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1 Features and application

_Tribloc_ - flow switches/-guards were developed to monitor material flow in pneumatic conveying.

_Tribloc_ - flow switches/-guards reliably detect a stop in the flow and supply information about start and stop of transportation processes, plugging and blow-by. As an option they are available with an 4 - 20 mA current loop providing a measure for the flow rate.

The system can be customized to different applications with a great degree of flexibility. The user carry out adjustments to the specific conveyance situation by adapting the parameters for:

- amplification
- threshold
- damping

Parameterization is carried out in discrete steps. By this method a set of parameters can easily be copied to other _Tribloc_ - flow switches/guards in the same installation.

Additionally the amplification can be fine adjusted.

The flow/stop information is available by means of a double throw dry contact.

The relay's direction of action can be chosen depending on application specific requirements (see page 10 for details).
2 Installation & wiring

The **Tribloc** processing unit model R is housed in a top hat rail enclosure with protection class IP20. Lined up on a 35 mm top hat rail each processing unit will take up 26 mm.

The processing unit model R is to be installed in an electronics cabinet or a junction box. The connection to a sensor model S/R comprises of up to 150 m of a twisted pair cable with a cross-section of 2 x 0.5 mm².

The units are designed for a supply voltage of 24 VDC (±20%) and have a maximum power consumption of 5 W per unit.

The connecting diagram on the right lines out how a **Tribloc** processing unit is wired correctly.
Connecting diagram model „R”

Updated 43/07
3 Indicators at the processing unit

**LED Operation**

After startup all LEDs and the relay are activated for a short period. This is part of the power up test. After this the green *Operation* LED will flash at regular frequency of approximately 1 Hz. In case of a failure occurs this can be easily detected by the *Operation* LED.

**Level indicator**

Conveying triggers a characteristic input signal in the *Tribloc* - flow meters/-guards. The strength of this signal depends on transported material, flow rate and electrical properties of the material.

The *Level indicator* (LED array with 5 LED) visualizes the current signal strength of the input signal after amplification.

**LED Relay**

The yellow *Relay* LED indicates the relay status. The LED lights up while the relay is activated. This behavior is independent on the chosen relay’s direction of action. Therefore the LED indicates either conveyance or stop of flow dependent on the adjusted operation mode. (see also p.10)

**LED Test**

The red *Test* LED lights up while the processing unit is in test mode. At the same time all other LEDs and the relay are activated. The current loop will sink 20 mA in test mode.
4 Parameterization interface

Tribloc processing units model R possess no controls at the unit itself due to the use of a top hat rail housing.

Parameterization is done via a special interface utilizing either

- a programming device
  or
- a PC with the program "Tribloc - Programmer" and a programming cable.

In chapter 5 parameterization is described independent of the method used.
Subsequently the special aspects of parameterization with the programming device respectively with the PC are discussed.
5 Parameterization

By means of three multiple position switches (each with positions 0 to 9) amplification, threshold and damping can be adjusted. The mode of operation can be selected with a quadruple DIP switch. A Potentiometer allows a fine adjustment.

Amplification

With the Amplification switch the amplification of the signal can be adjusted. The signal strength is visualized by the 5 LEDs of the level indicator. The positions 0 to 9 of the switch correspond to an amplification of 1 to 10.

Amplification fine

The potentiometer Amplification fine can be used to make several devices display exactly the same reading.

Threshold

With the Threshold switch the threshold of the device can be adjusted. The positions 0 to 9 of the switch correspond to a threshold of 0 to 90%. The device will detect flow whenever the selected threshold is exceeded.
Damping

With the Damping switch a low-pass filter can be configured. The following table shows the effective damping in relation to the position of the switch:

<table>
<thead>
<tr>
<th>Damping switch position</th>
<th>time constant in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0,5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>60</td>
</tr>
</tbody>
</table>

DIP switches

With the DIP switches can be selected whether the relay is energized or de-energized during conveying. In addition the damping properties of the relay, the current loop and a current loop test can be specified with the DIP-switches.

The table on the next page shows the adjustment possibilities for the DIP-switches.
The Tribloc - measuring device provides (optionally) a passive 4 - 20 mA current loop, that can output the measured value from 0 to 100%.

The current loop is electrically isolated from the rest of the electronic circuit and is externally powered (e.g. from a PLC).

By means of the DIP-switch 4 the current loop can be setup to always put out 20 mA for testing purposes.

In this case the Test LED and all other indicators will be lit continuously. The Heartbeat LED however will continue to flash as an operation indicator.

In any case the Relay LED is always lit while the relay is energized!

### 6 Current loop (optional)

<table>
<thead>
<tr>
<th>switch position: DIP-switch 1</th>
<th>Off</th>
<th>On</th>
</tr>
</thead>
<tbody>
<tr>
<td>status of relay during conveying:</td>
<td>energized</td>
<td>de-energized</td>
</tr>
<tr>
<td>status of relay during stop of flow:</td>
<td>de-energized</td>
<td>energized</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>status of relay during power failure</th>
<th>stop of flow</th>
<th>conveyance</th>
</tr>
</thead>
<tbody>
<tr>
<td>corresponds to:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>switch position: DIP-switch 2</th>
<th>damped value</th>
<th>undamped value</th>
</tr>
</thead>
<tbody>
<tr>
<td>for relay</td>
<td>for relay</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>switch position: DIP-switch 3</th>
<th>damped value</th>
<th>undamped value</th>
</tr>
</thead>
<tbody>
<tr>
<td>for current loop</td>
<td>for current loop</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>switch position: DIP-switch 4</th>
<th>current loop:</th>
<th>current loop test:</th>
</tr>
</thead>
<tbody>
<tr>
<td>normal operation</td>
<td>output: 20 mA</td>
<td></td>
</tr>
</tbody>
</table>
Parameterization of the Tribloc - flow switch/-guard is carried out by means of the programming device shown on the right hand side. The Tribloc programming device is housed in a case with protection class IP40.

The four-way phone jack on the end of its cable is inserted into the corresponding socket on the Tribloc processing unit. The power for the programming device is then supplied by the Tribloc processing unit model R.

All settings for the Tribloc processing unit can be made using the controls on the Tribloc programming device.
The settings for the parameters controlling amplification, threshold and damping can be adjusted by means of the three upper rotary switches. Additional settings can be made with the quadruple DIP switch. Thorough descriptions of the settings can be found in a different chapter starting from page 8.

Multicolor LEDs at the switches indicate the current position of the switch as well as the current value in the Tribloc processing unit:

- A LED lit up green indicates that the position of the switch and the current setting in the Tribloc processing unit match.
- If the settings do not match a LED lit up amber will indicate the position of the switch and a LED lit up red will indicate the current setting in the Tribloc processing unit.

By momentary depressing the "Transfer" button the positions of the switches are transmitted to the connected Tribloc - processing unit model R. A successful transmission can be identified by the fact that no more LEDs are lit up red or orange afterwards.
With the dial "Fine adjustment" the output of the current loop can be adjusted within a certain range. To get a medial position the dial can be pushed in. The medial position will be indicated by the LED located above the dial.

After approximately 3 minutes without operation of any control the Tribloc programming device will enter a power save mode. In this mode all LEDs are off. Only the ⚡ indicator will flash once every two seconds. As soon as any control is operated the device will return to normal operation.

**Adjustment to a given sensor**

Before a sensor can be utilized together with a Tribloc processing unit model R the processing unit must be matched to the sensor. Therefore the "Transfer" button must be depressed for five seconds while there is no flow in the sensor. The Tribloc processing unit will report the result of the adjustment. This is indicated at the Tribloc programming device as follows:

![LED configurations](image)

If the zero-point adjustment was successful the middle row of LEDs (position 2 and 7 of the switches) will light up continuously for approximately three seconds.

If there is a flow inside the sensor during zero-point adjustment and adjustment consequently fails the upper row of LEDs (position 4 and 5 at the switches) will flash six times.

If there is no sensor connected or the connection is broken during zero-point adjustment and adjustment consequently fails the lower row of LEDs (position 0 and 9 at the switches) will flash six times.
Parametrization of the Tribloc flow switch/-guard is carried out utilizing the Software "Tribloc - Programmer" shown on the right hand side. To do so the Tribloc processing unit must be connected to a unused USB port of the PC by means of a special programming cable.

In the upper half of the program window the current settings in the Tribloc are displayed. The settings made in the lower half can be transferred to the processing unit by clicking the ↑ button. In order to read out the settings of the Tribloc the ↓ button can be clicked. Additionally there are buttons for fine adjustment and automatic zero-point adjustment in the lower left of the program window. Before the zero-point adjustment is carried out a warning is issued and afterwards the result is displayed.

By the poitioons of the DIP switches the operation behaviour of the relay and the current-loop are controlled. For details see the chapter starting from page 10.
8 Adjust of the Tribloc - system to the conveying situation

To adjust the Tribloc - system to different conveying situations, following steps have to be executed:

**Basic setting**

- Check if all **DIP - Switches** are in position „Off“.
  - If not, switch them to „Off“.
- Set the potentiometer **Amplification fine** to position 1,0.
- Set the **Damping** switch to position 1.

Now a zero-point adjustment for the sensor can be carried out during a stop of conveying.

How the adjustment is conducted can be found in

- chapter 7a when utilizing a programming device
- chapter 7b when utilizing a PC and a programming cable

(This adjustment is not mandatory because an approximate adjustment has already bee made during factory testing)

**Adjustment of signal level**

- Set **Amplification** switch during conveying at maximum flow rate to the position where all green LEDs of the **Level Indicator** are lit permanently and the yellow LED flickers occasionally.
Adjustment of the threshold for conveying

• Choose position 9 for **Threshold**

• Decrease the setting of the **Threshold** switch slowly from position 9 until the relay is energized and the LED **Relay** is lit permanently.

! If conveying can not be interrupted due to operational reasons the next step can be skipped and the proper function of the **Tribloc** system should be checked later at the next stop of conveying.

Adjustment of the threshold for stop of flow

• Now check if the relay is de-energized when conveying stops. If not, set the **Threshold** switch to next higher position.

! If the adjustment of threshold for stop and for conveying can not be carried out successfully with the same position of the **Threshold** switch restart with the step **Adjustment of signal level** and increase or decrease the position of the **Amplification** switch by one.

• Restart conveying

Time response / Damping

• Adjust the **Damping** switch to the desired value for damping. (refer to table on page 9)
Relay’s direction of action

• With the DIP switch 2 the direction of action for the relay can be set up.
  It can be selected whether the relay should be energized or de-energized during conveying. With this setting the failsafe-behavior in case of a power loss can be controlled. (refer to table on page 10)

Additional settings

• With the DIP switch 2 can be selected whether the relay reacts to the damped or the undamped measured value.

• In the same way DIP switch 3 is used to select the damped or the undamped measured value for the output of the current loop.

• The DIP switch 4 is only for testing the current loop (see page 10) and must be in position “off” for normal operation.

⚠️ Because all adjustments are made in discrete steps it is possible to transfer a configuration to other Tribloc processing units operating at the same conveyance conditions.
Tri bloc E

Processing unit for Tri bloc Flow switches -guards

Model R

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