

LPG - Side Channel Pump System

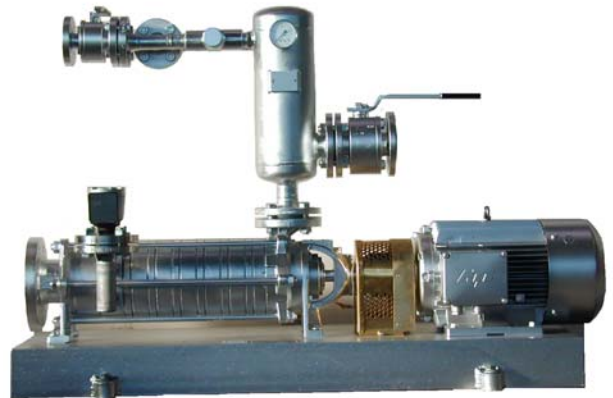


PC 3102/7 ... 6107/7

Suction lift operation out off under ground tanks

TECHNICAL DATA

Output	:	max. 30 m ³ /h
Differential pressure	:	max 18 bar m
Speed	:	max. 1800 rpm
Shaft sealing	:	standard mechanical seal closed coupled as option
Nominal pressure	:	PN 25
Tank volume	:	max. 200 m ³
Suction lift	:	max 4 m
LPG	:	-100% propene -mixtures propene/butane with min. 20% propane
Temperatue	:	-25 to 80°C (-40°C option)
Flange connections	:	DIN 2501 PN 25



APPLICATION

- auto gas dispensers
- cylinder filling
- vaporizer feeding
- burner feeding
- carrousel filling
- road tanker loading

Technical safety regulations and the lack of space for safety distances require the installation of underground tanks where extraction of LPG is only possible by top-off loading via the dome flange.

The PC plant is a top-mounted pump system outside the tank which operates on suction lift operation with only a suction pipe inside the tank.

In this case no mechanical or electrical components are inside the pressurized tank (LPG storage) and there is easy access to the outside mounted pump for service and maintenance.

The minimum liquid level in the tank depends only on the safety distance between suction pipe and tank bottom which in this instance will only be a few centimetres. With this type of installation you obtain maximum utilization of the storage tank volume and considerably more than that with a submersible pump.

Subsequently the top mounted PC system offered the greatest benefits:

- **Higher reliability**
- **Low operating costs**
- **Higher revenue**
- **Easy maintenance**
- **Short filling times**
- **Multi tank system possible**

DESIGN

- CEH pump with retaining stage for level control in material GG25 or GGG40.3
- dry-running protection and amplifier
- motor (explosion/flame-proof)
- pressure gauge
- discharge connection with ball valve
- bypass valve with return line and relief valve
- return line with orifice, check valve and ball valve

CEH-pumps are horizontal, self-priming side channel pumps of handling gas along with the liquid, in segmental type construction with open vane wheel impellers. To obtain favourable NPSH values the CEH pump combines more side channel stages with a specially designed centrifugal suction stage impeller.

Operating principle

Priming

After start up the pump primes vapour out of the suction line. By the exhausting of vapour and re vaporization during the suction phase heat is drawn from the liquid in the suction pipe and lowers the temperature and pressure in the suction pipe.

The pressure difference generated against the constant tank pressure causes the liquid to rise up to the pump and pumping commences.

Operation

Now an energy-bearing partial flow is returned to the vapour phase of the tank and increases the temperature / pressure in the vapour phase above vapour pressure of the liquid and forces the liquid to climb up to the pump level.

This small continuous by-pass is fed from the pump to the vapour phase to maintain a higher vapour phase pressure at all times to ensure bubble-free LPG handling.

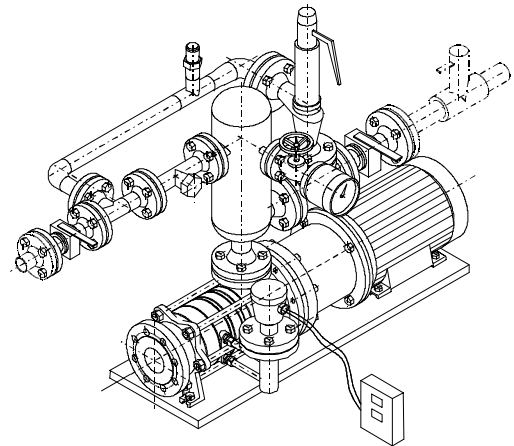
Sterling Fluid Systems France

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Components

The system consists of:

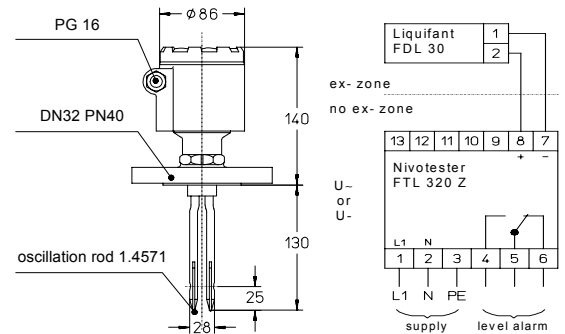
- Side channel combi pump CEH
- motor (explosion-/flame-proof)
EEx e II T3 or
EEx de IIC T4
- base plate
- flexible/magnetic coupling
- gas separator
- bypass valve
- check valve
- relief valve
- pressure gauge
- 2 ball valves
- piping



Dry running protection (part of. PC plant)

After the pump the dry running protection device is the most important component of the system. It is fitted directly into the retaining stage of the pump to detect the liquid level inside the pump casing. It not only protects the pump against dry running but also keeps the pump in a primed condition. The dry running protection is explosion proof and designed to operate in hazardous areas. It's of major importance for the priming and the operating reliability of the system to follow the guidelines of this wiring scheme.

- If there is no liquid in the pump, it is impossible to start the pump. If the pump has service liquid, it will start to prime, but will be switched off if the unit is not primed within 30 sec
- If during stand-still the liquid level in the pump drops below the centreline, the pump will be switched on automatically to prime the pump and then continues operation for 10 sec (option, switchboard)



Pump liquid level controller E&H Liquiphant

Foot valve (option)

Special recommend for car filling stations where are short priming time requested. The membrane is a special material suitable for LPG, saved a low resistant and a high sealing function.



Switchboard: PC - installations for automatic (option)

Automatic operation is applied where longer periods of standstill of the plant may cause the evaporation of the internal service liquid of the pump. By the automatic switching on when the level falls below the minimum and the automatic switching off when the maximum level is reached the plant remains self-acting operable. This automatic control is recommendable especially for refuelling installations.

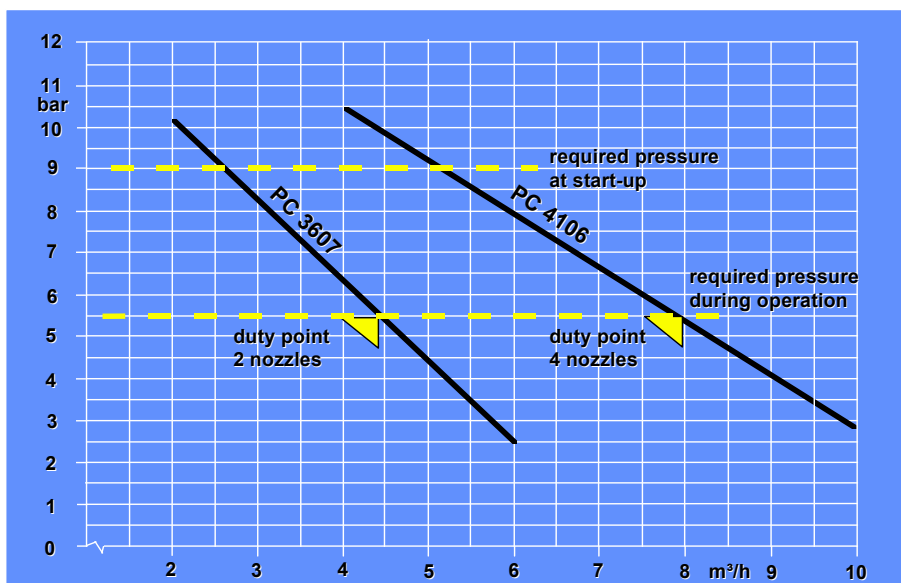


Pump Selection for Car Filling Stations

The criteria for selection of the right pump size are:

- required differential pressure at start-up : **9,0 bar**
The pressure collapses immediately after filling has started but it is of major importance that the pump is capable of generating this start-up differential pressure within its performance range differential pressure of 9 bar covers the most unfavourable temperature conditions.
- differential pressure during filling : **5,5 bar**
- dispenser filling flow rate : **30 l/min per nozzle**
only one minute for customer to tank 30 l
- for a dispenser with **two nozzles** is 60 l/min : **3,6 m³/h.**
- for a dispenser with **four nozzles** is 120 l/min : **7,2 m³/h.**

During filling operation the actual duty point of the PC unit PC 3607 and unit 4106 moves to a differential pressure of 5,5 bar and a dispenser filling flow rate of 4,4m³/h and 8,0 m³/h i.e. 36,6 l/min and 33,3 l/min per nozzle.



Other sizes please contact above company address

Installations

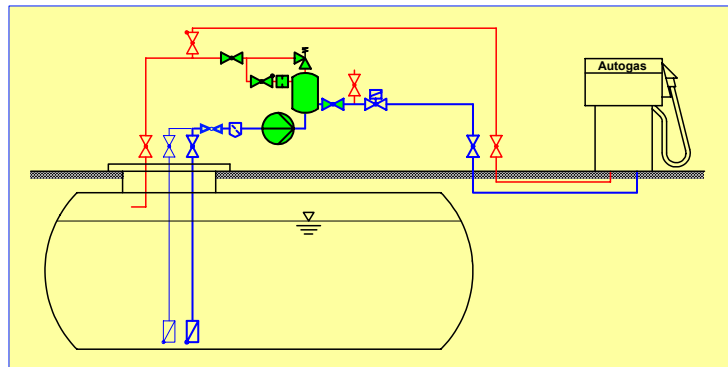
There are different installation requirements on site and the top-mounted PC unit has to comply with them.



a) Different tank diameters

The standards for LPG tanks vary in a lot of countries, therefore it must be possible to adapt the pumping system to the different tank diameters. Inside the pressurized tank the top mounted PC unit requires only a suction pipe which can easily be adapted to all tank diameters, if the suction lift does not exceed 4 m.

In case of a submersible pump changes of the pump barrel will be necessary and in case of a vertical tank pump even the pump length must be modified. With the top-mounted PC system the pump unit always remains the same because the adaptation to different tank diameters is limited to the suction line.

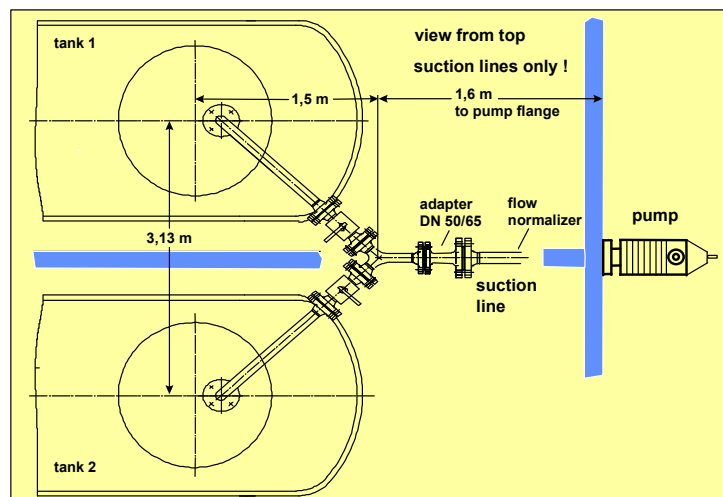


b) One pump for two tanks

Another advantage of the top-mounted PC unit is the fact that one pump only will be needed for two tanks in comparison to submersible pumps when each tank must be equipped with one pump. The second tank can be installed at a later time when increasing turnover of LPG requires a higher storage capacity.

Also in remote areas the installation of a second tank can be of benefit because the number of truck drives for refilling can be reduced and cut costs. The design of the suction pipe is of major importance for the performance and reliability of the system.

The first tank has to be installed parallel to the pump axis. The horizontal part of the suction line is connected to the main suction line with a y-piece. The initial installation costs are not higher than for a standard installation with one tank /one pump and an underground tank in line with the pump axis.



Should there be a future requirement to double the storage capacity then it is very easy to install a second tank and add a second suction line and by-pass line to the existing system.

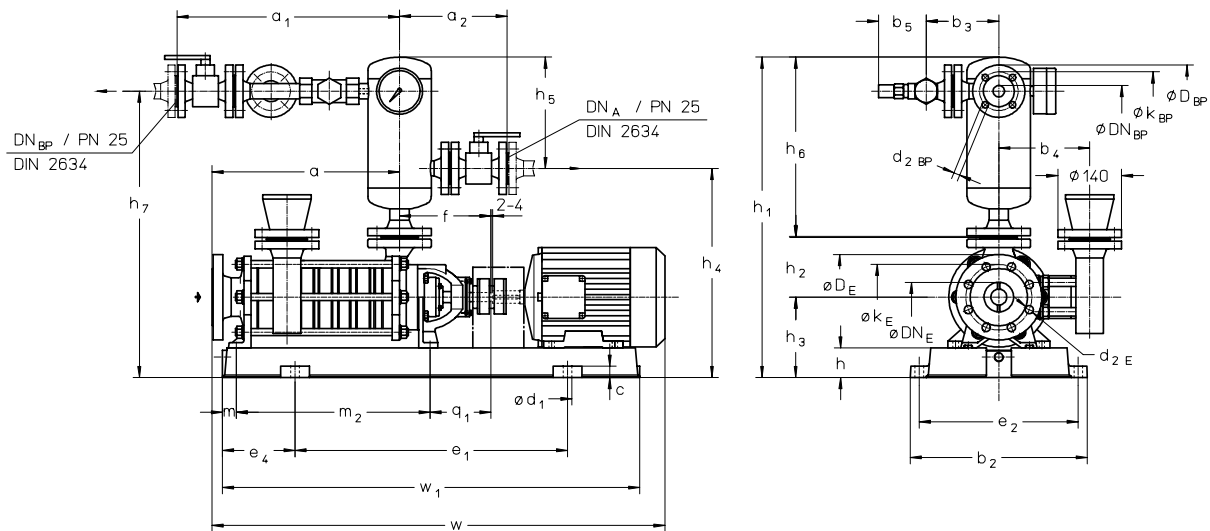
The advantage of installing a top-mounted PC unit is that it can be used with two tanks with very minor modifications.

The initial costs for a one tank installation are kept low. When extending the system to two tanks the existing installation remains un-touched. The only additional investment will be in a small amount of pipe work.

Huge savings over submersible equipment!

Attention for suction line

- A short suction line guarantee a short priming time
- Only ball valves should be used
- A sup instead a filter reduce the hydraulic resistance and evaporation of liquid
- After a order a detailed installation drawing is part of delivery



Dimension in mm

	a	a ₁	a ₂	b ₂	b ₃	b ₄	b ₅	c	DN _A	D _A	D _E	DN _E	DN _{BP}	D _{BP}	d ₁	d _{2BP}	d _{2A}
PC 3607	493	490	237	450	160	200	105	30	25	115	185	65	25	185	24	14	14
PC 4106	598	490	257	490	160	210	105	30	40	150	200	80	25	185	24	14	18

	d _{2E}	d ₁	d ₁	e ₁	e ₂	e ₄	f	h	h ₁	h ₂	h ₃	h ₄	h ₅	h ₆	h ₇	k _E	k _A	k _{BP}
PC 3607	18	24	24	660	400	180	201	80	741	123	212	496	245	395	666	145	85	85
PC 4106	18	24	24	840	440	205	195	110	863	140	242	539	324	479	789	160	110	85

	m	m ₂	q ₁	w	w ₁	weight
PC 3607	20	507	134	1020	1020	195 kg
PC 4106	80	590	140	1250	1200	240 kg

