ENGINEERING TOMORROW

Data sheet

Dual position solenoid valve
Type ICSH 25-80

ICSH dual position solenoid valve belongs to the ICV family and consists of an ICV housing, an ICS insert together with an ICSH top cover with 2 EVM normally closed solenoid pilots installed in the top cover.

ICSH is used in hot gas lines for the opening of hot gas defrost flow to the evaporator in 2 steps. Both steps are activated by a controller or a PLC energizing the magnetic coils in a time delay sequence.

Step 1 (approx. 20% of full flow) is to allow a smooth pressure build-up in the evaporator, while the subsequent step 2 opens the flow to 100% to get the full defrost capacity.

The ICSH is designed for large industrial refrigeration systems with ammonia, fluorinated refrigerants or CO_2.

The ICSH features 2 configuration options, which is established at site.

One option is dependent configuration, which secures that step 2 can never open unless step 1 has been mechanically activated.

Second option is independent configuration that allows step 2 to open disregarding step 1. By choosing the independent option attention should be paid to the risk of liquid hammering in case the step 1 for any reason is disregarded.

Features

- Designed for Industrial Refrigeration applications for a maximum working pressure of 52 bar g / 754 psig.
- Applicable to HCFC, HFC, R717 (Ammonia) and R744 (CO_2).
- Direct welded connections.
- Connection types include butt weld, socket weld and solder connections.
- Low temperature steel body.
- Low weight and compact design.
- 2-wire connection for use with a timer relay or 4 wire connection for connecting to a controller or a PLC.
- The ICSH main valve top cover can be oriented in any direction without the function of pilot valves being affected.
- Stabilizes working conditions and eliminates pressure pulsations during opening of hot gas.
- Manual opening possible.
- PTFE seat provides excellent valve tightness.
- Service friendly design.

Contents **Page**

Approvals
The ICV valve concept has been designed to fulfill global refrigeration requirements.

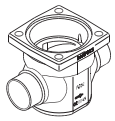
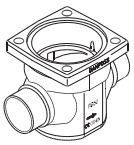
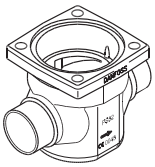
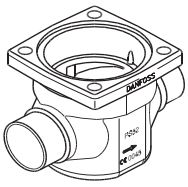
ICSH valves		
Nominal bore	DN≤ 25 (1 in.)	DN 32 - 80 (1¼ - 3 in.)
Classified for	Fluid group I	
Category	Article 4, paragraph 3	II

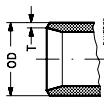
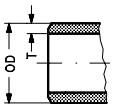
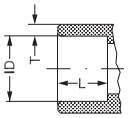
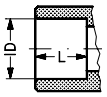
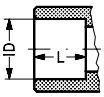
The ICSH Concept

The ICSH concept is developed to highest flexibility of direct welded connections. For valve sizes ICV 25 – ICV 65 a wide range of connection sizes and types is available.

The direct welded (non-flanged) connections secure low risk of leakage.

- There are five valve bodies available (ICSH 80 makes use of ICV 65 housing).

				
ICV 25	ICV 32	ICV 40	ICV 50	ICV 65

D	A	SOC	SD	SA
				
Butt-weld DIN	Butt-weld ANSI	Socket weld ANSI	Solder DIN	Solder ANSI

Design (valve)

Connections
There is a wide range of connection types available with ICSH valves:

- D: Butt weld, EN 10220
- A: Butt weld, ANSI (B 36.10)
- SOC: Socket weld, ANSI (B 16.11)
- SD: Solder connection, EN 1254-1
- SA: Solder connection, ANSI (B 16.22)

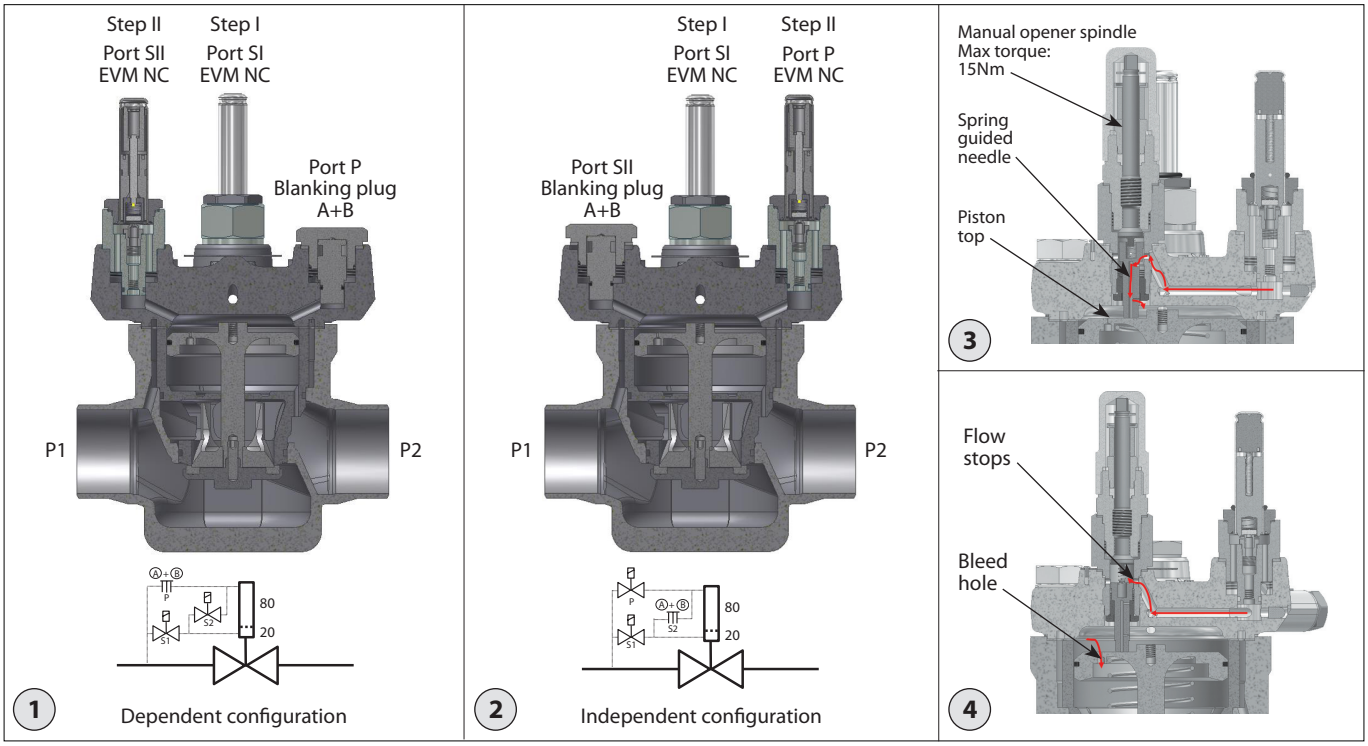
The ICSH valves are approved in accordance with the European standard specified in the Pressure Equipment Directive and are CE marked.
For further details / restrictions - see Installation Instruction.

Valve body and top cover material
Low temperature steel

Technical data

- *Refrigerants*
  Applicable to HCFC, HFC, R717 (Ammonia) and R744 (CO_2).
  Temperature range:
  Media: -60 – 120 °C / -76 – 248 °F.
- *Pressure*
  The valve is designed for a max. working pressure of 52 bar g / 754 psi g
- Step 1 20% capacity of step 2 (full capacity)
- *Surface protection*
  The ICSH external surface is zinc-chromated to provide good corrosion protection.
- *Min. opening pressure differential:*
  0.2 bar (2.9 psi) higher inlet pressure than otlet pressure for fully open.
- *Coil requirements:*
  Both coils to be IP67.

	ICSH 25-25	ICSH 32	ICSH 40	ICSH 50	ICSH 65	ICSH 80
K_v (m^3/h) (full capacity)	11.5	17	27	44	70	85
C_v (USgal/min) (full capacity)	13.3	20	31	51	81	98



Function

The ICSH is designed for a 2 step opening of the hot gas flow for the evaporator defrost.
Step 1 (20% capacity) is intended for a smooth pressure build up in the evaporator - step 2 will open for full capacity.

The valve is pilot controlled by 2 standard EVM Normally Closed valves and the 2 EVM's are controlled by an external controller like PLC.

The external controller simply needs to activate the 2 EVM coils in a sequence with a certain time offset.

The time offset depends on the specific conditions around the ICSH and must be determined at site.

The opening of the ICSH is done by a pressure difference between the inlet pressure P1 and the outlet pressure P2, and for the main valve to open fully, a Δp of 0.2 bar (2.9 psi) is needed.

The ICSH main valve can be configured into 2 different configurations: Dependent or Independent.

The Dependent setup (fig. 1) means that fully open (step 2) can only be performed if step 1 is performed successfully. If step 1 for some reason fails, the valve will not open at all.
The matching control program should, in this case, be to activate step 1 coil followed by activation of step 2 coil.

Dependent setup is done by installing the 2 EVM's in Port SI (step 1) and Port SII (step 2), and blanking off the P port with Blanking plug A+B.

The Independent setup (fig. 2) involves the option to force step 2 to open independent of the result of step 1.

The matching control program should also in this case be to activate step 1 coil followed by activation of step 2 coil. When step 2 is activated the full flow will immediately be started.

Attention:
A risk of liquid hammering in the system might be present.

Independent setup is done by installing the 2 EVM's in Port SI (step 1) and Port P (step 2), and blanking off the SII port with Blanking plug A+B.

The internal channel structure allows in both configurations a direct flow to the step 1 EVM. By activating step 1 the flow will continue through the spring guided needle that is resting on the top of the piston (see fig. 3).

The flow will build up a pressure on top of the piston, which will start moving down i.e. start open the main valve. The spring guided needle follows the pistons movement downwards and after a predefined distance the needle reaches its stop position, where the needle closes the supply flow (see fig 4).

The bleed hole in the piston top will allow a certain flow out of the pressurized chamber thus enable the piston to move upwards, but any movement of the piston is now being controlled by the needle that compensates by opening the supply flow.

The needle will balance the supply/bleed flows and keep the piston at this position. Step I flow - equivalent to approx. 20% of capacity - has now been established.

After a predetermined period of time the step II coil is activated.
In dependent set-up further flow can only reach the step II EVM if step I EVM is open (working properly).
In independent set-up further flow can reach the step II EVM regardless the status of step I.
Once flow is passing through step II EVM it continues to the top of the piston and moves the piston to full open position.

For both configurations the valve will close and stay closed when both coils are de-energised.

The closing is achieved by drainage through the bleed hole.

ICSH is including a manual opener like all the valves in the ICV family. The operation of the opener is done by turning the spindle clockwise (opening the valve) or counterclockwise (closing the valve).

Attention should be paid to the maximum torque applied to the spindle when turning: **Never exceed 15 Nm to the spindle in any direction.**

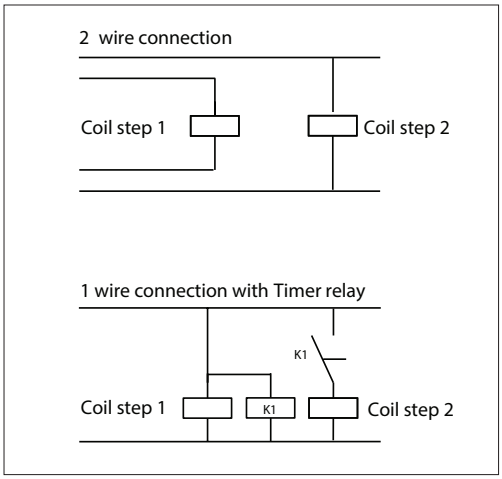
Controller and Wiring

The 2 steps need to be activated from a PLC in a time delay sequence. The time delay itself must be determined on site since local conditions are decisive.

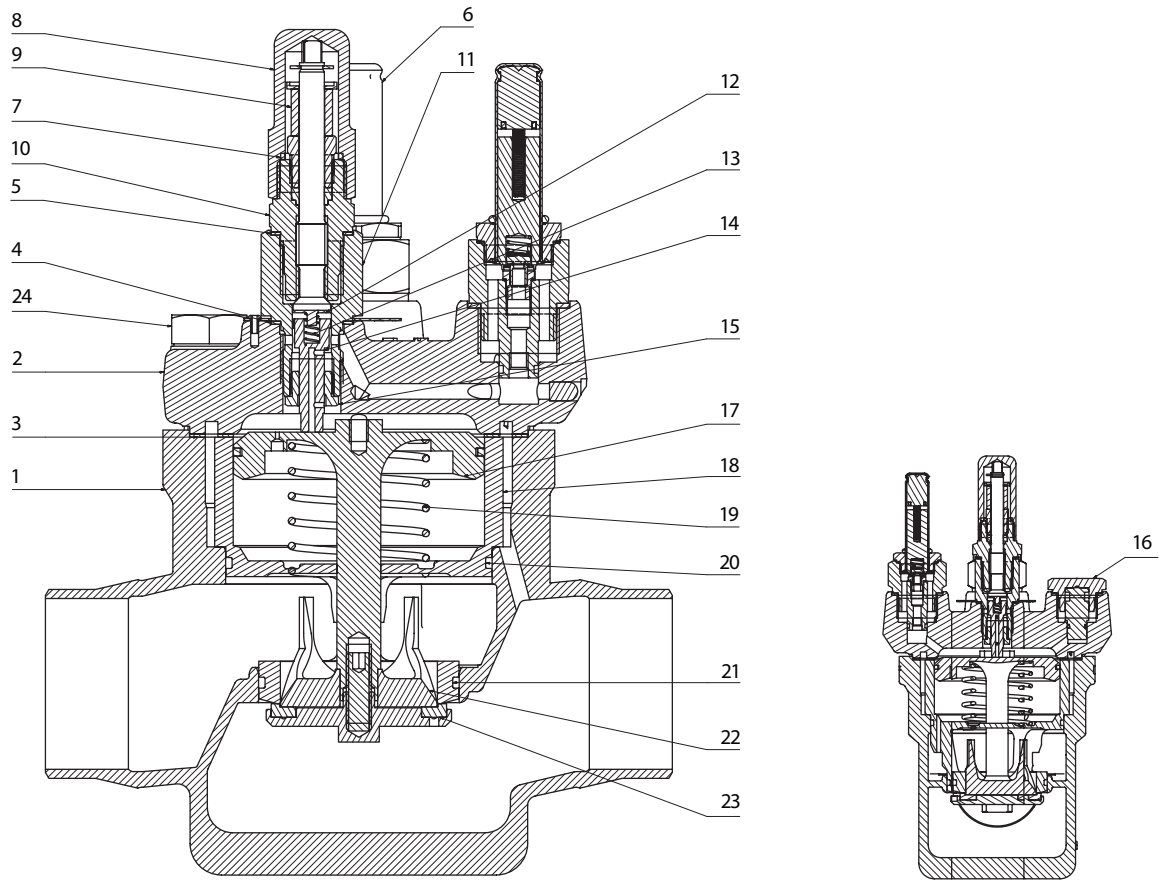
The wiring from the controller to the 2 coils can be done by either one or two cables.

By one cable layout only one signal is needed though an additional timer relay has to be connected according to the figure to the right.

Two cable layout requires two subsequent output signals from the PLC.



Material specification

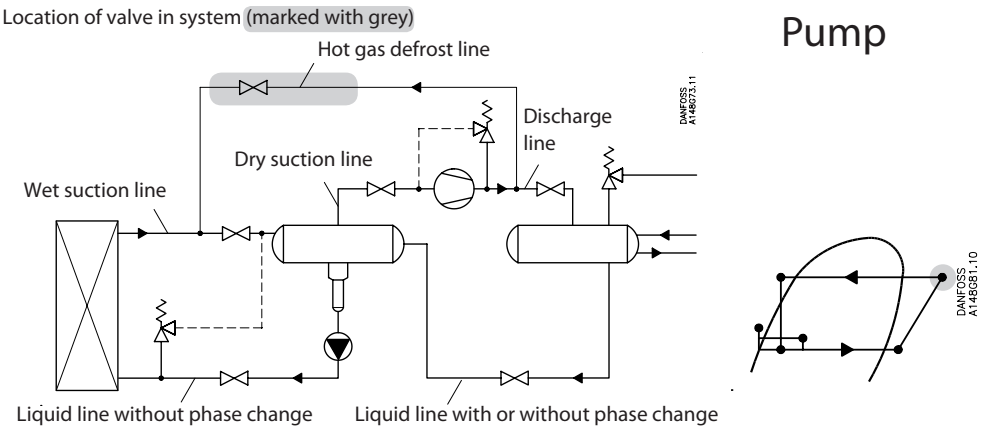


No	Part	Material	EN	ASTM
1	Body	Low temerature Steel	G20Mn5QT EN 10213-3	LCC A352
2	Top Cover	Low temperature Steel	P285QH EN-10222-4	LF2 A350
3	Gasket	Fibre non asbestos		
4	Gasket	Aluminium		
5	Gasket	Aluminium		
6	EVM NC			
7	Gasket	Nylon		
8	Cap	Steel		
9	Stopper	Nylon		
10	Manual opener	Steel		
11	Needle Housing	Stainless steel		
12	Spring Bush	Stainless steel		
13	Spring	Steel		
14	Needle	Stainless steel		
15	Nozzle	Cast iron		
16	Plug	Steel		
17	Piston	Steel		
18	Cylinder	Steel		
19	Spring	Steel		
20	O-ring	Cloroprene(Neoprene)		
21	O-ring	Cloroprene(Neoprene)		
22	Cone	Steel		
23	Valve Plate	PTFE		
24	Bolt	Stainless steel	A2-70 EN1515-1	A2-70, B1054

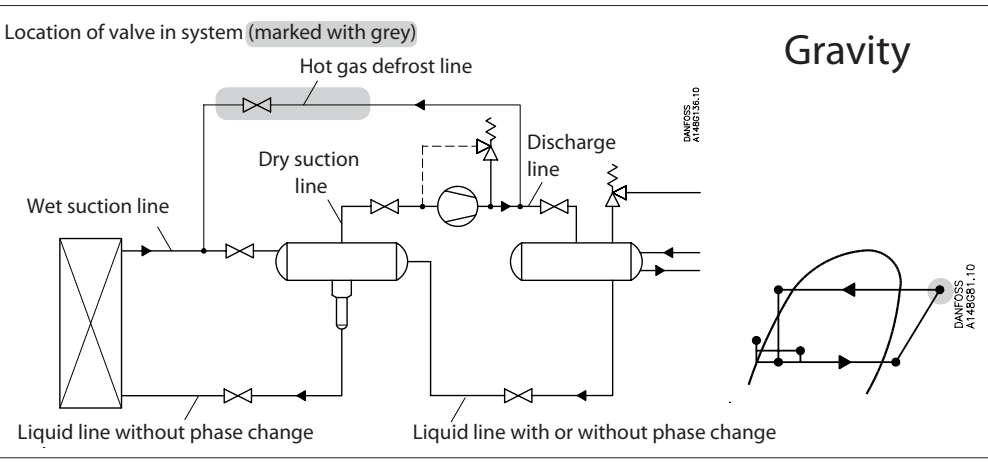
Nominal capacities

Hotgas line

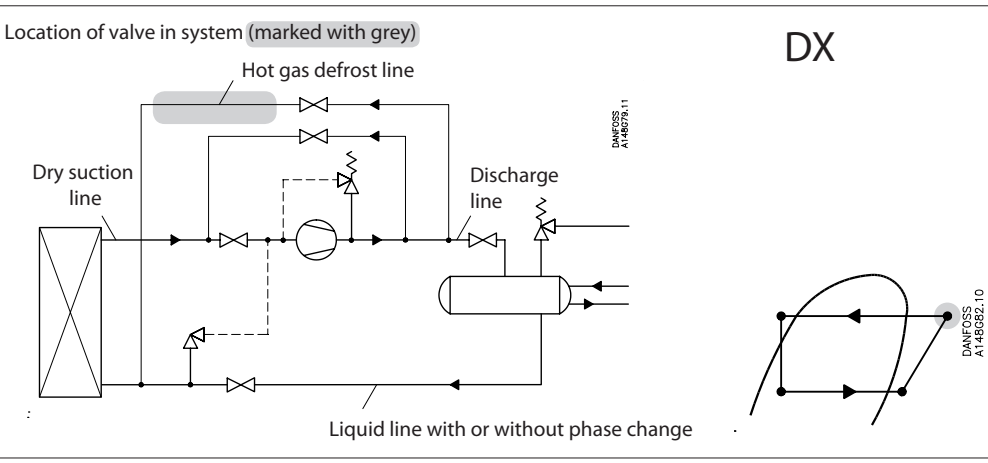
Pump



Gravity



DX



Nominal capacities

Hotgas line

SI units

Calculation example (R 717 capacities):

An application has following running conditions:

T_e = –20 °C
Q_o = 90 kW
T_{liq} = 10°C
Max. Δp = 0.4 bar
$T_{disch.}$ = 60°C

The capacity table is based on nominal condition (Δp = 0.2 bar, T_{liq} = 30°C, $P_{disch.}$= 12 bar, $T_{disch.}$= 80°C)
Therefore the actual capacity must be corrected to nominal condition by means of correction factors.

Correction factor for Δp 0.4 bar $f_{\Delta p}$ = 0.71
Correction factor for liquid temperature f_{Tliq} = 0.92
Correction factor for $T_{disch.}$ 60°C , $f_{disch.}$ = 0.97

$Q_n = Q_o \times f_{\Delta p} \times f_{Tliq} \times f_{Tdisch.} =$
$90 \times 0.71 \times 0.92 \times 0.97 = 57$ kW

From the capacity table an ICS 25-15 function module with Q_n capacity 73 kW is selected.

US units

Calculation example (R 717 capacities):

An application has following 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 an ICS 25-10 function module with Q_n capacity 12.0 TR is selected.

Nominal capacities

Hotgas line

R 717

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30°C,
$P_{disch.}$ = 12 bar,
ΔP = 0.2 bar,
$T_{disch.}$ = 80°C
Superheat = 8°C

Function module	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			–50	–40	–30	–20	–10	0	10	20
ICS25-5	25	1.7	19.8	20.2	20.5	20.7	20.9	21.1	21.3	21.5
ICS25-10		3.5	40.8	41.5	42.0	42.5	43.0	43.5	44.0	44.2
ICS25-15		6	70.0	71.0	72.0	73.0	74.0	74.8	75.4	76.0
ICS25-20		8	93.0	95.0	96.0	97.5	99.0	99.7	101	101
ICS25-25		11.5	134	136	138	140	142	143	144	145
ICS32	32	17	199	201	205	207	209	211	213	215
ICS40	40	27	315	320	325	329	333	336	339	341
ICS50	50	44	514	521	529	536	542	548	553	556
ICS65	65	70	817	829	843	854	864	872	879	885
ICS80	80	85	991	1007	1022	1035	1048	1058	1067	1074

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

ΔP [bar]	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

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

Discharge temperature	Correction factor
50°C	0.96
60°C	0.97
80°C	**1.00**
90°C	1.01
100°C	1.03
110°C	1.04
120°C	1.06

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

Liquid temperature	Correction factor
–20°C	0.82
–10°C	0.86
0°C	0.88
10°C	0.92
20°C	0.96
30°C	**1.00**
40°C	1.04
50°C	1.09

R 717

US units

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

Function module	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	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
ICS80	80	98	275	280	285	289	292	295	297	298

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

Hotgas line

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 10°C,
P_{disch} = 10 bar,
ΔP = 0.2 bar
T_{disch} = 80°C
Superheat = 8°C

R 744

Function module	Valve body size	K_v [m^3/h]	Evaporating temperature [°C]							
			–50	–40	–30	–20	–10	0	10	20
ICS25-5	25	1.7	12.5	12.7	12.8	12.9	12.9	12.9	12.5	12.8
ICS25-10		3.5	25.7	26.2	26.5	26.6	26.6	26.3	25.8	26.4
ICS25-15		6	44.0	45.0	45.3	45.6	45.5	45.1	44.2	45.0
ICS25-20		8	59.0	60.0	60.2	60.7	60.7	60.1	59.0	60.0
ICS25-25		11.5	85.0	86.0	87.0	87.4	87.3	86.5	85.0	87.0
ICS32	32	17	125	127	128	129	129	128	125	128
ICS40	40	27	199	202	204	205	205	203	199	203
ICS50	50	44	324	329	332	334	334	331	324	331
ICS65	65	70	515	523	529	532	531	526	516	527
ICS80	80	85	626	636	642	646	645	640	626	640

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

ΔP [bar]	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

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

Discharge temperature	Correction factor
50°C	0.96
60°C	0.97
80°C	**1.00**
90°C	1.01
100°C	1.03
110°C	1.04
120°C	1.06

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

Liquid temperature	Correction factor
–20°C	0.52
–10°C	0.67
0°C	0.91
10°C	**1.00**
15°C	1.09

US units

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

R 744

Function module	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	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
ICS80	80	98	167	169	171	171	168	164	159	154

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

Hotgas line

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30°C,
P_{disch} = 8 bar,
ΔP = 0.2 bar
T_{disch} = 80°C
Superheat = 8°C

R 134a

Function module	Valve body size	K_v [m^3/h]	Evaporating temperature [°C]						
			–40	–30	–20	–10	0	10	20
ICS25-5	25	1.7	5.1	5.4	5.6	5.9	6.1	6.3	6.5
ICS25-10		3.5	10.6	11.0	11.6	12.0	12.5	13.0	13.4
ICS25-15		6	18.1	19.0	19.8	20.6	21.5	22.3	23.0
ICS25-20		8	24.1	25.3	26.4	27.5	28.6	29.7	30.7
ICS25-25		11.5	34.7	36.0	38.0	39.6	41.0	42.7	44.0
ICS32	32	17	51.0	54.0	56.0	58.5	61.0	63.0	65.0
ICS40	40	27	82.0	85.0	89.0	93.0	97.0	100	104
ICS50	50	44	133	139	145	151	157	163	169
ICS65	65	70	211	221	231	241	251	260	269
ICS80	80	85	256	268	280	293	304	315	326

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

ΔP [bar]	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

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

Discharge temperature	Correction factor
50°C	0.96
60°C	0.97
80°C	**1.00**
90°C	1.01
100°C	1.03
110°C	1.04
120°C	1.06

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

Liquid temperature	Correction factor
–20°C	0.66
–10°C	0.70
0°C	0.76
10°C	0.82
20°C	0.90
30°C	**1.00**
40°C	1.13
50°C	1.29

US units

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

R 134a

Function module	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	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
ICS80	80	98	67	72	75	79	83	86	89

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

Nominal capacities

Hotgas line

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30°C,
P_{disch} = 12 bar
ΔP = 0.2 bar,
T_{disch} = 80°C
Superheat = 8°C

R 404A

Function module	Valve body size	K_v [m³/h]	Evaporating temperature [°C]							
			–50	–40	–30	–20	–10	0	10	20
ICS25-5	25	1.7	4.8	5.1	5.4	5.7	6.0	6.3	6.6	6.8
ICS25-10		3.5	9.8	10.4	11.1	11.8	12.4	13.0	13.6	14.1
ICS25-15		6	16.7	18.0	19.0	20.2	21.3	22.3	23.3	24.2
ICS25-20		8	22.3	24.0	25.4	27.0	28.3	29.7	31.0	32.0
ICS25-25		11.5	32.0	34.0	36.5	38.5	40.7	42.7	44.6	46.0
ICS32	32	17	48.0	51.0	54.0	57.0	60.0	63.0	66.0	69.0
ICS40	40	27	75.0	81.0	86.0	91.0	96.0	100	105	109
ICS50	50	44	123	131	140	148	156	163	171	177
ICS65	65	70	195	208	222	235	248	260	271	282
ICS80	80	85	238	254	270	286	301	315	330	342

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

ΔP [bar]	Correction factor
0.2	**1.00**
0.25	0.89
0.3	0.82
0.4	0.71
0.5	0.63
0.6	0.58

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

Discharge temperature	Correction factor
50°C	0.96
60°C	0.97
80°C	**1.00**
90°C	1.01
100°C	1.03
110°C	1.04
120°C	1.06

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

Liquid temperature	Correction factor
–20°C	0.55
–10°C	0.60
0°C	0.66
10°C	0.74
20°C	0.85
30°C	**1.00**
40°C	1.23
50°C	1.68

US units

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

R 404A

Function module	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	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
ICS80	80	98	61	65	70	75	80	84	88	91

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

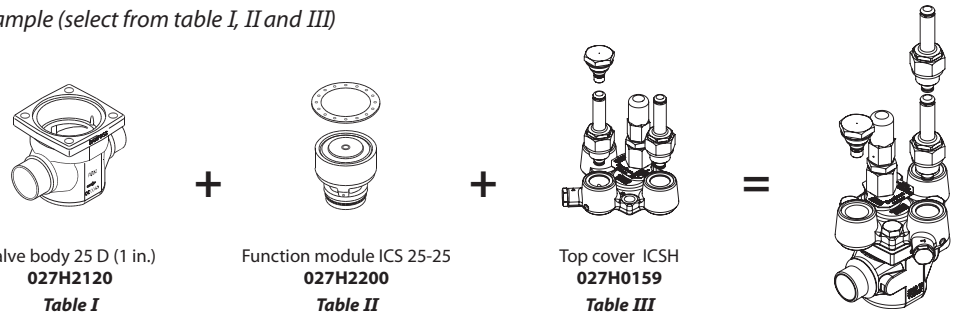
Correction factor for liquid temperature (T_{liq}).

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

ICSH 25

Ordering from the parts programme

Example (select from table I, II and III)

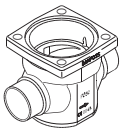


Valve body 25 D (1 in.)
027H2120
Table I

Function module ICS 25-25
027H2200
Table II

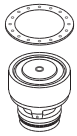
Top cover ICSH
027H0159
Table III

ICV 25 valve body w/different connections *Table I*



20 D (¾ in.)	25 D (1 in.)	32 D (1¼ in.)	40 D (1½ in.)
027H2128	**027H2120**	**027H2129**	**027H2135**
35 SD (1⅜ in. SA)	28 SA (1⅛ in.)	22 SA (⅞ in.)	28 SD (1⅛ in.)
027H2134	**027H2126**	**027H2125**	**027H2124**
22 SD (⅞ in.)	20 A (¾ in.)	25 A (1 in.)	32 A (1¼ in.)
027H2123	**027H2131**	**027H2121**	**027H2130**
20 SOC (¾ in.)	25 SOC (1 in.)	20 FPT (½ in.)	25 FPT (1 in.)
027H2132	**027H2122**	**027H2133**	**027H2127**

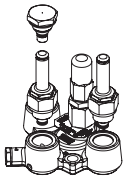
ICS 25 function module *Table II*



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

ICSH 25 top cover *Table III*



Description	Code Number
Top cover ICSH	**027H0159** *)

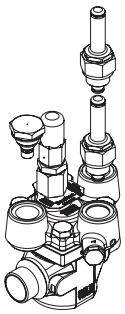
*) Including bolts, one blanking plug (A+B) and 2 EVM NC

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ; SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

Ordering complete factory assembled valve

(body, function module and top cover)

Table A



	Available connections							
	20 D (¾ in.)	25 D (1 in.)	32 D (1¼ in.)	40 D (1½ in.)	35 SD (1⅜ in. SA)	28 SA (1⅛ in.)	22 SA (⅞ in.)	28 SD (1⅛ in.)
ICSH 25-25 *)		**027H2309**						

	22 SD (⅞ in.)	20 A (¾ in.)	25 A (1 in.)	32 A (1¼ in.)	20 SOC (¾ in.)	25 SOC (1 in.)	20 FPT (½ in.)	25 FPT (1 in.)
ICSH 25-25 *)			**027H2308**			**027H2307**		

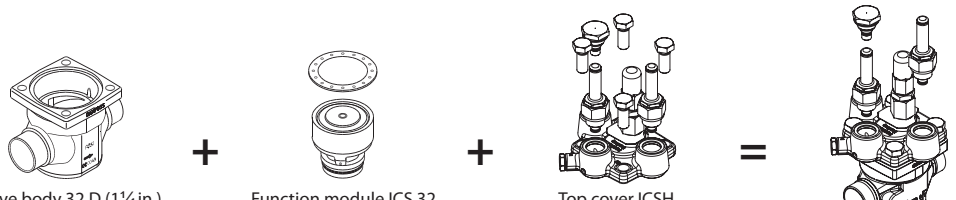
Select from parts programme

*) Including one blanking plug (A+B) and 2 EVM NC

ICSH 32

Ordering from the parts programme

Example (select from table I, II and III)



Valve body 32 D (1¼ in.)
027H3120
Table I

Function module ICS 32
027H3200
Table II

Top cover ICSH
027H0164
Table III

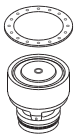
ICV 32 valve body w/different connections *Table I*

32 D (1¼ in.)	40 D (1½ in.)	42 SA (1⅝ in.)	42 SD (1⅝ in.)
027H3120	**027H3125**	**027H3127**	**027H3128**

35 SD (1⅜ in. SA)	32 A (1¼ in.)	32 SOC (1¼ in.)	40 A (1½ in.)
027H3123	**027H3121**	**027H3122**	**027H3126**

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ;
SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

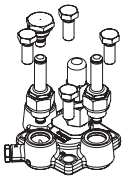
ICS 32 function module *Table II*



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

*) Including gasket and O-rings

ICSH 32 top cover *Table III*



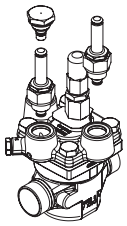
Description	Code Number
Top cover ICSH	**027H0164** *)

*) Including bolts, one blanking plug (A+B) and 2 EVM NC

Ordering complete factory assembled valve

(body, function module and top cover)

Table A



	Available connections							
	32 D (1¼ in.)	40 D (1½ in.)	42 SA (1⅝ in.)	42 SD (1⅝ in.)	35 SD (1⅜ in. SA)	32 A (1¼ in.)	32 SOC (1¼ in.)	40 A (1½ in.)
ICSH 32 *)	**027H3309**					**027H3378**	**027H3377**	

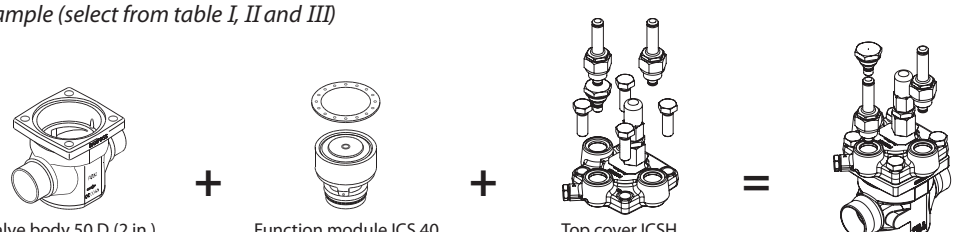
Select from parts programme

*) Including one blanking plug (A+B) and 2 EVM NC

ICSH 40

Ordering from the parts programme

Example (select from table I, II and III)



Valve body 50 D (2 in.)
027H4126
Table I

Function module ICS 40
027H4200
Table II

Top cover ICSH
027H0169
Table III

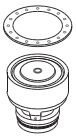
ICV 40 valve body w/different connections *Table I*

40 D (1½ in.)	50 D (2 in.)	42 SA (1⅝ in.)	42 SD (1⅝ in.)
027H4120	**027H4126**	**027H4124**	**027H4123**

40 A (1½ in.)	40 SOC (1½ in.)	50 A (2 in.)	
027H4121	**027H4122**	**027H4127**	

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ;
SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

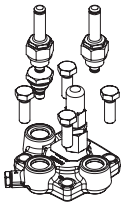
ICS 40 function module *Table II*



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

*) Including gasket and O-rings

ICSH 40 top cover *Table III*



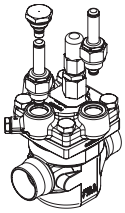
Description	Code Number
Top cover ICSH	**027H0169** *)

*) Including bolts, one blanking plug (A+B) and 2 EVM NC

Ordering complete factory assembled valve

(body, function module and top cover)

Table A



	Available connections						
	40 D (1½ in.)	50 D (2 in.)	42 SA (1⅝ in.)	42 SD (1⅝ in.)	40 A (1½ in.)	40 SOC (1½ in.)	50 A (2 in.)
ICSH 40 *)	**027H4309**				**027H4308**	**027H4307**	

Select from parts programme

*) Including one blanking plug (A+B) and 2 EVM NC

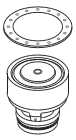
ICSH 50

Ordering from the parts programme

Example (select from table I, II and III)

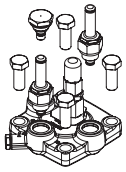
Valve body 65 D (2½ in.)
027H5124
Table I

+



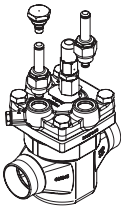
Function module ICS 40
027H5200
Table II

+



Top cover ICSH
027H0174
Table III

=



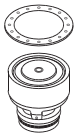
ICV 50 valve body w/different connections *Table I*

50 D (2 in.)	65 D (2½ in.)	54 SD (2⅛ in. SA)	50 A (2 in.)
027H5120	**027H5124**	**027H5123**	**027H5121**

50 SOC (2 in.)	65 A (2½ in.)		
027H5122	**027H5125**		

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ;
SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

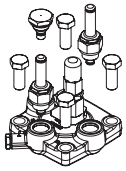
ICS 50 function module *Table II*



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

*) Including gasket and O-rings

ICSH 50 top cover *Table III*



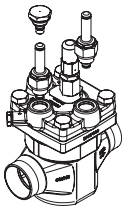
Description	Code Number
Top cover ICSH	**027H0174** *)

*) Including bolts, one blanking plug (A+B) and 2 EVM NC

Ordering complete factory assembled valve

(body, function module and top cover)

Table A



	Available connections					
	50 D (2 in.)	65 D (2½ in.)	54 SD (2⅛ in. SA)	65 A (2½ in.)	50 A (2 in.)	50 SOC (2 in.)
ICSH 50 *)	**027H5309**				**027H5308**	**027H5307**

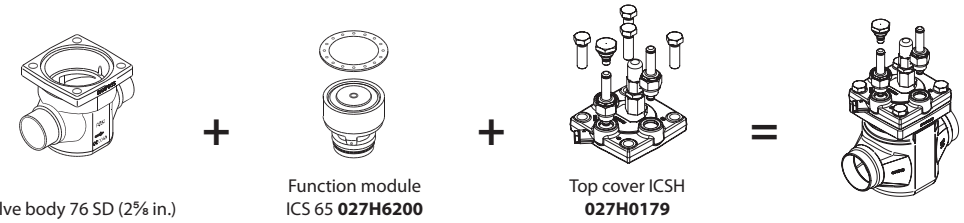
Select from parts programme

*) Including one blanking plug (A+B) and 2 EVM NC

ICSH 65 and ICSH 80

Ordering from the parts programme

Example (select from table I, II and III)



Valve body 76 SD (2⅝ in.)
027H6124
Table I

Function module
ICS 65 **027H6200**
ICS 80 **027H8200**
Table II

Top cover ICSH
027H0179
027H0227
Table III

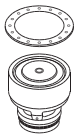
ICV 65 valve body w/different connections — *Table I*

65 D (2½ in.)	65 A (2½ in.)	65 J (2½ in.)	80 D (3 in.)
027H6120	**027H6121**	**027H6122**	**027H6126**

80 A (3 in.)	67 SA (2 ⅝ in.)	76 SD (3 in.)	65 SOC (2½ in.)
027H6127	**027H6125**	**027H6124**	**027H6123**

D = Butt-weld DIN ; A = Butt-weld ANSI ; J = Butt-weld JIS ; SOC = Socket weld ANSI ;
SD = Solder DIN ; SA = Solder ANSI ; FPT = Female Pipe Thread

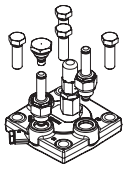
ICS 65-80 function module — *Table II*



Description	Code Number
ICS 65	**027H6200** *)
ICS 80	**027H8200** *)

*) Including gasket and O-rings

ICSH 65-80 top cover — *Table III*

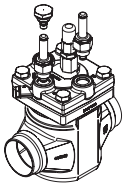


Description	Code Number
Top cover ICSH (65)	**027H0179** *)
Top cover ICSH (80)	**027H0227** *)

*) Including bolts, one blanking plug (A+B) and 2 EVM NC

Ordering complete factory assembled valve

(body, function module and top cover) — *Table A*



	Available connections							
	65 D (2½ in.)	65 A (2½ in.)	65 SOC (2½ in.)	80 D (3 in.)	80 A (3 in.)	67 SA (2⅝ in.)	76 SD (3 in.)	65 J (2½ in.)
ICSH 65 *)	**027H6309**	**027H6311**	**027H6308**					
ICSH 80 *)				**027H7302**	**027H7303**			

Select from parts programme

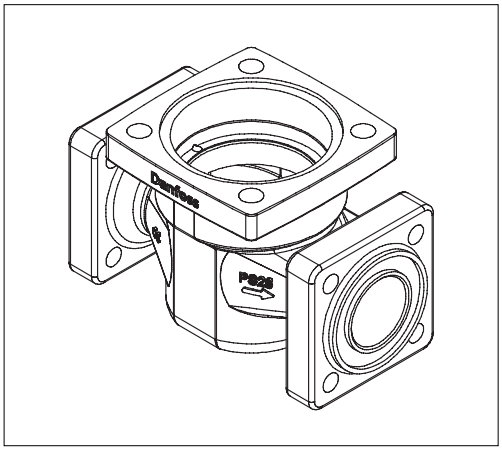
*) Including one blanking plug (A+B) and 2 EVM NC

Note:
The capacity of the ICS 80 module can only be achieved when using the valve body with 80 D or A (3 in) connections.
If any other ICV 65 valve body is used the capacity of the complete valve will be reduced by up to 6%.

Accessories

ICV PM flanged valve housings
ICV PM flanged valve housings can replace the PM valves on already installed refrigeration systems.

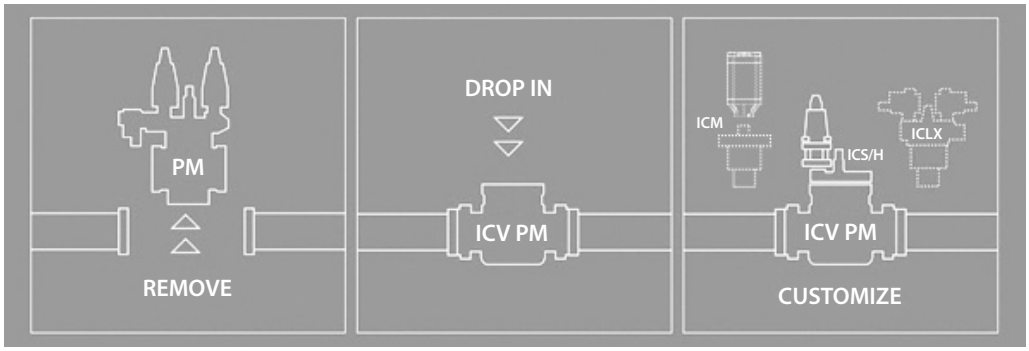
Pressure range
The ICV PM valve housing is designed for a max. working pressure of 28 bar g / 406 psig and therefore a suitable replacement for PM valves in the service market. They also offer the same drop-in dimensions as the PM valves.



Description	Code no.
ICV 25 PM Valve housing	**027H2119** *)
ICV 32 PM Valve housing	**027H3129** *)
ICV 40 PM Valve housing	**027H4128** *)
ICV 50 PM Valve housing	**027H5127** **)
ICV 65 PM Valve housing	**027H6128** **)

*) Includes ICV PM valve housing, flange gaskets and flange bolts.
**) Includes ICV PM valve housing, flange gaskets, flange bolts and flange nuts.

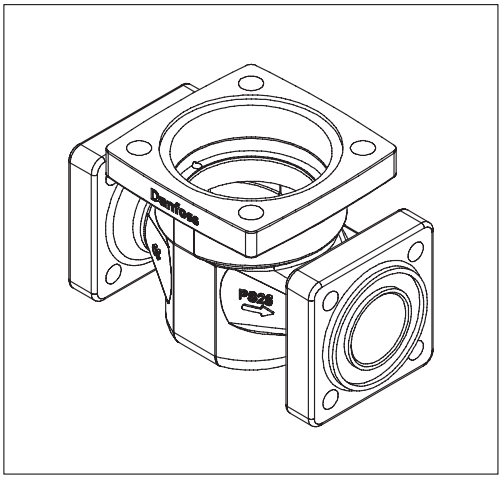
Function modules and top covers must be ordered separately (see the section "Ordering").



Accessories

ICV (H)A4A flanged valve housings
ICV (H)A4A flanged valve housings can replace the (H)A4A valves on already installed refrigeration systems.

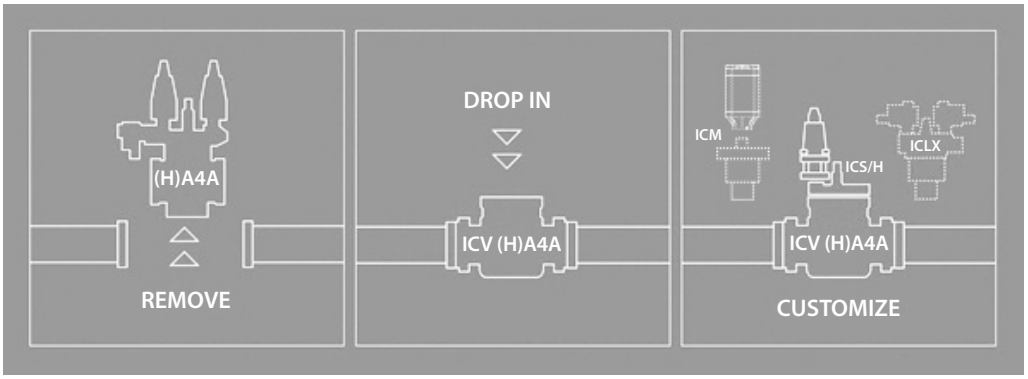
Pressure range
The ICV (H)A4A valve housing is designed for a max. working pressure of 28 bar g / 406 psig and therefore a suitable replacement for (H)A4A valves in the service market. They also offer the same drop-in dimensions as the (H)A4A valves.



Description	Code no.
ICV 25 (H)A4A Valve housing	**027H2304 *)**
ICV 32 A4A Valve housing	**027H3130 *)**
ICV 32 HA4A Valve housing	**027H3131 *)**
ICV 40 (H)A4A Valve housing	**027H4129 *)**
ICV 50 (H)A4A Valve housing	**027H5128 ***
ICV 65 (H)A4A Valve housing	**027H6129 ***

*) Includes ICV (H)A4A valve housing, flange gaskets, flange bolts and flange nuts.

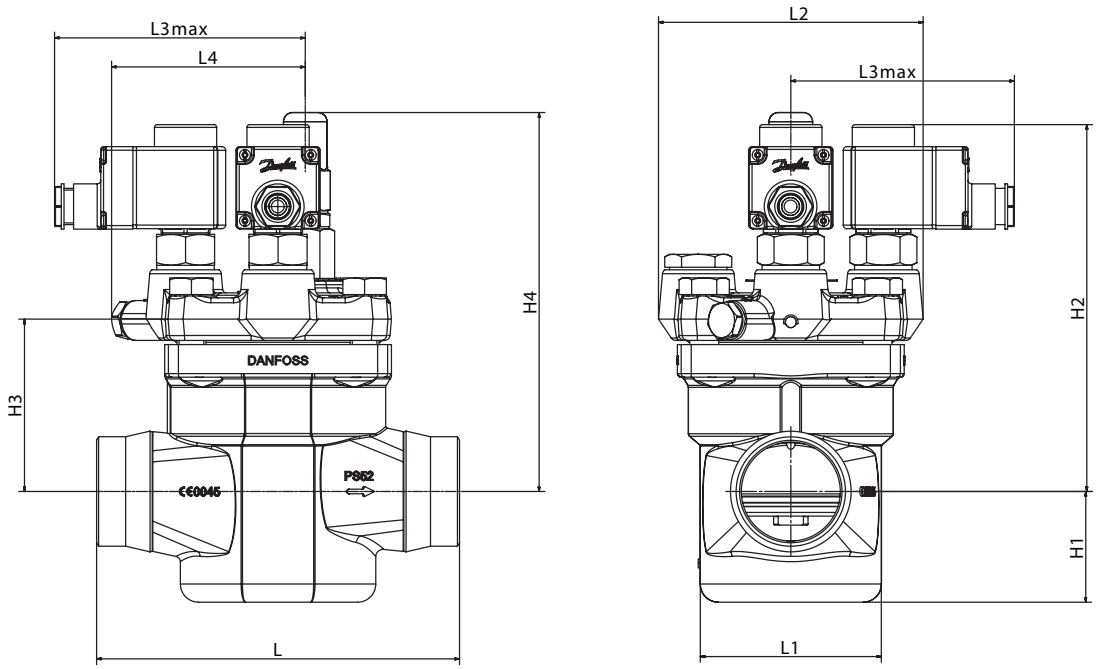
Function modules and top covers must be ordered separately (see the section "Ordering").



Blanking plug A + B for pilot valves

Description	Code number
Blanking plug incl. flat gasket	**027F1046**

Dimensions



ICSH 25-25	L		
	DIN	A	SOC
mm	135	135	147
in	5.31	5.31	5.79

ICSH 25-25	L1	L2	L3max(s1)	L3max(S-2)	L4	H1	H2	H3	H4	Weight
mm	65	146.5	138	123	100.5	39.5	168.5	61	174	3.8 Kg
in	2.56	5.77	5.43	4.84	3.96	1.56	6.63	2.40	6.85	7.93lb

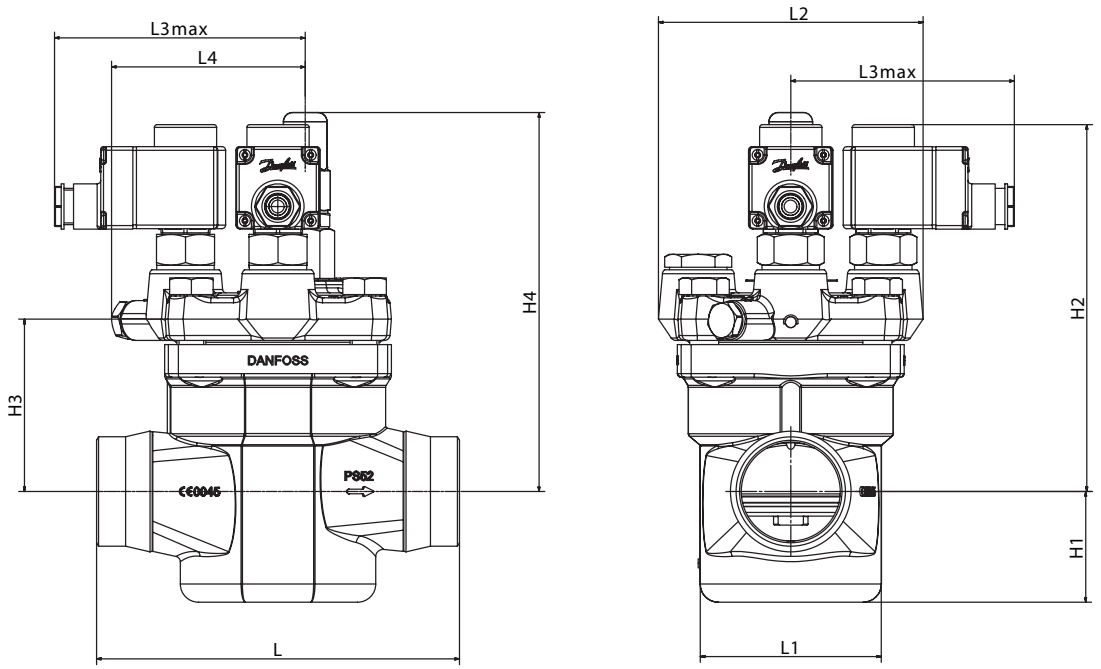
ICSH 32	L		
	DIN	A	SOC
mm	145	145	148
in	5.71	5.71	5.83

ICSH 32	L1	L2	L3max(s1)	L3max(S-2)	L4	H1	H2	H3	H4	Weight
mm	75	146.5	138	123	102	42.5	182	72	187.6	5.1
in	2.95	5.77	5.43	4.84	4.02	1.67	7.17	2.83	7.39	11.1lb

ICSH 40	L		
	DIN	A	SOC
mm	160	160	180
in	6.30	6.30	7.09

ICSH 40	L1	L2	L3max(s1)	L3max(S-2)	L4	H1	H2	H3	H4	Weight
mm	86	146	138	123	102	51.5	186.5	78	193	6.5 Kg
in	3.39	5.75	5.43	4.84	4.02	2.03	7.34	3.07	7.60	14lb

Dimensions



ICSH 50	L		
	DIN	A	SOC
mm	200	200	216
in	7.87	7.87	8.50

ICSH 50	L1	L2	L3max(s1)	L3max(S-2)	L4	H1	H2	H3	H4	Weight
mm	100	146	138	123	107	61	202	95	209	9.4 Kg
in	3.94	5.75	5.43	4.84	4.21	2.40	7.95	3.74	8.23	20.3lb

ICSH 65	L		
	DIN	A	SOC
mm	230	230	230
in	9.06	9.06	9.06

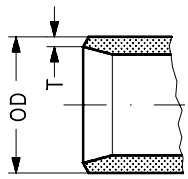
ICSH 65	L1	L2	L3max(s1)	L3max(S-2)	L4	H1	H2	H3	H4	Weight
mm	130	145.6	138	123	106.7	69	222.5	114.5	232	13.7 Kg
in	5.12	5.73	5.43	4.84	4.20	2.72	8.76	4.51	9.13	29.8lb

ICSH 80	L		
	DIN	A	
mm	245	245	
in	9.65	9.65	

ICSH 80	L1	L2	L3max(s1)	L3max(S-2)	L4	H1	H2	H3	H4	Weight
mm	130	145.6	138	123	106.7	69	222.5	112.5	232	13.7 Kg
in	5.12	5.73	5.43	4.84	4.20	2.72	8.76	4.43	9.13	29.8lb

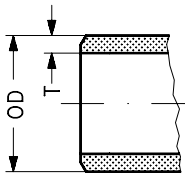
Connections

D: *Butt-weld (EN 10220)*



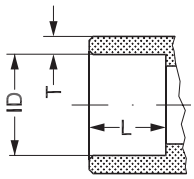
Size mm	Size in.	OD mm	T mm	OD in.	T in.
20	(¾)	26.9	2.3	1.059	0.091
25	(1)	33.7	2.6	1.327	0.103
32	(1¼)	42.4	2.6	1.669	0.102
40	(1½)	48.3	2.6	1.902	0.103
50	(2)	60.3	2.9	2.37	0.11
65	(2½)	76.1	2.9	3	0.11
80	(3)	88.9	3.2	3.50	0.13

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



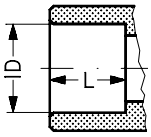
Size mm	Size in.	OD mm	T mm	OD in.	T in.	Schedule
(20)	¾	26.9	4.0	1.059	0.158	80
(25)	1	33.7	4.6	1.327	0.181	80
(32)	1¼	42.4	4.9	1.669	0.193	80
(40)	1½	48.3	5.1	1.902	0.201	80
(50)	2	60.3	3.9	2.37	0.15	40
(65)	2½	73.0	5.2	2.87	0.20	40
(80)	3	88.9	5.5	3.50	0.22	40

SOC:
Socket welding ANSI (B 16.11)



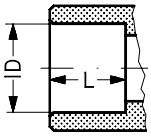
Size mm	Size in.	ID mm	T mm	ID in.	T in.	L mm	L in.
(20)	¾	27.2	4.6	1.071	0.181	13	0.51
(25)	1	33.9	7.2	1.335	0.284	13	0.51
(32)	1¼	42.7	6.1	1.743	0.240	13	0.51
(40)	1½	48.8	6.6	1.921	0.260	13	0.51
(50)	2	61.2	6.2	2.41	0.24	16	0.63
(65)	2½	74	8.8	2.91	0.344	16	0.63

SD: *Soldering (EN 1254-1)*



Size mm	Size in.	ID mm		ID in.		L mm	L in.
22		22.08				16.5	
28		28.08				26	
35		35.07				25	
42		42.07				28	
54		54.09				33	
76		76.1				33	

SA: Soldering (ANSI B 16.22)



	Size in.			ID in.			L in.
	⅞			0.875			0.650
	1⅛			1.125			1.024
	1⅜			1.375			0.984
	1⅝			1.625			1.102
	2⅛			2.125			1.300
	2½			2.625			1.300