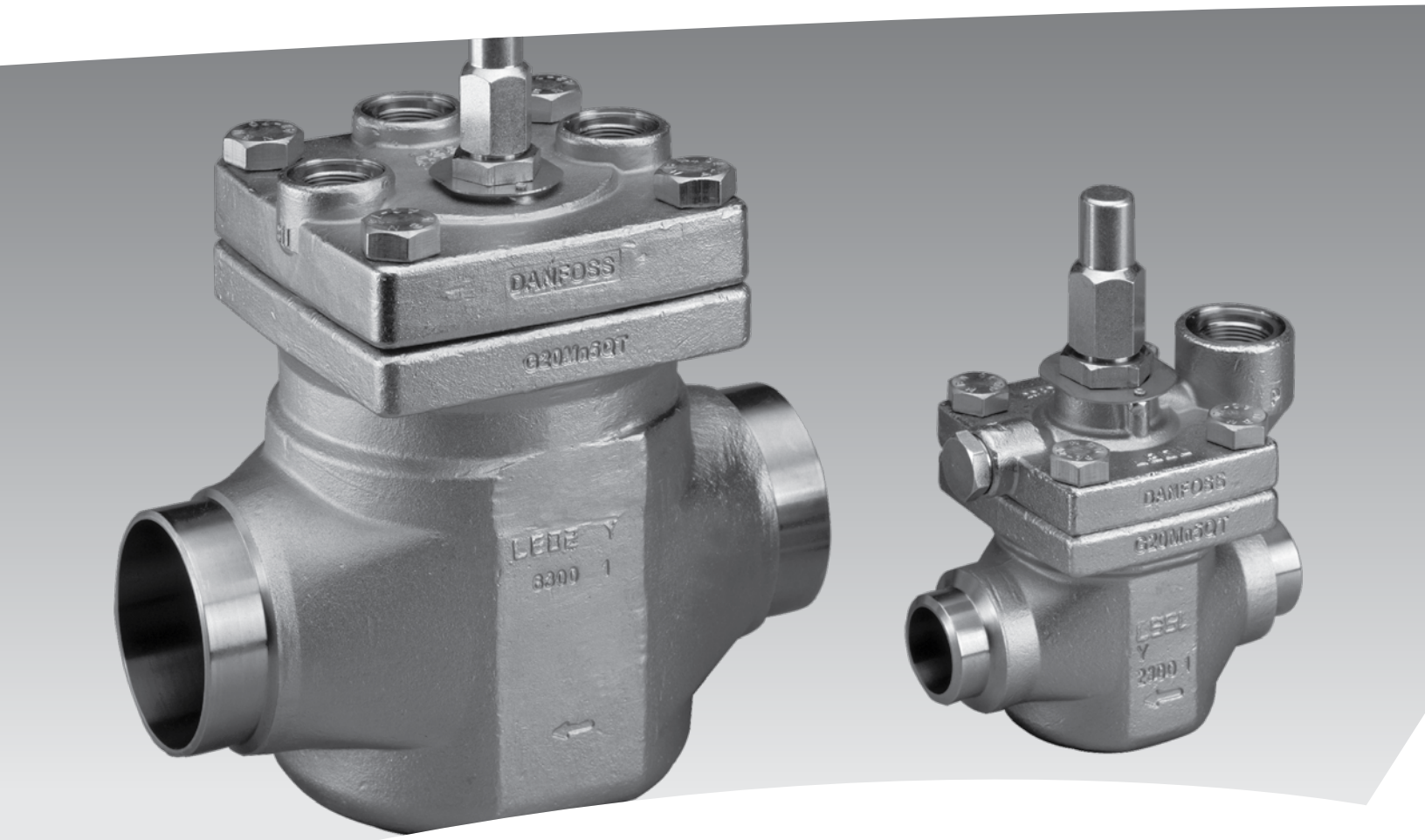
MAKING MODERN LIVING POSSIBLE



Pilot controlled servo valves

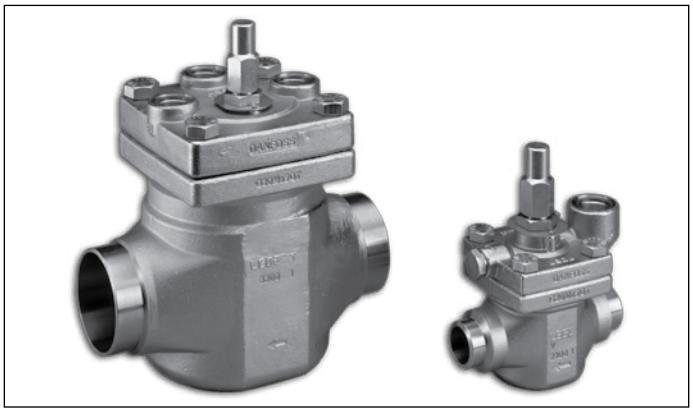
Type ICS - Solenoid Valves
Pressure Regulating Valves

REFRIGERATION AND
AIR CONDITIONING

Technical leaflet

Contents

Introduction



ICS servo valves belong to the ICV (Intelligent Control Valve) family and are one of two product groups.

ICV types
– ICS - Industrial Control Servo
– ICM - Industrial Control Motor

The valve comprises three main components: valve body, function module and top cover.

ICS servo valves are pilot operated valves for regulating pressure, temperature, and ON/OFF function in refrigeration systems. ICS valves are designed for low and high-pressure refrigerants.

ICS valves can be used on the high and low-pressure sides, in wet and dry suction lines and in liquid lines without phase change (i.e. where no expansion takes place in the valve).

The function of ICS valves is dependent on the pilot pressure applied from either a pilot valve or external pilot pressure source.

ICS 1 pilot has one pilot pressure connection and ICS 3 pilot has three pilot pressure connections.

The associated Danfoss pilot valves can be either screwed directly into the ICS valve or connected via an external pilot line. Several pilot valves can be used on one ICS valve to provide numerous variations in control functions.

The ICS valve top cover includes a pressure gauge connection port which can be used to monitor the valve inlet pressure when setting and adjusting the pilot valves.

The spindle in the top cover can be used for manually opening the ICS valve.

Features

- Designed for industrial refrigeration applications for a maximum working pressure of 754 psig / 52 bar.
- Applicable to all common refrigerants including R717 and R744 (CO_2) and non corrosive gases/liquids.
- Direct coupled connections to eliminate leak potential
- Low temperature steel body (-76 to 248°F)
- Low weight and compact design.
- V-port regulating cone ensures optimum regulating accuracy particularly at part load.
- Function module has a Teflon (PTFE) piston ring ensuring precise control accuracy.
- Modular Concept
  – Valve overhaul is performed by simply replacing the function module
  – Possible to convert ICS servo to ICM motor valve
- Manual opening.
- Pressure gauge connection port to measure valve inlet pressure.
- The top cover can be rotated into any one of four positions without affecting the operation of the valve.

Design

ICS valves are designed as pilot operated valves requiring minimal pressure differential to open. If the pressure difference is 0 psi/0 bar, the ICS valve will be closed. If the pressure difference is 3 psi / 0.2 bar or more, the ICS valve will be fully open. At pressure differences between 1 psi / 0.07 bar and 3 psi / 0.2 bar, the opening degree will be correspondingly proportional.

The ICS is available for use with either one, two, or three pilot valves.

Two of the three pilot pressure connections (S1 and S2) are connected in series while the third (P) is connected in parallel to S1 and S2. This allows different combinations of pilot valves to be used, thus providing numerous variations in control functions.

Approvals
The ICV valve concept is designed to fulfil global refrigeration requirements.
For specific approval information, please contact Danfoss.

The ICS valves are approved in accordance with the European standard specified in the Pressure Equipment Directive and are CE marked.
For further details / restrictions - see Installation Instruction

Valve body and top cover material
Low temperature steel

ICS valves		
Nominal bore	DN≤ 25 (1 in.)	DN 32-65 mm ($1^1/_4$ - $2^1/_2$ in.)
Classified for	Fluid group I	
Category	Article 3, paragraph 3	II

Technical data

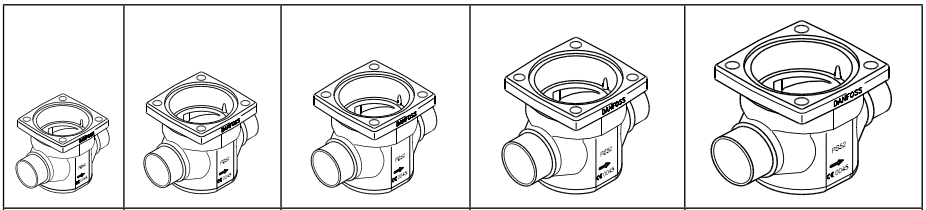
- *Refrigerants*
  Applicable to all common refrigerants including R717 and R744 (CO_2) and non-corrosive gases/liquids.
  Use with flammable hydrocarbons cannot be recommended; please contact Danfoss.
- *Temperature range*
  –76/+248°F (–60/+120°C).
- *Surface protection*
  ICS 25 - 65:
  The external surface is zinc-chromated to provide good corrosion protection.
- *Pressure range*
  The valve is designed for:
  Max. working pressure: 754 psig (52 bar g)

  Opening differential pressure:
  Fully open: Min. 3 psig (min. 0.2 bar g)
  Max. Opening Pressure Differential (MOPD), solenoid valves only - at nominal conditions.
  – 10 W a.c. up to 305 psi (21 bar)
  – 20 W a.c. up to 580 psi (40 bar)
  – "Power electronic" up to 725 psi (50 bar)

The ICS Concept

The ICS concept is developed around a modular principle. This gives the possibility of combining function modules and top covers with special valve body size that is available in a variety of connection possibilities.

- There are five valve bodies available.

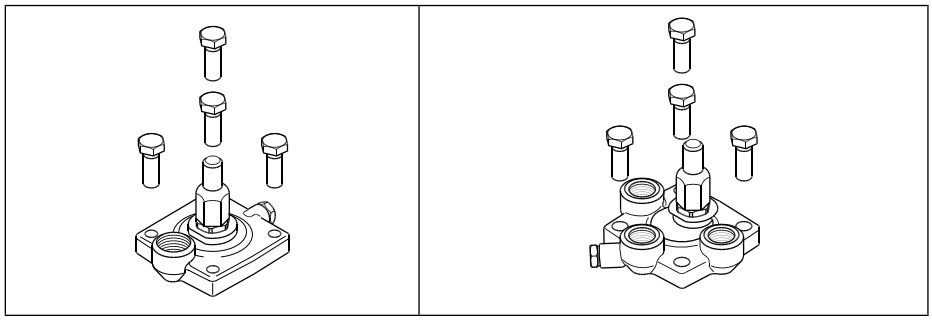


ICV 25	ICV 32	ICV 40	ICV 50	ICV 65

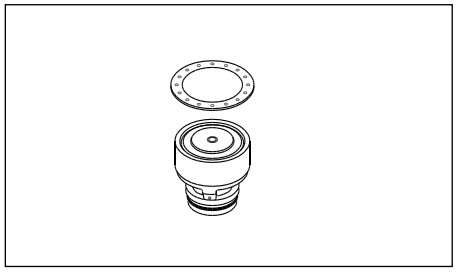
- Each valve body is available with a range of undersized through oversized connection sizes and types.

Valve Size	Module Port Size		Flow Coefficient Cv (Kv)		Connection Type and Size			
	Inches	(mm)			FPT	SW	WN	ODS
ICS 25-5	3/16"	(5)	2	(1.7)	3/4", 1"	3/4", 1"	3/4", 1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 25-10	3/8"	(10)	4.1	(3.5)	3/4", 1"	3/4", 1"	3/4", 1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 25-15	5/8"	(15)	7	(6.0)	3/4", 1"	3/4", 1"	3/4", 1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 25-20	3/4"	(20)	9.3	(8.0)	3/4", 1"	3/4", 1"	3/4", 1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 25-25	1"	(25)	13.3	(11.5)	1"	1"	1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 32	1¼"	(32)	20	(17)	-	1¼"	1¼", 1½"	1-3/8", 1-5/8"
ICS 40	1½"	(40)	31	(27)	-	1-1/2"	1½", 2"	1-5/8"
ICS 50	2"	(50)	51	(44)	-	2"	2", 2½"	2-1/8"
ICS 65	2½"	(65)	81	(70)	-	2½"	2½", 3"	2-5/8"

- Each valve body may be fitted with a 1 pilot or 3 pilot top cover.

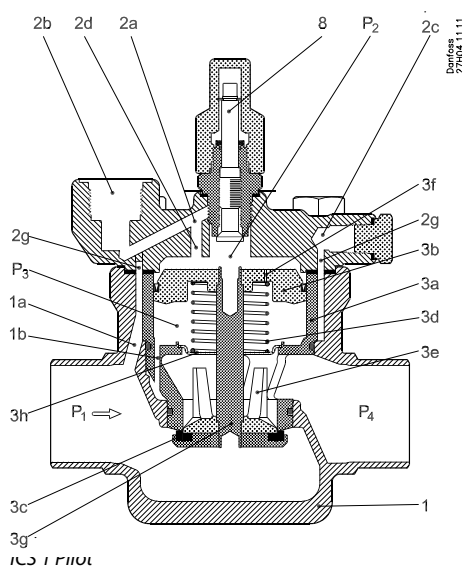


In ICS-25, multiple inserts (function modules) are available to give different capacities.



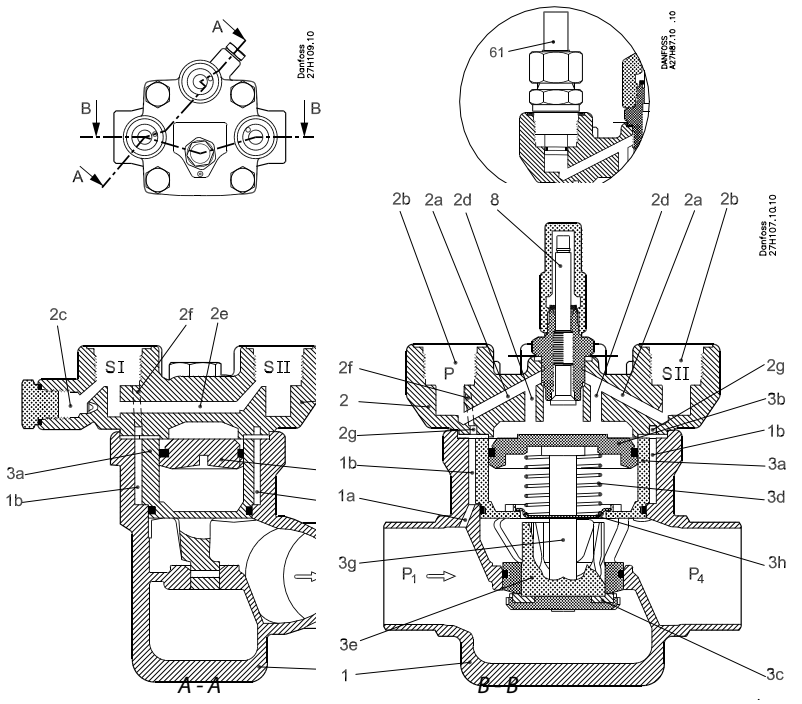
Type	Valve body size	C_v (USgal/min)
ICS25-5	25	2.0
ICS25-10		4.1
ICS25-15		7.0
ICS25-20		9.3
ICS25-25		13.3
ICS32	32	20
ICS40	40	31
ICS50	50	51
ICS65	65	81

Function



ICS 1 Pilot

Fig. 1



ICS 3 Pilots

Fig. 2

ICS 1 Pilot and ICS 3 Pilot

1. Body
1a Pilot channel to inlet side
1b Circular gap between house and module
2. Top cover
2a Pilot channels in top cover
2b Pilot insertion hole
2c Pressure gauge connection
2d Piston top inlet channel
2e Cross channel SI to SII
2f SI inlet channel
2g Circular groove
3 Function module
3a Cylinder
3b Piston
3c Valve plate
3d Spring
3e Cone
3f Equalisation orifice
3g Spindle
3h Spring support plate

p_1 Inlet pressure
p_2 Pressure on piston
p_3 Pressure underneath piston
p_4 Outlet pressure
8 Manual operating spindle

The ICS main valve is a pilot operated valve. The types of pilot valves used determine the function. The ICS main valve with pilot valve(s) controls refrigerant flow by modulation or on/off in accordance with the pilot valve and main valve status. The manual spindle can be used to open the valve plate.

The degree of opening of the main valve is determined by the pressure difference (differential pressure) between pressure p_2, which acts on top of the servo piston (3b), and pressure p_3, which acts on the underside of the servo piston.

If this pressure difference is 0, the main valve will be fully closed.
If the pressure difference is 3 psi (0.2 bar) or greater, the main valve will be fully open.
At pressure differences (p_2 - p_3) between 1 psi (0.07 bar) and 3 psi (), the degree of opening will be correspondingly proportional.

The port of the throttle cone (3e) is V-shaped, which provide good regulation characteristic to pilot operated main valves even at low loads.
P_3 pressure is equal to the valve outlet pressure (P_4), due to a clearance between the spindle (3g) and the spring support plate (3h) in the function module. The opening degree of the ICS valve is therefore controlled by the application of P_2 pressure acting on top of the servo piston, which is equal to or greater than valve outlet pressure (P_4).

$p_2 = p_4$ ~ closed
$p_2 = p_4 + 3$ psi (0.2 bar)~ fully open
$p_4 \leq p_2 \leq p_4 + 3$ psi (0.2 bar) ~ proportional degree of opening.

The maximum pressure (p_2) can act on the top of the servo piston (3b). p_2 normally corresponds to the pressure, p_1 - ICS main valve inlet pressure. Inlet pressure p_1 is led, via the drilled channels (1a, 1b, 2f, 2b (pilot), 2a, 2d) in the valve body (1) and cover (2) through the individual pilot valves and onto the top of the servo piston (3b).

The degree of opening of the individual pilot valves determines the magnitude of pressure p_2 and thus the degree of opening of the main valve. The equalization hole (3f) in the servo piston (3b) ensures that pressure p_2 is balanced in accordance with the degree of opening of the pilot valve.

Note:
When ICS valves with 3 pilot ports are used with external pressure connector (fig. 2, pos. 61), the valve port inlet pressure will be isolated.
Single Pilot Function
The ICS can be fitted with just a single screwed-in pilot valve or external pilot connection. The degree of opening of the main valve will be in accordance with the control status of the pilot valve or external pilot flow control.
ICS main valve with one pilot connection is fully closed when the pilot valve is fully closed and fully open when the pilot valve is fully open. Otherwise the degree of opening of the main valve is proportional to the degree of opening of the pilot valve.
Multiple Pilot Function
The ICS 3 pilot version can be fitted with one, two, or three pilot valves so that up to three multiple functions are possible. If the external pilot connection is used, more functions can be added.

Function *(continued)*

In the ICS three pilot version, the pilot ports are related as follows:

- The pilot valves fitted in ports SI and SII are connected in series.
  The ICS 3 pilot operated main valve will be fully closed if just one of the series-connected pilot valves is closed and the P port is plugged. The main valve can only open if both pilot valves are open at the same time.
- The pilot valve fitted in port P is connected in parallel to the pilot valves in ports SI and SII.

The ICS valve will be fully open if the pilot valve in P is fully open, irrespective of the degree of opening of pilot valves SI and SII.
The ICS valve will be fully closed if the pilot valve in P is fully closed and at least one of the valves in SI or SII is fully closed at the same time. The relation between the pilot valves in ports SI, SII and P is shown in Table 1.

If the ICS is not fitted with three pilot valves, the unused port(s) must be sealed with a pilot cap A or a combination of pilot cap A and blanking plug B. If the pilot cap and blanking plug are fitted as an assembled unit, A + B, the channels from the specific port will be closed. (See Figure 1)

If only cap A is fitted, the channels from the ports in question will be open. If the degree of opening of the ICS main valve is not to be a function of the main valve inlet pressure, or if more than three regulating functions are required, ports SI, SII or P can be fitted with a nipple for the connection of external pilot pressure. This applies to all ICS versions.

The pressure to which the external pilot line is connected will then determine the main valve function. Pilot valves installed in external lines must be mounted in a type CVH housing.

Depending on the function of the pilot valves, the ICS regulating characteristic becomes:

- on/off
- proportional
- integral or
- cascade.

ICS main valves are therefore especially suitable for all forms of temperature and pressure regulating systems.

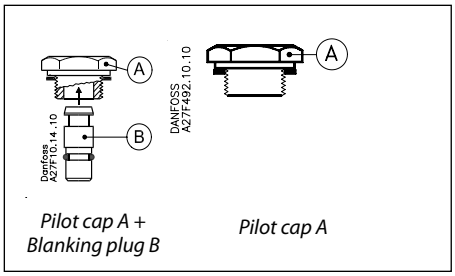
An overview of the types of pilot valves available can be found in Table 2, or technical leaflet: "Pilot valves for operated main valves" (RD4XC).

On the following pages, a number of standard configuration examples can be found. These are only for explanatory purpose. However, by using the literature regarding pilot valves these examples are easier to comprehend.

Table 1

Pilot valve port			ICS valve
SI	SII	P	
Open	Open	Closed	Open
Open	Open	Open	Open
Open	Closed	Closed	Closed
Open	Closed	Open	Open
Closed	Open	Closed	Closed
Closed	Open	Open	Open
Closed	Closed	Closed	Closed
Closed	Closed	Open	Open

Figure 1



Pilot cap A + Blanking plug B *Pilot cap A*

Figure 2

Example (ICS with 3 pilot valves)

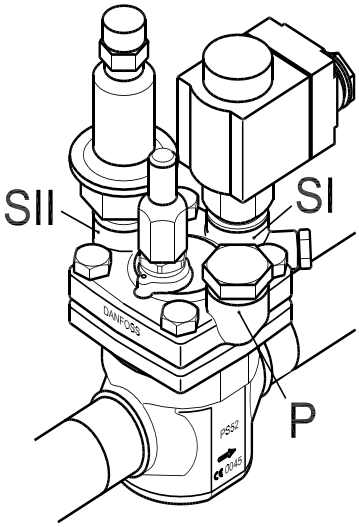
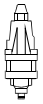
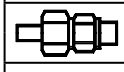
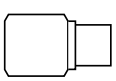
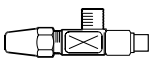


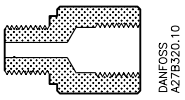
Table 2

Pilots and accessories for ICS and PM Pressure Regulators

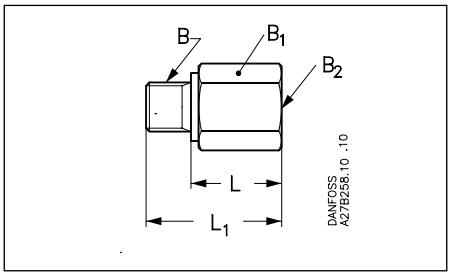
	Type	Description	Range	MWP psig	Part No.
	CVP (LP)	Pilot Valve, Inlet Pressure	0 to 102 psig	250	027B1100
			20" to 29 psig	250	027B1101
	CVP (HP)	Pilot Valve, Inlet Pressure	20" to 102 psig	406	027B1164
			58 to 319 psig	406	027B1160
			58 to 406 psig	406	027B1161
	CVP (XP)	Pilot Valve, Inlet Pressure	363 to 754 psig	754	027B0080
	CVC	Pilot Valve, Outlet Pressure	13"-102 psig	406/250	027B1070
	CVPP (HP)	Pilot Valve, Diff. Pressure	0 to 102 psig	406	027B1162
			58 to 319 psig	406	027B1168
	CVT	Pilot Valve, Temperature (Temperature rise opens valve)	-40°F to +32°F	320	027B1110
			+14°F to +77°F	320	027B1111
			+68°F to +140°F	320	027B1112
			+176°F to +284°F	320	027B1116
	CVTO	Pilot Valve, Temperature (Temperature rise closes valve)	-40°F to +32°F	320	027B1117
			+14°F to +77°F	320	027B1118
			+68°F to +140°F	320	027B1119
	CVQ	Pilot Valve, Electronic	29.5" to 72.5 psig	250	027B1139
			0 to 87 psig	250	027B1140
			25 to 116 psig	250	027B1141
	EVM (NC)	Pilot Valve, Solenoid (Normally Closed) Does Not Include Coil	-	508	027B1120
	EVM (NO)	Pilot Valve, Solenoid (Normally Open) Does Not Include Coil	-	508	027B1130
	-	Pilot Blanking Plug	-	-	027F1046
	-	External Pilot Connector for ICS 5 to 65	1/4" FPT	-	027B2065
		Pressure Gauge Connection Adapter	1/4" FPT	-	027B2062
		Pressure Gauge Connection Adapter and SNV-ST 1/4" MPT x 1/4" FPT gauge valve	1/4" FPT	-	148B418062

Accessories
(Table 2 continued)

Pressure gauge adapter.

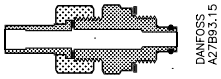


Description	Code no.
$^1/_4$ FPT	**027B2062**

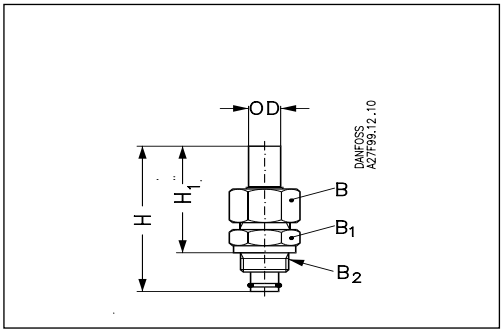


Accessories			L	L_1		B	B_1	B_2
Pressure gauge connection								
	mm in.		23 0.91	35.5 1.40		G $^1/_4$ A	AF 22	$^1/_4$ FPT

External pilot connection, 1/4" female - NPT



ICS	Description	Code no.
5 - 65	External pilot connection, 1/4" female - NPT (incl. damping orifice, D: 1.0 mm)	**027B2065**

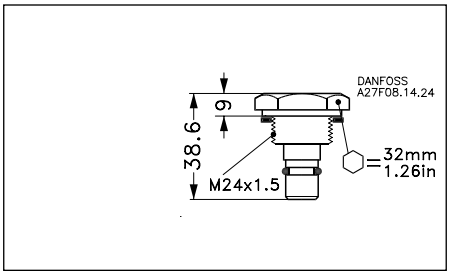


Accessories			H	H_1	OD	B	B_1	B_2
External pilot connection								
	mm in.		90 3.54	66 2.60	18 0.71	AF 32	AF 32	M 24 × 1.5

Blanking plug for pilot valves.

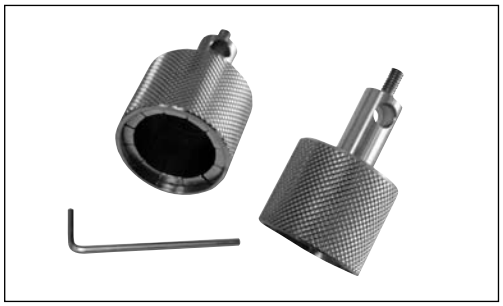
Description	Code no.
Blanking plug	**027F1046**

Other gauge connections available, contact Danfoss.



Multi-function tool

Description	Code no.
For all sizes of ICS and ICM 20 to 32	**027H0180**
For all sizes of ICS and ICM 40 to 65	**027H0181**



The multi-function tool can be used for:

- Removing the ICS function module
- Operating the ICS manual spindle
- Manually operating motorized valve type ICM

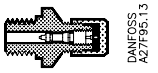
For further information please see the instruction PIHU0A.

Accessories - Special Pressure Gauge Connections

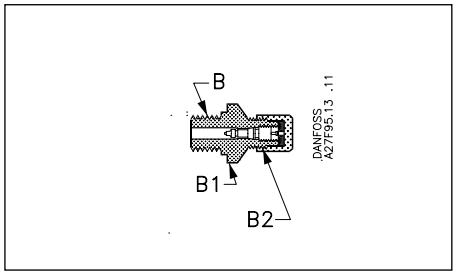
(Table 2 continued)

Flare

Pressure gauge connection, 1/4 in. flare (self-closing) Must not be used in R 717 plant.



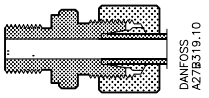
Description	Code no.
1/4 in. flare	**027B2041**



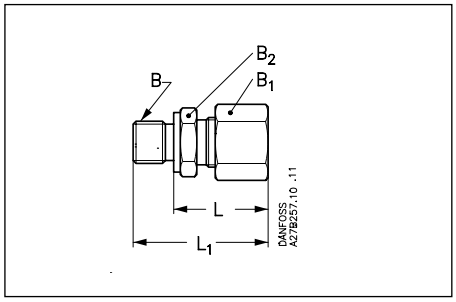
Accessories						B	B_1	B_2
Pressure gauge connection, 1/4 in. flare (self-closing)								
1/4 in. flare	mm in.					G 1/4 A	AF 19	1/4 in. flare

Cutting ring

Pressure gauge connection

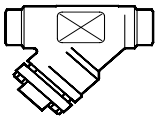


Description	Code no.
Cutting ring connection, 6 mm	**027B2063**
Cutting ring connection, 10 mm	**027B2064**



Accessories			L	L_1		B	B_1	B_2
Pressure gauge connection (cutting ring)								
6 mm	mm in.		27 1.06	39 1.54		G 1/4 A	AF 19	AF 14
10 mm	mm in.		29 1.14	40 1.57		G 1/4 A	AF 19	AF 14

Table 3- Recommended strainers (FIA)

			Strainer body without element			Strainer element for liquid line	Strainer element for liquid or suction line	Strainer element for suction line
						100 mesh	72 mesh	38 mesh
	Strainer Type	Size	A	FPT	SOC	150 my	250 my	500 my
	FIA Straightway	20 (3/4 in.)	**148H3098**	**148H3116**	**148H3110**	**148H3124**	**148H3126**	**148H3128**
	FIA Straightway	25 (1 in.)	**148H3099**	**148H3117**	**148H3111**	**148H3125**	**148H3127**	**148H3129**
	FIA Straightway	32 (1 1/4 in.)	**148H3100**	**148H3118**	**148H3112**	**148H3125**	**148H3127**	**148H3129**
	FIA Straightway	40 (1 1/2 in.)	**148H3101**		**148H3113**	**148H3125**	**148H3127**	**148H3129**
	FIA Straightway	50 (2 in.)	**148H3102**		**148H3114**	**148H3130**	**148H3138**	**148H3144**
	FIA Straightway	65 (2 1/2 in.)	**148H3103**			**148H3131**	**148H3139**	**148H3145**
	FIA Straightway	80 (3 in.)	**148H3104**			**148H3119**	**148H3120**	**148H3121**

Contact Danfoss for other strainer variations.

Steps for ordering valves assembled with pilots:

Step 1: Specify ICS valve (ICS type, connection size/type), Table 4 below.
Step 2: Specify regulator configuration, consult Danfoss for variations not listed, Figures 3-14
Step 3: Specify coil voltage and accessories where applicable.
Note: Review default pilot types/ranges and note any substitutions from Table 2, page 8.

Example for ordering:
Dual inlet pressure regulator type ICS with ¾" Port size, 1" SOC connections and gauge valve with adapter for fitting into regulator.
Item 1: ICS 25-20-D with 1" SOC connections (see Figure 11)
Item 2: ¼" gauge valve with adapter, p/n 148B418062 (selected from ICS accessories)

Table 4

Valve Size	Module Port Size		Flow Coefficient Cv (Kv)		Connection Type and Size			
	Inches	(mm)			FPT	SW	WN	ODS
ICS 25-5	3/16"	(5)	2	(1.7)	3/4", 1"	3/4", 1"	3/4", 1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 25-10	3/8"	(10)	4.1	(3.5)	3/4", 1"	3/4", 1"	3/4", 1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 25-15	5/8"	(15)	7	(6.0)	3/4", 1"	3/4", 1"	3/4", 1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 25-20	3/4"	(20)	9.3	(8.0)	3/4", 1"	3/4", 1"	3/4", 1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 25-25	1"	(25)	13.3	(11.5)	1"	1"	1", 1¼"	7/8", 1-1/8", 1-3/8"
ICS 32	1¼"	(32)	20	(17)	-	1¼"	1¼", 1½"	1-3/8", 1-5/8"
ICS 40	1½"	(40)	31	(27)	-	1-1/2"	1½", 2"	1-5/8"
ICS 50	2"	(50)	51	(44)	-	2"	2", 2½"	2-1/8"
ICS 65	2½"	(65)	81	(70)	-	2½"	2½", 3"	2-5/8"

BW = Butt-weld ANSI; SW = Socket weld ANSI;
ODS = Solder ANSI; FPT = Female Pipe Thread

Standard configurations

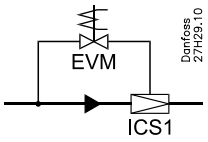
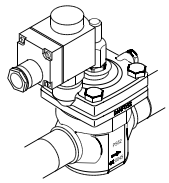
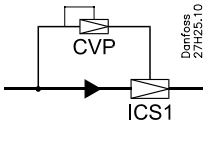
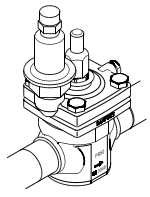
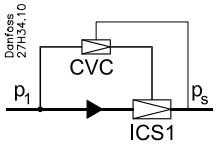
Figure 3 - **Solenoid Valve**		*Products*	
On/off regulation		1 × ICS 1 Pilot 1 × EVM 1 × coil	

Figure 4 - **STD**		*Products*	
Constant pressure regulation - ICS and PM sizes 5 to 65 are standard with CVP(LP) pilot range 0 to 102 psig. PM sizes 80 to 125 are standard with CVP(HP) pilot range 20 in.HG to 102 psig.		1 × ICS 1 Pilot 1 × CVP (LP)	

Standard configuration examples

Figure 5 - **"O"**

Outlet pressure regulation - PM sizes 5 to 65 are with CVC pilot range 13 in.HG to 102 psig and external pilot mounting set for connection between CVC pilot and the outlet of the PM valve. ICS sizes 5 to 65 and PM sizes 80 to 125 are only with CVC pilot.



Products

1 × ICS 1 Pilot
1 × CVC

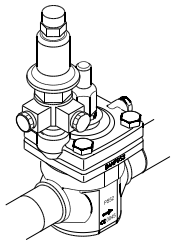
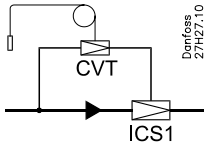


Figure 6 - **"T"**

Thermostatic regulation - Standard with CVT pilot range +14°F to +77°F, which opens valve on temperature rise. CVTO valves, which close valve on temperature rise are available.



Products

1 × ICS 1 Pilot
1 × CVT

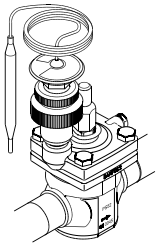
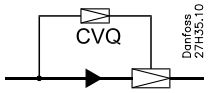


Figure 7 - **"J"**

Electronically controlled pressure regulation - Standard with CVQ pilot range 0 to 87 psig.



Products

1 × ICS 1 Pilot
1 × CVQ

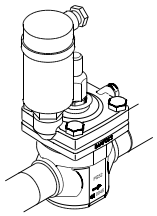
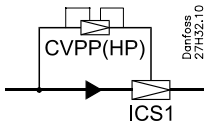


Figure 8 - **"L"**

Differential pressure regulation - PM sizes 5 to 65 are standard with CVPP(HP) pilot range 0 to 102 psi and external pilot mounting set for connection between CVPP pilot and the outlet of the PM valve. ICS sizes 5 to 65 and PM sizes 80 to 125 are standard



Products

1 × ICS 1 Pilot
1 × CVPP (HP)

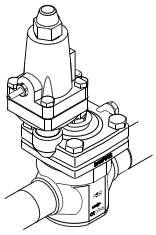
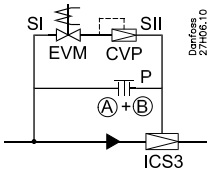


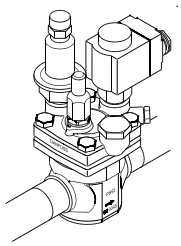
Figure 9 - **"S"**

Inlet pressure regulation combined with forced closing - ICS and PM sizes 5 to 65 are standard with CVP(LP) pilot range 0 to 102 psig and EVM(NC) pilot. PM sizes 80 to 125 are standard with CVP(HP) pilot range 20 in.HG to 102 psig and EVM(NC) pilot.



Products

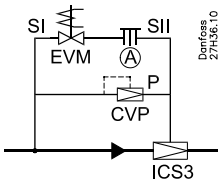
1 × ICS 3 Pilots
1 × pilot plug A + blanking plug B(P)
1 × CVP (LP)(SII)
1 × EVM(SI)
1 × coil



Standard configurations *(continued)*

Figure 10 - **"B"**

Constant inlet pressure regulation combined with electrical forced wide opening - ICS and PM sizes 5 to 65 are standard with CVP(LP) pilot range 0 to 102 psig and EVM(NC) pilot. PM sizes 80 to 125 are standard with CVP(HP) pilot range 20 in.HG to 102 psi.



Products

1 × ICS 3 Pilots
1 × pilot cap A(SII)
1 × CVP (LP)(P)
1 × EVM(SI)

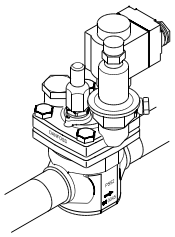
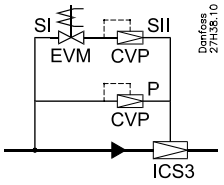


Figure 11 - **"D"**

Dual inlet pressure regulation with changeover between two preset evaporating pressures - ICS and PM sizes 5 to 65 are standard with two CVP(LP) pilots range 0 to 102 psig and EVM(NC) pilot. PM sizes 80 to 125 are standard with two CVP(HP) pilots range 2.



Products

1 × ICS 3 Pilots
2 × CVP (LP)
1 × EVM
1 × coil

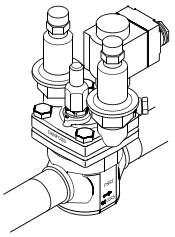
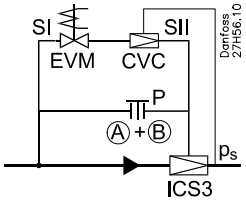


Figure 12 - **"OS"**

Outlet pressure regulation combined with electrical forced closing - PM sizes 5 to 65 are with CVC pilot range 13 in.HG to 102 psig, EVM(NC) pilot and external pilot mounting set for connection between CVC pilot and the outlet of the PM valve. ICS sizes.



Products

1 × ICS 3 Pilots
1 × pilot cap A + blanking cap B
1 × CVC
1 × EVM
1 × coil

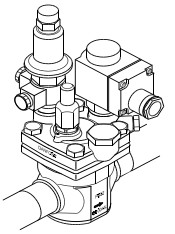
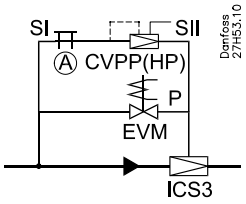


Figure 13 - **"BL"**

Differential pressure regulation combined with electrical forced wide opening - PM sizes 5 to 65 are standard with CVPP(HP) pilot range 0 to 102 psi, EVM(NC) pilot and external pilot mounting set for connection between CVPP pilot and the outlet of the PM.



Products

1 × ICS 3 Pilots
1 × pilot cap A
1 × CVPP (HP)
1 × EVM
1 × coil

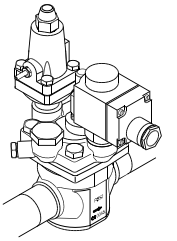
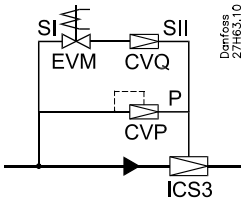


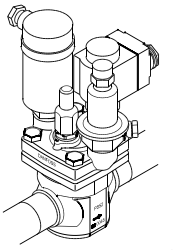
Figure 14 - **"JD"**

Electronically controlled temperature regulation combined with electric forced closing and changeover to constant pressure regulation - ICS and PM sizes 5 to 65 are standard with CVQ pilot range 0 to 87 psig, EVM(NC) pilot and CVP(LP) pilot range 0 to 102.



Products

1 × ICS 3 Pilots
1 × CVQ
1 × CVP (LP)
1 × EVM
1 × coil

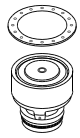


Other configurations available, contact Danfoss.

ICS 25

Spare parts

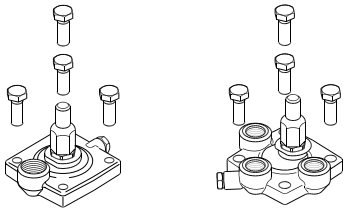
ICS 25 function module



Description	Code Number
ICS 25-5	**027H2201** *)
ICS 25-10	**027H2202** *)
ICS 25-15	**027H2203** *)
ICS 25-20	**027H2204** *)
ICS 25-25	**027H2200** *)

*) Including gasket and O-rings

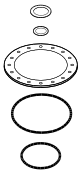
ICS 25 top cover



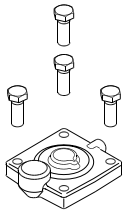
ICS 1 *ICS 3*

Description	Code Number
Top cover 1 Pilot	**027H2172** *)
Top cover 3 Pilots	**027H2173** **)

*) Including bolts
**) Including bolts and one blanking plug



Spare Parts	Code Number
ICS 25 Service kit	**027H2222**



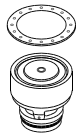
Accessories	Code Number
ICS 25 Blank top cover	**027H2174** *)

*) Including bolts and gaskets

ICS 32

Spare parts

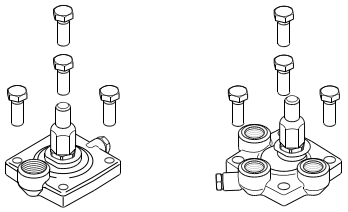
ICS 32 function module



Description	Code Number
ICS 32	**027H3200** *)

*) Including gasket and O-rings

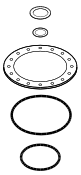
ICS 32 top cover



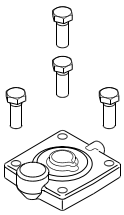
ICS 1 *ICS 3*

Description	Code Number
Top cover 1 Pilot	**027H3172** *)
Top cover 3 Pilots	**027H3173** **)

*) Including bolts
**) Including bolts and one blanking plug



Spare Parts	Code Number
ICS 32 Service kit	**027H3222**



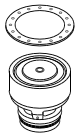
Accessories	Code Number
ICS 32 Blank top cover	**027H3174** *)

*) Including bolts and gaskets

ICS 40

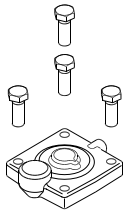
Spare parts

ICS 40 function module



Description	Code Number
ICS 40	**027H4200** *)

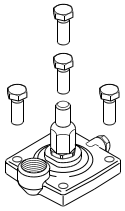
*) Including gasket and O-rings



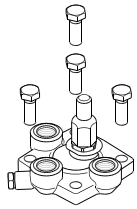
Accessories	Code Number
ICS 40 Blank top cover	**027H4174** *)

*) Including bolts and gaskets

ICS 40 top cover



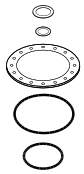
ICS 1



ICS 3

Description	Code Number
Top cover 1 Pilot	**027H4172** *)
Top cover 3 Pilots	**027H4173** **)

*) Including bolts
**) Including bolts and one blanking plug

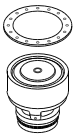


Spare Parts	Code Number
ICS 40 Service kit	**027H4222**

ICS 50

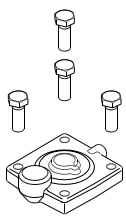
Spare parts

ICS 50 function module



Description	Code Number
ICS 50	**027H5200** *)

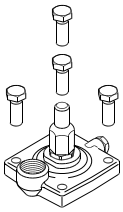
*) Including gasket and O-rings



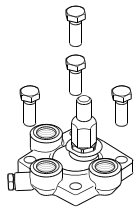
Accessories	Code Number
ICS 50 Blank top cover	**027H5174** *)

*) Including bolts and gaskets

ICS 50 top cover



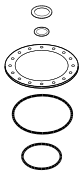
ICS 1



ICS 3

Description	Code Number
Top cover 1 Pilot	**027H5172** *)
Top cover 3 Pilots	**027H5173** **

*) Including bolts
**) Including bolts and one blanking plug

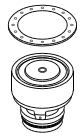


Spare Parts	Code Number
ICS 50 Service kit	**027H5222**

ICS 65

Spare parts

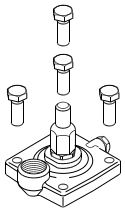
ICS 65 function module



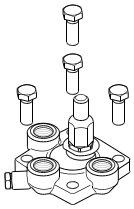
Description	Code Number
ICS 65	**027H6200** *)

*) Including gasket and O-rings

ICS 65 top cover



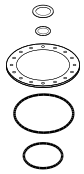
ICS 1



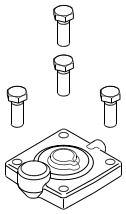
ICS 3

Description	Code Number
Top cover 1 Pilot	**027H6172** *)
Top cover 3 Pilots	**027H6173** **)

*) Including bolts
**) Including bolts and one blanking plug



Spare Parts	Code Number
ICS 65 Service kit	**027H6222**

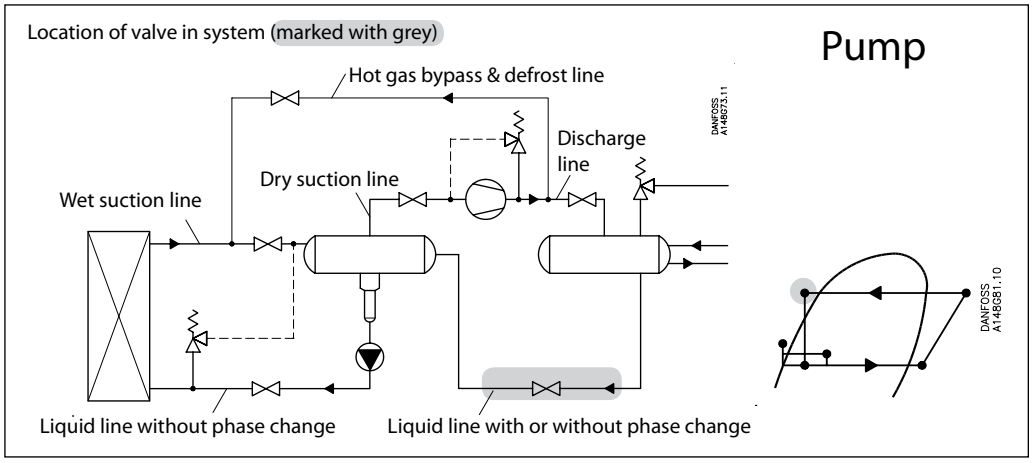


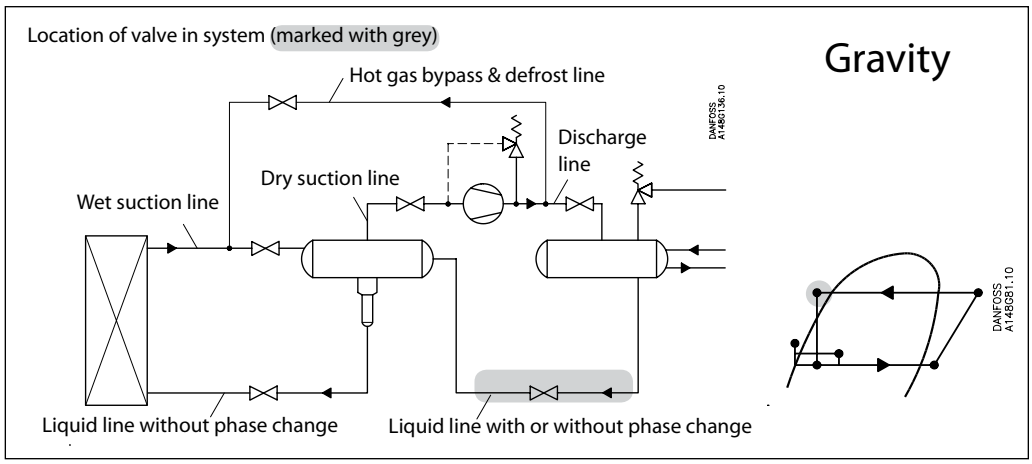
Accessories	Code Number
ICS 65 Blank top cover	**027H6174** *)

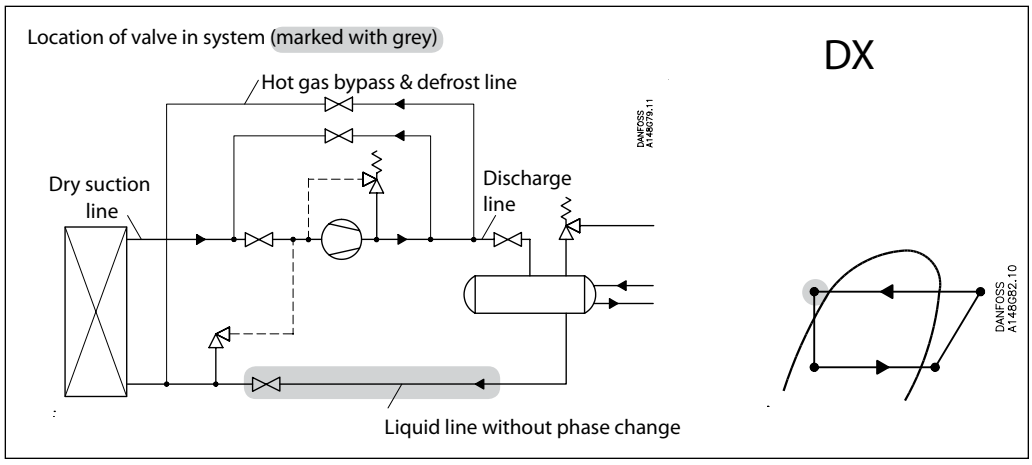
*) Including bolts and gaskets

Nominal capacities

Liquid line with/without phase change







Nominal capacities

Liquid line with/without phase change

Calculation example (R 717 capacities):

Running conditions in a plant are as follows:
T_e = –20°F
Q_o = 130 TR
Liquid temperature = 50°F
Max. Δp = 4 psi

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, T_{liq} = 90°F)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 4 psi, $f_{\Delta p} = 0.87$
Correction factor for liquid temperature $f_{Tliq} = 0.92$

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} = 130 \times 0.87 \times 0.92 = 104$ TR

From the capacity table a ICS25-15 with Q_n capacity 175 TR is selected.

Liquid line with/without phase change

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi

R 717

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	48.0	48.8	49.6	50.6	51.0	51.4	52.0	52.0
ICS25-10		4.1	99.0	100	102	104	105	106	107	107
ICS25-15		7	169	172	175	178	180	181	183	184
ICS25-20		9.3	226	230	233	237	240	242	244	245
ICS25-25		13.3	324	330	335	341	345	348	351	352
ICS32	32	20	480	488	496	503	509	514	518	520
ICS40	40	31	762	775	788	799	808	816	822	826
ICS50	50	51	1242	1262	1285	1302	1317	1330	1340	1345
ICS65	65	81	1975	2010	2043	2070	2095	2115	2130	2140

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	1.00
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.82
10°F	0.85
30°F	0.88
50°F	0.92
70°F	0.96
90°F	1.00
110°F	1.04
130°F	1.09

Nominal capacities

Liquid line with/without phase change

R 22

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	9.5	9.8	10.1	10.5	10.7	11.0	11.3	11.5
ICS25-10		4.1	19.5	20.2	20.9	21.5	22.1	22.7	23.2	23.6
ICS25-15		7	33.5	34.6	35.9	37.0	38.0	39.0	39.8	40.5
ICS25-20		9.3	44.5	46.2	47.8	49.2	50.6	52.0	53.0	54.0
ICS25-25		13.3	64.0	66.4	68.6	71.0	73.0	75.0	76.0	77.6
ICS32	32	20	95.0	98.0	101	105	108	110	112	115
ICS40	40	31	151	156	161	166	171	175	179	182
ICS50	50	51	245	254	263	271	279	285	291	297
ICS65	65	81	390	404	418	431	443	454	464	472

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.73
10°F	0.77
30°F	0.82
50°F	0.87
70°F	0.93
90°F	**1.00**
110°F	1.09
130°F	1.20

R 744

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 50°F,
ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	11.7	11.9	12.0	12.0	11.9	11.6	10.9	9.3
ICS25-10		4.1	24.2	24.6	24.8	24.8	24.5	23.8	22.4	19.0
ICS25-15		7	41.5	42.1	42.5	42.5	42.0	40.8	38.4	32.7
ICS25-20		9.3	55.3	56.2	56.7	56.7	56.0	54.4	51.0	43.6
ICS25-25		13.3	79.5	81.8	81.5	81.5	80.5	78.0	73.5	63.0
ICS32	32	20	118	119	120	120	119	115	109	93
ICS40	40	31	187	190	191	191	189	184	173	147
ICS50	50	51	304	309	312	312	308	299	281	240
ICS65	65	81	484	492	496	496	490	476	448	382

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.48
10°F	0.64
30°F	0.88
50°F	**1.00**

Nominal capacities

Liquid line with/without phase change

R 134a

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]						
		(USgal/min)	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	8.5	9.0	9.4	9.8	10.3	10.7	11.1
ICS25-10		4.1	17.5	18.4	19.4	20.3	21.2	22.0	22.8
ICS25-15		7	30.0	31.6	33.2	34.7	36.2	37.7	39.0
ICS25-20		9.3	40.0	42.1	44.3	46.3	48.4	50.3	52.0
ICS25-25		13.3	57.4	60.6	63.6	66.5	69.5	72.3	75.0
ICS32	32	20	85	89	94	98.5	103	107	111
ICS40	40	31	135	142	149	156	163	170	176
ICS50	50	51	220	232	244	255	266	277	287
ICS65	65	81	350	369	387	405	423	440	456

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.64
10°F	0.68
30°F	0.74
50°F	0.81
70°F	0.89
90°F	**1.00**
110°F	1.15
130°F	1.35

R 404A

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	5.4	5.8	6.2	6.6	7.0	7.4	7.8	8.0
ICS25-10		4.1	11.0	11.9	12.8	13.7	14.5	15.3	16.0	16.6
ICS25-15		7	18.9	20.4	22.0	23.4	24.9	26.2	27.4	28.4
ICS25-20		9.3	25.2	27.2	29.2	31.3	33.0	35.0	36.5	38.0
ICS25-25		13.3	36.1	39.1	42.0	45.0	47.6	50.0	52.5	54.4
ICS32	32	20	53.5	57.8	62.0	66.4	70.4	74.0	77.6	80.4
ICS40	40	31	85.0	92.0	99.0	106	112	118	123	128
ICS50	50	51	138	150	161	172	182	192	201	208
ICS65	65	81	220	238	256	274	290	306	320	331

Correction factor for ΔP ($f_{\Delta P}$)

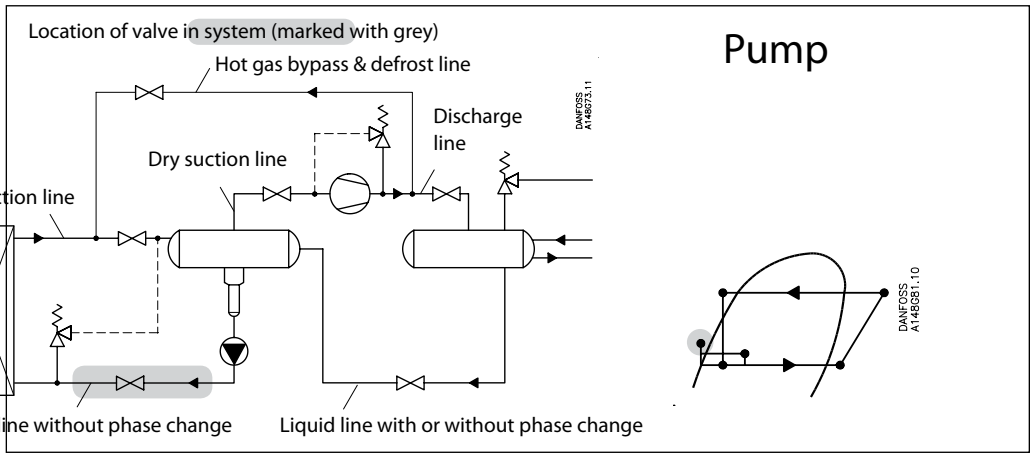
ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.52
10°F	0.57
30°F	0.63
50°F	0.72
70°F	0.83
90°F	**1.00**
110°F	1.29
130°F	1.92

Nominal capacities

Liquid line without phase change



Calculation example (R 717 capacities):
Running conditions in a plant are as follows:

T_e = –20 F
Q_o = 130 TR
Circulation rate = 3
Max. Δp = 4 psi

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, circulation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 4 psi, $f_{\Delta p} = 0.87$
Correction factor for circulation rate $f_{rec} = 0.75$

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 130 \times 0.87 \times 0.75 = 85$ TR

From the capacity table a ICS 25 with Q_n capacity 114 TR is selected.

Nominal capacities

Liquid line without phase change

R 717

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	18.0	17.4	16.9	16.2	15.6	14.9	14.2	13.4
ICS25-10		4.1	37.0	35.9	34.7	33.4	32.0	30.6	29.6	27.6
ICS25-15		7	63.4	61.5	59.4	57.3	55.0	52.5	50.0	47.3
ICS25-20		9.3	84.5	82.0	79.3	76.3	73.3	70.0	66.6	63.0
ICS25-25		13.3	122	118	114	110	105	102	95.7	91.0
ICS32	32	20	180	174	169	162	156	149	142	134
ICS40	40	31	285	276	267	258	247	236	225	213
ICS50	50	51	465	451	436	420	403	385	366	347
ICS65	65	81	740	717	694	668	641	613	583	552

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

R 22

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	4.4	4.2	4.1	3.9	3.7	3.5	3.2	3.0
ICS25-10		4.1	9.0	8.7	8.3	8.0	7.6	7.1	6.7	6.2
ICS25-15		7	15.5	14.9	14.3	13.6	13.0	12.2	11.5	10.6
ICS25-20		9.3	20.6	19.9	19.1	18.2	17.3	16.3	15.3	14.2
ICS25-25		13.3	29.7	28.6	27.4	26.2	24.9	23.5	22.0	20.4
ICS32	32	20	44.0	42.2	40.5	38.7	36.8	34.6	32.5	30.2
ICS40	40	31	70.0	67.0	64.3	61.4	58.3	55.0	51.6	47.8
ICS50	50	51	114	109	105	100	95.0	90.0	84.0	78.0
ICS65	65	81	181	174	167	159	151	143	134	124

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

Nominal capacities

Liquid line without phase change

R 744

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	5.6	5.8	4.8	4.3	3.8	3.2	2.4	1.4
ICS25-10		4.1	11.4	10.7	9.8	8.8	7.8	6.5	5.0	2.8
ICS25-15		7	19.6	18.3	16.8	15.2	13.3	11.2	8.6	4.8
ICS25-20		9.3	26.1	24.4	22.4	20.2	17.7	14.9	11.4	6.3
ICS25-25		13.3	37.6	35.0	32.2	29.0	25.5	21.4	16.4	9.1
ICS32	32	20	55.5	51.8	47.6	43.0	37.7	31.6	24.2	13.5
ICS40	40	31	88.0	82.0	75.5	68.0	60.0	50.2	38.5	21.4
ICS50	50	51	144	134	123	111	98.0	82.0	62.7	35.0
ICS65	65	81	229	213	196	177	155	130	100	55.4

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

Liquid line without phase change

R 134a

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]						
		(USgal/min)	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	4.1	4.0	3.8	3.6	3.4	3.2	3.0
ICS25-10		4.1	8.5	8.1	7.7	7.4	7.0	6.6	6.1
ICS25-15		7	14.4	13.8	13.2	12.6	11.9	11.2	10.4
ICS25-20		9.3	19.2	18.4	17.6	16.7	15.8	14.9	13.8
ICS25-25		13.3	27.4	26.3	25.1	23.9	22.7	21.3	19.8
ICS32	32	20	41.2	39.5	37.8	35.9	34.1	32.0	29.8
ICS40	40	31	63.9	61.2	58.6	55.7	52.8	49.6	46.1
ICS50	50	51	105	101	96.3	91.6	86.9	81.5	75.9
ICS65	65	81	167	160	153	146	138	130	121

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

Nominal capacities

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

R 404A

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	3.6	3.5	3.2	3.0	2.9	2.7	2.4	2.2
ICS25-10		4.1	7.4	7.0	6.7	6.3	5.9	5.5	5.0	4.5
ICS25-15		7	12.5	12.1	11.4	10.8	10.1	9.4	8.6	7.7
ICS25-20		9.3	16.9	16.1	15.2	14.4	13.5	12.6	11.5	10.3
ICS25-25		13.3	24.2	23.2	21.9	20.7	19.4	18.0	16.5	14.7
ICS32	32	20	35.8	34.2	32.3	30.6	28.8	26.7	24.4	21.8
ICS40	40	31	57.0	54.4	51.3	48.6	45.6	42.5	38.8	34.6
ICS50	50	51	93.0	88.6	84.0	79.0	74.4	69.0	63.0	56.5
ICS65	65	81	147	141	133	126	118	110	101	90.0

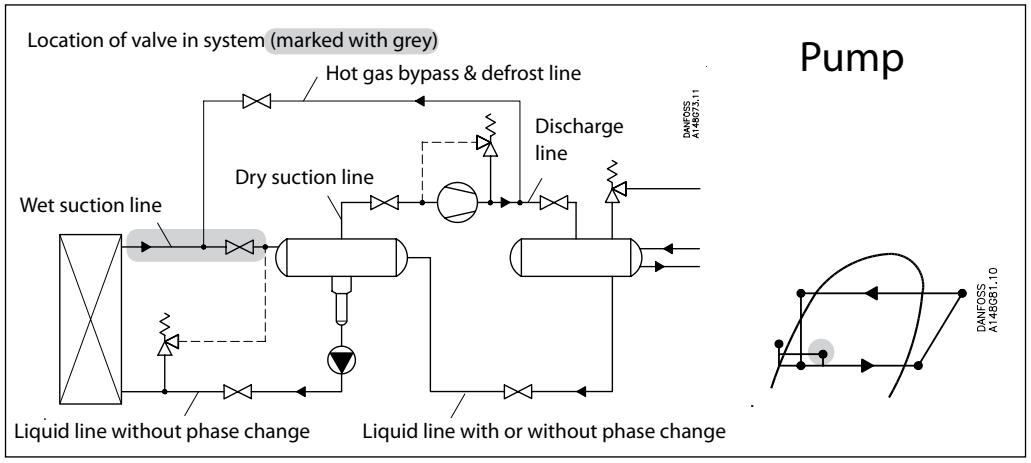
Correction factor for ΔP ($f_{\Delta P}$)

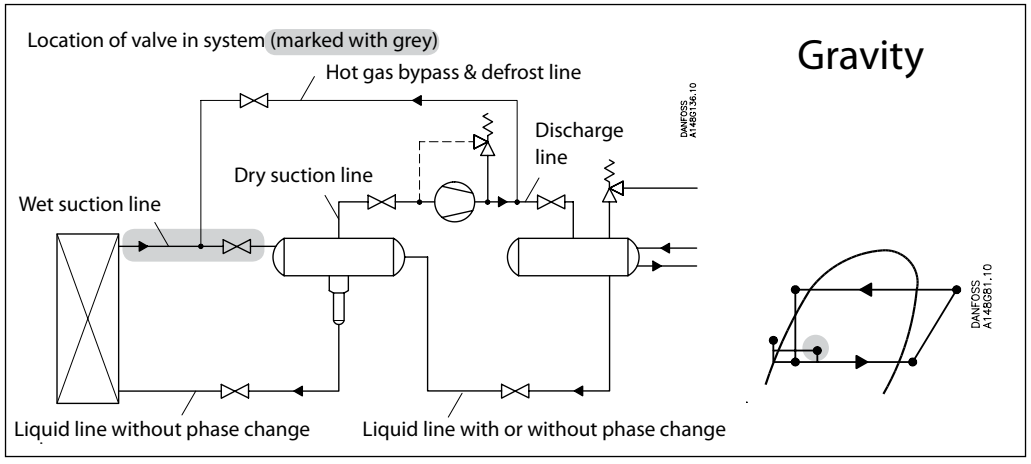
ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.5
3	0.75
4	**1**
6	1.5
8	2
10	2.5

Wet suction line





Nominal capacities

Wet suction line

Calculation example (R 717 capacities):

An application has following running conditions:

T_e = –20 F
Q_o = 8 TR
Circulation rate = 3
Max. Δp = 4 psi

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, circulation rate = 4)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 4 psi, $f_{\Delta p} = 0.87$
Correction factor for circulation rate $f_{rec} = 0.9$

$Q_n = Q_o \times f_{\Delta p} \times f_{rec} = 8 \times 0.87 \times 0.9 = 6.3$ TR

From the capacity table a ICS 25-20 with Q_n capacity 6.8 TR is selected.

R 717

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	0.6	1.1	1.4	1.8	2.2	2.6	3.0	3.5
ICS25-10		4.1	1.3	2.2	3.0	3.7	4.5	5.4	6.2	7.1
ICS25-15		7	2.3	3.7	5.1	6.4	7.8	9.2	10.7	12.2
ICS25-20		9.3	3.0	5.0	6.8	8.5	10.3	12.3	14.2	16.2
ICS25-25		13.3	4.4	7.1	9.7	12.2	14.9	17.6	20.4	23.3
ICS32	32	20	6.5	10.5	14.3	18.1	22.0	26.0	30.0	34.5
ICS40	40	31	10.3	16.8	22.8	28.8	35.0	41.4	48.0	55.0
ICS50	50	51	16.8	27.3	37.0	47.0	57.0	67.0	78.0	89.0
ICS65	65	81	26.8	43.5	59.0	75.0	91.0	107	124	142

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

Wet suction line

Nominal capacities

R 22

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	0.2	0.5	0.7	0.8	0.9	1.1	1.2	1.3
ICS25-10		4.1	0.5	1.1	1.3	1.6	1.9	2.2	2.4	2.7
ICS25-15		7	0.8	1.8	2.3	2.8	3.2	3.7	4.1	4.6
ICS25-20		9.3	1.1	2.4	3.0	3.7	4.3	4.9	5.5	6.1
ICS25-25		13.3	1.6	3.5	4.4	5.2	6.1	7.0	7.9	8.7
ICS32	32	20	2.4	5.2	6.5	7.9	9.2	10.5	11.9	13.1
ICS40	40	31	3.7	8.1	10.1	12.2	14.3	16.3	18.4	20.3
ICS50	50	51	6.1	13.3	16.7	20.1	23.5	26.9	30.2	33.4
ICS65	65	81	9.69	21.1	26.5	31.9	37.3	42.7	48.0	53.0

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

R 744

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	1.5	1.7	2.0	2.2	2.3	2.4	2.4	1.8
ICS25-10		4.1	3.0	3.5	4.0	4.5	4.8	5.0	4.8	3.7
ICS25-15		7	5.2	6.0	6.9	7.7	8.2	8.6	8.3	6.4
ICS25-20		9.3	6.9	8.1	9.2	10.2	11.0	11.4	11.1	8.5
ICS25-25		13.3	10.0	11.6	13.2	14.7	15.8	16.4	15.9	12.3
ICS32	32	20	14.7	17.2	19.4	21.7	23.3	24.2	23.5	18.2
ICS40	40	31	23.3	27.3	31.0	34.5	37.0	38.5	37.3	28.8
ICS50	50	51	38.0	44.5	50.5	56.0	60.5	62.7	60.8	47.0
ICS65	65	81	60.5	71.0	80.0	89.0	96.0	100	96.7	75.0

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

Nominal capacities

Wet suction line

R 134a

Type	Valve body size	C_v (USgal/min)	Evaporating temperature [°F]						
			–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	0.3	0.5	0.6	0.7	0.8	1.0	1.1
ICS25-10		4.1	0.6	1.0	1.2	1.5	1.7	2.0	2.2
ICS25-15		7	1.0	1.6	2.1	2.5	2.9	3.4	3.8
ICS25-20		9.3	1.4	2.2	2.8	3.3	3.9	4.5	5.1
ICS25-25		13.3	2.0	3.1	3.9	4.8	5.6	6.4	7.2
ICS32	32	20	3.0	4.7	5.9	7.2	8.4	9.7	10.9
ICS40	40	31	4.6	7.2	9.2	11.1	13.1	15.0	16.8
ICS50	50	51	7.6	11.9	15.1	18.3	21.5	24.6	27.7
ICS65	65	81	12.1	18.9	24.1	29.1	34.1	39.1	44.0

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

R 404A

Capacity table for nominal conditions, Q_N [Tons of Refrigeration], circulation rate = 4, ΔP = 3 psi

Type	Valve body size	C_v (USgal/min)	Evaporating temperature [°F]							
			–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	0.4	0.5	0.7	0.8	0.9	1.0	1.1	1.2
ICS25-10		4.1	0.8	1.1	1.3	1.6	1.8	2.1	2.3	2.3
ICS25-15		7	1.4	1.9	2.3	2.7	3.2	3.6	3.9	2.5
ICS25-20		9.3	1.9	2.5	3.1	3.6	4.2	4.8	5.3	5.7
ICS25-25		13.3	2.8	3.6	4.4	5.2	6.0	6.8	7.5	8.1
ICS32	32	20	4.1	5.3	6.5	7.7	8.9	10.1	11.1	12.0
ICS40	40	31	6.5	8.5	10.3	12.2	14.2	16.0	17.7	19.1
ICS50	50	51	10.6	13.8	16.8	19.9	23.0	26.0	29.0	31.0
ICS65	65	81	16.9	22.0	26.7	31.7	36.7	41.5	46.0	49.5

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

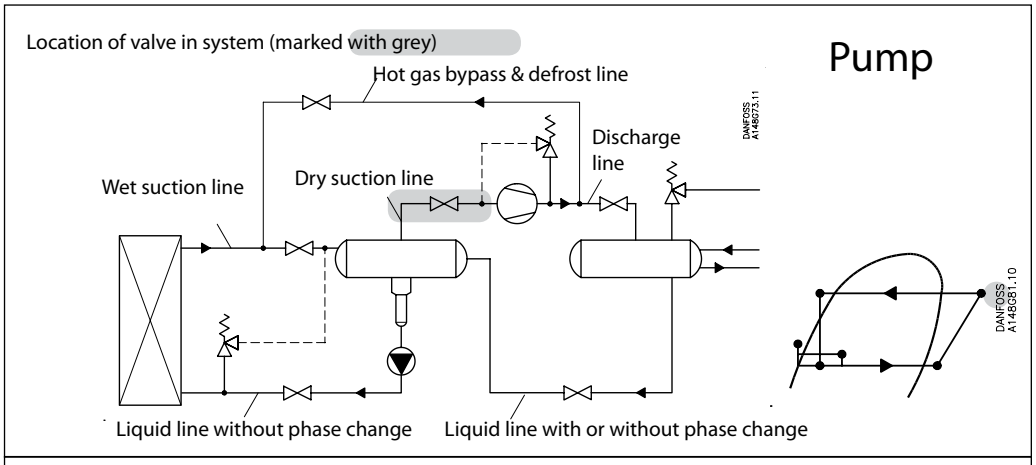
Correction factor for circulation rate (f_{rec})

Circulation rate	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

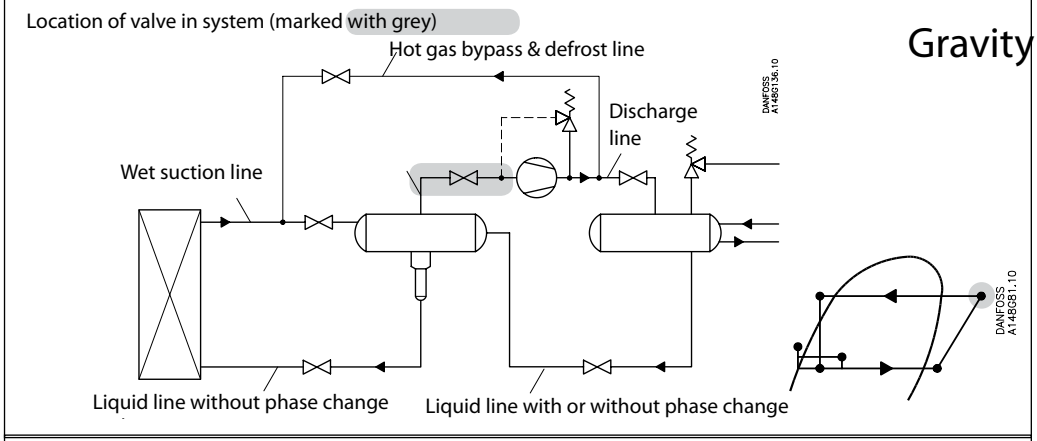
Nominal capacities

Dry suction line

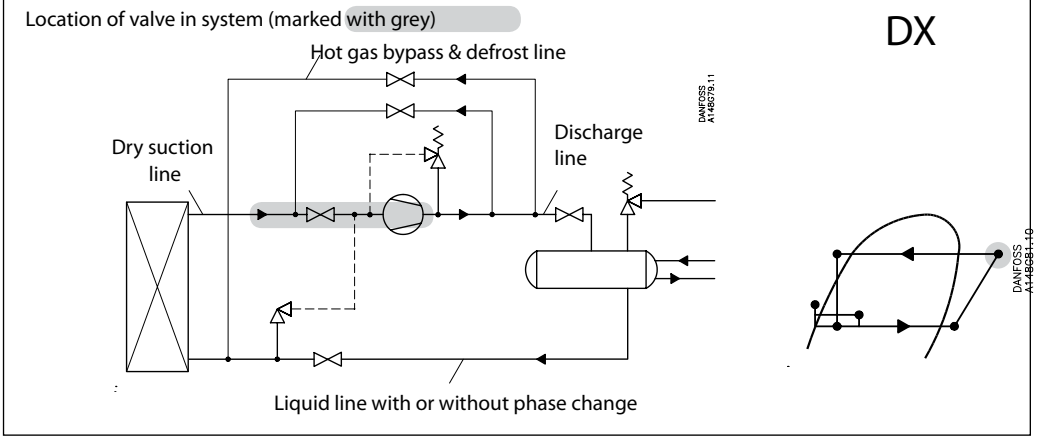
Pump



Gravity



DX



Nominal capacities

Dry suction line

Calculation example (R 717 capacities):

An application has following running conditions:

T_e = 0°F
Q_o = 20 TR
T_{liq} = 50°F
Max. Δp = 4 psi

The capacity table is based on nominal condition (pressure drop Δp = 3 psi, T_{liq} = 90°F)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 4 psi, T_{liq} = 0.87
Correction factor for liquid temperature f_{Tliq} = 0.92

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} = 20 \times 0.87 \times 0.92 = 16$ TR

From the capacity table a ICS 25-25 with Q_n capacity 18.7 TR is selected.

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi
Superheating = 12°F

R 717

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	1.3	1.6	2.2	2.8	3.5	4.3	5.2	6.2
ICS25-10		4.1	2.5	3.4	4.4	5.7	7.2	8.9	10.7	12.8
ICS25-15		7	4.2	5.7	7.6	9.8	12.3	15.2	18.4	22.0
ICS25-20		9.3	5.6	7.6	10.1	13.0	16.4	20.2	24.5	29.3
ICS25-25		13.3	8.1	11.0	14.5	18.7	23.6	29.0	35.3	42.0
ICS32	32	20	12.0	16.2	21.5	27.7	35.0	43.0	52.0	62.0
ICS40	40	31	19.0	25.8	34.2	44.0	55.5	68.0	83.0	99.0
ICS50	50	51	30.9	42.0	55.7	72.0	90.0	111	135	161
ICS65	65	81	48.2	67.0	89.0	114	144	177	215	256

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

T_s	Correction factor
10°F	1.00
14°F	1.00
18°F	1.00
20°F	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.82
10°F	0.85
30°F	0.88
50°F	0.92
70°F	0.96
90°F	**1.00**
110°F	1.04
130°F	1.09

Nominal capacities

Dry suction line

R 22

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi
Superheat =12°F

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	0.5	0.7	0.8	1.1	1.3	1.6	2.0	2.3
ICS25-10		4.1	1.0	1.3	1.7	2.2	2.7	3.4	4.0	4.8
ICS25-15		7	1.7	2.3	3.0	3.8	4.7	5.7	6.9	8.2
ICS25-20		9.3	2.3	3.0	3.9	5.0	6.2	7.6	9.2	10.9
ICS25-25		13.3	3.2	4.3	5.6	7.2	8.9	10.9	13.1	15.6
ICS32	32	20	4.9	6.5	8.5	10.8	13.4	16.4	19.8	23.5
ICS40	40	31	7.5	10.1	13.1	16.7	20.8	25.4	30.6	36.4
ICS50	50	51	12.4	16.6	21.6	27.5	34.2	41.8	50.4	59.9
ICS65	65	81	19.7	26.4	34.3	43.6	54.3	66.4	80.0	95.1

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

T_s	Correction factor
10°F	1.00
14°F	1.00
18°F	1.00
20°F	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.73
10°F	0.77
30°F	0.82
50°F	0.87
70°F	0.93
90°F	**1.00**
110°F	1.09
130°F	1.20

R 744

Capacity table at nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 50°F,
Δp = 3 psi
Superheating = 12°F

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	1.7	2.1	2.6	3.1	3.7	4.2	4.9	5.4
ICS25-10		4.1	3.4	4.3	5.3	6.4	7.5	8.7	10.0	11.2
ICS25-15		7	5.9	7.4	9.1	10.9	12.9	15.0	17.0	19.2
ICS25-20		9.3	7.9	9.9	12.1	14.5	17.2	20.0	22.8	25.5
ICS25-25		13.3	11.3	14.2	17.4	21.0	24.7	28.6	32.8	36.7
ICS32	32	20	16.7	21.0	25.7	31.0	36.5	42.4	48.5	54.3
ICS40	40	31	26.6	33.3	41.0	49.0	58.0	67.0	77.0	86.0
ICS50	50	51	43.3	54.3	66.5	80.0	94.0	110	125	141
ICS65	65	81	69.0	86.5	106	127	150	174	199	223

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

T_s	Correction factor
10°F	1.00
14°F	1.00
18°F	1.00
20°F	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.48
10°F	0.64
30°F	0.88
50°F	**1.00**

Nominal capacities

Dry suction line

R 134a

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi
Superheating=12°F

Type	Valve body size	C_v	Evaporating temperature [°F]						
		(USgal/min)	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	0.5	0.6	0.8	1.0	1.3	1.6	1.9
ICS25-10		4.1	0.9	1.2	1.6	2.0	2.6	3.2	4.0
ICS25-15		7	1.5	2.0	2.7	3.5	4.4	5.5	6.8
ICS25-20		9.3	2.0	2.7	3.6	4.7	5.9	7.4	9.1
ICS25-25		13.3	2.9	3.9	5.2	6.7	8.5	10.6	13.0
ICS32	32	20	4.2	5.8	7.7	9.9	12.6	15.7	19.3
ICS40	40	31	6.7	9.2	12.2	15.7	20.0	25.0	30.6
ICS50	50	51	11.0	15.0	19.8	25.7	32.5	40.6	50.0
ICS65	65	81	17.4	23.7	31.5	40.8	52.0	64.6	79.0

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

T_s	Correction factor
10°F	1.00
14°F	1.00
18°F	1.00
20°F	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.64
10°F	0.68
30°F	0.74
50°F	0.81
70°F	0.89
90°F	**1.00**
110°F	1.15
130°F	1.35

R 404A

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi
Superheat =12°F

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	0.4	0.5	0.7	0.9	1.1	1.4	1.8	2.1
ICS25-10		4.1	0.7	1.0	1.4	1.8	2.3	2.9	3.6	4.4
ICS25-15		7	1.3	1.8	2.4	3.1	4.0	5.0	6.2	7.5
ICS25-20		9.3	1.7	2.3	3.1	4.1	5.3	6.6	8.2	10.0
ICS25-25		13.3	2.4	3.4	4.5	5.9	7.6	9.6	11.8	14.4
ICS32	32	20	3.6	5.0	6.7	8.8	11.2	14.1	17.5	21.3
ICS40	40	31	5.7	7.9	10.6	13.9	17.8	22.4	27.7	34.0
ICS50	50	51	9.3	12.9	17.3	22.7	29.0	36.6	45.1	55.0
ICS65	65	81	14.8	20.5	27.5	36.0	46.2	58.0	72.0	88.0

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for superheat (T_S)

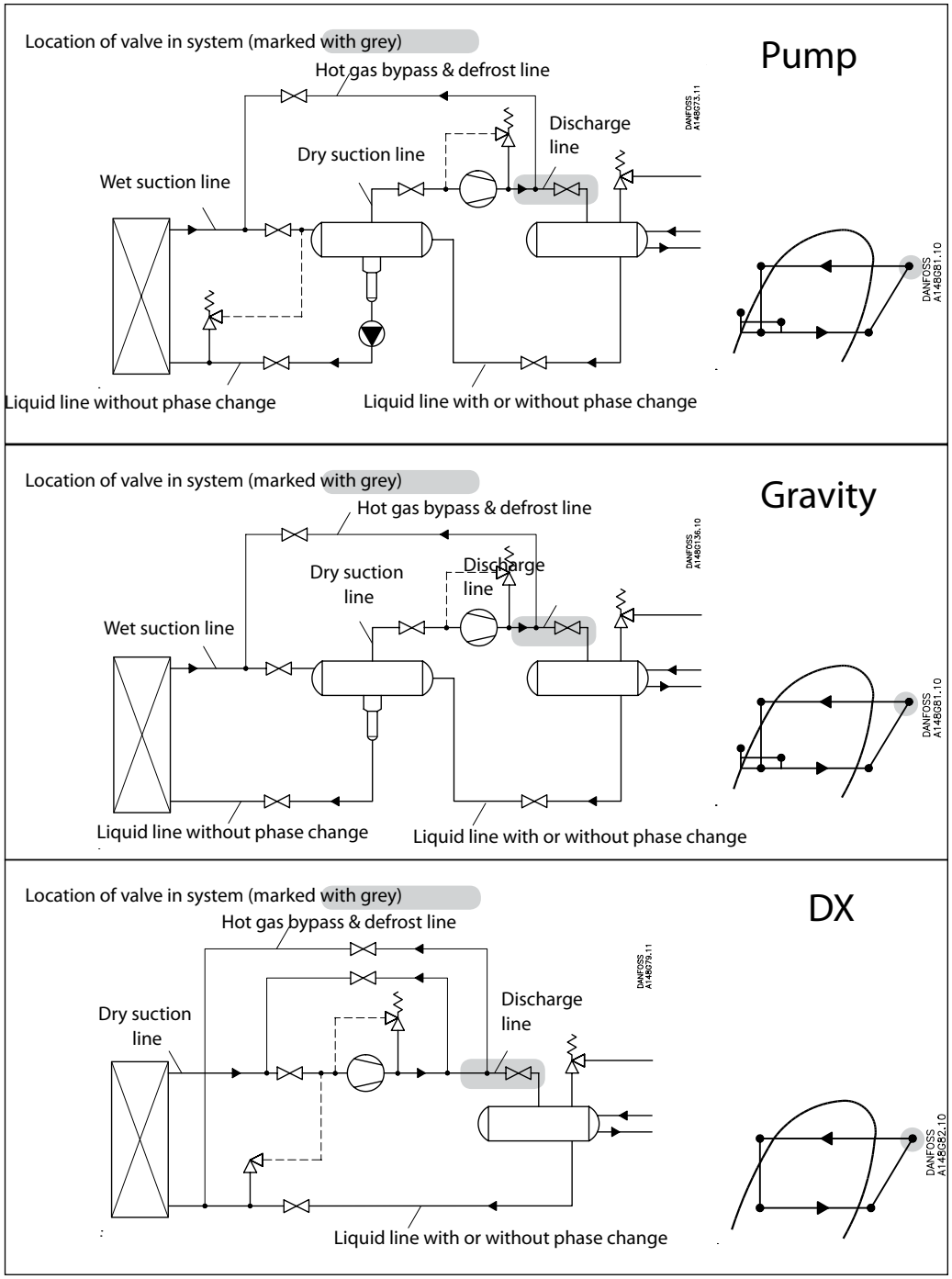
T_s	Correction factor
10°F	1.00
14°F	1.00
18°F	1.00
20°F	1.00

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.52
10°F	0.57
30°F	0.63
50°F	0.72
70°F	0.83
90°F	**1.00**
110°F	1.29
130°F	1.92

Nominal capacities

Discharge line



Nominal capacities

Discharge line

Calculation example (R 717 capacities):

An application has folowing running conditions:

T_e = 0°F
Q_o = 18 TR
T_{liq} = 50 °F
Max. Δp = 5.8 psi
$T_{disch.}$ = 120°F

The capacity table is based on nominal conditions (Δp = 3 psi, T_{liq} = 90°F, $P_{disch.}$ = 185 psi, $T_{disch.}$ = 180°F)

Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 5.8 psi, $f_{\Delta p}$ = 0.72
Correction factor for liquid temperature f_{Tliq} = 0.92
Correction factor for $T_{disch.}$ 120°C , $f_{disch.}$ = 0.95

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} \times f_{Tdisch.}$ =
$18 \times 0.72 \times 0.92 \times 0.95 = 11.3$ TR

From the capacity table a ICS 25-10 with Q_n capacity 12 TR is selected.

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 2.9 psi,
$P_{disch.}$ = 185 psi,
$T_{disch.}$ = 180°F
Superheat = 12°F

R 717

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	5.6	5.7	5.8	5.8	5.9	6.0	6.0	6.0
ICS25-10		4.1	11.4	11.6	11.8	12.0	12.1	12.3	12.3	12.4
ICS25-15		7	19.6	20.0	20.3	20.6	20.8	21.0	21.2	21.3
ICS25-20		9.3	26.2	26.6	27.0	27.4	27.8	28.0	28.2	28.3
ICS25-25		13.3	37.6	38.3	39.0	39.4	39.9	40.3	40.5	40.8
ICS32	32	20	55.5	56.5	57.5	58.3	59.0	59.5	60.0	60.3
ICS40	40	31	88.0	90.0	91.0	92.5	94.0	94.5	95.0	95.7
ICS50	50	51	144	146	149	151	153	154	155	156
ICS65	65	81	229	233	237	240	243	245	247	248

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

Discharge temperature	Correction factor
120°F	0.95
140°F	0.97
180°F	**1.00**
200°F	1.02
210°F	1.02
230°F	1.04
250°F	1.06

Correction factor for liquid temperature (T_{liq}).

Liquid temperature	Correction factor
–10°F	0.82
10°F	0.85
30°F	0.88
50°F	0.92
70°F	0.96
90°F	**1.00**
110°F	1.04
130°F	1.09

Nominal capacities

Discharge line

R 22

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi,
P_{disch} = 120 psi,
T_{disch} = 180°F
Superheat = 12°F

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.2
ICS25-10		4.1	3.7	3.9	4.0	4.1	4.3	4.4	4.5	4.6
ICS25-15		7	6.4	6.6	6.8	7.1	7.3	7.4	7.6	7.8
ICS25-20		9.3	8.5	8.8	9.1	9.4	9.6	9.9	10.1	10.3
ICS25-25		13.3	12.1	12.6	13.0	13.4	13.8	14.2	14.5	14.8
ICS32	32	20	18.2	18.9	19.6	20.2	20.7	21.3	21.8	22.2
ICS40	40	31	28.3	29.3	30.3	31.3	32.1	33.0	33.8	34.4
ICS50	50	51	46.5	48.2	49.9	51.4	52.9	54.3	55.5	56.7
ICS65	65	81	73.9	76.6	79.2	81.7	84.0	86.2	88.2	90.0

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

Discharge temperature	Correction factor
120°F	0.95
140°F	0.97
180°F	**1.00**
200°F	1.02
210°F	1.02
230°F	1.04
250°F	1.05

Correction factor for liquid temperature (T_{liq}).

Liquid temperature	Correction factor
–10°F	0.73
10°F	0.77
30°F	0.82
50°F	0.87
70°F	0.93
90°F	**1.00**
110°F	1.09
130°F	1.20

R 744

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi
P_{disch} = 120 psi,
T_{disch} = 180°F
Superheat = 12°F

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	3.4	3.4	3.5	3.5	3.4	3.3	3.2	3.1
ICS25-10		4.1	6.9	7.0	7.1	7.1	7.0	6.8	6.6	6.4
ICS25-15		7	11.9	12.1	12.2	12.2	12.0	11.7	11.3	11.0
ICS25-20		9.3	15.8	16.1	16.2	16.2	16.0	15.6	15.1	14.7
ICS25-25		13.3	22.8	23.1	23.3	23.3	23.0	22.4	21.8	21.1
ICS32	32	20	33.7	34.1	34.5	34.5	34.0	33.1	32.2	31.2
ICS40	40	31	53.4	54.3	54.7	54.7	54.0	52.5	51.0	49.6
ICS50	50	51	87.0	88.4	89.0	89.0	88.0	85.5	83.3	80.8
ICS65	65	81	138	141	142	142	140	136	132	129

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

Discharge temperature	Correction factor
120°F	0.95
140°F	0.97
180°F	**1.00**
200°F	1.02
210°F	1.02
230°F	1.04
250°F	1.05

Correction factor for liquid temperature (T_{liq}).

Liquid temperature	Correction factor
–10°F	0.48
10°F	0.64
30°F	0.88
50°F	**1.00**

Nominal capacities

Discharge line

R 134a

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi
P_{disch} = 120 psi,
T_{disch} = 180°F
Superheat = 12°F

Type	Valve body size	C_v	Evaporating temperature [°F]						
		(USgal/min)	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	1.4	1.5	1.5	1.6	1.7	1.7	1.8
ICS25-10		4.1	2.3	3.0	3.1	3.3	3.4	3.6	3.7
ICS25-15		7	4.9	5.1	5.4	5.6	5.9	6.1	6.3
ICS25-20		9.3	6.5	6.8	7.2	7.5	7.8	8.1	8.4
ICS25-25		13.3	9.3	9.8	10.3	10.8	11.3	11.7	12.1
ICS32	32	20	13.8	14.5	15.2	16.0	16.6	17.3	18.0
ICS40	40	31	21.9	23.0	24.2	25.3	26.5	27.5	28.5
ICS50	50	51	35.6	37.5	39.4	41.3	43.0	44.8	46.5
ICS65	65	81	56.7	59.7	62.9	65.7	68.5	71.3	74.0

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

Correction factor for discharge temperature (T_{disch}).

Discharge temperature	Correction factor
120°F	0.95
140°F	0.97
180°F	**1.00**
200°F	1.02
210°F	1.02
230°F	1.04
250°F	1.05

Correction factor for liquid temperature (T_{liq}).

Liquid temperature	Correction factor
–10°F	0.64
10°F	0.68
30°F	0.74
50°F	0.81
70°F	0.89
90°F	**1.00**
110°F	1.15
130°F	1.35

R 404A

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 3 psi,
P_{disch} = 120 psi,
T_{disch} = 180°F
Superheat = 12°F

Type	Valve body size	C_v	Evaporating temperature [°F]							
		(USgal/min)	–60°F	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
ICS25-5	25	2	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.8
ICS25-10		4.1	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.8
ICS25-15		7	4.4	4.7	5.0	5.4	5.7	6.0	6.3	6.5
ICS25-20		9.3	5.8	6.2	6.7	7.2	7.6	8.0	8.4	8.7
ICS25-25		13.3	8.4	8.9	9.6	10.3	10.9	11.5	12.0	12.5
ICS32	32	20	12.4	13.2	14.2	15.2	16.1	17.0	17.8	18.4
ICS40	40	31	19.6	21.0	22.6	24.1	25.6	27.0	28.2	29.3
ICS50	50	51	32.0	34.2	36.8	39.3	41.7	44.0	46.0	47.7
ICS65	65	81	51.0	54.3	58.5	62.5	66.3	70.0	73.0	76.0

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
3	**1.00**
4	0.87
5	0.79
6	0.72
7	0.66
8	0.62

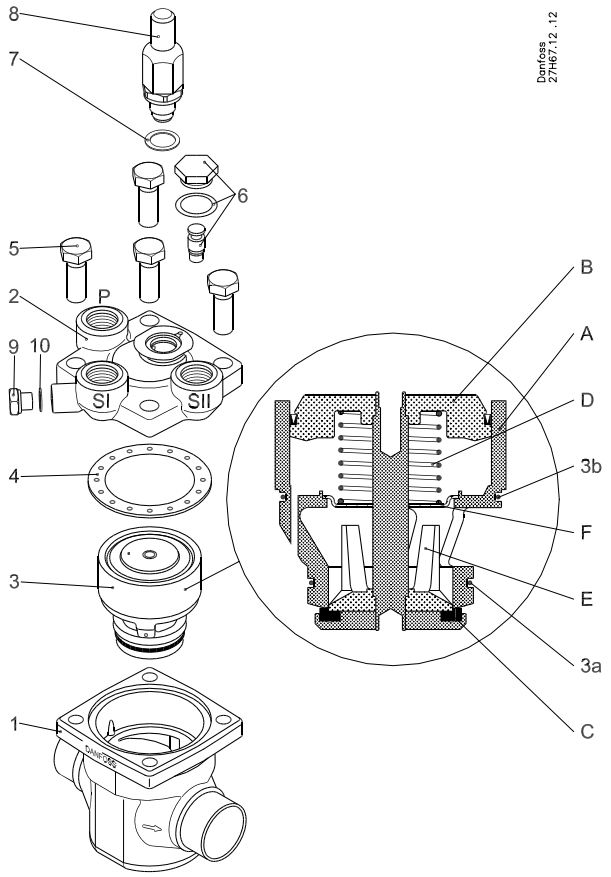
Correction factor for discharge temperature (T_{disch}).

Discharge temperature	Correction factor
120°F	0.95
140°F	0.97
180°F	**1.00**
200°F	1.02
210°F	1.02
230°F	1.04
250°F	1.05

Correction factor for liquid temperature (T_{liq}).

Liquid temperature	Correction factor
–10°F	0.52
10°F	0.57
30°F	0.63
50°F	0.72
70°F	0.83
90°F	**1.00**
110°F	1.29
130°F	1.92

Material specification

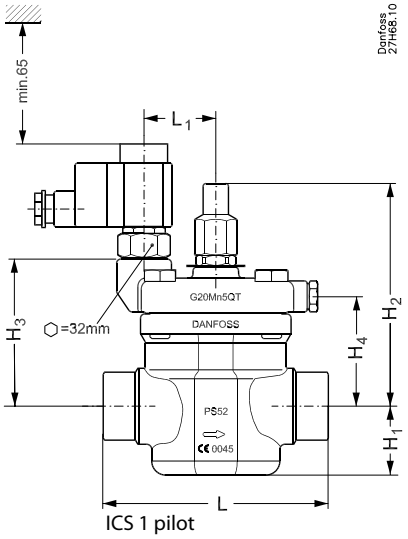


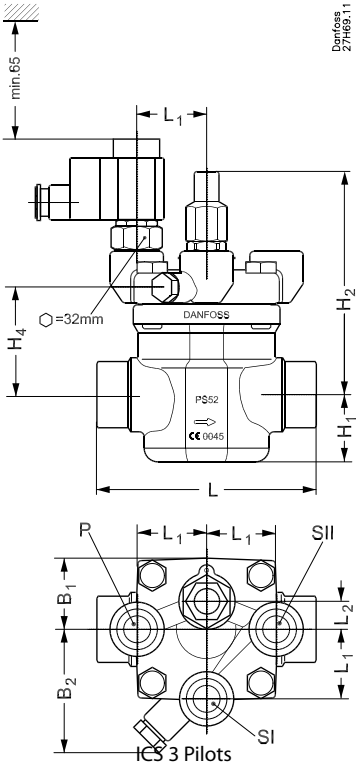
Bolt sizes (pos. 5)

Type	Screw
ICS 25	M12 × 30 A2-70 DIN 933
ICS 32	M14 × 35 A2-70 DIN 933
ICS 40	M14 × 40 A2-70 DIN 933
ICS 50	M16 × 40 A2-70 DIN 933
ICS 65	M16 × 50 A2-70 DIN 933

No.	Part	Material	EN	ASTM	JIS
1	Body	Low temperature steel	G20Mn5QT, EN 10213-3	LCC A352	SCPL1 G5151
2	Top cover	Low temperature steel	G20Mn5QT, EN 10213-3	LCC A352	SCPL1 G5151
3	Function module (assembled)				
3a	o-ring	Cloroprene (Neoprene)			
3b	o-ring	Cloroprene (Neoprene)			
A	Cylinder	Steel			
B	Piston	Steel			
C	Valve plate	PTFE			
D	Spring	Steel			
E	Cone	Steel			
F	Intermediate plate	Steel			
4	Gasket	Fiber, non-asbestos			
5	Bolts	Stainless steel	A2-70, EN 1515-1	Grade B8 A320	A2-70, B 1054
6	Plug	Steel			
7	Gasket	Aluminium			
8	Manual operating spindle	Steel			
9	Plug	Steel			
10	Gasket	Aluminium			

Dimensions and weights - ICS 25-5 to ICS 25-25

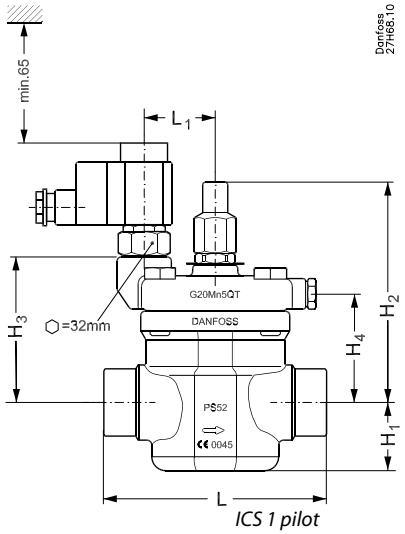




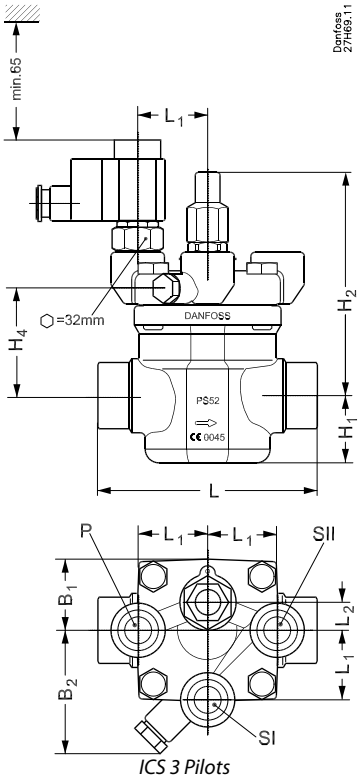
Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
$^3/_4$ in. BW	mm	37	138	86	60	135	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.31	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.
1 in.BW	mm	37	138	86	60	135	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.31	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.
$1^1/_4$ in. BW	mm	37	138	86	60	135	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.31	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.
$^3/_4$ in.SOC	mm	37	138	86	60	135	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.31	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.
1 in. SOC	mm	37	138	86	60	147	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.79	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.
$^7/_8$ in. ODS	mm	37	138	86	60	135	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.31	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.
$1^1/_8$ in. ODS	mm	37	138	86	60	147	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.78	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.
$1^3/_8$ in. ODS	mm	37	138	86	60	147	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.78	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.
$^3/_4$ in. FPT	mm	37	138	86	60	135	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.31	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.
1 in. FPT	mm	37	138	86	60	135	51	15	42	87	3 kg	3.6 kg
	in.	1.46	5.43	3.39	2.36	5.31	2.00	0.59	1.65	3.43	6.6 lb.	7.92 lb.

BW = Butt-weld ANSI ; SOC = Socket weld ANSI ; ODS = Solder ANSI ; FPT = Female Pipe Thread

Dimensions and weights - ICS 32



ICS 1 pilot

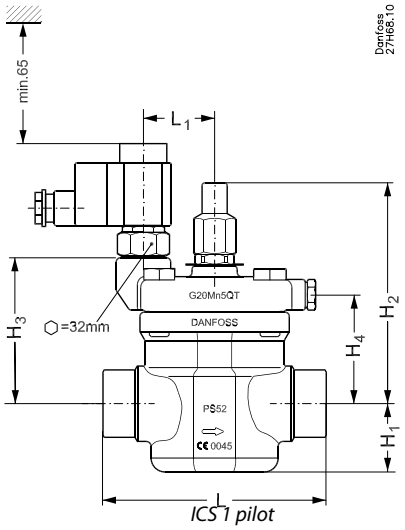


ICS 3 Pilots

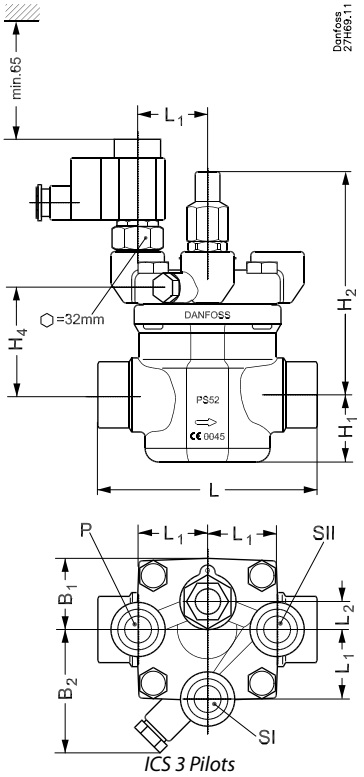
Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
32 BW ($1^1/_4$ in.)	mm	40	153	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.02	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
40 BW ($1\ ^1/_2$ in.)	mm	40	153	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.02	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
$1^1/_4$ in. SOC	mm	40	153	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.02	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
$1^3/_8$ in. ODS	mm	40	153	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.02	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
$1^5/_8$ in. ODS	mm	40	153	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.02	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.

BW = Butt-weld ANSI; SOC = Socket weld ANSI; ODS = Solder ANSI ; FPT = Female Pipe Thread

Dimensions and weights - ICS 40



ICS 1 pilot

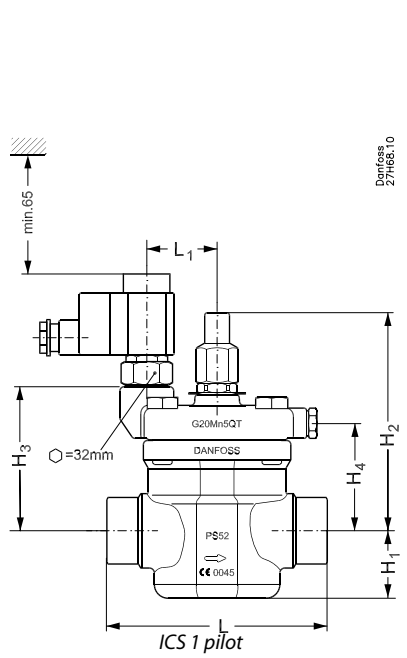


ICS 3 Pilots

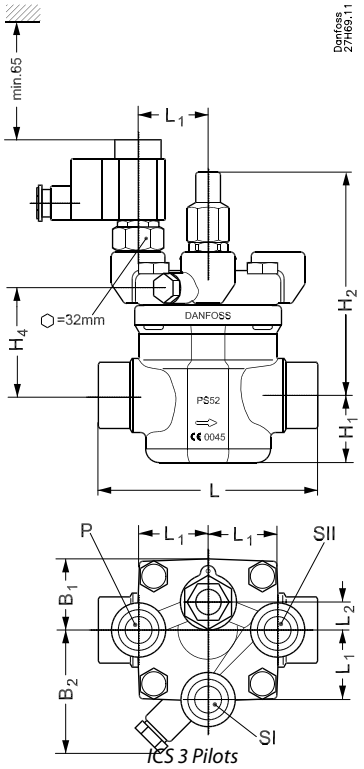
Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
$1^1/_2$ in. BW	mm	49	159	105	78	160	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.26	4.13	3.07	6.30	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.
2 in. BW	mm	49	159	105	78	180	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.26	4.13	3.07	7.09	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.
$1^1/_2$ in. SOC	mm	49	159	105	78	180	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.26	4.13	3.07	7.09	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.
$1^5/_8$ in. ODS	mm	49	159	105	78	180	51	15	54	87	5.9 kg	6.3 kg
	in.	1.93	6.26	4.13	3.07	7.09	2.00	0.59	2.13	3.43	13.0 lb.	13.9 lb.

BW = Butt-weld ANSI; SOC = Socket weld ANSI; ODS = Solder ANSI; FPT = Female Pipe Thread

Dimensions and weights - ICS 50



ICS 1 pilot

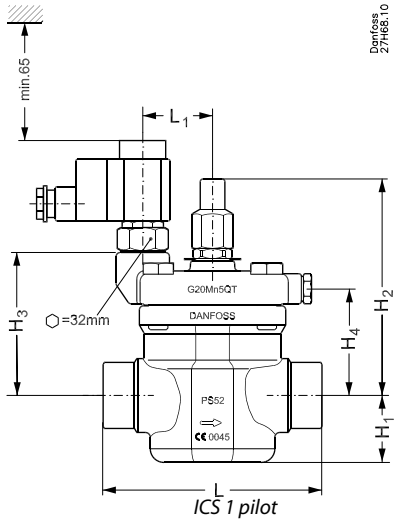


ICS 3 Pilots

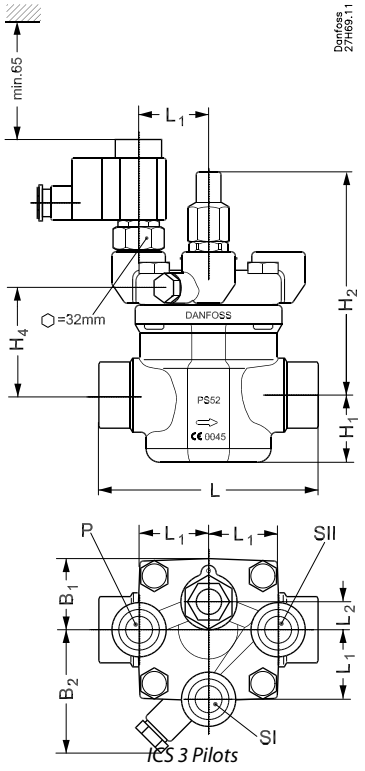
Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
2 in. BW	mm	59	174	120	93	200	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	6.85	4.72	3.66	7.87	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
$2^1/_2$ in. BW	mm	59	174	120	93	210	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	6.85	4.72	3.66	8.27	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
2 in. SOC	mm	59	174	120	93	216	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	6.85	4.72	3.66	8.50	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
$2^1/_8$ in. ODS	mm	59	174	120	93	216	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	6.85	4.72	3.66	8.50	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.

BW = Butt-weld ANSI ; SOC = Socket weld ANSI ; ODS = Solder ANSI ; FPT = Female Pipe Thread

Dimensions and weights - ICS 65



ICS 1 pilot



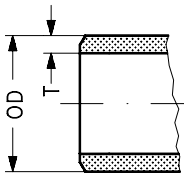
ICS 3 Pilots

Connection		H_1	H_2	H_3	H_4	L	L_1	L_2	B_1	B_2	Weight ICS 1 Pilot	Weight ICS 3 Pilots
$2^1/_2$ in. BW	mm	65	195	140	115	230	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.68	5.51	4.53	9.06	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
3 in. BW	mm	65	195	140	115	245	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.68	5.51	4.53	9.65	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
$2^1/_2$ in. SOC	mm	65	195	140	115	230	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.68	5.51	4.53	9.06	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.
$2^5/_8$ in. ODS	mm	65	195	140	115	245	51	15	70	91	13.4 kg	13.5 kg
	in.	2.56	7.68	5.51	4.53	9.65	2.00	0.59	2.76	3.58	29.48 lb.	29.7 lb.

BW = Butt-weld ANSI; SOC = Socket weld ANSI; ODS = Solder ANSI ; FPT = Female Pipe Thread

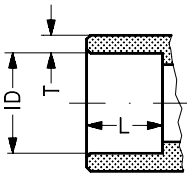
Connections

BW: *Butt-weld ANSI (B 36.10)*



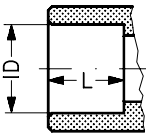
Size mm	Size in.	OD mm	T mm	OD in.	T in.	Schedule	
(20)	3/4	26.9	4.0	1.059	0.158	80	
(25)	1	33.7	4.6	1.327	0.181	80	
(32)	1 1/4	42.4	4.9	1.669	0.193	80	
(40)	1 1/2	48.3	5.1	1.902	0.201	80	
(50)	2	60.3	3.9	2.37	0.15	40	
(65)	2 1/2	73.0	5.2	2.87	0.20	40	
(80)	3	88.9	5.5	3.50	0.22	40	

SOC:
Socket welding ANSI (B 16.11)



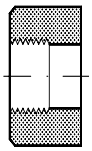
Size mm	Size in.	ID mm	T mm	ID in.	T in.	L mm	L in.
(20)	3/4	27.2	4.6	1.071	0.181	13	0.51
(25)	1	33.9	7.2	1.335	0.284	13	0.51
(32)	1 1/4	42.7	6.1	1.743	0.240	13	0.51
(40)	1 1/2	48.8	6.6	1.921	0.260	13	0.51
(50)	2	61.2	6.2	2.41	0.24	16	0.63
(65)	2 1/2	74	8.8	2.91	0.344	16	0.63

ODS: Soldering (ANSI B 16.22)



	7/8			0.875			0.650
	1 1/8			1.125			1.024
	1 3/8			1.375			0.984
	1 5/8			1.625			1.102
	2 1/8			2.125			1.300
	2 5/8			2.625			1.300

FPT:
Female pipe thread,
(ANSI/ASME B 1.20.1)



Size mm	Size in.	Inside pipe thread		
(20)	3/4	(3/4 × 14 NPT)		
(25)	1	(1 × 11.5 NPT)		

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