SELECTING DIFFERENTIAL PRESSURE PILOTS

SPENCE Differential Pressure Regulators may usually be classified in one or the other of the following groups:

1. Control of the delivery pressure at a constant, adjustable, predetermined differential above another source of fluid pressure. This case is illustrated by the use of the SPENCE Type EN Differential Pressure Regulator on a boiler feedwater make-up line to control the delivery pressure of the feedwater at a constant differential above the boiler steam pressure. Another example is the use of the Type EN to control the steam pressure on a steam atomizing oil burner at a constant differential above the oil pressure at the nozzle.
2. Control of the differential pressure or pressure drop across the Pressure Regulator itself. This case is illustrated by the use of the SPENCE Type EN24 Differential Pressure Regulator installed in parallel with a heat exchanger to maintain a constant differential across it, thereby limiting the flow rate of fluid through the heater.

The table below lists the principal Differential Pilots.

DIFFERENTIAL PRESSURE REGULATOR PILOTS

Type	Service Conditions											Normal Accuracy ±	Diaphragm		Loading	Operating Characteristics	Main Valve
	Cast Iron			Cast Bronze[a]			Cast Steel			Differential Pressure							
	Max. Initial Pressure psi	Max. Temperature °F	Max. Diaph. Pressure psi	Max. Initial Pressure psi	Max. Temperature °F	Max. Diaph. Pressure psi	Max. Initial Pressure psi	Max. Temperature °F	Max. Diaph. Pressure psi	Min. psi	Max. psi		Diameter inches	Material			
N	250	450	240	300	500	290	600	750	300	3	150	1 psi	3½	St. Stl.	Spring	Closes on increase in differential Delivery pressure controlled at set differential above loading pressure Loading Pressure may be any fluid	E or C Series
N33	250	450	240	300	500	290	600	750	300	3	150	1 psi	3½	St. Stl.	Spring		E or C Series
N20	250	366	250	300	366	300	300	366	300	3	150	1 psi	31/2	St. Stl.	Spring	Opens on increase in differential Initial pressure controlled at set differential above loading pressure Loading pressure may be any fluid	E or C Series

[a]Bronze Body Pilots are recommended for water service.

NOTES ON SELECTION OF PILOTS

TYPE N AND N33 PILOTS require that the delivery pressure (pressure of fluid discharged from the Regulator) be controlled at a given differential above some separate source of loading pressure.

TYPE N meets the requirements of most boiler feedwater make-up and steam atomizing oil burner differential control problems as described in the first group in the above table.

TYPE N33 is a version of the Type N in which two separated diaphragms are employed to preclude the possibility of contact between the two fluids applied to the pilot.

TYPE N20 is a differential relief pilot which causes the Main Valve to open when its initial pressure exceeds the loading pressure by a set differential.

SIZING DIFFERENTIAL PRESSURE REGULATORS

Data Required for Ordering

1. SERVICE Fluid flowing though Regulator.

2. INITIAL (INLET) PRESSURE

(a) Maximum/Minimum.

(b) Superheat, Gravity, etc.

(1) Steam Service–Total Temperature or Degrees Superheat, if any.

(2) Air, Gases, Water and Liquids–Temperature and Specific Gravity.

3. LOADING PRESSURE

(a) Maximum/Minimum.

(b) Fluid

4. CONTROLLED PRESSURE

(a) Maximum/Minimum.

(b) Fluid

5. DELIVERY PRESSURE Maximum/Minimum.

6. CAPACITY Maximum required flow through Regulator.

7. END CONNECTIONS Screwed or Flanged. (If flanged, state drilling.)

Example

Select size and type Regulator to control the flow of water from a Motor-Driven Centrifugal Boiler Feed Pump maintaining an Excess or Differential pressure of 50 psi between the boiler feedwater and the boiler steam pressure. The feedwater temperature is 240°F. The boiler steam pressure is 150 psi. Flow 90 gpm at 220 psi pump discharge pressure.

1. Water

2. (a) 220 psi

(b) 240°F

3. (a) 150 psi Boiler Pressure

(b) Steam

4. (a) 200 psi (Loading plus Excess Pressure)

(b) Water

5. Identical with Controlled Pressure, Item 4

6. 90 gpm

7. Flanged, if 2½" size or larger

Selection of Type and Size of Regulator

MAIN VALVE	PILOT
A. TYPE —See Selection Criteria for Steam, Air, Gases or Water and Liquids in beginning of this Section.	See Selection Criteria and Selection Charts opposite.
B. SIZE—See applicable Valve Capacity Tables in this Section.	
C. MATERIAL— See Main Valve Selection Chart in Technical Reference Section or individual Product Pages.	See Pilot Selection Chart opposite or individual Product Pages.

D. ACCESSORIES—See Accessories in Other Products Section.

Selection of Type and Size of Regulator

MAIN VALVE	PILOT
A. Since pressure drop across valve (Initial Pressure minus Delivery Pressure) is greater than 10 psi: **SELECT TYPE E**	Since Initial Pressure 220 psi, 240°F, Differential (Excess) Pressure 50 psi and the Delivery and Controlled Pressures are the same: **SELECT TYPE N**
B. For 90 gpm: **SELECT 3"**	
C. For 220 psi, 240°F: **SELECT CAST IRON, FLANGED 250 LB.**	For 220 psi, 240°F: **SELECT BRONZE**
D. For Water Service: Dashpot required.	None required in this case.

ANSWER: 3" SPENCE TYPE EN, CAST IRON BODY, 250 LB FLANGED ENDS, EQUIPPED WITH BRONZE DASHPOT AND BRONZE PILOT BODY.

NOTE: Differential Regulators should always be protected by properly designed Strainers.

Water Capacity Table–Flow in Gallons per Minute

These flow rates provide a simple method for sizing regulators or water pipes with inlet velocities in the range of 240 to 600 fpm. Spence Regulators have variable seat sizes. The factory will select the proper seat for particular flow and pressure drop. Additional capacity data is available on request.

VALVE OR PIPE SIZE															
¼	⅜	½	¾	1	1¼	1½	2	2½	3	4	5	6	8	10	12
Velocity, fpm															
247	251	255	262	270	277	285	300	315	330	360	390	420	480	540	600
1.3	2.5	4.0	7.3	12	22	30	52	78	127	238	405	630	1250	2210	3490