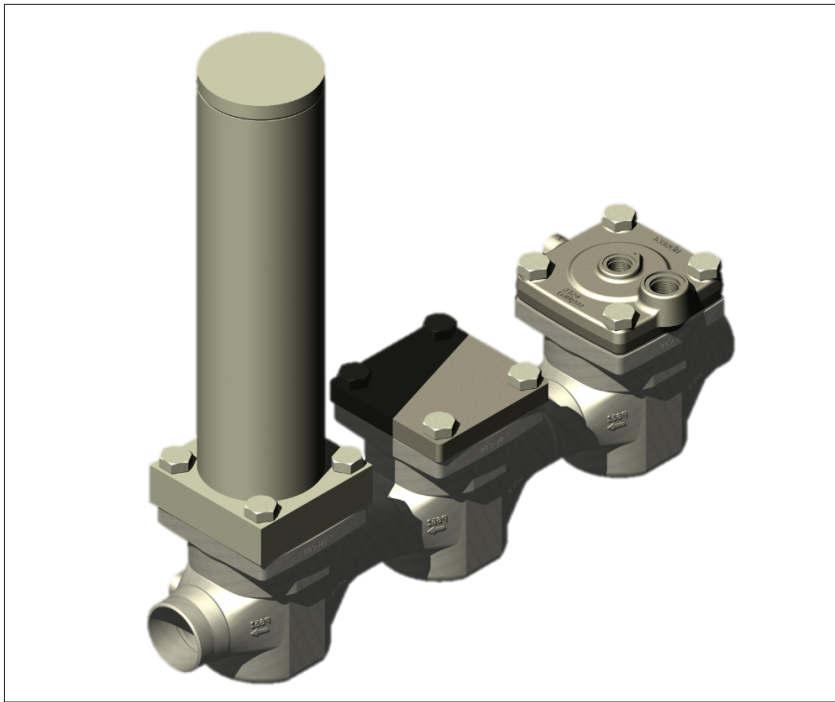


Data sheet

Eco-Damper

ICD damper, ICC Check valve and ICS control valve



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 g / 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.

Contents	Page
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Technical data	3
Approvals	3
Function	4
Selection	5
Capacity	5
Material specification	6
Ordering	7
Dimensions	9



Approvals

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.

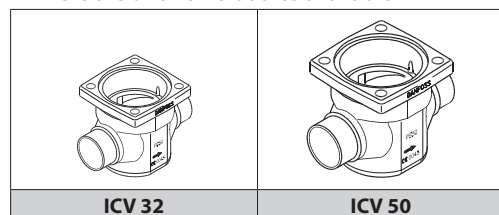
ICD, ICC and ICS valves	
Nominal bore	DN 32 - 50 (1¼ - 2 in.)
Classified for	Fluid group I
Category	II

The Eco-Damper concept

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

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

- There are two valve bodies available



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:

- 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 Eco-Damper 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.

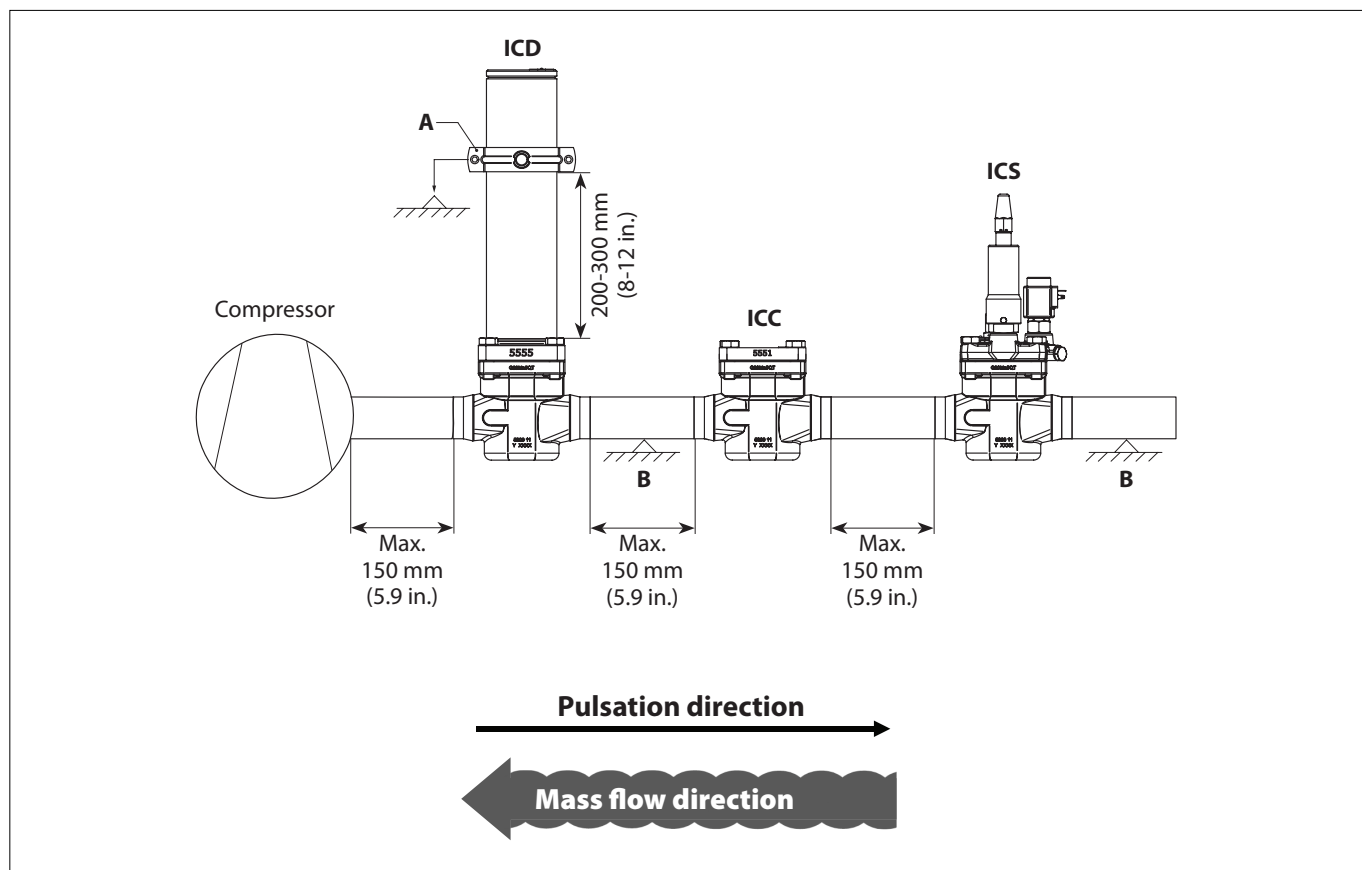
Valve body and top cover material
Low temperature steel

Technical data

- **Refrigerants**
Applicable to R717 (Ammonia)
- **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
- **Surface protection**
For excellent corrosion protection all valve outer surfaces are zinc-chromated. The Damper module is painted.

- **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)
- **Coil requirement for ICS+EVM**
Coils to be IP67
- **Damping frequency range**
100 – 500Hz

	Size 32	Size 50
K _v (m ³ /h)	17	44
C _v (USgal/min)	20	51



Function

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 should 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.

To achieve the optimum dampening effect and avoid vibrations it is important to secure the internal distances between the different components (see above figure).

For an appropriate support of the ICD, a tailored clamp suspension (A) is included in the ICD box. The supports B are also required for reducing vibrations and must be prepared and installed at site.

Selection

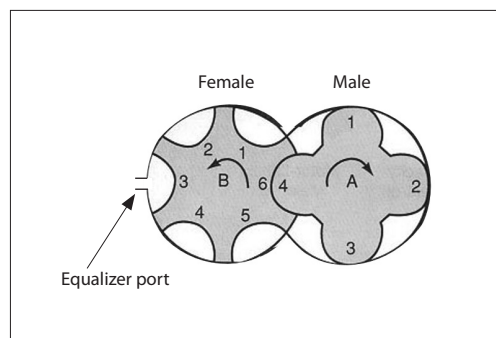
To determine the actual pulsation frequency of a compressor use this formula:

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

Example:
 $\text{Frequency} = 2000 * 6 / 60 = 200 \text{ Hz}$

If $100 \text{ Hz} < \text{Frequency} < 500 \text{ Hz}$ 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 coolselector2.

For application and compressor model confirmation please contact Danfoss.

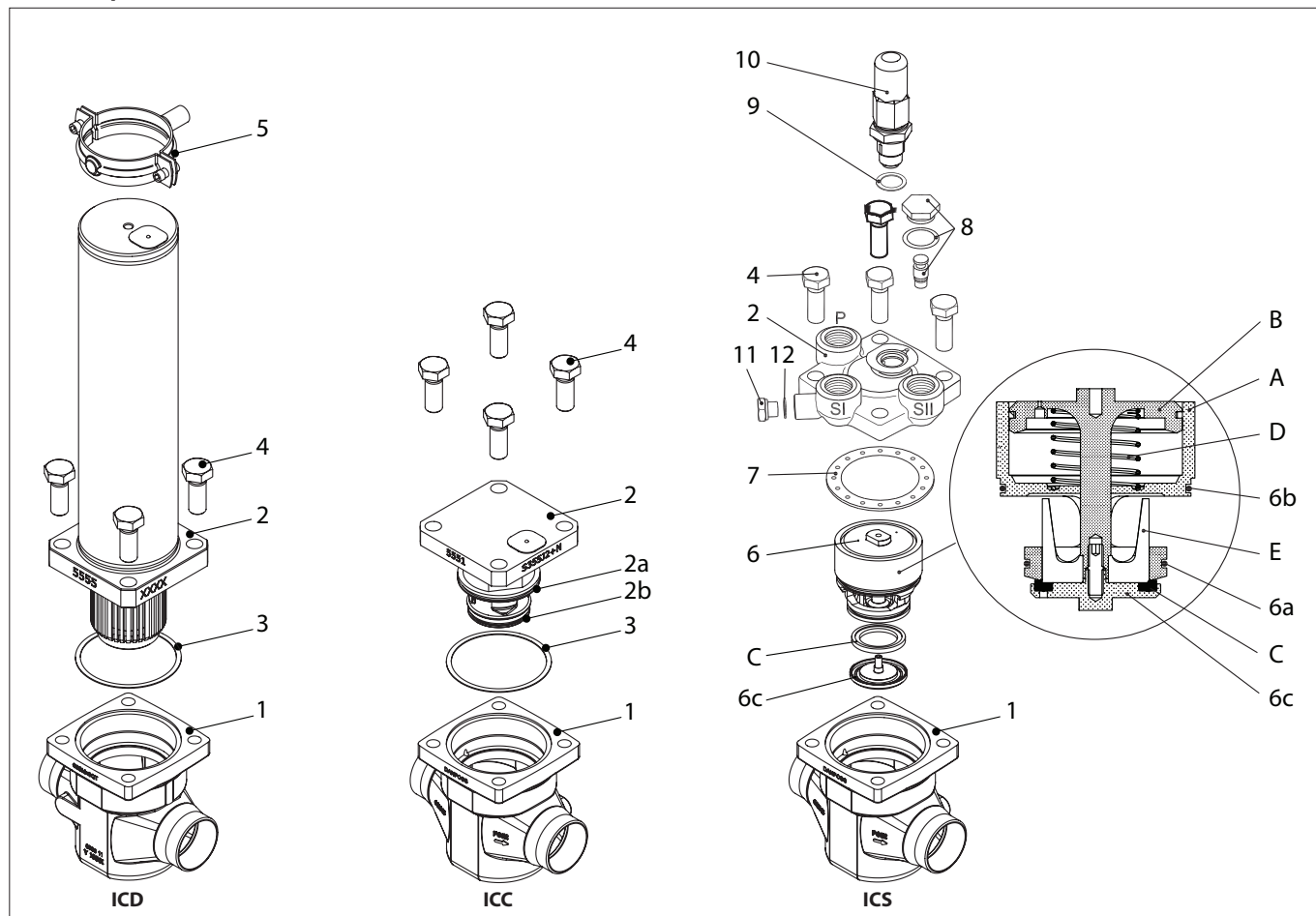
Housing size	ICD connection size	ICC connection size
32	DN32	DN32
	DN40	DN40
50	DN50	DN50
	DN65	DN65

These criteria should be used for selection

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

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

Material specification



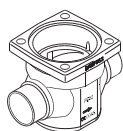
No	Part	Material	EN	ASTM	JIS
1	Body	Low temperature steel	G20Mn5QT, EN 10213-3	LCC A352	SCPL1 G5151
2	Top assembly	Low temperature steel	G20Mn5QT, EN 10213-3 P285QH+QT 10222-4	LCC A352 LF2, A350	SCPL1 G5151
2a	O-ring	Cloroprene (Neoprene)			
2b	O-ring	Cloroprene (Neoprene)			
3	Gasket	Fiber, non-asbestos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

ICD, ICC, ICS 32

Ordering from the parts programme

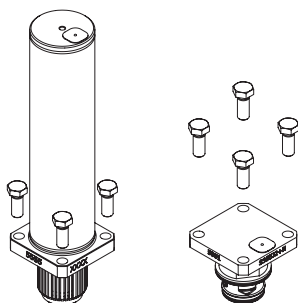
Example

(select from table 1 to 4)



3 x Valve body
32 D (1 1/4 in.)
027H3120
Table 1

+



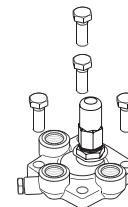
1 x Function module set
ICD & ICC
027H3201
Table 2

+



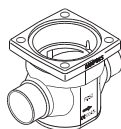
1 x Function module
ICS 32
027H3200
Table 3

+



1 x Top cover
3 pilots
027H3173
Table 4

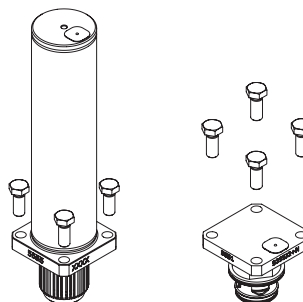
ICV 32 valve body w/different connections Table 1



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

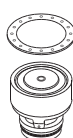
ICD & ICC function module set Table 2



Description	Code Number
ICD & ICC 32	027H3201

Including bolts, gaskets and o-rings

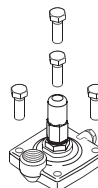
ICS 32 function module Table 3



Description	Code Number
ICS 32	027H3200 *)

*) Including gasket and O-rings

ICS 32 top cover



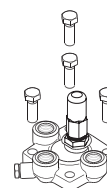
ICS 1

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

*) Including bolts

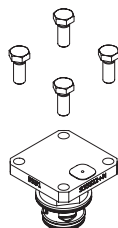
**) including bolts and one blanking plug

Table 4



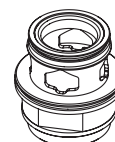
ICS 3

Spare parts/Accessories



Description	Code Number
ICC 32 function module	027H3202

Including bolts, gaskets and o-rings



Description	Code Number
ICC 32 repair kit	027H3039

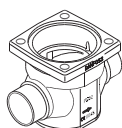
Including gasket and O-rings

ICD, ICC, ICS 50

Ordering from the parts programme

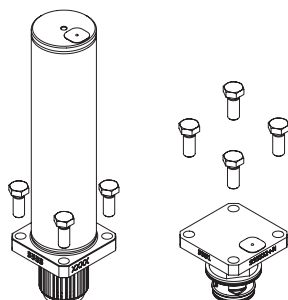
Example

(select from table 1 to 4)



3 x Valve body
50 D (2 in.)
027H5120
Table 1

+



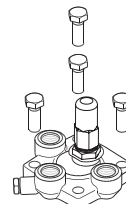
1 x Function module set
ICD & ICC
027H5201
Table 2

+



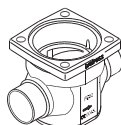
1 x Function module ICS 50
027H5200
Table 3

+



1 x Top cover
3 pilots
027H5173
Table 4

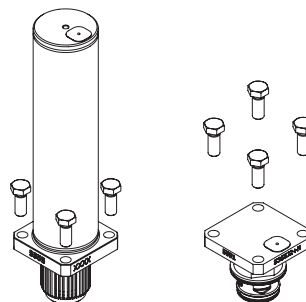
ICV 50 valve body w/different connections Table 1



50 D (2 in.)	65 D (2½ in.)	54 SD (2¼ 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

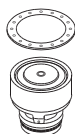
ICD & ICC function module set Table 2



Description	Code Number
ICD & ICC 50	027H5201

Including bolts, gaskets and o-rings

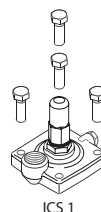
ICS 50 function module Table 3



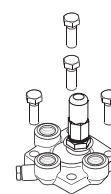
Description	Code Number
ICS 50	027H5200 *)

*) Including gasket and O-rings

ICS 50 top cover



ICS 1

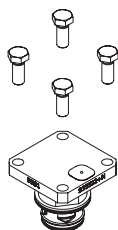


ICS 3

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

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

Spare parts/Accessories



Description	Code Number
ICV 50 function module	027H5202

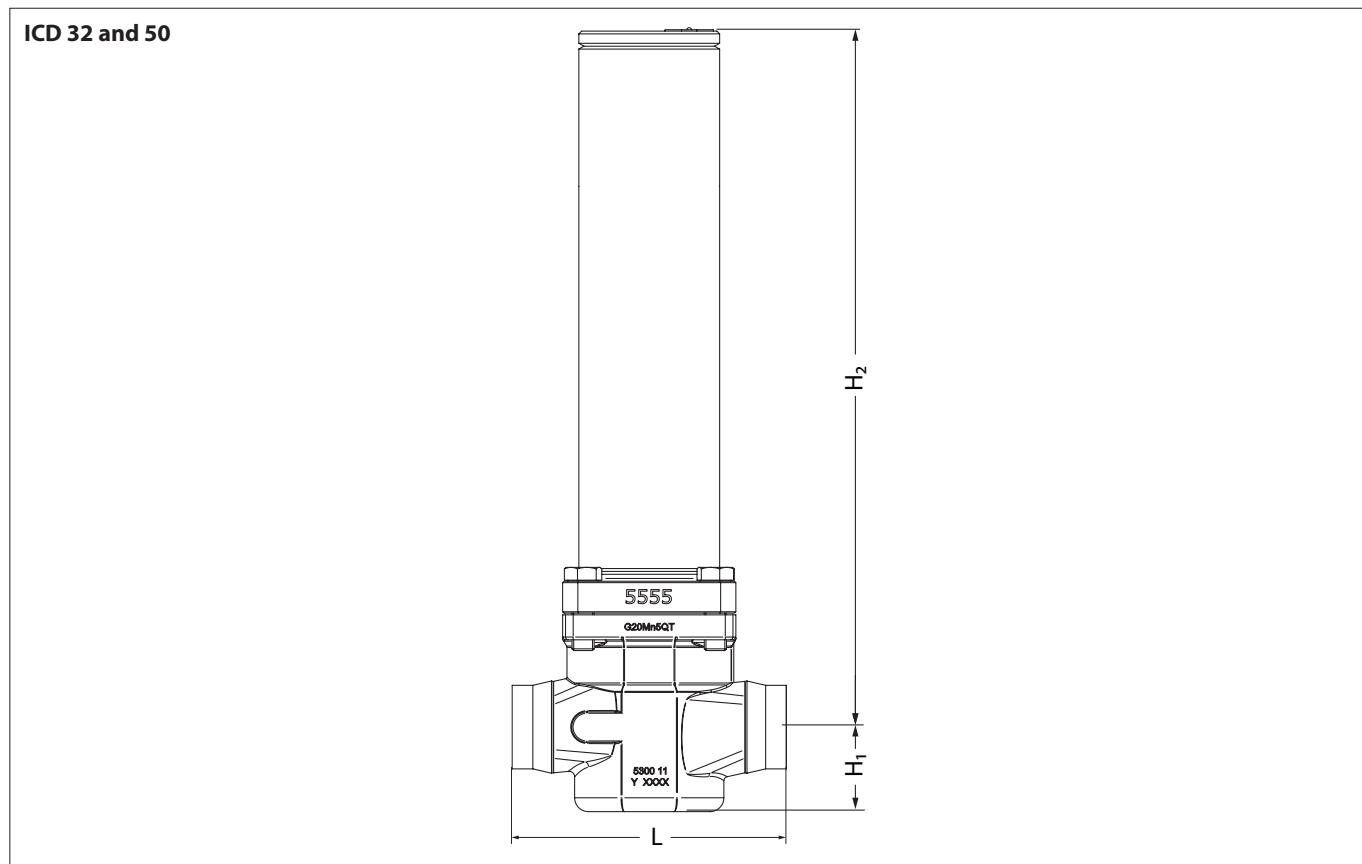
Including bolts, gaskets and o-rings



Description	Code Number
ICV 50 repair kit	027H5017

Including gasket and O-rings

Dimensions

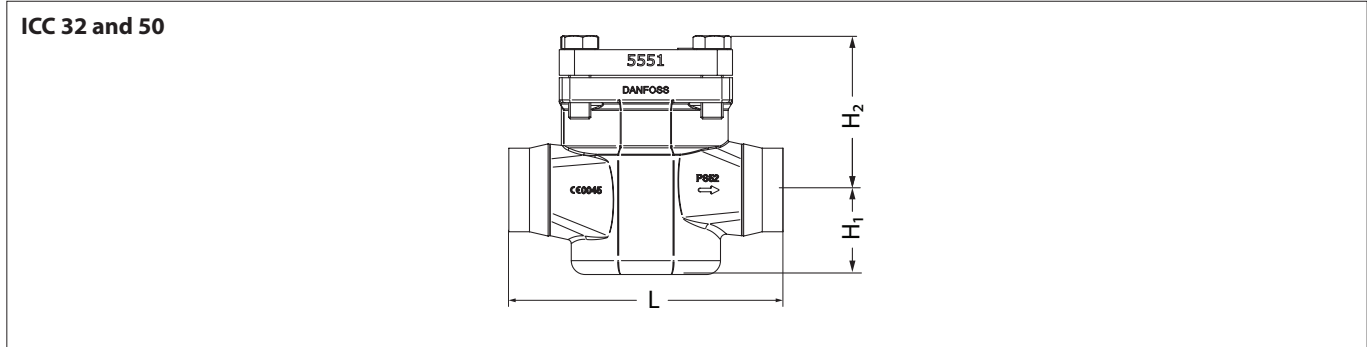


Housing with module

Connection		H ₁	H ₂	L		Weight
32 D (1¼ in.)	mm	40	482.57	145	Kg	7.0
	in.	1.57	18.99	5.71	lbs	15.4
40 D (1½ in.)	mm	40	482.57	145	Kg	6.8
	in.	1.57	18.99	5.71	lbs	14.9
32 A (1¼ in.)	mm	40	482.57	145	Kg	6.8
	in.	1.57	18.99	5.71	lbs	15.0
40 A (1½ in.)	mm	40	482.57	145	Kg	6.8
	in.	1.57	18.99	5.71	lbs	15.1
32 SOC (1¼ in.)	mm	40	482.57	148	Kg	6.9
	in.	1.57	18.99	5.83	lbs	15.3
35 SD (1⅜ in. SA)	mm	40	482.57	148	Kg	6.8
	in.	1.57	18.99	5.83	lbs	14.9
42 SD (1⅝ in.)	mm	40	482.57	148	Kg	6.8
	in.	1.57	18.99	5.83	lbs	14.9
42 SA (1⅝ in.)	mm	40	482.57	148	Kg	6.8
	in.	1.57	18.99	5.83	lbs	14.9
50 D (2 in.)	mm	59	503.74	200	Kg	12.2
	in.	2.32	19.83	7.87	lbs	26.9
65 D (2½ in.)	mm	59	503.74	210	Kg	12.6
	in.	2.32	19.83	8.27	lbs	27.8
50 A (2 in.)	mm	59	503.74	200	Kg	12.3
	in.	2.32	19.83	7.87	lbs	27.1
65 A (2½ in.)	mm	59	503.74	210	Kg	12.6
	in.	2.32	19.83	8.27	lbs	27.8
50 SOC (2 in.)	mm	59	503.74	216	Kg	13.4
	in.	2.32	19.83	8.5	lbs	29.6
54 SD (2⅜ in. SA)	mm	59	503.74	216	Kg	12.4
	in.	2.32	19.83	8.5	lbs	27.2

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

Connections

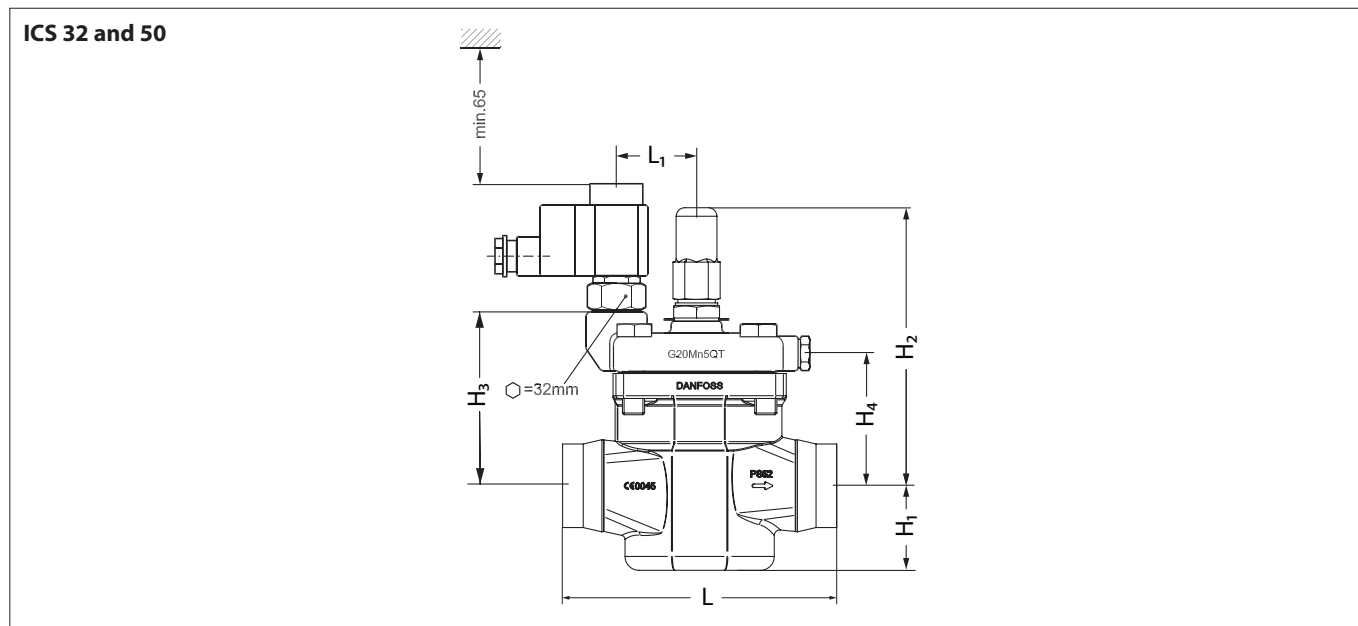


Housing with top cover

Connection		H ₁	H ₂	L		Weight
32 D (1¼ in.)	mm	40	86.8	145	Kg	6.5
	in.	1.57	3.42	5.71	lbs	14.4
40 D (1½ in.)	mm	40	86.8	145	Kg	6.6
	in.	1.57	3.42	5.71	lbs	14.6
32 A (1¼ in.)	mm	40	86.8	145	Kg	6.6
	in.	1.57	3.42	5.71	lbs	14.6
40 A (1½ in.)	mm	40	86.8	145	Kg	6.7
	in.	1.57	3.42	5.71	lbs	14.7
32 SOC (1¼ in.)	mm	40	86.8	148	Kg	6.8
	in.	1.57	3.42	5.83	lbs	14.9
35 SD (1⅜ in. SA)	mm	40	86.8	148	Kg	6.6
	in.	1.57	3.42	5.83	lbs	14.6
42 SD (1⅝ in.)	mm	40	86.8	148	Kg	6.6
	in.	1.57	3.42	5.83	lbs	14.6
42 SA (1⅝ in.)	mm	40	86.8	148	Kg	6.6
	in.	1.57	3.42	5.83	lbs	14.6
50 D (2 in.)	mm	59	111.25	200	Kg	9.1
	in.	2.32	4.38	7.87	lbs	20.0
65 D (2½ in.)	mm	59	111.25	210	Kg	9.5
	in.	2.32	4.38	8.27	lbs	20.9
50 A (2 in.)	mm	59	111.25	200	Kg	9.1
	in.	2.32	4.38	7.87	lbs	20.2
65 A (2½ in.)	mm	59	111.25	210	Kg	9.5
	in.	2.32	4.38	8.27	lbs	20.9
50 SOC (2 in.)	mm	59	111.25	216	Kg	10.3
	in.	2.32	4.38	8.5	lbs	22.7
54 SD (2⅜ in. SA)	mm	59	111.25	216	Kg	9.2
	in.	2.32	4.38	8.5	lbs	20.3

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

Dimensions



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 (1¼ in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
40 D (1½ in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
32 A (1¼ in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
40 A (1½ in.)	mm	40	160	100	74	145	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.71	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
32 SOC (1¼ in.)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
35 SD (13/8 in. SA)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
42 SD (15/8 in.)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.83	2.00	0.59	2.00	3.43	9.9 lb.	11 lb.
42 SA (15/8 in.)	mm	40	160	100	74	148	51	15	51	87	4.5 kg	5 kg
	in.	1.57	6.30	3.93	2.91	5.83	2.00	0.59	2.00	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	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
65 D (2½ 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	2.00	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	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
65 A (2½ 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	2.00	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	8.50	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.
54 SD (21/8 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	8.50	2.00	0.59	2.48	3.58	19.6 lb.	20.2 lb.

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

