Pump Protection (Centrifugal) Using Maric Flow Controllers

MARIC FLOW CONTROL AUSTRALIA

Maric Constant Flow Valves

Constant Flow Rate Regardless of Pressure

50 Years

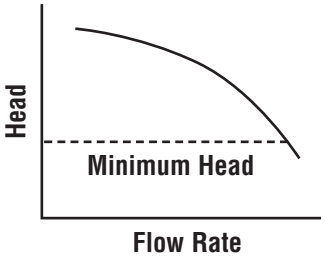
Est. 1963

A tamper-resistant method, of protecting centrifugal pumps from running off their curve, is to place a correctly sized Maric flow controller, close to the pump discharge.

Introduction:

A common cause of submersible centrifugal pump failure, is that of allowing them to run at below their minimum operating head. This is the same as allowing them to deliver too high a flow rate.

For long trouble-free life, flow rate and head should be maintained within the manufacturers specifications.



A typical pump performance curve is shown to the left.

The system also has its own characteristic curve, which will be influenced by friction and other mechanical devices such as valves, fittings, orifices & other components.

Gate valves and pressure sustaining valves are often used to prevent this, however, their disadvantages include:

- being prone to unauthorized adjustment
- can fail due to gate vibrating loose
- impose an unnecessarily high headloss at the duty point, reducing pump output and efficiency, and
- can require maintenance.

Maric flow control valves offer protection without these disadvantages.

Headloss:

The benefit of the Maric flow control valve is that it will result in less energy or head loss than the common gate valve, fixed orifice or pressure-sustaining valve. **This is because**; as the flow rate through the Maric valve reduces below its rated flow, the head loss drops off significantly. (Duty flow rate is usually well in from the right hand side of curve.)

The Maric flow controllers' orifii actually open up as the

Maric 50mm x 3 orifice screwed brass flow controllers

pressure differential across it reduces, in an attempt to maintain the same flow.

With a "fixed orifice" gate valve, head loss at lower flows remains high, & the head loss across a pressure sustaining valve will not change at all, resulting in a significant energy loss, at the duty point, increasing pumping costs, and may necessitate increasing the pump size.

The Maric valve will impose whatever resistance (head) is required in order to maintain the valves rated flow rate.

Example; when flow rate through Maric valve is 70% of the valves nominal flow, the headloss is around 4 metres only. Refer Maric Performance curve (overleaf) at 70% of rated flow.

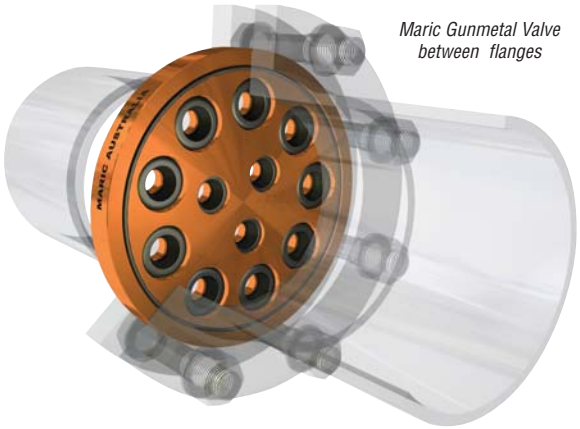
Question; What will be the headloss across the Maric valve in my installation?;

Answer; It depends on the flow rate, i.e, at valves full rated flow, headloss will be between 140 and 1000 kPa*. At a *lower* flow rate, i.e., the duty point, headloss will be less. e.g., 60% of the valves flow = 30 kpa only.

*For standard "Precision" spec 140 – 1000 kPa flow controllers

Pumps can be damaged on:

- **Any bore**, where people can unwittingly open up the bores' gate valve in an attempt to increase flow.
- **High draw-down bores,** – i.e. a relatively high standing water table at start-up, as compared to a much lower level for the normal operating condition. At start-up, these pumps have little head against them.



Maric Gunmetal Valve between flanges

- **Empty pipe work at start–up,** i.e. lack of, or faulty check valve, or where lines on surface drain empty. It takes time to fill pipes sufficiently to obtain the required head.
- **Over-pumping beyond the refill rate,** to point of drawing in air or sand, leading to unstable conditions.
- **A burst in the pipework** may allow uncontrolled flow and upthrust or cavitation.
- **Pumps with two separate duties;**
  - One, a tank elevated 50m up a hill, and
  - The other, to feed a dam at the same elevation as the pump. (Without a flow controller here, pump damage may result, due to lack of head).

Submersible pump installation

- **Rising water tables;**

  Limiting pump peak flow rate can prevent electric motors from overloading as operating head reduces.

Other Applications;

- An existing pump at rivers edge fills tanks with water. The local council mandates that, for the health of the river, property owners must reduce rate of draw. It is stipulated that a non-adjustable flow control device is used.

Key features of Maric Flow Controllers:

- **Tamperproof:** Maric valves are non-adjustable, which prevents owners from trying to "get more from their bore".
- **Maintenance free, reliable and self-cleaning:** As there are no wearing parts, the valves require no maintenance, adjustment or cleaning during their 20+ year life span.

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Case Study: Franklin FPS1A-13TS

Using Maric flow control valve for pump protection in a high standing (high draw-down) water table condition.

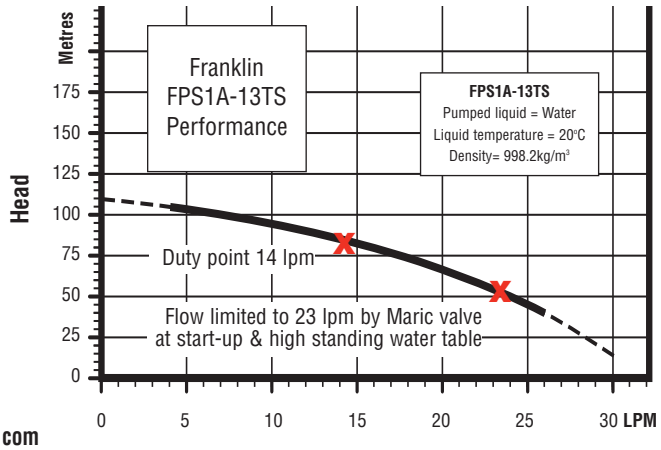
This pump suits the application at the 85m draw down level, however, will run off the right hand side of curve with only 20m head against pump at start up resulting in pump and motor damage.

Installation Details

• Pump	Franklin FPS1A-13TS
• Flow Controller	Maric 23 litre per minute Precision
• Pump depth	110m
• Standing water table	20m
• Typical draw down water level	85m
• Max flow allowed (rhs of curve)	1.55m3/hr (26.0 lpm)
• or, Min. Head required	43m
• Duty	To fill tank at ground level adjacent borehead

Pump Selected; Franklin FPS1A-13TS

Manufacturers performance curve below indicates flow should not exceed 1.4m^3/hr (23L/min).



Gunmetal wafer type valve mounted between flanges

Pump Protection Requirement

To limit flow, or add sufficient head, during start-up, to prevent pump and motor damage due to upthrust condition.

Three options available

1, Gate Valve: They are cheap, can be noisy and can also result in a high headloss at the duty point, reducing pump output. As these valves can be adjusted by anyone, they are **not tamperproof**, and are often opened all the way in the endeavour to get maximum flow and can fail due to gate vibrating loose.

2, Pressure Sustaining valve: These are expensive, adjustable, and can result in a potentially high headloss at duty point, reducing pump output. Again, as they are adjustable, they are **not tamperproof**, and are often opened all the way in the endeavour to get maximum flow.

3, Flow Controller: These are the **best solution** for high standing water table, with lower duty point conditions. **They are tamperproof**, inexpensive and result in a low headloss at the duty point as can be seen in the graph below.

Question:

What will the headloss be across the Maric valve and its affect on pump performance at the 85m duty point?

Answer:

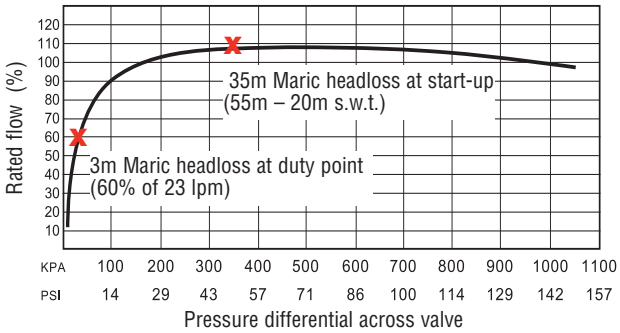
Very little. Around 3 metres.

Why?:

At 85 metres drawdown (and resulting head against pump), flow rate will be 0.85m3/hr (14 lpm) only . This is 60% only of the rated flow of the flow controller, and at 60% of flow through the Maric valve, the pressure differential, (or headloss) is around 3 metres only, having little affect on pump output.

Flow Control Valve Performance:

Flow control valve performance curve below indicates 60% of rated flow = 3 metres headloss only (see **X**).



Conclusion:

As in the above application, and many similar cases, the Maric flow control valve is an excellent choice for pump protection, due to its lower headloss, cost effectiveness, long maintenance free life and being **virtually tamperproof**.

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