Type 20 and Type 40 Sizing Direct Steam Injection Humidifiers

Product selection

The best diffusion of steam into the air flow is achieved by spreading the outlet nozzles of the lance(s) evenly within the duct, vertically and horizontally.
This is achieved by following the example through the five steps below.

Step 1 - The known data

Duct size	**1 800 mm high and 1 800 mm wide**
Steam pressure	**1.5 bar g**
Required maximum steam flowrate	**110 kg/h**
Spirax Sarco valve connection	**Screwed**
Valve actuation	**Electric**
Actuator voltage	**230 Vac, 100/110 Vac, 24 Vac/dc**
Control signal	**VMD, 0-10 Vdc, 4-20 mA**

Step 2 - Select the lance

Select the recommended number of lances required from Table 1 to match the known duct height.

Table 1

Duct height in mm	Number of lances
up to 1 000	1
1 000 - 1 700	2
1 700 - 2 200	**3**
2 200 - 2 600	4
2 600 and above	5

Number of recommended lances required = 3

Step 3 - Select the lance model

Select the lance model from Table 2 to match the known duct width.

Duct width in mm **Table 2**

Maximum	450	630	900	1 200	1 470	1 780	2 080	2 380	2 690	3 000	3 300	3 610	3 950
Minimum	280	450	630	900	1 200	1 470	1 780	2 080	2 380	2 690	3 000	3 300	3 610

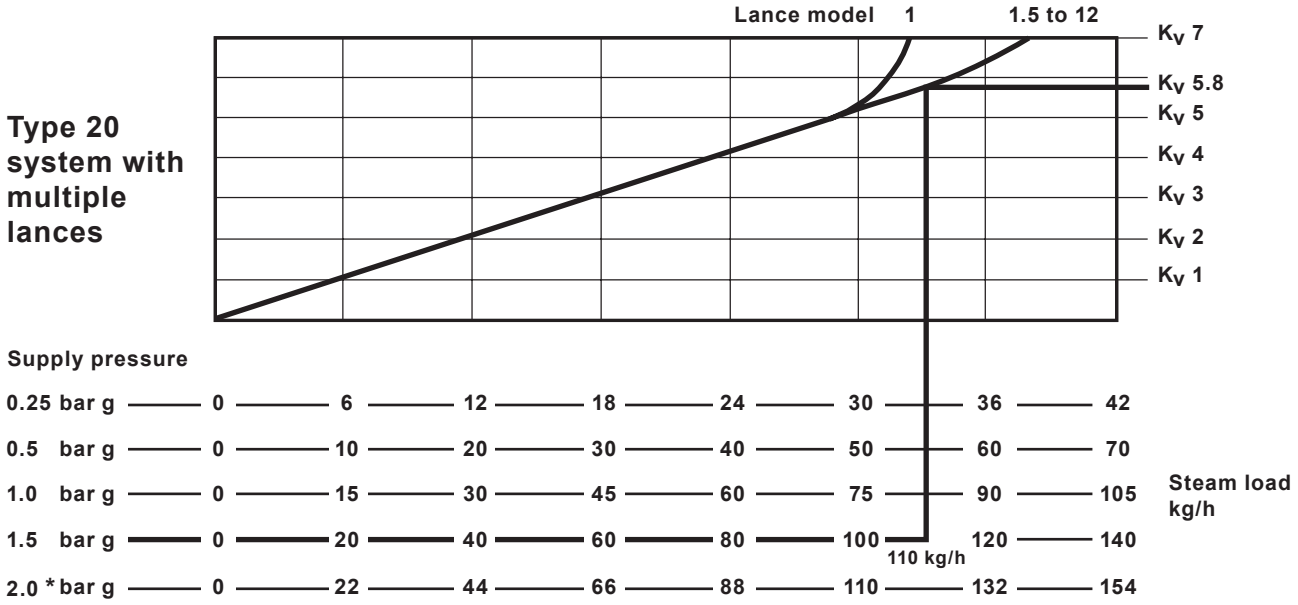
Lance model	1	1.5	2	3	4	5	**6**	7	8	9	10	11	12

Recommended lance model = 6

Step 4 - Select the system

Select the system that will handle the known capacity (Type 20 or Type 40) to obtain the required valve Kv. See overleaf and the example below:

Type 20 system with multiple lances



* Recommended maximum inlet steam pressure to separator for quiet operation of the humidifier. For operating pressures above 2 bar g consult Spirax Sarco.

It will be seen that the Type 20 system for multiple lances requires a K_V value of 5.8

Step 5 - Select the control valve and separator

Having selected the required valve K_V, the actual valve size and actuator can now be found from the chart headed 'Valve selection' on TI-P795-03. Always select the next highest valve K_{VS}, to the K_V required.

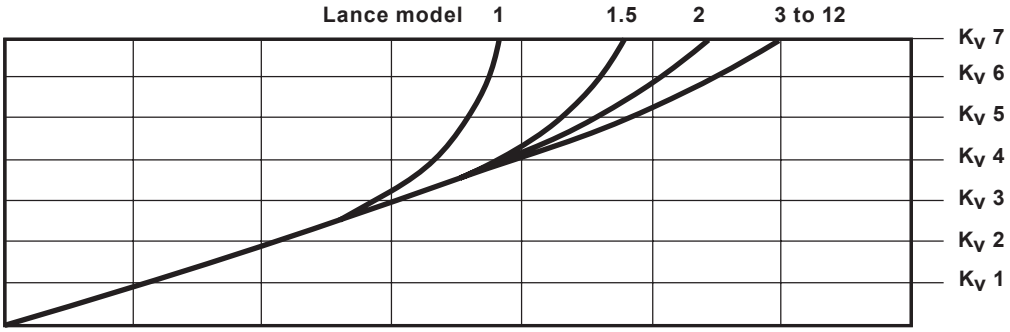
Recommended control valve is a DN20 LE31 with screwed BSP connections.
Recommended actuator is an AEL3E for 24 V operation VMD control signal.

Final product selection and specification from the above example:

1 x Spirax Sarco S.I. humidifier for 110 kg/h at 1.5 bar g; 1 x Type 20 separator with DN20 LE31 valve screwed BSP, with AEL3E actuator for 24 V operation VMD control signal, and 3 x Type 20 model 6 lances.

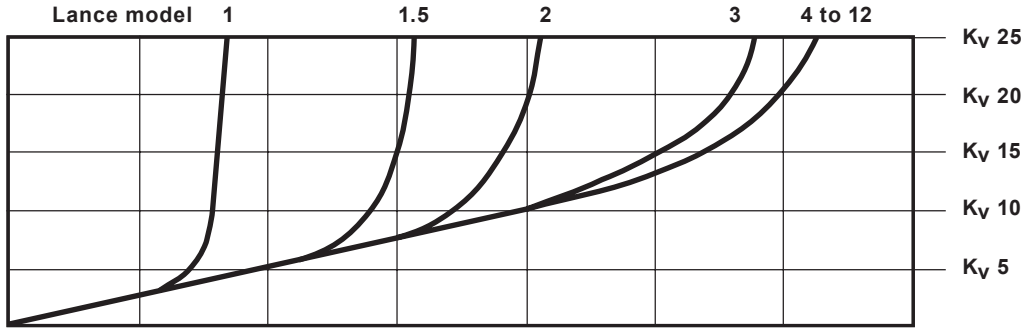
System sizing

Type 20 system with single lance



Supply pressure									
0.25 bar g	0	6	12	18	24	30	36	42	Steam load kg/h
0.5 bar g	0	10	20	30	40	50	60	70	
1.0 bar g	0	15	30	45	60	75	90	105	
1.5 bar g	0	20	40	60	80	100	120	140	
2.0 * bar g	0	22	44	66	88	110	132	154	

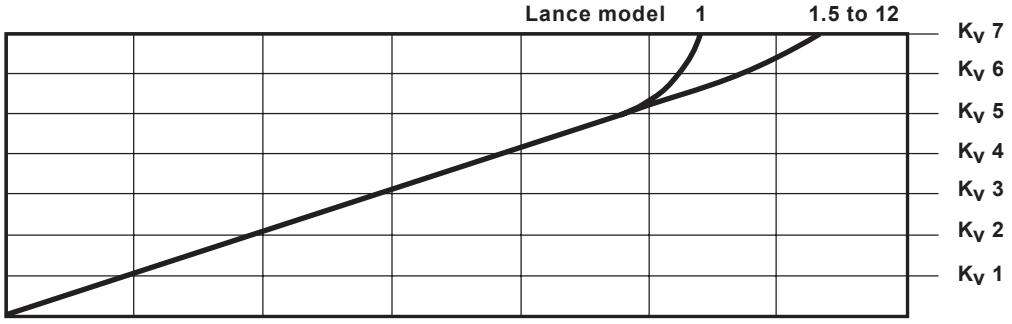
Type 40 system with single lance



Supply pressure									
0.25 bar g	0	19	38	57	76	95	114	133	Steam load kg/h
0.5 bar g	0	28	56	84	112	140	168	196	
1.0 bar g	0	40	80	120	160	200	240	280	
1.5 bar g	0	50	100	150	200	250	300	350	
2.0 * bar g	0	58	116	174	232	290	348	406	

System sizing (continued)

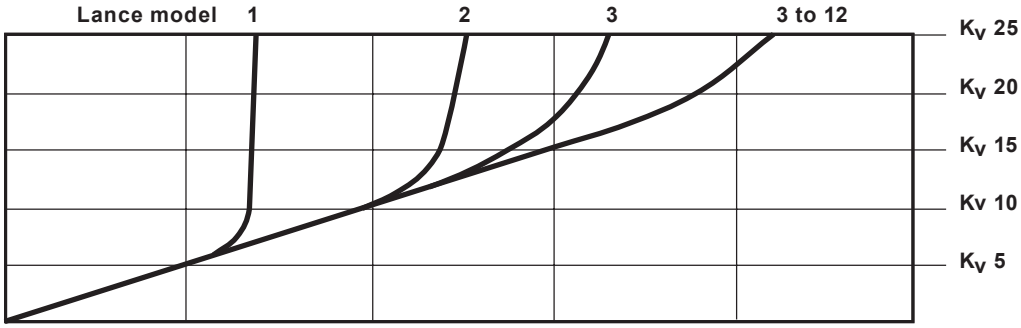
Type 20 system with multiple lances



Supply pressure								
0.25 bar g	0	6	12	18	24	30	36	42
0.5 bar g	0	10	20	30	40	50	60	70
1.0 bar g	0	15	30	45	60	75	90	105
1.5 bar g	0	20	40	60	80	100	120	140
2.0 * bar g	0	22	44	66	88	110	132	154

Steam load kg/h

Type 40 system with multiple lances



Supply pressure							
0.25 bar g	0	35	70	105	140	175	
0.5 bar g	0	55	110	165	220	275	
1.0 bar g	0	80	160	240	320	400	
1.5 bar g	0	100	200	300	400	500	
2.0 * bar g	0	115	230	345	460	575	

Steam load kg/h

* **Note:** 2.0 bar g is the maximum recommended inlet steam pressure to the separator for quiet operation of the humidifier. For operating pressures above 2 bar g consult Spirax Sarco.