

Module 7

## CREATE PHOTOVOLTAIC FORMULA

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**Here we create the PHOTOVOLTAIC formula**

**You have to work with the MyVariable library for this formula**

**For this formula we need 8 My Variables, which we define beforehand**

## We create the formula: - PHOTOVOLTAIC

With this formula we define the following MyVariables

- |                             |              |
|-----------------------------|--------------|
| 1. For the CHF amount       | <b>CHF1</b>  |
| 2. 1 watt                   | <b>W1</b>    |
| 3. Inclination angle module | <b>an</b>    |
| 4. Length east/west side    | <b>Low</b>   |
| 5. 1 meter                  | <b>m1</b>    |
| 6. Module name              | <b>MODUL</b> |
| 7. Distance                 | <b>Lr</b>    |
| 8. Length north/south side  | <b>Lns</b>   |

With these MyVariables we can create the table "ANLA\_T.

**Block 1:  
Formelname**

Name	<b>PHOTOVOLTAIK</b>	Description	PV-Kosten rechnen
Category	Engineering	Subcategory	Construction engineering

**Block 2:  
Editor + Rechner**

```

/* Länge Ost-West */
Mns=RND((Lns-2*Lr)/((TAB(ANLA_T,MODUL,3) * m1)),0)
Mow=RND((Low-2*Lr)/(Lr+2*(TAB(ANLA_T,MODUL,4) * m1)*COS(an))-0.5,0)*2
Module = Mow *Mns

Ptot_Gesamtleistung=Module * (TAB(ANLA_T,MODUL,1) * W1)
Gesamtkosten= Module * (TAB(ANLA_T,MODUL,2) * CHF1)

/* Tabellenwerte der Tabelle ANLA_T */
ModulLeistung = (TAB(ANLA_T,MODUL,1) * W1)
ModulPreis = (TAB(ANLA_T,MODUL,2) * CHF1)
ModulLaenge = (TAB(ANLA_T,MODUL,3) * m1)
ModulBreite = (TAB(ANLA_T,MODUL,4) * m1)
    
```

**Block 3:  
Variablen und  
Rechts  
Ergebnisse**

Show Errors		<input checked="" type="checkbox"/>	Significant numbers	6
Lns	Länge Nord/Südseite	91.57	m	
Lr	Abstand	0.3	m	
MODUL	Modul-Name	LG 310		
m1	1 Meter	1	m	
Low	Länge Ost/Westseite	24.8	m	
an	Neigungswinkel Modul	10	°	
W1	1 Watt	1.000	W	
CHF1	CHF-Betrag	1	CHF	
Mns		55.000000		
Mow		20.000000		
Module		1 100.000000		
Ptot_Gesamtleistung		341 000	W	
Gesamtkosten		399 630	CHF	
ModulLeistung		310.000	W	
ModulPreis		363.300	CHF	
ModulLaenge		1.64000	m	
ModulBreite		1.00000	m	

## We create the PHOTOVOLTAIC formulas with the table MODUL

The PV photovoltaic system costs are to be calculated on a system surface (flat roof). The following values are provided for calculating the number of modules:

- Length, north/south side                      in m
- Distance between 2 modules                in m
- Length measurement                            in m
- Length, east / west side                      in m

Thereby 3 different PV products "MODUL" have to be considered (see table)

	A	B	C	D	E
1	<b>MODUL</b>	<b>Leistung</b>	<b>Preis</b>	<b>Länge</b>	<b>Breite</b>
2	<b>TYP</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
3	Luxor Exo	200 Watt	CHF 168.54	1.58 m	0.808 m
4	LG310	310 Watt	CHF 363.30	1.64 m	1.000 m
5	Q-Cells	280 Watt	CHF 256.10	1.67 m	1.000 m

Define the above the table in abaCal **(1)**

1. Create MyVariable MODULE **(2)** for Luxor Exo, LG310 and Q-Cells
2. Create MyVariable TYP **(3)** for performance, price, length and width
3. Generate MyTables ANLA\_T with the variables MODULE and TYP **(4)**

### Personal Library

- My Formulas
- My Variables **(1)**
- My Tables
- My Linear Systems
- My Numeric Derivatives
- My Numeric Integrals

MyVariables: MODUL **(2)**

Table: Values for ANLA\_T

MODUL	TYP	Result
Luxor Exo	1	200
LG 310	1	310
Q-Cells	1	280
Luxor Exo	2	168.54
LG 310	2	363.3
Q-Cells	2	256.1
Luxor Exo	3	1.58
LG 310	3	1.64
Q-Cells	3	1.67
Luxor Exo	4	0.808
LG 310	4	1
Q-Cells	4	1

MyVariables : TYP **(3)**

# 1. Create MyVariable MODUL

## Personal Library / My Variables

(1)

	Name ▲	Description
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After "Create in MyVariables" (1) the MyVariable "MODUL" is to be created. This MyVariable is created for the 3 PV product names: Luxor Exo, LG 310 and Q-Cells (2). Any number of product names can be saved in the table. So that abaCal can determine that various product names need to be saved, the following must be defined:

Switch "Format" to alphanumeric and set the "Code" to "Yes" (3).

Because this MyVariable becomes part of a table, the "Tables" field (4) must be checked.

SI units (5) cannot be defined for MyVariables in a table.

**Variable: MODUL**

Data

Category <input type="text" value="Engineering"/>	Subcategory <input type="text" value="Construction engineering"/>
Name <input type="text" value="Enter variable name manually"/> <input type="text" value="MODUL"/>	Description <input type="text" value="Modul-Name"/>
Format <input type="text" value="alphanumeric"/>	Informations (Optional) <input type="text"/>
Code <input type="text" value="Yes"/>	Tables <input checked="" type="checkbox"/>
Default value <input type="text" value="Luxor Exo"/>	Unit definition <input type="text" value="This variable has no unit"/>
Constant value <input type="text" value="No"/>	

(3) points to the **Code** field.

(2) points to the **Save** button.

Number	Value in English
<input type="text" value="01"/>	<input type="text" value="Luxor Exo"/>
<input type="text" value="02"/>	<input type="text" value="LG 310"/>
<input type="text" value="03"/>	<input type="text" value="Q-Cells"/>

[add](#)

Notes

(4) points to the **Tables** checkbox.

(5) points to the **Unit definition** dropdown.

## 2. Create MyVariable TYP

MyVariables: TYPE **(1)** is defined as a simple variable. As above, the "Tables" field **(2)** must also be checked. Otherwise nothing needs to be added. The values of performance, price, length and width are only used when defining the table.

**(1)**

**Variable: TYP**

**Data**

Category	Engineering	Subcategory	Construction engineering
Name	Enter variable name manually TYP	Description	Leistungsart
Format	numeric	Informations (Optional)	
Code	No	Tables	<input checked="" type="checkbox"/>
Default value	1	Unit definition	This variable has no unit
Constant value	No		

Save Back

**(2)**

### 3. Generate MyTable ANLA\_T with the variables MODUL and TYP.

For the MyTables there are 2 MyVariables (1) to create ANLA\_T. They are MODULE and TYPE (2).

Line by line of the table (12 table lines) (3) are built up.

It is defined here that 2 criteria are set in the table in order to determine the "result" of the table. The result can be entered here for each MODULE and TYPE (4).

For each line in the table, begin with "Create" (5).

#### Programming the formula with the ANLA\_T table.

ModulLeistung = Module \* (TAB (ANLA\_T, MODUL, 1) \* m1): The program looks for the power in watts in the table and in this case calculates with 200 watts (Luxor Exo) and multiplies times the number of installed modules.

**Personal Library**

- My Formulas
- My Variables
- My Tables
- My Linear Systems
- My Numeric Derivatives
- My Numeric Integrals

**Personal Library / My Tables**

Category:

Name:

Number of results:

Subcategory:

Description:

**Parameter**

1	MODUL - Modul-Name	value exact
2	TYP - Leistungsart	value exact

**Notes**

Table: Create a result for ANLA\_T

**Parameter**

1MODUL	Luxor Exo
2TYP	3

**Result**

Result:

MODUL ▲	TYP	Result
Luxor Exo	1	200
LG 310	1	310
Q-Cells	1	280
Luxor Exo	2	168.54
LG 310	2	363.3
Q-Cells	2	256.1
Luxor Exo	3	1.58
LG 310	3	1.64
Q-Cells	3	1.67
Luxor Exo	4	0.808
LG 310	4	1
Q-Cells	4	1

## Formula programming:

When the MyVariables and the tables have been defined, formula programming can be started:

**Block 1:** Definition of the formula in the editor

Press **My Formulas / Create**: an empty editor appears.

Enter Name: **PHOTOVOLTAIC** and Description: **Calculate PV costs**

Enter: **Category: Engineering** and **Subcategory: Construction engineering**

By entering Category and Subcategory, we have defined which variables we have to work with.

**Block 2:** Enter the formula in the editor

Write text: `/* Länge Ost-West */`

**Formel 1:** This formula is used to calculate the number of modules for the roof.

$Mns = RND((Lns - 2 * Lr) / ((TAB(ANLA\_T, MODUL, 3) * m1)), 0)$

$Mow = RND((Low - 2 * Lr) / (Lr + 2 * (TAB(ANLA\_T, MODUL, 4) * m1) * COS(an)) - 0.5, 0) * 2$

$Module = Mow * Mns$

$Ptot\_Gesamtleistung = Module * (TAB(ANLA\_T, MODUL, 1) * W1)$

$GesamtKosten = Module * (TAB(ANLA\_T, MODUL, 2) * CHF1)$

**Formel 2:** Mit dieser Formel werden die Kosten und die Gesamtleistung der Anlage in Watt gerechnet.

`/* Tabellenwerte der Tabelle ANLA_T */`

$ModulLeistung = (TAB(ANLA\_T, MODUL, 1) * W1)$

$ModulPreis = (TAB(ANLA\_T, MODUL, 2) * CHF1)$

$ModulLaenge = (TAB(ANLA\_T, MODUL, 3) * m1)$

$ModulBreite = (TAB(ANLA\_T, MODUL, 4) * m1)$

To check: press the **Calculate** key.

### Variables & Constants

#### Standardvariables

#### My Variables

<b>Abr</b>	Abrundungs-Betrag	
<b>CHF1</b>	CHF-Betrag	[CHF]
<b>L1</b>	Modullänge	[m]
<b>Lb</b>	Modulbreite	[m]
<b>Lns</b>	Länge Nord/Südseite	[m]
<b>Lortg</b>	Länge Ortgang	[m]
<b>Low</b>	Länge Ost/Westseite	[m]
<b>Lr</b>	Abstand	[m]
<b>Ltr</b>	Länge Traufe	[m]
<b>MODUL</b>	Modul-Name	
<b>TYP</b>	Leistungsart	
<b>W1</b>	1 Watt	[W]
<b>an</b>	Neigungswinkel Modul	[°]

**Block 3: Variablen** (links) und **Ergebnisse** (rechts) anzeigen:

Lns	Länge Nord/Südseite	<input type="text" value="91.57"/>	<input type="text" value="m"/>	Mns	55.000000
Lr	Abstand	<input type="text" value="0.3"/>	<input type="text" value="m"/>	Mow	20.000000
MODUL	Modul-Name	<input type="text" value="LG 310"/>		Module	1 100.000000
m1	1 Meter	<input type="text" value="1"/>	<input type="text" value="m"/>	Ptot_Gesamtleistung	341 000 <input type="text" value="W"/>
Low	Länge Ost/Westseite	<input type="text" value="24.8"/>	<input type="text" value="m"/>	GesamtKosten	399 630 <input type="text" value="CHF"/>
an	Neigungswinkel Modul	<input type="text" value="10"/>	<input type="text" value="°"/>	ModulLeistung	310.000 <input type="text" value="W"/>
W1	1 Watt	<input type="text" value="1.000"/>	<input type="text" value="W"/>	ModulPreis	363.300 <input type="text" value="CHF"/>
CHF1	CHF-Betrag	<input type="text" value="1"/>	<input type="text" value="CHF"/>	ModulLaenge	1.64000 <input type="text" value="m"/>
				ModulBreite	1.00000 <input type="text" value="m"/>

Calculate

Save

Back

Graph

Create MyVariable