



# Welcome to Getting Started

## DIRcalc™ version 1.1



Refrigeration and  
Air Conditioning

# Mode Selection



**You can run DIRcalc™ in 3 different calculation modes**

**SERIES**  
Calculation of a complete refrigerant plant section including valves, pipes & fittings

**SINGLE**  
Calculation and selection of a single valve

**SAFETY**  
Calculation and selection of internal and external safety valves

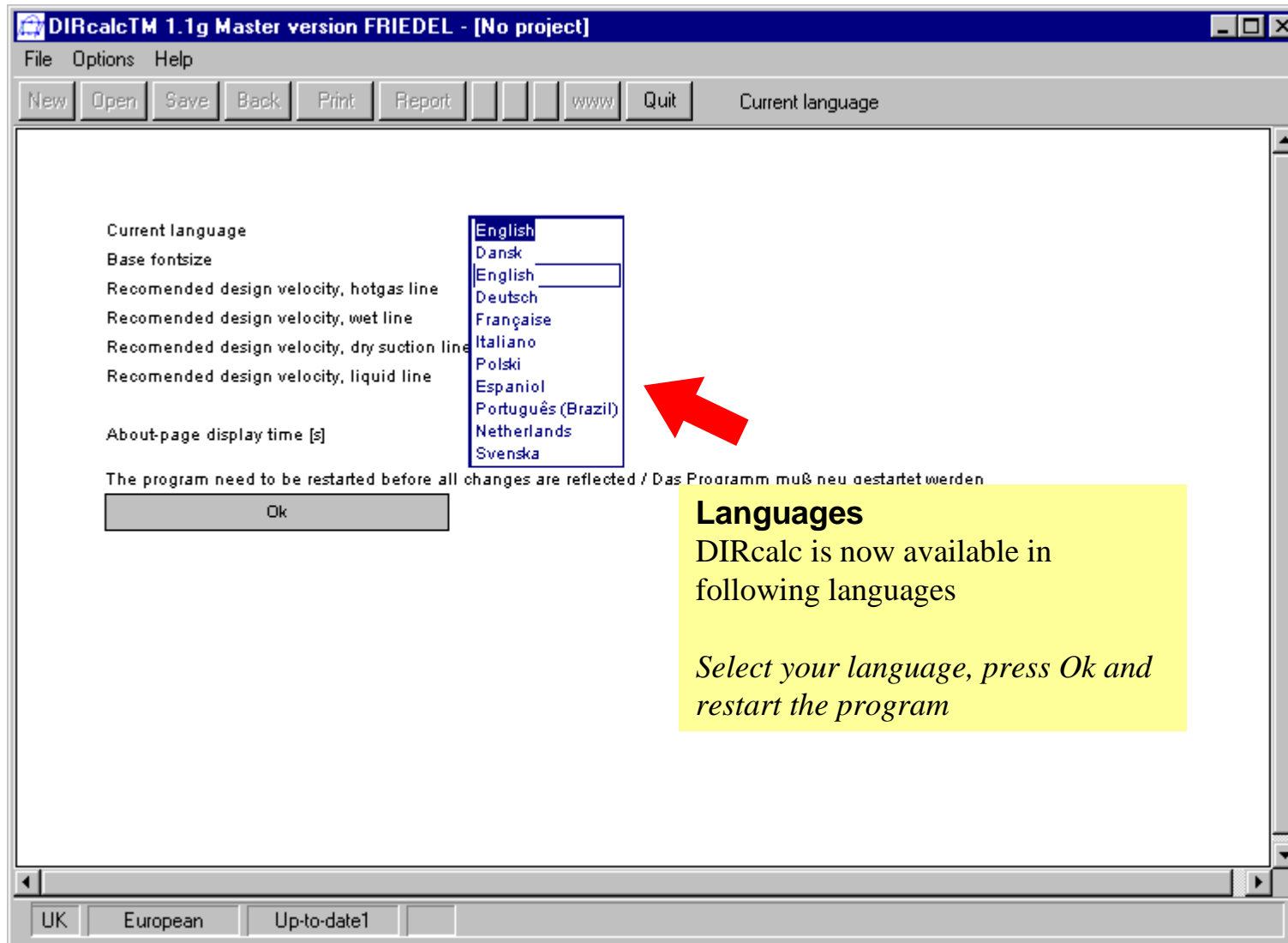
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**Master version**

UK European Up-to-date1 #



# Languages



**Languages**  
DIRcalc is now available in following languages

*Select your language, press Ok and restart the program*



# Velocities



DIRcalcTM 1.1g Master version FRIEDEL - [No project]

File Options Help

New Open Save Back Print Report www Quit

Current language	English
Base fontsize	12
Recomended design velocity, hotgas line	15.0 m/s
Recomended design velocity, wet line	12.0 m/s
Recomended design velocity, dry suction line	10.0 m/s
Recomended design velocity, liquid line	1.00 m/s
	0
About-page display time [s]	0

The program need to be restarted before all changes are reflected / Das Programm muß neu gestartet werden

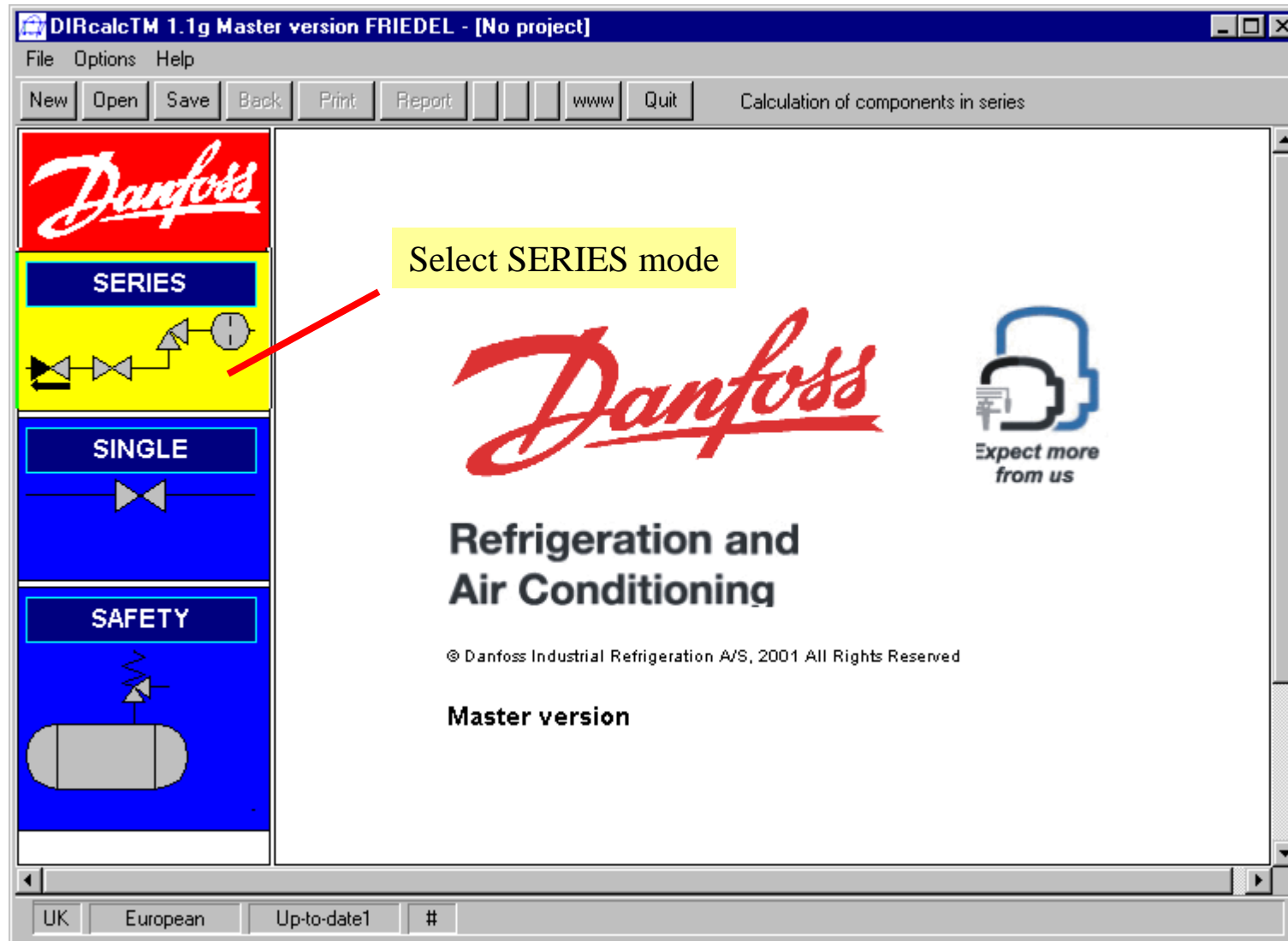
Ok

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**Velocities**  
In *Edit Preferences* you can input your own set of design velocities as a basis for your DIRcalc calculations



# Calculation in SERIES Mode



Refrigeration and  
Air Conditioning

# Calculation in SERIES Mode



The screenshot shows the DIRcalcTM 1.1g Master version FRIEDEL - [No project] window. The menu bar includes File, Options, and Help. The toolbar contains buttons for New, Open, Save, Back, Print, Report, www, and Quit. A red circle highlights the 'Pumpcirculated evaporator' button. The main window displays a schematic diagram of a refrigeration system with a pump-circulated evaporator. A green circle highlights the 'SERIES PUMP' button, with a text box stating 'Click on a line with your mouse R717'. A green arrow points to the 'PUMP' system icon in the left sidebar, with a text box '1. Select a system'. A red arrow points to a refrigerant line in the diagram, with a text box '2. Select a refrigerant line'. A blue text box 'Line not selected yet' is positioned near the diagram. The bottom status bar shows 'UK', 'European', 'Up-to-date1', and '#'. The Danfoss logo is visible in the top left corner of the software window.



# Extended Product Database



DIRcalcTM 1.1g Master version FRIEDEL - [No project]

File Options Help

New Open Save Back

Product family

or without phase change R717

	Temperature	t or p	Temperature
Evap.cap	10.0 kW	Evap.temp	-10.0 °C
Cond.temp		Cond.temp	25.0 °C
Massflow	31.3 kg/h	Evap.pres	2.91 bar
Cond.pres		Cond.pres	10.1 bar

Expansion valves: MEV, AKV

Stop valves: SVA50 – 200, BM, GBC, GVC

Filters: Filter driers

Solenoids: EVR, EVRS, EVRST, PKVD, PM+EVM, PMext.

Control valves: KVL, KVP, KVR, MRV, PKV, PKVS

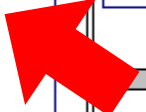
Check valves: NRV/H, NRVA

Pipes & Fittings: Copper piping & fittings

UK European Up-to-date1 #

In version 1.1, the following products has been added to the product database:

- Expansion
- Expansion
- Stop
- Filters
- Solenoids
- Control
- Check
- Steel Piping (DIN)
- Steel Piping (ANSI)
- Cu piping (DIN)
- Cu piping (ANSI)



# Traffic Light Indication



**DIRcalc™ 1.1g Master version FRIEDEL**

File Options Help

New Open Save Back Print Report

**SERIES** **PUMP** **Liquid line with or without phase change** **R717**

Flow or cap.	Capacity	t or p	Temperature	t or p	Temperature
Evap.cap	10.0 kW	Evap.temp	-10.0 °C	Cond.temp	25.0 °C
Massflow	31.3 kg/h	Evap.pres	2.91 bar	Cond.pres	10.1 bar
Line multiplier	1.00	Superheating	0.00 K	Subcooling	5.00 K

Design size	DN5 (4.30)	Design velocity	1.00 m/s	Refrigerant	R717
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Condenser Separator

dp max. load bar  
dt max. load K  
Max.load info  
Min.rec.load %  
Vel.max.load m/s  
Vel.min.load m/s  
Feed back

Errors and omissions excepted. The data are subject to change without notice

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**New feature, traffic light indication**  
In version 1.1, a traffic light always shows the status of the calculation

Input operating data into the edit boxes.  
In general, blue text or numbers in DIRcalc™ are edit or list boxes.



# Extended Refrigerant Database



DIRcalcTM 1.1g Master version FRIEDEL - [No project]

File Options Help

New Open Save Back Print Report www Quit Refrigerant

**SERIES** **PUMP** **Liquid line with or without phase change** **R717**

Flow or cap.	Capacity	t or p	Temperature	t or p	Temperature
Evap. cap	10.0 kW	Evap. temp	-10.0 °C	Cond. temp	25.0 °C
Massflow	31.3 kg/h	Evap. pres	2.91 bar	Cond. pres	10.1 bar
Line multiplier	1.00	Superheating	0.00 K	Subcooling	5.00 K

Design size DN5 (4.30) Design velocity 1.00 m/s Refrigerant R717

Condenser

dp max. load  
dt max. load  
Max. load info  
Min. rec. load  
Vel. max. load  
Vel. min. load  
Feed back

Errors and omissions excepted. The data are subject to change without notice

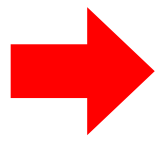
UK European Up-to-date1 #



### Solenoids

- EVR
- EVRA
- EVRAT
- EVRA+NRVS
- EVRAT+NRVS
- EVRS
- EVRST
- ~~GPS~~
- ~~P14VD~~
- PM-EVM
- ~~PM-EXT~~
- ~~PML~~
- ~~PMLX~~

The refrigerant database in DIRcalc has been extended now containing 20 different refrigerants. The refrigerants are divided into 4 groups separated by colors.



- R12
- R22
- R134A
- R404A
- R407C
- R502
- R507
- R717
- R23
- R123
- R123A
- R124
- R125
- R508B
- R290
- R600
- R600A
- R1270
- R410A
- R744

Freon / HFC

Miscellaneous

Flammable

High pressure



# Building up the Line Section



DIRcalcTM 1.1g Master version FRIEDEL - [No project]

File Options Help

New Open Save Back Print Report www Quit

**SERIES** **PUMP** **Liquid line with or without phase change** **R717**

Flow or cap.	Capacity	t or p	Temperature	t or p	Temperature
Evap. cap.	10.0	Evap. temp	-10.0 °C	Cond. temp	25.0 °C
	kW	Evap. pres	2.91 bar	Cond. pres	10.1 bar
	kg/h	Superheating	0.00 K	Subcooling	5.00 K

Design size DN5 (4.30) Design velocity 1.00 m/s Refrigerant R717

Condenser EVRAT40 Separator

dp ma  
dt ma  
Max. l  
Min. rec. load  
Vel. max. load m/s 0.289  
Vel. min. load m/s  
Feed back

**1. Choose the type of component group**

**2. Pick the product symbol and drag the product to the dotted line**

**Note:**  
Components with a red line across are not suited for the selected refrigerant.  
Components with a red cross are not suited for the selected line

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# Calculation in SERIES Mode



DIRcalcTM 1.1g Master version FRIEDEL - [No project]

File Options Help

New Open Save Back Print Report www Quit

**SERIES** **PUMP** **Liquid line with or without phase change** **R717**

Flow or cap.	Capacity	t or p	Temperature	t or p	Temperature
Evap.cap	10.0 kW	Evap.temp	-10.0 °C	Cond.temp	25.0 °C
Massflow	31.3 kg/h	Evap.pres	2.91 bar	Cond.pres	10.1 bar
Line multiplier	1.00	Superheating	0.00 K	Subcooling	5.00 K

Design size	DN5 (4.30)	Design velocity	1.00 m/s	Refrigerant	R717
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Stop

BM

GBC

GVC

Min.rec.load %

Vel.max.load m/s 1.16 0.289

Vel.min.load m/s

Feed back **DN**

100%

0.000922 bar

0.00299 K

21.1%

78.9%

Errors and omissions excepted. The data are subject to change without notice

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This value indicates the nominal pipe diameter. All components added to the dotted line will adapt to the value.

This value indicates the calculated pipe diameter based on the design velocity

Design velocity. You can input your own set of design velocities in *Edit Preferences*



# Locked / Unlocked



The screenshot shows the DIRcalcTM 1.1g Master version FRIEDEL - [No project] interface. The main window displays a refrigeration line configuration for R717. The line is labeled "Liquid line with or without phase change". The configuration includes a condenser (SVA40 str...) and an evaporator (EVRAT20 separator). A red arrow points to the evaporator component on the line diagram.

Flow or cap.	Capacity	t or p	Temperature	t or p	Temperature
Evap. cap	10.0 kW	Evap. temp	-10.0 °C	Cond. temp	25.0 °C
Mass flow	31.3 kg/h	Evap. pres	2.91 bar	Cond. pres	10.1 bar
Line multiplier	1.00	Superheating	0.00 K	Subcooling	5.00 K

Design size	Design velocity	Refrigerant
DN40 (4.30)	1.00 m/s	R717

Condenser: SVA40 str... EVRAT20 separator

dp max. load bar: 0.0000103 0.0000808

dt max. load K: 0.00000530 0.000282

Max. load info

Min. rec. load %

Vel. max. load m/s: 0.00997 0.0372

Vel. min. load m/s

Feed back: **DN**

100% 0.0000825 bar 0.000267 K

98%

2%

Errors and controls excepted. The database is subject to change without notice

**New Feature, Locked / unlocked**  
 1. Enter the product database by clicking on the specific component on the line



# Locked / Unlocked




DIRcalc™ 1.1g Master version FRIEDEL - [No project]

File Options Help

New Open Save Back Print Report www Quit Locked/Unlocked :

### The Product Database

Product :	REG6-1 angle	Min temperature	-50.0	°C
Opn.degree	100 %	Max temperature	150	°C
Number of spindle turns	5	Min pressure	----	----
		Max pressure	25.0	bar(g)
		Min pres.drop	----	----
		Max pres.drop	25.0	bar
		Nom.connection (mm)	DN6	
		Nom.connection (Inch)	1/4	
		Kv	0.170	m3/h
		Locked/Unlocked :	Unlocked	



Ok Cancel

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1. Change the size of the component
  2. Choose *Locked*
  3. Press the Ok button.
- The component is then independent of changes in pipe size



# Locked / Unlocked



DIRcalcTM 1.1g Master version FRIEDEL - [No project]

File Options Help

New Open Save Back Print Report www Quit

**SERIES** **PUMP** **Liquid line with or without phase change** **R717**

Flow or cap.	Capacity	t or p	Temperature	t or p	Temperature
Evap. cap	10.0 kW	Evap. temp	-10.0 °C	Cond. temp	25.0 °C
Max flow	31.3 kg/h	Evap. pres	2.91 bar	Cond. pres	10.1 bar
Line multiplier	1.00	Superheating	0.00 K	Subcooling	5.00 K

Design size	Design velocity	Refrigerant
DN40 (4.30)	1.00 m/s	R717

Condenser: SVA40 sta... EVRAT20 Separator

dp max. load bar: 0.00000 0.0000808

dt max. load K: 0.0000000 0.000262

Max. load info

Min. rec. load %

100% 0.0000825 bar 0.000267 K

98%

2%

Error and/or limit exceeded. The database is not to change without notice

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The grey text indicates that the component has been locked



# Total Pressure Drop Calculation



The screenshot shows the Danfoss software interface for a refrigeration system. The main window displays the following data:

Flow or cap.	Capacity	Star p.	Temperature
Evap. cap	10.0 MW	Evap. temp	-10.0 °C
Max flow	93.4 kg/h	Evap. pres	2.91 bar
Circ. rate	3.00	Pump pres. lift	2.50 bar

Req. pipe size	Req. pipe velocity	Refrigerant
DN15 (15.2)	0.201 m/s	R717

Separator	FID20-15-DIN	TUBH20-DIN	RE920-4 an...	TUBUP20-DIN	FIU20-25-DIN	Evaporator
dp max. load bar	0.0000214	0.0000440	0.00985	0.0627	0.00000185	
dt max. load K	0.000111	0.000229	0.0512	0.327	0.00000589	
Max load info						
Min. req. load %						
Vel. max. load m/s	0.0930	0.0930	0.0930	0.0930	0.0930	
Vel. min. load m/s						
Feed back		DN				

The bar chart at the bottom shows the percentage contribution of each component to the total pressure drop:

Component	Percentage
Separator	0.1%
FID20-15-DIN	13.6%
TUBH20-DIN	86.3%
RE920-4 an...	-%
TUBUP20-DIN	-%
FIU20-25-DIN	-%
Evaporator	-%

A red arrow points to the bar chart area.

**New Feature, total pressure drop calculation**  
 The total pressure drop is now available on screen and on the report as well




# REG Spindle Turns in SERIES



**The Product Database**

Product : **REG-10-1 angle**  
Opn.degree : **100** %  
Number of spindle turns : **5**



Min temperature : -50.0 °C  
Max temperature : 150 °C  
Min pressure : ---  
Max pressure : 25.0 bar(g)  
Min pres.drop : ---  
Max pres.drop : 25.0 bar  
Nom.connection (mm) : DN10  
Nom.connection (inch) : 3/8  
Kv : 0.170 m<sup>3</sup>/h  
Loaded/Unloaded : **Unlocked**

Ok Cancel Adaptive

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**New Feature, REG spindle turns in Series calculations**  
The REG spindle turns have been added in the product database in SERIES.



# REG Spindle Turns in SINGLE



**SINGLE PUMP Liquid line with or without phase change R717**

Flow or cap.		Capacity		t or p		Temperature		t or p		Temperature	
Evap. cap	10.0	kW		Evap. temp	-10.0	°C		Cond. temp	25.0	°C	
Massflow	31.3	kg/h		Evap. pres	2.91	bar		Cond. pres	10.1	bar	
Line multiplier	1.00			Superheating	0.00	K		Subcooling	5.00	K	

Rec. pipe size: DN8 (10.6)    Rec. pipe velocity: 0.165 m/s    Refrigerant: R717

**Hand reg. valve, angle    REG angle**

Calculation basis:

- Pres. drop 7.14 bar
- Velocity 0.165 m/s
- Size No DN size

Errors and omissions excepted. The data are subject to change without notice.

Product	Size	dp max. lead	dt max. lead	Opn. degree	Turn	Max. lead info	Vel. max. lead	Feed back
		bar	K	%			m/s	
RE06-1 angle	DN8	7.14	35.0	100	5	14.9%		
RE06-2 angle	DN8	7.14	35.0	100	5	7.56%		
RE06-3 angle	DN8	7.14	35.0	100	5	3.99%		

**New Feature, REG spindle turns in Single calculations**  
 The REG spindle turns has been added in the Result box in SINGLE  
**Notice:** If you are using a REG as an expansion valve DIRcalc will force the valve to be 100% open when selecting the proper size.



# Options in SAFETY



		Min. value	Max. value
Refrigerant	R717		
Used Standard	prEN ISO 4128-2	Set pressure, Pset bar(g)	15.0 15.0 25.0
Select calculation basis	Massflow	ts, Pts bar	1.00 1.00 25.0
Massflow input	Vessel acc. to prEN13138	trefere °C	20.0 20.0 100
Design massflow	Vessel area		
	Compressor acc. to prEN13138		
	Volume flow		
	Massflow		

**New Feature, Options in Safety calculations**  
The options defining the dimensioning mass flow for a safety valve calculation has been extended by:

- 1) You can enter the outside surface area of the vessel
- 2) You can enter the volume flow



# Flow Diagram in the Report



The screenshot shows the 'DirCalcTM Calculation Report' window. It features a menu bar (File, Options, Help) and a toolbar (Open, Save, Back, Print, Report, Run, Quit). The report content is organized into several sections:

- Project data:**

Date	13.11.2001
File	61 getting started.dan
Project	61 getting started
Information	<a href="#">Info text</a>
- System data:**

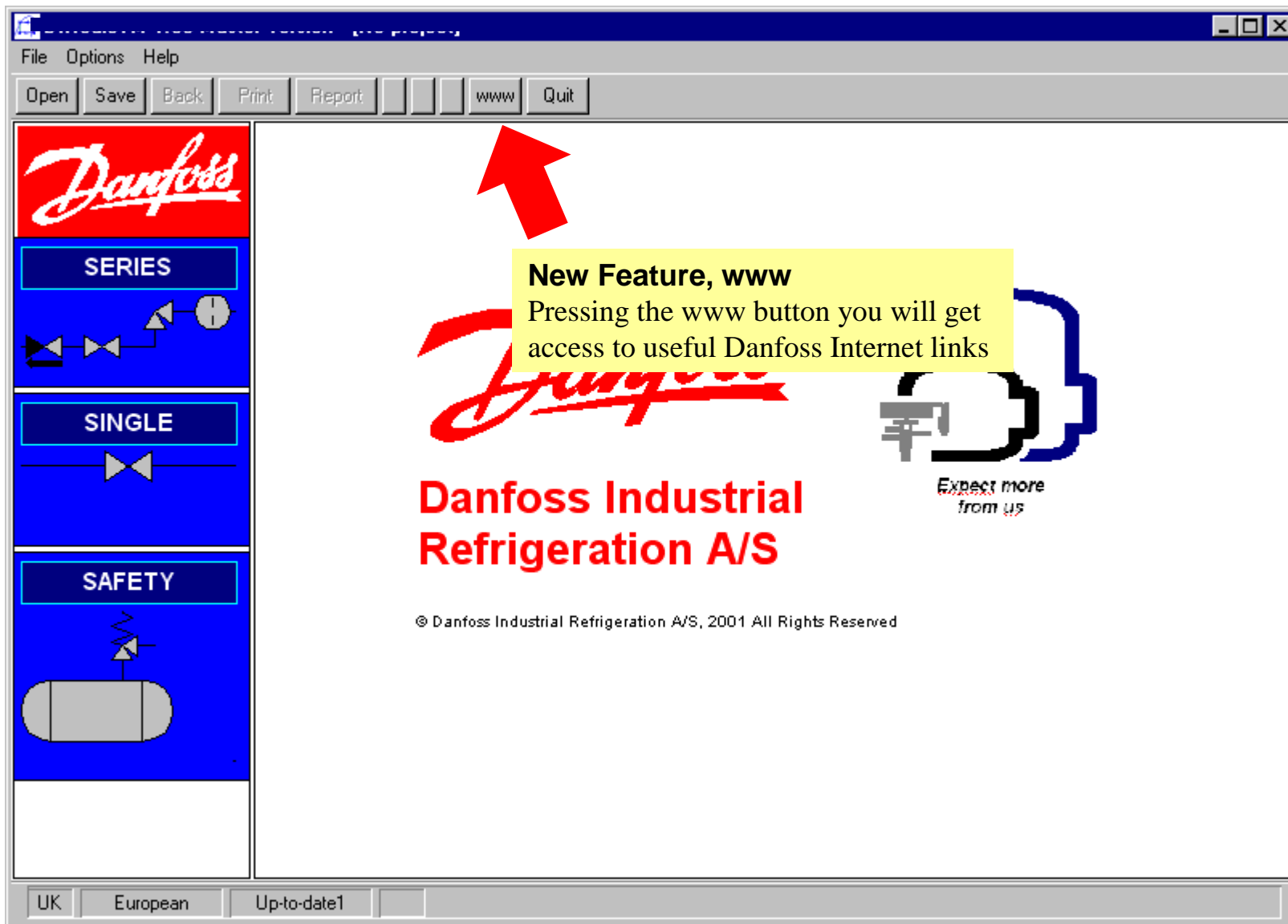
Refrigerant	R717
Selected task	SERIES
Selected system	PUMP
Selected pipeline	Liquid line without phase change
Rec pipe size	DN15 (15.2)
Rec pipe velocity	m/s 0.201
- Operating data:**

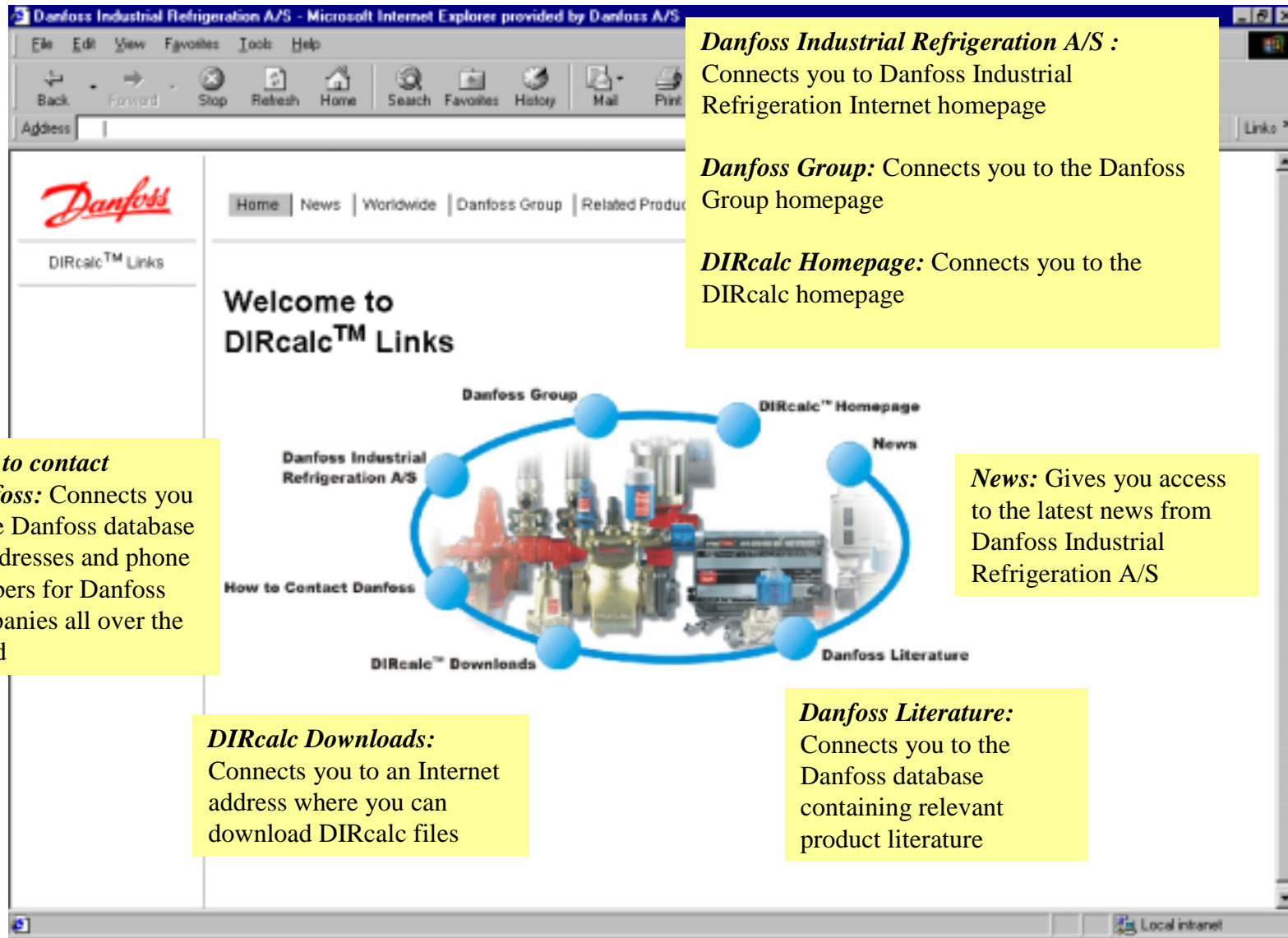
Evap. cap	kW	90.0
Line massflow	kg/h	83.4
Evap. temp	°C	-10.0
Evap. pres	bar	2.91
Circ. rate		3.00
Pump pres. lift	bar	2.60
Calculated total pressure drop, max load	bar	0.477
Calculated total temperature drop, max load	K	2.67
- Flow diagram:** A section containing five icons representing different components: a fan, a pipe, a valve, a pump, and another fan. Below the icons are labels: 'FD20-15-DIN', 'TUBH20-DIN', 'REG10-1 an...', 'TUBUP20-DIN', and 'FRQ0-25-DIN'. A red arrow points to this section from the right.

The report contents include project data, system data, operating data, results for each component as well as feed back text. For each report you can input a description text of your own, in the information edit box

**New feature, flow diagram in the report**  
The flow diagram built up in Series is now available in the report as well







**Danfoss Industrial Refrigeration A/S :** Connects you to Danfoss Industrial Refrigeration Internet homepage

**Danfoss Group:** Connects you to the Danfoss Group homepage

**DIRcalc Homepage:** Connects you to the DIRcalc homepage

**How to contact Danfoss:** Connects you to the Danfoss database of addresses and phone numbers for Danfoss companies all over the world

**News:** Gives you access to the latest news from Danfoss Industrial Refrigeration A/S

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**Danfoss Literature:** Connects you to the Danfoss database containing relevant product literature