Flow indicator
TIVG 15R ... 40R
Installation and maintenance

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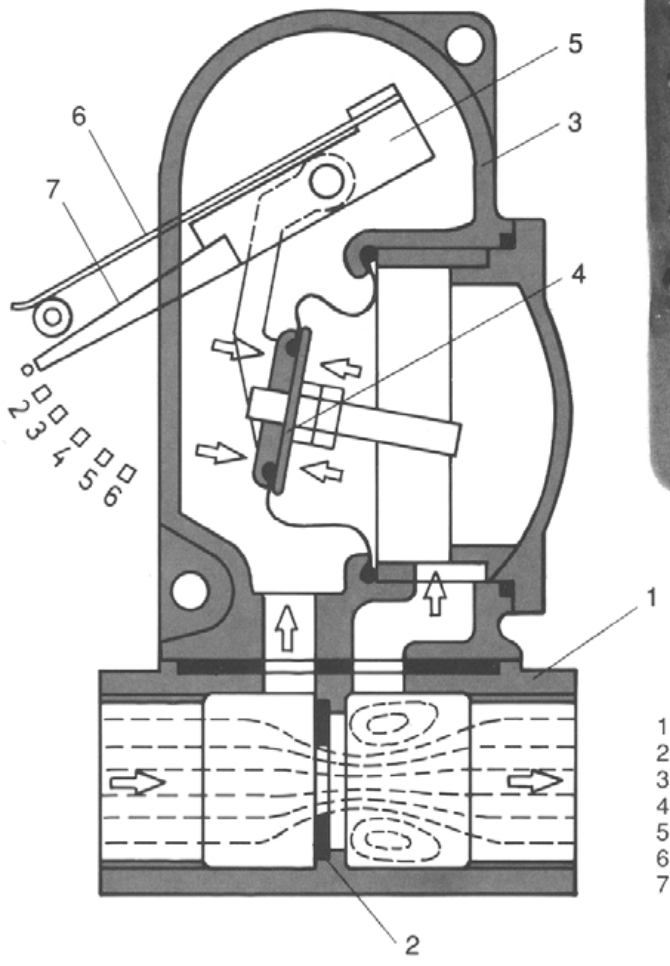

1 Orifice plate housing
2 Orifice plate
3 Pressure sensitive device housing
4 Membrane
5 Actuator
6 Spring
7 Pointer

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Operation

The flow indicator shows the rate of flow of a liquid in a piping system.

The indicator is designed principally for water, lubricating oils and transformer oils. The last figure in the type designation signifies the type of liquid for which the particular indicator is intended. An odd figure as in designation TIVG 40R-1 signifies water and an even figure as in TIVG 25R-4 signifies oil. The indicator may also be used for other liquids, in which case the density and the viscosity of the liquid determines the type to be used.

The pressure-sensitive and indicating device is the same for all sizes. Refer to the illustration on page 1.

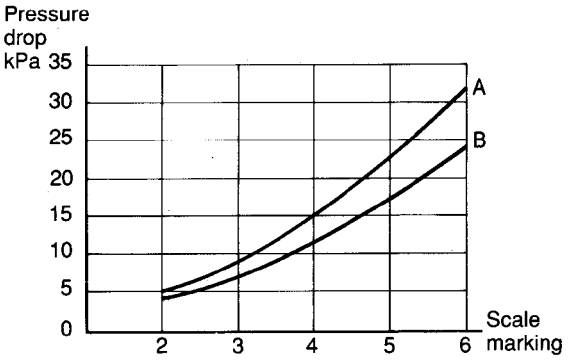
The liquid flows through an annular ring, located inside the indicator, which causes a drop in pressure the magnitude of which is dependent upon the quantity of liquid flowing through the ring.

The pressure drop influences an actuator which, in turn, acts upon a pointer that indicate the rate of flow on a scale graduated from 2 to 6. The scale value multiplied by a constant gives the flow in litres/minute to an accuracy of ±10 % of the maximum scale value.

The actuator has two individually adjustable arms, each of which influences its own particular contact, and can be set to cause contact change-over anywhere between the scale values 2 and 5,5. Normally, the internal contact unit is set to cause contact change-over at scale value 5,5 for **increasing flow** and the external for contact change-over at scale value 2,5 for **decreasing flow**.

The internal contact unit is connected to terminals 1, 2 and 3 while the external unit is connected to terminals 4, 5 and 6.

The design of the indicator makes the reading independent of the static pressure, which may amount to a maximum of 1 MPa. The indicator only reacts to the difference in pressure caused by the orifice plate. The residual pressure drop is shown in Fig. 1.



A = TIVG 15R for 0,2 – 0,6, 04 – 1,2, 0,8 – 2,4 and 1,6 – 4,8 l/m.
B = TIVG 15R for other ranges and TIVG 25R and TIVG 40R.

Fig. 1 The approximate residual pressure drop related to the pointer indication.

Installation

The flow indicator can be mounted in any desired position. Arrows on the orifice plate housing denote the direction of flow. Excessive disturbances in the flow may cause the pointer to oscillate resulting in unjustified signals.

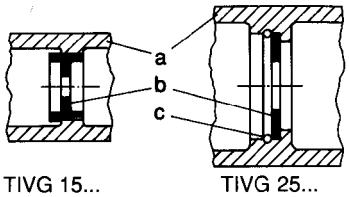
To avoid disturbances, the pipe immediately upstream of the indicator should be straight and free from valves for a distance of 10 to 20 times the pipe diameter.

Valves which are partly closed often cause severe disturbances and should not be located closer to the indicator than the distance stated above. However, bends in the piping may be located immediately downstream of the indicator if the rate of flow is not too high. **When starting up, the valves should be partly closed to avoid too violent reaction in the indicator.** The valves should then be adjusted to provide the normal flow. The specified maximum flow for the indicator may be exceeded by 50 % without causing damage to the indicator, but the pointer only indicates the maximum scale value. The residual pressure loss will, however, increase drastically; it amounts approximately to the square of the increase in flow. Within certain limits, the measuring range of the indicator can be modified by replacing the orifice plate and the scale. *Refer to Fig. 2.*

Orifice plates and scales with measuring ranges lower than those given in the adjacent table, will be supplied on request.

The indicator is practically unaffected by the viscosity of the liquid and, consequently, the reading will also be correct for liquids which change their viccosity in service, e.g., oil which becomes thinner the warmer it becomes.

To regulate small quantities, sluice or slide valves should be used. Seat valves are unsuitable, as the disc moves, causing a variation in the quantity of liquid flowing through them. For rates of flow below 10 l/min, the valve must not be larger than 3/8" even if the pipe is 1/2". Larger valves render regulation more difficult.



TIVG 15... TIVG 25...

a Orifice plate housing
b Orifice plate
c Lock ring

Fig. 2

Type TIVG	Types of liquid	Measuring range l/min.	Scale constant	Orifice plate Art.No.	Orifice diam., mm
15R	water and oil	0,2–0,6	0,1	**5692 174-1**	1,4
		0,4–1,2	0,2	**-2**	2
		0,8–2,4	0,4	**-3**	3
		1,6–4,8	0,8	**-4**	4,4
		3–9	1,5	**-5**	6
		5–15	2,5	**-6**	7,7
		10–30	5	**-7**	9,9
25R-1	water	16–48	8	**2151 049-91**	13,5
25R-2	oil	16–48	8	**-92**	13
25R-3	water	24–72	12	**-93**	16,2
25R-4	oil	24–72	12	**-94**	15,5
25R-5	water	40–120	20	**-95**	20
25R-6	oil	40–120	20	**-96**	19,3
40R-1	water	40–120	20	**-103**	21,7
40R-2	oil	40–120	20	**-104**	20,5
40R-3	water	70–210	35	**-105**	27
40R-4	oil	70–210	35	**-106**	26

To prevent the blocking of the hole in the orifice plate, impurities larger than the orifice must not be allowed to enter the indicator. Refer to the table above. The indicator is practically insensitive to silt and similar matter. When used on radiators the indicator should, if possible, be located on the "cold" side since this will help to prevent the aging of the rubber components.

The orifice plates are dimensioned on the assumption that the indicator is connected to steel pipes in accordance with the table below. Faulty readings may result from using pipes of smaller diameters.

Thread	Nominal bore, DN	Inner diam., mm
R1/2"	15	16
R1"	25	27,2
R1 1/2"	40	41,8

The rubber seal in the cable gland must be selected to provide adequate sealing.

Changing the setting of the change-over contacts *Refer to Fig. 5*

1. **Re-adjustment of internal contact (terminals 1, 2 and 3).** Loosen screw (29). Turn the inner arm (27) with roller, counter clockwise to obtain contact chang-over at the new lower scale value. Tighten screw (29). Check to ensure that contact change-over takes place at the desired scale value by turning actuator (6) with aid of an Allen key placed in locking screw (3). Make fine adjustments by turning the arm (27).
2. **Re-adjustment of external contact (terminals 4, 5 and 6).** Loosen screw (4). Turn the outer arm (28) with roller, clockwise to obtain contact chang-over at the new higher scale value. Tighten screw (4). Check and make fine adjustments as mentioned above.

Note! That the setting of the arms will be different for contact change-over at a given scale value for increasing flow and contact change-over at the same scale value for decreasing flow.

Changing the direction of flow

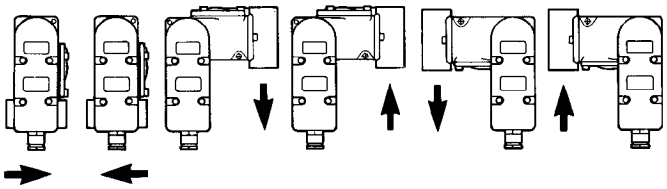


Fig. 3

The indicator is delivered assembled for the direction of flow stated in the order. The direction of flow is changed in accordance with one or both of the following.

1. **Turning the indicating device.** *Refer to Fig. 5*
(to locate the indicator in vertical position).
Remove the cover (1), loosen screws (2) and screw (3) of the actuator. Turn the entire indicating device (30) to the desired position. Tighten all screws. Ensure that the leaf spring on actuator (6) lies against its support roller (7) without being tensioned. Check the zero setting and the setting of the change-over contacts.
2. **Turning the orifice plate housing** *Refer to Fig. 6*
(when the indicator is to be oriented to obtain direction of flow that is opposite to that stated in order).
Remove the screws (25) which hold the orifice plate housing (26) and turn the latter so that the arrow points in the direction of flow and then attach it to the pressure unit.

Maintenance

The indicator should be inspected at regular intervals depending on the conditions under which it is operating. The rubber in the membrane and sealing hose is subject to aging, particularly at high temperatures. Deterioration is slight at temperatures below 50 °C but at 70–90 °C it is accelerated.

In severe operating conditions (high temperature, silt which solidifies, etc.) the function of the indicator should be checked by stopping the circulation, in which case a signal should be received and the pointer should move to zero. This check should, for instance, be made every second month. No general rules can be given regarding the intervals between inspections since the operating conditions can vary considerably.

Replacing the membrane *Refer to Fig. 6*

Remove the cover (8), the membrane support (13) and the washer (12). When fitting the new membrane (11) it is important to ensure that its lowest part is located to the far right in the housing when this is viewed as shown in the figure. The pertinent positions are marked in the figure with *. The side of the membrane on which the fabric-reinforcement is visible should face the cover. When securing the washer (12) ensure that the welt on the membrane fits in the grove in the centre. There should be no wrinkles in the membrane when it is fitted.

The large welt on the membrane should then fit in the grove in the housing. Check this when fitting the membrane support. Now replace the cover, noting that it is guided by the membrane support and that the screwholes in the cover are asymmetric to ensure the correct positions of the support and the cover. After fitting the membrane, check the zero position and the contact change-over.

Replacing the sealing hose

Refer to Figs. 5 and 6

Remove the membrane as described above. Loosen locking screw (3) and remove the actuator (6). Remove the screws (2) in the cover of the pressure sensitive device and lift up the latter. It may be necessary to turn the indicating device (30) to a position parallel to the pipe in order to lift up the pressure sensitive device.

Refer to Figs. 7 and 8.

Remove the screws (19), and pull out the shaft including centre (22). The sealing hose (21) can now be removed. Remove the slide-rings (20) from inside the hose and use them again when fitting the new hose. Using good thin oil, lubricate guide sleeve (17) and then fit the slid-rings onto the sleeve. The sleeve should be completely full of slide-rings, the sealing hose may otherwise be damaged. Push the hose over the slid-rings and then place one O-ring (16), two washers (18) and one O-ring (16) on the sealing hose (21). Insert the shaft including centre (22) in the guide sleeve (17) and tighten the screws (19).

Fig. 4 shows the position of the centre in relation to the cover when securing the sealing washers (18). The contours of the washers (18) must also coincide. The position need not be fixed with any great accuracy. The main thing is that the hose is twisted as little as possible when the

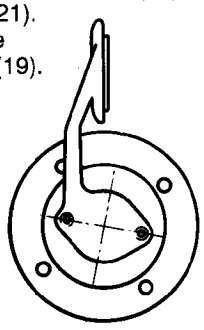


Fig. 4

Cont. on page 5.

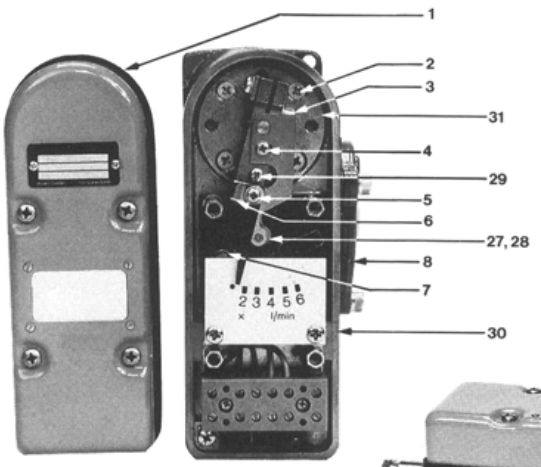


Fig. 5

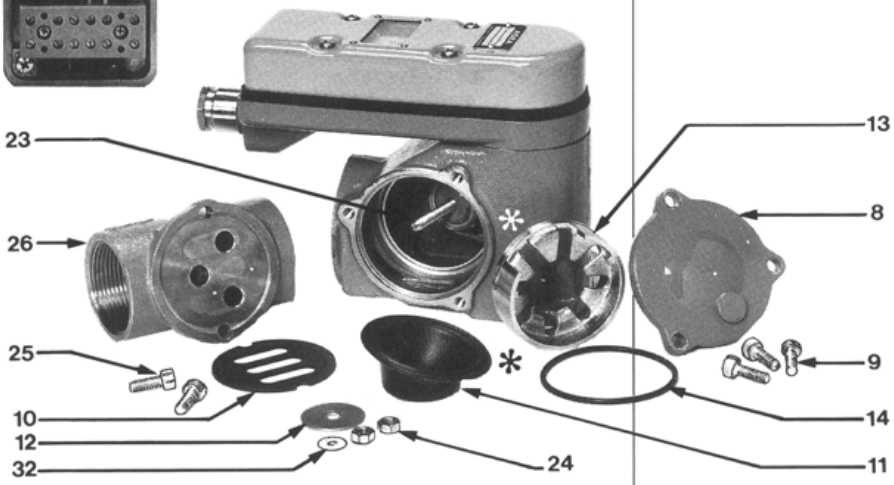


Fig. 6
**) Pertinent positions*

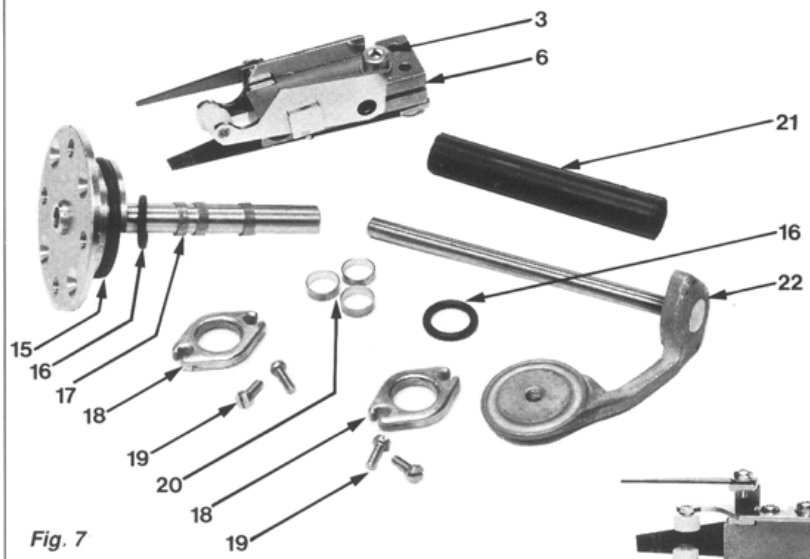
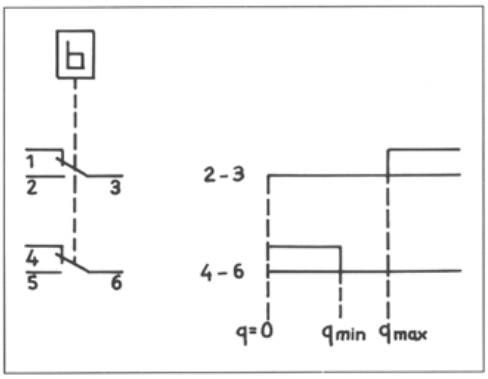


Fig. 7

Diagram



Item numbers in the figures

1 Cover
2 Screw (for 31)
3 Locking screw (for 6)
4 Screw (for item 28)
5 Screw (for pointer)
6 Actuator
7 Support roller
8 Cover
9 Screw (for item 8)
10 Gasket (for item 26)
11 Membrane
12 Washer (for centre)
13 Membrane support
14 O-ring (for item 8)
15 O-ring (for item 31)
16 O-ring (for item 21 and 18)
17 Guide sleeve
18 Washer
19 Screw (for item 18)
20 Slide-ring
21 Sealing hose
22 Shaft with centre
23 Screw (for centre)
24 Nut (for item 23)
25 Screw (for item 26)
26 Orifice plate housing
27 Arm with roller
28 Arm with roller
29 Screw (for item 27)
30 Indicating unit
31 Cover of pressure-sensitive device
32 Sealing washer between items 12 and 24

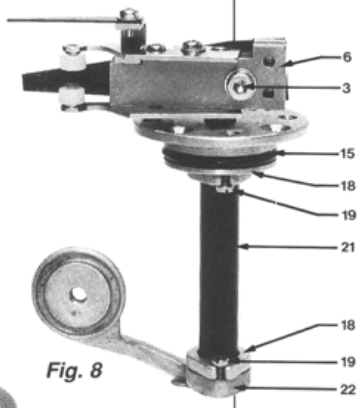


Fig. 8

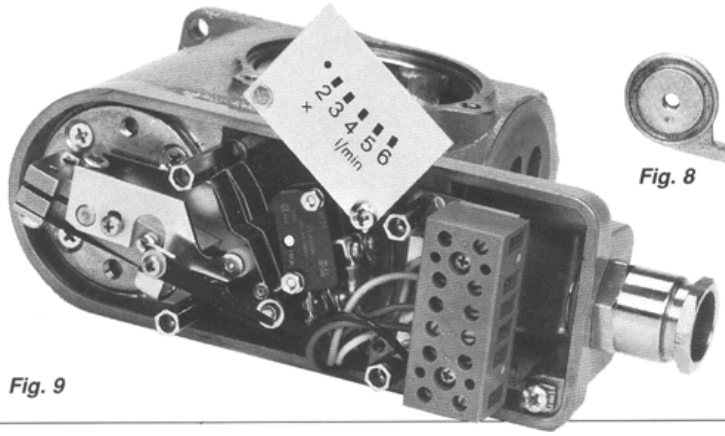


Fig. 9

cont.

Replacing the sealing hose

indicator is in service and that the hose is not twisted when the membrane and the centre are in the mid-position. Attach the pressure-sensitive device in its housing, *Fig. 5*, and tighten the screws (2).

Fit the membrane in position. See under section entitled "Replacing the membrane".

Fit actuator (6) and secure it to the shaft (22), *Figs. 5 and 8*. Push the centre (22) inwards when fitting so that the membrane (11) rests with the welt in the groove of the housing without being stretched. At the same time, the leaf spring (6) is to press lightly against the support roller (7) without being tensioned.

Check

- that the actuator is securely fixed to the shaft
- that the pointer is in the zero position
- that the setting for contact change-over is correct
- that the stop screw (23), *Fig. 6*, limits the deflection to the upper edge of scale value 6. The stop is inserted to prevent the overloading of the spring. Adjust the stop by moving the nuts (24).

Cleaning the pressure-sensitive device housing

If the indicator is used in systems with very silty or excessively polluted water, the pressure sensitive device housing can in the majority of cases be flushed clean by removing the cover, membrane support and membrane and by letting water flow through the opening.

In severe cases, when the deposits are semi-solid or solid, the pressure sensitive device housing must be removed from the orifice plate housing and flushed separately. Any deposits in the grooves on the baseplate of the pressure-sensitive device housing must be removed.

Spare parts

Qty	Item No.	Nomenclature	Article No.
1	11	Membrane	2152 490-1
1	21	Sealing hose	2515 094-1
1	15	Sealing ring	2152 2011-408
1	14	Sealing ring	2152 2012-420
2	16	Sealing ring	2152 2011-309
1	10	Gasket	2152 312-1
20	20	Slide-ring	1113 171-2