ENGINEERING TOMORROW

Data Sheet

Temperature regulating valve Type **ORV**

Assures optimal oil temperature control in refrigeration systems



ORV are 3-way industrial valves for maintaining a constant oil temperature in gas compressor systems, by mixing hot and cold oil in the lubricating system of e.g. screw or turbo type compressors.

The ORV valves are with few components and with extended cylindrical connections, to ensure ease of installation and service.

Features

- Stainless steel nickel plated thermostatic element.
- Butt-weld (DIN, ANSI) or socket weld (SOC) connection.
- No manual adjustment.
- Plug and Play design.
- Optimised flow characteristics.
- Robust design.
- High resistance against vibrations or shock.
- Can be mounted in any direction.
- Easy to dismantle and service when required.
- Classification: DNV, CRN, BV, EAC etc. To get an updated list of certification on the products please contact your local Danfoss Sales Company.

Functions

Mixing operation
ORV valve can work as a mixing or diverting valve. The ORV temperature regulating valve utilises high coefficient of thermal expansion of wax to create the internal movement necessary to have a cold and a hot inlet mixing to a common outlet. The outlet temperature corresponds to the nominal temperature of the thermostatic element.

The valve house has three ports:
- Port A is used for the common outlet
- Port B is for the hot inlet
- Port C is for the cold inlet

When the compressor unit is cold at start up, the thermostatic element will be contracted to let the full flow from port B pass until the nominal temperature (-5K / 10 °F) is reached (Fig. 1.1). The thermostatic element will then begin to extract to let the outlet become a mixture of hot and cold oil.

When the nominal temperature is reached, the element is positioned in approximately half open position (Fig. 1.2). If the temperature is reaching approximately the nominal temperature plus 5K, the thermostatic element has been extracted to its fully open position (Fig. 1.3). In this position the oil temperature will only come from the cold inlet port (C) from oil cooler.

Figure 1: Mixing operation

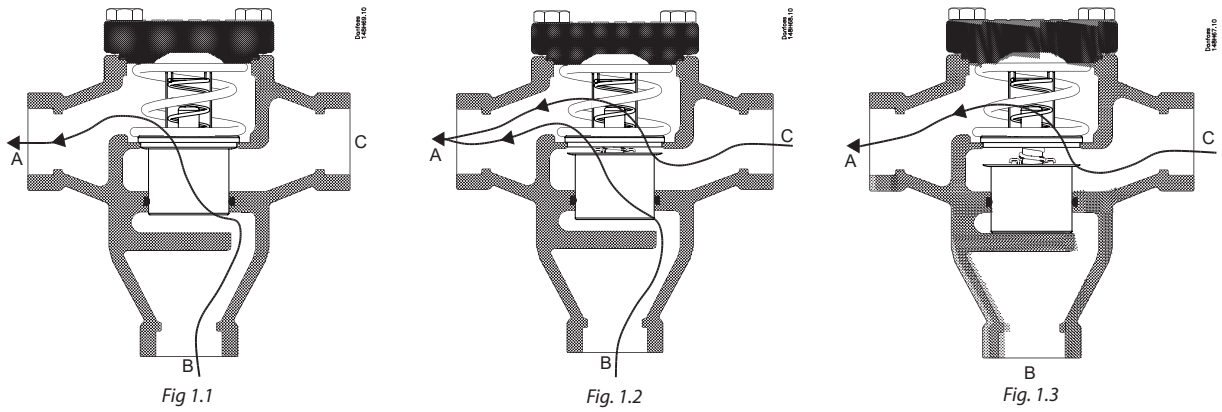


Fig 1.1 *Fig. 1.2* *Fig. 1.3*

From Figure 1: Mixing operation, it can be seen how the sleeve on the element is sliding in a vertical direction. The thermostatic element is kept in position by a spring.

Diverting operation
Diverting operation is similar to the mixing operation. It is carried out with separation in to two of the fluid with single temperature. Due to that the temperature on the inlet is very stable fact the regulation is very smooth. The inlet temperature would correspond to the nominal temperature of the thermostatic element.

The valve house has three ports:
- Port A is used for the common inlet
- Port B is for the cold outlet
- Port C is for the warm outlet

The diverting operation otherwise is similar to the mixing operation.

Figure 2: Diverting operation

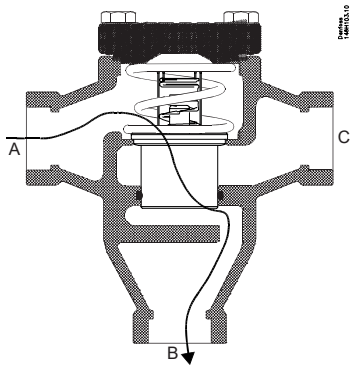


Fig. 2.1

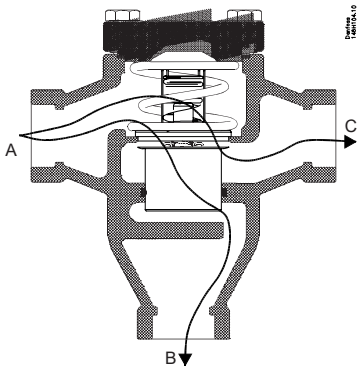


Fig. 2.2

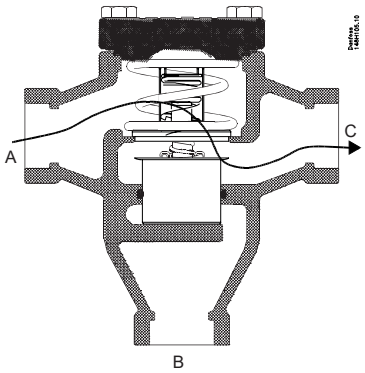


Fig. 2.3

Application

Examples

Figure 3: Example of the system with ORV for mixing operation

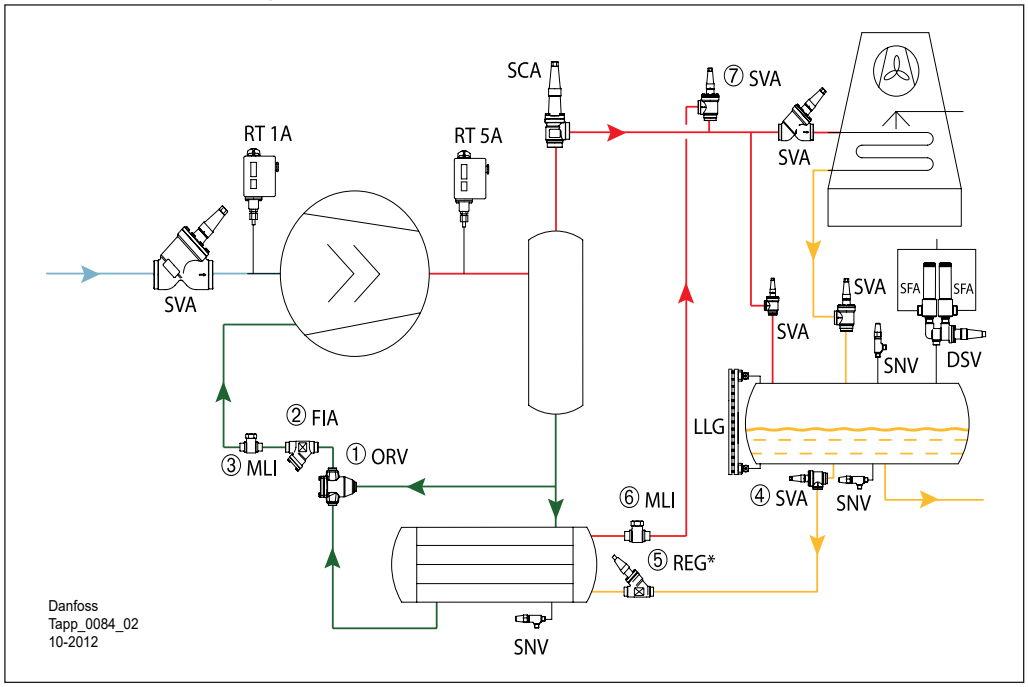
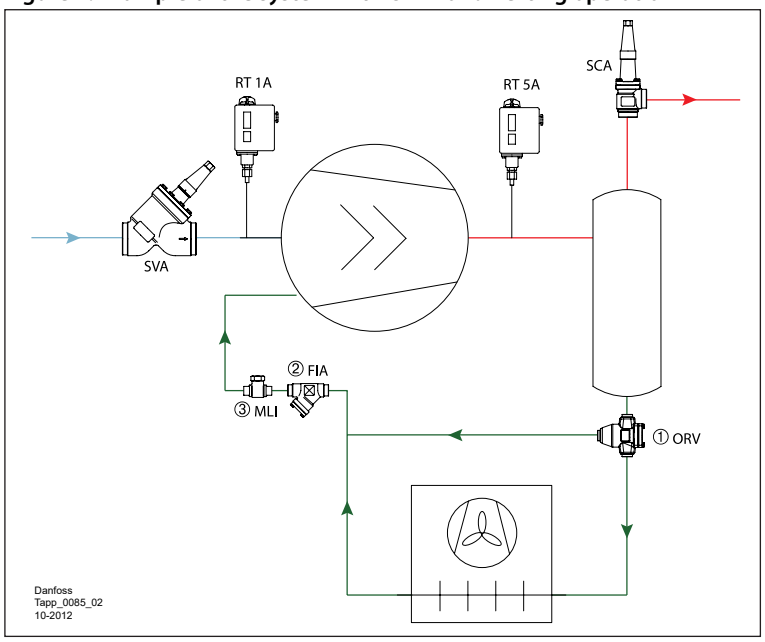


Figure 4: Example of the system with ORV for diverting operation



Media

Refrigerants

Oils:
Applicable to all common refrigeration oils.

Refrigerants:
Applicable to HC, HCFC, HFC, R717 (Ammonia) and R744 (CO_2).

For further information please refer to installation instruction for ORV.

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 data

Table 1: Pressure and temperature range

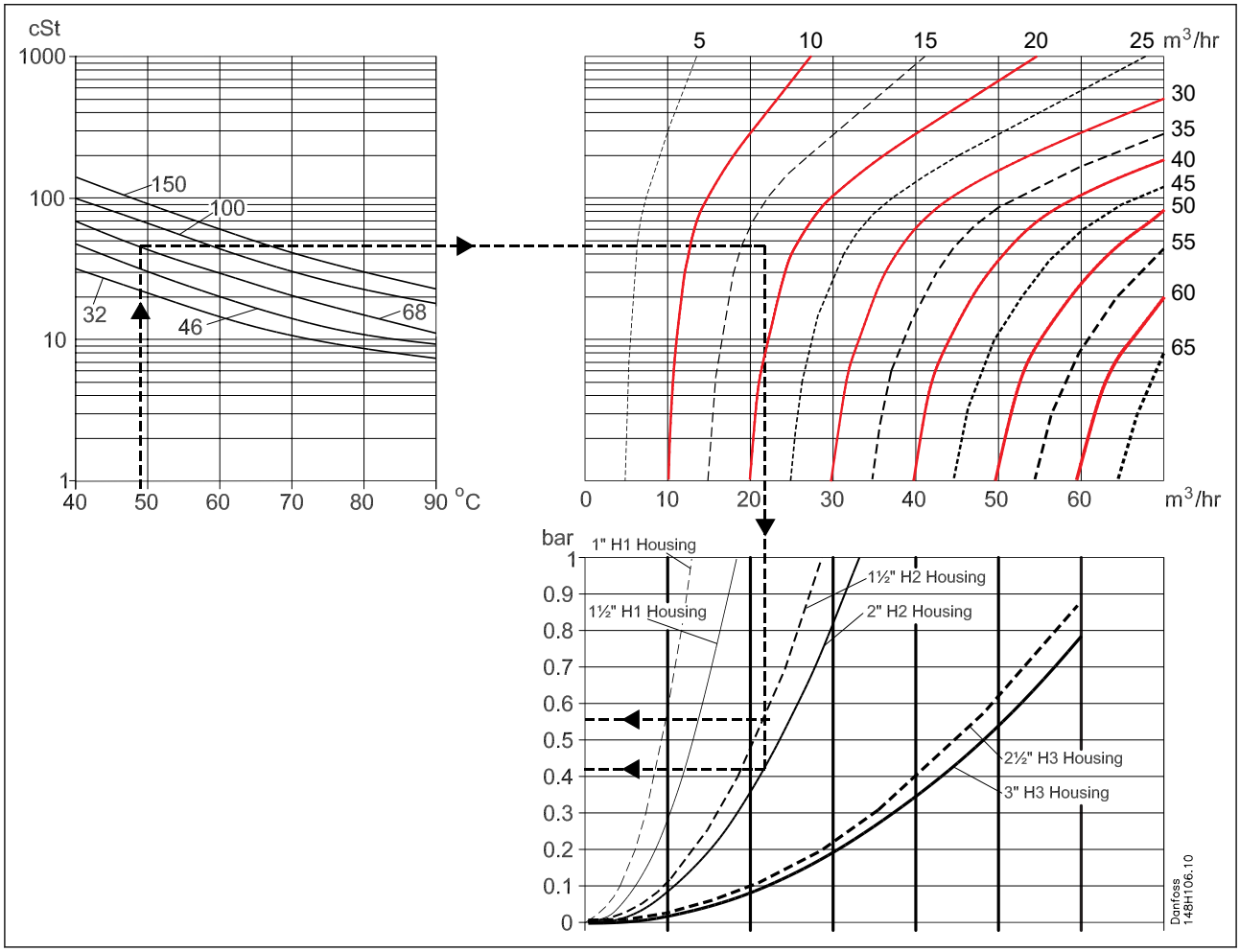
Description	Values
Minimum operating temperature:	≥ -10 °C (+14 °F)
The valves are designed for a max. working pressure	40 bar (580 psig)

Table 2: Max. temperature limit based on the element temperature settings

Types	Limit
43 °C / 110 °F	77 °C / 170 °F
49 °C / 120 °F	82 °C / 180 °F
60 °C / 140 °F	93 °C / 200 °F
77 °C / 170 °F	110 °C / 230 °F

Capacities, SI units

Figure 5: Capacities graphs



Selection example
Oil type: Grade 68
Required flow: 17 m³/h
Nominal oil temperature: 49 °C
Pipe dimension: 40 mm

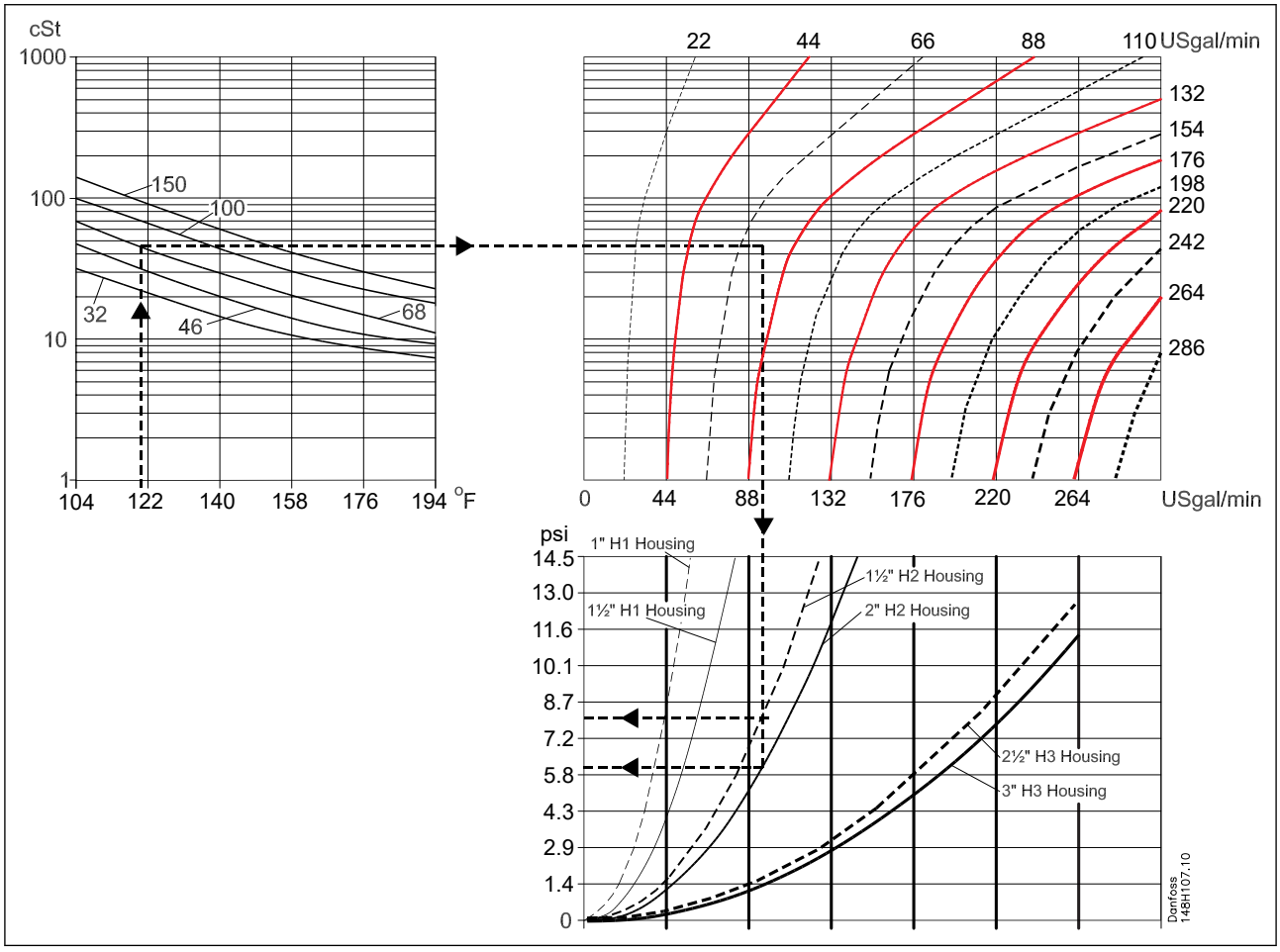
The upper left curve shows the viscosity of different grades of oil as a function of the temperature. The viscosity is continued into the upper right curve where the 17 m^3/h must be found. The line is drawn vertically downwards into the capacity table for the ORV valve models.

As shown two selections can be made:
Either ORV 40 H2 with pressure drop at approx. 0.56 bar or ORV 50 H2 with pressure drop at 0.42 bar.

The final selection will depend on the available pressures in the system. If the pressures are low (or can be low at certain loads) the ORV 50 H2 might be preferred. If the pressures are constantly available the pipe dimension may be taken into account and the ORV 40 H2 might be preferred.

Capacities, US units

Figure 6: Capacities graph



Selection example
Oil type: Grade 68
Required flow: 75 USgal/min.
Nominal oil temperature: 120 °F
Pipe dimension: 1½"

The upper left curve shows the viscosity of different grades of oil as a function of the temperature. The viscosity is continued into the upper right curve where the 75 USgal/min. must be found. The line is drawn vertically downwards into the capacity table for the ORV valve models.

As shown two selections can be made: Either
- ORV 1½H2 with pressure drop 8.2 psi or
- ORV 2"H2 with pressure drop 6.2 psi

The final selection will depend on the available pressures in the system. If the pressures are low (or can be low at certain loads) the ORV 2" H2 might be preferred. If the pressures are constantly available the pipe dimension may be taken into account and the ORV 1½" H2 might be preferred.

Material specification

Figure 7: ORV 25-80

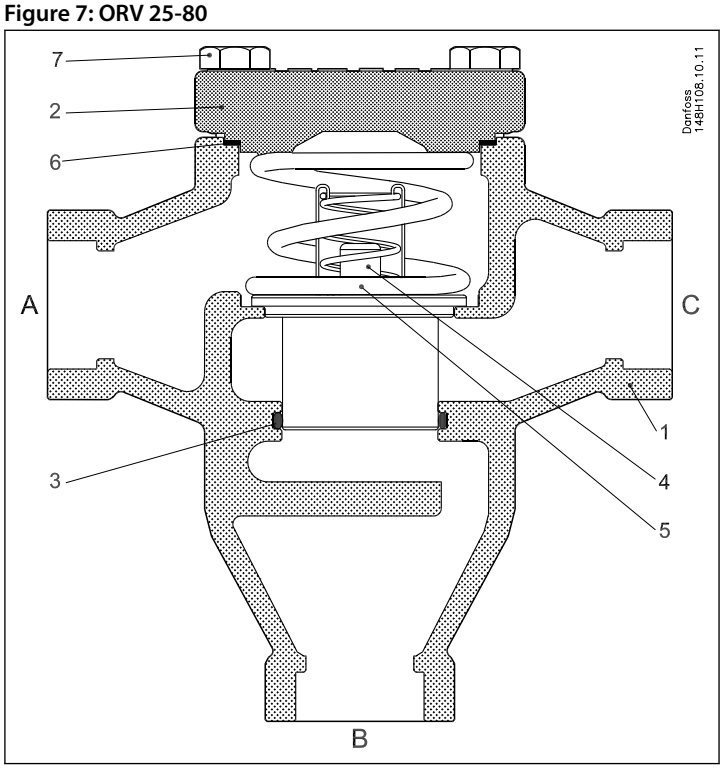


Table 3: Material and parts list

No.	Part	Material	EN		ASTM standard	
1	Housing	Steel	GP240GH	10213-2	WCB	A 216
2	Cover	Steel	GP240GH P285QH	10213-2 10222-4	WCB	A 216 A 350
3	Glide ring	PTFE				
4	Element[1]	Stainless steel and NI plated parts				
5	Spring	Steel	DIN17223	10270-1		
6	Gasket	Non asbestos				
7	Bolts	Steel	Quality 8.8	ISO4017	Grade 5	

[1] The thermostatic element may look differently from one shown on the picture. All types of thermostats used by Danfoss have the same function, temperature setting and P-band.

Connections

Available with the following connections:

- Butt weld DIN (EN 10220), DN 25-80 (1-3 in.)
- Butt weld ANSI (B 36.10 Schedule 80), DN 25 - 40 (1 - 1½ in.)
- Butt weld ANSI (B 36.10 Schedule 40), DN 50 - 80 (2 - 3 in.)
- Socket Weld (ANSI B 16.11), DN 25 - 50 (1 - 2 in.)

Figure 8: Identification example

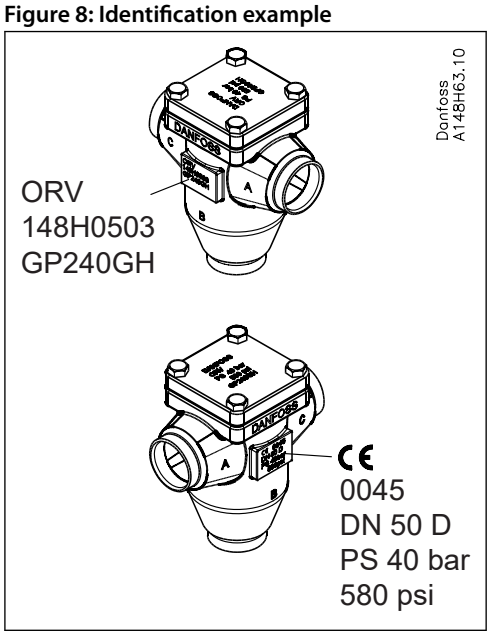


Figure 9: DIN

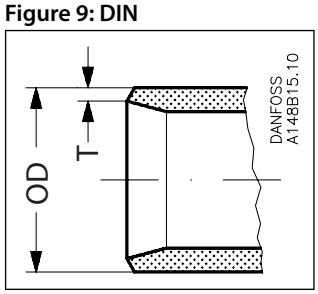


Table 4: Butt-weld DIN (EN10220)

Size mm	Size in	OD mm	T mm	OD in	T in	K_v / C_v H1 housing		K_v / C_v H2 housing		K_v / C_v H3 housing	
						K_v m^3/h	C_v Usgal/min	K_v m^3/h	C_v Usgal/min	K_v m^3/h	C_v Usgal/min
25	1	33.7	2.6	1.327	0.103	15	17	-	-	-	-
40	1½	48.3	2.6	1.902	0.103	22	26	30	35	-	-
50	2	60.3	2.9	2.37	0.11	-	-	36	42	-	-
65	2½	76.1	2.9	3	0.11	-	-	-	-	65	75
80	3	88.9	3.2	3.5	0.13	-	-	-	-	75	87

Figure 10: ANSI

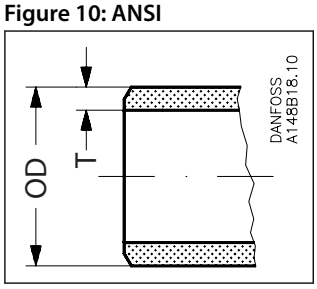


Table 5: Butt-weld ANSI (B 36.10 Schedule 80)

Size mm	Size in	OD mm	T mm	OD in	T in	K_v / C_v H1 housing		K_v / C_v H2 housing		K_v / C_v H3 housing	
						K_v m^3/h	C_v Usgal/min	K_v m^3/h	C_v Usgal/min	K_v m^3/h	C_v Usgal/min
25	1	33.7	4.6	1.327	0.181	15	17	-	-	-	-
40	1½	48.3	5.1	1.902	0.201	22	26	30	35	-	-

Table 6: Butt-weld ANSI (B 36.10 Schedule 40)

Size mm	Size in	OD mm	T mm	OD in	T in	K_v / C_v H1 housing		K_v / C_v H2 housing		K_v / C_v H3 housing	
						K_v m^3/h	C_v Usgal/min	K_v m^3/h	C_v Usgal/min	K_v m^3/h	C_v Usgal/min
50	2	60.3	3.9	2.37	0.15	-	-	36	42	-	-
65	2½	73	5.2	2.87	0.2	-	-	-	-	65	75
80	3	88.9	5.5	3.5	0.22	-	-	-	-	75	87

Figure 11: SOC

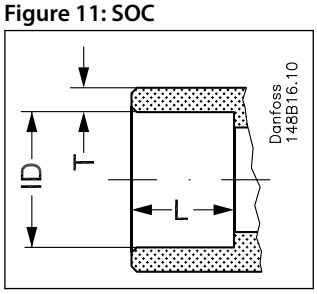


Table 7: Socket welding ANSI (B 16.11)

Size mm	Size in	ID mm	T mm	ID in	T in	L mm	L in	K_v / C_v H1 housing		K_v / C_v H2 housing		K_v / C_v H3 housing	
								K_v m^3/h	C_v Usgal/ min	K_v m^3/h	C_v Usgal/ min	K_v m^3/h	C_v Usgal/ min
25	1	33.9	7.2	1.335	0.284	13	0.51	15	17	-	-	-	-
40	1½	48.8	6.6	1.921	0.26	13	0.51	-	-	30	35	-	-
50	2	61.2	6.2	2.41	0.24	16	0.63	-	-	36	42	-	-

Dimensions and weights

Figure 12: H1, H2 and H3 housing types

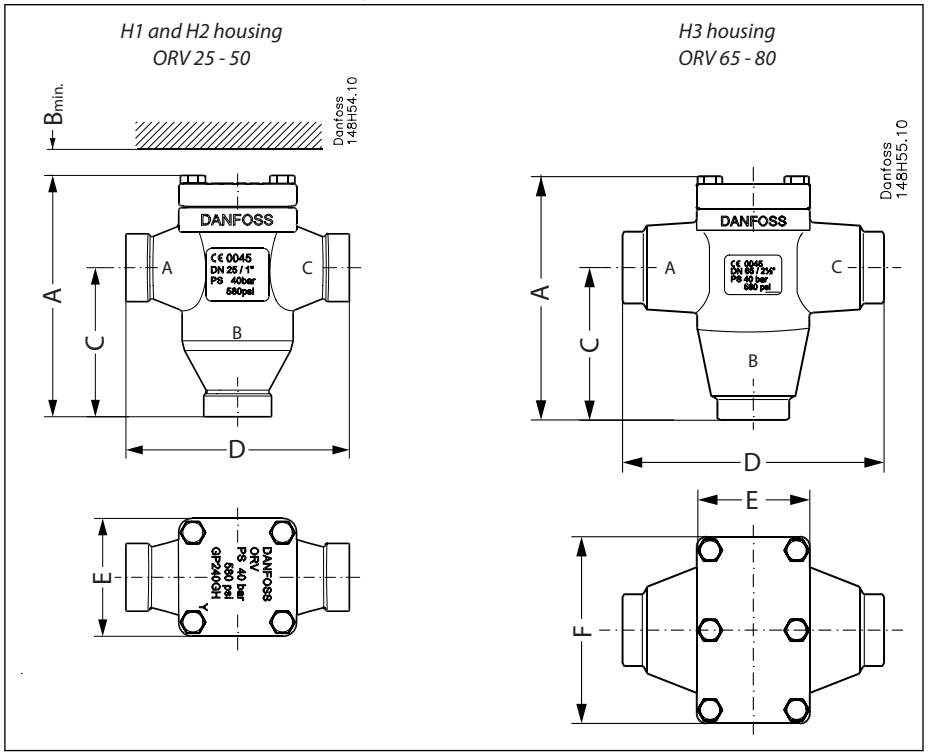


Table 8: Valve size and type

Type	Valve size		A	$B_{MIN.}$	C	D	E	F	Weight
H1 housing	ORV 25-40	mm	178	75	110	165	87	-	4.5 kg
	(1-1½)	in.	7.00	3.00	4.33	6.50	3.43	-	10 lb
H2 housing	ORV 40-50	mm	215	80	138	196	110	-	9.0 kg
	(1½-2)	in.	8.46	3.15	5.43	7.72	4.33	-	20 lb
H3 housing	ORV 65-80	mm	252	80	155	266	115	190	18 kg
	(2½-3)	in.	9.92	3.15	6.10	10.47	4.53	7.48	40 lb

NOTE:
Specified weights are approximate values only.

Ordering

Type codes

Table 9: ORV valve type and size

Valve type	ORV	Oil regulating valve, high specification		
		Available connections		
		DIN	ANSI	SOC
Nominal size in mm (valve size measured on the connection diameter)	25	X	X	X
	40	X	X	X
	50	X	X	X
	65	X	X	
	80	X	X	
Connection	A D SOC	Butt weld connection: ANSI Butt weld connection: DIN Socket welding		
Valve housing	3-WAY	3-WAY		

IMPORTANT:
Where products need to be certified according to specific certification societies or where higher pressures are required, the relevant information should be included at the time of ordering.

Ordering ORV valves from the parts programme

Example:
ORV 40 DIN H2 49 °C /120 °F:
Thermostat element and cover gasket code number 148H3464 and
Complete valve housing code number 148H3402

Table 10: ORV parts programme

Thermostat		Code no.
Thermostat 43 °C /110 °F	ORV 25 and ORV 40 H1	148H3466
	ORV 40 and ORV 50 H2	148H3467
	ORV 65 and ORV 80 H3	148H3468[1]
Thermostat 49 °C /120 °F	ORV 25 and ORV 40 H1	148H3463
	ORV 40 and ORV 50 H2	148H3464
	ORV 65 and ORV 80 H3	148H3465[1]
Thermostat 60 °C /140 °F	ORV 25 and ORV 40 H1	148H3469
	ORV 40 and ORV 50 H2	148H3470
	ORV 65 and ORV 80 H3	148H3471[1]
Thermostat 77 °C /170 °F	ORV 25 and ORV 40 H1	148H3472
	ORV 40 and ORV 50 H2	148H3473
	ORV 65 and ORV 80 H3	148H3474[1]

[1] For valve housing size H3 the code number includes two H2 thermostats.

NOTE:
The thermostat code numbers do not include guide ring.

Gasket and guide ring are included when ordering the complete valve housing but can also be ordered separately as spare parts.

Table 11: Valve housing

Complete valve housing including gasket and guide ring but without thermostat	Code no.
ORV 25 DIN H1	148H3399
ORV 25 SOC H1	148H3400
ORV 25 ANSI H1	148H3401
ORV 40 DIN H1	148H3361
ORV 40 DIN H2	148H3402
ORV 40 SOC H2	148H3403
OVR 40 ANSI H1	148H3404

Complete valve housing including gasket and guide ring but without thermostat	Code no.
ORV 40 ANSI H2	148H3405
ORV 50 DIN H2	148H3406
ORV 50 SOC H2	148H3407
ORV 50 ANSI H2	148H3408
ORV 65 DIN H3	148H3409
ORV 65 ANSI H3	148H3410
ORV 80 DIN H3	148H3362
ORV 80 ANSI H3	148H3411

ORV spare parts

Table 12: Spare parts

Part	Spare parts for	Code no.
Gasket and guide ring	ORV 25 and ORV 40 H1	148H3246
	ORV 40 and ORV 50 H2	148H3247
	ORV 65 and ORV 80 H3	148H3248[(1)]

[(1)] Including two guide rings and one gasket.

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.

Table 13: Pressure Equipment Directive (PED)

CE	ORV valves are approved according to the European standard specified in the Pressure Equipment Directive and are CE marked. For further details / restrictions - see Installation Instruction.

File name	Document type	Document topic	Approval authority
RU Д-DK.БЛ08.B.00191_18	EAC Declaration	Machinery & Equipment	EAC
0045 202 1204 Z 00354 19 D 001(00)	Pressure - Safety Certificate	-	TÜV
RU Д-DK.PA01.B.72054_20	EAC Declaration	PED	EAC
033F0685.AK	EU Declaration	EMCD/PED	Danfoss
TS271067J-2023	Manufacturing Permission	TSG	AQSIQ
033F0691.AE	Manufacturers Declaration	RoHS	Danfoss
033F0686.AH	Manufacturers Declaration	PED	Danfoss
033F0691.AE	Manufacturers Declaration	RoHS	Danfoss
19.10325.266	Marine - Safety Certificate	-	RMRS

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