# PRESSURE OPERATED PUMP
# POP-LC

The ADCAMat POP-LC low capacity pressure operated pump is recommended in the transfer of steam condensate, oils and other non-hazardous liquids compatible with the construction, to a higher elevation or pressure.
Under certain conditions, it can drain a closed vessel under vacuum or pressure.The pump can be operated using steam, compressed air or other gases, and is manufactured in carbon steel or stainless steel.

## OPERATION

Liquid flows by gravity into the pump through an inlet check valve, lifting the float. At this point, the motive fluid intake valve is closed while the vent valve is open. As the float reaches its highest position the motive fluid intake valve opens and the vent valve closes, allowing the motive fluid to enter the pump body. The pressure in the pump builds up just enough to overcome backpressure.
The pressurized liquid opens the outlet check valve and the discharge starts. The liquid discharged may be quantified through a special counter, enabling the pump to function as a reliable flow meter.
When the float reaches its lower position the motive fluid intake valve closes and the vent valve opens allowing the liquid to fill the pump once again, repeating the cycle.

## MAIN FEATURES

Compact design.
Hardened stainless steel wear parts.
High-endurance inconel springs.
Low filling head to minimize installation space.
No electric requirements or NPSH issues.
Suitable for hazardous environments.
Low running costs.
Pump mechanism with 360º rotation (limited to flange bolt holes).

| | |
|---|---|
| OPTIONS: | Level gauge.<br>Stroke counter. |
| USE: | To lift steam condensate and other liquids compatible with the construction. |
| AVAILABLE MODELS: | POP-LCS – carbon steel.<br>POP-LCSS – stainless steel. |
| SIZES: | 1" x 1", 11/2" x 1", 11/2" x 11/2".<br>DN 25 x 25, DN 40 x 25 and DN 40 x 40. |
| CONNECTIONS: | Flanged EN 1092-1 PN 16.<br>Flanged ASME B16.5 Class 150.<br>Female threaded ISO 7 Rp (threaded flanges).<br>Others on request. |
| INSTALLATION: | Horizontal installation. An example is shown in Fig. 1. See IMI – Installation and maintenance instructions. |
| MOTIVE MEDIUM: | Saturated steam, compressed air, nitrogen and other gases. |

**BODY LIMITING CONDITIONS ***

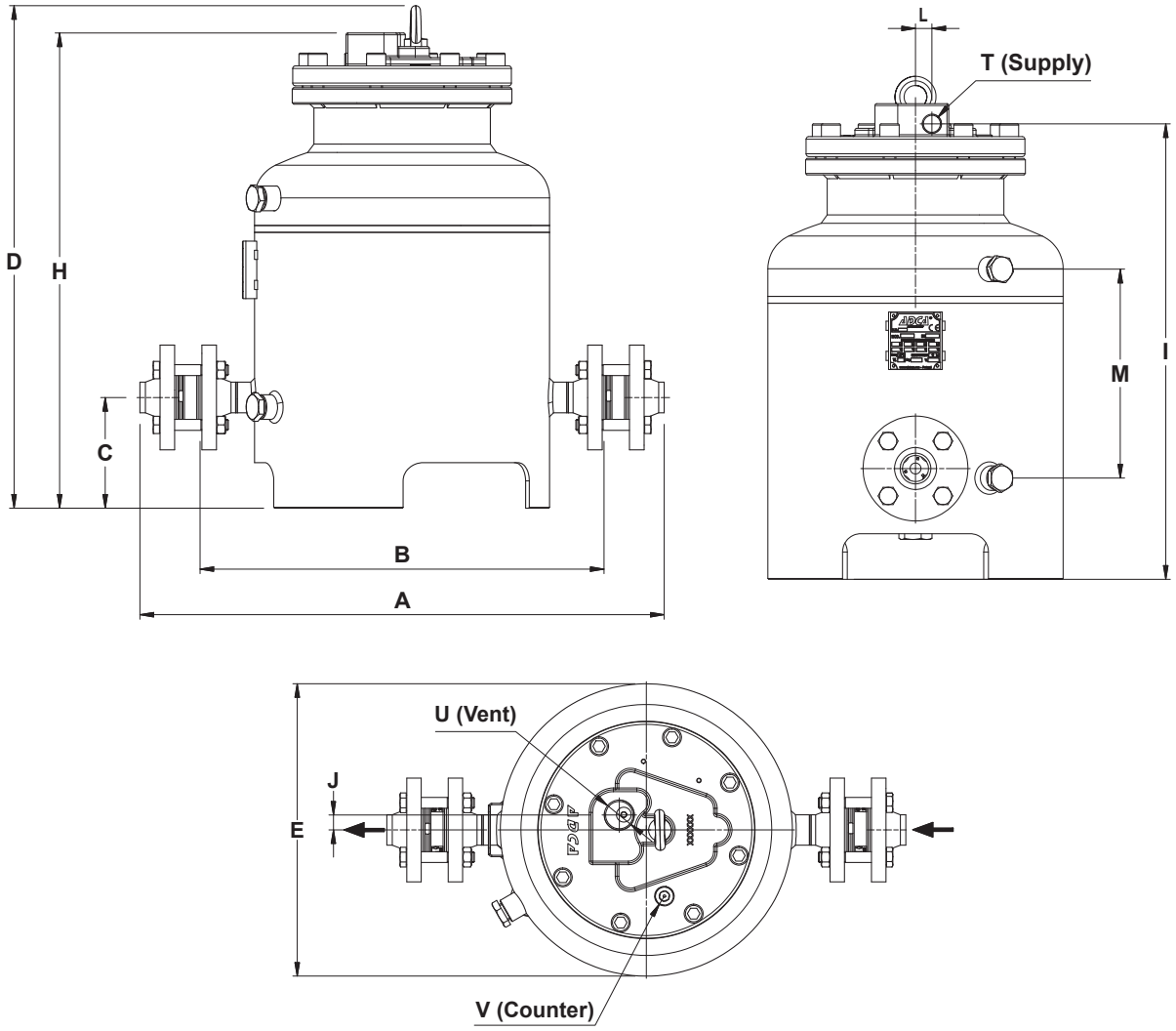
| POP-LCS | | | POP-LCSS | | |
|---|---|---|---|---|---|
| | ALLOW. PRESS. | RELAT. TEMP. | | ALLOW. PRESS. | RELAT. TEMP. |
| PN 16 | 16 bar | 50 ºC | PN 16 | 16 bar | 50 ºC |
| | 14 bar | 100 ºC | | 15 bar | 100 ºC |
| | 13 bar | 195 ºC | | 12,7 bar | 200 ºC |
| | 12 bar | 250 ºC | | 12 bar | 250 ºC |
| CLASS 150 | 16 bar | 50 ºC | CLASS 150 | 15,3 bar | 50 ºC |
| | 14 bar | 100 ºC | | 13,3 bar | 100 ºC |
| | 13 bar | 195 ºC | | 11,1 bar | 200 ºC |
| | 12 bar | 250 ºC | | 10,2 bar | 250 ºC |

* Rating according to EN 1092-1:2018.

**CE MARKING – GROUP 2 (PED – European Directive)**

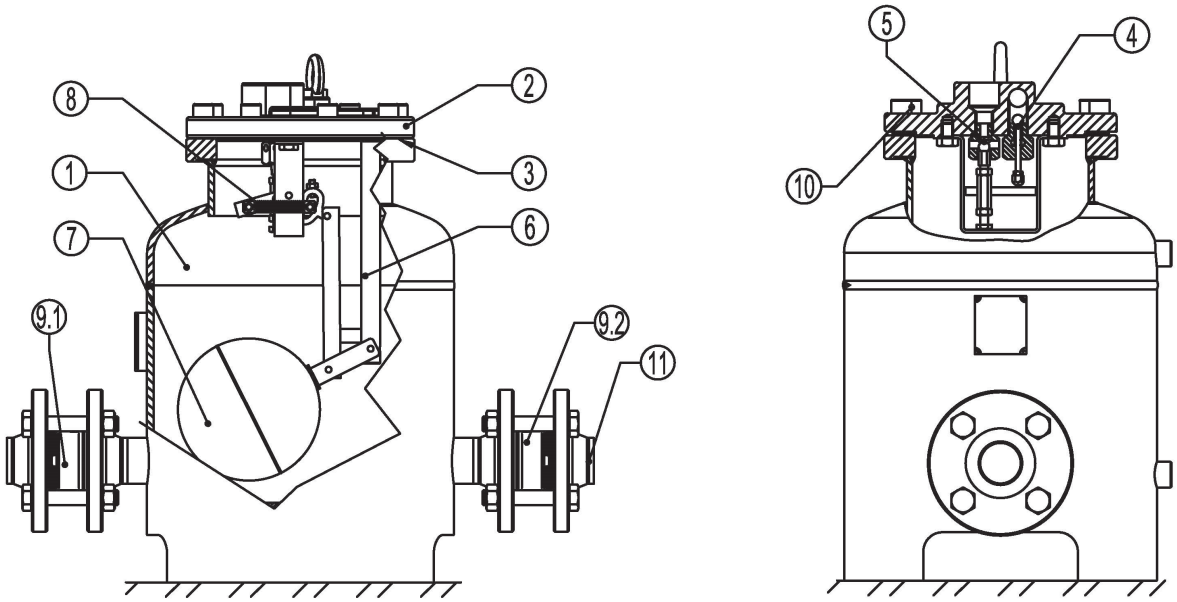
| PN 16 | Category |
|---|---|
| All sizes | 2 (CE marked) |

| LIMITING CONDITIONS | |
|---|---|
| Liquid specific gravity | 0,8 to 1 |
| Maximum viscosity | 5 ºEngler |
| Maximum motive inlet pressure | 10 bar |
| Minimum motive inlet pressure | 0,5 bar |
| Maximum operating temperature | 185 ºC |
| Minimum operating temperature * | 0 ºC |
| Pump discharge per cycle | 11,2 L |




| DIMENSIONS (mm) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | A * | B * | C | D | E | H | I | J | L | M | T ** | U ** | V ** | WGT. (kg) | VOL. (L) |
| 1" x 1" DN 25 x 25 | 578 | 444 | 122 | 552 | 323 | 522 | 500 | 17 | 18 | 229 | 1/2" | 1" | 1/2" | 60 | 25,7 |
| 11/2" x 1" DN 40 x 25 | 597 | 449 | 122 | 552 | 323 | 522 | 500 | 17 | 18 | 229 | 1/2" | 1" | 1/2" | 60 | 25,7 |
| 11/2" x 11/2" DN 40 x 40 | 615 | 454 | 122 | 552 | 323 | 522 | 500 | 17 | 18 | 229 | 1/2" | 1" | 1/2" | 61 | 25,7 |

* With EN 1092-1 welding neck flanges. Dimensions may differ if ASME B16.5 flanges or ISO 7 Rp female threaded flanges are requested. Consult the manufacturer.
** As standard, in versions manufactured with EN 1092-1 PN 16 flanges, these connections are female threaded ISO 7 Rp. In versions with ASME B16.5 flanges, these connections are female threaded NPT.




| MATERIALS | | | |
|---|---|---|---|
| **POS. Nº** | **DESIGNATION** | **POP-LCS** | **POP-LCSS** |
| **1** | Pump body | P265GH / 1.0425; P235GH / 1.0345; S235JR / 1.0038 | AISI 316 / 1.4401; AISI 316L / 1.4404 |
| **2** | Cover | GJS-400-15 / 0.7040 | CF8M / 1.4408 |
| **3** | * Cover gasket | Stainless steel / Graphite | Stainless steel / Graphite |
| **4** | * Intake valve/seat assembly | Stainless steel | Stainless steel |
| **5** | * Exhaust valve/seat assembly | Stainless steel | Stainless steel |
| **6** | Internal mechanism | Stainless steel | Stainless steel |
| **7** | * Float | Stainless steel | Stainless steel |
| **8** | * Spring assembly (2 pcs.) | Inconel | Inconel |
| **9.1** | * Outlet check valve | CF8M / 1.4408 | CF8M / 1.4408 |
| **9.2** | * Inlet check valve | CF8M / 1.4408 | CF8M / 1.4408 |
| **10** | Bolts | Steel 8.8 | Stainless steel A2-70 |
| **11** | Counter flanges | P250GH / 1.0460 | AISI 316 / 1.4401 |

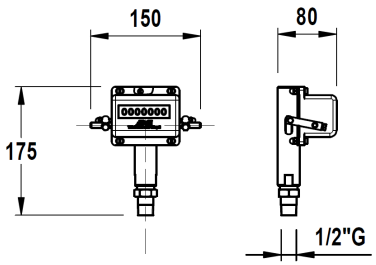
* Available spare parts.

## STROKE COUNTER

A stroke counter can be screwed onto a respective female threaded connection on the pump cover. Mechanical and digital versions are available. The mechanical version requires that the following conditions are met.

| LIMITING CONDITIONS * | |
|---|---|
| Minimum motive pressure (steam) | 6 bar |
| Minimum motive pressure (compressed air and nitrogen) | 5 bar |
| Minimum system backpressure (steam) | 700 mbar * |
| Minimum system backpressure (compressed air and nitrogen) | 700 mbar * |

* The pump outlet check valve can be supplied with a stronger spring to simulate increased system backpressure. Consult manufacturer.




The digital version is composed of sensor and remote stroke counter. The device can be tailor made to meet customer requirements and is not dependent on the process condition. The standard unit is battery powered, features an LCD display and optional volt-free output connection for remote monitorization. Consult manufacturer.

## SIZING

To accurately size a pressure operated pump, the following information must be provided:

1. The condensate load (kg/h).

2. The operating medium (steam, compressed air or other gases) and its pressure.

3. The total lift or backpressure in bar the pump will have to overcome. This includes the change in fluid level elevation after the pump (0.0981 bar/m of lift), plus pressure in the return piping, plus the pressure drop caused by pipe friction and other system components.

4. Available filling head (see Fig. 1) in mm or any other dimension that allows its determination.

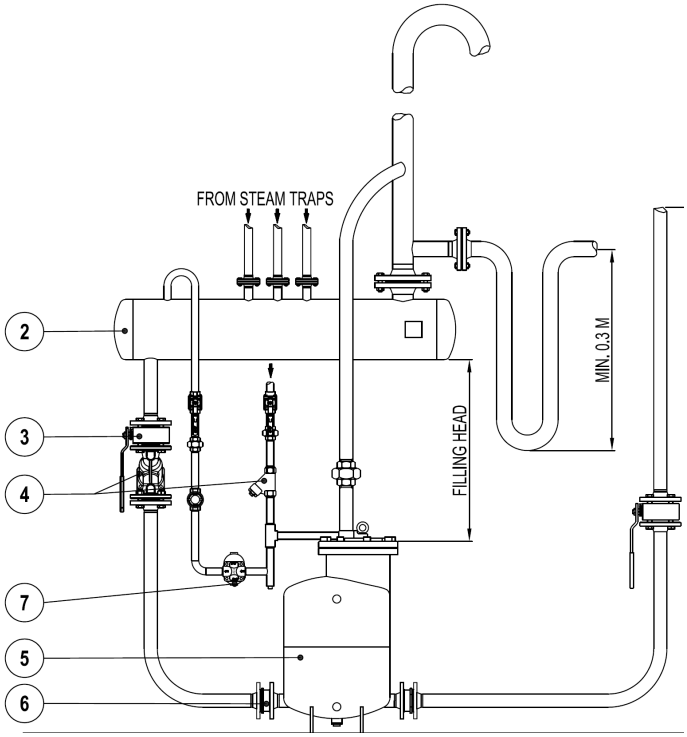



Fig. 1

| MATERIALS | | | |
|---|---|---|---|
| **POS. Nº** | **DESIGNATION** | **POS. Nº** | **DESIGNATION** |
| **2** | Receiver | **5** | Pump |
| **3** | Ball valve | **6** | Disc check valve |
| **4** | Y strainer | **7** | Steam trap |

| CAPACITY CORRECTION FACTOR FOR GASES OTHER THAN STEAM | | | | | |
|---|---|---|---|---|---|
| **% Backpressure vs Motive pressure (BP/MP)** | **10%** | **30%** | **50%** | **70%** | **90%** |
| **Correction factor** | 1,04 | 1,08 | 1,12 | 1,18 | 1,28 |

Table 1

| CAPACITY CORRECTION FACTORS FOR FILLING HEADS OTHER THAN 300 mm | | | | |
|---|---|---|---|---|
| **PUMP SIZE** | **FILLING HEAD (mm)** | | | |
| | **150** | **300** | **600** | **900** |
| **1" x 1" DN 25 x 25** | 0,7 | 1 | 1,2 | 1,35 |
| **11/2" x 1" DN 40 x 25** | 0,7 | 1 | 1,2 | 1,35 |
| **11/2" x 1/12" DN 40 x 40** | 0,7 | 1 | 1,2 | 1,35 |

Table 2

RECEIVER

A receiver is recommended to temporarily hold the liquid and prevent any flooding of the equipment, while the pump is performing a pumping cycle. A definable length of large diameter pipe can be used.
Suggested receiver sizes are shown in Table 3.

| RECEIVER | | | |
|---|---|---|---|
| **PUMP SIZE** | **1" x 1" DN 25 x 25** | **11/2" x 1" DN 40 x 25** | **11/2" x 11/2" DN 40 x 40** |
| **Pipe size with 1 m lenght** | 6" | | |

Table 3

| FLOW RATE (kg/h)<br>INSTALLATION WITH 300 mm FILLING HEAD<br>ABOVE THE PUMP COVER | | | |
|---|---|---|---|
| **MOTIVE PRESSURE (bar)** | **TOTAL LIFT (bar)** | **1" x 1" DN 25 x 25** | **11/2" x 1" and 11/2" x 11/2" DN 40 x 25 and DN 40 x 40** |
| 1 | 0,35 | 820 | 1260 |
| 2 | | 1050 | 1540 |
| 3 | | 1100 | 1750 |
| 4 | | 1150 | 1860 |
| 5 | | 1210 | 1970 |
| 6 | | 1250 | 2160 |
| 8 | | 1290 | 2180 |
| 10 | | 1300 | 2195 |
| 2 | 1 | 800 | 1200 |
| 3 | | 940 | 1430 |
| 4 | | 1080 | 1590 |
| 5 | | 1110 | 1660 |
| 6 | | 1140 | 1730 |
| 8 | | 1180 | 1820 |
| 10 | | 1200 | 1880 |
| 3 | 2 | 790 | 1100 |
| 4 | | 900 | 1520 |
| 5 | | 1000 | 1580 |
| 6 | | 1140 | 1690 |
| 8 | | 1200 | 1785 |
| 10 | | 1220 | 1820 |
| 4 | 3 | 750 | 1000 |
| 5 | | 860 | 1310 |
| 6 | | 910 | 1450 |
| 8 | | 970 | 1540 |
| 10 | | 980 | 1580 |
| 5 | 4 | 730 | 960 |
| 6 | | 840 | 1310 |
| 8 | | 920 | 1410 |
| 10 | | 940 | 1500 |
| 6 | 5 | 710 | 890 |
| 8 | | 770 | 1040 |
| 10 | | 880 | 1150 |
| 7 | 6 | 730 | 840 |
| 8 | | 790 | 980 |
| 10 | | 880 | 1090 |

Table 4 (based on liquid specific gravity of 0,9 to 1,0)

Example

| | |
|---|---|
| Condensate load | 950 kg/h |
| Filling head | 150 mm |
| Motive fluid | Compressed air |
| Available pressure | 8 bar |
| Vertical lift after pump | 10 m |
| Return piping pressure | 1,2 bar |
| Piping friction pressure drop | Negligible |

Filling head correction:
With 150 mm filling head the correction factor from Table 2 is 0,7. The corrected capacity is thus 1540 kg/h x 0,7 = 1078 kg/h.

Calculations:
Total backpressure: 1,2 bar + (10 m x 0,0981) = 2,181 bar.
Assuming steam as motive medium at a pressure of 8 bar and a total backpressure of 3 bar, then according to Table 4 a DN 40 pump, with a capacity of 1540 kg/h, is the recommended size.

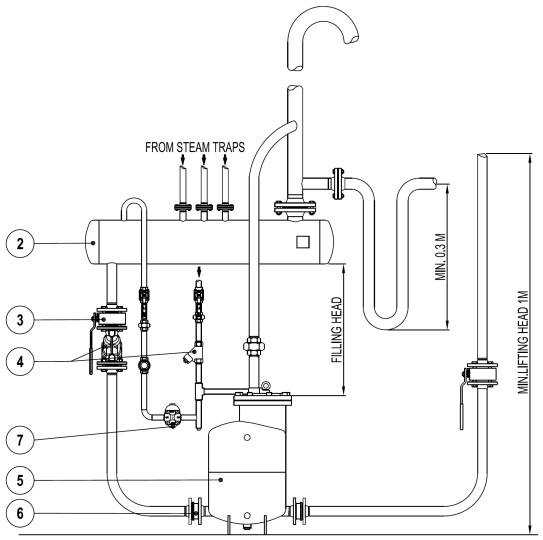
Correction for air as a motive medium:
The % backpressure is 2,181 bar / 8 bar = 27%.
The correction factor from Table 1 is 1,08.
The corrected capacity is thus 1078 kg/h x 1,08 = 1164,2 kg/h, and so, a DN 40 pump is still the recommended size.

## TYPICAL APPLICATIONS

### CONDENSATE RECOVERY IN A OPEN LOOP SYSTEM

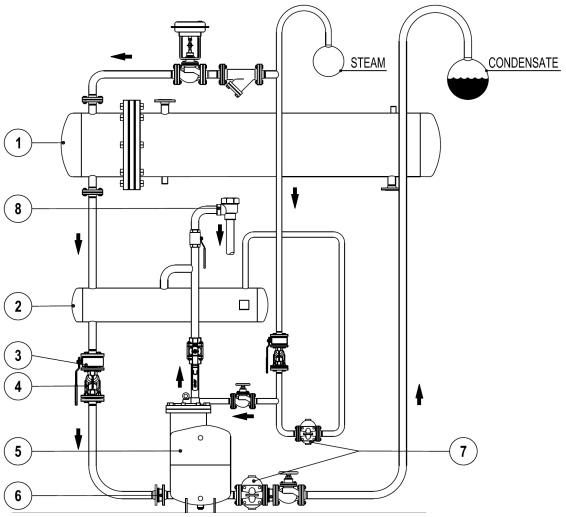
The pump transfers high temperature condensate without cavitation problems.
The vent line must be unrestricted and self draining to the receiver.

| MATERIALS | | | |
|---|---|---|---|
| **POS. Nº** | **DESIGNATION** | **POS. Nº** | **DESIGNATION** |
| **1** | Heat exchanger | **5** | Pump |
| **2** | Receiver | **6** | Disc check valve |
| **3** | Ball valve | **7** | Steam trap |
| **4** | Y strainer | **8** | Air vent |




### REMOVAL OF CONDENSATE UNDER PRESSURE WITH PUMP AND STEAM TRAP COMBINATION

The pump is installed in a closed loop with its vent connected to a pressurized reciever.
When steam pressure is sufficient to overcome backpressure, the steam trap operates. As soon as, e.g., the equipment's control valve starts to modulate, the steam pressure will decrease (even vacuum can occur). The lower differential pressure decreases the steam trap ability to discharge, causing the condensate level to rise inside the body of the pump. Once the pump float reaches its higher position, the intake valve opens and steam replaces the necessary positive pressure to pump out the condensate.




### DRAINAGE OF A SINGLE UNIT UNDER VACUUM

This configuration works with units operating with a minimum absolute pressure of 0,2 bar.
For proper operation the filling head (H1) must range between 1 and 2 meters. The lift (H) must be as minimum as possible, but never less than 1 meter, otherwise a siphon with hight (H2) is required.
Steam must be used as motive medium, and its maximum pressure should not exceed 3 bar.