Data sheet

Shut-off ball valve

GBC (90 bar) / GBCT (140 bar)

For CO_2 application

Description

Danfoss shut-off ball valves, type GBC (90 bar), GBCT (140 bar) are manually operated shut-off valves for CO_2 refrigeration systems, in order to open and to shut off inner flow path by operating the valve spindle.
The valves are specifically designed for intrinsic standstill security, meaning that the valves can withstand pressures normally arising when the refrigeration system is shut off, i.e. during serving or during unexpected power failure.

The valve structure and materials are designed and tested specifically for use with CO_2 refrigerant.
GBC (90 bar) valves are designed to use in subcritical CO_2 refrigeration systems.
GBCT (140 bar) valves are approved for use in transcritical CO_2 systems.

Features & benefits

- GBC (90 bar)
  - Maximum working pressure: 90 bar / 1305 psig
  - Applicable for subcritical CO_2 refrigeration systems
  - Bidirectional flow
  - Bleed hole design to prevent liquid entrapment when the valve is closed
  - Able to isolate both directions during service
  - Sealing material especially for CO_2 to ensure long term product reliability
  - Stainless steel body with Cu-plated stainless steel tube - easy and fast brazing for systems with copper piping
  - Available of access port version for 6s – 22s
  - Meet demand for lead-free and full RoHS compliance
  - UL/cUL Listed, complies with pressure equipment directive 2014/68/ EU
- GBC 10HS service valve (90 bar)
  - Maximum working pressure: 90 bar / 1305 psig and applicable for subcritical CO_2 refrigeration systems
  - Used to isolate the system when changing the AKS pressure transmitter
  - Stainless steel body with Cu-plated stainless steel tube - easy and fast brazing for systems with cooper piping
  - Optional connector for AKS pressure transmitter - G ⅜ in or ¼ NPT
  - Meet demand for lead-free and full RoHS compliance, complies with pressure equipment directive 2014/68/EU
- GBCT (140 bar)
  - Maximum working pressure: 140 bar / 2031 psig
  - Applicable for transcritical CO_2 refrigeration systems
  - Bidirectional flow
  - Bleed hole design to prevent liquid entrapment when the valve is closed
  - Sealing material especially for CO_2 to ensure long term product reliability
  - Version with reinforced copper-iron tube extensions to allow easy torch-brazing installation for systems with K65 piping
  - Version with stainless-steel butt welding connections, suitable for systems with stainless-steel piping
  - Available of access port version for all sizes
  - UL/cUL Listed, complies with pressure equipment directive 2014/68/ EU

Applications

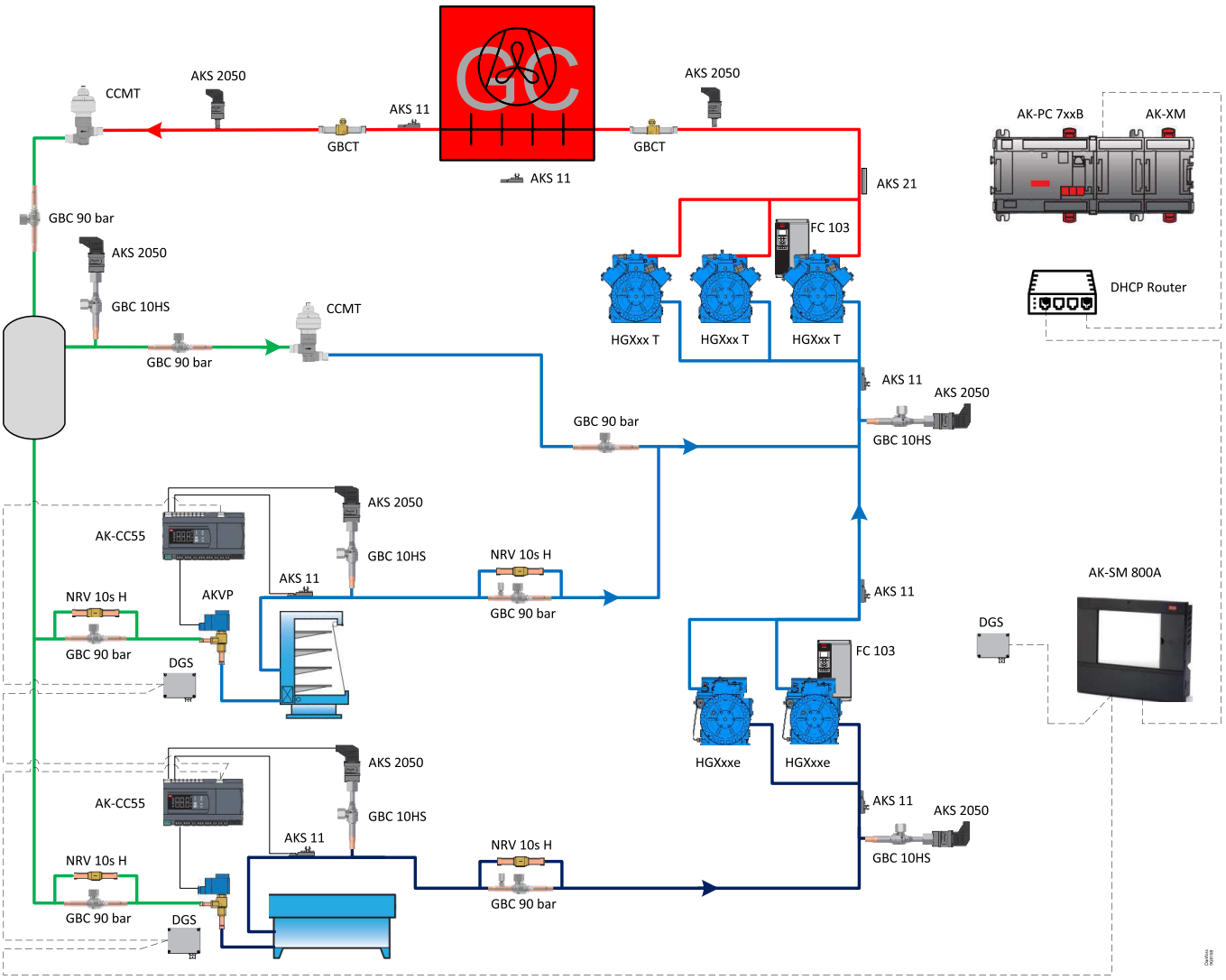
Typical applications for CO_2 ball valves are:

- Display cases
- Cold rooms
- Rack/Pack units

Danfoss CO_2 ball valves are designed for the following refrigerant cycles:

- GBC with PS = 90 bar, Cu-plated stainless steel connections equipped, for subcritical systems
- GBCT with PS = 140 bar, copper (K65) / stainless steel connections equipped, for transcritical systems

Figure: Application



	HP High Pressure (120 – 140 bar)		LP Suction Pressure MT (35 – 55 bar)
	HP Receiver Pressure (60 – 90 bar)		LP Suction Pressure LT (25 – 30 bar)

Ordering

Product code numbers

GBC solder ODF/ODF, Cu plated stainless steel connections

Figure: GBC 6 – 16s without access port, solder ODF

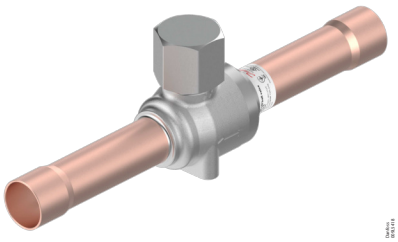


Figure: GBC 6 – 16s with access port, solder ODF

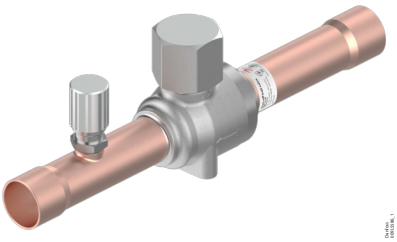


Figure: GBC 18 – 42s without access port, solder ODF

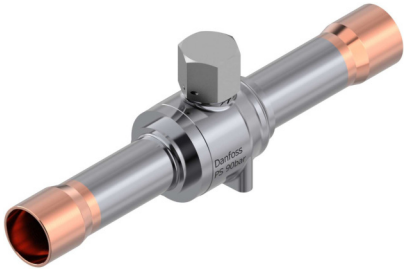


Figure: GBC 18 – 22s with access port, solder ODF

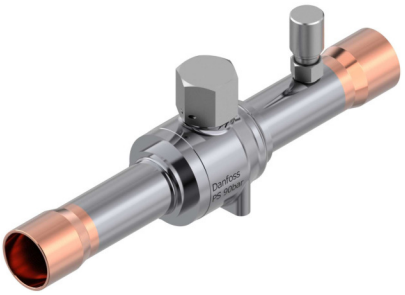


Table: GBC solder ODF/ODF, Cu-plated stainless steel connections

Type	Code no.		Connection		K_v (1)	C_v (1)	Multi pack	PED category	Max. working pressure	Media temperature range
	without access port	with access port	[in]	[mm]	[m^3/h]	[gal/min]	Qty/ pack	[Fluid Group]	PS/MWP	
GBC 6s H	009L5415	009L5581	¼	–	1.78	2.06	30	Art. 4.3	90 bar / 1305 psig	-40 – 100 °C / -40 – 212 °F
	009L5395	009L5580	–	6	1.78	2.06	30			
GBC 10s H	009L5416	009L5582	⅜	–	7.00	8.09	30			
	009L5396	009L5583	–	10	7.00	8.09	30			
GBC 12s H	009L5417	009L5585	½	–	8.00	9.25	30			
	009L5397	009L5584	–	12	8.00	9.25	30			
GBC 16s H	009L5418	009L5586	⅝	16	12.40	14.33	25			
GBC 18s H	009L5419	009L5588	¾	–	31.00	35.84	25			
	009L5399	009L5587	–	18	31.00	35.84	25			
GBC 22s H	009L5420	009L5589	⅞	22	25.47	29.44	25			
GBC 25s H	009L5400	–	1	–	55.93	64.66	5			
GBC 28s H	009L5526	–	1 ⅛	–	65.85	76.12	5			
	009L5406	–	–	28	65.85	76.12	5			
GBC 35s H	009L5410	–	1 ⅜	35	103.05	119.13	4			
GBC 42s H	009L5529	–	1 ⅝	–	175.41	202.78	4	Cat. I		
	009L5411	–	–	42	175.41	202.78	4			

(1) Calculated based on fluid dynamic equations

Solder connection reference standard ISO 2016 (≈EN 1254-1)

Figure: GBC 10HS solder ODF / G ⅜ in

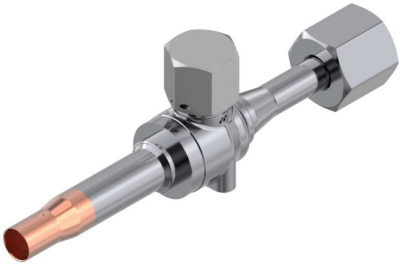


Figure: GBC 10HS solder ODF / ¼ in NPT

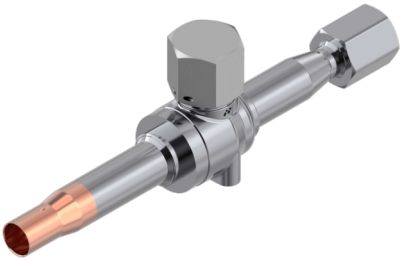


Table: GBC 10HS

Type	Code no.	Connection [in]		Multi pack	PED category	Max. working pressure	Media temperature range
		Solder	G / NPT	Qty/pack	[Fluid group]	PS/MWP	
GBC 10HS	009L0035	⅜	G ⅜	30	Art. 4.3	90 bar / 1305 psig	-40 – 100 °C / -40 – 212 °F
GBC 10HS	009L0036	⅜	¼ NPT	30			

GBCT solder ODF/ODF, copper connections

Figure: GBCT without access port, solder ODF

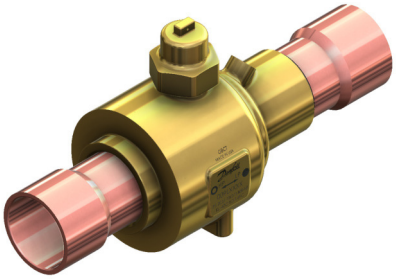


Figure: GBCT with access port, solder ODF

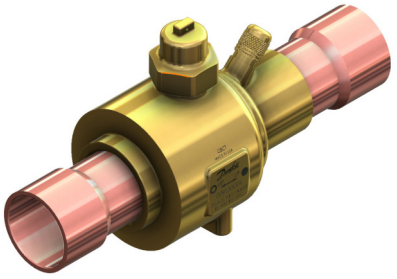
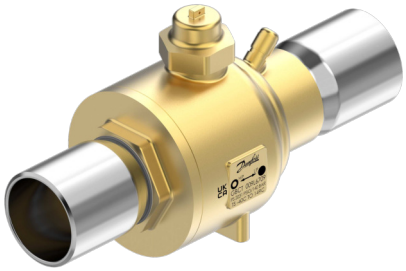


Table: GBCT solder ODF/ODF, copper connections

Type	Code no		Connection		K_v	C_v	Multi pack	Max working pressure	Media temperature range	PED category
	without access port	with access port	[in]	[mm]	[m^3/h]	[gal/min]	Qty/pack	PS/MWP		[Fluid Group]
GBCT 6s	009L6415	009L6581	¼	–	0.9	1.0	30	140 bar / 2031 psig	-40 – 149 °C / -40 – 300 °F	Art. 4.3
GBCT 10s	009L6416	009L6582	⅜	–	3.7	4.3	30			
GBCT 12s	009L6417	009L6585	½	–	5.4	6.2	30			
GBCT 16s	009L6418	009L6586	⅝	–	10.4	12.1	30			
GBCT 18s	009L6419	009L6588	¾	–	16.4	19.0	18			
GBCT 22s	009L6420	009L6589	⅞	–	23.7	27.5	18			
GBCT 28s	009L6406	009L6451	1 ⅛	–	42.3	48.9	4			
GBCT 35s	009L6410	009L6453	1 ⅜	–	67.1	77.6	4			
GBCT 42s	009L6411	009L6454	1 ⅝	–	83.1	96.1	4			Cat. I
GBCT 54s	009L6412	009L6456	2 ⅛	–	171.3	198.0	2			

GBCT butt weld, stainless steel connections

Figure: GBCT butt weld, stainless steel connections



Type	Code no		Connection		K_v	C_v	Multi pack	Max. working pressure	Media temperature range	PED category
	without access port	with access port	NPS [in]	ODE [mm]	[m^3/h]	[gal/min]	Qty/pack	PS/MWP		[Fluid Group]
GBCT 10 D	–	009L6701	–	10.3	3.5	4	30	140 bar / 2031 psig	-40 – 149 °C / -40 – 300 °F	Art. 4.3
GBCT 13 D	–	009L6702	–	13.5	4.2	4.9	30			
GBCT 17 D	–	009L6703	–	17.2	8.9	10.3	30			
GBCT 21 D	–	009L6704	–	21.3	18	21	16			
GBCT 27 D	–	009L6705	–	26.9	36	42	4			
GBCT 34 D	–	009L6706	1	33.7	64	74	4			
GBCT 42 D	–	009L6707	1.25	42.4	96	111	4			Cat. I
GBCT 48 D	–	009L6708	1.5	48.3	169	196	2			
GBCT 60 D	–	009L6709	2	60.3	202	234	2			

NPS = National Pipe Size
ODE = Outside Diameter External
Butt-weld connection reference standard EN 10220

Spare parts code numbers

Figure: Seal cap kit

Table: Seal cap kit

Type	Valve connection size		Industrial pack [pcs]	Code no.
	[inch]	[mm]		
GBC 6s H – 12s H	¼ – ½	6 – 12	4	009L5209
GBC 16s H – 22s H	⅝ – ⅞	16 – 22	4	009L5210
GBC 25s H – 28s H	1 – 1 ⅛	25 – 28	2	009L5211
GBC 35s H – 42s H	1 ⅜ – 1 ⅝	35 – 42	2	009L5212

Figure: Schrader valve

Table: Schrader valve

Type	Industrial pack [pcs.]	Code no.
GBC 6s H – 42s H	10	009L5213

Figure: Lock ring

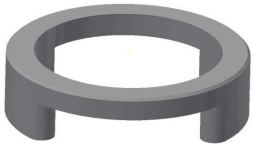


Table: Lock ring

Type	Industrial pack [pcs]	Code no.
GBC 6 – 22s H	10	009L7017
GBC 35 – 42s H	10	009L7018

Note: The spare parts are only for GBC. For GBCT spare parts, please consult Danfoss.

Media

Refrigerants

Table: Media

Refrigerants	R 744 (CO_2)
Refrigerant oil	POE, PVE, PAG (Not compatible for mineral oil and PAO)

NOTE: For the application use with R744 as part of a secondary loop or cascade:

1. The design pressure of the refrigerant containing component is not less than the design pressure of the associated components.
2. The component is not provided with any pressure relief or pressure regulating relief valve and that a sufficient number of valves having capacity deemed adequate shall be field installed on the refrigeration system.
3. When the refrigeration system is de-energized, venting of R744 may occur through the pressure regulating relief valves, and may need to be recharged, but the valve should not be defeated or bypassed.
4. A sufficient number of pressure relief and pressure regulating valves may need to be provided based upon system capacity and located such that no stop valve is provided between the relief valve and the parts or section of the system being protected.

Product details

General data

Table: Technical data

Technical data	GBC	GBCT
Max. working pressure	90 bar / 1305 psig	140 bar / 2031 psig
Media temperature range	-40 – 100 °C / -40 – 212 °F	-40 – 149 °C / -40 – 300 °F
Flow direction	Bi-flow	Bi-flow
Isolation orientation during service	Bi-directional	Uni-directional (following GBCT instruction)
Environmental transport/storage temperature and humidity	-40 – 65 °C / -40 – 150 °F. Air humidity: RH≤95%.	

Mounting of GBCT

Danfoss recommends that GBCT valves are installed so that the HP side is oriented towards the highest pressure side of the system when the valve is in the closed position. The ball valve will only internally seal in closed position when flow direction is from HP to LP.

Figure: Marking of GBCT

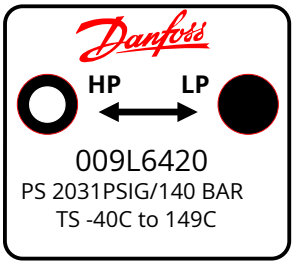
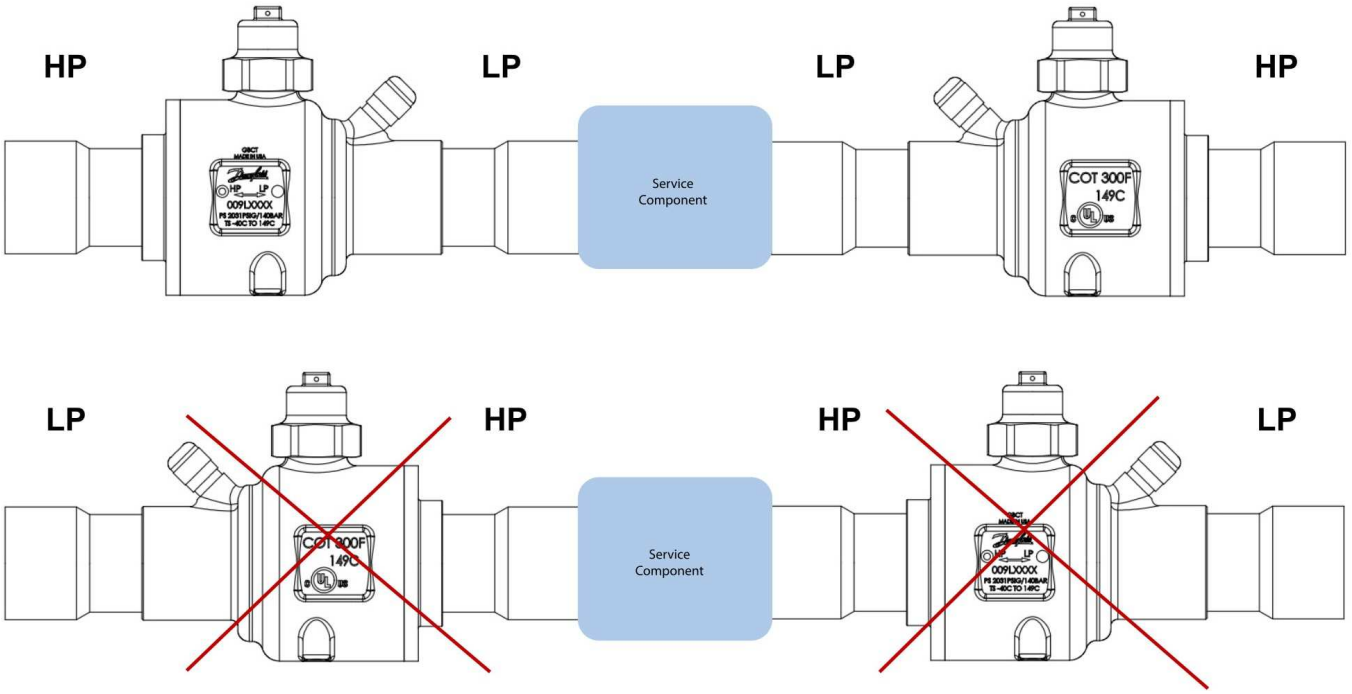


Table: Marking of GBCT

Inscription	Explanation
"HP"	Indicates where the bleed hole of ball is located and Danfoss recommends the HP side is oriented towards the highest pressure side of system when valve is in closed position.
"LP"	Indicates the side without bleed hole and shall be oriented towards to the low pressure side of system when valve is in closed position.

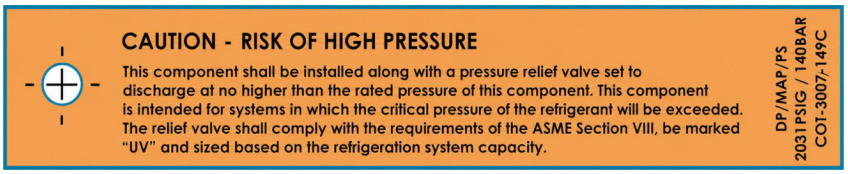
Figure: Flow direction for GBCT



GBCT CAUTION - RISK OF HIGH PRESSURE

Do not close with CO_2 liquid temperature below ambient. This component shall be installed along with a pressure relief valve set to discharge at no higher than the rated pressure of this component. This component is intended for systems in which the critical pressure of the refrigerant will be exceeded. The relief valve shall comply with the requirements of ASME section VIII, be marked "UV" and sized based on the refrigeration system capacity. An orange hanging tag is added on all valves as per requirement of UL certificate.

Figure: Hanging tag of GBCT



Identification

Relevant product data is available on the product and box label. An example of a box label and product label are shown, including an explanation of the content.

Figure: Box label

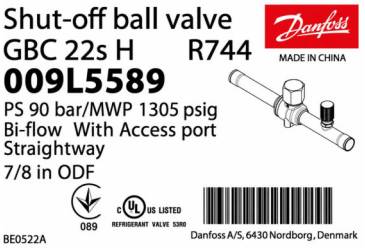


Figure: Product label

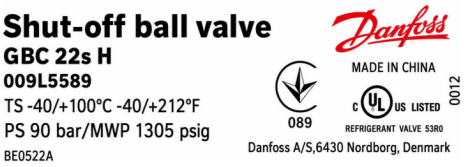


Table: Product and label text

Position	Inscription	Explanation
Box label; Product label	Shut-off ball valve	Product name
Box label; Product label	GBC 22s H	Product type
Box label; Product label	009L5589	Code number for ordering
Box label	Bi-flow	Flow type
Box label	Straightway	Direction
Box label	R744	Refrigerant
Box label	⅞ in ODF	Connection size and type
Box label; Product label	PS 90 bar / MWP 1305 psig	Max. working pressure in bar and psig
Box label; Product label	BE0522A	Code for production place and time (BE = Wuqing, week 05, year 2022, weekday A = Monday)
Box label; Product label	MADE IN CHINA	Manufacturing site acc. to EN standards
Box label	EAN code	Barcode for individual code no. identification according to EAN standard
Product label	TS -40 – 100 °C / -40 – 212 °F	Media temperature range
Box label; Product label	Additional information: Relevant approval authority logos	–

Design

Design and materials

Direct flow gives maximum through-flow with minimum pressure drop across valve. The combination of laser welded valve body (2) and valve tail (4), ball seat/seal (3), double O-ring seal in spindle (6), and cap seal (7) provides the best tightness.

Figure: GBC 6 – 16s with Cu-plated stainless steel tube

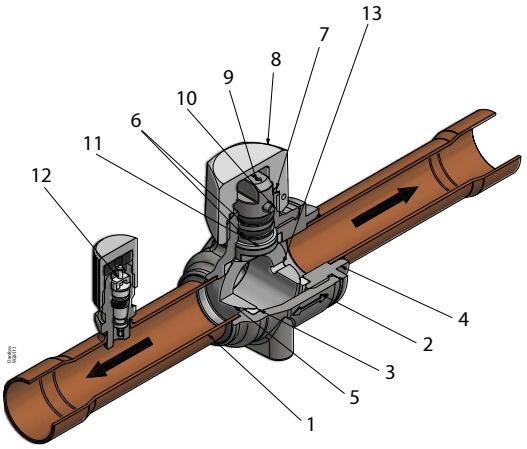


Figure: GBC 18 – 42s with partial Cu-plated stainless steel tube

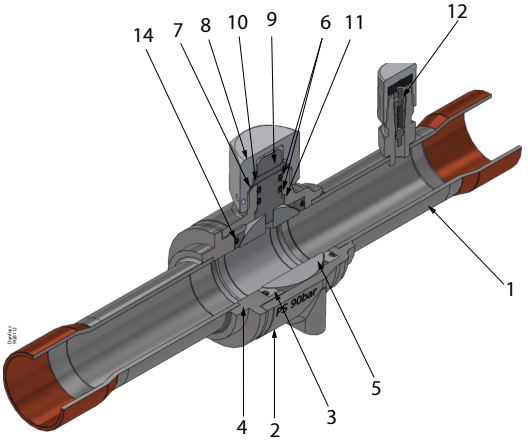


Figure: GBC 10HS with G⅜ connector

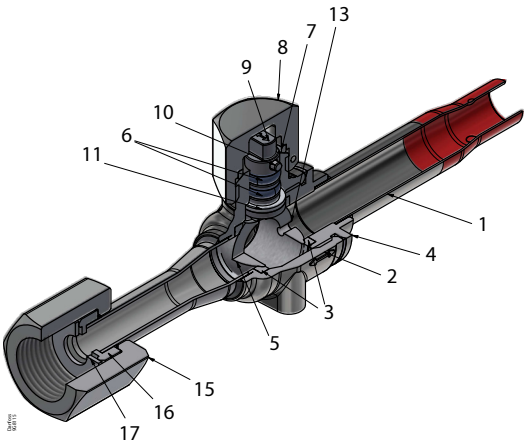


Figure: GBC 10HS with ¼NPT connector

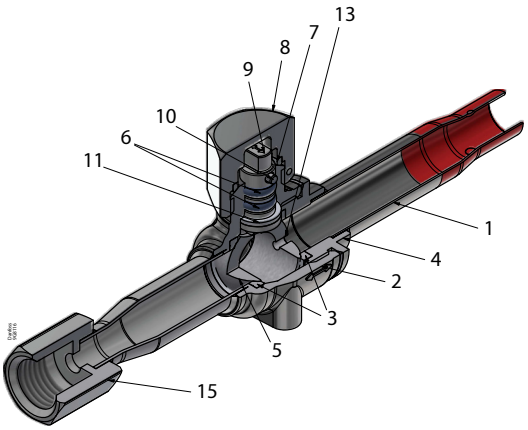


Figure: GBCT with copper tube

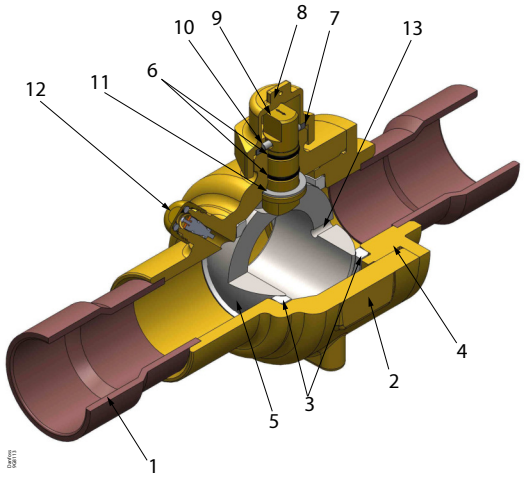


Figure: GBCT with stainless steel tube

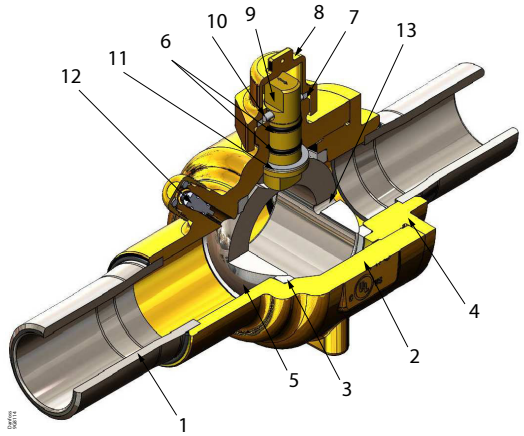


Table: Design and materials

Position	Description	Material			
		GBC (6 – 16s)	GBC (18 – 42s)	GBC 10HS	GBCT
1	Connection tube	Cu-plated stainless steel	Cu-plated stainless steel	Cu-plated stainless steel	Copper/Stainless steel
2	Valve body	Stainless steel	Stainless steel	Stainless steel	Brass
3	Ball seat	PTFE	PTFE	PTFE	PTFE
4	Valve tail	Stainless steel	Stainless steel	Stainless steel	Brass
5	Ball	Stainless steel	Stainless steel	Stainless steel	Stainless steel
6	Double O-ring seal in spindle	EPDM	EPDM	EPDM	FKM
7	Cap seal	PTFE	PTFE	PTFE	PTFE
8	Seal cap	Aluminum	Aluminum	Aluminum	Brass
9	Spindle	Stainless steel	Stainless steel	Stainless steel	Stainless steel / Brass
10	Pin	Stainless steel	Stainless steel	Stainless steel	Stainless steel
11	Guide ring	PTFE	PTFE	PTFE	PTFE
12	Schrader valve	Brass	Brass	–	Brass
13	Bleed hole	–	–	–	–
14	O-ring for the ball seat	–	EPDM	–	–
15	Union nut	–	–	Stainless steel	–
16	Adaptor	–	–	Stainless steel	–
17	Gasket	–	–	Aluminum	–

Dimensions

We have chosen to show dimensions of the major versions.
You will find downloadable dimension drawings for individual code numbers on Danfoss store as part of the Visuals tab for individual code numbers.

Weights also differ depending on the design of the individual code numbers. Weights are available as part of the technical data for individual code numbers on Danfoss store.

GBC solder ODF/ODF, Cu plated stainless steel connections

Figure: GBC solder ODF/ODF, Cu plated stainless steel connections

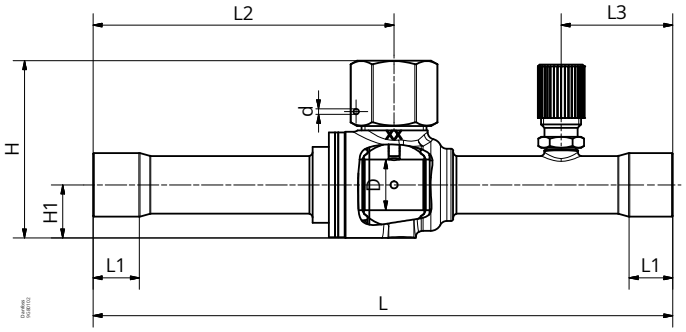


Table: GBC solder ODF/ODF, Cu plated stainless steel connections

Type	Size	Connection	Connection tolerance	H	H1	L	L1	L2	L3	D	d	Weight	Code no.	
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	without access port	with access port
GBC 6s H	¼ in	6.35	+0.065/+0.155	43	12	139	7	72.4	31	11	1.5	0.13	009L5415	009L5581
	6 mm	6											009L5395	009L5580
GBC 10s H	⅜ in	9.52		43	12	139	9	72.4	31	11	1.5	0.13	009L5416	009L5582
	10 mm	10											009L5396	009L5583
GBC 12s H	½ in	12.7		43	12	161	9	83.4	31	11	1.5	0.14	009L5417	009L5585
	12 mm	12											009L5397	009L5584
GBC 16s H	⅝ in	16		50	14.7	161	12	83.6	31	14	1.5	0.22	009L5418	009L5586
	16 mm													
GBC 18s H	¾ in	19.05		58	18.8	185	12	95.8	37	18	1.5	0.4	009L5419	009L5588
	18 mm	18											009L5399	009L5587
GBC 22s H	⅞ in	22.22	+0.075/+0.185	58	18.8	185	17	95.8	37	18	1.5	0.4	009L5420	009L5589
	22 mm													
GBC 25s H	1 in	25.4		80	25	208	20	111	44	24.1	2	0.85	009L5400	–
GBC 28s H	1 ⅛ in	28.58		80	25	208	20	111	44	24.1	2	0.85	009L5526	–
	28 mm	28											009L5406	–
GBC 35s H	1 ⅜ in	35	+0.09/+0.23	110	35	251	25	133	44	35	2	2.2	009L5410	–
	35 mm													
GBC 42s H	1 ⅝ in	41.28		110	35	281	29	149	56	35	2	2.2	009L5529	–
	42 mm	42											009L5411	–

Figure: GBC 10HS solder ODF / G ⅜ in

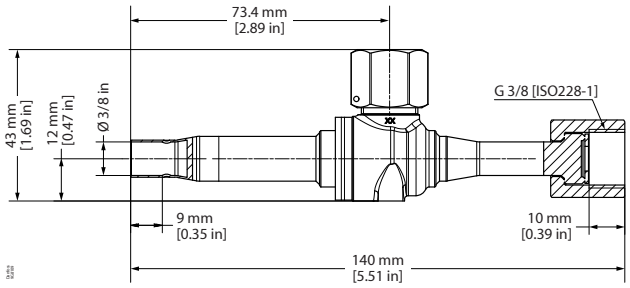
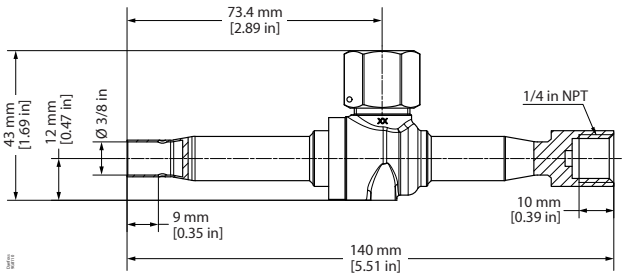


Figure: GBC 10HS solder ODF / ¼ in NPT



GBCT solder ODF/ODF, copper connections

Figure: GBCT solder ODF/ODF, copper connections

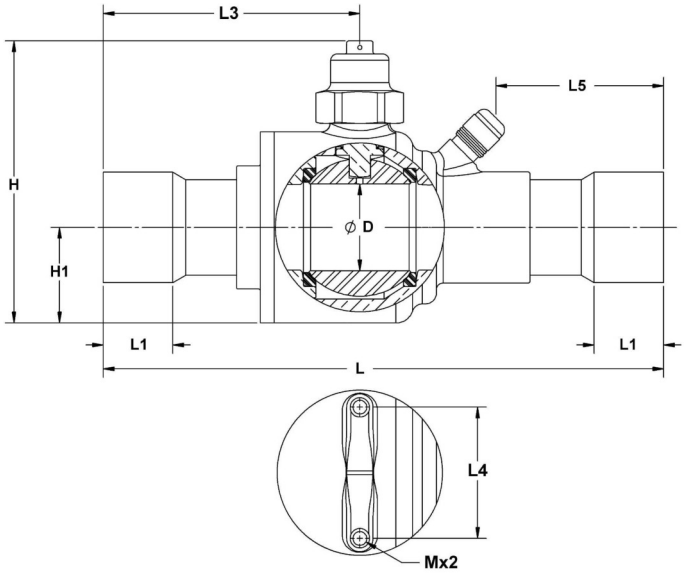


Table: GBCT solder ODF/ODF, copper connections

Type	Size	Connection	Connection tolerance	H	H1	L	L1	L3	L4	L5	M	D	Weight	Code no.	
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	without access port	with access port
GBCT 6s	¼ in	6.35	+0.051/+0.155	57	14	127	7	55	22	N/A	M4 × 0.7	13	0.27	009L6415	–
				57	14	127	7	55	22	26	M4 × 0.7	13	0.27	–	009L6581
GBCT 10s	⅜ in	9.52		57	14	132	9	58	22	N/A	M4 × 0.7	13	0.28	009L6416	–
				57	14	132	9	58	22	28	M4 × 0.7	13	0.28	–	009L6582
GBCT 12s	½ in	12.70		57	14	139	10	61	22	N/A	M4 × 0.7	13	0.28	009L6417	–
				57	14	139	10	61	22	32	M4 × 0.7	13	0.28	–	009L6585
GBCT 16s	⅝ in	15.88		57	14	148	13	66	22	N/A	M4 × 0.7	13	0.29	009L6418	–
				57	14	148	13	66	22	36	M4 × 0.7	13	0.29	–	009L6586
GBCT 18s	¾ in	19.05		72	20	148	17	67	30	N/A	M4 × 0.7	19	0.50	009L6419	–
				72	20	148	17	67	30	40	M4 × 0.7	19	0.50	–	009L6588
GBCT 22s	⅞ in	22.22		72	20	185	20	86	30	N/A	M4 × 0.7	19	0.52	009L6420	–
				72	20	185	20	86	30	58	M4 × 0.7	19	0.53	–	009L6589
GBCT 28s	1 ⅛ in	28.58	+0.075/+0.185	92	28	185	24	84	38	N/A	M4 × 0.7	25	1.12	009L6406	–
				92	28	185	24	84	38	53	M4 × 0.7	25	1.13	–	009L6451
GBCT 35s	1 ⅜ in	34.93		103	35	205	25	94	48	N/A	M6 × 1.0	32	2.01	009L6410	–
				103	35	205	25	94	48	61	M6 × 1.0	32	2.03	–	009L6453
GBCT 42s	1 ⅝ in	41.28	+0.075/+0.203	113	40	240	28	114	55	N/A	M6 × 1.0	38	2.94	009L6411	–
				113	40	240	28	114	55	72	M6 × 1.0	38	2.96	–	009L6454
GBCT 54s	2 ⅛ in	53.98		144	53	275	35	132	74	N/A	M6 × 1.0	51	6.18	009L6412	–
				144	53	275	35	132	74	81	M6 × 1.0	51	6.19	–	009L6456

GBCT butt weld, stainless steel connections

Figure: GBCT butt weld, stainless steel connections

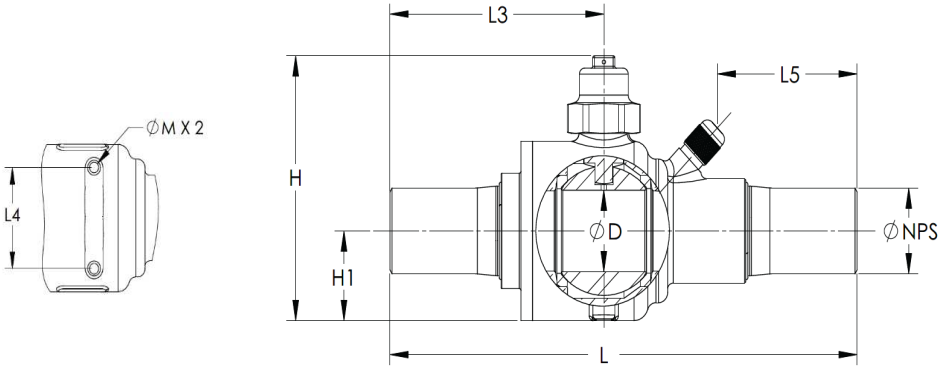


Table: GBCT (ODE)

Type	ODE	H	H1	L	L3	L4	L5	M	D	Weight	Code no.
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	with access port
GBCT 10 D	10.20	57	14	132	57	22	29	M4 x 0.7	13	0.27	009L6701
GBCT 13 D	13.50	57	14	139	61	22	32	M4 x 0.7	13	0.28	009L6702
GBCT 17 D	17.20	57	14	148	66	22	36	M4 x 0.7	13	0.29	009L6703
GBCT 21 D	21.30	72	20	185	86	30	58	M4 x 0.7	19	0.54	009L6704
GBCT 27 D	26.90	92	28	185	84	38	53	M4 x 0.7	25	1.08	009L6705
GBCT 34 D	33.70	103	35	205	94	48	61	M6 x 1.0	32	2.08	009L6706
GBCT 42 D	42.40	113	40	240	114	55	72	M6 x 1.0	38	3.13	009L6707
GBCT 48 D	48.30	144	52	275	132	74	81	M6 x 1.0	51	6.23	009L6708
GBCT 60 D	60.30	144	52	275	132	74	81	M6 x 1.0	51	6.51	009L6709

ODE = Outside Diameter External

Table: GBCT (NPS)

Type	NPS	H	H1	L	L3	L4	L5	M	D	Weight	Code no.
	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lbs]	with access port
GBCT 10 D	⅛	2.2	0.6	5.2	2.2	0.9	1.1	M4 x 0.7	0.5	0.60	009L6701
GBCT 13 D	¼	2.2	0.6	5.5	2.4	0.9	1.3	M4 x 0.7	0.5	0.62	009L6702
GBCT 17 D	⅜	2.2	0.6	5.8	2.6	0.9	1.4	M4 x 0.7	0.5	0.64	009L6703
GBCT 21 D	½	2.8	0.8	7.3	3.4	1.2	2.3	M4 x 0.7	0.7	1.19	009L6704
GBCT 27 D	¾	3.6	1.1	7.3	3.3	1.5	2.1	M4 x 0.7	1.0	2.38	009L6705
GBCT 34 D	1	4.1	1.4	8.1	3.7	1.9	2.4	M6 x 1.0	1.3	4.59	009L6706
GBCT 42 D	1 ¼	4.4	1.6	9.4	4.5	2.2	2.8	M6 x 1.0	1.5	6.90	009L6707
GBCT 48 D	1 ½	5.7	2.1	10.8	5.2	2.9	3.2	M6 x 1.0	2.0	13.7	009L6708
GBCT 60 D	2	5.7	2.1	10.8	5.2	2.9	3.2	M6 x 1.0	2.0	14.4	009L6709

NPS = National Pipe Size

Connections

Connection diagrams of GBC (90 bar)

Type	Connection type	Connection Size	
GBC (90bar)	Solder ODF	6 mm	¼ in
		10 mm	⅜ in
		12 mm	½ in
		16 mm	⅝ in
		18 mm	¾ in
		22 mm	⅞ in
		–	1 in
		28 mm	1 ⅛ in
		35 mm	1 ⅜ in
		42 mm	1 ⅝ in

Connection diagrams of GBCT (140 bar)

Type	Connection type	Connection Size	
GBCT (140bar)	Solder ODF	–	¼ in
			⅜ in
			½ in
			⅝ in
			¾ in
			⅞ in
			1 ⅛ in
			1 ⅜ in
			1 ⅝ in
			2 ⅛ in
	Butt weld	10.2 mm	⅛ in
		13.5 mm	¼ in
		17.2 mm	⅜ in
		21.3 mm	½ in
		26.9 mm	¾ in
		33.7 mm	1 in
		42.4 mm	1 ¼ in
		48.3 mm	1 ½ in
		60.3 mm	2 in

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