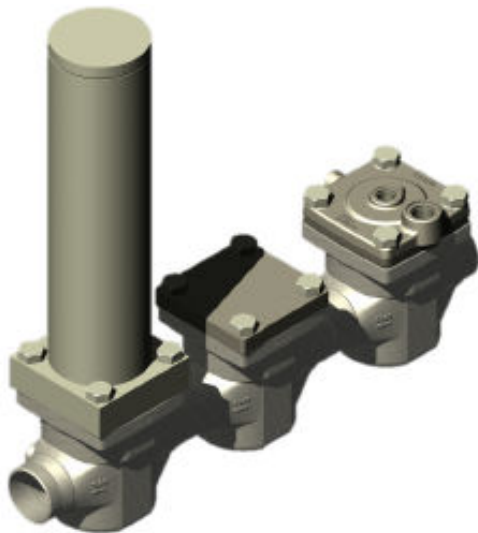


Data Sheet

Eco-Damper ICD damper, ICC Check valve and ICS control valve

(3 valve) system build on the ICV modular concept



The Danfoss Eco-damper solution is a 3 component (3 valve) system build on the ICV modular concept.

Each component consists of an ICV housing and 1 of 3 modules performing the functions Dampening (ICD), Non-return (ICC) and Control (ICS 1 or 3 pilots) respectively.

The Danfoss Eco-damper solution is used in the economizer line of typical screw compressors to dampen the pulsations from the compressor.

The Eco damper system is designed for high damping efficiency over a broad band of low frequencies with neglectable pressure drop.

It comes in sizes 32 and 50 and is offered from a parts program giving a wide variety of connection types and sizes.

The ICD is a unique damping system combining the Helmholtz, Quarter wave and Expansion chamber principles into a broad band damper, able to reduce the Ammonia pulsations by 30% to 80% for critical frequencies in the frequency range of 100 to 500 Hz.

Features

- Designed for Industrial Refrigeration applications for a maximum working pressure of 52 bar / 754 psig.
- Applicable to R717 (Ammonia)
- Direct welded connections
- Connection types include butt weld, socket weld and solder connections
- Low temperature steel body
- Low weight and compact design
- The 3 top covers can be turned in any of 4 orientations without affecting the individual functions
- Manual opening of the solenoid valve (ie. the line) possible
- Robust PTFE seat secures long lasting solenoid valve function
- Service friendly design

Portfolio overview

ICD, ICC, ICS 32 & 50

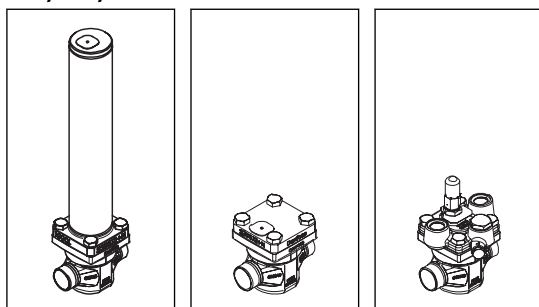
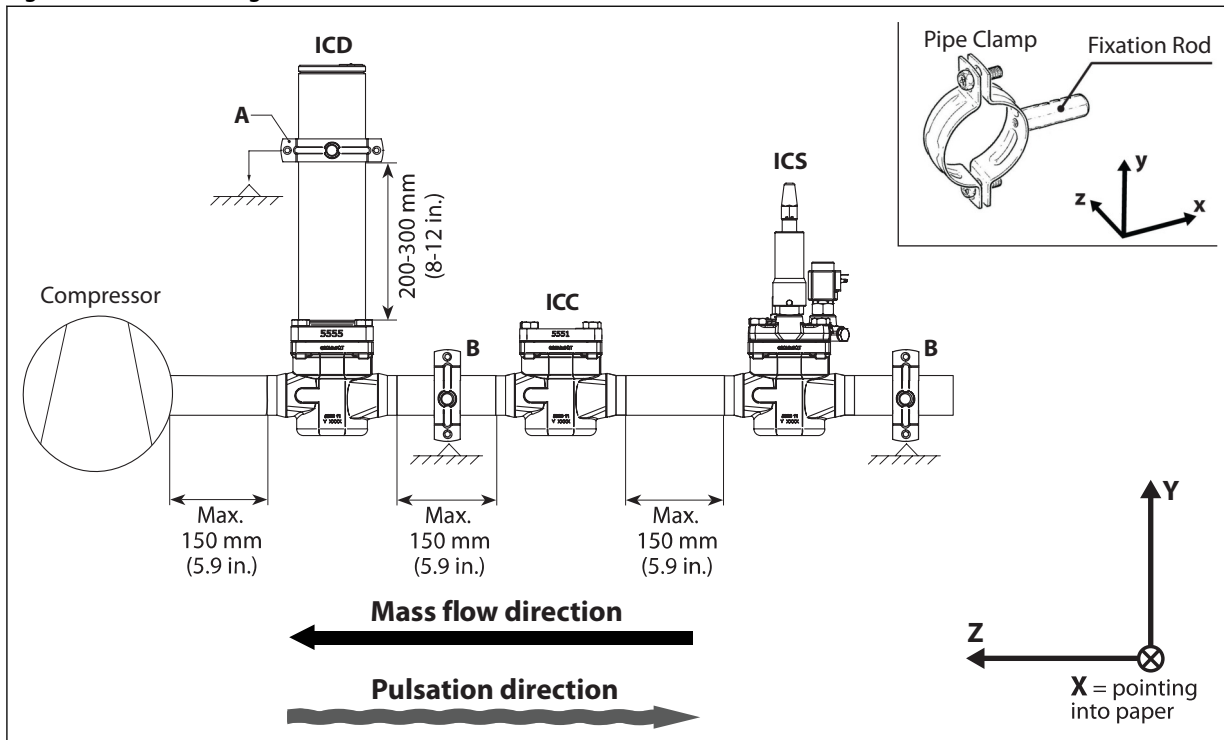


Table 1: Portfolio overview

Description	ICD, ICC, ICS 32	ICD, ICC, ICS 50
Valve body/connection material	Steel	Steel
Connection standard	EN 10220 ANSI (B 36.10) ANSI (B 16.11) EN 1254-1 ANSI (B 16.22)	EN 10220 ANSI (B 36.10) ANSI (B 16.11) EN 1254-1 ANSI (B 16.22)
Connection type	Butt weld Socket weld Solder connection	Butt weld Socket weld Solder connection
Min. opening differential pressure	ICS = 0,07 bar (1 psi) ICC = 0,04 bar (0.6 psi)	ICS = 0,07 bar (1 psi) ICC = 0,04 bar (0.6 psi)
Pressure differential for fully opening of the ICS and ICC valves	ICS = 0,2 bar (2.9 psi) ICC = 0,08 bar (1.2 psi)	ICS = 0,2 bar (2.9 psi) ICC = 0,08 bar (1.2 psi)
K_v (m³/h)	ICC = 16.6 ICD = 17.7	ICC = 40.4 ICD = 39.4
C_v (USgal/min)	ICC = 19.3 ICD = 20.6	ICC = 47 ICD = 45.9
Temperature range	ICD Temp. Range from -60 °C – 150 °C / -76 °F – 302 °F ICC Temp. Range from -60 °C – 120 °C / -76 °F – 248 °F ICS Temp. Range from -60 °C – 120 °C / -76 °F – 248 °F	ICD Temp. Range from -60 °C – 150 °C / -76 °F – 302 °F ICC Temp. Range from -60 °C – 120 °C / -76 °F – 248 °F ICS Temp. Range from -60 °C – 120 °C / -76 °F – 248 °F
Max. working pressure	52 bar / 754 psig	52 bar / 754 psig

Functions

Figure 1: Functional diagram



Though the refrigerant flow in the economizer line is towards the compressor, the pulsations moves in the opposite direction. Due to this phenomenon the sequence of the 3 components is important. Seen from the compressor the dampening comes first followed by flow alignment and flow control.

It is equally important to orientate the valve housings with the arrow pointing in the mass flow direction (pointing towards the compressor).

Distances between the single components are of great importance and recommendations must be followed.

The Eco damper is designed for high efficiency dampening of pulsation pressure peeks and creating unidirectional flow in economizer lines of Ammonia systems.

Depending on the RPM's and geometry of the typical screw compressor the frequency and amplitude of the pulsations in the economizer lines will vary.

The ICD damper is specifically designed for dampening of the critical Ammonia pulsations in the broad band of 100 to 500 Hz.

A simple calculation will clarify if a certain compressor set-up will result in pulsation frequencies between 100 and 500 Hz and this clarification should be made before considering the Eco damper solution. Please look into the Selection section.

The ICD is a unique damping system combining the Helmholtz, Quarter wave and Expansion chamber principles into a broad band damper, able to reduce the Ammonia pulsations by 30% to 80% for critical frequencies in the specified frequency band.

The ICC non-return/check valve is a robust valve optimized to withstand pulsations in the same low frequency band. The ICC features the ability to reduce small pulsating movements in the wrong direction with an overall low pressure drop for the main flow direction.

The ICS control valve is the ordinary valve used for allround control purposes. In the Eco-Damper application the 3 pilot version is offered to be able to include more functions like solenoid and/ or pressure control. The solenoid function is the on/off function for the entire Eco-Damper.

The Eco-Damper solution must be assembled like shown in the above figure with the ICD next to the compressor followed by the ICC and finally the ICS.

NOTE:

In order to prevent exceeding vibrations caused by the ICD eigenfrequency, pipe clamps for fastening the ICD must be installed, and the max distances have to be followed (Figure 1: Functional diagram. Pos. A and B are mandatory). The pipe clamp for pos. A is included in the box. The B pipe clamps and the support must be strong and robust fixation points to help reduce vibrations.

As a guideline the values for stiffness of the clamp support can be found in following tables. For reference of coordinate system see Figure 1: Functional diagram. The pipe clamps at A and B have to provide the following minimum stiffness if the fixation rod is pointing in x-direction:

In N/mm	A	B
X	275.000	375.000
Y	14.000	36.000
Z	14.000	36.000

The pipe clamps at B have to provide the following minimum stiffness if the fixation rod is pointing in y-direction (clamp at A remains unchanged):

In N/mm	A	B
X	275.000	36.000
Y	14.000	375.000
Z	14.000	36.000

Selection

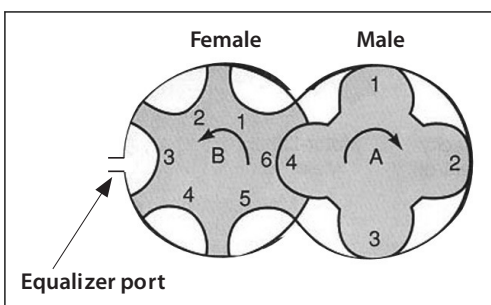
To determine the actual pulsation frequency of a compressor use this formula:

$$\text{Frequency} = \text{RPM (female)} * \text{number of grooves (female)} / 60 \text{ [Hz]}$$

Example: Frequency = 2000 * 6 / 60 = 200 Hz

If 100 Hz < Frequency < 500 Hz dampening is possible with the Eco damper.

Further selection should be based on housing size, connection size and capacity.



Capacity

Once the frequency range is confirmed to be within damper range, the next step is to find the right valve capacity.

For selection and capacity calculation please refer to [Coolselector®2](#)

For application and compressor model confirmation please contact Danfoss.

Housing size	ICD connection size	ICC connection size
32	DN32	DN32
	DN40	DN40
50	DN50	DN50
	DN65	DN65

These criteria should be used for selection.

Eco-Damper - ICD damper, ICC Check valve and ICS control valve

- Complete Eco-Damper solution (ICD+ICC): Lowest pressure drop @ min. and max. capacity
- Check ICC: Pressure drop min. @ minimum capacity (to be outside un-stable area) Check pressure drop max. @ maximum capacity
- Control/solenoid valve: Pressure drop @ min. and max. capacity
- Check control/solenoid valve: Pressure drop min. @ minimum capacity (to be outside un-stable area) Check pressure drop max. @ maximum capacity

i NOTE:

For assistance in relation to selection of right valve capacity please contact Danfoss.

Media

Refrigerants

Applicable to R717 (Ammonia)

New refrigerants

Danfoss products are continually evaluated for use with new refrigerants depending on market requirements.

When a refrigerant is approved for use by Danfoss, it is added to the relevant portfolio, and the R number of the refrigerant (e.g. R513A) will be added to the technical data of the code number. Therefore, products for specific refrigerants are best checked at store.danfoss.com/en/, or by contacting your local Danfoss representative.

Product specification

Pressure and temperature

Table 2: Pressure and temperature

Max. temperature range	Media: -60 °C – 120 °C / -76 °F – 248 °F.
Max. working pressure	52 bar / 754 psig
Min. opening differential pressure	ICS = 0,07 bar (1 psi) ICC = 0,04 bar (0.6 psi)
Pressure differential for fully opening of the ICS and ICC valves	ICS = 0,2 bar (2.9 psi) ICC = 0,08 bar (1.2 psi)
K _v (m ³ /h)	Size 32: 17 Size 50: 44
C _v (USgal/min)	Size 32: 20 Size 50: 51
Coil requirement for ICS+EVM	Coils to be IP67
Damping frequency range	100 – 500Hz
Surface protection	For excellent corrosion protection all valve outer surfaces are zinc-chromated. The Damper module is painted.

Material specification

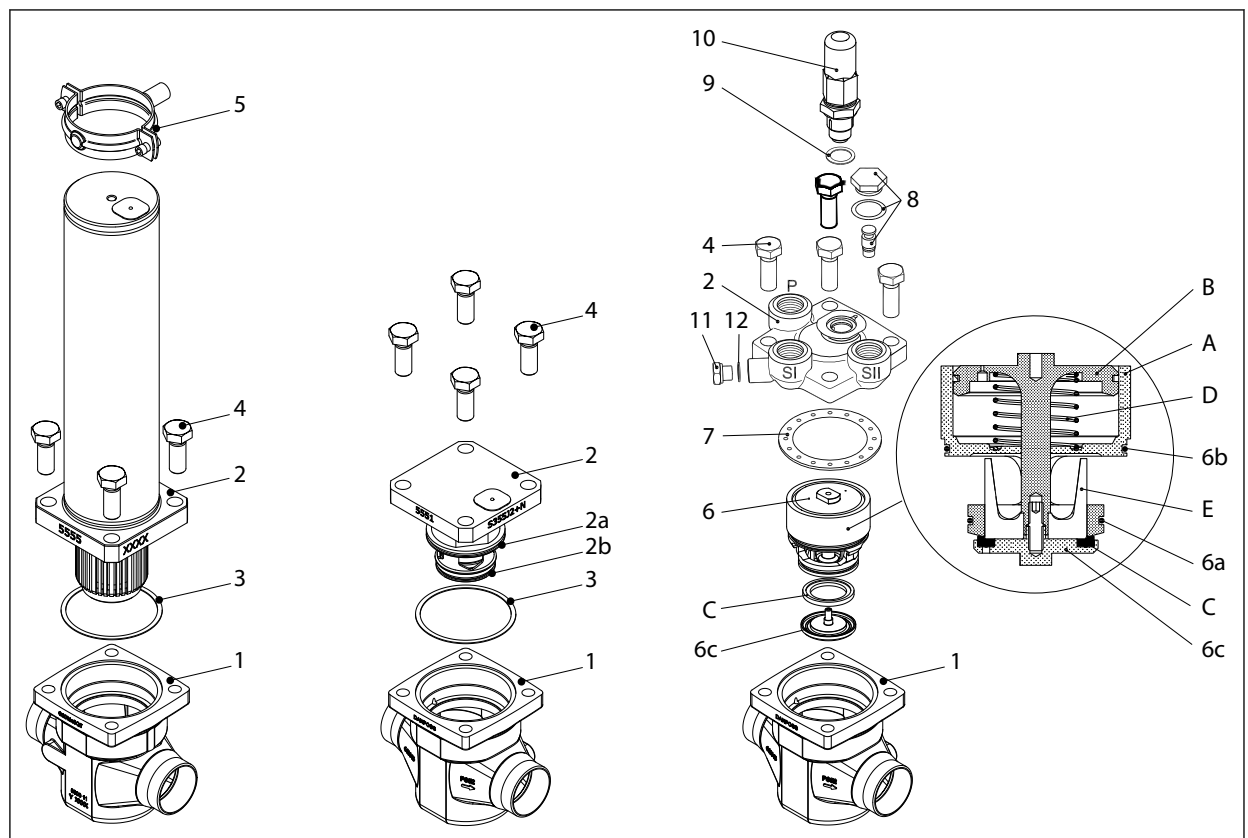


Table 3: Material specification

No	Part	Material	EN	ASTM	JIS
1	Body	Low temperature steel	G20Mn5QT EN 10213-3	LCC A352	SCPL1 G5151
2	Top assembly	Low temperature steel	G20Mn5QT, EN 10213-3 P285QH+QT 10222-4	LCC A352 LF2, A350	SCPL1 G5151
2a	O-ring	Cloroprene (Neoprene)			
2b	O-ring	Cloroprene (Neoprene)			
3	Gasket	Fiber, non-asbestos			
4	Bolts	Stainless steel	A2-70, EN 1515-1	Grade B8 A320	A2-70, B 1054

No	Part	Material	EN	ASTM	JIS
5	Pipe support	Stainless Steel			
6	Function module (assembled)				
6a	o-ring	Cloroprene (Neoprene)			
6b	o-ring	Cloroprene (Neoprene)			
6c	Washer plate	Steel			
A	Cylinder	Steel			
B	Piston	Steel			
C	Valve plate	PTFE			
D	Spring	Steel			
E	Cone	Steel			
7	Gasket	Fiber, non-asbestos			
8	Plug	Steel			
9	Gasket	Aluminium			
10	Manual operating spindle	Steel			
11	Plug	Steel			
12	Gasket	Aluminium			

Connections

The Eco-Damper concept

The Eco-Damper concept is developed to highest flexibility of direct welded connections. For valve sizes ICV 32 and 50 a wide range of connection sizes and types is available.

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

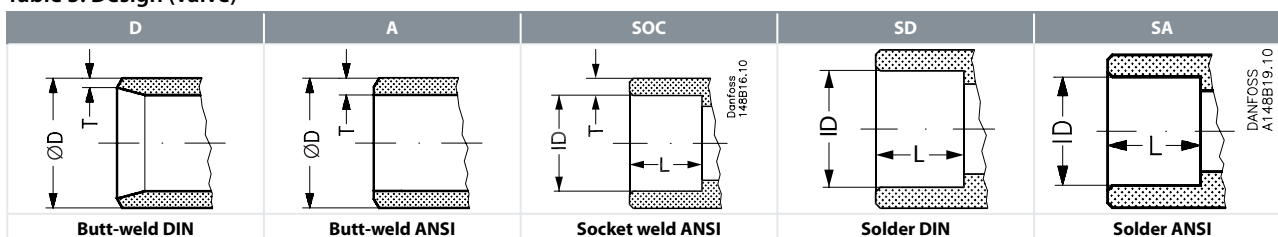
Table 4: There are two valve bodies available



There is a wide range of connection types available:

- **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)

Table 5: Design (valve)



Dimensions and weights

ICD 32 and 50

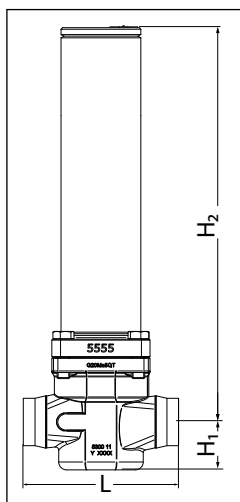


Table 6: Housing with module

Connection		H ₁	H ₂	L	Weight
32 D (1 1/4 in.)	mm	40	482.57	145	7 Kg
	in.	1.57	18.99	5.71	15.4 lbs
40 D (1 1/2 in.)	mm	40	482.57	145	6.8 Kg
	in.	1.57	18.99	5.71	14.9 lbs
32 A (1 1/4 in.)	mm	40	482.57	145	6.8Kg
	in.	1.57	18.99	5.71	15 lbs
40 A (1 1/2 in.)	mm	40	482.57	145	6.8 Kg
	in.	1.57	18.99	5.71	15.1 lbs
32 SOC (1 1/4 in.)	mm	40	482.57	148	6.9 Kg
	in.	1.57	18.99	5.83	15.3 lbs
35 SD (1 3/8 in. SA)	mm	40	482.57	148	6.8 Kg
	in.	1.57	18.99	5.83	14.9 lbs
42 SD (1 5/8 in.)	mm	40	482.57	148	6.8 Kg
	in.	1.57	18.99	5.83	14.9 lbs
42 SA (1 5/8 in.)	mm	40	482.57	148	6.8 Kg
	in.	1.57	18.99	5.83	14.9 lbs
50 D (2 in.)	mm	59	503.74	200	12.2 Kg
	in.	2.32	19.83	7.87	26.9 lbs
65 D (2 1/2 in.)	mm	59	503.74	210	12.6 Kg
	in.	2.32	19.83	8.27	27.8 lbs
50 A (2 in.)	mm	59	503.74	200	12.3 Kg
	in.	2.32	19.83	7.87	27.1 lbs
65 A (2 1/2 in.)	mm	59	503.74	210	12.6 Kg
	in.	2.32	19.83	8.27	27.8 lbs
50 SOC (2 in.)	mm	59	503.74	216	13.4 Kg
	in.	2.32	19.83	8.5	29.6 lbs
54 SD (2 1/8 in. SA)	mm	59	503.74	216	12.4 Kg
	in.	2.32	19.83	8.5	27.2 lbs

NOTE:

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

ICC 32 and 50

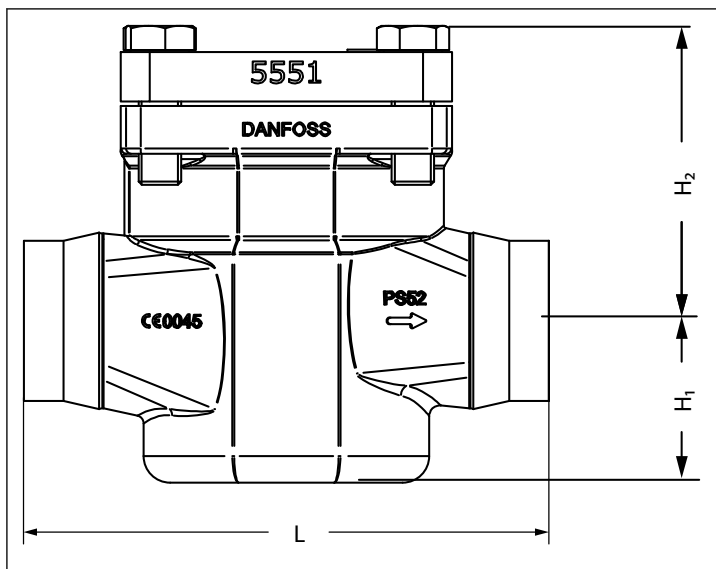


Table 7: Housing with top cover

Connection		H ₁	H ₂	L	Weight
32 D (1 1/4 in.)	mm	40	86.8	145	6.5 Kg
	in.	1.57	3.42	5.71	14.4 lbs
40 D (1 1/2 in.)	mm	40	86.8	145	6.6 Kg
	in.	1.57	3.42	5.71	14.6 lbs
32 A (1 1/4 in.)	mm	40	86.8	145	6.6 Kg
	in.	1.57	3.42	5.71	14.6 lbs
40 A (1 1/2 in.)	mm	40	86.8	145	6.7 Kg
	in.	1.57	3.42	5.71	14.7 lbs
32 SOC (1 1/4 in.)	mm	40	86.8	148	6.8 Kg
	in.	1.57	3.42	5.83	14.9 lbs
35 SD (1 3/8 in. SA)	mm	40	86.8	148	6.6 Kg
	in.	1.57	3.42	5.83	14.6 lbs
42 SD (1 5/8 in.)	mm	40	86.8	148	6.6 Kg
	in.	1.57	3.42	5.83	14.6 lbs
42 SA (1 5/8 in.)	mm	40	86.8	148	6.6Kg
	in.	1.57	3.42	5.83	14.6 lbs
50 D (2 in.)	mm	59	111.25	200	9.1 Kg
	in.	2.32	4.38	7.87	20 lbs
65 D (2 1/2 in.)	mm	59	111.25	210	9.5 Kg
	in.	2.32	4.38	8.27	20.9 lbs
50 A (2 in.)	mm	59	111.25	200	9.1 Kg
	in.	2.32	4.38	7.87	20.2 lbs
65 A (2 1/2 in.)	mm	59	111.25	210	9.5 Kg
	in.	2.32	4.38	8.27	20.9 lbs
50 SOC (2 in.)	mm	59	111.25	216	10.3 Kg
	in.	2.32	4.38	8.5	22.7 lbs
54 SD (2 1/8 in. SA)	mm	59	111.25	216	9.2 Kg
	in.	2.32	4.38	8.5	20.3 lbs

NOTE:

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 and 50

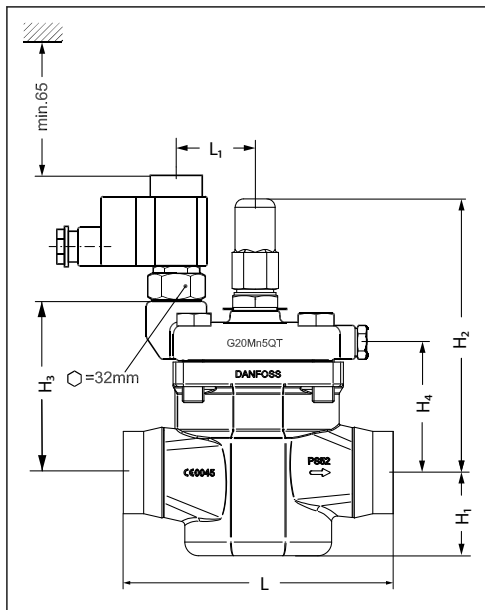


Table 8: Housing with module

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 D (1 1/4 in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.3	3.93	2.91	5.71	2	0.59	2	3.43	9.9 lb.	11 lb.
40 D (1 1/2 in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.3	3.93	2.91	5.71	2	0.59	2	3.43	9.9 lb.	11 lb.
32 A (1 1/4 in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.3	3.93	2.91	5.71	2	0.59	2	3.43	9.9 lb.	11 lb.
40 A (1 1/2 in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.3	3.93	2.91	5.71	2	0.59	2	3.43	9.9 lb.	11 lb.
32 SOC (1 1/4 in.)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.3	3.93	2.91	5.83	2	0.59	2	3.43	9.9 lb.	11 lb.
35 SD (1 3/8 in. SA)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.3	3.93	2.91	5.83	2	0.59	2	3.43	9.9 lb.	11 lb.
42 SD (1 5/8 in.)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.3	3.93	2.91	5.83	2	0.59	2	3.43	9.9 lb.	11 lb.
42 SA (1 5/8 in.)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.3	3.93	2.91	5.83	2	0.59	2	3.43	9.9 lb.	11 lb.
50 D (2 in.)	mm	59	181	120	93	200	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	7.87	2	0.59	2.48	3.58	19.6 lb.	20.2 lb.
65 D (2 1/2 in.)	mm	59	181	120	93	210	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	8.27	2	0.59	2.48	3.58	19.6 lb.	20.2 lb.
50 A (2 in.)	mm	59	181	120	93	200	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	7.87	2	0.59	2.48	3.58	19.6 lb.	20.2 lb.
65 A (2 1/2 in.)	mm	59	181	120	93	210	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	8.27	2	0.59	2.48	3.58	19.6 lb.	20.2 lb.
50 SOC (2 in.)	mm	59	181	120	93	216	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	8.5	2	0.59	2.48	3.58	19.6 lb.	20.2 lb.
54 SD (2 1/8 in. SA)	mm	59	181	120	93	216	51	15	63	91	8.9 kg	9.2 kg
	in.	2.32	7.13	4.72	3.66	8.5	2	0.59	2.48	3.58	19.6 lb.	20.2 lb.

NOTE:

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

ICD, ICC, ICS 32

Ordering from the parts programme

Table 9: Example (select from table 10 to 13)

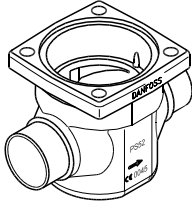
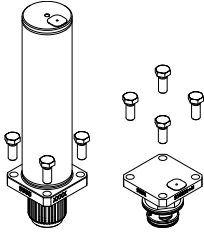
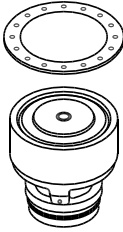
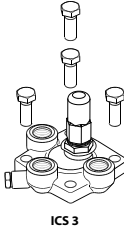
	+		+		+	
3 x Valve body 32 D (1 1/4 in.) 027H3120 Table 10		1 x Function module set ICD & ICC 027H3201 Table 11		1 x Function module ICS 32 027H3200 Table 12		1 x Top cover 3 pilots 027H3173 Table 13

Figure 2: ICV 32 valve body

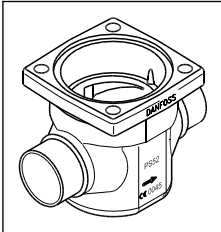


Table 10: ICV 32 valve body w/different connections

32 D (1 1/4 in.) 027H3120	40 D (1 1/2 in.) 027H3125	42 SA (1 5/8 in.) 027H3127	42 SD (1 5/8 in.) 027H3128
35 SD (1 3/8 in. SA) 027H3123	32 A (1 1/4 in.) 027H3121	32 SOC (1 1/4 in.) 027H3122	40 A (1 1/2 in.) 027H3126

NOTE:

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

Figure 3: ICD & ICC

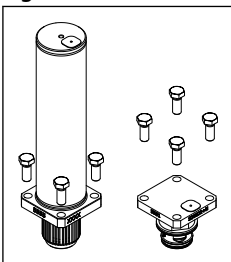


Table 11: ICD & ICC function module set

Description	Code Number
ICD & ICC 32	027H3201

NOTE:

Including bolts, gaskets and o-rings

Figure 4: ICS 32

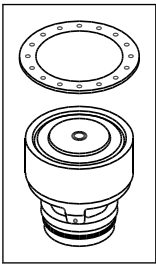


Table 12: ICS 32 function module

Description	Code Number
ICS 32	027H3200

NOTE:

Including gasket and O-rings

Figure 5: Top cover 1 Pilot Figure 6: Top cover 3 Pilots

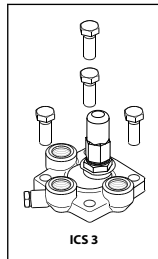
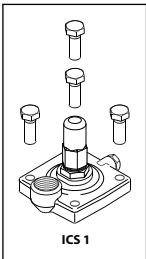


Table 13: ICS 32 top cover

Description	Code Number
Top cover 1 Pilot	027H3172 ⁽¹⁾
Top cover 3 Pilots	027H3173 ⁽²⁾

⁽¹⁾ Including bolts

⁽²⁾ Including bolts and one blanking plug

ICD, ICC, ICS 50

Ordering from the parts programme

Table 14: Example (select from table 15 to 18)

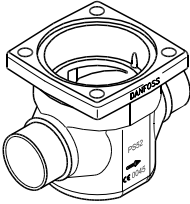
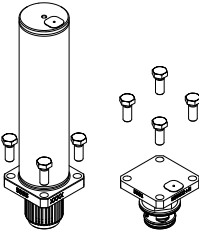
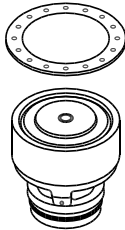
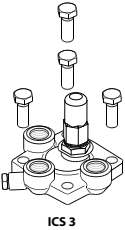
	+		+		+	
3 x Valve body 50 D (2 in.) 027H5120 Table 15		1 x Function module set ICD & ICC 027H5201 Table 16		1 x Function module ICS 50 027H5200 Table 17		1 x Top cover 3 pilots 027H5173 Table 18

Figure 7: ICV 50 valve body

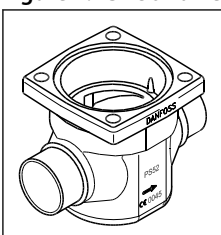


Table 15: ICV 50 valve body w/different connections

50 D (2 in.) 027H5120	65 D (2½ in.) 027H5124	54 SD (2 ⅛ in. SA) 027H5123	50 A (2 in.) 027H5121
50 SOC (2 in.) 027H5122	65 A (2 ½ in.) 027H5125		

NOTE:

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

Figure 8: ICD & ICC

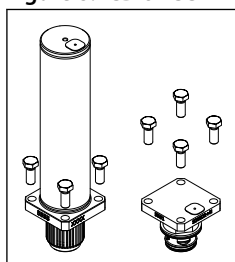


Table 16: ICD & ICC function module set

Description	Code Number
ICD & ICC 50	027H5201

NOTE:

Including bolts, gaskets and o-rings

Figure 9: ICS 50

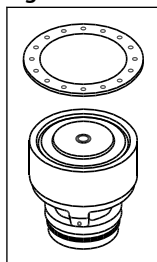


Table 17: ICS 50 function module

Description	Code Number
ICS 50	027H5200

NOTE:

Including gasket and O-rings

Figure 10: Top cover 1 Pilot Figure 11: Top cover 3 Pilots

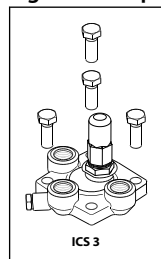
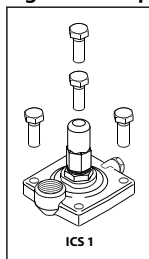


Table 18: ICS 50 top cover

Description	Code Number
Top cover 1 Pilot	027H3172 ⁽¹⁾
Top cover 3 Pilots	027H3173 ⁽²⁾

⁽¹⁾ Including bolts

⁽²⁾ Including bolts and one blanking plug

Spare parts and accessories

Figure 12: Function module

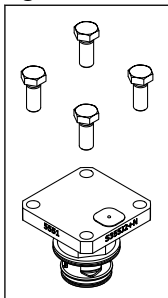


Table 19: Function module

Description	Code Number
ICC 32 function module	027H3202
ICC 50 function module	027H5202

Figure 13: Repair kit

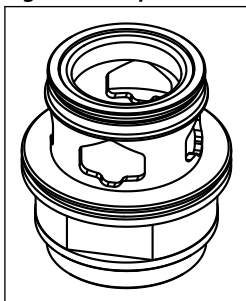


Table 20: Repair kit

Description	Code Number
ICC 32 repair kit	027H3039
ICC 50 repair kit	027H5017

NOTE:

Including bolts, gaskets and o-rings

Certificates, declarations, and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at danfoss.com or contact your local Danfoss representative if you have any questions.

The ICV valve concept is designed to fulfil global refrigeration requirements.

The individual components are CE, CRN and UL approved. For specific approval information, please contact Danfoss.

Table 21: Compliance

ICD, ICC and ICS valves		
	Nominal bore	DN 32 - 50 (1 1/4 - 2 in.)
	Classified for	Fluid group I
	Category	II

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