KTM Pressure Independent Control Valve
# Table of Contents

3  **Why Pressure Independence?**

4  **Introducing the KTM Control Valve**

5  **Control Valve Operation**

6  **Features and Benefits of the KTM**

7  **Sizing and Selection**

8-9  **Sizing Selection Graph**

10  **KTM Dimensional Data**

11  **Connections and Adapters**

12  **Installation and Adjustments**

13  **Specifications and Ordering**

14-15  **Suggested Specifications**
Why Pressure Independence?

Why Design for Constant Differential Pressure?

The three main benefits of maintaining constant differential pressure in the control valve are:

- Accurate and stable modulating control giving reduced energy costs.
- No complaints about irritating noise.
- Easy balancing and commissioning, due to hydraulically independent circuits.

Typical variable flow systems have certain advantages, like reduced pump energy consumption, good compatibility between production and distribution flows, and they can be designed with a diversity factor allowing for plant expansion with the same pipe work since full load does not occur often.

Design vs. Reality

In the real world, hydronic systems don’t often operate at design load, so the control valves have problems fulfilling their role. If a plant is running at 50% of design load then flow will be around 20% of design flow. Pressure drops in pipes and accessories on the circuits become negligible and differential pressure on the circuit increase dramatically. The control valves are obliged to work with a small opening, making modulating control difficult. This in turn leads to dramatic climate swings as the controller will only be able to operate in on-off mode, leaving you with three options:

- Accept unstable control
- Widen the proportional band (and lose accurate control)
- Balance the system with differential pressure controllers

In order to optimize your system and get the most out of the variable flow systems, the controllers must be able to do their job properly. The controllers can only do this if design flows prevail in the plant when necessary. If the differential pressure varies too much, it is necessary to stabilize it to prevent incorrect flows. Thus, being able to keep differential pressure constant will improve control, ensuring comfortable indoor climate, less noise, lower start-up and maintenance costs as well as energy efficient operation.

Using a valve which maintains a constant differential pressure, like the KTM from Flow Design, helps you cost-effectively optimize your variable flow system to achieve the ideal indoor climate for your building projects. You’ll reap the benefits of real energy savings, reduced maintenance, and peace of mind for years to come.

Thank you for choosing Flow Design!

The KTM is ideal when the requirements include—

- Precise and accurate temperature control, such as in hospitals, research laboratories, or process control applications;
- Variable load balancing and hydraulic independence, when wide load swings are present, such as shopping malls, hotels, convention centers or schools;
- Future expansion possibilities, such as warehouses, large lease office buildings, and schools.
The Flow Design KTM offers a broad size range suitable for any building application, at a competitive price point, and with a proven track record of trouble-free use. It represents the best value in the market for pressure independent control valves.

The KTM from FDI is a pressure independent flow and temperature control valve built in one body especially for use on chilled or hot water coils in fan coil units, air handlers, variable flow systems and other similar places where accurate control of flow and temperature is required.

- It consists of a throttle for flow adjustment (flow limitation valve), valve for temperature regulation (control valve) and inline differential pressure ($\Delta P$) controller, built one after another in one common housing. It’s three typically separate valve functions, in one simple component.

- The KTM’s flow at a given setpoint remains constant regardless of any pressure variations in the system up to 230 psi. The differential pressure controller keeps the differential pressure over the control valve constant, guaranteeing a control valve authority close to one regardless of the load, for the ultimate in accurate control.

- The high control valve authority means you can design for a reduced pressure drop across the control valve (for lower noise), lower the pump head (optimize the use of the variable speed pumps) and by that, reduce overall pumping costs.

- Every control loop is hydraulically independent. Changes in other circuits have no effect on the flow in the circuits where these valves are installed. The system can be built upon in a modular fashion, making it easier to accommodate future expansions.

- The KTM’s conical valve plug design provides equal percentage characteristics for modulating control. The maximum flow rate is set by use of a convenient dial and the actuator takes over from there. The actuator moves the linear plug mechanism to set the flow at any value between zero and the set maximum. This simple design provides easy presetting of flow rates and greater flexibility in valve selection by eliminating the typical $C_v$ sizing calculations.

- The KTM valve is pressure relieved, so high-force actuators are not required. Low-force actuators can completely shut the valve since there is a constant differential pressure across the control surface, even with high differential pressure in the systems.

- The highly efficient inline design of the KTM valve provides good cavitation resistance and ensures noise free operation of the valve even in extreme conditions. Engineers, installers and the tenants all gain peace of mind.

- The use of special Ryton® PPS reduces the friction between the surfaces and thus gives the valve good hysteresis properties.

- Each KTM valve is individually tested for valve and seat leakage, and flow accuracy. Valves in size group 3 and above are provided with individual flow charts for accurate presetting.

- The KTM valve is available with a standard factory mounted actuator from the factory. Any other actuator if supplied to the factory can be assembled with the valve from the factory; the KTM valve can be preset and tagged to the required flow.
**HOW DOES THE KTM WORK?**

The pressure upstream of the throttle of the valve acts through an internal capillary tube (V+) to the inlet side of the diaphragm (3) in the pressure regulation chamber and attempts to close the valve.

The pressure downstream of the throttle acts through the internal capillary tube (V-) to the outlet side of the diaphragm and together with the spring force (2) attempts to open the valve.

The maximum flow required is set through the throttle (1) on threaded valves and the maximum flow is set through the adjustment nut and thus the actuator lift limitation on flanged valves.

The pressure regulating mechanism maintains a constant differential pressure across the control surface regardless of the pressure variations in the system.

**KTM 1/2" - 2" (Threaded)**

The pressure regulating mechanism is capable of absorbing very high differential pressures while maintaining constant flow at a given setpoint across the valve regardless of the pressure variations in the system up to 230 psi, giving, the engineer, the contractor and the tenant a peace of mind.

Once the maximum flow is set, the actuator modulates the flow according to the requirements and the integrated differential pressure controller maintains constant differential pressure and thus constant flow in the circuit at a given setpoint regardless of the pressure variations in other parts of the system.

A separate shut-off/isolation valve, like a ball valve on threaded valves, or a butterfly valve on flanged valves, can be installed for shut-off operation.

**KTM 2 1/2" - 5" (Flanged)**

Note: The KTM closes at increasing flow or temperature. When fail closed is needed, KTM should be used with actuators which extend their stem in case of power failure to fully close the valve. The KTMI is a KTM valve with inverse action. The KTMI can be used with actuators which retract their stem in case of power failure in applications where fail closed is needed. For more information on the KTMI, contact your sales representative or Flow Design at 1-800-ASK-FLOW.
# Features and Benefits of the KTM

## Features


2. Mechanism to manually limit the flow and also control the flow with the actuator.

3. Differential pressure regulator maintains a constant differential pressure across the control surface regardless of differential pressure variations in the system up to 230 psi.

4. The conical plug ensures Equal percentage characteristics (EQM) at full flow.

5. The KTM valve requires a very small pressure drop to operate.

6. Compact Inline Design.

7. Flow control accuracy within ±5%.

8. Tests
   - Leakage Test
   - Seat Leakage Test
   - Flow Measurement Test

## Benefits

1. Eliminates the need for multiple components, reducing connections, total product and labor costs. Robust inline design saves space.

2. Eliminates the need for Cv calculations and sizing. Gives the user the flexibility to select the valve with the required max flow/tonnage and allow the actuator to modulate the flow.

3. Pressure variations in the system will not affect the flow.

4. Ensures that circuits are independent of each other, allowing easier commissioning and making the system modular to accommodate future expansions.

5. Ensures that there is desired flow at all conditions, enabling faster startup, saving pump head and reducing energy costs.

6. Control valve authority close to one, regardless of load, provides greater overall control performance while reducing pump head and pumping costs.

7. Most of the pressure drop takes place in the regulating chamber, the control valve sees smaller pressure drops, and the valves are much quieter-reducing tenant complaints.

8. EQM characteristics means that the valve matches the characteristics of the heat exchanger or the cooling coil, so heat transfer is proportional to the control signal thus giving accurate control.

9. The efficient valve design makes the required pressure drop for valve operation very small, helping to reduce pump head and energy usage.

10. Inline design makes the valve compact and allows greater flows and smaller valves with less risk of cavitation.

11. Inline design makes it easier to insulate the valve if necessary.

12. The efficient valve design ensures that the accuracy is within ±5%, providing precise temperature control, increased comfort and energy savings.

13. Each and every valve is subjected to all of these three tests, which ensures that the valve is 100% seat tight, leak proof and accurate within ±5% of the stated value.
The KTM valve can be selected by any of three options:

1. If you know the required tonnage at 10 degree temperature difference, the required valve can be selected based on tonnage from the dimension table (see page 10), and the required end connection can be chosen from the connections table (see page 11).

2. If you do not know the tonnage, the valve can be selected based on the maximum flow required and the available connections as shown in the Dimensions table (page 10) and Connections table (page 11).

For example, if you require 17 gpm on a 1” pipe, you can choose the valve from size group 2, with Fc=3 psi, which flows 18.5 gpm and is available with end connections for 1” pipe.

3. The valve can also be easily selected from the tabular graphs on page 8 (Fc = 3) and page 9 (Fc = 6). Each of the vertical bars represent a size group, referenced at the bottom of each bar; within each bar, the total pressure drop across the valve is shown at a particular gpm, as referenced on the left side of the chart. Select the size group with the preferred pressure drop at a given gpm.

The pressure drop across the valve can be calculated as follows:

Fc represents the pressure drop across the throttle and control surface which is constant 3 psi or 6 psi, depending on the valve chosen and it can be verified through the P/T ports provided on the KTM valve.

The pressure drop in the differential pressure controller can be calculated by the using the following formula since the design flow Q and Cv of the valve are known:

$$\Delta P_{\text{controller}} = \left( \frac{Q}{C_v} \right)^2$$

(Q is the design flow in gpm)

Therefore the total pressure drop across the valve can be calculated by the following formula:

$$\Delta P_{\text{Total}} = F_c + \left( \frac{Q}{C_v} \right)^2$$

($\Delta P_{\text{Total}}$ is in psi, Fc = 3 psi or 6 psi depending on the valve selected, Q is the design flow in gpm, Cv of the valve found in the Dimensions table).

The illustration above shows the application of the KTM valve on a typical air handling unit. For more application examples of all Flow Design products, please refer to our application guide form No. 320.
EXAMPLE: Select the best fit valve capable of flowing 10 gpm from the Fc = 3 chart above. Looking at the tables for each Group Size, you will see that all but the smallest valve (Group Size 1) will flow 10 gpm. The general recommendation is to choose the smallest valve possible that will handle the required flow at an acceptable pressure drop. This increases control accuracy and reduces first cost. You will see that in Group 2, the total pressure drop across the valve at 10 gpm will be about 3.3 psi. Then, confirm the available connections between the selected Group Size and the actual pipe size, as shown in the tables on page 11, to match your piping configuration.
The following graph represents $\Delta P_{\text{Total}}$ in psi for the minimum and maximum controllable flow of the KTM valve in size groups 1-7.
### KTM DIMENSIONAL DATA

#### PRODUCT INFORMATION

**KTM 1/2" - 2" Threaded**

**KTM 2 1/2" - 5" Flanged**

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### DIMENSIONS

**Max $\Delta P = 230$ PSI, $F_C = 3$ PSI**

<table>
<thead>
<tr>
<th>Tons of Cooling/ Heating per $10^\circ \Delta T$</th>
<th>Qmax gpm</th>
<th>Size Group</th>
<th>FDI Model No.*</th>
<th>d(Thread)</th>
<th>Flange ANSI Class</th>
<th>$\Phi D$ in</th>
<th>$L$ in</th>
<th>$H1$ in</th>
<th>$H2$ in</th>
<th>$Cv$</th>
<th>Weight lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4.8</td>
<td>1</td>
<td>KTM3DP-2TON-T</td>
<td>-</td>
<td>150</td>
<td>3.1</td>
<td>4.3</td>
<td>1.8</td>
<td>3.9</td>
<td>4.8</td>
<td>3.3</td>
</tr>
<tr>
<td>8</td>
<td>18.5</td>
<td>2</td>
<td>KTM3DP-8TON-T</td>
<td>-</td>
<td>G 1 1/4</td>
<td>3.8</td>
<td>5.9</td>
<td>2.1</td>
<td>3.7</td>
<td>18.6</td>
<td>4.4</td>
</tr>
<tr>
<td>18</td>
<td>44.0</td>
<td>3</td>
<td>KTM3DP-18TON-T</td>
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<td>G2</td>
<td>4.9</td>
<td>7.5</td>
<td>2.6</td>
<td>3.7</td>
<td>40.7</td>
<td>9.9</td>
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<tr>
<td>36</td>
<td>86.1</td>
<td>4</td>
<td>KTM3DP-36TON-FL</td>
<td>-</td>
<td>2 1/2&quot;</td>
<td>8.7</td>
<td>11.4</td>
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<td>5.7</td>
<td>81.4</td>
<td>48.5</td>
</tr>
<tr>
<td>44</td>
<td>105.7</td>
<td>5</td>
<td>KTM3DP-44TON-FL</td>
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<td>3&quot;</td>
<td>8.7</td>
<td>12.2</td>
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<td>5.7</td>
<td>81.4</td>
<td>52.9</td>
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<tr>
<td>73</td>
<td>176.1</td>
<td>6</td>
<td>KTM3DP-73TON-FL</td>
<td>-</td>
<td>4&quot;</td>
<td>12.6</td>
<td>13.8</td>
<td>4.5</td>
<td>7.3</td>
<td>174.4</td>
<td>119.0</td>
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<tr>
<td>92</td>
<td>220.1</td>
<td>7</td>
<td>KTM3DP-92TON-FL</td>
<td>-</td>
<td>5&quot;</td>
<td>12.6</td>
<td>15.7</td>
<td>5.0</td>
<td>8.3</td>
<td>174.4</td>
<td>127.9</td>
</tr>
</tbody>
</table>

Dimensions not to be used for construction unless prints certified by factory

**Max $\Delta P = 230$ PSI, $F_C = 6$ PSI**

<table>
<thead>
<tr>
<th>Tons of Cooling/ Heating per $10^\circ \Delta T$</th>
<th>Qmax gpm</th>
<th>Size Group</th>
<th>FDI Model No.*</th>
<th>d(Thread)</th>
<th>Flange ANSI Class</th>
<th>$\Phi D$ in</th>
<th>$L$ in</th>
<th>$H1$ in</th>
<th>$H2$ in</th>
<th>$Cv$</th>
<th>Weight lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6.6</td>
<td>1</td>
<td>KTM6DP-3TON-T</td>
<td>-</td>
<td>150</td>
<td>3.1</td>
<td>4.3</td>
<td>1.8</td>
<td>3.9</td>
<td>4.8</td>
<td>3.3</td>
</tr>
<tr>
<td>10</td>
<td>23.3</td>
<td>2</td>
<td>KTM6DP-10TON-T</td>
<td>-</td>
<td>G 1 1/4</td>
<td>3.8</td>
<td>5.9</td>
<td>2.1</td>
<td>3.7</td>
<td>18.6</td>
<td>4.4</td>
</tr>
<tr>
<td>22</td>
<td>57.2</td>
<td>3</td>
<td>KTM6DP-11TON-T</td>
<td>-</td>
<td>G2</td>
<td>4.9</td>
<td>7.5</td>
<td>2.6</td>
<td>3.7</td>
<td>40.7</td>
<td>9.9</td>
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<tr>
<td>55</td>
<td>132.1</td>
<td>4</td>
<td>KTM6DP-55TON-FL</td>
<td>-</td>
<td>2 1/2&quot;</td>
<td>8.7</td>
<td>11.4</td>
<td>3.5</td>
<td>5.7</td>
<td>81.4</td>
<td>48.5</td>
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<tr>
<td>62</td>
<td>149.7</td>
<td>5</td>
<td>KTM6DP-62TON-FL</td>
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<td>8.7</td>
<td>12.2</td>
<td>3.8</td>
<td>5.7</td>
<td>81.4</td>
<td>52.9</td>
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<td>100</td>
<td>242.2</td>
<td>6</td>
<td>KTM6DP-100TON-FL</td>
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<td>12.6</td>
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<td>128</td>
<td>308.2</td>
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<td>15.7</td>
<td>5.0</td>
<td>8.3</td>
<td>174.4</td>
<td>127.9</td>
</tr>
</tbody>
</table>

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*NOTE: FDI Model No. is based on $10^\circ \Delta T$. For pressure independent KTM control valves, any value of $\Delta T$ can be selected depending on the application; the tonnage capacity of that valve will vary accordingly.*
### Connections

<table>
<thead>
<tr>
<th>Tons of Cooling/Heating per 10° ΔT</th>
<th>Q&lt;sub&gt;max&lt;/sub&gt; (gpm)</th>
<th>Size Group</th>
<th>FDI Model No.</th>
<th>Union Threads</th>
<th>1/2&quot;</th>
<th>3/4&quot;</th>
<th>1&quot;</th>
<th>1 1/4&quot;</th>
<th>1 1/2&quot;</th>
<th>2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4.8</td>
<td>1</td>
<td>KTM3DP-2TON-T</td>
<td>G1</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>18.5</td>
<td>2</td>
<td>KTM3DP-8TON-T</td>
<td>G 1 1/4</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>44.0</td>
<td>3</td>
<td>KTM3DP-18TON-T</td>
<td>G2</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- Sizes 2 1/2" and above are flanged and do not need any separate connections.
- \( F = \text{Female NPT}, \ M = \text{Male NPT} \) and \( S = \text{Sweat} \)

### Connections

<table>
<thead>
<tr>
<th>Tons of Cooling/Heating per 10° ΔT</th>
<th>Q&lt;sub&gt;max&lt;/sub&gt; (gpm)</th>
<th>Size Group</th>
<th>FDI Model No.</th>
<th>Union Threads</th>
<th>1/2&quot;</th>
<th>3/4&quot;</th>
<th>1&quot;</th>
<th>1 1/4&quot;</th>
<th>1 1/2&quot;</th>
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</thead>
<tbody>
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<td>KTM6DP-3TON-T</td>
<td>G1</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td></td>
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</tr>
<tr>
<td>10</td>
<td>23.3</td>
<td>2</td>
<td>KTM6DP-10TON-T</td>
<td>G 1 1/4</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td>F,M,S</td>
<td></td>
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### Adapters for Linear Actuators

The adapters for the following linear actuators are available. The adapter ordering code must be used when ordering the KTM valve to ensure proper adapter for your actuator is supplied with the valve.

<table>
<thead>
<tr>
<th>Company</th>
<th>Actuator Model</th>
<th>Adapter Ordering Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Design*</td>
<td>AVM 115S</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>AVM 234SF132</td>
<td>2</td>
</tr>
<tr>
<td>Johnson Controls</td>
<td>VA 715X series</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>VA 4233 series</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>VA-7450 series</td>
<td>5</td>
</tr>
<tr>
<td>Honeywell</td>
<td>M7410E</td>
<td>6</td>
</tr>
<tr>
<td>Siemens</td>
<td>Powermite 599 Series</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>(MT series SSC electronic)</td>
<td></td>
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</tbody>
</table>

**Note:**
- *Preferred actuator for KTM valves, available directly from the factory.

Flow Design actuator can be ordered from the factory by specifying the Model No. on the actuator, AVM 115S to be used for threaded valves and AVM 234SF132 to be used for flanged valves. When Flow Design actuator is ordered, the KTM valve is assembled with the actuator mounted on the valve.

Any other actuator from the above list can also be mounted and assembled on the KTM valve if supplied to the factory.

KTM valves with flanged ends have their control head individually designed for the actuators which would be used on it, so it is necessary to specify the actuator to be used with the KTM valve when ordering.
**INSTALLATION**

It is possible to install the KTM valve in the return pipe (i.e. downstream the consumer) or in the inlet pipe (i.e. upstream the consumer).

It is recommended to install the valve in the return pipe. The flow direction is show by the arrow (11) on the valve’s body.

The best position is horizontal one where vent screws are on the top and the flow adjustment scale is visible.

In case where electrical actuator is used, it is recommended to install the KTM valve with adapter on top or in a lateral position, so as to prevent the water to come in direct contact with electricity.

Installation of a strainer (e.g. Flow Design Inc. Model YC) upstream of the valve is recommended.

For the proper functioning of the valve, it is important to ensure that the working temperature and pressure do not exceed allowed values.

Before installing the valve, it is recommended to check the fitting length of the valve and distance between the connections on the pipeline.

While soldering the valve must be protected from too high temperature. This typically means that soldering should be carried out by slipping union nut and tail piece onto the pipe separate from the valve, soldering the tailpiece in place, and installing the valve with the gaskets between the tailpieces after they have cooled.

In case of flanged connections (i.e. 2 ½” and higher models), check the pitch diameter and the screw threads.

When the pipeline and the KTM valve are full of water and the pressure is stabilized, vent the valve with the vent screws (2).

Pressure and temperature ports (i.e. P/T ports) can be installed on the valve to measure the differential pressure across the throttle and control valve.

It is possible to install a shut-off/isolation valve (Ball valve for threaded ends and Butterfly valve for flanged end valves). The P/T ports on the shut off valve along with the ones on the valve body can be used to measure the differential pressure across the valve.

Note: The shut-off operation can be achieved by the actuator also.

**ADJUSTMENTS**

**Flow adjustment for threaded end valves**

1. Unscrew the fixing nut (7) on a throttle up till the end.

2. Turn the throttle (10) clockwise down to the start position (the point 0,0 on the adjustment scale and the red pointer (8) on the body should be aligned).

3. Then adjust the corresponding number of scale turns to the required maximum flow according to the flow chart.

4. When the flow is adjusted, tighten the fixing nut clockwise down until it stops.

5. It is possible to secure the position of the throttle with the leaden seal - use holes on the body (9) and the throttle (10).

The water flow has been measured on each individual valve in all positions of adjustment scale.

**Flow adjustment for flanged end valves**

1. Unscrew the fixing screw (7) with an Allen key 2 mm.

2. Screw the flow adjustment screw (1) clockwise until it stops (setting 0,0 on the adjustment scale).

3. Unscrew the flow adjustment screw for the necessary full number of turns.

4. Then unscrew the flow adjustment screw further until the corresponding decimal number is aligned with the pointer (8).

5. At the end tighten the fixing screw.

The water flow has been measured on each individual valve in all positions of adjustment scale.

Note: Each valve has its own identity number and individual flow chart included in the scope of supply. The flow chart corresponds to water only. A copy of the chart can be provided by supplier.

To obtain the chart please provide the following Information: Valve Type, Size, Fc and Serial Number.
**Specifications**

- **Manufacturer:** Flow Design, Inc.
- **Sizes available:**
  - ½” - 2” (threaded)
  - 2 ½” - 5” (flanged per ANSI 150)
- **Maximum static pressure:** 360 psi (25 bar)
- **Max. differential pressure:** 230 psi (16 bar)
- **Pressure drop on the throttle and control valve (Fc):** 3 psi, 6 psi*
  - *6 psi via special order
- **Min/Max Temperature:** 14° /284°F
- **Flow Control Accuracy:** ±5 %
- **Valve body:** Ductile iron EN-GJS-400 18LT

- **Diaphragms and gaskets:** EPDM
- **Valve plug:** Stainless steel and EPDM, conical
- **Surface treatment:** Electrophoretic painting
- **Actuators:**
  - Adapters are available for most common linear actuators.
  - Max lift of the actuator must be confirmed.
- **Max. lift of the control valve:**
  - Size 1/2"-2" (Threaded): 0.4"
  - Size 2 1/2" - 5" (Flanged): 0.8"
- **Force required on the actuator:**
  - Size 1/2"- 2" (Threaded) – 23 pound-force
  - Size 2 1/2" - 5" (Flanged) – 90 pound-force

**Ordering Information**

- **Model No.**
  - **KTM3DP2-TON-T - 1/2M - 1/2M - 1 - UB/BF+FF**

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<tr>
<th>KTM Model</th>
<th>3DP</th>
<th>2-TON</th>
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<td>3DP3DPP2-TO</td>
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**Options**

**NOTE:**

- A shut-off valve Model UB with a P/T port for measuring pressure drop across the KTM valve, as explained in Testing and Commissioning (page 15) is available as a hook-up assembly with the KTM threaded valves.
- KTM Flanged valves can be provided with ANSI Class 150 flange spacer (Model FF) with an integral P/T port and a butterfly valve, (Model BF) for shut-off functionality as a hook-up assembly from the factory.
Pressure Independent Flow and Temperature Control Valve

A) MANUFACTURERS
1. Flow Design Inc. Model KTM 512 or approved equal.

B) DESIGN
1) The control valves shall exhibit pressure independent flow characteristics.
2) All pressure independent flow and temperature control valves shall consist of flow regulating throttle (balancing valve), valve for temperature control (control valve) and a pressure regulating mechanism (differential pressure control valve) in a single housing.
3) All pressure independent flow and temperature control valves shall have a conical plug for EQM characteristics.
4) All pressure independent flow and temperature control valves shall have a compact inline design, with low pressure losses and low noise operation characteristics.
5) The pressure regulating mechanism shall compensate for the pressure changes in system and shall maintain a constant pressure drop across the throttle and control surface for differential pressure changes up to 230 psi.
6) It should be possible to manually limit the flow to the required value with the flow adjustment throttle/nut and then modulate the flow with the control valve actuator.
7) Balancing valves and associated balancing shall not be required on devices where these pressure independent flow and temperature control valves are installed.
8) All pressure independent flow and temperature control valves shall use a low force linear actuator (eg. 23 lb-f on smaller valves and 90 lb-f on valves which are flanged) to modulate the flow.
   a) The manufacturer will be able to supply adapters for most common actuators. Please refer to the manufacturer’s technical submittal for more details.
   b) These low force actuators shall be able to shut-off the valve completely (bubble-tight).
   c) The control valve actuators can be supplied and installed by the pressure independent flow and temperature control valve manufacturer, or supplied and installed by the controls contractor or supplied by the controls contractor and shipped to the pressure independent flow and temperature control valve manufacturer for factory installation. The controls contractor shall be responsible for the wiring and testing the valve actuators.
   d) In cases where safety function is needed, use actuators which extend the stem in case of power failure.
9) The valve shall have two integral ports factory installed capable of being used to measure pressure or temperature. The first port shall be installed at the inlet to the valve, the second shall be installed between the throttle chamber and pressure regulating chamber. The differential pressure between these two ports shall be used to verify proper valve operation and flow regulation.
10) Isolation ball valve for smaller sizes and isolation butterfly valve along with spacer flange for higher sizes can be ordered for separate shut-off operation and the P/T port mounted on this ball valve or the spacer flange in case of butterfly valve can be used along with the ports mounted on the valve body to measure the differential pressure across the valve to verify that minimum required differential pressure is available for proper regulation.

C) MATERIAL AND CONSTRUCTION
1) The valve body shall be made of Ductile Iron and shall be surface treated with electrophoretic painting to give valve the best corrosion resistance beneath the outer layer of the coatings.
2) The diaphragm and seals shall be EPDM.
3) The springs shall be stainless steel.
4) The valve plugs shall be stainless steel and EPDM.
5) It is permissible to use only Ryton® PPS, EPDM or steel for internal parts. Use of any other plastic is not permissible.
6) The valves shall be designated based on tons of cooling for 10°C delta T and on the threads/flange size.
7) The smaller valves shall be available with union end to fit different combination of tailpieces. Please refer to manufacturer’s technical data for more information.
8) The bigger valves shall be flanged according to ANSI Class 150. Please refer to manufacturer’s technical data for more information on available sizes.
9) The required minimum pressure drop for valve operation shall be between 3 to 4.7 psi (for Fc=3 psi valve).
D) TESTING AND RATINGS

TESTS

Each valve shall be subjected to the following tests:

1) Leakage Test: Each valve shall be individually tested for leakage at 85 psi of air. All the valves are required to be leak proof.

2) Seat Leakage Test: Each valve shall be individually tested for seat leakage at 85 psi of air.

3) Flow Measurement Test: Each valve shall be individually tested for flow accuracy. The flow accuracy of the valve has to be within ±5%. Valves with 18 tons and higher capacity shall have the individual flow chart accompanying the valve.

RATINGS

1) The valves are rated for 350 psi at 14°F to 284°F.
2) The maximum pressure drop in the valve is 230 psi.

E) INSTALLATION

1) It should be possible to install the pressure independent flow and temperature control valve in the supply or return pipe.

2) The best position is horizontal with vent screws on top and flow adjustment scale should be visible.

3) Installation of a strainer (e.g. Flow Design model YC) upstream of the valve is recommended.

4) Install in accordance with manufacturer’s instructions.

Note: A shut-off ball valve Flow Design Model UB, should be used as a shut-off valve for KTM threaded valves i.e. size 2” and below. For KTM flanged valves, a special flange spacer with an inbuilt P/T port between the KTM valve and the butterfly valve flow design model BF, and a butterfly valve for shut-off can be ordered from the factory.