

# Batch System For Liquefied Gas

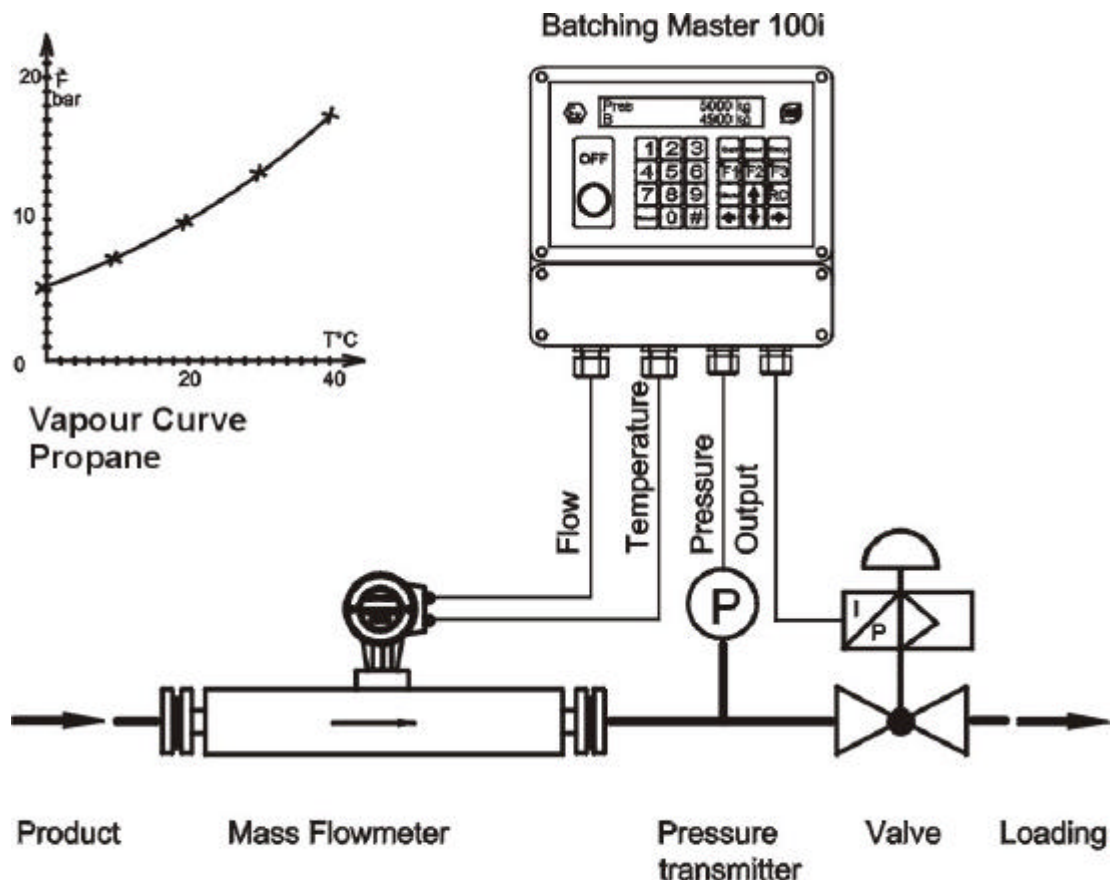
With a temperature-dependent pressure control function



## Custody Transfer Approved Batching System For Liquefied Gas

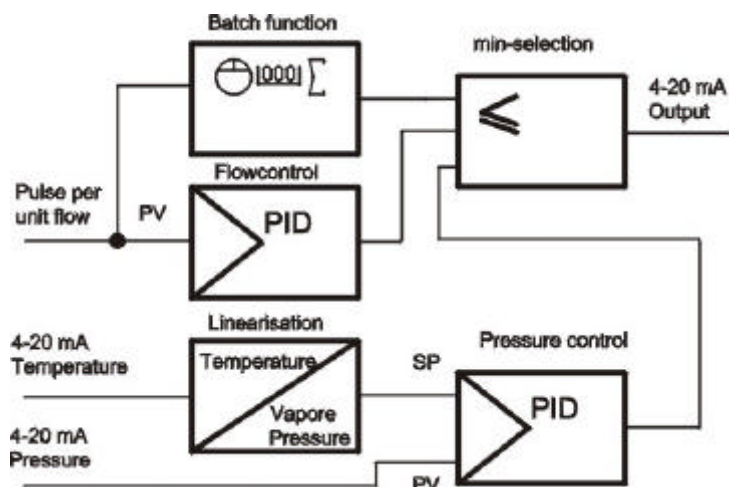
Loading and Batching of Liquefied Gas has to meet certain safety requirements:

- To ensure explosion protection, the flow velocity in the pipe must not exceed approximately 7 m/s, thus avoiding build-up of electrostatic charge.
- Liquefied Petroleum Gas demonstrates out-gassing effects as soon as the pressure falls below the vaporization pressure of the LPG. As shown in the vaporization curve of propane below, the temperature dependency of the pressure is non-linear. As a consequence, pressure control is required, the preset value of which is determined by the actual vaporization pressure. For safety reasons, the internal preset value needs to be about 1 bar higher than the required vapor pressure.



## Technical Solution using the Batching Master

### Block diagram:

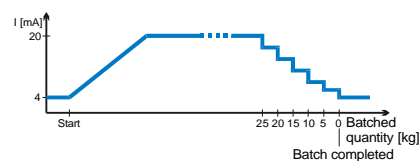


### Description:

As indicated in the block diagram, the batching master provides three functions operating in parallel. Based on a minimal selection procedure, the lowest value is transferred to the output of the Batching Master and thus to the control element.

#### 1. Batch Function:

When starting the batching procedure, the 4 to 20 mA output of the batching master opens the valve in a smooth and linear ramp. Before the batched volume has attained the preset value for the totaliser, the valve is closed via a 6-step shut down progression.



This procedure ensures precise batching and prevents hammer on the piping system, especially in high flow rate systems. This operation is performed locally, in the field. Important data are indicated directly at the loading station. In emergency conditions, the batching process can be stopped easily and safely via an emergency button on the device.

#### 2. Flow Control Function:

```
SP 20000 kg/h
PV 19990 kg/h
```

The flow controller can be switched via the # - key in the display. If the flow exceeds the preset value, the PID-control algorithm decreases the output signal, in order to keep the flow at its set point.

#### 3. Linearisation Function

As a rule, the vaporization curves for all liquids are more or less non-linear. Based on a 25-step linearization function, the temperature dependent preset values for the pressure in the pipe are calculated from the linearised vaporization curve, plus 1 bar added for safety purposes. Temperature and related pressure values from the vaporization curve of the product are to be entered into the batching master.

#### 4. Pressure Control Function

```
SP 9.8 bar
PV 9.8 bar
```

To prevent out-gassing, it has to be ensured that the pressure inside the pipe exceeds the pressure value based on the vaporization curve at the prevalent temperature by about 1 bar. As soon as pressure in the pipe falls below this calculated set point, the PID control algorithm starts closing the valve resulting in an increase of the pressure inside the pipe again. If the calculated set point cannot be attained within a certain time, the valve is closed completely and the batching process is stopped with the error message "Err Min-Flow" indicated on the display