

# Reciprocating Compressors for industrial refrigeration

GEA Grasso 10

Spare parts list (Original text)  
pador9111-PL10\_7

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## SAFETY INSTRUCTIONS

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### Hint!

**This manual must be carefully read and understood prior to installing and servicing the compressor (package)**

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#### **General Safety**

All service operations described in this servicemanual are only to be carried out by well-trained/qualified personnel and even then only after this service manual has been read carefully and is fully understood.

#### **Personal safety**

Observe all (inter)national and/or local safety standards, measures and regulations during reinstalling, repairing and connecting the compressor (package).

#### **Mechanical safety**

If the compressor does not have to be removed from its base, it is advisable to put warning labels on vital parts of the compressor saying that the plant is out-of-operation and must not be started up.

If the compressor has to be opened for service, the refrigerant has to be pumped down and the electric supply has to be cut off.

After having run the initial 100 operating hours, it is essential (in both new and modified plants) to replace the red running-in discharge oil filter element with the permanent grey filter element. Also replace the running-in suction gas filter element.

Check the direction of rotation is correct before re-starting the compressor.

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## PREFACE

### General

1. All documentation can be downloaded via our web site.
2. GEA technical manuals includes “generic paragraphs”; this means that **it can occur** that not all data as described is relevant for the current compressor series as mentioned in this manual. (For instance, not all compressor series are suitable for all mentioned refrigerants or not all compressor series includes two-stage compressors)

### Directives

Equipment is based on Pressure Equipment Directive (PED 97/23/EG) regulations and according to Machine Directive (MD 2006/42/EG) regulations.

The applied standards are:

NEN-EN-IEC 60204, NEN-EN-ISO 12100, NEN-EN-ISO 13857, NEN-EN 378

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# 1 PARTS COMPRESSOR

## 1.1 Replacement piston rings and cylinder liners



### Hint!

#### Recommendation/warning!

**For major overhauls or every repair where piston rings are being replaced it is strongly recommended to replace the cylinder liners as well. This is very important for the next reasons:**

For the best sealing between piston rings and cylinder liners, piston rings have to run in on the cylinder liner's inner surface. Therefore a new cylinder liner with a honing profile (crosshatching) in the best condition is absolutely required. Piston rings cannot run in properly on worn out or partly worn out cylinder liners. Without a decent honing profile no proper sealing between liners and rings can be achieved which may result in- or contribute to a bad performance of the compressor. Further on, this honing profile with the right crosshatching is demanded for a good lubrication between piston rings and liners and for the right oil distribution on the liner's inner surface.



Fig.1: New honing profile and crosshatching with the right angle

After being in operation for many running hours cylinder liners and piston rings will wear out and most cylinder liners will become unworn ridges (bumper rims or edges) due to the displacement of the piston rings inside the liner. The upper unworn ridge occurs at the upper death end and upper side of the upper piston ring and the lower ridge occurs at the death end of the lower side of the lower (oil scraper) ring. In many cases intermediate and oil scraper rings cause their own bumper ridges. (*Bumper steps*) Also, both upper and lower edge are set by the worn shape of the piston rings. This clearly explains why new piston rings can break when used in old/worn cylinder liners due to hitting the unworn bumper ridges at high speed. (*See also picture below*)

Therefore: Never install new pistons with new piston rings in old cylinder liners. It is strongly recommended to replace the cylinder liners too.

## PARTS COMPRESSOR

Running-in oil filter has to be installed after an overhaul or big repair

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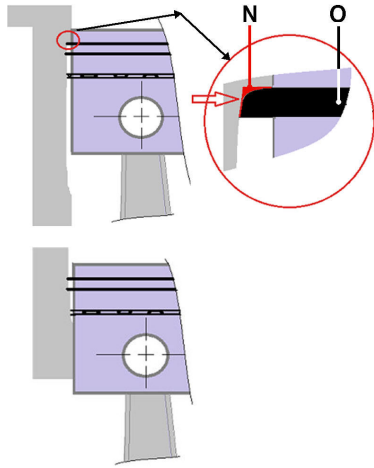


Fig.2: Don't use new piston rings on old cylinder liner

N	Shape of new piston ring (sharp)
O	Shape of old piston ring (rounded)

### 1.2 Running-in oil filter has to be installed after an overhaul or big repair



**Hint!**

This is why and when the running in oil filters are required:



**Warning!**

A running in oil filter has always to be installed after an overhaul or big repair for the 1<sup>st</sup> 100 hours of operation!

The oil and oil filters have to be replaced by new oil and filters.

Due to running-in wear of liners and piston rings, it's normal that the oil becomes grey during the 1<sup>st</sup> 100 operating hours.

After 100 operating hours, the oil could slightly become clear again.

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### 1.3 ...

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COMPRESSOR HOUSING WITH CONNECTIONS AND MAIN COMPONENTS

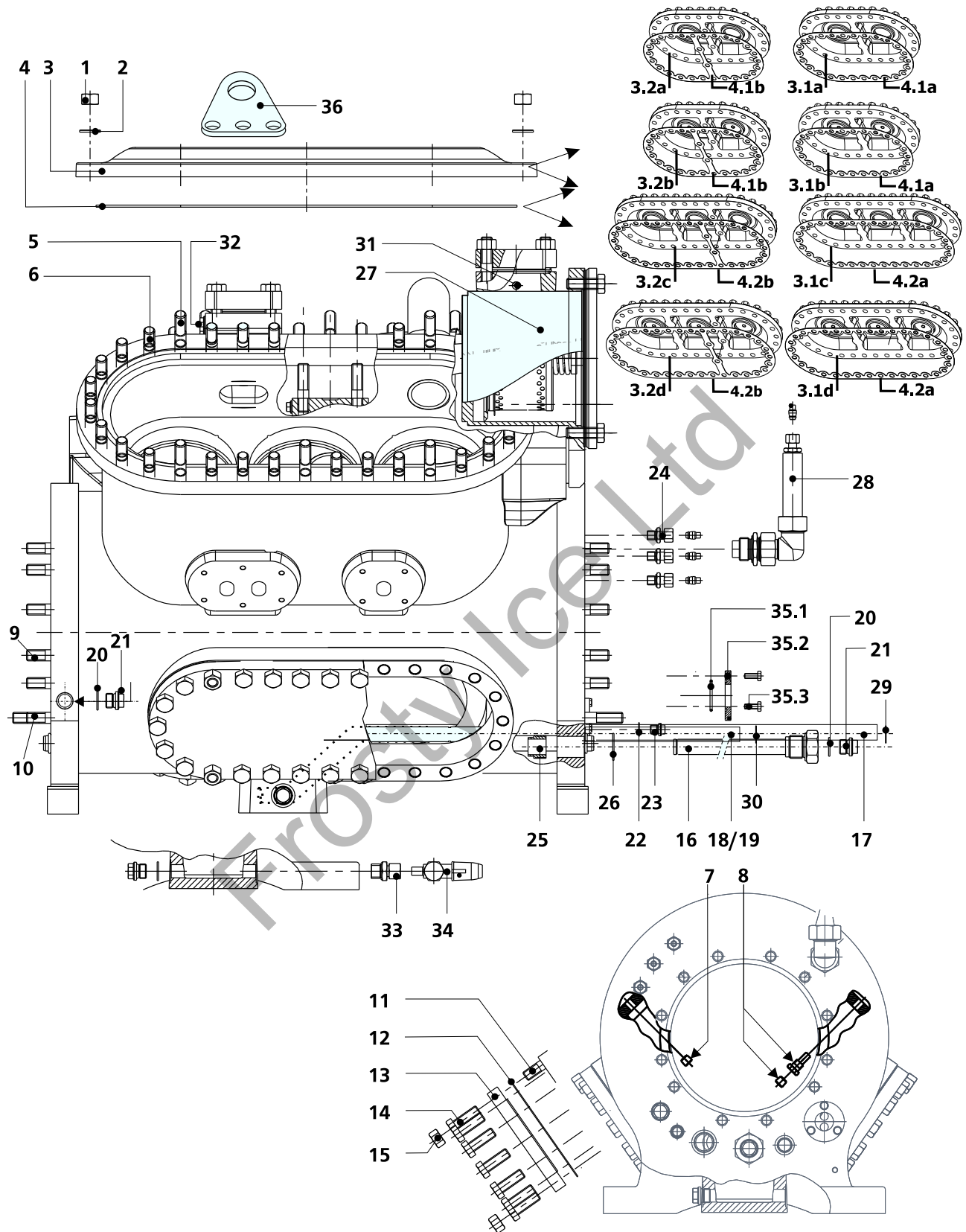


Fig. 3 COMPRESSOR HOUSING WITH CONNECTIONS AND MAIN COMPONENTS

COMPRESSOR HOUSING WITH CONNECTIONS AND MAIN COMPONENTS					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	HEXAGON NUT	M16	0115810		
2	FLAT WASHER	M16	1113801		
3.1a	CYLINDER COVER	Gr10-2	2390541		
3.1b	CYLINDER COVER	Gr10-2+	2390546		
3.1c	CYLINDER COVER	Gr10-3	2390551		
3.2d	CYLINDER COVER	Gr10-3+	2390556		
3.2a	CYLINDER COVER	Gr10-2	2390521		
3.2b	CYLINDER COVER	Gr10-2+	2390526		
3.2c	CYLINDER COVER	Gr10-3	2390531		
3.2d	CYLINDER COVER	Gr10-3+	2390536		
4.1a	GASKET	Gr10-LP	0907240		
4.1b	GASKET	Gr10-HP	0907246		
4.2a	GASKET	Gr10-LP	0907251		
4.2b	GASKET	Gr10-HP	0907256		
5	STUD	M16x 60	0151860		
6	STUD	M16x 40	0151840		
7	RESTRICTION PLUG	1/4-18-Lx 1.5	0123138		NPTF All cylinders single stage compressors and LP-cylinders two-stage compressors
8	RESTRICTION	13x 0.5	0123020		NPTF HP cylinders (two-stage)
9	STUD	M16x 40	0151840	10	
10	STUD	M16x 55	0151856	2	
11	STUD	M16x 40	0151840	4	
12.1	GASKET	194x 344x 1.5	0907098		for 2- and 4-cyl. compressor / 4 for 8-cyl. compressor
12.2	GASKET	194x 524x 1.5	0907099		2 for 3- and 6-cyl. compressor
13.1	SERVICE COVER	Gr10-2	2190180		
13.2	SERVICE COVER	Gr10-3	2190185		
14	HEXAGON HEAD BOLT	M16x 45	0110845		
15	HEXAGON NUT	M16	0115810		
16	CRANKCASE HEATER SLEEVE		*		
17.1	OIL CONNECTING LINE	22x 2x 613.5	0412261		
17.2	OIL CONNECTING LINE	22x 2x 793.5	0412279		
17.3	OIL CONNECTING LINE	22x 2x 1143.5	0412242		
18	OIL SUCTION LINE	22x 2x 793.5	0438335		
19	OIL SUCTION LINE		*		
20	ALU SEALING RING	21x 27x 2	0914023		Possibly to be replaced by 0941020
21	PLUG	G21	0136216		
22	ALU SEALING RING	13.5x 20x 1	0912014		Possibly to be replaced by 0941104
23	PLUG	G13S	0136134		
24	NIPPLE COUPLING	8G13	0338138	4	
25	NUT	G1+C824"	0123033		

COMPRESSOR HOUSING WITH CONNECTIONS AND MAIN COMPONENTS

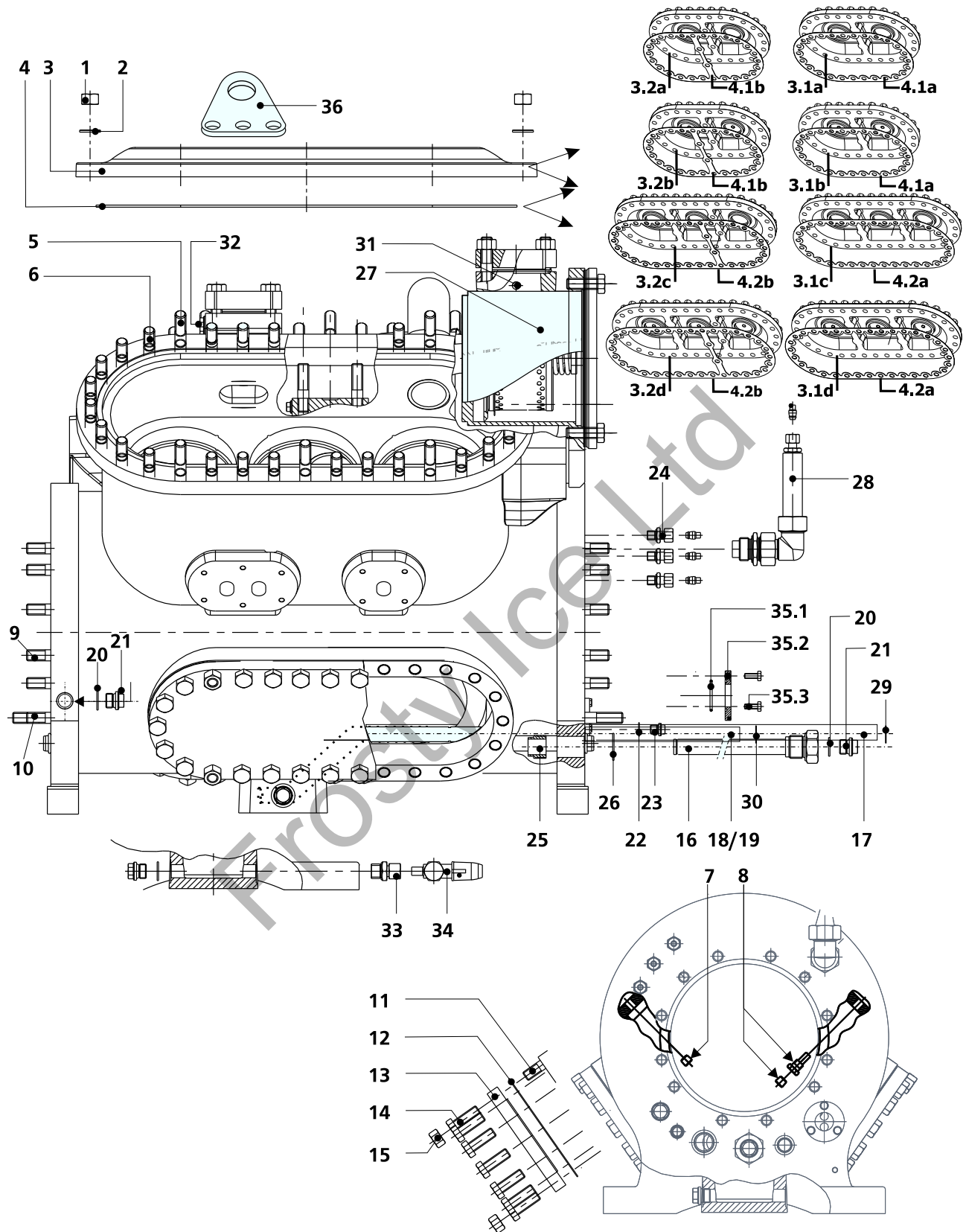


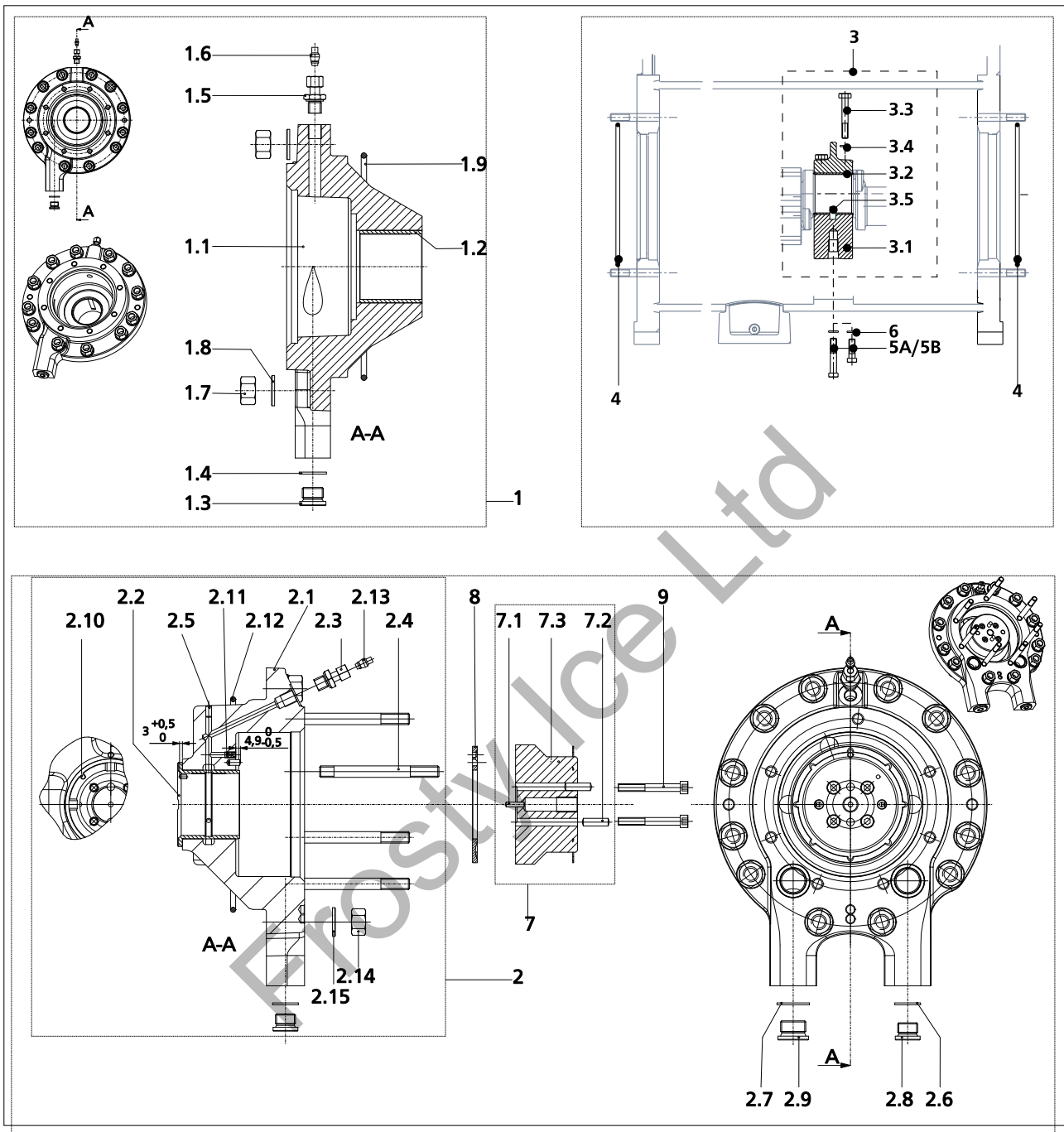
Fig. 3 COMPRESSOR HOUSING WITH CONNECTIONS AND MAIN COMPONENTS

COMPRESSOR HOUSING WITH CONNECTIONS AND MAIN COMPONENTS					
Pos	Description	Dims.	Item ref.	Qty	Remarks
26	ALU SEALING RING	33x 39x 2	0914033		
27.1	SUCTION GAS STRAINER	S L	*		
27.2	SUCTION GAS STRAINER	S V, L	*		
27.3	SUCTION GAS STRAINER	S V, K	*		
28	CRANKCASE EQUALISATION LINE		0490028		
29	O-RING	3.53x 21.8	0955212	2	
30	O-RING	3.55x 29.7	0952329	1	
31	NIPPLE COUPLING	8G13	0338138	4	
32	PLUG	G13S	0136134		
33	NIPPLE COUPLING	12G21	0338211		
34	STOP VALVE	TAH8-12	0607011		
35	SIGHT GLASS	29x 60	*	1	
35.1	O-RING	2.62x 32.99	0952284	1	
35.2	SIGHT GLASS	29x 60	1224029	1	
35.3	HEXAGON HEAD BOLT	M6x 16	0110316	3	
36	HOISTING EYE		*		
99	SWIVEL COUPLING	12G21	0339212		

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**BEARING COVERS AND INTERMEDIATE BEARINGS BRONZE ( from serial nr. 03071441 )**

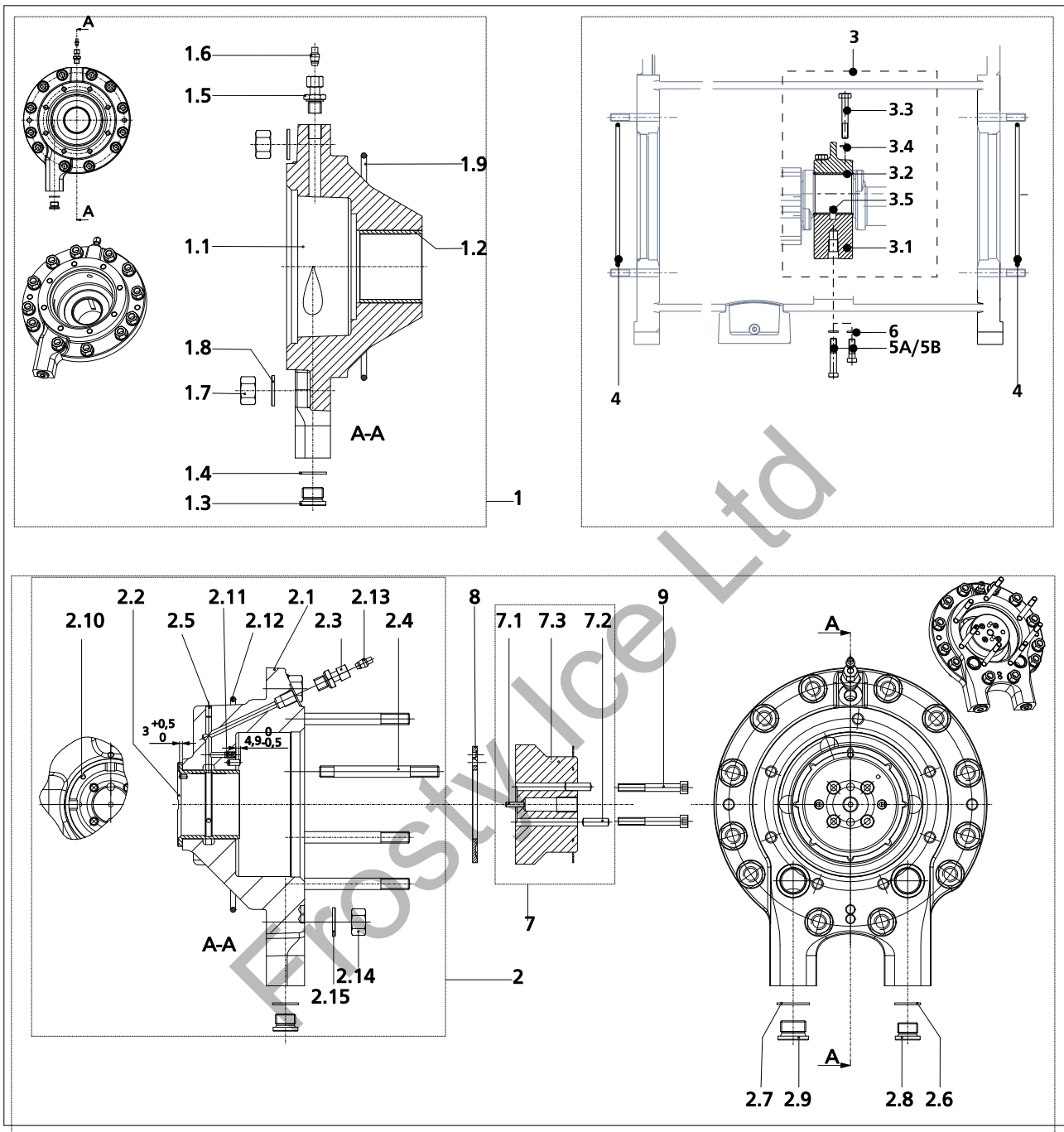


**Fig. 4 BEARING COVERS AND INTERMEDIATE BEARINGS BRONZE ( from serial nr. 03071441 )**

BEARING COVERS AND INTERMEDIATE BEARINGS BRONZE ( from serial nr. 03071441 )					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	BEARING COVER ASSY	Gr10 AZ	*	1	
1.1	BEARING COVER	AZ Gr10	2190005	1	
1.2	BEARING BUSH	65x 72x 62	1146762	1	
1.3	PLUG	G21-BZK	0365821	1	
1.4	ALU SEALING RING	21x 27x 2	0914023	1	Possibly to be replaced by 0941020
1.5	NIPPLE COUPLING	6G13	0338136	1	
1.6	SOLID CLAMPING SLEEVE INCL. O-RING	P6	0334596	1	
1.7	HEXAGON NUT	M16	0115810	12	
1.8	FLAT WASHER	M16	1113801	12	
1.9	O-RING	5.33x 215.27	0952550	1	
2	BEARING COVER ASSY	Gr10 PZ	*	1	
2.1	BEARING COVER	PZ Gr10 BRONZE	2190001	1	
2.2	BEARING BUSH	65x 72x 65	1146770	1	
2.3	NIPPLE COUPLING	6G13	0338136	1	
2.4	STUD	M12x 110	0151610	7	
2.5	DOWEL PIN	6x 12	1106612	2	
2.6	ALU SEALING RING	21x 27x 2	0914023	1	Possibly to be replaced by 0941020
2.7	ALU SEALING RING	27x 34x 2	0914027	1	ex. 09.12.027
2.8	PLUG	G21-BZK	0365821	1	
2.9	PLUG	G27	0365827	1	
2.10	DOWEL PIN	4x 8	1106408	1	
2.11	RESTRICTION	M6x 10x 2	0123311	1	
2.12	O-RING	5.33x 215.27	0952550	1	
2.13	SOLID CLAMPING SLEEVE INCL. O-RING	P6	0334596	1	
2.14	HEXAGON NUT	M16	0115810	12	
2.15	FLAT WASHER	M16	1113801	12	
3	BEARING BLOCK SET	Gr10	2090310	1	
3..	NUMBER OF INTERMEDIATE BEARINGS Gr10		*		
3.1	BEARING BLOCK HALVES		*		
3.2	BEARING SHELL	65x 60N AL	1144666	4	
3.3	HEXAGON HEAD BOLT	M12x 80	0110680	4	
3.4	LOCKING RING SET	13-ST- G.V.	1139600	2	in two pieces
3.5	DOWEL PIN	12x 26	1106226	2	
4	O-RING	5.33x 215.27	0952550		
5A	HEXAGON HEAD BOLT	M16x 90	0110890		
5B	HEXAGON HEAD BOLT	M16x 50	0110850		
6	LOCKING RING SET	M16/13- ST-G.V.	1139800		in two pieces
7	HOLD DOWN DISC SET	Gr10-25	2090320	1	
7.1	DOWEL PIN	5x 20	1106520	1	

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**BEARING COVERS AND INTERMEDIATE BEARINGS BRONZE ( from serial nr. 03071441 )**



**Fig. 4 BEARING COVERS AND INTERMEDIATE BEARINGS BRONZE ( from serial nr. 03071441 )**

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BEARING COVERS AND INTERMEDIATE BEARINGS BRONZE ( from serial nr. 03071441 )					
Pos	Description	Dims.	Item ref.	Qty	Remarks
7.2	DOWEL PIN	8 x 28	1106829	2	
7.3	CARRIER DISC	125	1125125	1	
8	THRUST RING	Gr10 BRONZE	1142011	1	
9	ALLEN HEAD SCREW	M8x 65	0104465	4	

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CRANKSHAFT

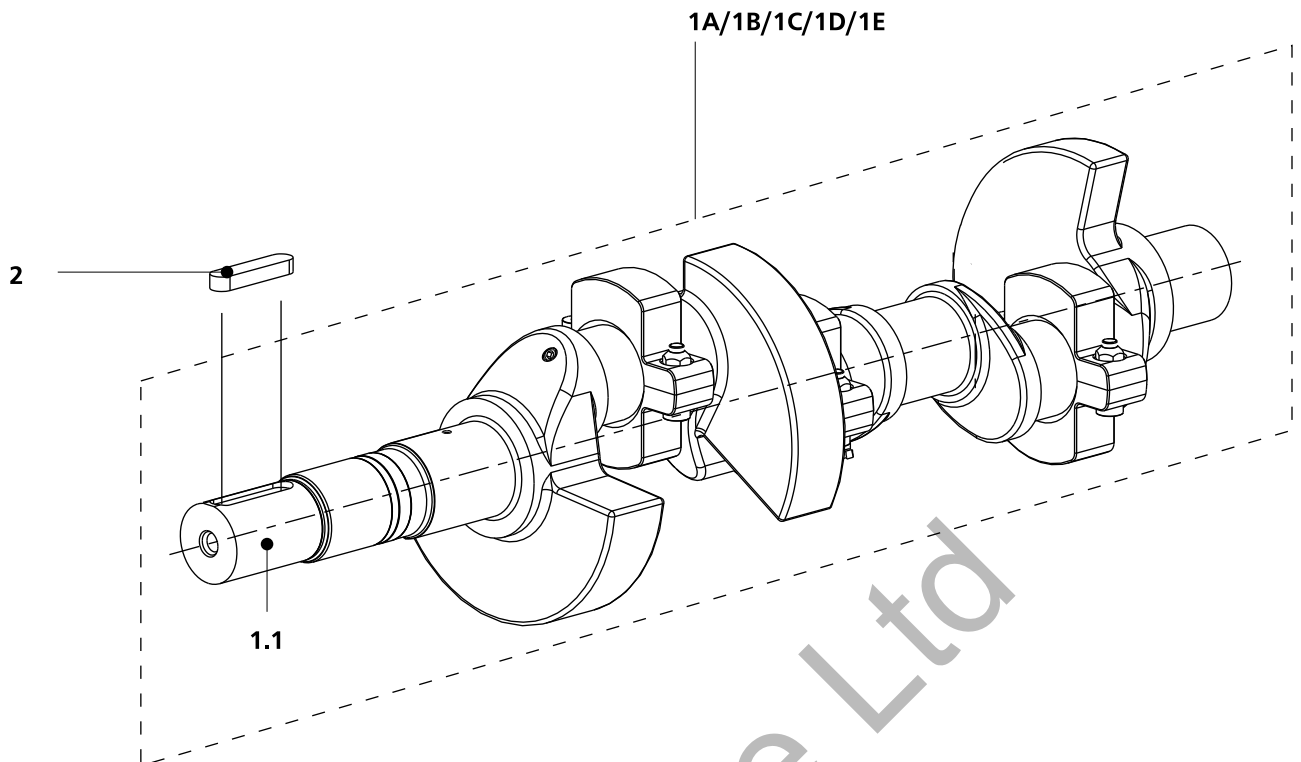


Fig. 5 CRANKSHAFT

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CRANKSHAFT					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1.1	CRANKSHAFT	E/K Gr10	*		
1.2	SPACER ASSY	65x 130x 36	*		
1a	CRANKSHAFT WITH APPROVAL	Grasso 810-SK	2291810		
1A	CRANKSHAFT	Grasso 810-SE	2291800		
1b	CRANKSHAFT WITH APPROVAL	Grasso 610-SK	2291610		
1B	CRANKSHAFT	Grasso 610-SE	2291600		
1c	CRANKSHAFT WITH APPROVAL	Grasso 410-SK	2291410		
1C	CRANKSHAFT	Grasso 410 -SE	2291400		
1d	CRANKSHAFT WITH APPROVAL	Grasso 310-SK	2291310		
1D	CRANKSHAFT	Grasso 310-SE	2291300		
1e	CRANKSHAFT WITH APPROVAL	Grasso 210-SK	2291210		
1E	CRANKSHAFT	Grasso 210-SE	2291200		
2	KEY	16x 10x 70	1102670		

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PISTON AND CONNECTING ROD

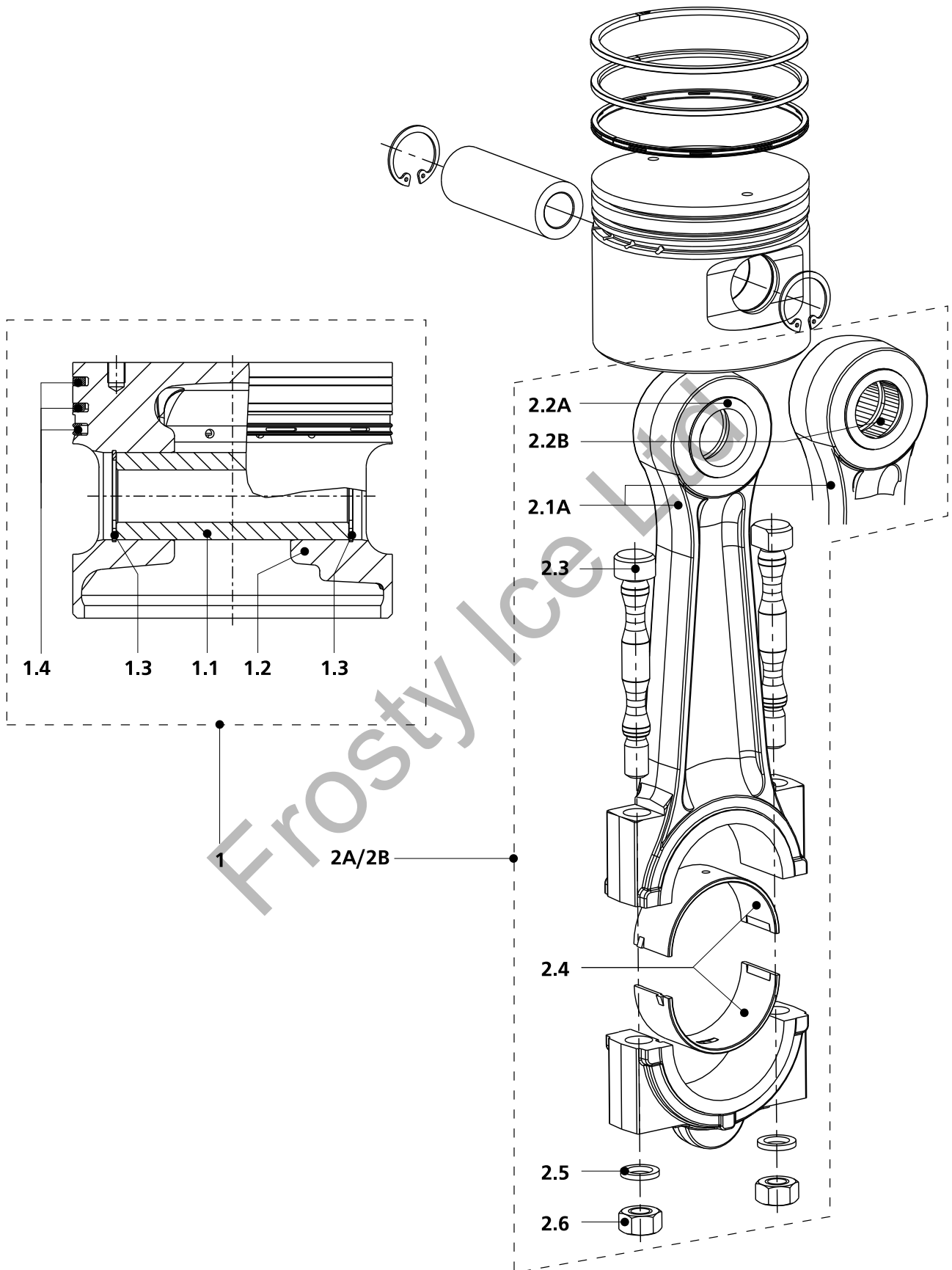


Fig. 6 PISTON AND CONNECTING ROD

PISTON AND CONNECTING ROD					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	PISTON ASSY	S110x 30x 88	2406010	1	
1.1	GUDGEON PIN	18x 30x 80	2420310	1	
1.2	PISTON	S110x 30x 88	*	1	
1.3	LOCKING RING	30	1104030	2	
1.4	SET OF PISTON RINGS	Gr10-25	2090315	1	
2A	CON ROD ASSY	V-M / Grasso 10	2491510	1	
2B	CON ROD ASSY	V-M / Grasso 10	2491520	1	
2.1a	CON ROD	V-M / Grasso 10	*	1	
2.1b	CON ROD	V-M / Grasso 10	*	1	
2.2a	BEARING BUSH	30x 42x 36 CU/SN	1146336	1	
2.2b	NEEDLE BEARING	RNA 4905	1163435	2	
2.3	CONNECTING ROD BOLT	MF12	0111601	2	
2.4	BEARING SHELL	65x 30N DR	1144367	1	replacement of p/n 1144365 - 1144366
2.5	LOCKING RING SET	13-ST- G.V.	1139600	2	in two pieces
2.6	HEXAGON NUT	MF12	0147605	2	

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CYLINDER LINER

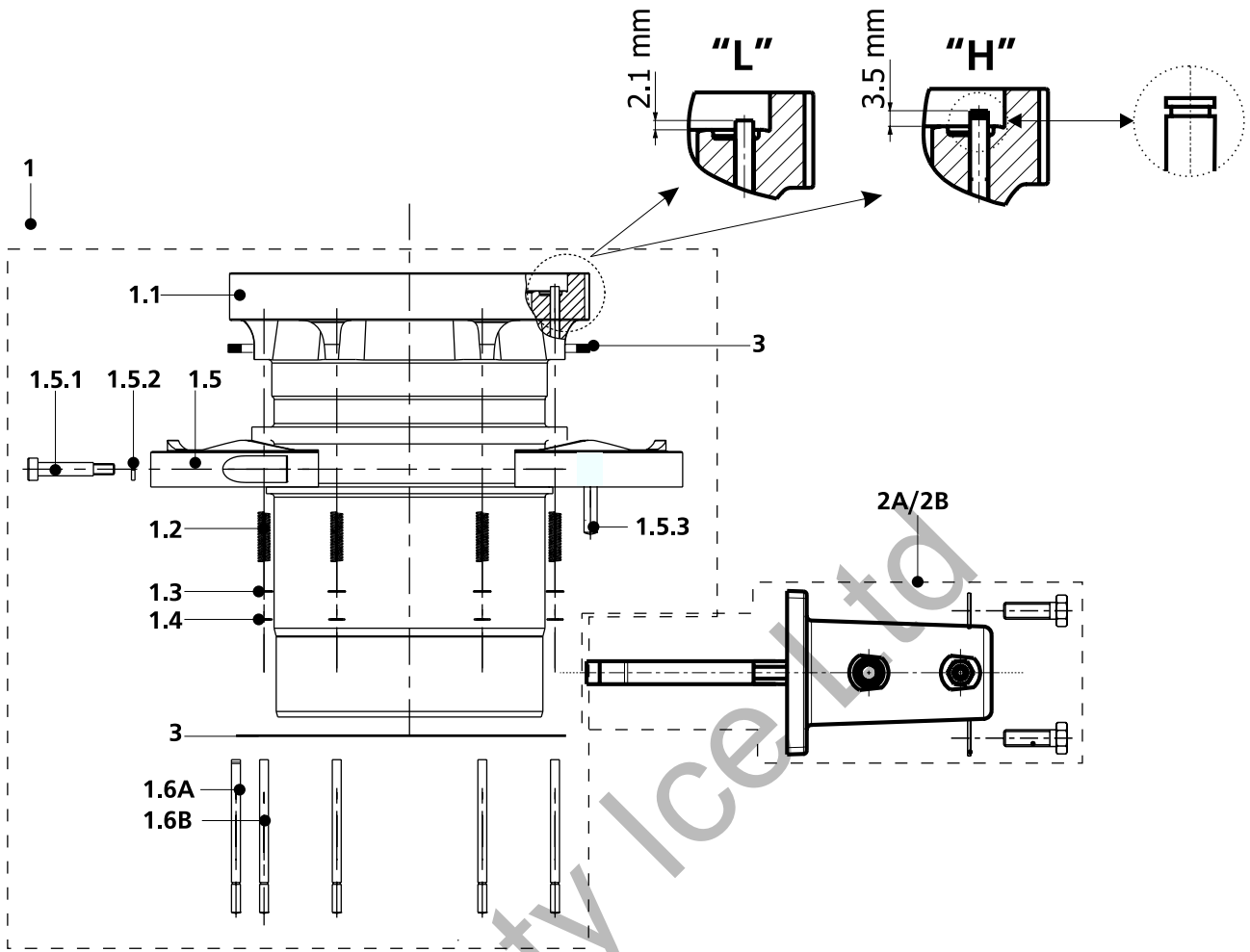


Fig. 7 CYLINDER LINER

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CYLINDER LINER					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	CYLINDER LINER ASSY	110 Gr10	2090270	1	
1.1	CYLINDER LINER	110 Gr10	2390110	1	
1.2	PRESSURE SPRING	0.5x 5x 18.5x 44.5	1131545	6	
1.3	WASHER	M4 DIN433	1113202	6	
1.4	CIRCLIP RING	3.2	1103004	6	
1.5	CAM RING, VALVE LIFTING	Gr10S	2791110	1	
1.5.1	FITTED BOLT	M5x 6F9x 25	0124025	2	
1.5.2	LOCKING RING	M6	1113064	2	
1.5.3	DOWEL PIN		*		
1.6A	PUSH PIN	4x 70.5	1106475	6	
1.6B	PUSH PIN	4x 69.1	1106465	6	
2A	VALVE LIFTING MECHANISM	Gr10 TYPE HP	*	1	
2B	VALVE LIFTING MECHANISM	Gr10 TYPE HP/HP	*	1	
3	GASKET	Gr10	0905161	1	

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CAPACITY CONTROL MECHANISM ( from serial nr. 01051365 )

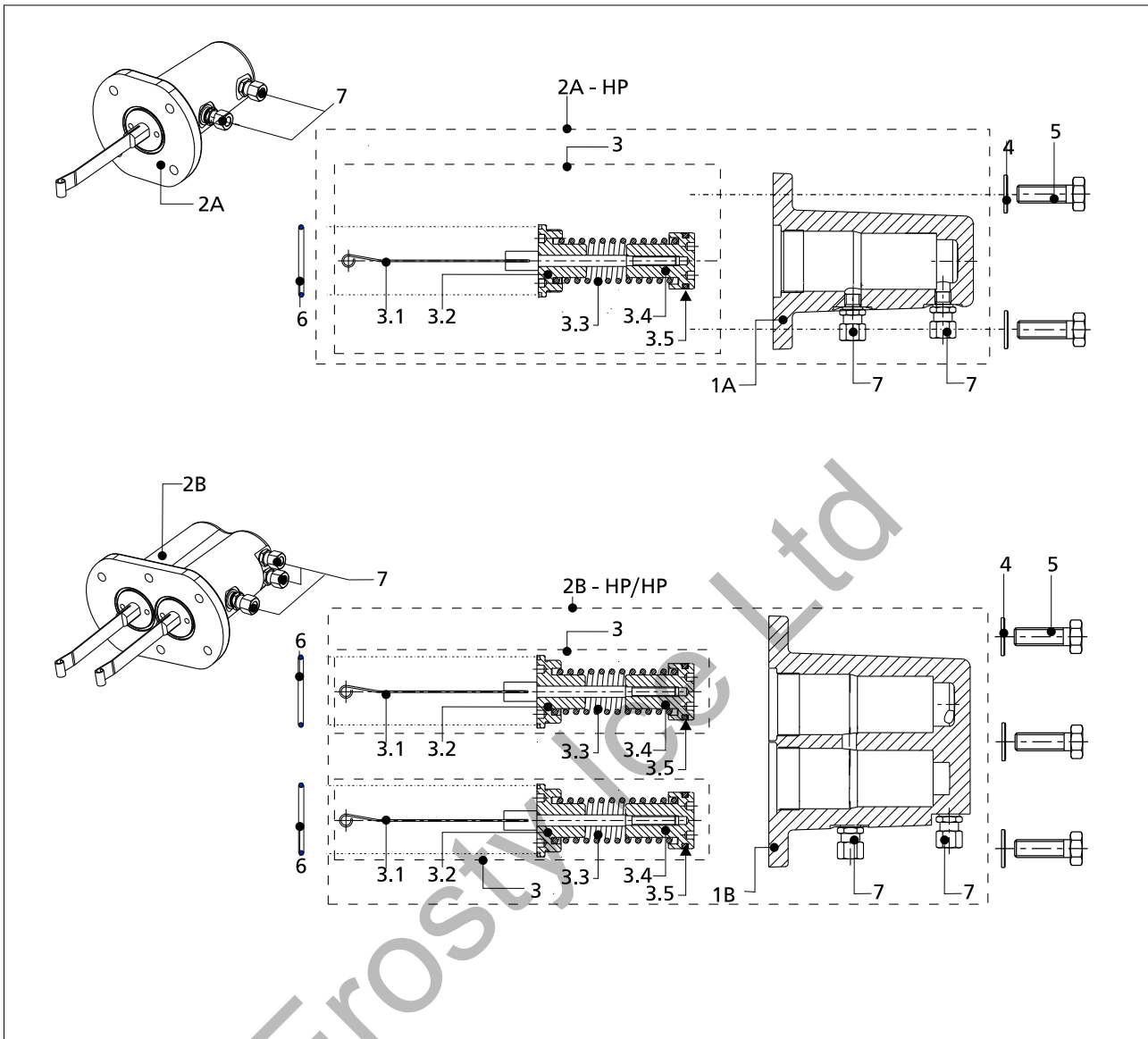


Fig. 8 CAPACITY CONTROL MECHANISM ( from serial nr. 01051365 )

CAPACITY CONTROL MECHANISM ( from serial nr. 01051365 )					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1A	VALVE LIFTING HOUSING	single housing	2790205		
1B	VALVE LIFTING HOUSING	double housing	2790210		
2A	VALVE LIFTING MECHANISM	Gr10 TYPE HP	*		
2B	VALVE LIFTING MECHANISM	Gr10 TYPE HP/HP	*		
3	SET OF CONTROL MECHANISM PARTS	type HP	2090260		
3.1	PUSH HANDLE 7, VALVE LIFTING	Gr10	2791007		
3.2	SHAFT GUIDE	M39x 1.5x 2B	2690720		
3.3	PRESSURE SPRING	3.2x 25x 12.5x 135	1131313		
3.4	CONTROL PISTON	35x 42	2690035		
3.5	QUAD RING	3.53x 28.17	0952328		
4	FLAT WASHER	M8	1113401		
5	HEXAGON HEAD BOLT	M8x 25	0110425		
6	O-RING	2.62x 40.95	0952289		
7	NIPPLE COUPLING	8G10	0338108		

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SUCTION AND DISCHARGE VALVE

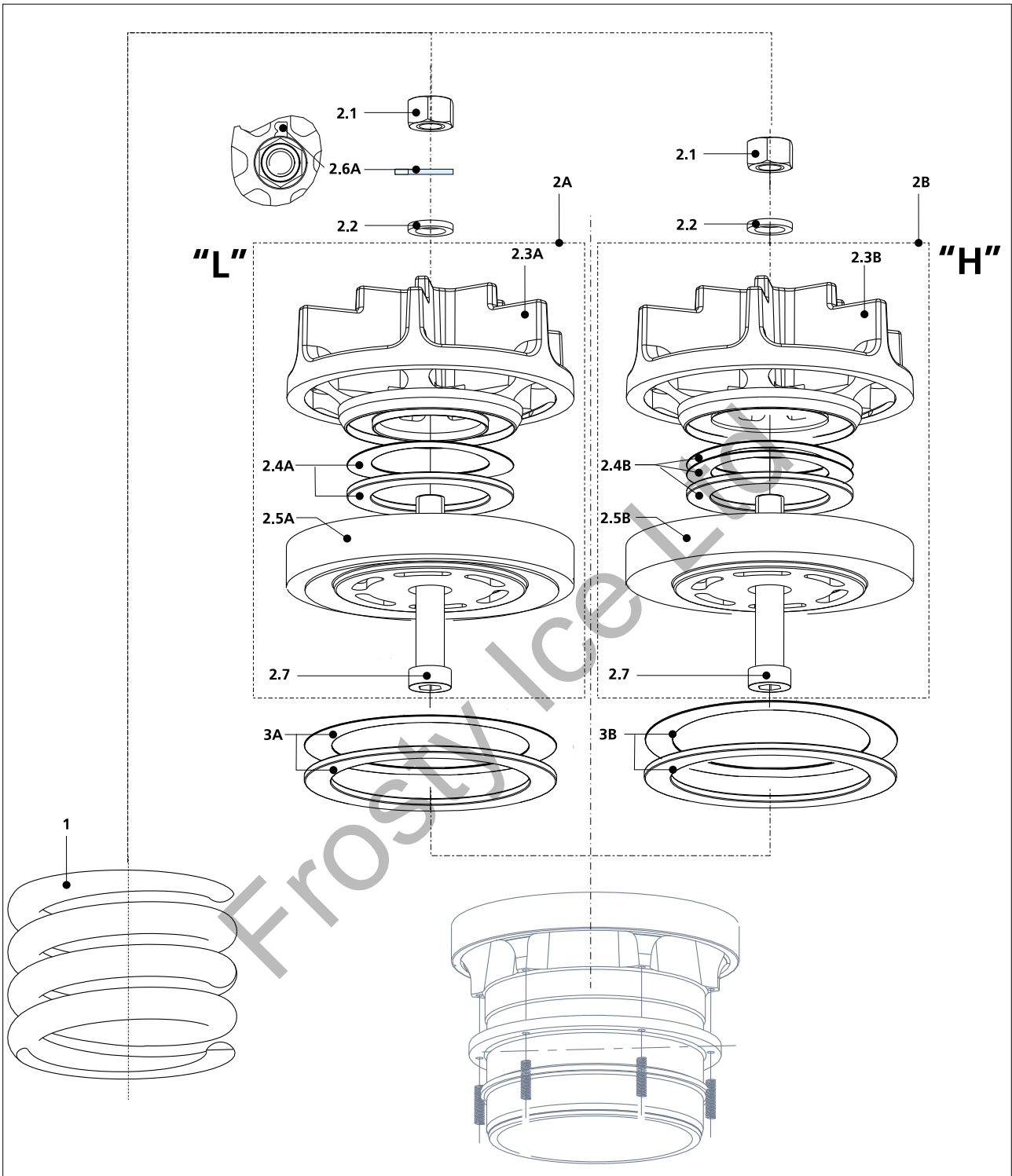


Fig. 9 SUCTION AND DISCHARGE VALVE

SUCTION AND DISCHARGE VALVE					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	PRESSURE SPRING	18x 111x 3x 118	1131183		
2A	DISCHARGE VALVE ASSY	Gr10 TYPE L A	2791120		NH3
2B	DISCHARGE VALVE ASSY	Gr10 TYPE H	2791130		Halocarbons
2.1	LOCKING NUT	M16	0145800		
2.2	FLAT WASHER	M16	1113801		
2.3A	STROKE LIMITOR, DISCHARGE VALVE	Gr10 TYPE L	2790100		
2.3B	STROKE LIMITOR, DISCHARGE VALVE	Gr10 TYPE H	2790105		
2.4A	DISCHARGE SINUSOIDAL SPRINGS/RINGS SET FOR 1-CYLINDER	"L"-VALVE DESIGN	2090240		
2.4B	DISCHARGE SINUSOIDAL SPRINGS/RINGS SET FOR 1-CYLINDER	"H"-VALVE DESIGN	2090245		
2.5A	VALVE SEAT	type L	2790314		
2.5B	VALVE SEAT	type H	2790300		
2.6A	RING A	M16	1133401		
2.7	SOCKET HEAD SCREW	M16x 100	0104811		
3A	SUCTION VALVE SPRINGS/RINGS REPLACEMENT SET FOR 1-CYLINDER	"L"-VALVE DESIGN	2090250		
3B	SUCTION VALVE SPRINGS/RINGS REPLACEMENT SET FOR 1-CYLINDER	"H"-VALVE DESIGN	2090255		

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ROTARY SHAFT SEAL

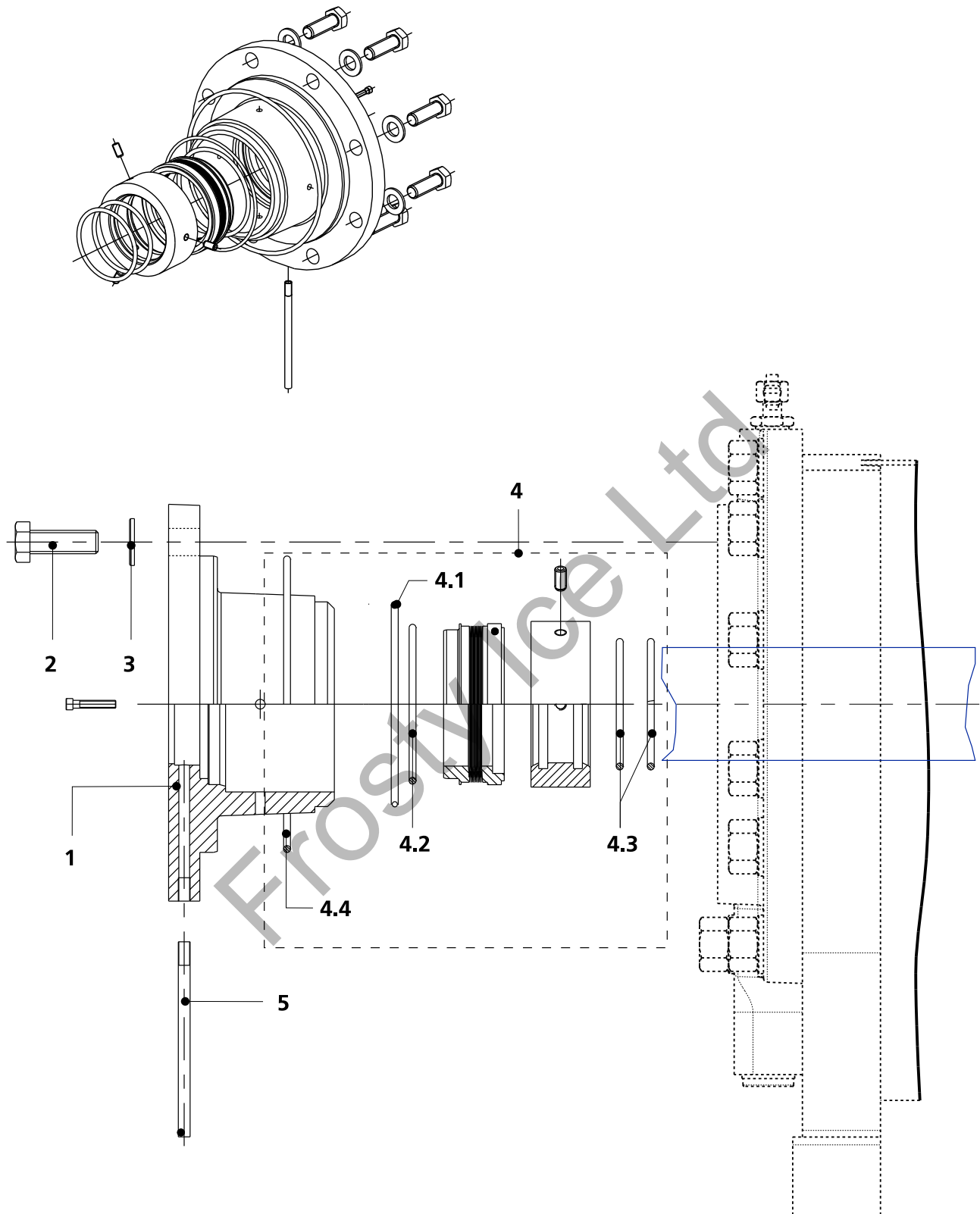


Fig. 10 ROTARY SHAFT SEAL

ROTARY SHAFT SEAL					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	SHAFT SEAL HOUSING	Gr10	2690500	1	
2	HEXAGON HEAD BOLT	M12x 35	0110635	8	
3	FLAT WASHER	M12	1113601	8	
4	SHAFT SEAL REPLACEMENT SET	60/61.5	2090235	1	
4.1	O-RING	2.65x 100	0952282	1	
4.2	O-RING	3.55x 75.8	0952377	1	
4.3	O-RING	3.53x 59.72	0952359	2	
4.4	O-RING	3.53x 145	0955257	1	
5	PIPE, OIL	M6x 0.5x 100	4405006	1	

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OIL PUMP ( from serial number 06081432 )

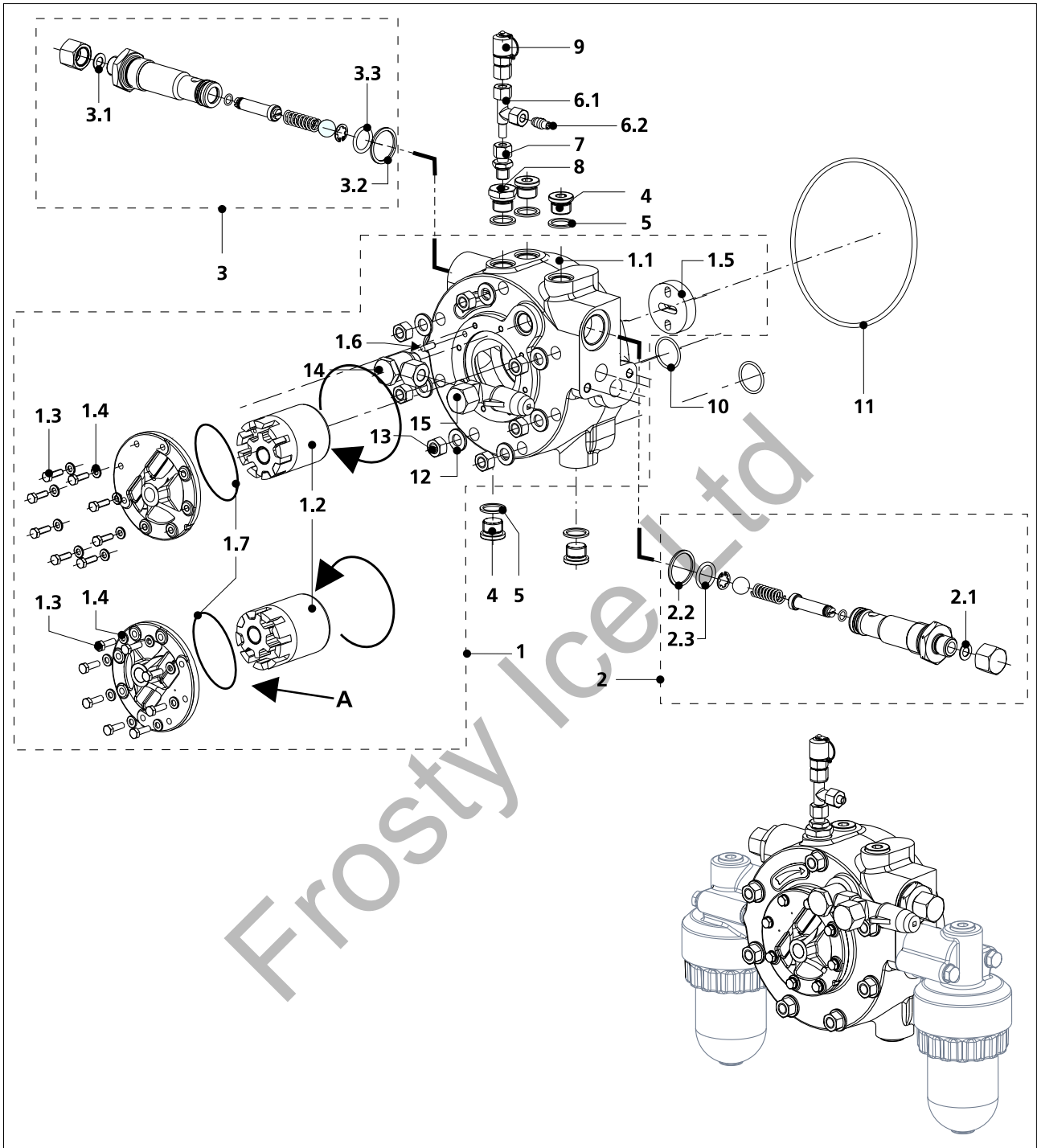


Fig. 11 OIL PUMP ( from serial number 06081432 )

OIL PUMP ( from serial number 06081432 )					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	OIL PUMP ASSY	Gr10	2090295	1	
1.1	OIL PUMP HOUSING	Gr12	2638520	1	Standard
1.2	PUMP ELEMENT	5HP/Gr10	2695130	1	
1.3	HEXAGON HEAD BOLT	M6x 20	0110320	8	
1.4	WASHER	M6	1113301	8	
1.5	CARRIER DISC	55x 8	1125006	1	
1.6	DOWEL PIN	6x 18x 3	1106617	1	
1.7	O-RING	2.62x 82.22	0952265	1	
2	CONTROL OIL PRESSURE REGULATOR SET		2038120	1	
2.1	ALU SEALING RING	10x 18x 1	0912010	1	
2.2	ALU SEALING RING	33x 39x 2	0914033	1	
2.3	O-RING	3.53x 21.8	0955212	1	
3	LUBRICATION OIL PRESSURE REGULATOR SET		2038118	1	
3.1	ALU SEALING RING	10x 18x 1	0912010	1	
3.2	ALU SEALING RING	33x 39x 2	0914033	1	
3.3	O-RING	3.53x 21.8	0955212	1	
4	PLUG	G21-BZK	0365821	5	
5	ALU SEALING RING	21x 27x 2	0914023	5	Possibly to be replaced by 0941020
6.1	T-COUPLING	8x 8x 8	0340408	1	
6.2	SOLID CLAMPING SLEEVE INCL. O-RING	P8	0334598	1	
7	NIPPLE COUPLING	8G13	0338138	1	
8	SOCKET NIPPLE	G13x G21	0302213	1	
9	MEASURING COUPLING	8 mm	0645608	1	
10	O-RING	2.62x 29.82	0952230	2	
11	O-RING	3.53x 145	0955257	1	
12	FLAT WASHER	M12	1113601	7	
13	HEXAGON NUT	M12	0115610	7	
14	SWIVEL COUPLING	12G21	0339212	1	
15	STOP VALVE	TAH8-12	0607011	1	

OIL FILTERS

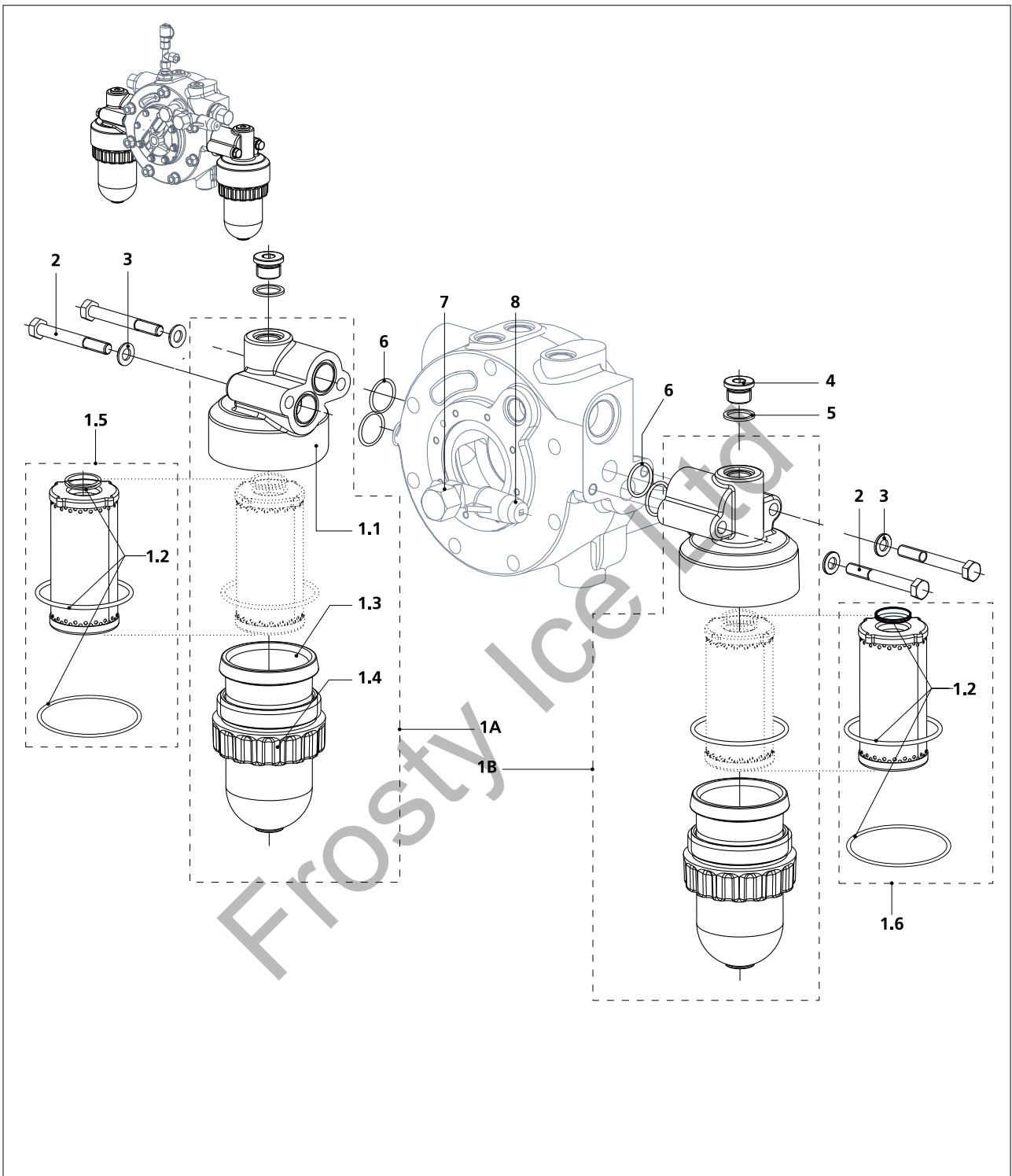


Fig. 12 OIL FILTERS

OIL FILTERS					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1A	SUCTION OIL FILTER ASSY	24	*	1	
1B	DISCHARGE OIL FILTER ASSY	24	*	1	
1.1	FILTER UPPER HOUSING		*		
1.2	SET OF SEALS		0990030	1	for oil filter 07.11.025
1.3	FILTER CUP		*	1	
1.4	RING NUT		*	1	
1.5	SUCTION OIL FILTER SET (BLUE MARKED)	24	2038128	1	
1.6a	DISCHARGE OIL FILTER SET (GREY MARKED)	24	2038124	1	
1.6b	HIGH CAPACITY OIL FILTER SET (GREY MARKED)		2038125	1	Check if the length of the oil charge filter is equal to the length of the oil suction filter cup of the compressor involved, if so, a longer oil discharge filter cup with Ref. Nr. 07.02.675 is also required!
2	HEXAGON HEAD BOLT	M10x 80	0110581	2	
3	FLAT WASHER	M10	1113501	2	
4	PLUG	G21-BZK	0365821	2	
5	ALU SEALING RING	21x 27x 2	0914023	2	Possibly to be replaced by 0941020
6	O-RING	2.5x 26.0	0952254	4	
7	SWIVEL COUPLING	12G21	0339212	1	
8	STOP VALVE	TAH8-12	0607011	1	

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SUCTION GAS STRAINER

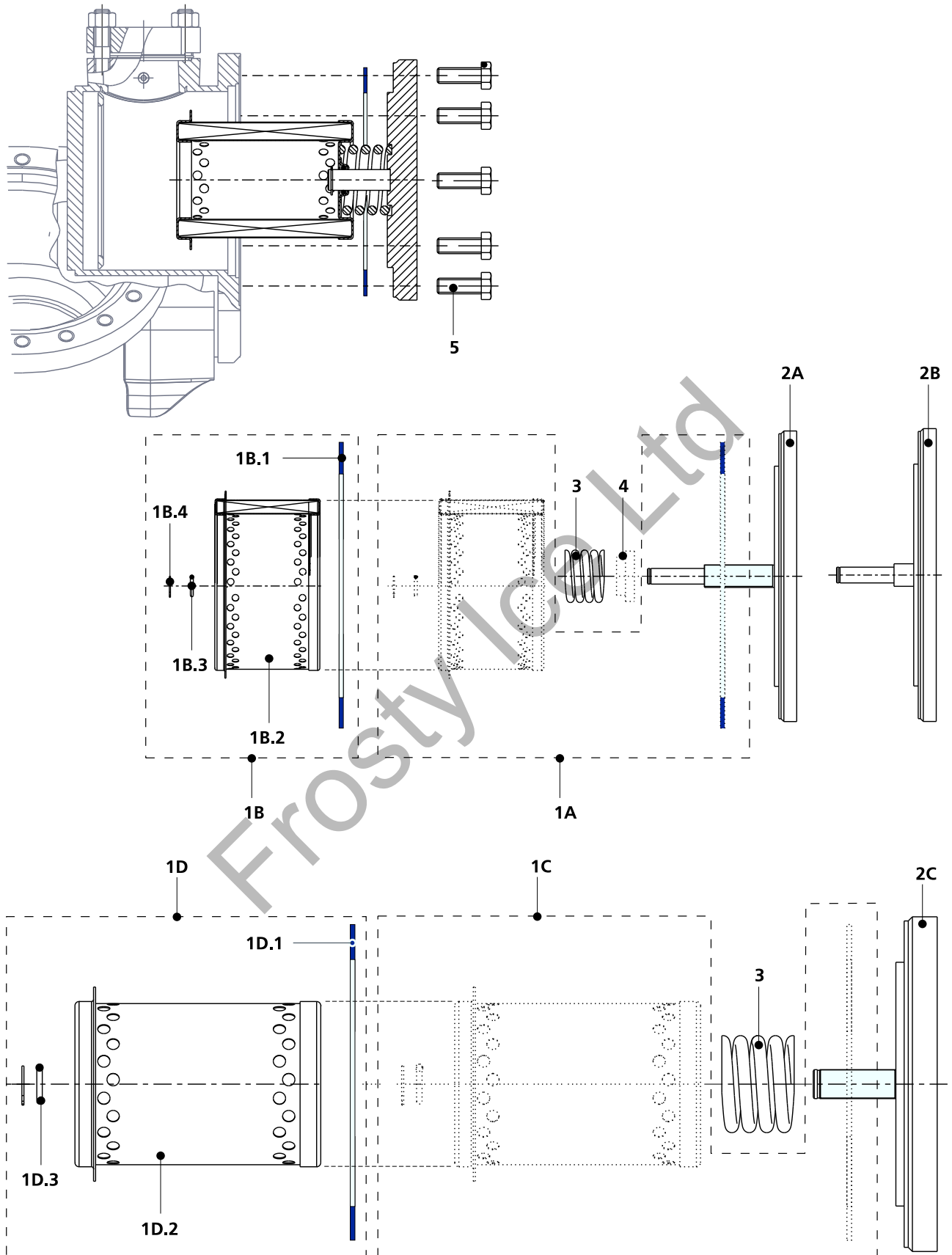


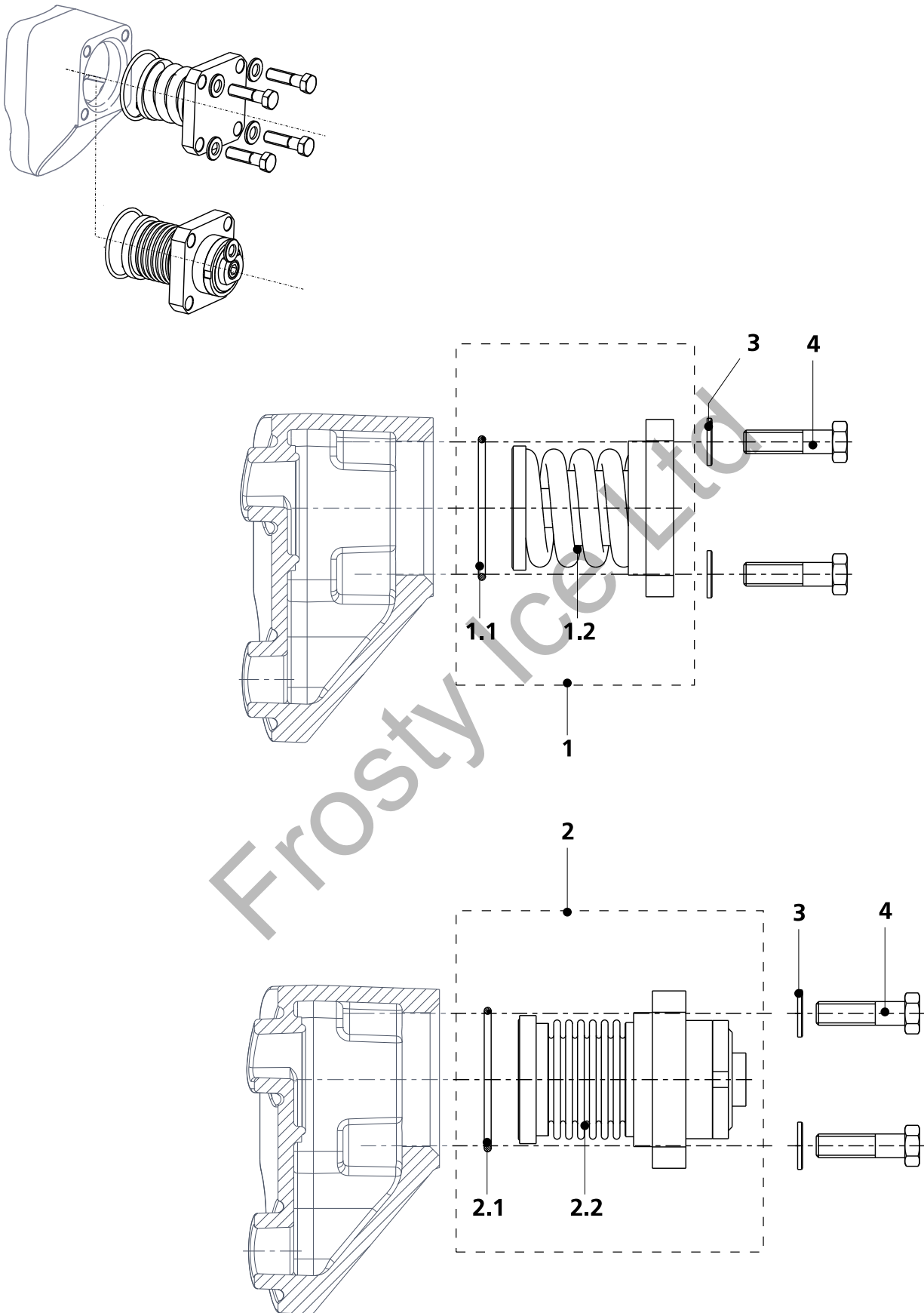
Fig. 13 SUCTION GAS STRAINER

SUCTION GAS STRAINER					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1A	SUCTION GAS FILTER		*	1	
1B	REPLACEMENT SET FOR GAUZE FILTER ELEMENT	2000K	2090290	1	For 4, 6, and 8 cylinders
1B1	GASKET	198x 254x 2	0907226	1	For 4, 6, and 8 cylinders
1B2	REPLACEMENT GAUZE FILTER ELEMENT	2000K	*	1	
1B3	O-RING	2.65x 13.95	0952269	1	
1B4	CIRCLIP RING	14	1103014	1	
1C	SUCTION GAS FILTER		*	1	
1D	REPLACEMENT SET FOR GAUZE FILTER ELEMENT	1000	2090285	1	For Grasso 210, 310, 2110
1D1	GASKET	118x 158x 2	0907137	1	For 2 and 3 cylinders
1D2	GAUZE FILTER ELEMENT		*	1	1000/150
1D3	O-RING	2.65x 13.95	0952269	1	
1D4	CIRCLIP RING	14	1103014	1	
2A	SUCTION HOUSING COVER	200K	0530243	1	For Grasso 610, 810, 6210
2B	SUCTION HOUSING COVER	2000K	0530242	1	For Grasso 410, 3110, 4210
2C	SUCTION HOUSING COVER	1000	0530162	1	For Grasso 210, 310, 2110
3	PRESSURE SPRING	6x 40x 2.7x 42	1131601	1	
4	SPRING RETAINER	14.5x 45	4836015	1	
5A	HEXAGON HEAD BOLT	M12x 45	0110645	6	
5B	HEXAGON HEAD BOLT	M16x 45	0110845	10	

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**PRESSURE RELIEF VALVES**



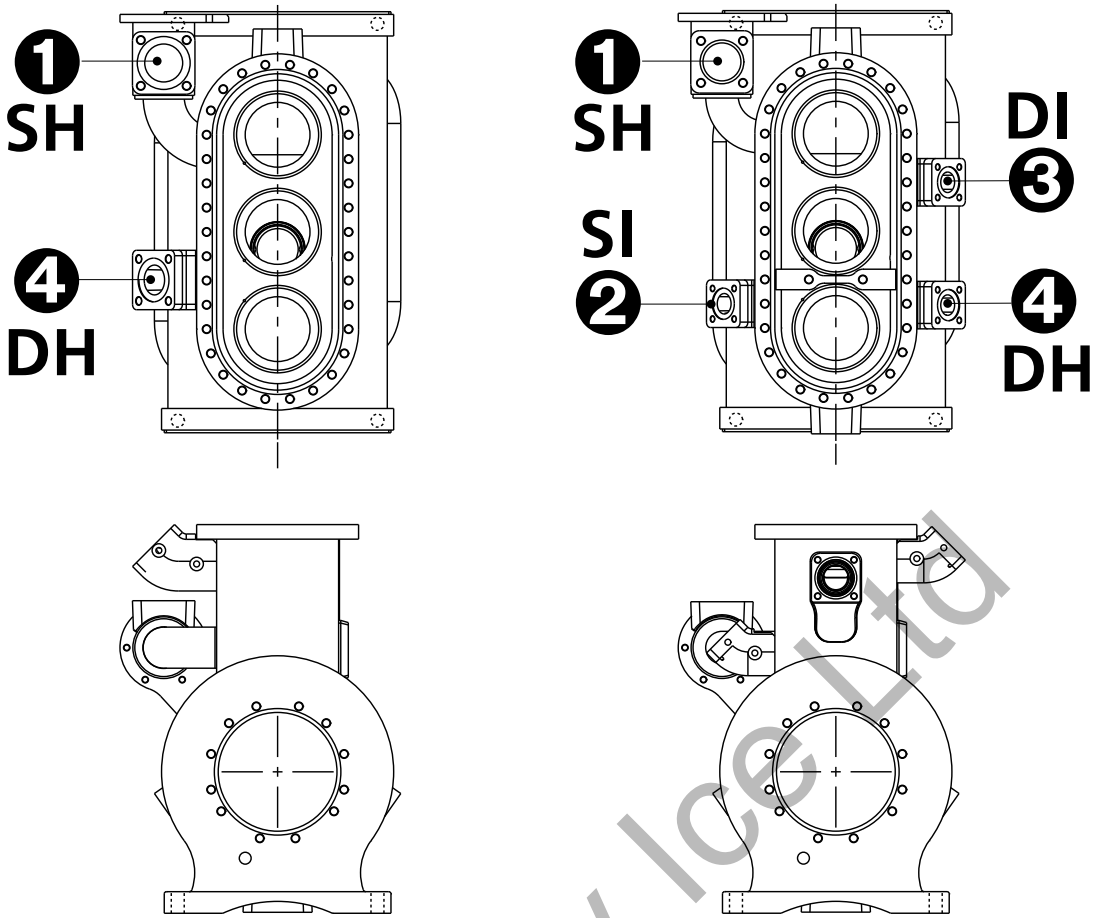
**Fig. 14 PRESSURE RELIEF VALVES**

PRESSURE RELIEF VALVES					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	RELIEF VALVE SET	5HP-CO2	2090345	1	
1.1	O-RING	3.53x 66.27	0955231	1	
1.2	RELIEF VALVE	Gr10-25	*	1	
2	RELIEF VALVE SET	5HP-NH3	2090350	1	independent
2.1	O-RING	3.53x 66.27	0955231	1	
2.2	RELIEF VALVE	Gr10-25	*	1	
3	FLAT WASHER	M12	1113601	4	
4	HEXAGON HEAD BOLT	M12x 45	0110645	4	

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MAIN FLANGE SEALING RINGS



- |                   |                    |
|-------------------|--------------------|
| <b>Grasso 210</b> | <b>Grasso 2110</b> |
| <b>Grasso 310</b> | <b>Grasso 3110</b> |
| <b>Grasso 410</b> | <b>Grasso 4210</b> |
| <b>Grasso 610</b> | <b>Grasso 6210</b> |
| <b>Grasso 810</b> |                    |

COMPRESSOR TYPE	SH	DH	SI	DI
GRASSO 210	B	A		
GRASSO 310	C	B		
GRASSO 410	C	B		
GRASSO 610	D	C		
GRASSO 810	E	D		
GRASSO 2110	B	A	A	A
GRASSO 3110	C	A	A	A
GRASSO 4210	C	A	B	B
GRASSO 6210	D	A	B	B

Fig. 15 MAIN FLANGE SEALING RINGS

MAIN FLANGE SEALING RINGS					
Pos	Description	Dims.	Item ref.	Qty	Remarks
A	GASKET	48x 58x 3	0906048	1	
B	GASKET	67x 81x 3	0906067	1	
C	GASKET	84x 98x 3	0906084	1	
D	GASKET	98x 112x 3	0906098	1	
E	GASKET	117x 131x 3	0906117	1	

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STANDARD SETS OF PARTS, SEALS AND TOOLS

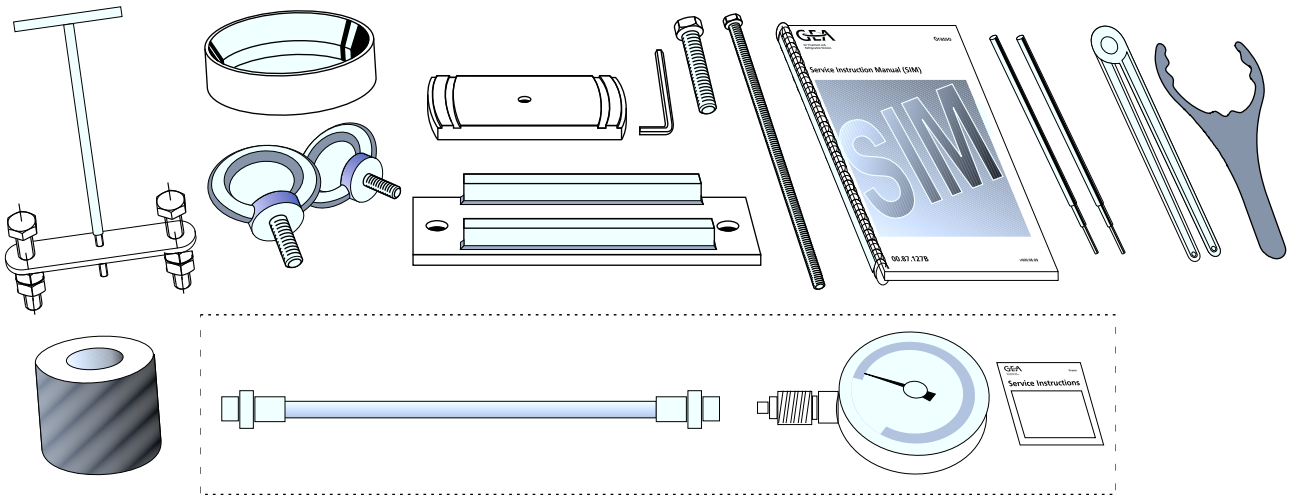


Fig. 16 SET OF TOOLS

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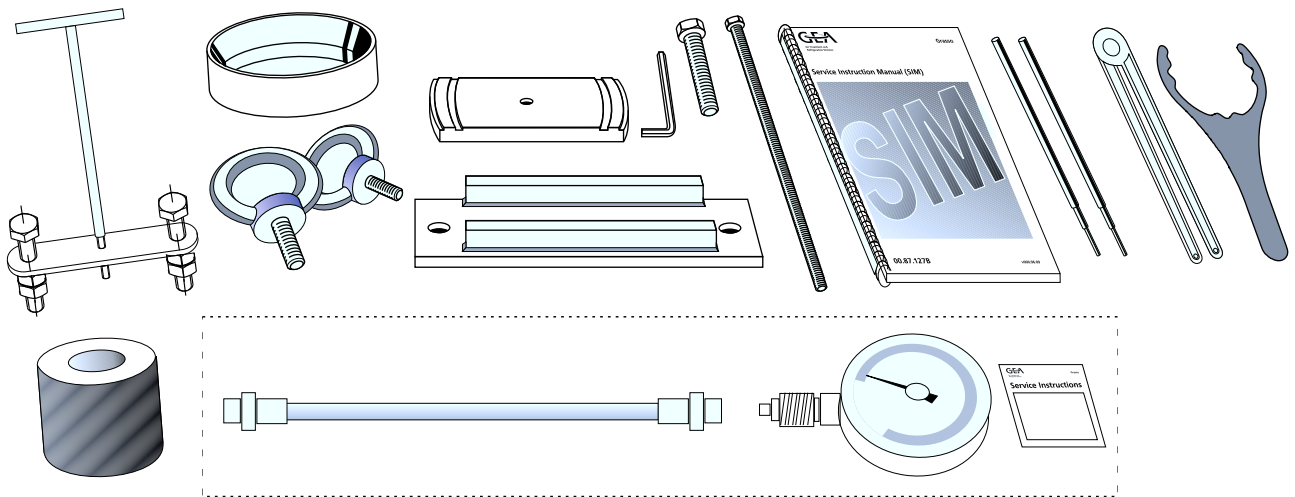
STANDARD SETS OF PARTS, SEALS AND TOOLS					
Pos	Description	Dims.	Item ref.	Qty	Remarks
A	BASIC GASKET AND O-RING SET		2090220	1	
B	GASKET/O-RING SET FOR 2-CYLINDER HEAD COVER		2090225		
C	GASKET/O-RING SET FOR 3-CYLINDER HEAD COVER		2090230		
D	SUCTION VALVE SPRINGS/RINGS REPLACEMENT SET FOR 1-CYLINDER	"L"-VALVE DESIGN	2090250		
E	SUCTION VALVE SPRINGS/RINGS REPLACEMENT SET FOR 1-CYLINDER	"H"-VALVE DESIGN	2090255		
F	DISCHARGE SINUSOIDAL SPRINGS/RINGS SET FOR 1-CYLINDER	"H"-VALVE DESIGN	2090245		
G	DISCHARGE SINUSOIDAL SPRINGS/RINGS SET FOR 1-CYLINDER	"L"-VALVE DESIGN	2090240		
H	SHAFT SEAL REPLACEMENT SET	60/61.5	2090235	1	
K	SET OF TOOLS Gr10	Gr10	2090215	1	
L	SERVICE INSTRUCTION MANUAL	SIM 10 GB	9990217	1	

## SURVEY OF TORQUES FOR BOLTS AND NUTS GRASSO 10

Item	Threaded connection	Thread size	Torque in N.m. <sup>1</sup>	Remarks
1	Bearing cover nuts (both sides)	M16	120	
2	Coupling bearing cover on pump side	M12	80	
3	Shaft seal housing nuts	M12	80	
4.1	Oil pump housing bolts	M12	80	
4.2	Pump element bolts	M6	7	
5	Connecting rod bolts	MF12	34 - 44	
6	Valve-lifting housing bolts	M8	17.5	
7	Coupling of the control line valve-lifting housing	G1/8"	-	tightened
8	Discharge valve (centre bolt)	M16	120	
9	Cylinder head nuts	M16	140	
10	Cylinder liner tie bolt - nut	M12	80	
11	Sight glass flange bolts	M6	7	
12	Crankcase side cover bolts	M16	120	
13	Pressure relief valve cover bolts	M12	80	
14	Pressure relief valve assembly mounting bolts	M12	80	
15	Oil discharge filter bolts	M10	35	
16	Oil suction filter bolts	M10	35	
17	Suction filter housing bolts 2, 3 and 4 cyl. compressor	M16	120	
18	Suction filter housing bolts 6, 9 and 12 cyl. compressor	M12	80	
19	Bearing block bolts	M12	80	
20	Intermediate bearing block bolts	M16	120	

1 1 N.m = 0,102 kgf.m = 0,738 lbf.ft

**PARTS COMPRESSOR**  
**SURVEY OF**  
**TORQUES FOR BOLTS**  
**AND NUTS GRASSO**  
**STANDARD SETS OF PARTS, SEALS AND TOOLS**



**Fig. 16 SET OF TOOLS**

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Item	Threaded connection	Thread size	Torque in N.m. <sup>1</sup>	Remarks
21	Counterweight bolts	M16	120	
22	Crankshaft spacer ring bolts	M10	35	
23	Standard and heavy duty thrust bearing (pressure piece) socket head screws	M8	23	
24	Shaft seal (locking) screws	M4	19	
25	Socket head screw of disc/lever	M10	35	
26	Sealing plug	G1/4"		tightened
27	Sealing plug	G1/2"		tightened
28	Hand nut suction/discharge filter	M90X3		handtight
29	Threaded rod auxiliary tool	M12		--
30	Lubricating oil pressure regulator - hexagon	M27		tightened
31	Control oil pressure regulator - hexagon	M27		tightened
32	Crankshaft sealing plugs	M10		centre punch
33	Non-return valve in cylinder liner collar	G1/4"		tightened
34	Tapered plug in cylinder liner collar	G1/4"		tightened
35	Push bolt from auxiliary tools	M12		tightened
36	Pulley puller for shaft seal	M8		
37	Foundation bolts	M20		tightened
38	Drive coupling bolts			see service instruction
39	Hub securing bolts (4x)	M12		tightened
40	Hub securing (centre) bolt	M16	120	
41	Shaft seal - Crankshaft	M5	4 - 5	
42	Bolts cam ring valve lifting mechanism	M 5	5	Refer

**2 PARTS SUPPLEMENTARY**

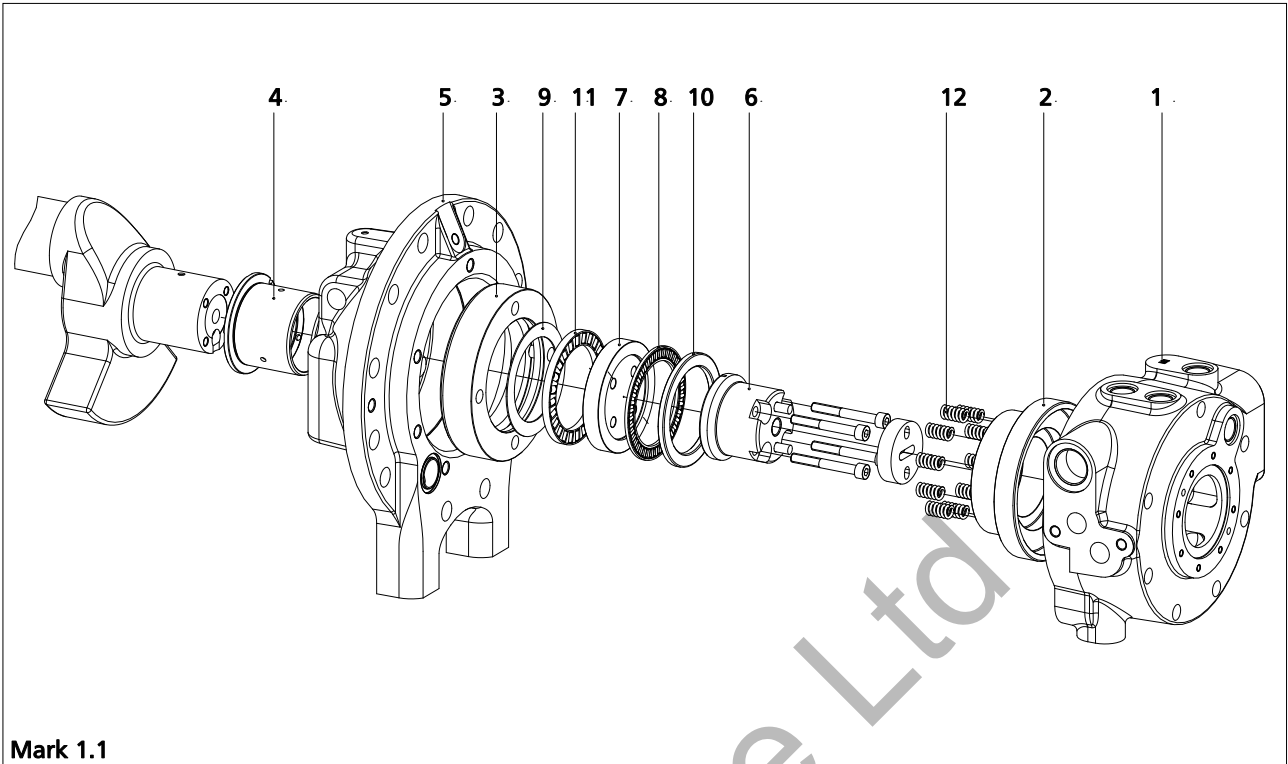
**2.1 ...**

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Thrust Bearing Mark 1



Mark 1.1

Fig. 17 Thrust Bearing Mark 1

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Thrust Bearing Mark 1					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	OIL PUMP HOUSING	Mark 1	2638521	1	For Mark 1 design For use with heavy duty thrust bearing
2	SPRING RETAINER	140x 70x 52.5 MARK1	2790400	1	
3	HOUSING RING	151x 100x 32.5	0938100	1	
4	BEARING BUSH	65x 72x 61 MARK 1	1146061	1	
5	BEARING COVER	RC10 Mark 1	2190003	1	
6	CARRIER DISC	75x 65xx 55.5 S	1125164	1	
7	SHAFT WASHER	98x 65x 75x 15.5	1138075	1	
8	NEEDLE THRUST BEARING	RC10	1148003	1	Mark 1
9	THRUST WASHER	RC10	1148005	1	Mark 1
10	HOUSING WASHER	RC10	1148007	1	Mark 1
11	CYLINDRICAL ROLLER THRUST BEARING	RC10	1148009	1	Mark 1
12	DIE SPRING		1135226	10	
X	SET OF SPARE PARTS THRUST BEARING MARK 1	Gr10	2090104		Mark 1.1 for 4 cylinders Recondition kit
Y	COMPLETE SET THRUST BEARING MARK 1.	Gr10	2090105		Mark 1 for 2 cylinders Conversion kit, includes 2090104

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Compressor housing Mark 1.1

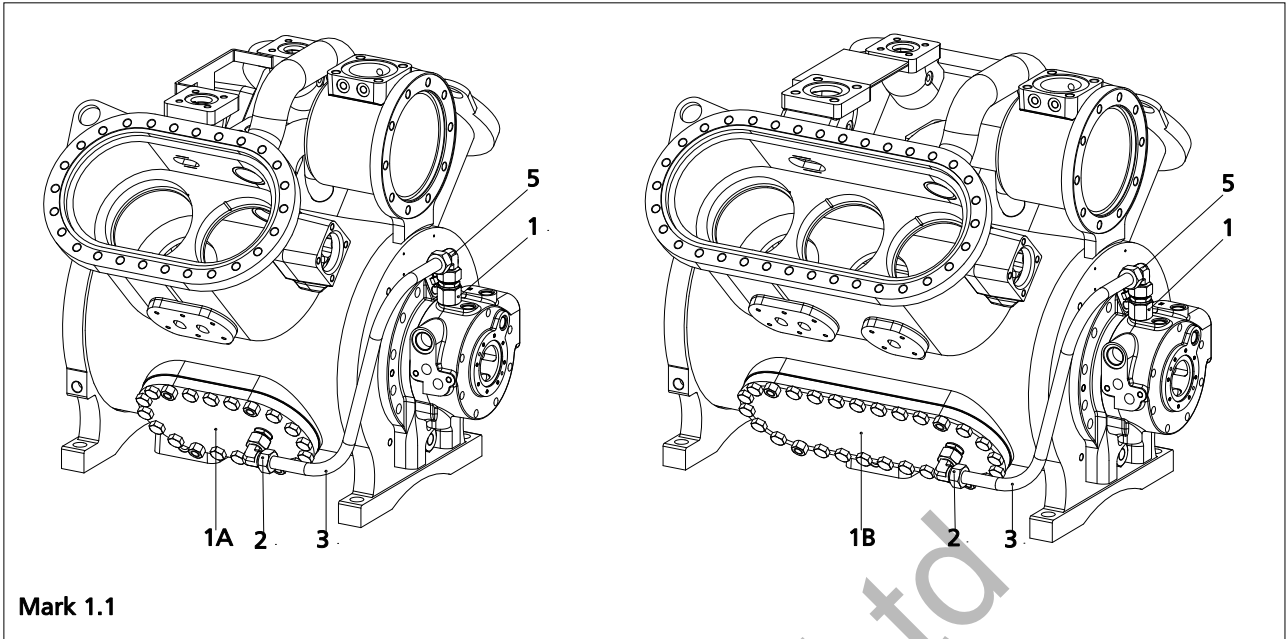


Fig. 18 Compressor housing Mark 1.1

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Compressor housing Mark 1.1					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1A	SERVICE COVER	RC10-2 S	0530203	1	Mark 1
1B	SERVICE COVER	RC10-3 S	0530204	1	Mark 1
2	STUD ELBOW	22x G27	0341322	2	
3	PIPE STEEL	22x 2	6105022		
4	SOCKET NIPPLE	G21x G27	0302229	1	
5	SWIVEL COUPLING 6G10	6G10	0339106	1	

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DISCHARGE VALVE 1800 RPM

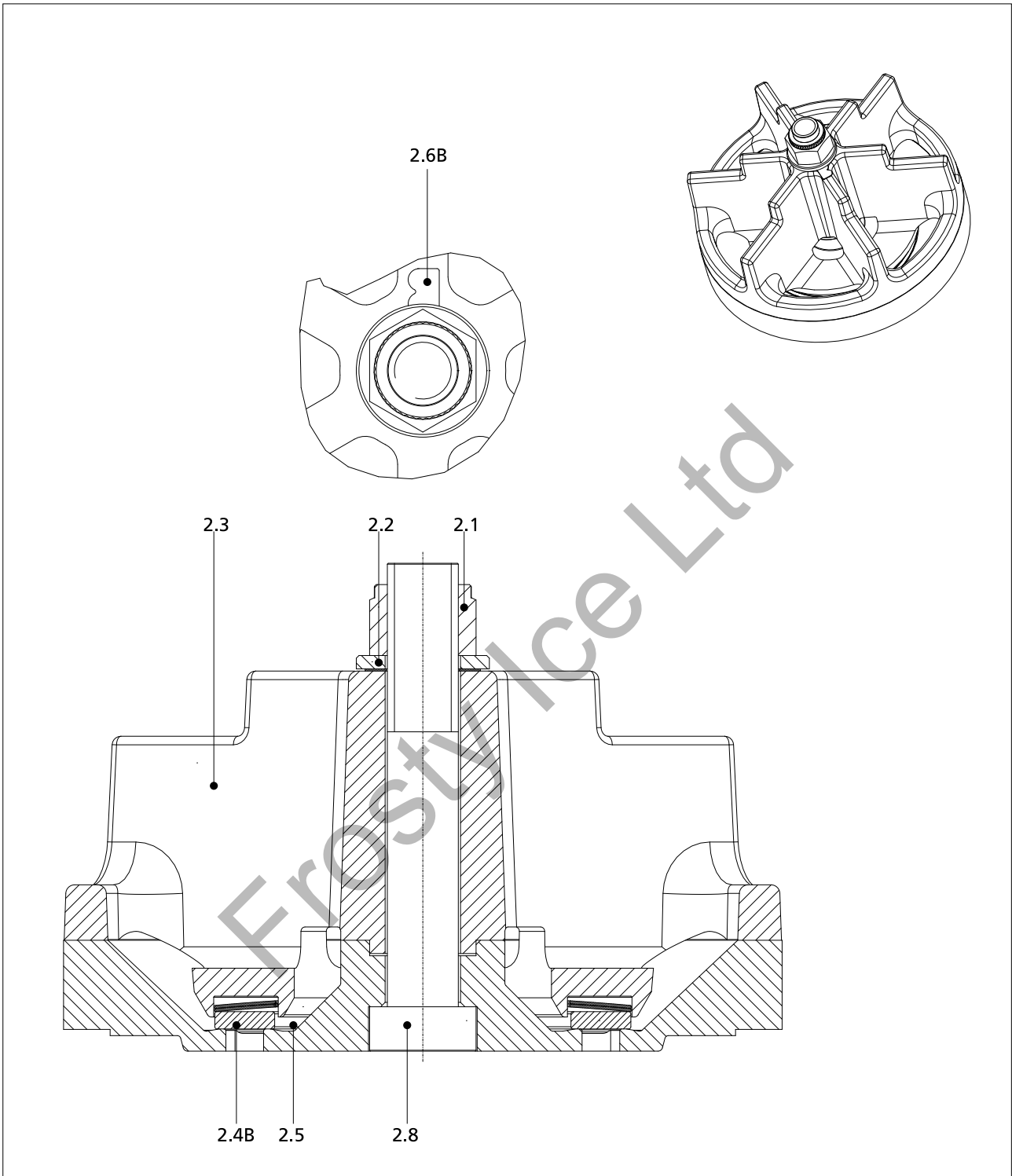


Fig. 19 DISCHARGE VALVE 1800 RPM

DISCHARGE VALVE 1800 RPM					
Pos	Description	Dims.	Item ref.	Qty	Remarks
2A	DISCHARGE VALVE ASSY	Gr10 TYPE L C	2791126	1	
2B	DISCHARGE VALVE ASSY	Gr10 TYPE L B	2791124	1	
2.1	LOCKING NUT	M16	0145800	1	
2.2	FLAT WASHER	M16	1113801	1	
2.3	STROKE LIMITOR, DISCHARGE VALVE	Gr10 TYPE L	2790100	1	
2.4A	DISCHARGE SINUSOIDAL SPRINGS/RINGS SET FOR 1-CYLINDER	'L'-VALVE DESIGN	2090240	1	
2.4B	DISCHARGE SINUSOIDAL SPRINGS/RINGS SET FOR 1-CYLINDER	'H'-VALVE DESIGN	2090245	1	
2.5	VALVE SEAT	type L	2790314	1	
2.6A	RING C	M16	1133405	1	
2.6B	RING B	M16	1133403	1	
2.7	RING	Gr10 C	1134502	1	
2.8	SOCKET HEAD SCREW	M16x 100	0104811	1	

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**3 PARTS HISTORY**

**3.1 ...**

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COMPRESSOR HOUSING WITH CONNCTIONS AND MAIN COMPONENTS ( up to serial nr. 01041303 )

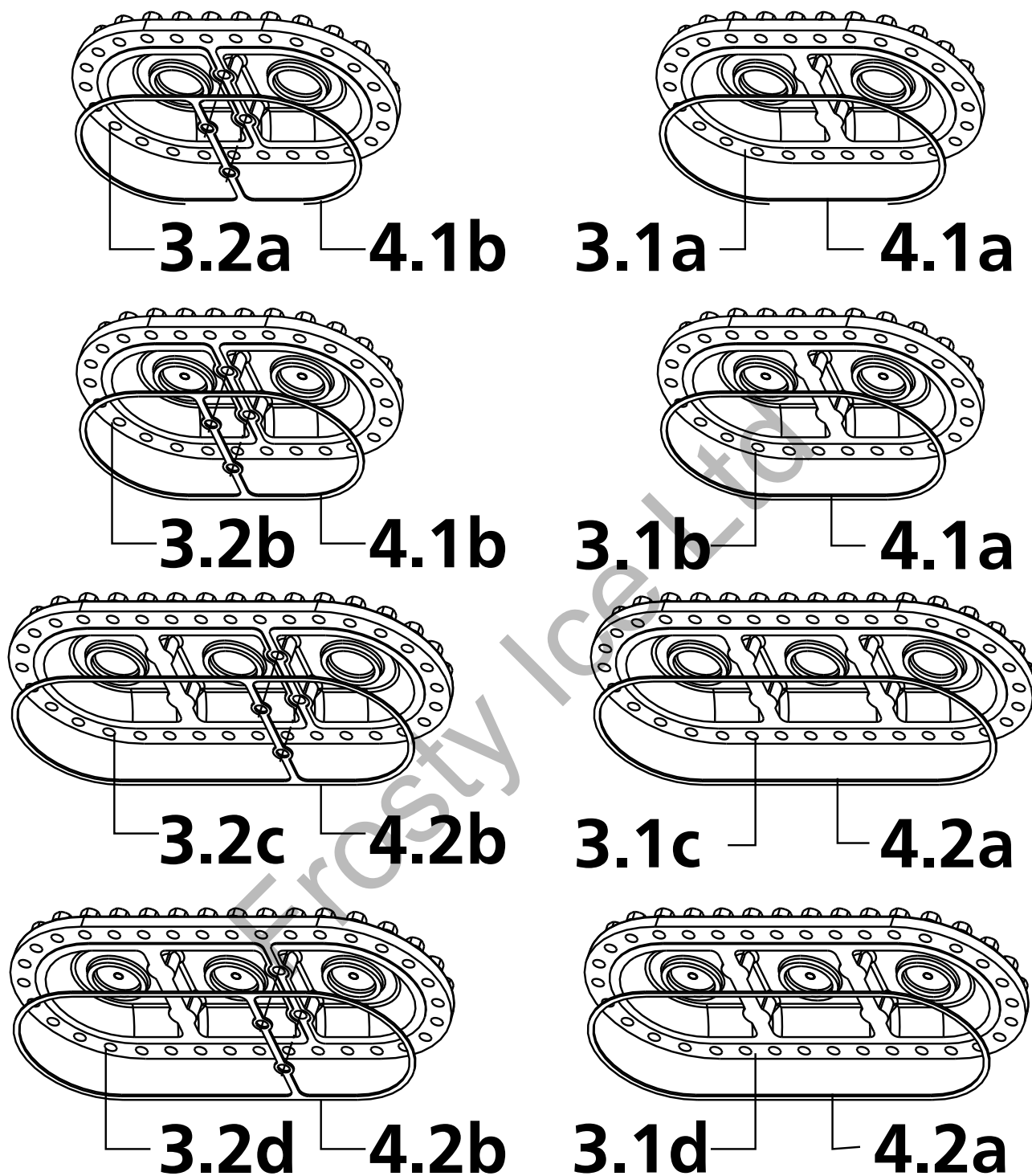


Fig. 20 COMPRESSOR HOUSING WITH CONNCTIONS AND MAIN COMPONENTS ( up to serial nr. 01041303 )

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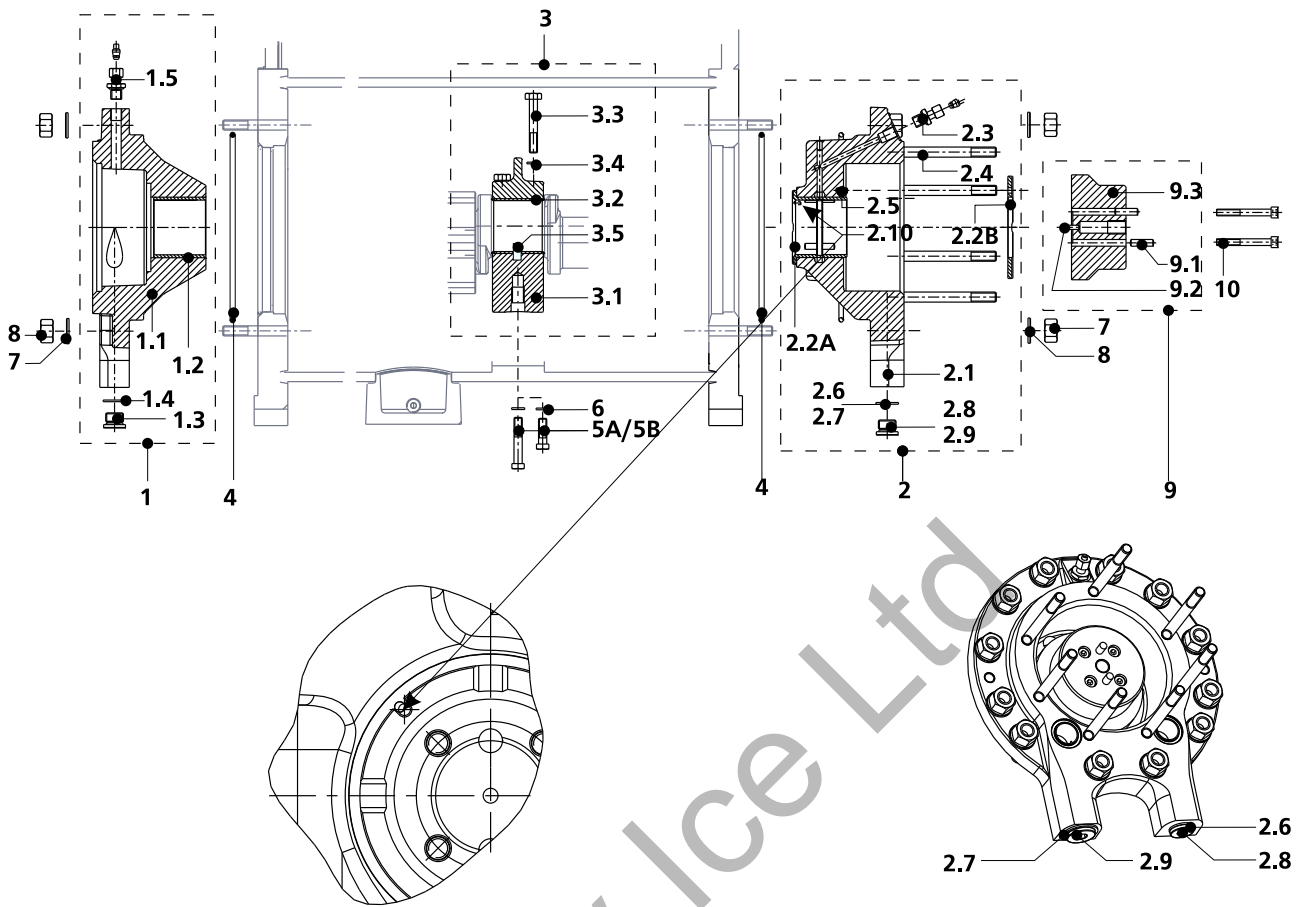
COMPRESSOR HOUSING WITH CONNCTIONS AND MAIN COMPONENTS ( up to serial nr. 01041303 )					
Pos	Description	Dims.	Item ref.	Qty	Remarks
4.1a	GASKET	Gr10-LP	0907240		
4.1b	GASKET	Gr10-HP	0907245		
4.2a	GASKET	Gr10-LP	0907250		
4.2b	GASKET	Gr10-HP	0907255		

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**BEARING COVERS AND INTERMEDIATE BEARINGS ( up to serial nr. 03071440 )**



**Fig. 21 BEARING COVERS AND INTERMEDIATE BEARINGS ( up to serial nr. 03071440 )**

BEARING COVERS AND INTERMEDIATE BEARINGS ( up to serial nr. 03071440 )					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1	BEARING COVER ASSY	Gr10 AZ	*		
1.1	BEARING COVER	AZ Gr10	2190005		
1.2	BEARING BUSH	65x 72x 62	1146762		
1.3	PLUG	G21-BZK	0365821		
1.4	ALU SEALING RING	21x 27x 2	0914023		Possibly to be replaced by 0941020
1.5	NIPPLE COUPLING	6G13	0338136		
2	BEARING COVER ASSY	Gr10 PZ	*		
2.1	BEARING COVER ASSY	PZ - VM	2190000		
2.2	BEARING BUSH SET		2090210		
2.3	NIPPLE COUPLING	6G13	0338136		
2.4	STUD	M12x 110	0151610	7	
2.5	DOWEL PIN	6x 12	1106612		
2.6	ALU SEALING RING	21x 27x 2	0914023		Possibly to be replaced by 0941020
2.7	ALU SEALING RING	27x 34x 2	0914027		ex. 09.12.027
2.8	PLUG	G21-BZK	0365821		
2.9	PLUG	G27	0365827		
2.10	DOWEL PIN	4x 8	1106408		
2.2A	BEARING BUSH	65x 72x 65	*		
2.2B	THRUST RING	Gr10	*		
3	BEARING BLOCK SET	Gr10	2090310		
3.1	BEARING BLOCK HALVES		*		
3.2	BEARING SHELL	65x 60N AL	1144666		
3.3	HEXAGON HEAD BOLT	M12x 80	0110680	4	
3.4	LOCKING RING SET	13-ST- G.V.	1139600	4	in two pieces
3.5	DOWEL PIN	12x 26	1106226	2	
4	O-RING	5.33x 215.27	0952550		
5A	HEXAGON HEAD BOLT	M16x 90	0110890		
5B	HEXAGON HEAD BOLT	M16x 50	0110850		
6	LOCKING RING SET	M16/13- ST-G.V.	1139800		in two pieces
7	FLAT WASHER	M16	1113801	12	
8	HEXAGON NUT	M16	0115810	12	
9	HOLD DOWN DISC SET	Gr10-25	2090320		
9.1	DOWEL PIN	5x 20	1106520		
9.2	DOWEL PIN	8x 28	1106828	2	
9.3	CARRIER DISC	125	1125125		
10	ALLEN HEAD SCREW	M8x 65	0104465	4	

CAPACITY CONTROL MECHANISM ( up to 01051364 )

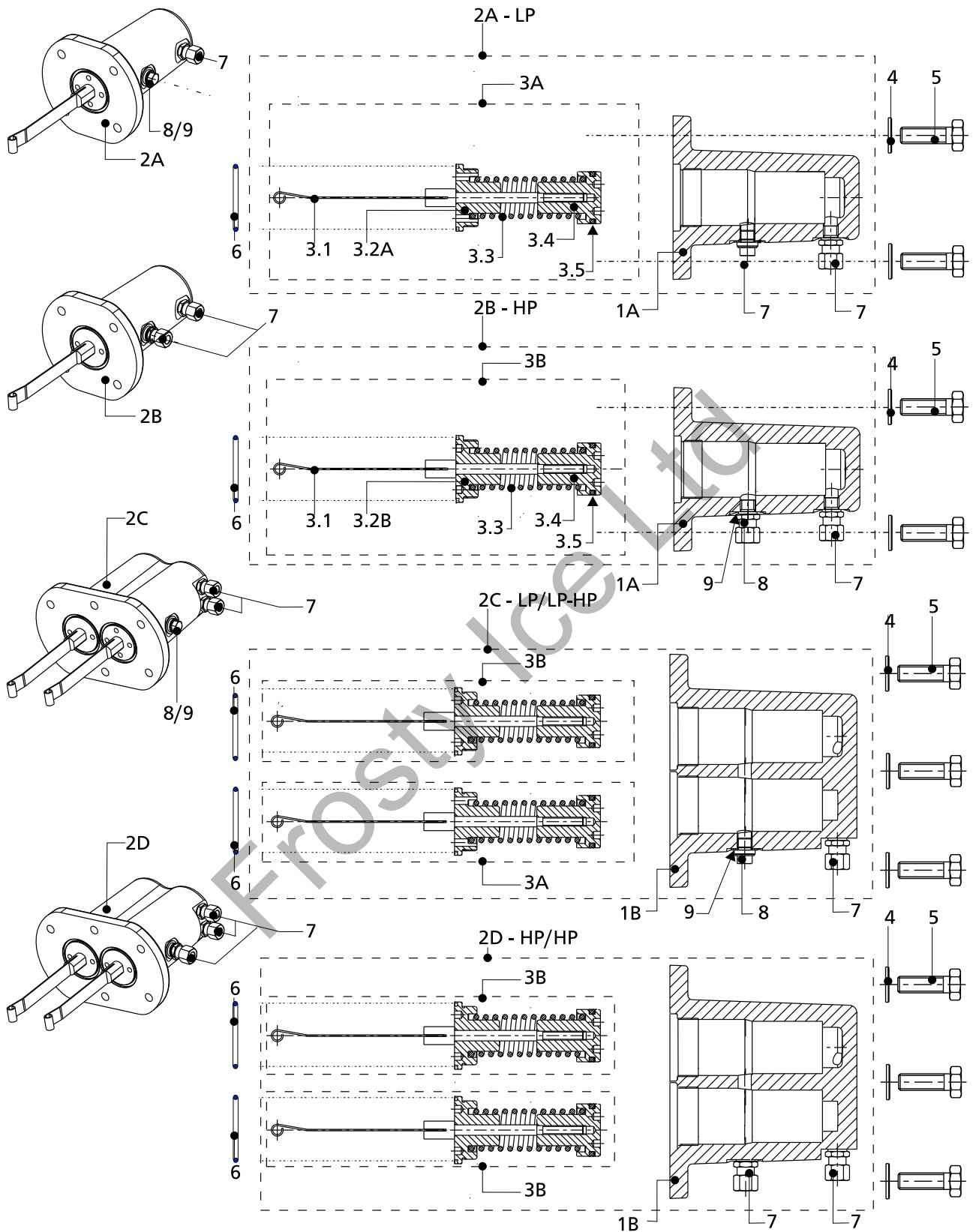


Fig. 22 CAPACITY CONTROL MECHANISM ( up to 01051364 )

CAPACITY CONTROL MECHANISM ( up to 01051364 )					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1A	VALVE LIFTING HOUSING	single housing	2790205		
1B	VALVE LIFTING HOUSING	double housing	2790210		
2A	VALVE LIFTING MECHANISM	Gr10 TYPE LP	*		
2B	VALVE LIFTING MECHANISM	Gr10 TYPE HP	*		
2C	VALVE LIFTING MECHANISM	Gr10 TYPE LP/LP-HP	*		
2D	VALVE LIFTING MECHANISM	Gr10 TYPE HP/HP	*		
3.1	PUSH HANDLE 7, VALVE LIFTING	Gr10	2791007		
3.2A	SHAFT GUIDE	M39x 1.5x 4D	2690740		
3.2B	SHAFT GUIDE	M39x 1.5x 2B	2690720		
3.3	PRESSURE SPRING	3.2x 25x 12.5x 135	1131313		
3.4	CONTROL PISTON	35x 42	2690035		
3.5	QUAD RING	3.53x 28.17	0952328		
3A	SET OF CONTROL MECHANISM PARTS	type LP	2090265		
3B	SET OF CONTROL MECHANISM PARTS	type HP	2090260		
4	FLAT WASHER	M8	1113401		
5	HEXAGON HEAD BOLT	M8x 25	0110425		
6	O-RING	2.62x 40.95	0952289		
7	NIPPLE COUPLING	8G10	0338108		
8	PLUG	G10B	0136108		
9	ALU SEALING RING	10x 18x 1	0912010		

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OIL PUMP ( up to serial number 06081431 )

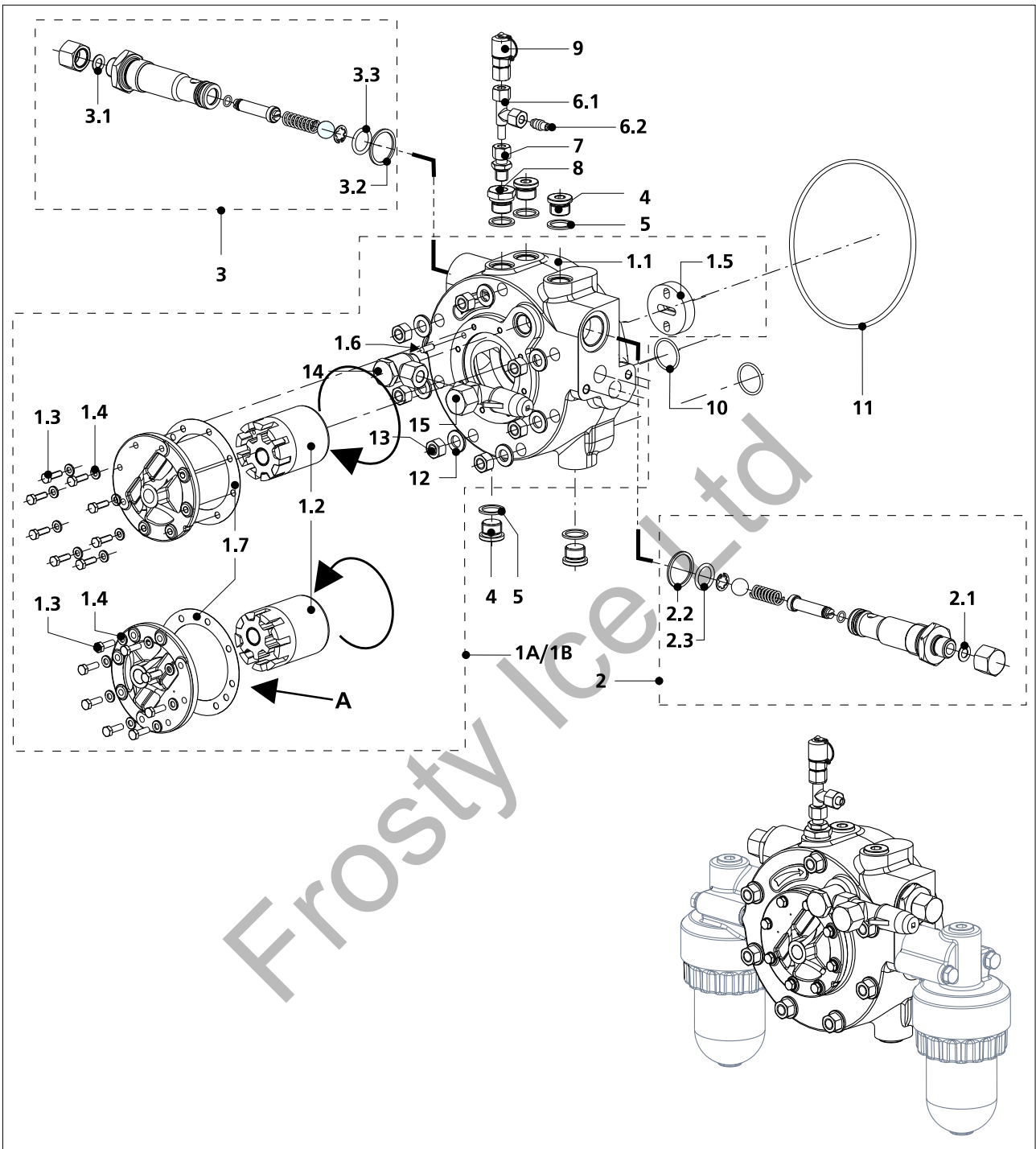


Fig. 23 OIL PUMP ( up to serial number 06081431 )

OIL PUMP ( up to serial number 06081431 )					
Pos	Description	Dims.	Item ref.	Qty	Remarks
1A	OIL PUMP ASSY	Gr10	2090295		
1B	OIL PUMP ASSY	Gr10	2090294		
1.1	OIL PUMP HOUSING	Gr12	2638520		
1.2	PUMP ELEMENT	Gr12	2638140		
1.3	HEXAGON HEAD BOLT	M6x 20	0110320	8	
1.4	WASHER	M6	1113301	8	
1.5	CARRIER DISC	55x 8	1125006		
1.6	DOWEL PIN	6x 18x 3	1106617		
1.7	GASKET	83x 115x 0.5	0903083		
2	CONTROL OIL PRESSURE REGULATOR SET		2038120		
2.1	ALU SEALING RING	10x 18x 1	0912010		
2.2	ALU SEALING RING	33x 39x 2	0914033		
2.3	O-RING	3.53x 21.8	0955212		
3	LUBRICATION OIL PRESSURE REGULATOR SET		2038118		
3.1	ALU SEALING RING	10x 18x 1	0912010		
3.2	ALU SEALING RING	33x 39x 2	0914033		
3.3	O-RING	3.53x 21.8	0955212		
4	PLUG	G21-BZK	0365821	5	
5	ALU SEALING RING	21x 27x 2	0914023	5	Possibly to be replaced by 0941020
6.1	T-COUPLING	8x 8x 8	0340408		
6.2	SOLID CLAMPING SLEEVE INCL. O-RING	P8	0334598		
7	NIPPLE COUPLING	8G13	0338138		
8	SOCKET NIPPLE	G13x G21	0302213		
9	MEASURING COUPLING	8 mm	0645608		
10	O-RING	2.62x 29.82	0952230	2	
11	O-RING	3.53x 145	0955257		
12	FLAT WASHER	M12	1113601	7	
13	HEXAGON NUT	M12	0115610	7	
14	SWIVEL COUPLING	12G21	0339212		
15	STOP VALVE	TAH8-12	0607011		

## We live our values.

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GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 Index.

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