

Injection valve
Type TXI 2

Introduction



Danfoss has developed a injection valve type TXI 2 for desuperheating in 2-stage refrigeration systems operating on R 22 where

the hot gas temperature and the intermediate pressure are the controlling variables.

Application

In principle there are two different ways in which to setup 2-stage refrigeration systems

as far as temperature signal to the liquid injection valve is concerned.

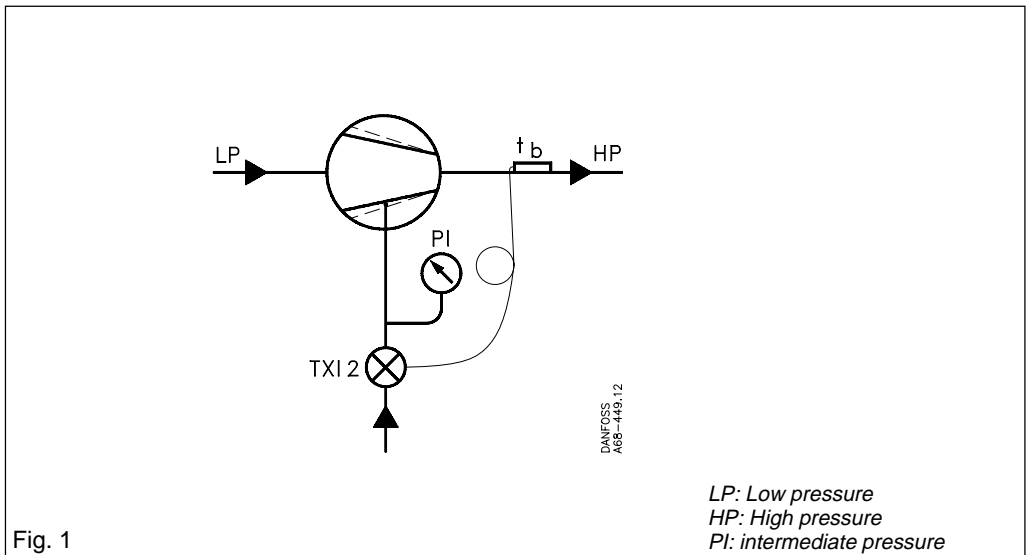
Application examples

Example 1
2-stage refrigeration system built up with a combined LP/HP compressor.

the intermediate pressure as pressure signal to the injection valve.

In this case the discharge gas temperature on the HP side is used as temperature signal and

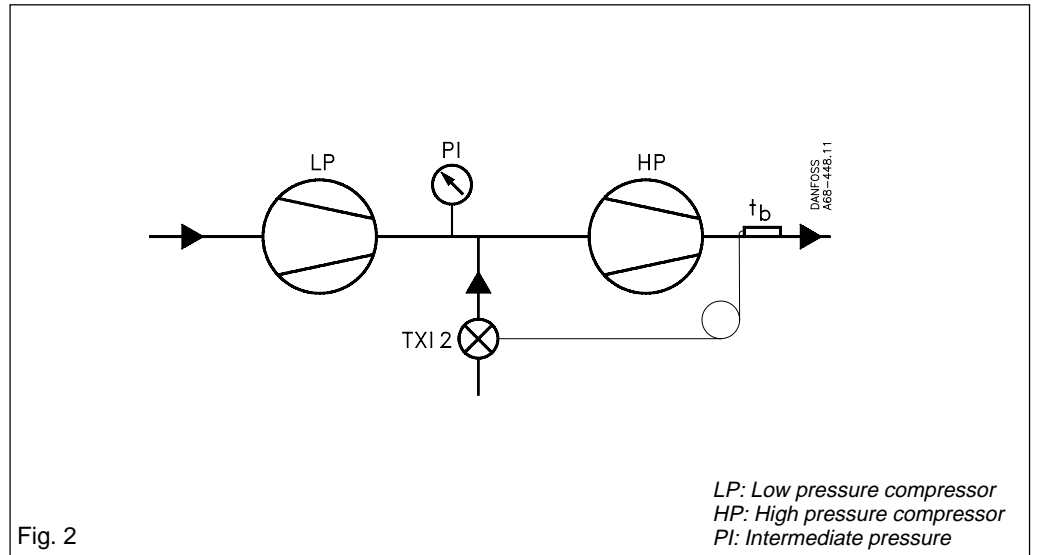
In this example a TXI 2 injection valve is used, see fig. 1.



Application examples continued

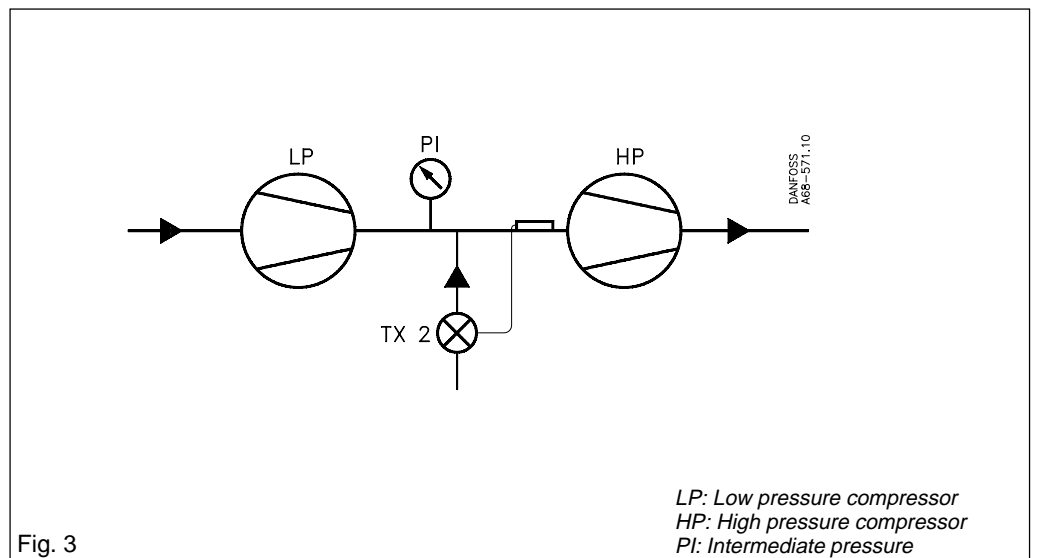
Example 2
 2-stage refrigeration system with 2 separate refrigerating compressors in series. In this set up a solution with injection valve type TXI 2 can be used, because the discharge gas

temperature on the HP side can be used as temperature signal and the intermediate pressure as pressure signal to the injection valve, see fig. 2.



Example 3
 Same setup as in example 2 with 2 separate refrigerating compressors in series. As in this setup there is an accessible control signal where there is correspondence between pressure and temperature, regulation

of the strongly superheated condition of the refrigerant can be undertaken by a traditional thermostatic expansion valve e.g. Danfoss type TX 2 for R 22 refrigeration systems, see fig. 3.



Operation

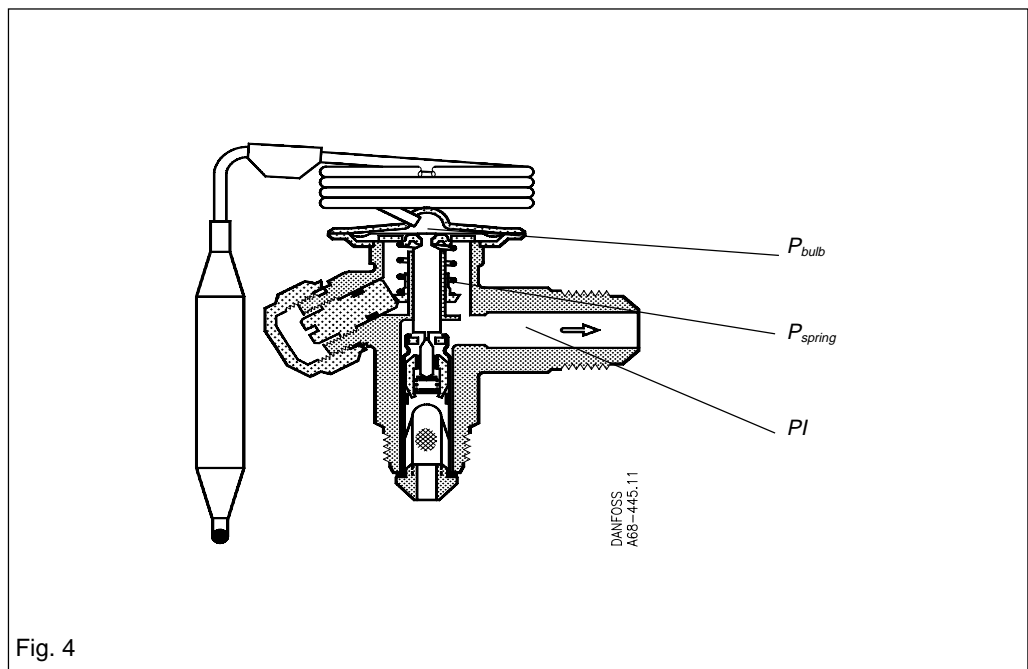


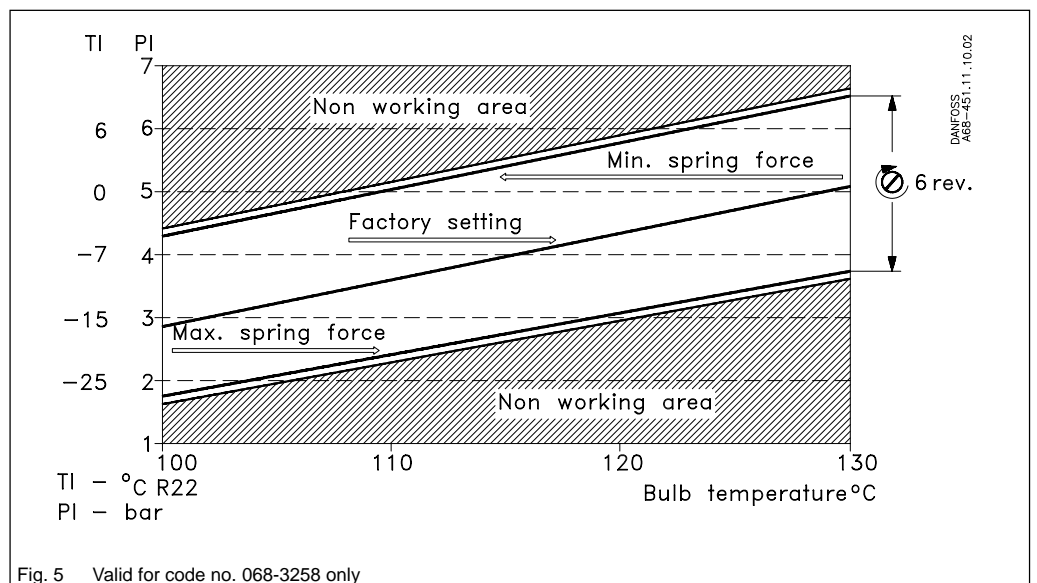
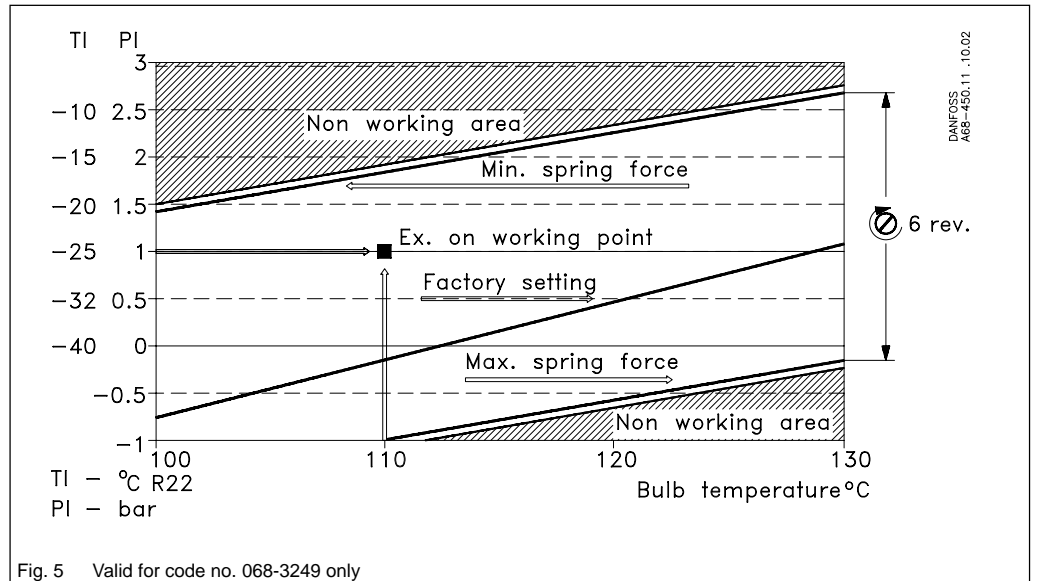
Fig. 4

The valve function is controlled by the intermediate pressure (PI) acting under the diaphragm and the bulb pressure derived from

the discharge gas temperature across the diaphragm (fig. 4).

The intermediate pressure (PI), setting spring and bulb temperature form a working range

which, expressed in a co-ordinate system, makes up a working area, see fig. 5.



Within the limits of this area, the working point required is found (PI/t_{bulb}).

superheat) and the valve capacity (size of orifice).

The location of the working point depends on the spring force set and in addition to that dependent on the proportional band (the

Therefore, the sizing is decisive for a satisfactory result.

Sizing

To size TXI 2 the refrigerating capacity required to remove the superheat at the intermediate stage must be known as well as the required discharge gas temperature on the discharge side.

difference between the condensing pressure and the pressure at the intermediate stage.

Besides this the pressure drop Δp across the injection valve must be determined as the

With the values for the required capacity, the evaporating temperature t_0 (PI) of the intermediate stage and the pressure drop across TXI 2, the correct orifice size can be determined.

Example:

Required refrigerating capacity Q= 5 kW
 Evaporating temperature at intermediate state t_0 = -25°C
 Pressure drop across TXI 2 Δp = 12 bar
 Discharge gas temperature (HP)= 110°C

Valve type	Orifice No.	Evaporating temperature -25°C							
		Pressure drop across valve Δp bar							
		2	4	6	8	10	12	14	16
TXI 2 - 0.2	00	0.69	0.83	0.94	1.02	1.08	1.12	1.14	1.15
TXI 2 - 0.3	01	1.21	1.51	1.71	1.85	1.96	2.04	2.09	2.11
TXI 2 - 0.6	02	1.66	2.13	2.42	2.62	2.77	2.87	2.94	2.97
TXI 2 - 0.8	03	2.98	3.82	4.33	4.69	4.96	5.15	5.27	5.33
TXI 2 - 1.2	04	4.36	5.59	6.35	6.89	7.30	7.60	7.80	7.91
TXI 2 - 1.5	05	5.55	7.10	8.06	8.74	9.26	9.64	9.89	10.02
TXI 2 - 2.0	06	6.80	8.68	9.84	10.67	11.30	11.77	12.08	12.25

TXI 2 with orifice 03 fits that example as the values in the capacity tables are shown with a proportional band of 6 K.

Capacity in kW

Valve type	Orifice No.	Evaporating temperature (PI) -10°C							
		Pressure drop across valve Δp bar							
		2	4	6	8	10	12	14	16
TXI 2 - 0.2	00	0.79	0.96	1.1	1.2	1.2	1.3	1.3	1.3
TXI 2 - 0.3	01	1.6	2.0	2.3	2.5	2.6	2.7	2.8	2.8
TXI 2 - 0.6	02	2.2	2.9	3.3	3.6	3.8	4.0	4.1	4.1
TXI 2 - 0.8	03	3.9	5.1	5.9	6.4	6.8	7.1	7.3	7.3
TXI 2 - 1.2	04	5.8	7.6	8.7	9.5	10.1	10.5	10.8	10.9
TXI 2 - 1.5	05	7.4	9.6	11.0	12.0	12.8	13.3	13.6	13.8
TXI 2 - 2.0	06	9.1	11.8	13.5	14.7	15.6	16.2	16.6	16.8

Valve type	Orifice No.	Evaporating temperature (PI) -20°C							
		Pressure drop across valve Δp bar							
			4	6	8	10	12	14	16
TXI 2 - 0.2	00		0.88	1.0	1.1	1.1	1.2	1.2	1.2
TXI 2 - 0.3	01		1.7	1.9	2.0	2.2	2.3	2.3	2.3
TXI 2 - 0.6	02		2.4	2.7	2.9	3.1	3.2	3.3	3.3
TXI 2 - 0.8	03		4.2	4.8	5.2	5.5	5.8	5.9	6.0
TXI 2 - 1.2	04		6.2	7.1	7.7	8.2	8.5	8.7	8.8
TXI 2 - 1.5	05		7.9	9.0	9.8	10.3	10.8	11.0	11.2
TXI 2 - 2.0	06		9.6	11.0	11.9	12.6	13.1	13.5	13.7

Valve type	Orifice No.	Evaporating temperature (PI) -25°C							
		Pressure drop across valve Δp bar							
		2	4	6	8	10	12	14	16
TXI 2 - 0.2	00	0.69	0.83	0.94	1.02	1.08	1.12	1.14	1.15
TXI 2 - 0.3	01	1.21	1.51	1.71	1.85	1.96	2.04	2.09	2.11
TXI 2 - 0.6	02	1.66	2.13	2.42	2.62	2.77	2.87	2.94	2.97
TXI 2 - 0.8	03	2.98	3.82	4.33	4.69	4.96	5.15	5.27	5.33
TXI 2 - 1.2	04	4.36	5.59	6.35	6.89	7.30	7.60	7.80	7.91
TXI 2 - 1.5	05	5.55	7.10	8.06	8.74	9.26	9.64	9.89	10.02
TXI 2 - 2.0	06	6.80	8.68	9.84	10.67	11.30	11.77	12.08	12.25

Valve type	Orifice No.	Evaporating temperature (PI) -30°C							
		Pressure drop across valve Δp bar							
			4	6	8	10	12	14	16
TXI 2 - 0.2	00		0.79	0.90	0.96	1.0	1.1	1.1	1.1
TXI 2 - 0.3	01		1.4	1.5	1.7	1.8	1.8	1.9	1.9
TXI 2 - 0.6	02		1.9	2.2	2.7	2.5	2.6	2.6	2.7
TXI 2 - 0.8	03		3.4	3.9	4.2	4.4	4.6	4.7	4.8
TXI 2 - 1.2	04		5.0	5.7	6.2	6.5	6.8	7.0	7.1
TXI 2 - 1.5	05		6.4	7.2	7.8	8.3	8.6	8.8	9.0
TXI 2 - 2.0	06		7.8	8.8	9.6	10.1	10.5	10.8	11.0

Valve type	Orifice No.	Evaporating temperature (PI) -40°C							
		Pressure drop across valve Δp bar							
		2	4	6	8	10	12	14	16
TXI 2 - 0.2	00	0.60	0.71	0.80	0.86	0.92	0.95	0.98	0.99
TXI 2 - 0.3	01	0.90	1.11	1.25	1.35	1.43	1.49	1.53	1.55
TXI 2 - 0.6	02	1.23	1.55	1.74	1.88	1.97	2.05	2.09	2.12
TXI 2 - 0.8	03	2.20	2.78	3.12	3.36	3.54	3.68	3.77	3.81
TXI 2 - 1.2	04	3.20	4.04	4.56	4.93	5.21	5.43	5.58	5.67
TXI 2 - 1.5	05	4.07	5.14	5.79	6.26	6.62	6.90	7.09	7.20
TXI 2 - 2.0	06	4.98	6.28	7.07	7.65	8.09	8.44	8.68	8.82

Setting

TXI 2 cannot be set until the refrigerant system is started up. Setting after start-up is carried out when the discharge gas temperature has been recorded and the intermediate pressure is known or measured. By means of the diagram, fig. 5, the actual working point is found. From the location of

the working point in the diagram, fig. 5, it should be decided whether to increase or decrease the spring force.

Alteration of the spring from slack to tight setting corresponds to 6 revolutions of the TXI 2 setting screw.

Technical data

Perm. working pressure PBIMWP: 28 bar
 Max. test pressure: 36 bar
 Capillary tube: 1.5 m.

Ordering valve


Type	Connections [in.]	Temp. range	Pressure range (pi)	Weight KG	Code No.
TXI-2	$\frac{3}{8} \times \frac{1}{2}$ SAE flare	+100 → +130°C	0 - 2 bar	0.3	068-3249
TXI-2	$\frac{3}{8} \times \frac{1}{2}$ SAE flare	+100 → +130°C	1 - 5 bar	0.3	068-3258
TXI-2	$\frac{3}{8}$ SAE flare × $\frac{1}{2}$ solder	+100 → +130°C	0 - 2 bar	0.3	068-3342
TXI-2	$\frac{3}{8}$ SAE flare × $\frac{1}{2}$ solder	+100 → +130°C	1 - 5 bar	0.3	068-3343
TXI-2	$\frac{3}{8}$ SAE flare × $\frac{1}{2}$ solder	+80 → +110°C	1 - 5 bar	0.3	068-3344
TXI-2	$\frac{3}{8} \times \frac{1}{2}$ SAE flare	+80 → +110°C	1 - 5 bar	0.3	068-3360

Ordering accessories

Orifice assembly

Orifice no.	Code no. TE 2
00	068-2003
01	068-2010
02	068-2015
03	068-2006
04	068-2007
05	068-2008
06	068-2009

Flare nuts

Symbol	Connection for copper tubing with outside diam.		Reducer for copper tubing with outside diam.		Code no.
	in.	mm.	in.	mm.	
	1/4	6			011L1201
	3/8	10			011L1235
	1/2	12			011L1203
	3/8	10	1/4	6	011L1207

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