

Danfoss



Liquid level glasses, type LLG 185 - 1550

Introduction



LLG are liquid level glasses in ductile steel which meets the strictest requirements on industrial and marine refrigeration installations. The liquid level glasses are offered in 3 different versions:

- with welding nipples (LLG)
- with stop valves equipped with caps (LLG S)
- with stop valves and sight adapter in acrylic glass ready for insulation on site (LLG SF).

The range of liquid level glasses is based on 3 basic liquid level glasses: LLG 185, LLG 335 and LLG 740. The other standard lengths are combined by using variations of basic glass lengths.

LLG produce sufficient flow areas to secure the highest possible degree of synchronous operation, and have a specially hardened reflection glass for quick reading. The front and the base frame are mounted together from the front with countersunk allen screws. This ensures easy insulation on site as well as easy inspection and service, if any.

All liquid level glasses are equipped as standard with a built-in safety system (non return device). If a glass is damaged, the pressure of the refrigerant will activate the safety system and refrigerant loss will be limited to an absolute minimum.

Features

- Refrigerants
Applicable to all common non flammable refrigerants including R717 and non corrosive gases/liquids dependent on sealing material compatibility
- Temperature range
-10/+100°C (-14/+212°F) or
-50/+30°C (-58/+86°F)

- Maximum operating pressure: 25 bar g (363 psi g)
- Equipped with boron silicate glass, hardened by an accurately controlled heat treatment process
- Classification: To get an updated list of certification on the products please contact your local Danfoss Sales Company

Design

Glass

LLG's are equipped with a borosilicate glass, hardened by an accurately controlled heat treatment process. All glasses are according to DIN 7081.

Gaskets

The glasses are equipped with a special non-asbestos carbon compound gasket which provides superior mechanical characteristics and a long time guarantee against service leakage.

Connectors

LLG 590, LLG 995, LLG 1145 and LLG 1550 are joined together by 2 basic LLG's by means of a connector. The connector holds the two basic glasses together by means of screws and guiding pins, which ensures a rigid construction.

Stop Valves/Nipples

The glasses are connected to the refrigeration system by means of welding nipples or stop valves. Which ever system is used, the nipples or stop valves are screwed into a flange, which is located in the correct position and subsequently tightened with a seal gasket and 4 screws.

Installation

Install the glasses on a bracket using the 4 screws supplied with the glass.

Use the threaded holes on the back of the frame to mount the glass on a bracket (not of Danfoss supply). Always connect the piping after mounting on the bracket. Please note the importance of a minimum of stress in the liquid level glasses from the connected pipes.

Please also make sure that there is sufficient space behind the the liquid level glasses to ensure proper insulation, service and inspection, etc.

For installations below -10°C (+14°F) it is recommended to add the sight adapter to enable reading after insulation has been applied. For installations below -10°C (+14°F) in R717 plants it is recommended to use an oil column as described in the following pages. There will be no formation of bubbles or ice build-up in oilfilled liquid level glasses, which may be the case in the refrigerant-filled glasses.

The liquid sight glasses are designed to withstand high internal pressures. However, the piping system in general should be designed to avoid liquid traps and reduce the risk of hydraulic pressure caused by thermal expansion.

Note:

 The LLG liquid level glass can only be placed in CE approved applications with the stop valves in front.

Technical data

■ Refrigerants

The liquid level glasses are applicable to all common non flammable refrigerants including R717 and non corrosive gases/liquids dependent on sealing material compatibility.

For further information please see installation instruction for LLG.

Flammable hydrocarbons are not recommended. For further information please contact your local Danfoss Sales Company.

■ Temperature range

The liquid level glasses are applicable to the above mentioned refrigerants within the temperature range of:

-10/+100°C (+14/+212°F) for the LLG types with safety system with welding nipples and the LLG S types with safety system with stop valves.

-50/+30°C (-58/+86°F) for the LLG SF types with safety system with stop valves and sight adapter (acrylic glass) and the LLG F types with safety system and sight adapter (acrylic glass).

■ Pressure range

All LLG types are designed for:

Max. operating pressure 25 bar g (363 psi g)

Strength test: 50 bar g (725 psi g)

Leakage test: at 25 bar g (363 psi g).

Frostproof liquid level glasses

Example 1

Refrigerant: R717 (ammonia).

Temperature: Recommended for temperatures below -10°C (+14°F).

The principle shown in fig. 1 can be used in connection with low temperature liquid separators or intermediate coolers when the refrigerant is R717 (ammonia).

As the liquid level in the R717 separator varies the oil level will change simultaneously.

Oil Charging

The system is charged with synthetic oil type SHC 226 with a specific weight, differing from that of R717, and (h) must be multiplied by approximately 1.35 (the ratio of density oil to density R717) to calculate H.

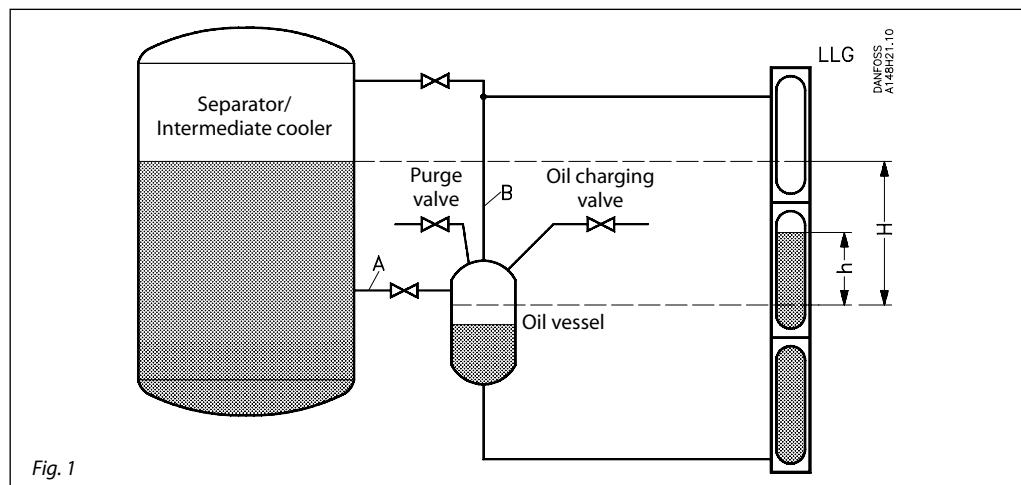
Charge the oil vessel (volume approximate 10 litres) to a level just below the lower balancing pipe (A) through the oil charging valve. Close the oil charging valve.

The oil will show in the liquid level glass at a level equal to the level in the oil vessel. When R717 is filled into the separator or intermediate cooler it will enter the oil vessel and press down the oil surface.

The R717 will also rise into the upper balance pipe (B) to a level equal to the level in the separator or intermediate cooler. As the oil surface in the oil vessel is pressed down, the oil will rise into the liquid level glass.

Note:

It is important to use an oil which is not likely to mix with R717. The oil must have a high viscosity index to ensure easy flowing at low temperatures. Mobil SHC 226 of the synthetic polyalphaolefin type has proven suitable for this purpose.



Frostproof liquid level glasses*Example 2*

Refrigerant: R717 (ammonia).
 Temperature: Recommended for temperatures below -10°C ($+14^{\circ}\text{F}$).

Fig. 2 shows a frostproof liquid level glass for an R717 liquid separator which is placed above ground level. The arrangement is called a Hampsonmeter.

Due to the evaporation taking place in the uninsulated balance pipe (ND 80/3 in.) the pressure in this pipe will be equal to
 $P_1 = P_0 + H \times \rho \times g$.

P_0 Separator pressure N/m²
 H R717 liquid level (see fig. 2) m
 ρ R717 density kg/m³
 g Acceleration due to gravity 9.81 m/s²

Oil Charging

The pressure will act on the oil surface in the oil vessel and cause the oil to rise in the liquid level glasses which are installed in a length of e.g. 2 in. pipe, the top of which is connected to the top of the separator which is at pressure P_0 .

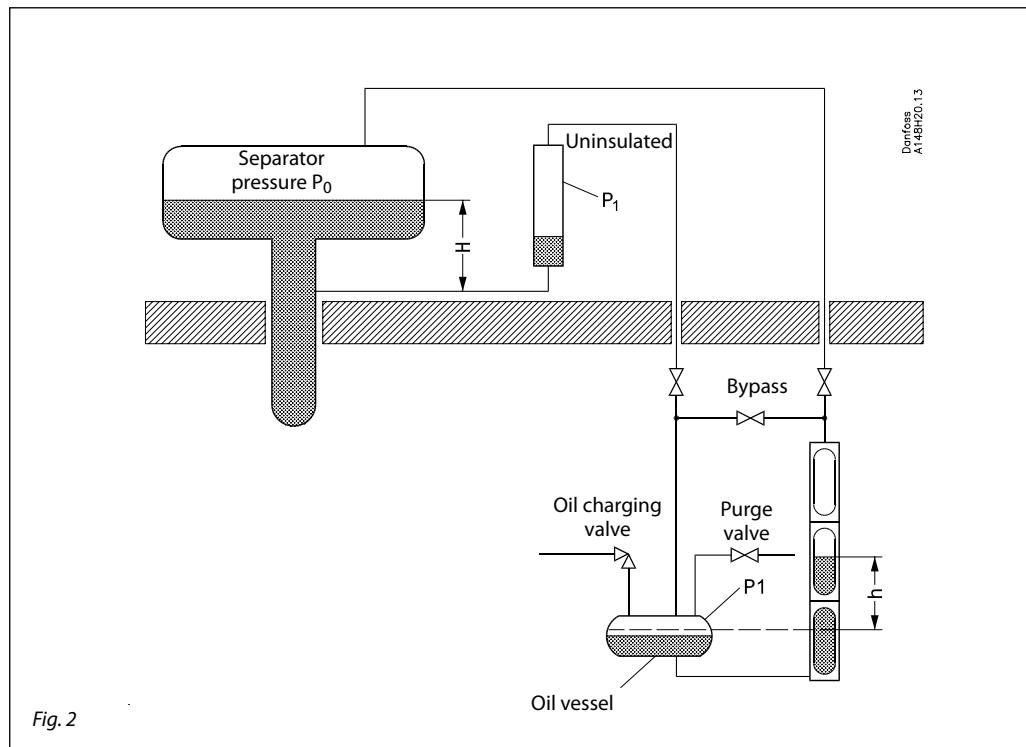
The oil will rise to a level h and H can then be calculated by multiplying h by 1.35 (the ratio of density oil to density R717).

Charge the oil vessel through the oil charging valve to a level of approximately $\frac{3}{4}$ of full level. The level will show in the lower liquid level glass.

Take care that the volume of the oil vessel is sufficient to allow the oil to rise into the liquid level glasses. When the system is operating keep the bypass valve closed.

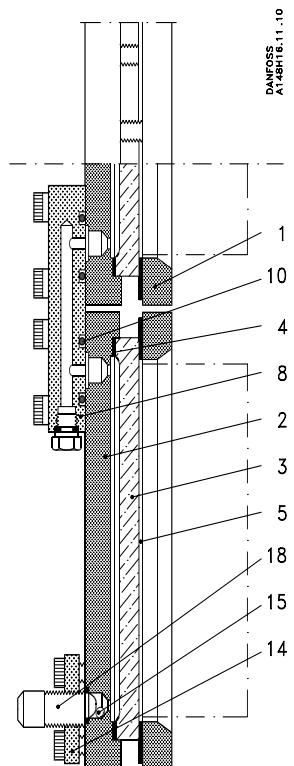
Note:

It is important to use an oil not likely to mix with R717, and having a high viscosity index to ensure easy oil movements at low temperatures. Mobil SHC 226 of the synthetic polyalphaolefin type has proven suitable for this purpose.

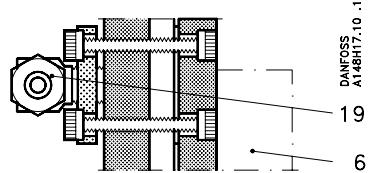


Material specification

LLG



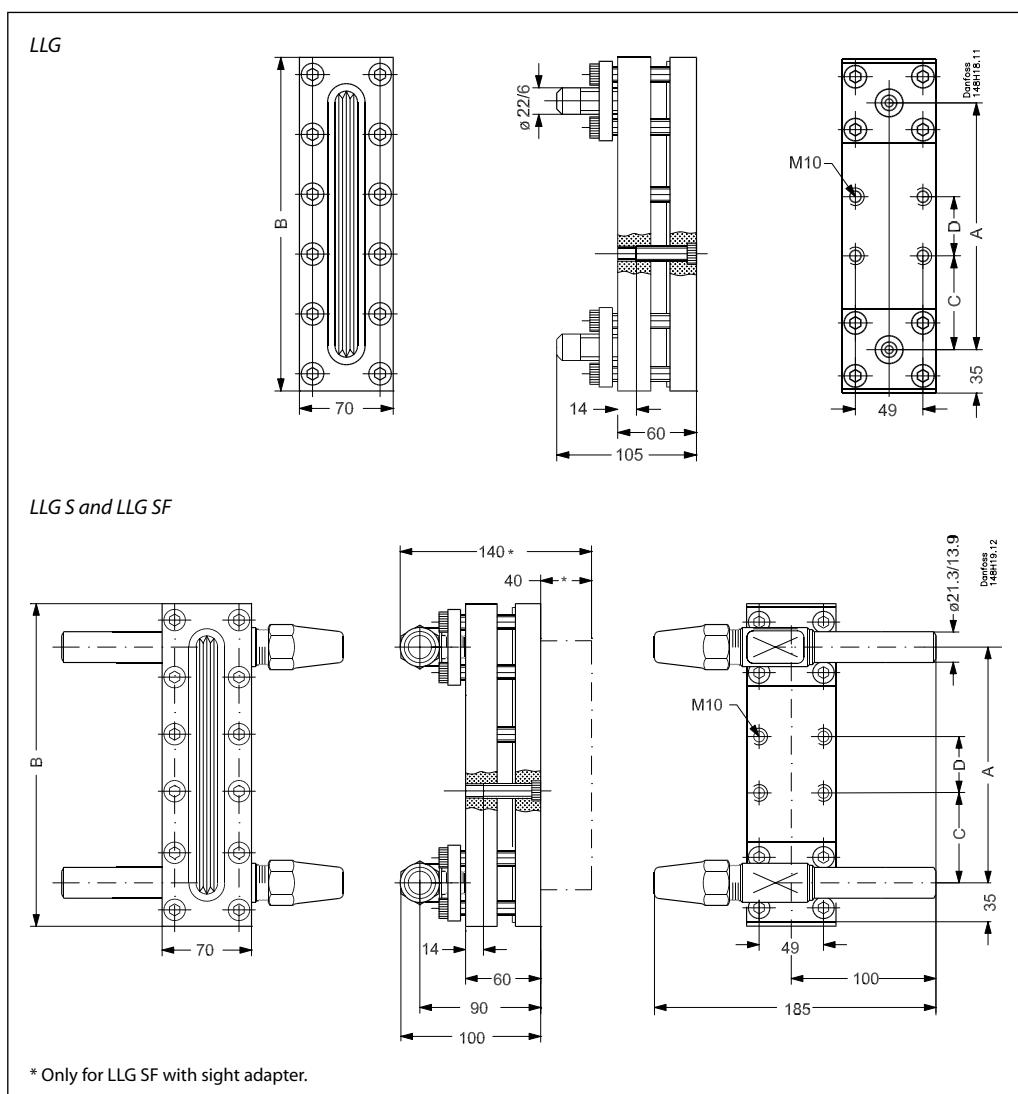
LLG S and LLG SF



No.	Part	Material	DIN	ISO	ASTM
1	Front frame	Steel	RSt. 37.2, 17 100	Fe 360 B, 630	Grade C, A 283
2	Back frame	Steel	RSt. 37.2, 17 100	Fe 360 B, 630	Grade C, A 283
3	Sight glass	Glass			
4	Gasket	Non-asbestos			
5	Protective coating for sight glass	Non-asbestos			
6	Sight adapter	PMMA-acrylic			
8	Connecting piece	Steel	RSt. 37.2, 17 100	Fe 360 B, 630	Grade C, A 283
10	O-ring	Cloroprene (Neoprene)			
14	Flange	Steel	RSt. 37.2, 17 100	Fe 360 B, 630	Grade C, A 283
15	Balls	Stainless steel			
18	Welding nipple	Steel	RSt. 37.2, 17 100	Fe 360 B, 630	Grade C, A 283
19	Stop valve (SNV-ST*)	Steel			

* See technical data for SNV-ST valves.

Dimensions and weights



Type	A	B	C	D	Weight	
LLG 185 - 1550						
LLG 185	mm in.	185 7 1/4	255 10	69 2 3/4	48 2	4.2 kg ¹⁾ 5.8 kg ²⁾
LLG 335	mm in.	335 13 1/4	405 16	63 2 1/2	42 1 3/4	7.5 kg ¹⁾ 9.2 kg ²⁾
LLG 590	mm in.	590 23 1/4	660 26	69 + 63 2 3/4 + 2 1/2	48 + 42 2 + 1 3/4	13.2 kg ¹⁾ 15.1 kg ²⁾
LLG 740	mm in.	740 29 1/4	810 32	63 2 1/2	42 1 3/4	16.5 kg ¹⁾ 18.5 kg ²⁾
LLG 995	mm in.	995 39 1/4	1065 42	69 + 63 2 3/4 + 2 1/2	48 + 42 2 + 1 3/4	22.5 kg ¹⁾ 24.7 kg ²⁾
LLG 1145	mm in.	1145 45	1215 47 3/4	63 2 1/2	42 + 42 1 3/4 + 1 3/4	25.7 kg ¹⁾ 28.0 kg ²⁾
LLG 1550	mm in.	1550 61	1620 63 3/4	63 2 1/2	42 1 3/4	33.5 kg ¹⁾ 36.1 kg ²⁾

¹⁾ Type LLG

²⁾ Type LLG S and LLG SF

Specified weights are approximate values only.

Ordering
How to order

The table below is used to identify liquid level glasses required.

Please note that the type codes only serve to identify the liquid level glasses, some of which may not form part of the standard product range.

For further information please contact your local Danfoss Sales Company.

Example for type codes
LLG 740 SF
Type codes

Valve type	LLG	Liquid Level Glass	Combined by:
Nominal size in mm			Combined by:
	185	DN 185	
	335	DN 335	
	590	DN 590	LLG 185 + LLG 335
	740	DN 740	
	995	DN 995	LLG 185 + LLG 740
	1145	DN 1145	LLG 335 + LLG 740
	1550	DN 1550	LLG 740 + LLG 740
Equipment	-	Safety system and welding nipples	
	F	Safety system and sight adapter	
	S	Safety system and stop valves (SNV-ST)	
	SF	Safety system, stop valves (SNV-ST) and sight adapter	

Liquid level glasses - LLG
With safety system and welding nipples

Length		Type	Code no.
mm	in.		
185	7 1/4	LLG 185	2512+049
335	13 1/4	LLG 335	2512+050
590	23 1/4	LLG 590	2512+051
740	29 1/4	LLG 740	2512+052
995	39 1/4	LLG 995	2512+053
1145	45	LLG 1145	2512+054
1550	61	LLG 1550	2512+055

Liquid level glasses for insulating - LLG F
With safety system and sight adapter

Length		Type	Code no.
mm	in.		
185	7 1/4	LLG 185 F	2512+078
335	13 1/4	LLG 335 F	2512+079
590	23 1/4	LLG 590 F	2512+080
740	29 1/4	LLG 740 F	2512+081
995	39 1/4	LLG 995 F	2512+082
1145	45	LLG 1145 F	2512+083
1550	61	LLG 1550 F	2512+084

Liquid level glasses - LLG S
With safety system and stop valves (SNV-ST)

Length		Type	Code no.
mm	in.		
185	7 1/4	LLG 185 S	2512+056
335	13 1/4	LLG 335 S	2512+057
590	23 1/4	LLG 590 S	2512+058
740	29 1/4	LLG 740 S	2512+059
995	39 1/4	LLG 995 S	2512+060
1145	45	LLG 1145 S	2512+061
1550	61	LLG 1550 S	2512+062

Liquid level glasses for insulating - LLG SF
With safety system, stop valves (SNV-ST) and sight adapter

Length		Type	Code no.
mm	in.		
185	7 1/4	LLG 185 SF	2512+066
335	13 1/4	LLG 335 SF	2512+067
590	23 1/4	LLG 590 SF	2512+068
740	29 1/4	LLG 740 SF	2512+069
995	39 1/4	LLG 995 SF	2512+070
1145	45	LLG 1145 SF	2512+071
1550	61	LLG 1550 SF	2512+072

Important!

Where products need to be certified according to specific certification societies or where higher pressures are required, the relevant information should be included at the time of order.

