for heating and cooling in 4-pipe system controlled using 4 straight way valves

As can be seen in Figure 1, several valves are needed for correct control. Alternatively, the 6-way zone valve launched by Belimo can be used. This innovative solution developed especially for 4-pipe systems takes the place of 4 straight way valves or 2 straight way valves and one 3-way change-over valve.



**Fig.2** Combined heat exchanger for heating and cooling in 4-pipe system controlled using a 6-way zone valve

Using the 6-way zone valve not only provides technical benefits (e.g. mixing of cold and hot water due to incorrect valve activation totally impossible) but is also a great help with planning and installation.

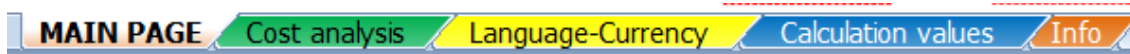
- Procurement, handling and installation of fewer components
- Vastly reduced risk of installation errors
- ...

It may be the case that only the costs for one 2-way valve are compared with those of one 6-way zone valve. This **incomplete** comparison produces higher costs for the 6-way solution. However, a complete consideration is only meaningful if the different number of valves needed is taken into account. This is done automatically and correctly by the calculation tool. Differences in material and the amount of work which arise during installation are also taken into account. The following are taken into account

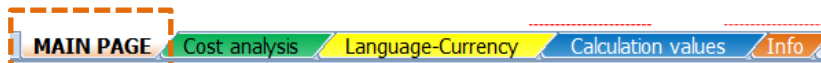
- costs of physical data points (control) → material costs
- junction boxes → material and installation costs
- cable between data points and junction boxes → material and laying costs
- actuators to motorise valves → material and installation costs
- valves → material and installation costs

## 2 Structure of the tool

The tool is an Excel file with five tabs:



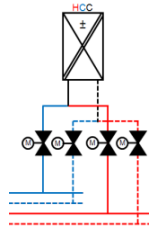
### 2.1 MAIN PAGE



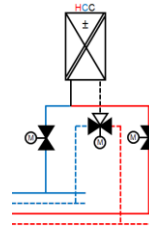
- **Operation/navigation**
  - Various buttons are provided for rapid operation and navigation within the tool.
  - Macros must be activated in Excel to use the buttons.
  - Other languages can be added in the *Calculation values* tab (see chapter 2.4).
  - The values used when the 'Use sample values' button is clicked on can also be changed in the *Calculation values* tab (see chapter 2.4).
- **Calculation base**
  - Input of the information required for the calculation.
  - The installation condition can be selected in the 'Installation type' drop-down menu. Depending on whether a building is already occupied or you are working with an empty new build, the time needed to install the components will vary. The standard times for installing the various components (e.g. 2-way valve, actuator and junction box) can be adjusted to the country-specific values in the *Calculation values* tab (see chapter 2.4).

- **Estimate of investment costs**

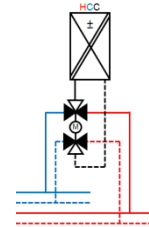
- The material and labour costs for producing three different hydraulic design options are calculated on the basis of the input provided.



**Fig.3a** 4 x 2-way valve  
(2 x modulating / 2 x open-close)



**Fig.3b** 2 x 2-way valve +  
1 x 3-way change-over valve



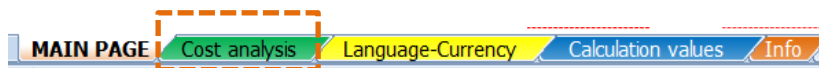
**Fig.3c** 1 x 6-way zone valve

- The relevant solution is not displayed if no value was entered for the valve needed in the calculation base.
- If no value is entered for the other components (e.g. junction box), the calculation is undertaken anyway. A value of zero is used in the calculation for the component in question.
- The level of detail of the cost breakdown can be selected by pressing the corresponding button (low/medium/high)

- **Estimate of investment costs (graphic depiction)**

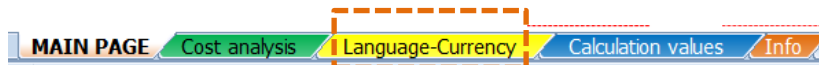
- The costs for the different hydraulic versions are also displayed graphically.

## 2.2 Cost analysis

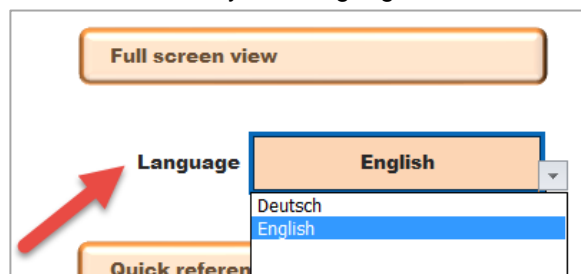
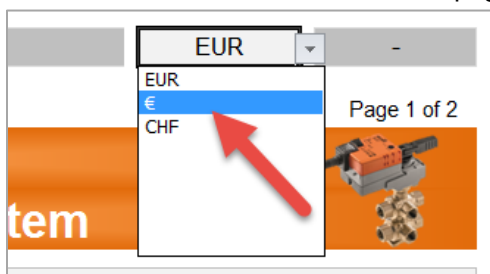


- Quick overview of the investment costs for the three different hydraulic solution options.
- The inputs required for this purpose are provided on the main page. The user also obtains supplementary results on the main page.

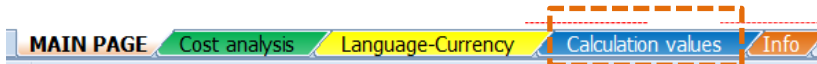
## 2.3 Language-Currency



- This tab offers the possibility of using additional currencies and languages.
- The corresponding instruction is stored in Excel.
- A selection can be made on the main page as to which currency and language are to be used.

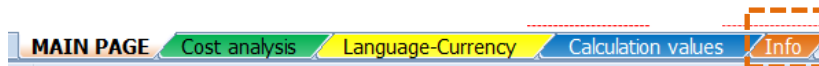


## 2.4 Calculation values



- **Calculation values (standard times):** This tab allows the standard times for component installation to be changed.
  - The times entered define how long it takes to install the corresponding components (in hours).
  - Four installation types are pre-filled. The times stated for these can be changed.
    - New building, one-time
    - New building, repetitive
    - Existing building, one-time
    - Existing building, repetitive
  - Two user-defined scenarios can now also be defined.
- **Values for sample calculation:** Sample values can be used on the main page by clicking on the corresponding button.
  - The values used when the corresponding button is clicked on can be changed in the *Calculation values* tab.

## 2.5 Info (Additional information)



- The costs taken into account by the calculation tool are shown in this tab.
- The 3 different hydraulic design variants are also shown schematically.

## 3 Supplementary information for the MAIN PAGE

- Light-grey fields are input fields.
  - Input/changes are not permitted in all other fields.
- Full-screen mode → It may be helpful to use Excel's full-screen mode especially if the monitor resolution is low (e.g. laptops).
  - This can be activated via the ribbon. As an alternative, a rapid selection button is available in the tool.



- The button **Print** leads to a fast printout on the configured printer. A two-page document is created.

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### Belimo Savings Estimator Investment costs 4-pipe system

Project: Test building  
Version: Pre-project #3  
Creator: Christian Luchinger  
Processing date: 21.03.2016

**Calculation basis**

Number of heat exchangers (Heating & Cooling)	50	pieces
Type of installation	New construction / one-time	
Average distance between control cabinet and junction box	25	meters
Cost of a 2-way valve including actuator (modulating)	36	EUR/piece
Cost of a 2-way valve including actuator (open-close)	32	EUR/piece
Cost of a 3-way valve including actuator	41	EUR/piece
Cost of a 6-way valve including actuator	165	EUR/piece
Cost of a physical data point	50	EUR/piece
Cable costs	0.19	EUR/meter
Cost of a junction box	9	EUR/piece
Hourly rate installation work	45	EUR/hour

**Estimate of costs**

	4 pcs 2-way	2 pcs 2-way 1 pcs 3-way	1 pcs 6-way
Number of valves per heat exchanger	4 Stk.	3 Stk.	1 Stk.
<b>Overall costs of material and installation</b>	<b>EUR 32'465</b>	<b>EUR 25'506</b>	<b>EUR 18'019</b>
<b>Total material costs</b>	<b>EUR 19'550</b>	<b>EUR 10'213</b>	<b>EUR 11'438</b>
Costs of all valves and actuators	EUR 8'800	EUR 5'650	EUR 8'250
Total number of valves and actuators	200 pieces	100 pieces	50 pieces
Number of 2-way	0 pieces	50 pieces	0 pieces
Number of 3-way	0 pieces	0 pieces	50 pieces
Number of 6-way	0 pieces	0 pieces	0 pieces
Costs of data points, cable, junction boxes	EUR 12'750	EUR 9'563	EUR 3'188
Number of data points / junction boxes	200 pieces	150 pieces	50 pieces
Total cable length	5 kilometres	3.75 kilometres	1.25 kilometres
<b>Total installation costs</b>	<b>EUR 12'915</b>	<b>EUR 10'294</b>	<b>EUR 6'581</b>
Costs of valve installation	EUR 9'550	EUR 7'020	EUR 5'490
Effort valve installation	190 hours	156 hours	122 hours
Installation effort 2-way	190 hours	95 hours	0 hours
Installation effort 3-way	0 hours	61 hours	0 hours
Installation effort 6-way	0 hours	0 hours	122 hours
Costs of actuator installation	EUR 4'365	EUR 3'274	EUR 1'091
Effort installation actuator	14 hours	11 hours	3.5 hours
Effort installation of junction box	52 hours	44 hours	15 hours
Effort cable installation	25 hours	19 hours	6.3 hours

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Project: Test building  
Version: Pre-project #3  
Creator: Christian Luchinger  
Processing date: 22.03.16

**Estimate of costs**

Configuration	Overall Costs (EUR)	Material Costs (EUR)	Installation Costs (EUR)	Percentage
4 pcs 2-way	EUR 32'465	EUR 19'550	EUR 12'915	180%
2 pcs 2-way / 1 pcs 3-way	EUR 25'506	EUR 10'213	EUR 10'294	142%
1 pcs 6-way	EUR 18'019	EUR 11'438	EUR 6'581	100%

**Disclaimer / Information**

This is an estimating tool which considers the named costs. Results are dependent on the accuracy of the input values.

For the calculation of the installation costs the following standard times has been used:

- Installation 2-way: 57 minutes per valve
- Installation 3-way: 73.2 minutes per valve
- Installation 6-way: 146.4 minutes per valve
- Installation Actuator: 4.2 minutes per actuator
- Installation Junction box: 17.4 minutes per junction box
- Effort cable installation: 0.3 minutes per linear meter

Subject to modifications and amendments.

- The button **Create PDF** creates a two-page PDF. The directory of the Excel file is selected as the location for saving the file.
  - The file name is selected as follows: YYYY-MM-DD Project\_Version.pdf

Project	
Version	
Creator	
Processing date	