Installation and Commissioning Instructions

FMU2 Floor Mixing Unit with Lowara Ecocirc Class A Pump

- Pre-assembled TM3 Thermostatic Mixing Control Group and manifold with either lockshields or flowmeters, available from 2 to 12 ways
- Thermostatic mixing valve with remote sensor for accurate control of flow temperature
- Easy to use thermostatic head with temperature locking feature
- Flow increase valve to increase flow rate for larger manifolds / heat outputs
- Adjustable temperature range from 20°C to 70°C making it suitable for screed drying
- Lowara Ecocirc Class A pump with unique anti-block operation. ErP 2015 compliant
- Built-in non-return valve to aid filling during commissioning
- Built-in automatic air-vent
- Built-in temperature gauge
- 1” male close coupled primary flow and return connections
- 1” male manifold connections with union for fast assembly / removal
- Optional ball valve set for fitting to 1” M primary connections
- Valve body kv range: 3.0 – 4.8
FMU2 Floor Mixing Unit 2

1. Construction

1. Underfloor heating manifold flow rail fitted with either flowmeters or lockshields
2. Underfloor heating manifold return rail designed to be fitted with electrothermic heads
3. Manifold mounting bracket - 210mm
4. TM3 mixing group mounting bracket - 210mm
5. Mixing valve body with M30x1.5 thread for fixing the thermostatic head, supplied separately
6. Flow increase valve (thermostatic model only)
7. Lowara Ecocirc 25-6/130 circulating pump
8. Thermostatic sensor phial located in pocket
9. Mixed flow temperature gauge, 0°C to 80°C
10. Automatic air vent
11. Mixing valve thermostatic head with remote sensor, adjustable from 20°C to 70°C with M30 x 1.5 securing ring
12. Non-return valve
13. Fill and drain valves
14. Primary flow connection, 1”BSP
15. Primary return connection, 1”BSP
2. Operation

The FMU2 Floor Mixing Unit offers a time saving pre-assembled mixing unit and manifold. At its heart is the TM3 Thermostatic Mixing Control Group which has an Emmeti designed mixing valve to ensure accurate temperature control of underfloor heating. The unique design of the internal mixing valve components ensures that hot water from the heat source and return water from the underfloor circuit are mixed together in the valve body to produce a range of temperatures from 20°C to 70°C. This range of temperatures suits the whole field of underfloor heating applications, from commissioning new floor screeds to operating with very thick floor screeds in commercial applications. The illustrations below show how the mixing valve operates through its remote sensing thermostatic head:

Initially the cool liquid in the remote sensing probe, allows almost all of the primary hot water from the heat source through the valve. Gradually the temperature of the probe rises as the underfloor circuits begin to warm up.

Depending on the temperature setting of the thermostatic head, as the temperature of the probe rises, the shuttle starts to close off the primary hot water allowing return water to maintain the temperature set on the head, up to 70°C if required.

Once the temperature set on the head has been reached at the probe, the shuttle balances the right amount of primary hot water and secondary return water to maintain this temperature. Depending on the thermostat setting, the hot water could be almost completely closed off allowing very low temperatures suitable for commissioning screed floors right down to 20°C if required.

The thermostatic mixing valve has a flow increase valve which allows return water to flow directly into the mixed water outlet. This cools the mixed water temperature sensed by the remote phial and causes the mixing valve to open allowing more primary hot water through the mixing chamber and raises the temperature to the setting on the head.

The other part of this powerful combination is Emmeti’s reliable, tried and tested underfloor heating manifold. Fitted with double regulating flowmeters or lockshields and electrothermic valves, the manifold complements the TM3 thermostatic mixing unit to create the perfect combination for today’s generation of underfloor heating systems.
3. Technical Data

**FMU2 Floor Mixing Unit**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary circuit maximum temperature:</td>
<td>90°C</td>
</tr>
<tr>
<td>Maximum pressure:</td>
<td>10 bar</td>
</tr>
<tr>
<td>Primary circuit max ΔP:</td>
<td>1 bar</td>
</tr>
<tr>
<td>Secondary control range: (thermostatic regulation)</td>
<td>20°C - 70°C</td>
</tr>
<tr>
<td>Heating capacity that can be exchanged at ΔT 7°C, ΔP available 0.25 bar :</td>
<td>10 kW by-pass pos. 0</td>
</tr>
<tr>
<td>Thermostatic regulation:</td>
<td>12.5 kW by-pass pos. 5</td>
</tr>
<tr>
<td>Climatic regulation:</td>
<td>11.5 kW</td>
</tr>
<tr>
<td>Mixing valve pressure drop (thermostatic regulation)</td>
<td>Kv 3</td>
</tr>
<tr>
<td>Pressure drops with open bypass valve (thermostatic regulation)</td>
<td>Kvmax 4.8</td>
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<tr>
<td>Thermometer scale:</td>
<td>0°C - 80°C</td>
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<tr>
<td>Mixing unit inlet connections:</td>
<td>1” BSP male</td>
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<td>Manifold outlet connections:</td>
<td>DN24 x 19tpi</td>
</tr>
<tr>
<td>Lowara Ecocirc circulator connections:</td>
<td>1” 1/2 BSP male union</td>
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</tbody>
</table>

**Lowara Ecocirc 25-6/130**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Motor design:</td>
<td>Electronically commutated, shaftless spherical motor design with permanent magnetic rotor</td>
</tr>
<tr>
<td>Max. system pressure:</td>
<td>10 bar</td>
</tr>
<tr>
<td>Electric connection:</td>
<td>200 – 240 Volt, 50 / 60 Hertz</td>
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<tr>
<td>Power consumption:</td>
<td>Models Ecocirc 25-6: 4 - 42 Watt</td>
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<td>Accepted liquids:</td>
<td>Heating water VDI 2035 Water/Glycol mixtures</td>
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<tr>
<td>Magnetite resistance:</td>
<td>Anti-Block Technology</td>
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<tr>
<td>Accepted temperature range:</td>
<td>-10 °C** to +110° C</td>
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<tr>
<td>Energy efficiency:</td>
<td>EEI ≤ 0,20, ErP 2015 ready</td>
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<tr>
<td>Motor protection class:</td>
<td>IP 44</td>
</tr>
<tr>
<td>Insulation class:</td>
<td>F</td>
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<tr>
<td>Power cable length:</td>
<td>2m</td>
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</tbody>
</table>

**Ecocirc Dimensions**

![Ecocirc Dimensions Diagram]
Installation & Commissioning Instructions

FMU2 Floor Mixing Unit 2

4. Installation

4.1 Installing the FMU2 Floor Mixing Unit

The FMU2 Floor Mixing Unit can be installed directly on the wall or a suitable mounting board by securing its brackets with suitable fixings (depending on the kind of wall). These need to be inserted into the designated holes shown or in an Emmeti manifold cabinet suitable for 120 mm minimum depth partitions.

Where the FMU2 unit is to be wall-mounted, then the mounting surface should be flat and vertical. The space necessary for the FMU2 can be determined from the table and drawing below.

Ensure that there is room for the isolating valves and fittings below the mixing unit inlet connections and leave at least 300mm from the lower manifold rail to the floor to prevent damage to the pipes where they enter the floor.

<table>
<thead>
<tr>
<th>Type</th>
<th>2 ways</th>
<th>3 ways</th>
<th>4 ways</th>
<th>5 ways</th>
<th>6 ways</th>
<th>7 ways</th>
<th>8 ways</th>
<th>9 ways</th>
<th>10 ways</th>
<th>11 ways</th>
<th>12 ways</th>
</tr>
</thead>
<tbody>
<tr>
<td>L mm</td>
<td>160</td>
<td>210</td>
<td>260</td>
<td>310</td>
<td>360</td>
<td>410</td>
<td>460</td>
<td>510</td>
<td>560</td>
<td>610</td>
<td>660</td>
</tr>
</tbody>
</table>

The mounting bracket holes can be used to mark the fixing positions and the mixing unit and manifold assembly screwed to the wall/ mounting surface using suitable fixings ensuring that the assembly is level. The pump should be turned to face forwards to avoid fouling the wall/ mounting surface.

Where the FMU2 mixing unit is to be mounted in a cabinet, check the overall dimensions of the FMU2 Floor Mixing Unit using the table and drawing below.

Secure the mixing unit and manifold assembly inside the cabinet. Ensure that there is room for the isolating valves and fittings below the mixing unit inlet connections and leave at least 300mm from the lower manifold rail to the floor to prevent damage to the pipes where they enter the floor.

Emmeti cabinets have movable internal mounting rails which allow the pump to be turned sideways to minimise the depth (see Fig.1 Page 2 and Fig. 2) and enable the assembly to fit inside the cabinet.
4. Installation

4.1 Installing the FMU2 Floor Mixing Unit

Adjust the cabinet feet with the 2 wing screws at each side, so that there is at least 300mm between the lower manifold rail and the floor. See Fig. 3.

Fig. 3

Secure the casing to the wall with suitable fixings and fill any gaps around the case with cement mortar or other suitable filler. A cardboard protector is provided with Emmeti cabinets to prevent the mortar entering the case.

Connect the flow and return pipes for the underfloor heating system circuits with a Monoblocco connector selected from the Emmeti range for the type of pipe being installed.

4.2 Installation of the thermostatic head and remote sensor for thermostatic regulation

For thermostatic regulation, a thermostatic head, supplied as a separate item, code 90046750, must be used. Set the thermostatic head to the maximum setting then position the head on the thermostatic valve body (see Fig. 1, item 11) with the index marker facing to the front. Then attach the head to the valve body using the securing ring on the head, tightening the ring lightly: do not over tighten.

4.3 Electrical Connections

The Domestic Building Services Compliance Guide recommends the use of a separate flow temperature high limit thermostat for systems connected to a high temperature water supply (i.e. more than 60°C) to ensure that the water temperature in an underfloor heating system does not rise above the temperature recommended for the floor. Emmeti UK offer a thermostat for this purpose, code: 28130632. Emmeti UK also offer EWC-1 and EWC-2 wiring centres designed specifically for the connection of electrical components in underfloor heating systems:

Code U9360010
EWC-1 230V 8-way wiring centre with on-off switch
Code U9360020
EWC-1 24V 8-way wiring centre with on-off switch
Code U9370001
EWC-2 230v 8-way wiring centre
Code U9370002
EWC-2 230v 12-way wiring centre

4.4 Hydraulic Connections

Connect the flow and return pipes to the G1 male inlet connections on the mixing unit. Emmeti recommend installing a suitable isolating valve for connection to the G1 inlet connections:

- Code 01306280, ¾"F x 1"F union, 1 pair with red and blue butterfly handles (no gaskets)
- Code 6066R006, 1"F x 1"F union, 1 pair with red and blue butterfly handles

The use of jointing paste and hemp or similar sealing materials is not recommended as this may interfere with the correct operation of the mixing valve and manifold.
5. Commissioning

5.1 Filling and Testing

The FMU2 Mixer Control Group has a built-in non return valve to ensure that the underfloor heating circuits can be simply filled from the drain and fill valves fitted to Emmeti manifolds. To use the non-return valve the underfloor heating circuits must be filled using the drain and fill valve fitted to the upper rail only – it will not work if the lower drain and fill valve is used to fill the circuits – see Fig. 4. (The FMU2 manifold is shown but the Topway T2 manifold is filled in the same way).

The control group, manifold and underfloor circuits can now be filled and commissioned in accordance with the manifold instructions. Prior to filling, a final check of all joints should be made to ensure no connections have loosened during transit (For details of the recommended commissioning procedure please refer to the Emmeti literature for the manifold). Emmeti manifolds are provided with double regulating valves supplied fitted with either lockshields or flowmeters as standard.

We recommend filling each circuit separately, opening the relative valves and double regulating valves each time and closing them again when the operation is completed. Once filled the system should be pressure tested in accordance with EN 1264.

5.2 Lowara Ecocirc 25-6/130

The pump is supplied with a pre-connected 2m long 3-core lead assembly ready for connection to the electrical controls system which should include a suitable switched fused isolator. Once the pump has been connected to the electrical controls system, ensure that it is filled and vented, then operate the controls system to call for heat and select the desired pump setting using the knob shown below in Fig. 5.

![Diagram of FMU2 Floor Mixing Unit 2](image)

Fig. 5 Lowara Ecocirc pump operating knob
5. Commissioning

5.2 Lowara Ecocirc 25-6/130

The pump has two operating modes:
1. Proportional pressure – where the pump automatically reduces its speed where lower flow is required, saving energy
2. Constant speed - where the pump maintains the same speed regardless of the flow.

To change between the two modes, turn the knob fully anticlockwise and then back to the chosen setting (between 1 and 7) within 5 seconds. The LED in the knob will change colour to indicate which operating mode has been selected:
- White – constant speed
- Blue – proportional pressure

The graphs on the previous page show the seven settings available in each operating mode to enable the pump to be set to give the correct flow to meet the designed heating load.

In order to remove air from the pump, an air purge function can be selected by turning the knob fully anticlockwise, waiting for at least five seconds, then turning the knob to the desired setting between 1 and 7. The air purge cycle will then start and last about 10 minutes before reverting to the chosen operating mode.

The pump can also be set to standby if required by selecting the air purge cycle and then immediately turning the knob back fully anticlockwise again. The LED will give a steady light to show it is in standby mode.

\[ \Delta T_{\text{Pip}} = 0,25 \text{ bar} \]

<table>
<thead>
<tr>
<th>Capacity (W)</th>
<th>Circulator Setting</th>
<th>Valve Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>18000</td>
<td>maximum</td>
<td>5</td>
</tr>
<tr>
<td>17000</td>
<td>maximum</td>
<td>3 - 4</td>
</tr>
<tr>
<td>16000</td>
<td>maximum</td>
<td>2</td>
</tr>
<tr>
<td>15000</td>
<td>maximum</td>
<td>1</td>
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<td>5</td>
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<tr>
<td>12000</td>
<td>average</td>
<td>4</td>
</tr>
<tr>
<td>11000</td>
<td>average</td>
<td>2 - 3</td>
</tr>
<tr>
<td>10000</td>
<td>average</td>
<td>1</td>
</tr>
</tbody>
</table>

\[ \Delta T_{\text{Pip}} = 0,25 \text{ bar} \]

<table>
<thead>
<tr>
<th>Capacity (W)</th>
<th>Circulator Setting</th>
<th>Valve Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>9000</td>
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<tr>
<td>8000</td>
<td>maximum</td>
<td>2 - 3</td>
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<td>0</td>
</tr>
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<td>6000</td>
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<td>5</td>
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<tr>
<td>5000</td>
<td>average</td>
<td>2 - 3</td>
</tr>
<tr>
<td>4000</td>
<td>average</td>
<td>0</td>
</tr>
</tbody>
</table>

\[ \Delta T_{\text{Pip}} = 5 \text{ °C} \]

\[ \Delta T_{\text{Pip}} = 0,25 \text{ bar} \]

\[ \Delta T_{\text{Pip}} = 0,25 \text{ bar} \]

For more information please call us on 01993 824900 or view our website at www.emmeti.co.uk
Installation & Commissioning Instructions

FMU 2 - Floor Mixing Unit 2

5. Commissioning

5.3 Setting the Flow Increase Valve

Once the total flow rate of the system has been calculated:

\[ Q_{ip} = \text{total underfloor system flow-rate} = \left( \frac{P [W] \times 0.86}{\Delta T_{ip}} \right) \]

Where \( P \) is the total calculated heat demand in Watts and \( \Delta T_{ip} \) is the calculated temperature difference across the underfloor system.

The pressure drop for the mixing unit can be read off on the graph Fig. 6. The mixing unit pressure drop curves show the Flow Increase Valve settings from fully closed to fully open and allow the installer/designer to choose a suitable flow rate and pressure drop to suit the system. Together with the calculated pressure drop of the underfloor system and manifold, the pump setting can then be chosen.

The tables, Fig. 7, show two examples of required system output against the Flow Increase Valve setting based on assumed values of underfloor flow temperature, temperature drop and pressure drop for the underfloor system for guidance.

If necessary, adjust the Flow Increase Valve as follows:

- Excessively high temperature drop.
- Insufficient flow rate - gradually open the Valve until you reach the required temperature drop.
- Flow temperature below the required value.

Gradually close the Valve until the required temperature is reached, allowing time for the system temperature to stabilise.

5.4 Setting the thermostatic head

Once the system has been filled and pressure tested, the individual underfloor circuits can be balanced. As part of this process the mixed flow temperature must be adjusted to the correct level for the system design. To achieve this, the thermostatic mixing valve can be set on the thermostatic head (ref. no. 7, Fig. 1), from 20 to 70°C as follows:

1. Turn the knob of the thermostatic head, to set the required underfloor flow temperature.
2. Allow sufficient time for the temperature to stabilise, then check the setting against the temperature reading on the mixed flow temperature gauge fitted to the control group (ref. no. 9, Fig. 1).

Temperature setting lock

The thermostatic head is provided with two setting pins, one red and the other blue. These pins are provided to lock the temperature setting as follows:

1. Set the required temperature as described above.
2. Locate the black dot - see Fig. 8 - and insert one pin on each side of the dot.
3. The head can now be rotated.

Fig. 8

5.5 Double regulating lockshield adjustment

The following commissioning instructions show separately the different procedures for setting up the designed flow rate using either lockshields or flowmeters.

Emmeti have evolved a new and superior lockshield design. This allows easier, quicker and more accurate onsite setting of the correct flow. It is more accurate at maintaining the correct low flow, when set to a small aperture. This lockshield can be upgraded on site to become an integrated flowmeter and lockshield.

How to balance using the lockshield:

Remove the red cover 1.

The black plastic assembly underneath has an inner sleeve, and an outer sleeve. The outer sleeve is used for isolating the valve, actuated using the impression in the top of the red cover. The inner sleeve is used to balance the circuit, increasing or decreasing the flow by using a 4mm Allen key, placed in the hexagon recess in the centre. The valve is supplied in the fully isolated position (flow is closed). First fully open the circuit. Turn the red cover over and using the top, turn the outer (isolating) sleeve 2 anticlockwise, until the circuit is fully open, rotate until you feel steady resistance, then stop. Then rotate back half a turn. To verify, you will have seen the black plastic assembly rising. Then, using the 4mm Allen key placed in the hexagon recess, rotate the inner (balancing) sleeve 3 clockwise. To verify you will have seen the inner sleeve falling. Rotate until you feel a strong resistance, then stop. Rotate back half a turn. The lockshield is now ready for flow setting.

NOTE: Make sure you do not leave the inner (balancing) sleeve in the fully open position, back it off half a turn to be sure the o-ring is not stressed.
5. Commissioning

5.5 Double regulating lockshield adjustment

Using the graphs below you can calculate the number of turns required to reach your chosen flow rate. Now start to open the inner (balancing) sleeve anticlockwise, by the number of turns you have calculated. Then stop. It is now set. Replace the red cover. To prevent tampering, you can seal the red cover into position, using wire and a lead seal, making use of the 2 holes in fins 4 on the red cover.

**Calculation methods:**

How to calculate the $\Delta p$ pressure drop with a 200 l/h Q water delivery capacity determined by the valve and lockshield, with 2.5 turns opening of the inner (balancing) sleeve.

1° Method: Use the pressure drop diagram see Fig. 9 below

$Q = 200 \text{ l/h}\quad \Delta p = 40 \text{ mbar}$

where $K_v$ stands for $Q$ the flow rate in $m^3/h$ corresponding to $\Delta p$ equalling 1 bar: $K_v = Q / \Delta p$

The relationship between $\Delta p$ (bar) and $Q$ ($m^3/h$) is as follows: $\Delta p = Q^2 / K_v^2$

$\Delta p = \Delta p$ one way + $\Delta p$ return;

$T_A = \text{All open. The above values refer to water temperature } 15^\circ C.$

$\Delta p = \text{no. of turns for opening adjustment device}$

$\Delta p = \text{no. of turns for opening adjustment device}$

2° Method: Use the $K_v$ diagram, see Fig.10 below

$K_v = 0.98 Q = 0.2 m^3/h$

$p = 0.22 / 0.98 \quad 2 = 0.04 \text{ bar}$

**Kv values (lockshield)**

- $K_v$ values for lockshield adjustment screw: nr. turns

**Fig. 9**

**Fig. 10**

5.6 Double regulating flowmeter adjustment

**Range of measurement**

- 0-4 l/min

**Maximum operating pressure**

- 6 bars

**Max. operating temperature**

- 90 °C

**Kv**

- 0.15 (1 l/min) - 0.55 (4 l/min)

**Kv max off scale**

- 0.9

**Precision**

- ±10% $fs$

**fs**

- Bottom of scale

**How to balance the circuits using flowmeters**

Flowmeters have a double regulating function i.e. they not only adjust water flow but also include an isolating function which can be opened and closed without affecting the flow setting.

The flowmeter has an inner combined flow regulator and flowmeter, see Fig. 11, and an outer red collar. The red collar, (1), is used for isolating the valve. The inner regulator is used to set the flow in the circuit, increasing or decreasing the flow by using the 19 mm spanner flats provided, see Fig. 12. The change in flow can be read in the scale on the flowmeter tube. The valve is supplied in the fully closed position. First open the isolating valve following the instructions below:

Turn the red collar anticlockwise approximately three and a half turns. You will see the whole of the flowmeter rotating and rising. If the valve is over-rotated - more than three and a half turns - then the internal plastic threads can become damaged and cause leaks. If you reach the positive stop please rotate back half a turn.

You are now ready to use the flow regulating function.

Lower the red collar until it touches the manifold (1). Then using a 19mm spanner, or your fingers, adjust the flow using the black spanner flats at the bottom of the flowmeter (2). You can read the required flow in litres per minute directly from the red indicator against the scale in the clear flowmeter tube. When you have set the required flow rate, raise the red collar (1) again, until it is engaged against the black spanner flats at the bottom of the flowmeter (2), see Fig. 13.

You can seal the red collar into position, using wire and a lead seal, using the two holes in the red collar (3) - Fig. 13 or product code 01306320 red circuit indicator bands.

Please see our website at www.emmeti.co.uk/products/manifold-accessories/spares-and-upgrade-kits.

**Cleaning the flowmeter tube**

Turn the red collar (1) clockwise, until the isolating function is fully closed. Remove the flowmeter tube by securing the black spanner flats, then using either hand pressure or a 17mm ring spanner, gently unscrew the flowmeter tube anticlockwise. Clean the tube and screw it back on. Turn the red collar (1) anticlockwise until the isolating valve is fully open again.
5. Commissioning

5.6 Double regulating flowmeter adjustment

Flowmeter pressure drop vs flow rate

Flow rate (l/h)

<table>
<thead>
<tr>
<th>Flow rate (l/h)</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
<th>3.5</th>
<th>TA</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆p [mbar]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
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<td></td>
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<td>100</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

no. of turns for opening the flow regulator

TA = Fully open.

The above values refer to water temperature at 15 °C.