

Application of High-Flow &  
Extended-Range Cartridges for  
AutoFlow Valves  
**2 1/2" - 24"**

  
*Engineering  
GREAT Solutions*

## Cartridges for AutoFlow Valves

### Application of High-Flow and Extended Range Cartridges for AutoFlow Valves, 2 1/2" - 24"

#### General

Five cartridge ranges are now available on AutoFlow products from 2 1/2" to 24". Since there is no price difference, they should be selected based on flow and control requirements. Three new high-flow ranges have been added. The new cartridges incorporate narrower control ranges: 3-20, 5-40 and 7-52. By utilizing narrower ranges, we were able to redesign the internal components, providing larger porting and fully utilizing our patented exit ports. WS valves now can have flow rates up to 60 percent higher. In many cases, this will allow a one-size reduction in the valve selection. FDI now offers line-size WS valves (2 1/2" - 24") meeting or exceeding ASHRAE recommended flows. The new cartridges also have larger porting and are ideal for dirty water systems such as condenser or fresh-water cooling systems.

#### Application Summary

High-flow cartridges 3-20, 5-40 and 7-52 ranges are used where more GPM is required in a specific line size, and the narrower control range will not result in problems with overflow. These high-flow valves avoid expensive piping transitions to accommodate larger than linesize valves.

**Extended-range cartridges** 2-32 and 5-60 ranges are used where a wide control range is required, such as an internal circuit on a variable speed pumping system.

#### Secondary Pumping or Distribution Loop

When WS valves are used for larger air handlers, etc., the 2-32 or 3-20 range should be used on the most remote circuits which determine the pump head. The 2- 32 range adds 4.6 feet and the 3-20 range adds 6.9 feet to the pump head. The other higher pressure drop ranges can generally be used on circuits closer to the pump without affecting the pump head. To determine if the pump selection will be affected by a higher range unit, the distribution piping losses must be known. These losses are generally not listed on the plan and must be obtained from the pump head calculations. Refer to the schematic on the reverse side where a 3-20 range (6.9 foot loss) AutoFlow valve is on the most remote index circuit. There is 6 feet of additional loss between the index circuit (number one) and circuit number two; thus, there is 12.9 feet available (6.9' + 6") without affecting the pump head and a 5 psi or 11.5 feet control range can be used. Circuit number three has 12 feet of additional distribution pipe loss (compared to the index) making 18.9 feet available so a 7 psi or 16.1 feet control range will not affect the pump. Circuit number four, having 24.9 feet available, can use a 16.1 feet control range as well. On interior circuits such as number four, the top end of the control range should exceed the pump head, 59.9 feet minus the terminal losses, ATC 12 feet, coil 13 feet, meaning that 34.9 feet is the maximum head available. The 3-20 psi range could be used here since it can control up to 41.6 feet of head (18 x 2.31).

#### Primary Pump Circuits

The WS valves are often used on primary circuits to control flow through chillers, boilers and condenser loops. These circuits often have a higher GPM for a given line size than secondary loops and are often individually pumped so that the WS pressure drop is added directly to the pump head. Ideally, the lowest startup range, 2-32 would be used; however, the WS valve may have to be larger than line size, requiring a more expensive installation. The alternative is to use a higher flow cartridge to reduce the size of the valve. When making this decision, remind the engineer that the increaser and reducer, to use a larger valve, could have as much as a one psi or 2.3 feet additional loss.

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## Four Air Handler Schematic

### Example Comments

3-18 Valve is on the index circuit, which has 6.9' head loss

5 psi or 11.5 ft. is OK  
 $6' + 6.9' = 12.9'$  available

7 psi or 16.1 ft. is OK  
 $12' + 6.9' = 18.9'$  available

7 psi or 16.1 ft. is OK  
 $18' + 6.9' = 24.9'$  available

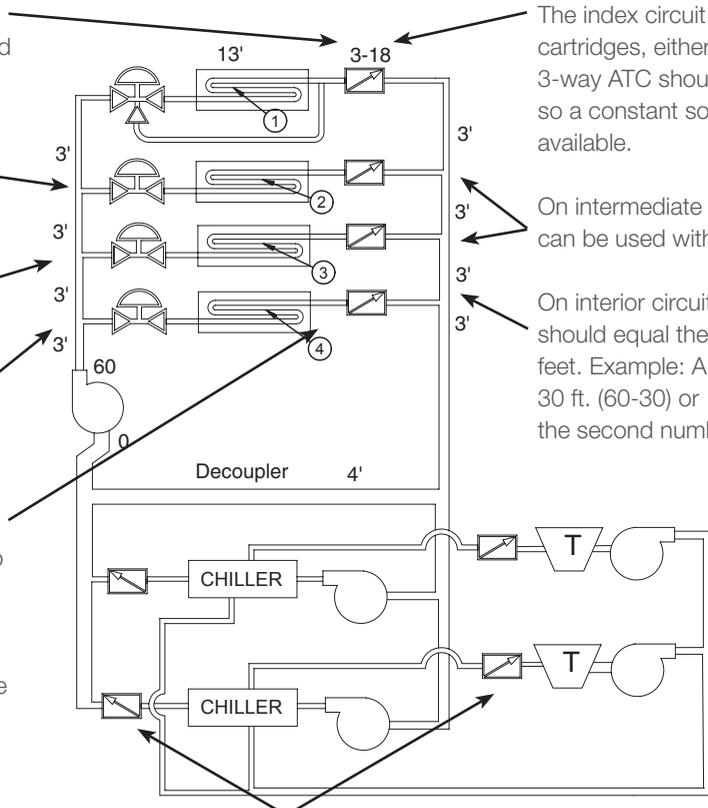
Can we use a 7-53 here without affecting the pump head? Yes, because there is 18 ft. of distribution loss between the two circuits and only 9.2 feet difference between their start-up pressure drops.  
 $(16.9 - 6.9 = 9.2)$

### General Comments

The index circuit should use the lowest pressure drop cartridges, either the 2-32 or the 3-18 range. Also, a 3-way ATC should be considered at the remote terminals so a constant source of hot or chilled water is available.

On intermediate circuits, high-flow (highloss) cartridges can be used without affecting the pump head.

On interior circuits, the top end of the control range should equal the pump head minus approximately 30 feet. Example: A 60-foot pump requires a control limit of 30 ft.  $(60-30)$  or 13 psi. Therefore, any control range with the second number of 13 or higher will work.



High-flow cartridges can be used in the equipment room. They will reduce piping cost and piping losses, but the higher start-up loss must be added to the pump head. Remember, one psi may be lost by installing one pipe size larger valve due to increased pipe friction.

## Nomenclature Review

### 2-32 Control Range

2 psi or 4.6' is the start-up or minimum differential pressure needed to achieve design flow. When a 2-32 valve is located on the index circuit, 4.6' are added to the pump head.

The regulator will start to overflow at a differential pressure above 32 psi or 73.6'. At 40 psi the overflow will only be about 12 percent.

