

Direct steam injection humidifiers



spirax
/sarco

Direct steam injection gives quality control of air humidity.

Research and development in separation, the use of lightweight stainless steel combined with a constant temperature lance system, has created new standards in direct steam humidification. These features provide quality, efficiency and all round value for money.

Effective moisture separation

The major factors that lift the total performance of Spirax Sarco S.I. humidifiers above other manufacturers are:

- A highly effective combination of centrifugal, vortex and baffle separation which ensures the driest steam is available at all times.
- The twin chamber separator which supplies the lance and pre-heat circuit.
- The capability to handle high steam loads without the loss of separator efficiency.
- Low mass, with high strength, allows fast warm-up.
- The consistent condensate discharge without re-entrainment.

Effective steam injection

Once the separator has completed its job, it is necessary to then deliver the steam into the air as a gas, (not as a water laden atmosphere). This is achieved through the Spirax Sarco lance by:

- Continuous heating over the full length of the lance.
- Ejection nozzles which take steam from the hottest part of the lance.
- Low mass for rapid pre-heating.
- The constant re-evaporation of any condensate in the lance.
- The extremely small lance surface area reduces the cooling effect and air flow resistance.

Why choose S.I. humidifiers?

The benefits of choosing S.I. humidifiers over other manufacturers has to be the simple fact, **it is an effective system** which ensures:

- High steam output per metre of lance.
- Very low noise levels.
- Simplified duct and piping requirements.
- Close spacing where multiple lances are needed.
- Low steam ejection velocity for efficient air / steam mixing.

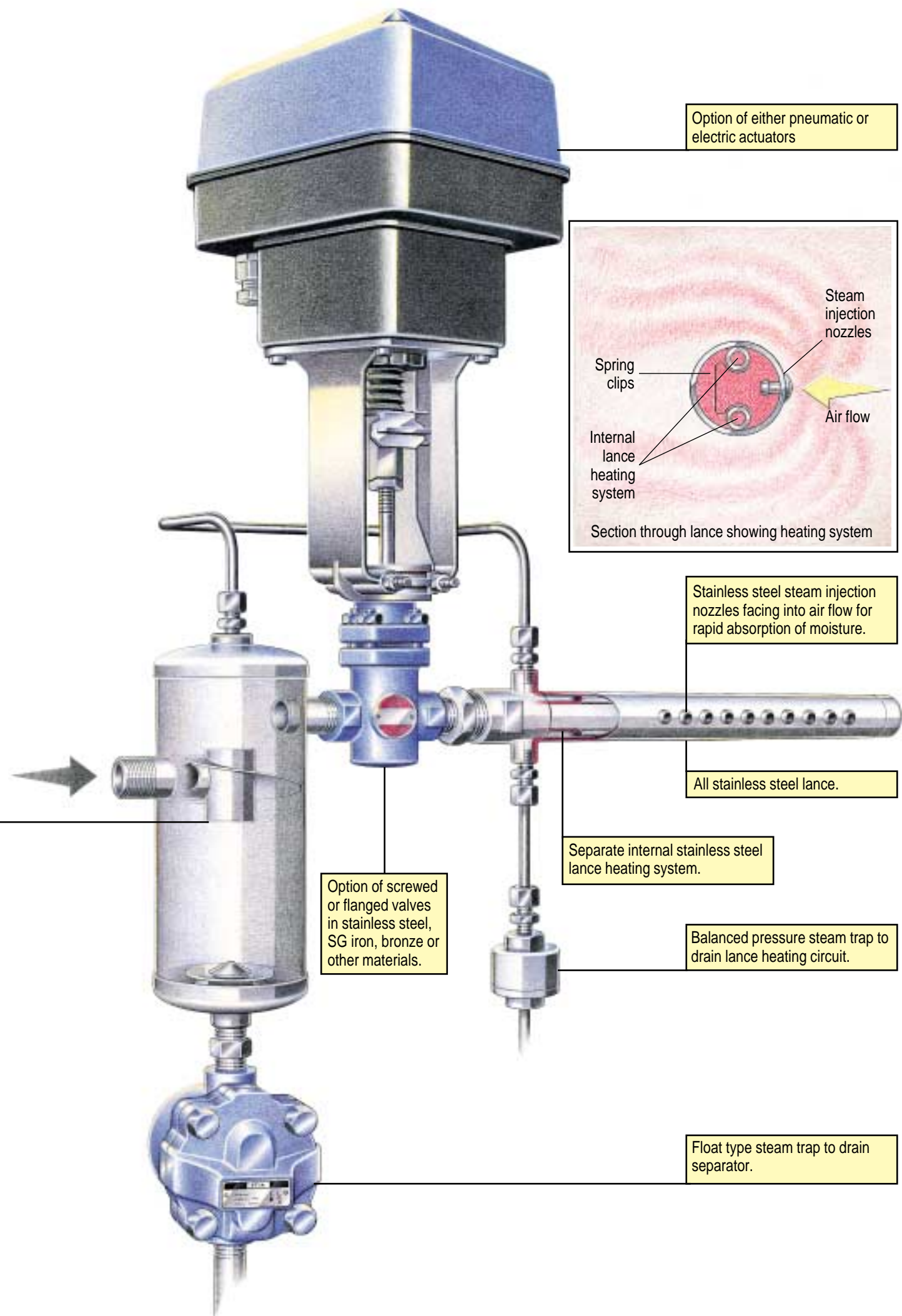
Stainless steel separator combining centrifugal, vortex and baffle separation.

S.I. steam injection humidifiers can be adapted to a wide range of duct sizes, temperatures and air velocities, with few additional components required.

Alternative makes of valve and actuator can be supplied.

User benefits

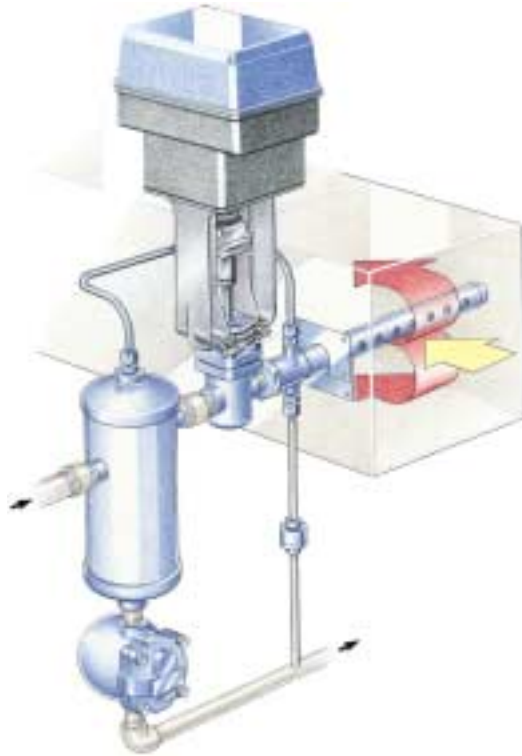
- The cleanliness of Legionella free steam.
- Rapid moisture absorption with minimal temperature rise.
- Small, compact and lightweight for easy low cost installation.
- Wide product choice.
- Simple construction in quality stainless steel.
- Few working parts giving minimal maintenance.
- Ultra low noise levels.
- Spirax Sarco's guarantee of worldwide technical support, knowledge and service.



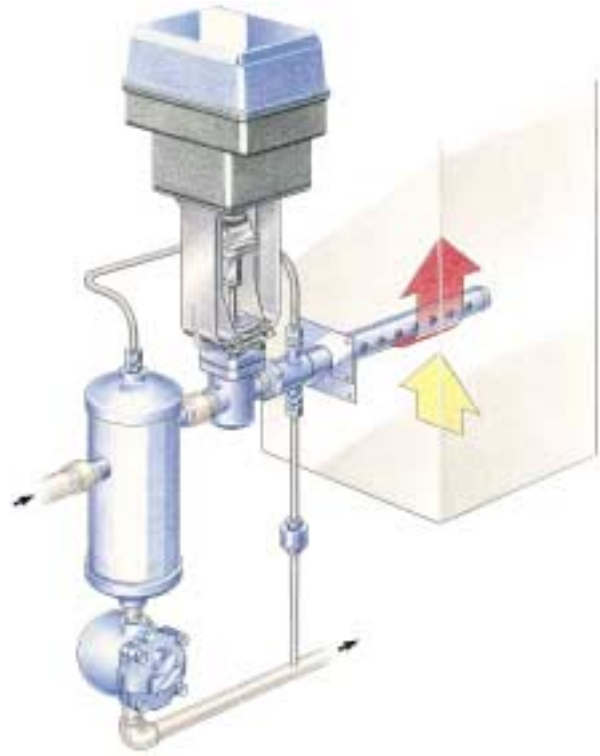
Typical applications

The most common application for humidification by direct steam injection occurs in air supply ducts used for control within living and office environments.

The versatile Spirax Sarco S.I. humidifier can easily accommodate the wide variety of applications and installations encountered, some of which are shown below.

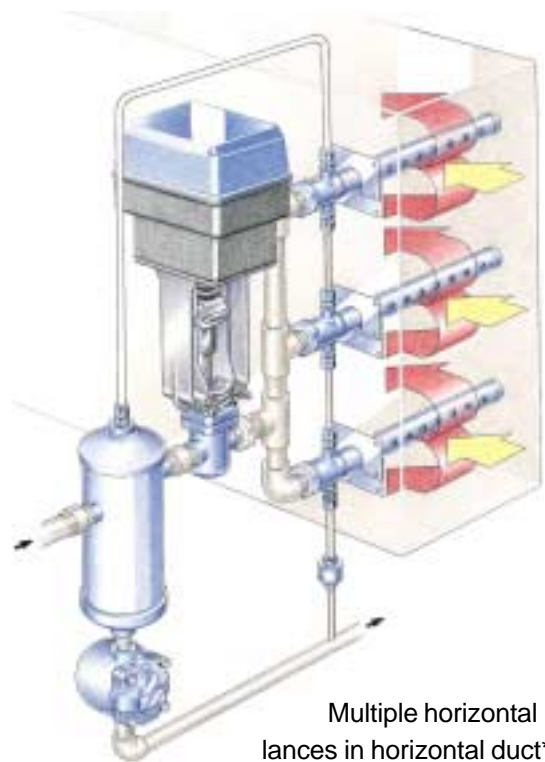


Horizontal lance in horizontal duct*



Horizontal lance in vertical duct*

Vertical lance in horizontal duct



Multiple horizontal lances in horizontal duct*

Note: These illustrations are general with some components omitted for clarity.

*Insertion of lance can be from either left or right side of ducting.

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.

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	Screwed
Valve actuation	Electric
Actuator voltage	24 Vac 50 / 60 Hz
Control signal	VMD

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

3. Select the lance model

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

Duct width in mm

Table 2

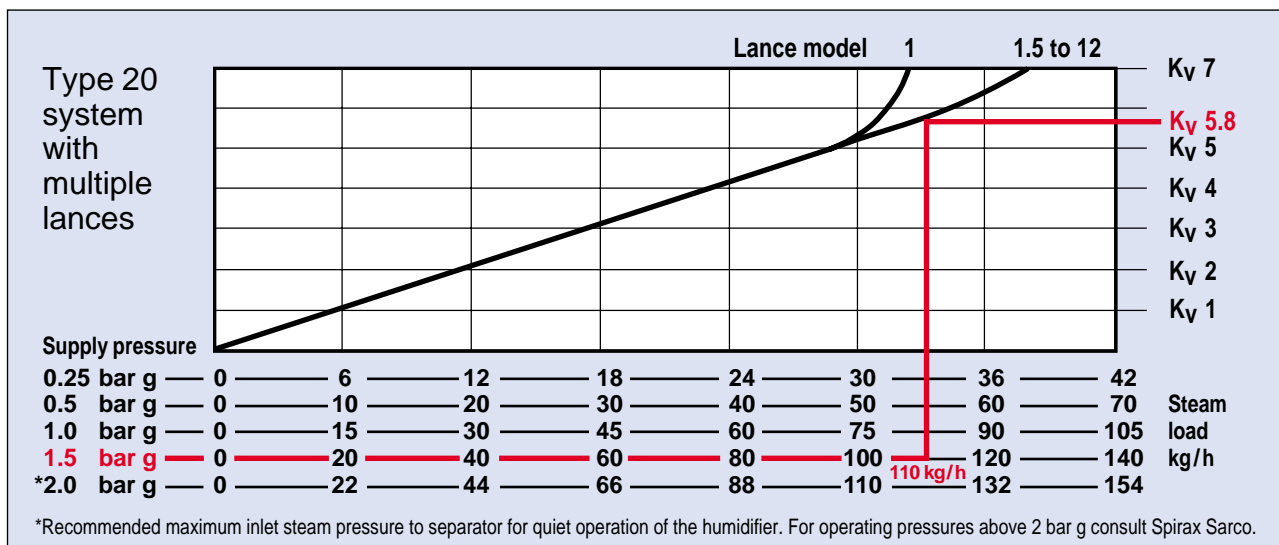
Maximum	450	630	900	1 200	1 470	1 780	2 080	2 380	2 690	3 000	3 300	3 610	3 950
Minimum	280	450	630	900	1 200	1 470	1 780	2 080	2 380	2 690	3 000	3 300	3 610

Lance model	1	1.5	2	3	4	5	6	7	8	9	10	11	12
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Recommended lance model = 6

4. Select the system

Select the system that will handle the known capacity (Type 20 or Type 40) to obtain the required valve K_v . See page 6 and the example below.



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

5. Select the control valve and separator

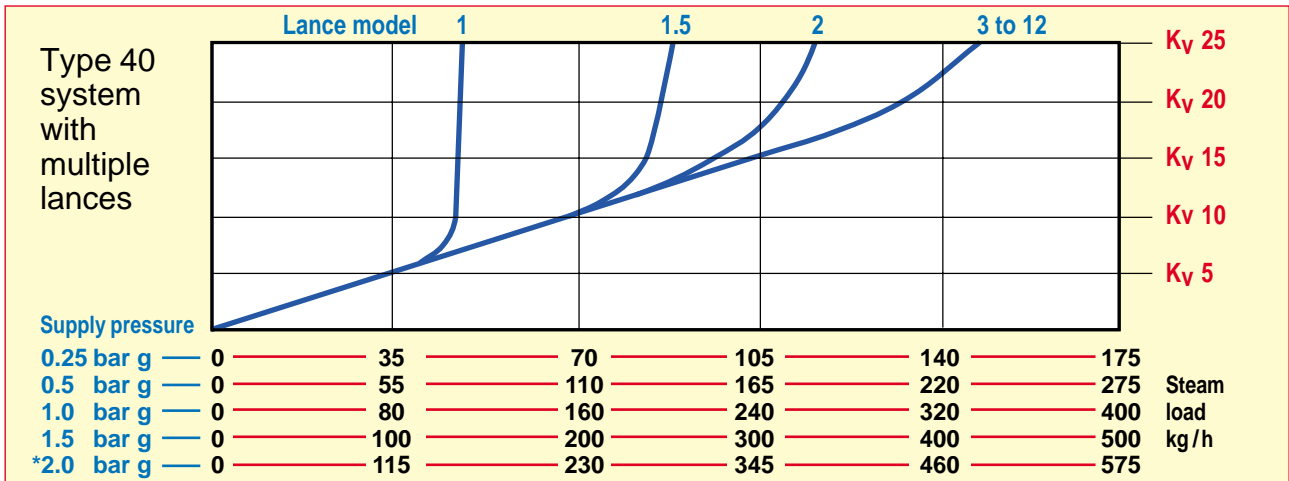
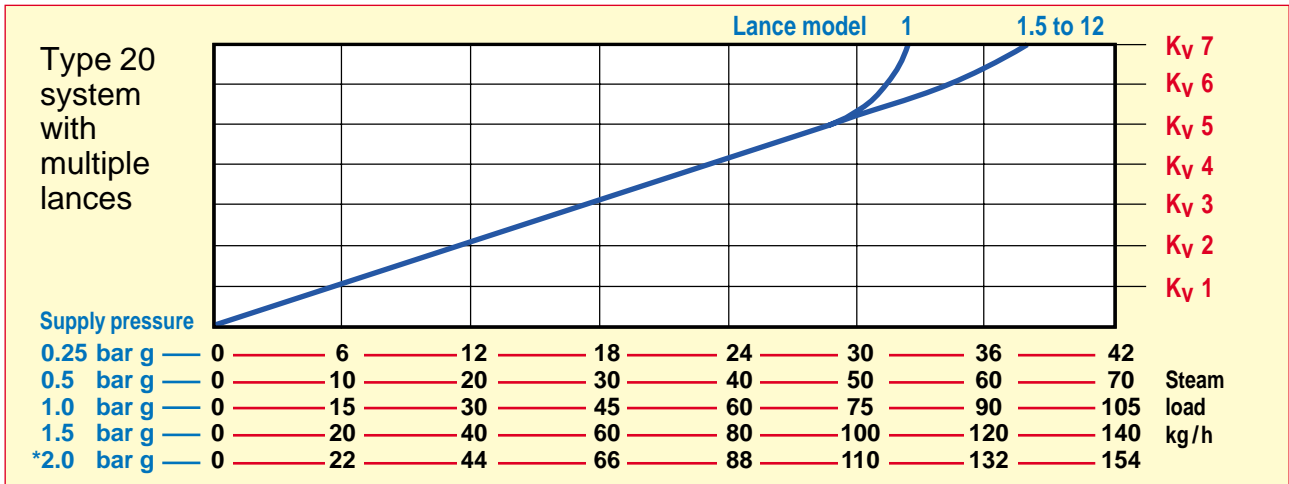
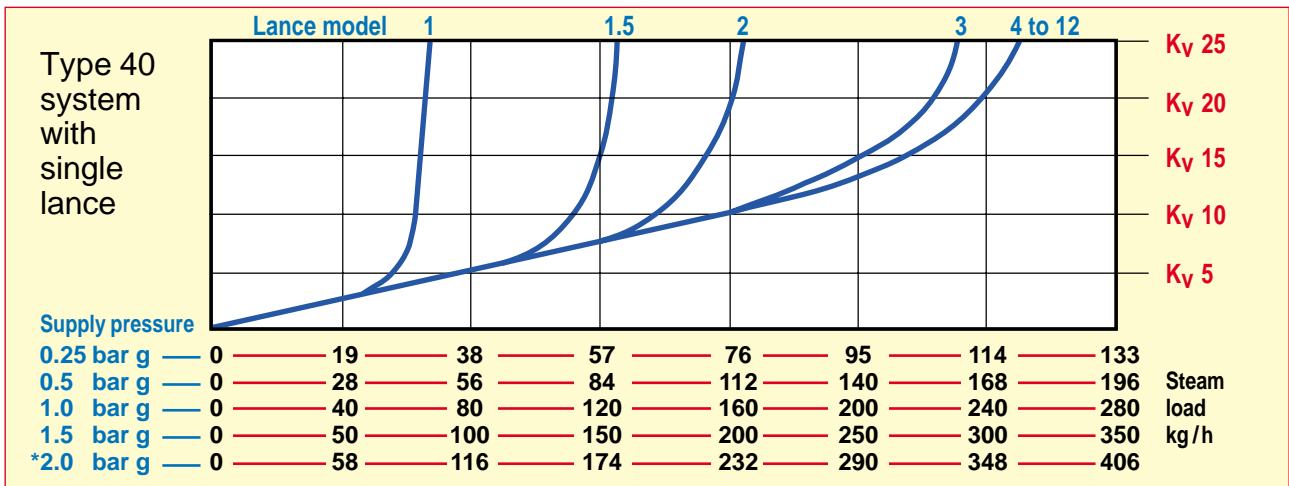
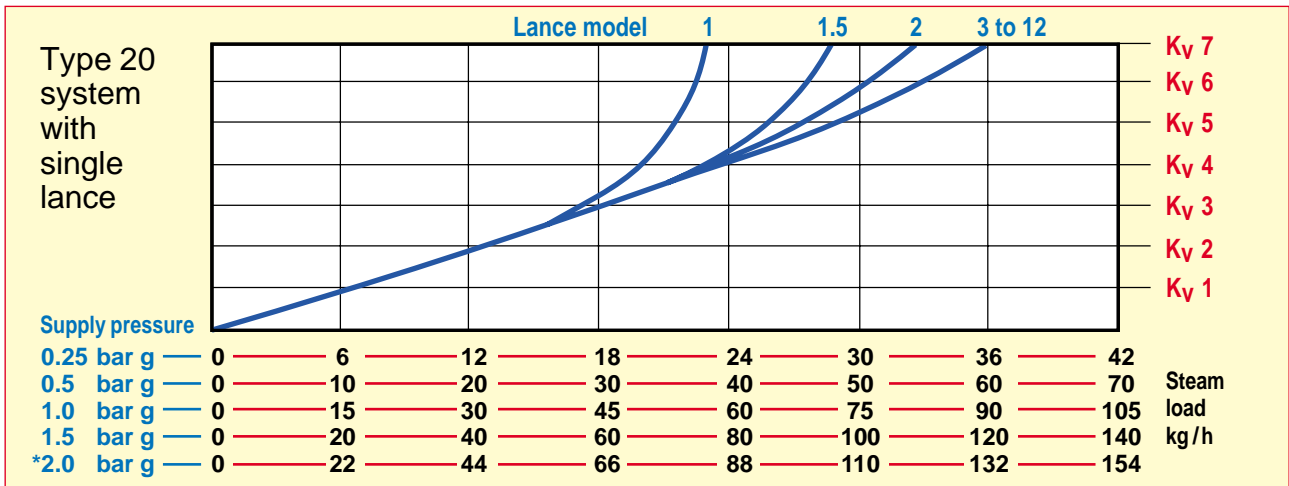
Having selected the required valve K_v , the actual valve size and actuator can now be found from the chart headed Valve selection on page 7. Always select the next highest valve K_{vs} , to the K_v required.

Recommended control valve is a DN20 LE31 with screwed BSP connections.
Recommended actuator is a EL3502SE 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 EL3502SE actuator for 24 V operation VMD control signal, and 3 x Type 20 model 6 lances.

System sizing



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

Valve selection

K _{vs}	Size	Valve selection		Actuator selection			
		Cast iron Screwed	Cast iron Flanged	Pneumatic 0.2 - 1.0 bar spring range	230 Vac VMD	Electric 24 V VMD	0 - 10 Vdc 24 V
0.4	DN15	LE31	LE33	PN3220	EL3501SE	EL3502SE	EL3512SE
1.0	DN15	LE31	LE33	PN3220	EL3501SE	EL3502SE	EL3512SE
1.6	DN15	LE31	LE33	PN3220	EL3501SE	EL3502SE	EL3512SE
4.0	DN15	LE31	LE33	PN3220	EL3501SE	EL3502SE	EL3512SE
6.3	DN20	LE31	LE33	PN3220	EL3501SE	EL3502SE	EL3512SE
10.0	DN25	LE31	LE33	PN3220	EL3501SE	EL3502SE	EL3512SE
16.0	DN32	LE31	LE33	PN3220	EL3501SE	EL3502SE	EL3512SE
25.0	DN40	LE31	LE33	PN3420	EL3501SE	EL3502SE	EL3512SE

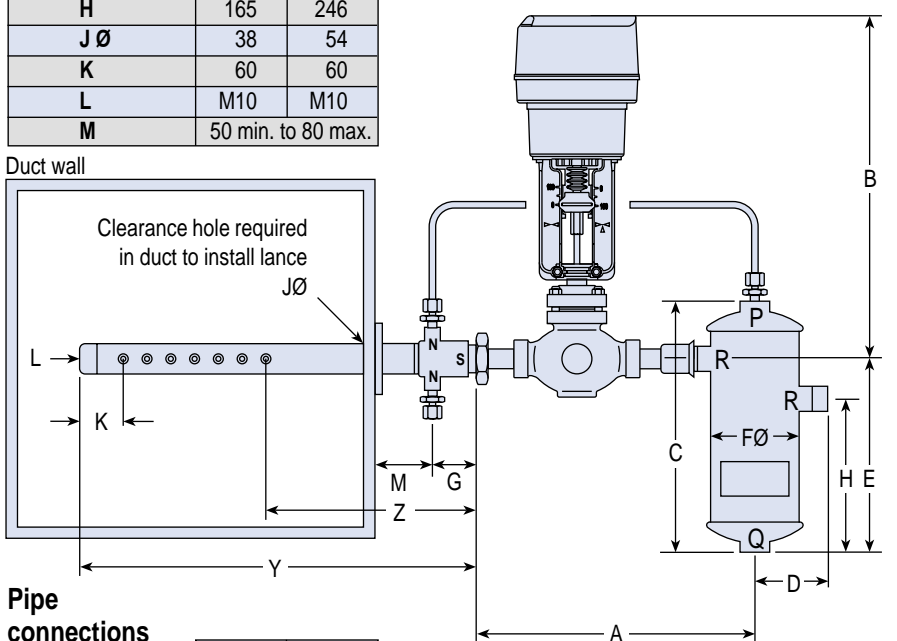
Note: KE valve option and EL3500 and PN5000 series actuators also available. Where positioners are required for any valve, consult Spirax Sarco. Other valves available upon request.

Assembly	Type20	Type40
DN15 A Screwed	213	
DN15 A Flanged	300	
DN20 A Screwed	192	340
DN20 A Flanged	290	440
DN25 A Screwed		330
DN25 A Flanged		405
DN32 A Screwed		340
DN32 A Flanged		430
DN40 A Screwed		270
DN40 A Flanged		375
C	270	395
D	85	120
E	208	316
F Ø	105	152
G	40	48
H	165	246
J Ø	38	54
K	60	60
L	M10	M10
M	50 min. to 80 max.	

Actuator type	Pneumatic	VMD	0 - 10 Vdc
DN15 B	345	375	375
DN20 B	345	375	375
DN25 B	355	385	385
DN32 B	383	390	390
DN40 B	383	390	390

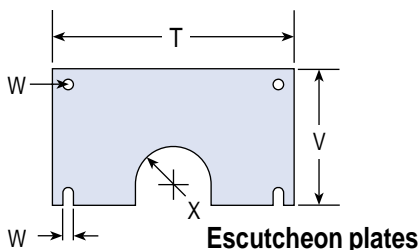
Lance model	Type20	Type40
1 Y	338	345
1 Z	138	137
Weight	0.88 kg	1.54 kg
1.5 Y	513	520
1.5 Z	173	152
Weight	1.14 kg	1.97 kg
2 Y	688	695
2 Z	192	207
Weight	1.4 kg	2.39 kg
3 Y	958	965
3 Z	183	197
Weight	1.8 kg	3.03 kg
4 Y	1268	1275
4 Z	208	207
Weight	2.26 kg	3.78 kg
5 Y	1528	1535
5 Z	212	203
Weight	2.65 kg	4.4 kg
6 Y	1838	1845
6 Z	298	207
Weight	3.11 kg	5.15 kg
7 Y	2138	2145
7 Z	214	201
Weight	3.65 kg	5.87 kg
8 Y	2438	2445
8 Z	210	297
Weight	4.0 kg	6.59 kg
9 Y	2748	2755
9 Z	216	199
Weight	4.46 kg	7.34 kg
10 Y	3058	3065
10 Z	238	237
Weight	4.92 kg	8.08 kg
11 Y	3358	3365
11 Z	218	197
Weight	5.37 kg	8.8 kg
12 Y	3688	3675
12 Z	208	237
Weight	5.83 kg	9.55 kg

Dimensions approximate in millimeters



Pipe connections BSP (ISO)	Type20	Type40
N	¼"	¼"
P	¼"	¼"
Q	½"	1"
R	¾"	1½"
S	1"	1½"

Escutcheon plates	Type20	Type40
T	115	115
V	65	65
W	5	5
X	17.5	25.5

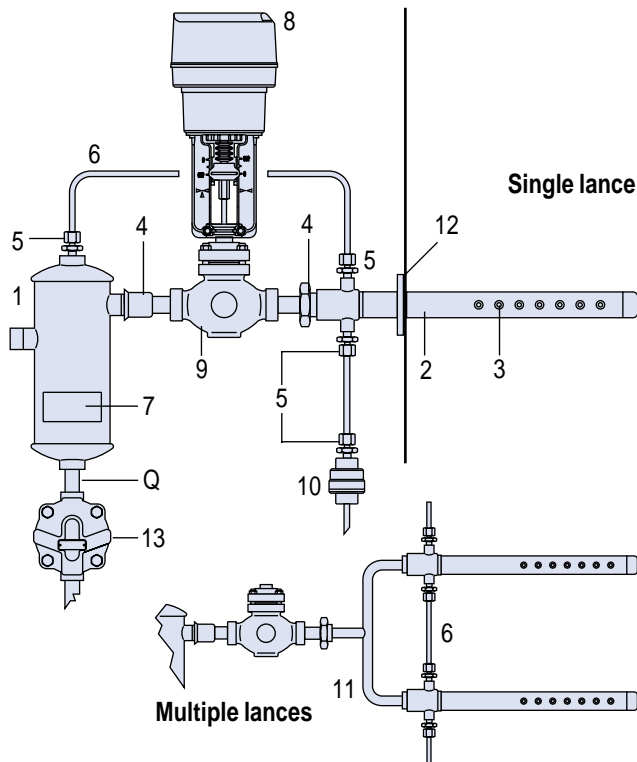


Separator	Type20	Type40
Weight	1.46 kg	3.7 kg

Limiting conditions Type 20 / 40

Separator body design conditions PN6
Maximum operating pressure 4 bar g
Maximum operating temperature 152°C

Technical information



Assembly information

Where Spirax Sarco supply the steam control equipment, the separator and valve would be dispatched assembled. Alternatively, the separator, valve and actuator can be dispatched fully assembled when requested, to simplify final installation.

Actuators can be pre-commissioned if the control signal is known. When the steam control is not part of the humidifier order, the piping components will be supplied partly assembled to the separator, for final assembly by the installer.

The separator and each lance are supplied with 2 x 8 mm O/D tube compression fittings (5):

- 1 for the tracer supply take-off from the top of the separator,
- 1 each for the inlet and outlet connections for the lance heating circuit and
- 1 for the inlet to the tracer drain trap (10).

A Spirax Sarco balanced pressure thermostatic trap (10) type ¼" MST21 (E) should be used for this application.

Materials

1 Separator	Shell	Stainless steel 304 (S14 / S11)*
	Internals	Stainless steel 304 S11*
2 Lance	Body	Stainless steel BS 3146 ANC3B*
	Tracer tube	Stainless steel 304L*
	Main tube	Stainless steel 304L*
	End cap	Stainless steel 304 S11*
	Spring clips	Stainless steel 304 (S14 / S11)*
3 Nozzles		Stainless steel - standard*
4 Pipe fittings		Malleable iron*
5 Compression fittings		Bright zinc plated mild steel
		Optional stainless steel 316L
6 Pre-heat tracer pipe 8 mm O/D tube -		Spirax Sarco or customer to supply
7 Name-plate		Aluminium
8 Actuator		See specific installation and maintenance instructions for model supplied
9 Valve	LE31 and LE33 CI DIN 1691 GG20	
	KE63	Stainless steel DIN 17445 4581
10 Tracer system	MST21(E)	Stainless steel
11 Lance interconnecting pipework - installer to supply		
12 Escutcheon plates		Galvanised steel
13 FT14 drain trap		SG iron DIN 1639 GGG40

* 316L Stainless steel option available

The preheater in the lance can be supplied with steam direct from the separator at the using steam pressure as shown, or alternatively from an independent source up to a maximum of 4 bar g.

The separator drain (Q) should be fitted with a Spirax Sarco float trap (with automatic air vent) to continuously discharge collected condensate.

Typical specification

The humidifier shall be a Spirax Sarco S.I. type of the direct steam injection design, having a stainless steel twin section separator with internal cyclonic and baffle moisture separation to provide dry saturated steam.

The injection lance in stainless steel shall be steam preheated, and utilise stainless steel nozzles.

The control valve shall be a Spirax Sarco 2-port valve with a spring reserve electric actuator suitable for a 24 Vac supply.

Some of the products shown may not be available in certain markets.

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