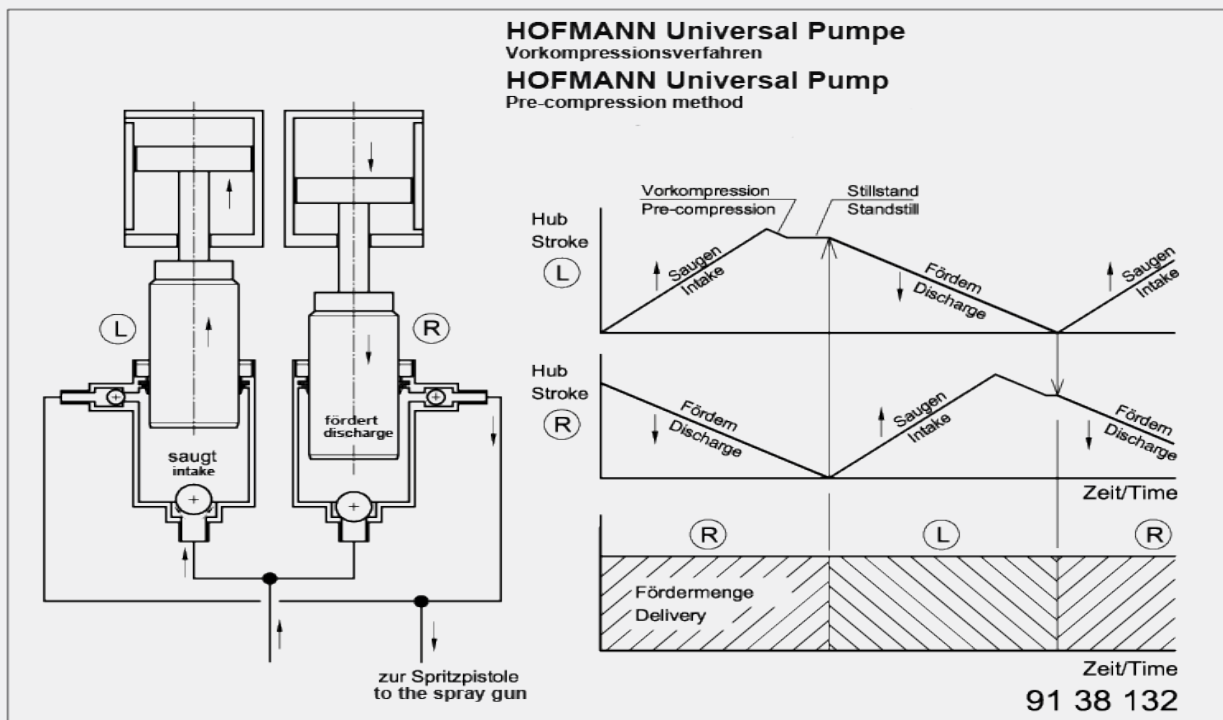




## Conex® Metering Pumps

ROAD  
MARKING  
SYSTEMS



**Conex® metering pumps**  
for **continuous**  
**exact**  
metering of critical media

- Delivery flow exactly proportionate to control speed
- No pulsation and no flow losses caused by passage through the return points
- Constant volumetric efficiency of 1 (within range of design) independent of alterations to pressure and viscosity

For a number of applications, the inability to exactly determine the volumetric efficiency makes it unacceptable, and/or elimination of pulsations by means of pulsation dampers creates problems. Many a metering operation cannot be satisfactorily resolved because there is no suitable pulsation damper available for the delivery medium or because the pulsation damper has to be constantly readjusted to align with large-scale fluctuation of head pressure and/or stroke frequency.

**HOFMANN CONEX® pumps** are the solution to these problems! Conex® is a acronym for:  
- **continuous** flow delivery  
- **exact** volumetric efficiency

Of course, being positive-displacement pumps, HOFMANN CONEX pumps also show the same previously described behavior of the forward strokes. But arranging the actual discharge stroke to operate in direct succession and sequentially independent of no-load and compression strokes eliminates their detrimental effects.

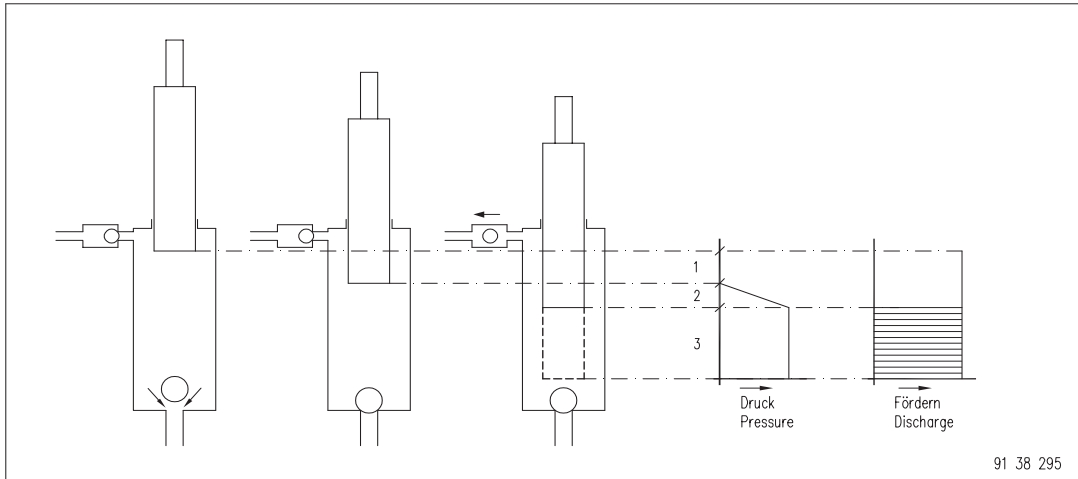
**HOFMANN CONEX®-pumps** therefore provide the following advantages:

- a volumetric efficiency of always close to 1

**HOFMANN-CONEX®-pumps** consist of two pump modules (illustr. 1). After the forward stroke begins for the one displacer, after the intake valve has closed, and with the outlet valve also closed, the delivery medium is compressed to a level approximately equal to the discharge pressure of the other pump module currently discharging medium. After this, the displacer comes to a halt whilst maintaining the level of pressure it has reached and does not continue the forward stroke with a discharge stroke until the other displacer has completed its discharge. The residual pulsation during changeover of discharge operation from one displacer to the other is negligible.

During the period in which one of the two displacers is discharging, the other displacer carries out the following steps in sequence, whereby its outlet valve is closed:

1. intake stroke
2. no-load stroke until the intake valve closes
3. compression stroke with build-up of pressure for the medium enclosed in the discharge cylinder, up to a level of pressure that is approximately 10 % less than the discharge pressure in the cylinder currently discharging. As soon as the pressure level has been reached, the displacer comes to a halt. The areas of forward stroke with actual discharge - marked in the diagram by "Discharge" - thus alternate **without** any interruption.



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With appropriately sealed reciprocating positive displacement pumps the displacers produce during their discharge operations constant rate delivery flows unaffected by pressure and medium viscosity. This means that the pumps are especially suitable for metering operations and are superior to rotating positive displacement pumps.

### Conventional pumps

When conventional pumps pass through return points, this causes pressure pulsation and interrupted flow. The latter results in a volumetric efficiency lower than 1 and usually barely calculable.

### Why?

The forward stroke begins with a no-load stroke as a consequence of medium backflow through the intake valve, which has not yet closed (stroke portion 1, illustr. 2). After the valve has closed, the compression stroke is initiated (stroke portion 2), whereby the pressure is built up to head pressure level.

The extent of the compression stroke depends on:

- head pressure
- compressibility of the medium (gas inclusions!)
- elasticity of the pump components and the compressibility of hydraulic fluid used for propulsion

Not until the head pressure has been reached does the outlet valve open and delivery begin (stroke portion 3)

### Pump drive system

The drive system requires two hydraulic fluid delivery flows of equal volume. These are produced by proportioning the volume of the fluid flow from a self-regulating hydraulic pump.

#### Version 1

Division by means of electrically controlled proportional valves, which are also used to control the volume of each fluid delivery flow and, thus, the metering pump's delivery rate.

#### Version 2

Division by means of two hydraulic rotational dosing valves, each of which produces a flow of hydraulic fluid proportionate to the rotational speed. Maximum torque 5 Nm.

Alternative drive systems for rotational valves:

1. Mechanical, e. g. by means of a friction wheel on moving surfaces
2. Electrical motor
3. Electrical stepping motor.

## Plunger-type pumps

Displacement is effected by plungers that protrude through a seal into the cylinder chambers.

Seals: Set of PTFE roof shaped sealing rings with spring pretensioning

Satisfactorily resistant to solids

Media temperature up to 150° C

When used in high-pressure paint spraying applications, the CONEX® pumps produce not only extremely low levels of pulsations, but also provide precisely adjustable discharge volume and the following advantages over conventional high-pressure pumps commonly used in paint spraying operations:

1. No pistons operating in a concealed manner inside the discharge cylinders
2. Seals only seal off against the outside and can be visually inspected
3. Optimum strain effect on the seals
  - 3.1 The stress on the seal is a stretch load, i. e. the plunger operates in the direction of the seal lips during its discharge stroke, which is the easiest situation to cope with for a seal, significant for media with solid content (illustr. 4)
  - 3.2 Seals are maintenance-free, self-adjusting to provide the optimum in bare necessity of sealing force. No manual tightening/ retightening necessary. Therefore, no danger of destruction by over tightening
4. Only one size of seal
5. No cylinder tubes susceptible to wear and tear with surfaces that cannot be inspected from outside

## Sample versions

### Illustr. 3, 5

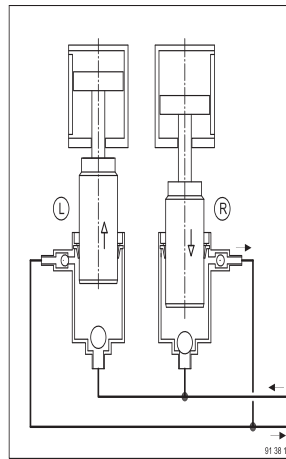
Delivery max. 26 l/min.  
Pressure max. 170 bar

### Illustr. 6, 7

Delivery max. 24 l/min.  
Pressure max. 180 bar

Both pump modules with two delivery cylinders connected in parallel (in this case arranged one above the other).

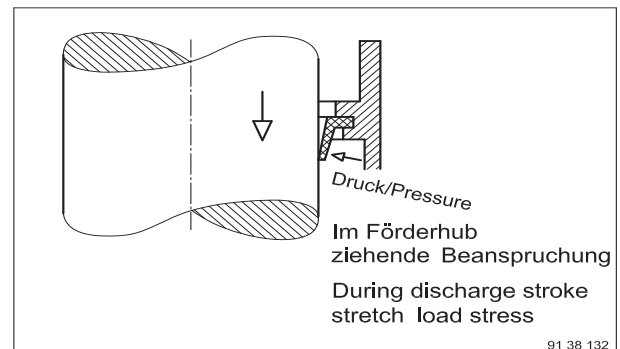
Pump suitable for two delivery flows 12 l/min. each.



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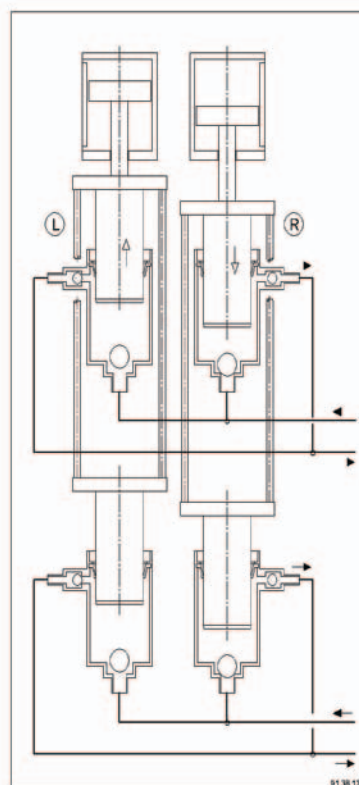
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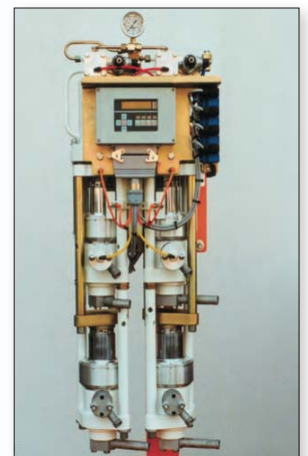
Im Förderhub  
ziehende Beanspruchung  
During discharge stroke  
stretch load stress

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## Bellow-type pumps

Displacement is effected by non-leak flexible steel bellows inserted in the cylinders to expand and contract without contact with the cylinder walls. There are no dynamic seals exposed to the effects on the discharge medium, therefore no wear and tear and no leaks at the seals.

Bellows-type pumps are suitable for the following situations:

- When there is a demand for absolute absence of leaks to the outside

- Wherever the discharge medium is sensitive to friction in seals

- At high temperature of up to 220° C

- When used in conjunction with discharge media with a high content of abrasive solids

### Version 1:

Bellows with direct activation (illustr. 8, 9)

The piston rods in the hydraulic drive cylinders transmit movement to the bottom plates of the bellows. The interior of the bellows is at atmospheric pressure. Service life for this type of bellows activation is influenced by the operating pressure.

### Version 2:

Bellows with indirect activation (illustr. 10, 11)

On these versions, the piston rods in the hydraulic drive cylinders transmit movement to hydraulic pistons, which in turn transmit displacement to the steel bellows by means of oil buffers. The bellows do not suffer any stress from a difference in pressure between inside and outside; there is thus no effect from the pressure on the bellows' service life. Leakage losses from the oil buffers are automatically replenished and any overfilling automatically eliminated to prevent detrimental impacts of the bellows at the cylinder bottoms.

### Sample versions

#### Illustr. 8, 9

Delivery max. 35 l/min.

Pressure max. 8 bar

Heating by heat transfer oil, max. 220° C.

Heat insulation.

#### Illustr. 10, 11

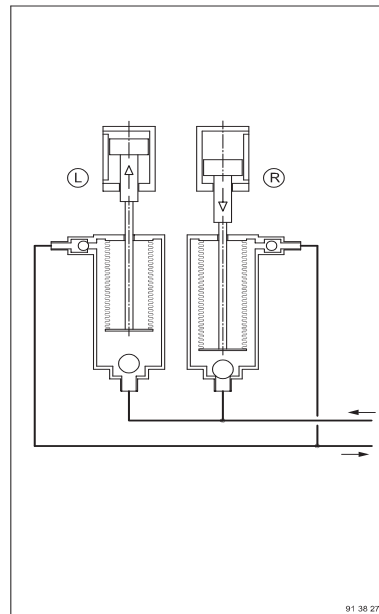
Delivery max. 40 l/min.

Pressure max. 10 bar

Intake filter, with pneumatically driven filter scraper.

Heating by heat transfer oil, max. 220° C.

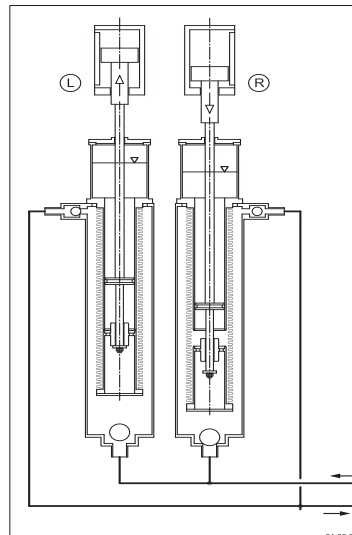
Heat insulation.



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