

## PROK COIL DLL DOCUMENTATION

20/01/2025 Ver. 1.0.3.7



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## REVISION HISTORY

1.0.3.7	Updated documentation for manifold index in input array (positions 59/60) and list of manifolds for copper or Steel/Stainless Steel manifold. DLL provides in the output array the dimensions for the connections (that can be threaded) and not the actual manifolds size. Output for condensing coil and DX coil is the manifold diameter (no threaded connections). Please note that, due to the max diameter of copper manifold is 67 mm, for liquid coil it is possible that the selected coil has a big number of rows to satisfy the maximum value of the liquid pressure drop. In this Steel manifold is a preferred solution
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## BRIEF DESCRIPTION/LICENSE AGREEMENT

To use the coil selection software PROCALC as a step in a more general design process, CalDllProK.dll is available for use with any programming language that supports standard Windows DLL: the user can insert the required input data and obtain results supplying proper parameters to the exported methods

Please note that only a minimal check is performed on the validity of the input values supplied; this could lead to unpredictable results if wrong data are specified. It is left to the user to assure data consistency. The DLL version of PROCALC is distributed under coil manufacturer's standard rules.

The software might be distributed with time operating limit. After the expiration date, the DLL might not work anymore.

Please contact the supplier for any further information.



## INSTALLATION

The files needed for a correct use of the DLL are:

File name	Description
CALCDLLPROK.DLL	Simple wrapper against PROCALC MFC DLL extensions.
HHSDPROK.DLL	Monophase engine
LIQPROK.DLL	Fluids database
CMPPROK.DLL	Common common library
LIQPROK.DLL	Liquid library
DATA.CFG	Data file
licensePROKDLL.cfg	User license

### WARNING

DLLs are written using Visual C++ 2017, and the user needs to distribute the VC++ UNICODE runtime. The runtime can be downloaded from ALTEC site:

Web link: [www.altecsoftware.com](http://www.altecsoftware.com)

LogIn UserID: **ALTEC**

LogIn Password: **ALTEC**

The correct file to download is :VCRedist\_2015\_x86.exe. Always check for latest version of the Microsoft Visual C++ runtime on Microsoft website.

N.B. the DLL is compiled as UNICODE, 32 bit.

## COIL COST CALCULATION

The Dll provides the coil costs if the file **coilcf.cfg** is available in the DATA Parh.

This file, provided by INDITER for each individual customer, contains information about cost calculation and price validity.

If the cost validity is expired then the InitCoilPROK method returns a warning error, -3, and the cost is not provided from the DLL

The customer code provided by INDITER is intended to be used in the input array, at position 39 "Price multiplier"



## DLL USAGE

In order to avoid DLL location problems, check that CalcdllPROK.dll, hhsdPROK.dll, liqPROK.dll, cmpPROK.dll are placed in the same directory of your executable file.

DLL searches for license file in the same folder.

CalcdllProK.dll exports three functions.

```
extern "C" int FAR WINAPI EXPORT InitCoilPROK();  
extern "C" BOOL FAR WINAPI EXPORT SelectCoilPROK(double vInp[NINPUTDATA], VARIANT  
vRis[NRESDATA], double vOpt[NOPTIONSDATA]);  
extern "C" int FAR WINAPI EXPORT InitCoilPROKWithPath(const wchar_t* path);
```

### 1. InitCoilPROK()

This function must be called once and before calling the SelectCoilPROK() method.

It loads the configuration data from the file DATA.CFG that is placed in the current folder (the current folder set in the caller' application)

The function returns an integer value:

- 0 = the DLL is successfully initialized
- 1 = Error initializing the DLL **Do not proceed.**
- 1 = License not valid. **Do not proceed.**

### 2. InitCoilPROKWithPath(const wchar\_t\* path)

This method has the same behaviour described for **InitCoilPROK()**, but is possible to specify the path where the configuration files of the dll are located. Specifically data.cfg and possible additional files distributed with the package and mentioned in the additional documentation.

The function returns an integer value:

- 0 = the DLL is successfully initialized
- 1 = Error initializing the DLL **Do not proceed.**
- 1 = License not valid. **Do not proceed.**

### 2. SelectCoilPROK(vector1, vector2, vector3)

The three parameters are:

- vector1 => array of 80 "double" elements that specifies input data
- vector2 => array of 80 "VARIANT" elements that contains calculation results
- vector3 => array of 1 "VARIANT" element that specifies optional flags (for future use)

The function returns a Integer value:

- 1 or -1 = the coil calculation succeeded



0 = Error (see Output array at index 24 for error message code)



## Usage from VB-VBA

// CHECK c++ example for further info

Function declaration

' specify the path where the dll is located in the following declaration

Declare Function InitCoilPROK Lib "c:\calcsoft\calcdll\CalcDllPROK.dll" As Int

Declare Function SelectCoilPROK Lib "c:\calcsoft\calcdll\CalcDllPROK.dll" (ByRef p1 As Double, ByRef p2 As Variant, ByRef p3 As Double) As Int

Const NINPUTDATA = 80

Const NRESDATA = 80

Const NOPTIONSDATA = 1

Function StartCalc Clicked()

Dim bErr As Boolean

Dim aInputData(NINPUTDATA) As Double

Dim aResult(NRESDATA) As Variant

Dim aOptions(NOPTIONSDATA) As Double

On Error GoTo StartCalc\_exit

' Collect data from input mask

aInputData(0) = 4 ' 4 Rows

aInputData(1) = 10 ' 10 tubes per row

aInputData(2) = 500 ' coil length 500 mm

aInputData(3) = 2,1 ' fin pitch 2.1 mm

aInputData(4) = 4 ' 4 circuits

aInputData(5) = 2 ' coil type "325"

aInputData(6) = 1 ' tube material Copper

aInputData(7) = 0,3 ' tube thickness 0.3 mm

aInputData(8) = 2 ' fin material Aluminium

aInputData(9) = 0,115 ' fin thickness 0.115 mm

aInputData(10) = 2 ' frame material Aluminium

aInputData(11) = 1,5 ' frame thickness 1.5 mm

aInputData(12) = 1 ' manifolds material Copper

aInputData(13) = -5 ' inlet temperature -5°C

aInputData(14) = 50 ' inlet relat. Humidity 50%





```
aInputData(15) = 2000          ' air volume 2000 Sm3/h  
aInputData(16) = 1           ' liquid type "Water"  
aInputData(17) = 80          ' liquid inlet temp 80 °C  
aInputData(18) = 70          ' liquid outlet temp 70 °C  
aInputData(37) = 1           ' calc type "Single Phase"
```

Return

StartCalc\_exit:

MsgBox("Errors during calculation")

Resume next

End function

Note: Please remember that the first array position is 0, so you find the coil description in aResult(29).



## Usage from C++

```
#define NINPUTDATA          80
#define NRESDATA            80
#define NOPTIONSDATA       1

extern "C" int WINAPI EXPORT InitCoilPROK();
extern "C" BOOL WINAPI EXPORT SelectCoilPROK(double vInp[NINPUTDATA], VARIANT
vRis[NRESDATA], double vOpt[NOPTIONSDATA]);
extern "C" int WINAPI EXPORT InitCoilPROKWithPath(const wchar_t* path);

void CMyVlew::OnCalcolo()
{
    // TODO: Add your control notification handler code here

    double alnp[NINPUTDATA];
    VARIANT aRis[NRESDATA];
    double aOpt[NOPTIONSDATA];

    // Collect data from input mask
    this->GetData(vInp);
    CString dllCfgPathFiles = "yourpath"

    short ris = ::InitCoilPROKWithPath(dllCfgPathFiles);
    if (ris != 0)
    {
        if (ris == -1)

            :AfxMessageBox(_T("Error:
License expired"), MB_OK | MB_ICONERROR);

            else

            :AfxMessageBox(_T("Error in InitCoilPROK()"), MB_OK | MB_ICONERROR);

            return;
    }
    // Call the DLL Function and check for
    return errors
    // *** CALL DLL CALCULATION ***

    BOOL start= ::SelectCoilPROK(alnp, aRis, aOpt);

    // *** DLL ERROR ***
    if (!start && aRis[24].dblVal != 11400)
    {
        tErrors errNo = (tErrors) ((int) aRis[24].dblVal);
        CString err = GetDLLErrorDescription(errNo);
    }
}
```



```
        ::AfxMessageBox(CStringEx(L"DLL Error n.%s", err + CStringEx(aRis[24].dblVal)), MB_OK |  
        MB_ICONERROR);  
  
        return;  
    }  
    // Show results  
    this->ShowResults(aRis);  
}
```

**Warning:** positions 29 of the output array contain BSTR values, so, in order to convert them to CString (in Visual C++), it is possible to create an instance of the class CString passing *aRis[29].bstrVal* to the constructor (see VARIANT structure declaration): It is left to the user to clear the result position containing a BSTR string after usage

```
CString coilDescription (aRis[29].bstrVal);  
::AfxMessageBox("Coil type: " + coilDescription);
```

```
#define NINPUTDATA      80  
#define NRESDATA        80  
#define NOPTIONSDATA    1
```

```
extern "C" BOOL FAR PASCAL EXPORT SelectCoilPROK(  
    double vInp[NINPUTDATA],  
    VARIANT vRis[NRESDATA],  
    double vOpt[NOPTIONSDATA]);
```

**Note:** Arrays in C/C++ are 0 based (first position is position number 0), so you find the coil description in aRis[29]. It is left to the user to clear all VARIANT BSTR values in result array after usage.



## INPUT ARRAY DESCRIPTION

Each position of the input array specified as the first parameter in SelectCoilPROK contains a value related to the variable used by the software according to the following table:

Input	Meaning	Measure unit/values
0	Number of rows	
1	Number of tubes	
2	Coil length	mm
3	Fin pitch	mm
4	Number of circuits	
5	Coil type	(see the specific document for the Input values)
6	Tube material	0: standard for selected coil geometry 1: CU 3: INOX304 5: CuSn 6: FE 10: CUNI9010
7	Tube thickness	mm. (0: standard thickness)
8	Fins material <sup>1</sup>	
9	Fins thickness <sup>2</sup>	mm
10	Frame material	
11	Frame thickness	mm
12	Manifolds material	
13	Air inlet temperature	°C
14	Air inlet humidity	A value between 0 and 100
15	Air Volume	m <sup>3</sup> /h
16	Fluid type <sup>3</sup>	
17	Fluid inlet temperature	°C
18	Fluid outlet temperature	°C
19	Fluid volume	dm <sup>3</sup> /h
20	Liquid Max Pressure Drop	

<sup>1</sup> See Table 6

<sup>2</sup> See Table 12

<sup>3</sup> See Table 5.



21	Evaporating pressure	bar
22	Evaporating temperature	°C
23	Condensing pressure	bar
24	Condensing temperature	°C
25	Super Heating ( $\Delta T$ )	
26	Sub Cooling ( $\Delta T$ )	
27	Glycol type	1: Ethylenglycol 2: Propilenglycol
28	Glycol Percentage – By volume	% (0-100)
29	Ambient Pressure (Working Pressure)	Bar
30	Number of gas Circuits, for Freon coils	
31	Required Capacity	kW
32	Required Outlet Air Temperature	°C
33	Tube Fouling	m <sup>2</sup> °C/W
34	Fin Fouling	m <sup>2</sup> °C/W
35	Safety on Surface	% (0-100)
36	Safety on Capacity	% (0-100)
37	Calculation type	1: Mono Phase 2: Evaporator 3: Condenser
38	Tolerance	0: basic 2: Premium
39	Price multiplier	Must be > 0 to have coil price
54	Overall length, mm.	Default = 0. If specified then finned length dimension is ignored
55	Overall height, mm.	Default = 0. If specified then finned height dimension is ignored
56	Minimum bottom plate height, mm	Default = 0. To be used when pos 54 and 55 is > 0
57	Minimum top plate height, mm	Default = 0 To be used when pos 54 and 55 is > 0
59	Inlet Header/manifold dimension	A number from 3 to 10, see table 8
60	Outlet Header/manifold dimension	A number from 3 to 10, see table 8

Table 1: Input values



It is possible to set the value for some parameters in several ways. There are groups of inputs for which only one value is required. It is not allowed to insert more than one type of input, otherwise an error is returned.

Table 2 indicates the alternative inputs.

Input	Meaning
0, 31,32	N° Rows / Capacity / Required outlet air temperature
18, 19	Fluid outlet temp / Fluid volume
21, 22	Evaporating pressure / Temperature
23, 24	Condensing pressure / Temperature

Table 2. Default values

### Valid combination of input values

- Either coil length or coil overall length must be specified
- Either number of tubes or coil overall height must be specified
- 
- When the number of rows (*input[2]*) is specified the desired outlet temperature (*input[32]*) must be 0. If (*input[4]*) is greater than zero a selection is performed and the number of rows of the selected coil is driven by the required performance.
- When the number of rows (*input[2]*) is specified the number of circuits (*input[4]*) is required
- If both air outlet temperature (*input[31]*) and required capacity (*input[32]*) is specified, the DLL uses the required capacity as valid input



## RESULTS ARRAY DESCRIPTION

The second parameter specified in InitCoilPROK call contains the results related to the data specified in the input array. The meaning of each position in the array is given in Table 3.

Output	Meaning	Measure unit
0	Capacity	kW
1	Capacity	kcal/h
2	Air outlet temperature	°C
3	Air outlet relative humidity	%
4	Air outlet absolute humidity	g/Kg
5	Fluid outlet temperature	°C
6	Fluid volume	dm <sup>3</sup> /h
7	Fluid volume	dm <sup>3</sup> /s
8	Fluid weight	kg/h
9	Fluid weight	kg/s
10	Air side pressure drop	Pa
11	Fluid side pressure drop	kPa
12	Capacity Reserve	%
13	Coil height	mm
14	Coil depth	mm
15	D dimension	mm
16	Gas velocity	m/s
17	Fluid velocity	m/s
18	Fluid density	kg/m <sup>3</sup>
19	Fluid viscosity	mPas
20	Fluid specific heat	J/Kg°C
21	Fluid conductivity	W/m°C
22	Sensible Heat/Total heat ratio	
23	Condensed water	kg/h
24	Error code <sup>4</sup>	
25	Number of rows	
26	Number of circuits	
27	Coil price	
28	Coil weight	kg
29	Complete coil denomination	
30	Subcooling	°C
31	Superheating	°C

<sup>4</sup> See Paragraph 7



32	Vapour fraction	
33	Inlet connection diameter	DN or "
34	Outlet connection diameter	DN or "
35	Vapour velocity inside inlet manifold	m/s
36	Vapour velocity inside tubes	m/s
37	Liquid velocity inside tubes	m/s
38	Liquid velocity inside outlet manifold	m/s
39	Number of distributors	
40	Distributors denomination	
41	Capillars outside diameter	mm
42	Capillars inside diameter	mm
43	Capillars length	mm
44	Distributor header diameter	mm
45	Condensing temperature	°C
46	Condensing pressure	bar
47	Evaporating temperature	°C
48	Evaporating pressure	bar
49	Total exchange surface	m <sup>2</sup>
50	Freon pressure drop	°C
51	Inlet air relative humidity	%
52	Internal volume	m <sup>3</sup>
53	Fins pitch	mm
54	Customer code	
55	Coil finned length	mm
56	Tubes number	
57	Tube thickness	mm
58	Coil overall length (standard manufacturer)	mm
59	Coil overall height (standard manufacturer)	Mm
60	Number of coils	m/s
61	Not used	
62	Not used	
63	Not used	
64	Not used	
65	Distance between manifolds (X) for water coils and single manifold	mm
66	Distance between manifolds (Y) for water coils and single manifold	mm





67	Number of gas circuit	
68	Not used	
69	Frame thickness	mm
70	Warning code	See error table
71	Fins thickness	mm
72	Connection side	1 same side, 2 opposite side
73	Air side pressure drop, dry mode	Pa
74	Frame length on bends side	mm
75	Air face velocity	m/s
76	Error in price calculation	
77	Bottom plate height	Mm
78	Top plate height	mm

Table 3. Results array description.

## DEFAULT VALUES

It is possible to specify only a minimum set of values in order to perform a selection.

For parameters without value (i.e. with value 0), default values will be assumed, according to the following table:

Input	Meaning	Default value
6	Tube Material	Standard value for selected Geometry
7	Tube Thickness	Standard value for selected Geometry
8	Fin Material	Standard value for selected Geometry
9	Fin Thickness	Standard value for selected Geometry
28	Glycol percentage	0
29	Working pressure	1.013 bar
33	Tube side fouling factor	0 m <sup>2</sup> °C/W
34	Gas side fouling factor	0 m <sup>2</sup> °C/W
35	Safety factor on surface	0
36	Safety factor on capacity	0

Table 4: default values for empty rows.



## TABLES

Fluid type	Value
Water	1
R134a	4
Steam	9
R407C	12
R404A	13
R410A	16
R507	15
R452A	70
R449A	69
R448A	73
R513A	71

Table 5: Fluid types

Fin material	Value
Copper	1
AL	2
Inox304	3
AlPainted	4
AlMg	9

Table 6: Fin material

Manifolds material	Value
Copper	1
Steel	6
SS304	3
SS316	17

Table 7: Manifold material



## ERROR CODES

If you specify wrong input data, error codes are returned according to the following table:

Error code	Error description
0	No Error
10000	Compute Type not specified (monophase, evaporator, condenser)
10001	Value of Compute Type not valid (monophase, evaporator, condenser)
10002	Tubes number not specified (must be more of 0)
10003	Value of Tubes number not valid
10004	Coil length not specified (must be more of 0)
10005	Value of Coil length not valid
10006	Fins space not specified (must be more of 0)
10007	Value of Fins space not valid
10008	Value of Inlet Air Temperature is out of range
10009	Relative Humidity not specified (must be more of 0)
10010	Value of Relative Humidity out of range
10011	Air Volume not specified (must be more of 0)
10012	Value of Air Volume out of range
10013	Liquid Type not specified
10014	Value of Liquid Type not valid (see Liquid table)
10015	Parameters Conflict (Combination with Liquid Type)
10016	Parameters Conflict (Combination with Liquid Type)
10017	Parameters Conflict (Combination with Liquid Type)
10018	Conflict in Compute Type and Liquid Type
10019	Inlet Air Temp. < Liquid Temp. (Evaporator)
10020	Inlet Air Temp. > Liquid Temp. (Condenser)
10021	Inlet Water Temperature out of range
10022	Outlet Water Temperature out of range
10023	Invalid value for Liquid Volume
10024	Invalid value for Super Heating
10025	Invalid value for Sub Cooling
10026	Some parameters are missing (see Press. Drop, Power, Outlet Temp. or number of circuits)
10027	Geometry not specified
10028	Invalid value for Geometry
10029	Rows value missed with Circuits input set



10030	Circuits value missed with Rows input set
10031	Request Capacity and Request Air Temperature not specified
10032	Default Tubes ID not found or missed
10033	Coil length and Client ID not specified
10034	Fins Type not found or invalid for this Geometry
10035	Tubes Type not found or invalid for this Geometry
10036	Inlet Collector Type not found or invalid for this Geometry
10037	Outlet Collector Type not found or invalid for this Geometry
10038	Frame Type not found or invalid for this Geometry
10039	Invalid Combination of Rows and Fins pitch
10200	The number of circuits is required. The number of circuits cannot be bigger than total number of tubes. For selection calculation, single phase liquid (either outlet temperature or capacity is required) the number of circuits or the max water side pressure drop must be specified
11070	Both or neither overall length and overall height must be specified
3010	Fluid velocity is out of limit: change number of circuits or maximum water pressure drop

Table 8: wrong input error codes.

If the calculation engine fails during iterations, the error code returned is listed in table 9.

Error code	Error description
10xx	Unknown error
20xx	General error
30xx	Liquid velocity out of allowable range
40xx	Out of temperature difference in iteration
50xx	Required capacity is too high
60xx	Endless loop
70xx	Liquid quantity is too high

Table 9: calculation engine error codes.



## INPUTS DATA EXAMPLES

For some examples regarding input's data, please look at the “examples” directory, where different combinations of Coil types, Geometries, Rows, Circuits, Fins, Tubes, Manifolds, Frame, Liquid and Air Temperatures, Liquid types and request Power are provided.

These examples are available as screenshot and as input files that can be loaded into the "CalcDIIsvr" tool.

Below, an example of Condenser calculation:

Please update the geometry ID with the correct value

A		B
1	Number of rows	6
2	Number of tubes	32
3	Coil length mm	1200
4	Fin pitch mm	2.5
5	Number of circuits	16
6	Geometry ID	2
7	Tube material	1
8	Tube thickness mm	0.64
9	Fin material	2
10	Fins thickness mm	0.180
11	Frame material	7
12	Frame thickness mm	2
13	Manifolds material	1
14	Air inlet temperature (°C)	10
15	Air inlet relative humidity %	50
16	Air volume m3h standard	5000
17	Liquid type	12
18	Liquid inlet temperature (°C)	
19	Liquid outlet temperature (°C)	
20	Liquid volume dm3/h	
21	Liquid max pressure drop kPa	
22	Liquid evap pressure Bar	
23	Liquid evap temperature (°C)	5
24	Liquid cond pressure Bar	
25	Liquid cond temperature (°C)	45
26	Superheating	5
27	Subcooling	2
28	Glycol type	
29	Glycole percentage %	
30	Ambient pressure Bar	
31	Number of gas circuits	
32	Required capacity kW	
33	Required airside outlet temperature (°C)	20
34	Tube Fouling factor	
35	Fins Fouling factor	
36	Safety	
37	Safety Power	
38	Calc Type (1=MonFas, 2=Evap, 3=Cond)	3
39	1:Standard tolerance - 2: Certified	2
40	???	
41	???	
42	???	
43	???	
44	???	
45	???	
46	???	
47	???	
48	???	
49	???	
50	???	
51	???	
52	???	
53	???	
54	???	
55	???	
56	???	

A		B
1	Capacity (KW)	16.96
2	Capacity (kcal/h)	14585.99055386
3	Air outlet temp (C°)	20
4	Air outlet rel humidity (%)	28.15
5	Air outlet Abs humidity (g/kg)	3.79
6	Liquid outlet temp	37.9428996
7	Liquid volume (dm3/h)	0
8	Liquid volume (dm3/s)	0
9	Liquid weight (kg/s)	350
10	Liquid weight (kg/s) 2	0.1
11	Air pressure drop	3.59
12	Liquid pressure drop	0.26
13	Reserve (%)	29.37
14	Coil height	1920
15	Frame length	-99
16	D dimension	-99
17	Gas velocity (m/s)	0.59
18	Liquid velocity (m/s)	0.44
19	Liquid density (kg/m3)	0
20	Liquid viscosity (mpa/s)	0
21	Liquid specific heat (kJ/kg°C)	0
22	Liquid conductivity (W/m°C)	0
23	Sensible/total heat ratio	1
24	Condensed water (kg/h)	0
25	USERID	0
26	Rows number	2
27	Circuit number	16
28	Coil total price (€)	0
29	Weight	78
30	Coil type	560A 32T-1200L-2F-2.5 16c
31	Subcooling	2
32	Superheating	5
33	Outlet Title	0
34	Connection inlet diameter	28 mm
35	Connection outlet diameter	22 mm
36	Vapour velocity in connections	2.39579097765
37	Vapour velocity in tubes	0.4430567274474
38	Liquid velocity in connections	0.03168139016851
39	Liquid velocity in tubes	0.2895213028152
40	Distributors number	0
41	Distributor type	0
42	Capillars external diameter (mm)	0
43	Capillars internal diameter (mm)	0
44	Capillars length (mm)	0
45	Distributors diameter (mm)	0
46	Condensing temp (°C)	45
47	Condensing pressure (bar)	17.52155761719
48	Evaporating temp (°C)	0
49	Evaporating pressure (bar)	0
50	Total exchange surface (m2)	101.7
51	Freon pressure drop (°C)	0
52	Inlet relativity humidity (%)	50
53	Internal volume (m3)	-99
54	Fin pitch (mm)	2.5
55	Customer result 1	0
56	Coil finned length	1200

**Notes:** please consider that in “CalcDIIsvr” tool the inputs/outputs are numbered starting from index “1” (as shown on the left of the rows), while in the array of the “CalcDIIPROK.dll” module the index starts from “0”, as in all C++ arrays.