



VERTICAL MULTI-STAGE PUMPS

VR 1 - 3 - 6 - 10 - 15 - 20 - 30 - 45 - 65 - 95

50 Hz - 60 Hz



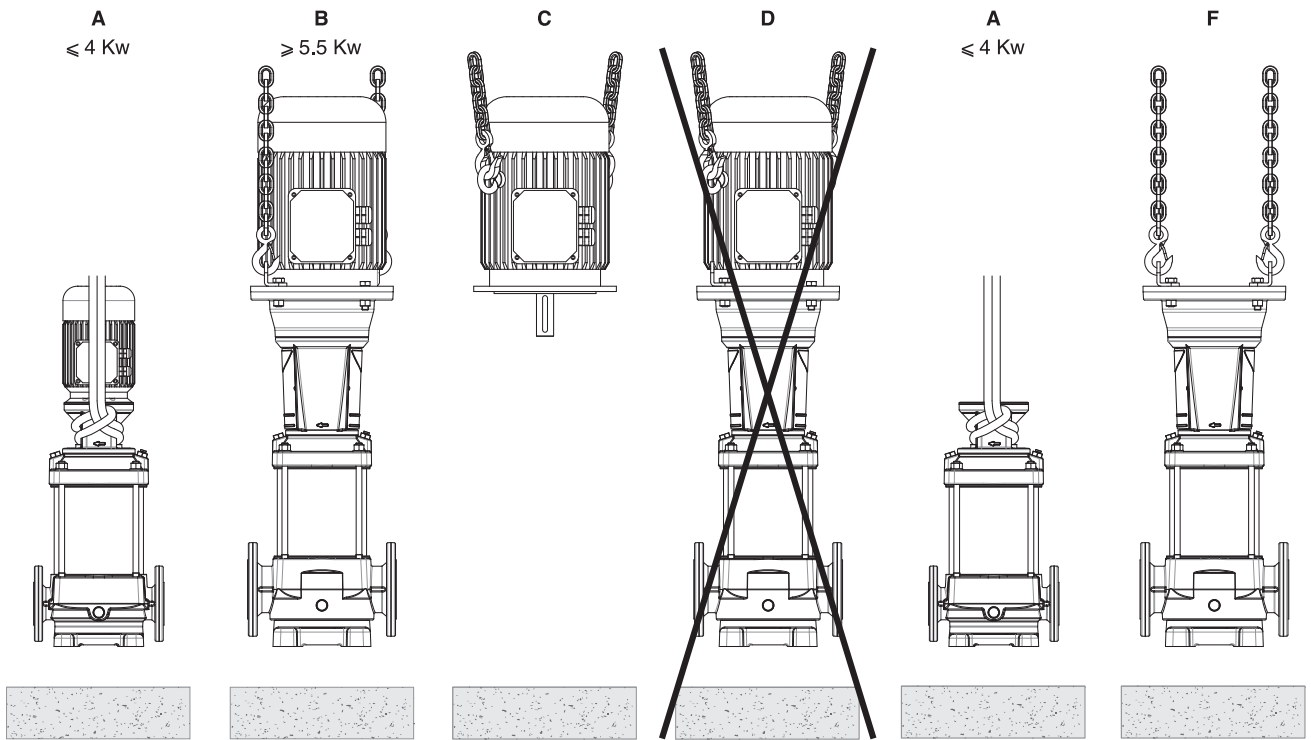
Operating and installation manual



Franklin Electric



Fig.1



00102478 11/2013

VERTICAL MULTI-STAGE PUMPS

50 Hz

VR 6

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 6/2	0,37	71	20	15	5,8	20,8
VR 6/3	0,37	71	20	15,5	5,8	21,3
VR 6/4	0,55	71	20	16	6,2	22,2
VR 6/5	0,75	80	20	16,5	9,5	26
VR 6/6	0,75	80	20	17,5	9,5	27
VR 6/7	1,1	80	20	18	11,1	29,1
VR 6/8	1,1	80	20	18,5	11,1	29,6
VR 6/9	1,1	80	20	19	11,1	30,1
VR 6/10	1,5	90	20	20	14	34
VR 6/11	1,5	90	20	20,5	14	34,5
VR 6/12	1,5	90	20	21	14	35
VR 6/13	1,5	90	20	21,5	14	35,5
VR 6/14	2,2	90	20	22	16	38
VR 6/15	2,2	90	20	22,5	16	38,5
VR 6/16	2,2	90	20	23	16	39
VR 6/17	2,2	90	20	23,5	16	39,5
VR 6/18	2,2	90	20	24	16	40
VR 6/19	2,2	90	20	24,5	16	40,5
VR 6/20	3	100	20	25,5	22,8	48,3
VR 6/21	3	100	20	26	22,8	48,8
VR 6/23	3	100	20	27	22,8	49,8
VR 6/25	3	100	20	28,5	22,8	51,3
VR 6/28	4	112	20	30	26,5	56,5
VR 6/30	4	112	20	31	26,5	57,5
VR 6/33	4	112	20	32,5	26,5	59
VR 6/36	5,5	132	20	53,5	33,6	87,1

60 Hz

VR 6

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 6/2	0,55	71	20	15	6,2	21,2
VR 6/3	0,75	80	20	15,5	9,5	25
VR 6/4	1,1	80	20	16	11,1	27,1
VR 6/5	1,1	80	20	16,5	11,1	27,6
VR 6/6	1,5	90	20	17,5	14	31,5
VR 6/7	1,5	90	20	18,5	14	32,5
VR 6/8	2,2	90	20	19	16	35
VR 6/9	2,2	90	20	19,5	16	35,5
VR 6/10	2,2	90	20	20	16	36
VR 6/11	3	100	20	21	22,8	43,8
VR 6/12	3	100	20	21,5	22,8	44,3
VR 6/13	3	100	20	22	22,8	44,8
VR 6/14	3	100	20	22,5	22,8	45,3
VR 6/15	4	112	20	23	26,5	49,5
VR 6/16	4	112	20	23,5	26,5	50
VR 6/17	4	112	20	24	26,5	50,5
VR 6/18	4	112	20	24,5	26,5	51
VR 6/19	5,5	132	20	44,5	33,6	78,1
VR 6/20	5,5	132	20	45	33,6	78,6
VR 6/21	5,5	132	20	45,5	33,6	79,1
VR 6/23	5,5	132	20	46,5	33,6	80,1

50 Hz

VR 10

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 10/2	0,75	80	20	17,5	9,5	27
VR 10/3	1,1	80	20	18	11,1	29,1
VR 10/4	1,5	90	20	19,5	14	33,5
VR 10/5	1,5	90	20	20	14	34
VR 10/6	2,2	90	20	20,5	16	36,5
VR 10/7	2,2	90	20	21	16	37
VR 10/8	3	100	20	22,5	22,8	45,3
VR 10/9	3	100	20	23	22,8	45,8
VR 10/10	4	112	20	24	26,5	50,5
VR 10/11	4	112	20	24,5	26,5	51
VR 10/12	4	112	20	25	26,5	51,5
VR 10/13	4	112	20	26	26,5	52,5
VR 10/15	5,5	132	20	46,5	33,6	80,1
VR 10/17	5,5	132	20	48	33,6	81,6
VR 10/19	7,5	132	20	49	36	85
VR 10/21	7,5	132	20	50,5	36	86,5
VR 10/23	7,5	132	20	52	36	88
VR 10/24	11	160	20	55	62	117

60 Hz

VR 10

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 10/2	1,1	80	20	17,5	11,1	28,6
VR 10/3	2,2	90	20	18,5	16	34,5
VR 10/4	2,2	90	20	19,5	16	35,5
VR 10/5	3	100	20	20,5	22,8	43,3
VR 10/6	4	112	20	21	26,5	47,5
VR 10/7	4	112	20	22	26,5	48,5
VR 10/8	5,5	132	20	42	33,6	75,6
VR 10/9	5,5	132	20	42,5	33,6	76,1
VR 10/10	5,5	132	20	43,5	33,6	77,1
VR 10/11	7,5	132	20	44	36	80
VR 10/12	7,5	132	20	44,5	36	80,5
VR 10/13	7,5	132	20	45,5	36	81,5
VR 10/15	11	160	20	49	62	111
VR 10/17	11	160	20	50,5	62	112,5

50 Hz

VR 15

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 15/1	1,1	80	20	23,5	12,0	35,5
VR 15/2	2,2	90	20	25	16	41
VR 15/3	3	100	20	27	18,7	45,7
VR 15/4	4	112	20	28,5	22,8	51,3
VR 15/5	4	112	20	30	22,8	52,8
VR 15/6	5,5	132	20	52	34	86
VR 15/7	5,5	132	20	53	34	87
VR 15/8	7,5	132	20	54,5	36	90,5
VR 15/9	7,5	132	20	56	36	92
VR 15/10	11	160	20	60	58	118
VR 15/11	11	160	20	61,5	58	119,5
VR 15/12	11	160	20	63	58	121
VR 15/13	11	160	20	64,5	58	122,5
VR 15/14	11	160	20	66	58	124
VR 15/15	15	160	20	67	64	131
VR 15/16	15	160	20	68,5	64	132,5
VR 15/17	15	160	20	70	64	134

60 Hz

VR 15

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 15/1	1,5	90	20	24	14	38,0
VR 15/2	3	100	20	26	18	44
VR 15/3	4	112	20	27	22,8	49,8
VR 15/4	5,5	132	20	49	34	83
VR 15/5	7,5	132	20	50,5	36	86,5
VR 15/6	11	160	20	54,5	58	112,5
VR 15/7	11	160	20	56	58	114
VR 15/8	11	160	20	57,5	58	115,5
VR 15/9	15	160	20	59	64	123
VR 15/10	15	160	20	60,5	64	124,5
VR 15/11	15	160	20	61,5	64	125,5
VR 15/12	18,5	160	20	63	98	161

50 Hz

VR 45

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 45/1-1A	3	100	20	55	18,7	73,7
VR 45/1	4	112	20	55	22,8	77,8
VR 45/2-2A	5,5	132	20	79	34	113
VR 45/2	7,5	132	20	79	36	115
VR 45/3-2A	11	160	20	86	58	144
VR 45/3	11	160	20	86	58	144
VR 45/4-2A	15	160	8	90	64	154
VR 45/4	15	160	11	90	64	154
VR 45/5-2A	18,5	160	11	94	88,9	182,9
VR 45/5	18,5	160	14	94	88,9	182,9
VR 45/6-2A	22	180	14	98,5	108,7	207,2
VR 45/6	22	180	17	98,5	108,7	207,2
VR 45/7-2A	30	200	17	105,5	228	333,5
VR 45/7	30	200	20	105,5	228	333,5
VR 45/8-2A	30	200	20	109,5	228	337,5
VR 45/8	30	200	20	109,5	228	337,5
VR 45/9-2A	37	200	20	113,5	242	355,5
VR 45/9	37	200	20	113,5	242	355,5
VR 45/10-2A	37	200	20	117,5	242	359,5
VR 45/10	37	200	20	117,5	242	359,5
VR 45/11-2A	45	225	20	124,5	308	432,5
VR 45/11	45	225	20	124,5	308	432,5
VR 45/12-2A	45	225	20	128,5	308	436,5
VR 45/12	45	225	20	128,5	308	436,5
VR 45/13-2A	45	225	20	132,5	308	440,5

50 Hz

VR 65

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 65/1-1A	4	112	20	61	22,8	83,8
VR 65/1	5,5	132	20	81	34	115
VR 65/2-2A	7,5	132	20	85,5	36	121,5
VR 65/2-1A	11	160	20	88,5	58	146,5
VR 65/2	11	160	20	88,5	58	146,5
VR 65/3-2A	15	160	20	93	64	157
VR 65/3-1A	15	160	20	93	64	157
VR 65/3	18,5	160	20	93	88,9	181,9
VR 65/4-2A	18,5	160	20	97,5	88,9	186,4
VR 65/4-1A	22	180	20	98	108,7	206,7
VR 65/4	22	180	20	98	108,7	206,7
VR 65/5-2A	30	200	20	105,5	228	333,5
VR 65/5-1A	30	200	20	105,5	228	333,5
VR 65/5	30	200	20	105,5	228	333,5
VR 65/6-2A	30	200	20	110	228	338
VR 65/6-1A	37	200	20	110	242	352
VR 65/6	37	200	20	110	242	352
VR 65/7-2A	37	200	20	114,5	242	356,5
VR 65/7-1A	37	200	20	114,5	242	356,5
VR 65/7	45	225	20	117,5	308	425,5
VR 65/8-2A	45	225	20	122	308	430
VR 65/8-1A	45	225	20	122	308	430
VR 65/8	45	225	20	122	308	430

50 Hz

VR 95

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 95/1-1A	5,5	132	20	82,5	34	116,5
VR 95/1	7,5	132	20	82,5	36	118,5
VR 95/2-2A	11	160	20	89	58	147
VR 95/2	15	160	20	89	64	153
VR 95/3-2A	18,5	160	20	93	88,9	181,9
VR 95/3	22	180	20	93	108,7	201,7
VR 95/4-2A	30	200	20	100	228	328
VR 95/4	30	200	20	100	228	328
VR 95/5-2A	37	200	20	104	242	346
VR 95/5	37	200	20	104	242	346
VR 95/6-2A	45	225	20	110,5	308	418,5
VR 95/6	45	225	20	110,5	308	418,5

VR 45

60 Hz

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 45/1-1A	5,5	132	20	75	34	109
VR 45/1	7,5	132	20	75	36	111
VR 45/2-2A	11	160	20	82	58	140
VR 45/2-1A	11	160	20	82	58	140
VR 45/2	15	160	7	82	64	146
VR 45/3-2A	18,5	160	7	86	98	184
VR 45/3-1A	18,5	160	9	86	98	184
VR 45/3	18,5	160	11	86	98	184
VR 45/4-2A	22	180	11	90,5	109	199,5
VR 45/4-1A	30	200	14	93,5	228	321,5
VR 45/4	30	200	16	93,5	228	321,5
VR 45/5-2A	30	200	16	97,5	228	325,5
VR 45/5-1A	30	200	18	97,5	228	325,5
VR 45/5	37	200	20	97,5	242	339,5
VR 45/6-2A	37	200	20	101,5	242	343,5
VR 45/6-1A	37	200	20	101,5	242	343,5
VR 45/6	37	200	20	101,5	242	343,5
VR 45/7-2A	45	225	20	108,5	308	416,5
VR 45/7-1A	45	225	20	108,5	308	416,5
VR 45/7	45	225	20	108,5	308	416,5

VR 65

60 Hz

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 65/1-1A	7,5	132	20	81	36	117
VR 65/1	11	160	20	84	58	142
VR 65/2-2A	15	160	18	88,5	64	152,5
VR 65/2-1A	18,5	160	20	88,5	98	186,5
VR 65/2	22	180	20	89	109	198
VR 65/3-2A	22	180	20	93,5	109	202,5
VR 65/3-1A	30	200	20	96,5	228	324,5
VR 65/3	30	200	20	96,5	228	324,5
VR 65/4-2A	37	200	20	101	242	343
VR 65/4-1A	37	200	20	101	242	343
VR 65/4	45	225	20	104	308	412
VR 65/5-2A	45	225	20	108,5	308	416,5
VR 65/5-1A	45	225	20	108,5	308	416,5

VR 95

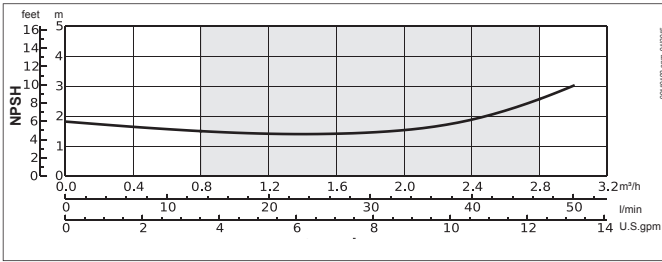
60 Hz

Pump Model	Motor		H1 Bar	Weight (kg)		
	kW	Size		Pump	Motor	Electric Pump
VR 95/1-1A	11	160	20	85,5	58	143,5
VR 95/1	15	160	19	85,5	64	149,5
VR 95/2-2A	18,5	160	19	89	98	187
VR 95/2-1A	22	180	20	89,5	109	198,5
VR 95/2	30	200	20	92,5	228	320,5
VR 95/3-2A	37	200	20	96,5	242	338,5
VR 95/3-1A	37	200	20	96,5	242	338,5
VR 95/3	45	225	20	99,5	308	407,5
VR 95/4-2A	45	225	20	103	308	411

Fig.3

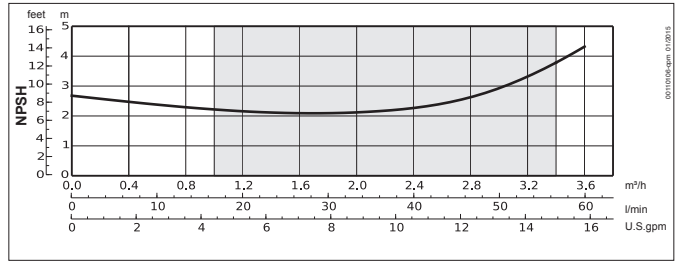
50 Hz

VR1



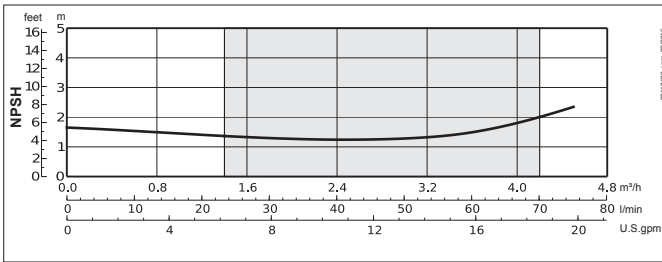
VR1

60 Hz



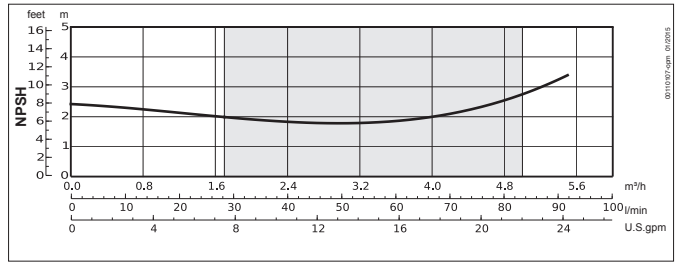
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VR3



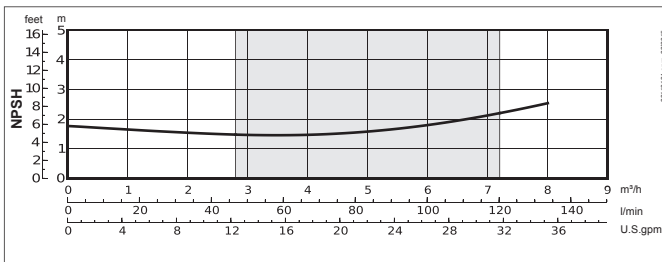
VR3

60 Hz



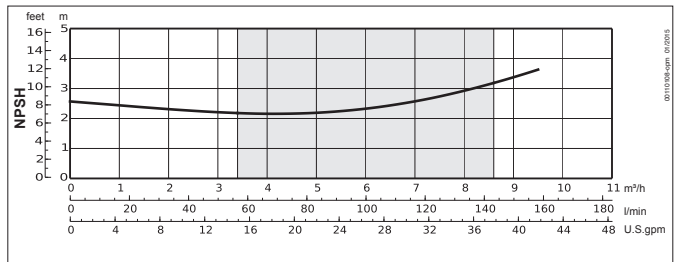
50 Hz

VR6



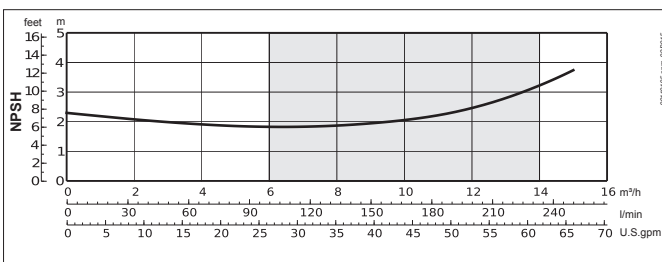
VR6

60 Hz



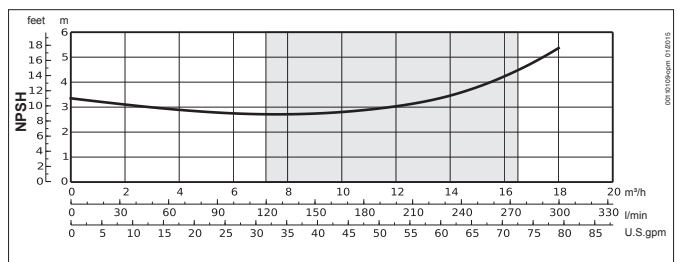
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VR10



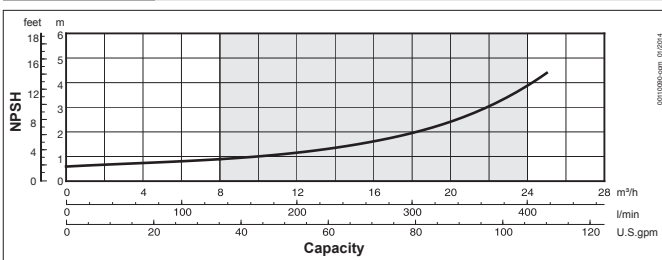
VR10

60 Hz



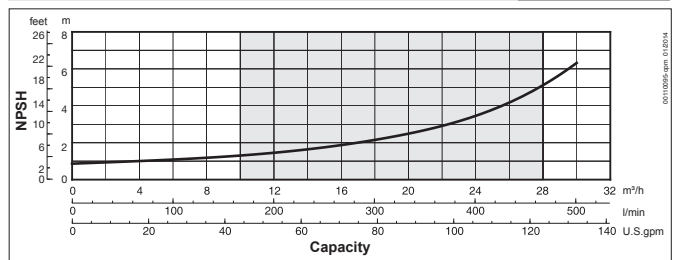
50 Hz

VR15



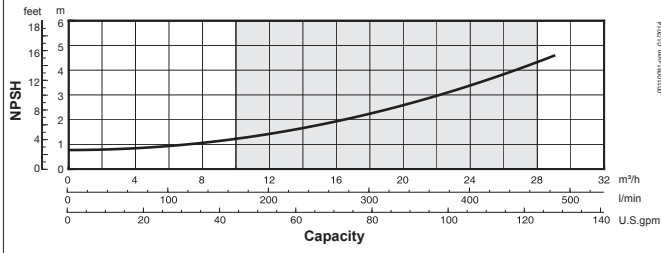
VR15

60 Hz



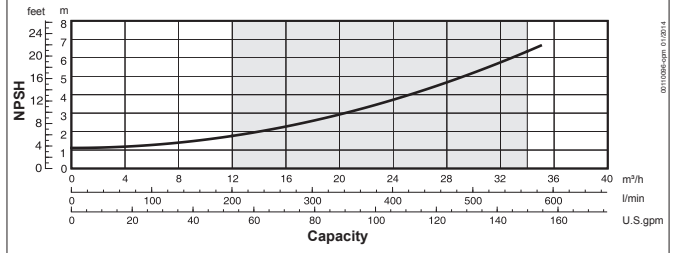
50 Hz

VR20



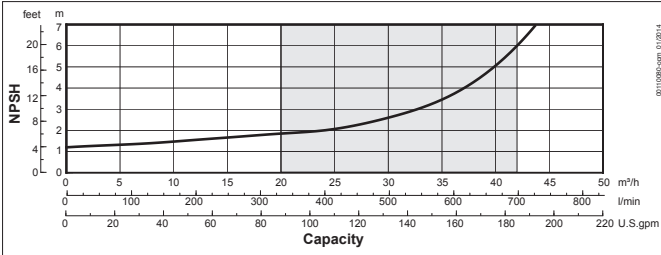
60 Hz

VR20



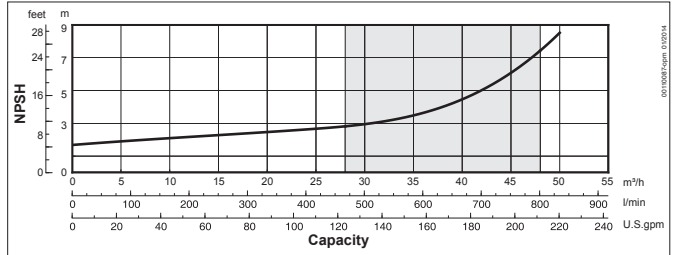
50 Hz

VR30



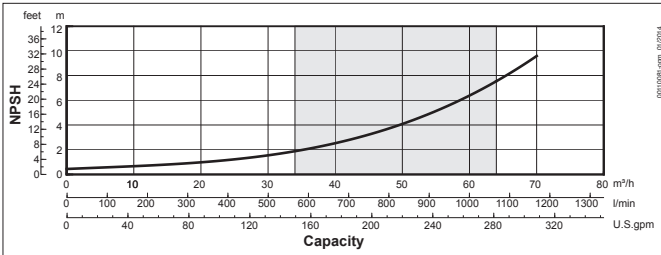
60 Hz

VR30



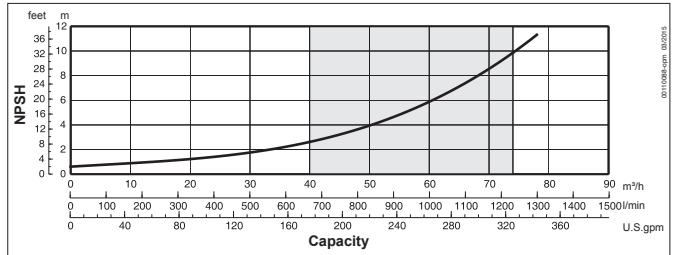
50 Hz

VR45



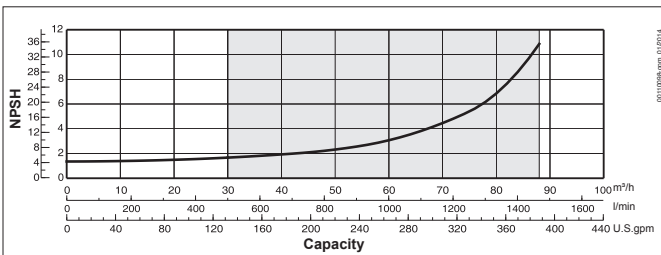
60 Hz

VR45



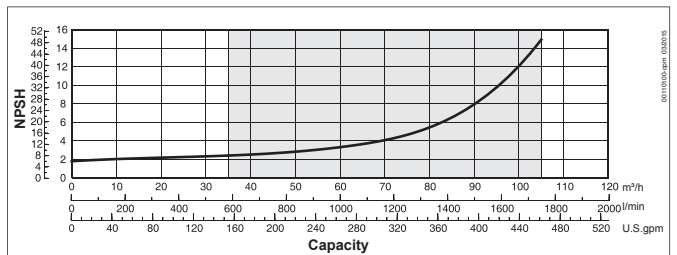
50 Hz

VR65



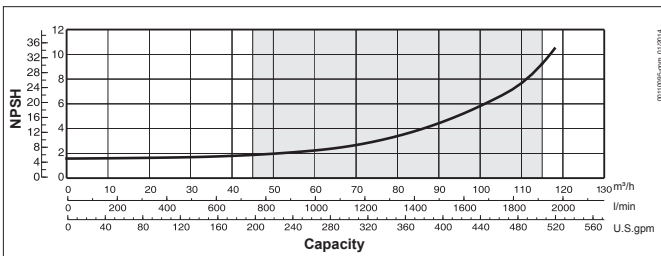
60 Hz

VR65



50 Hz

VR95



60 Hz

VR95

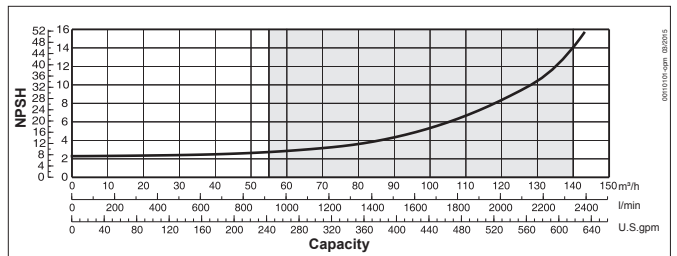


Fig.4

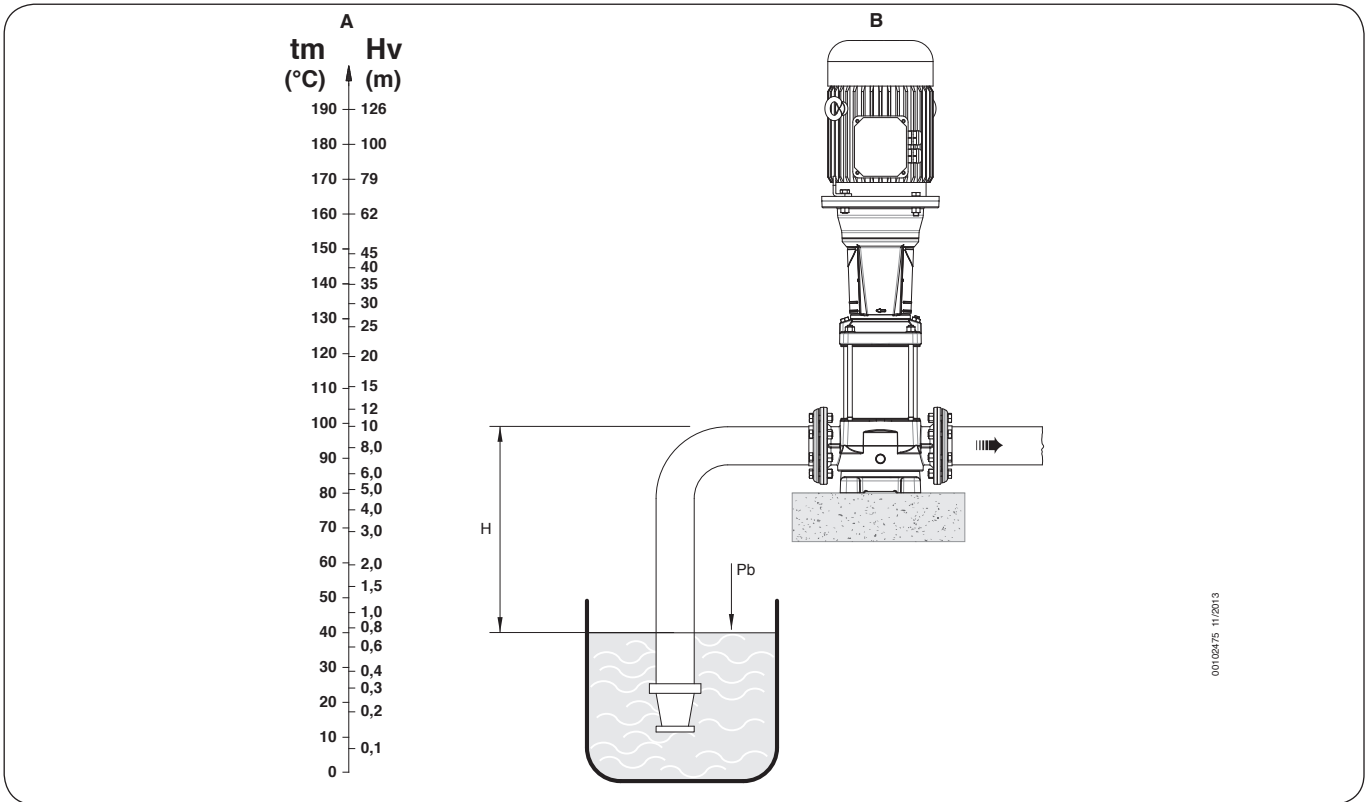


Fig.5

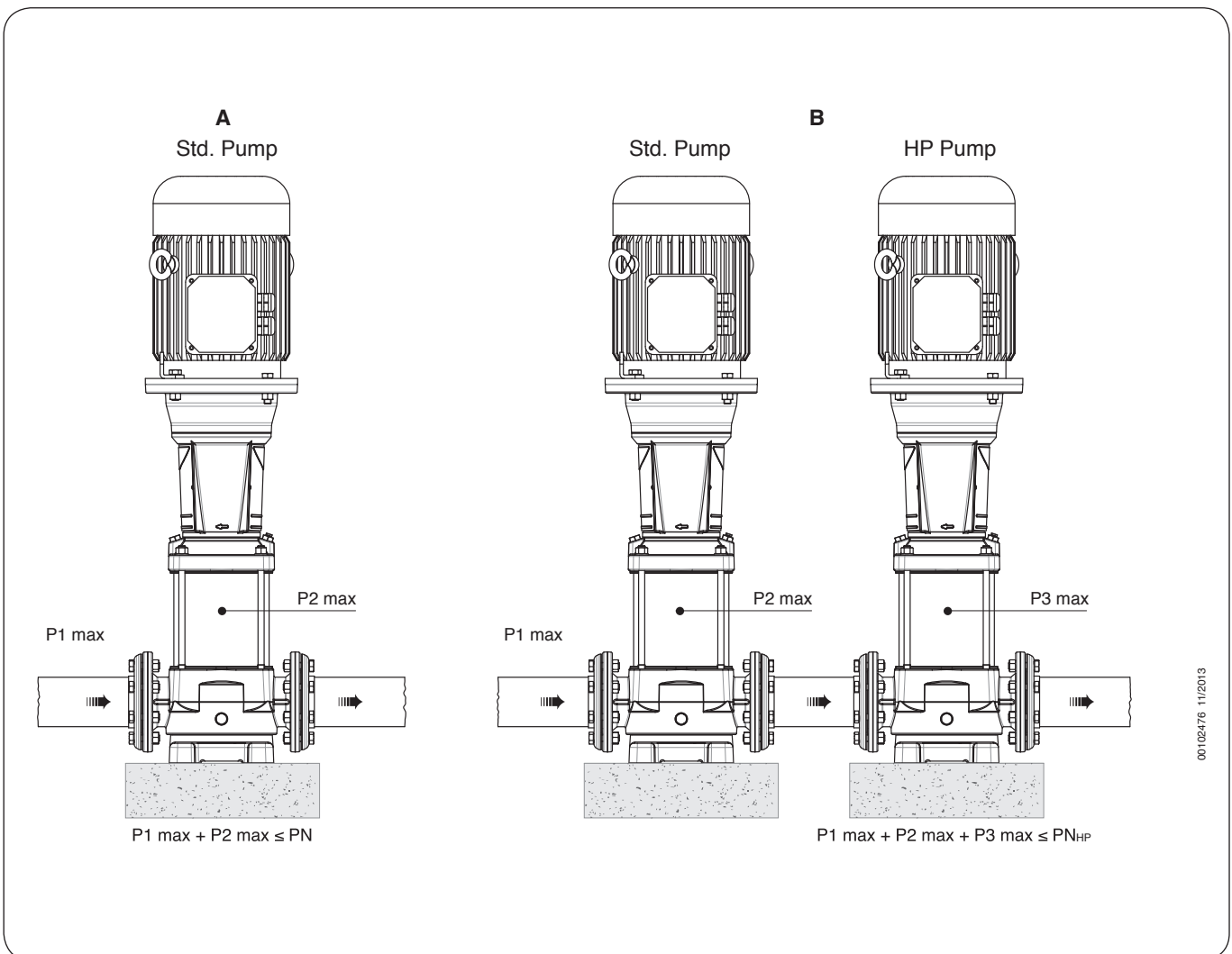


Fig.6

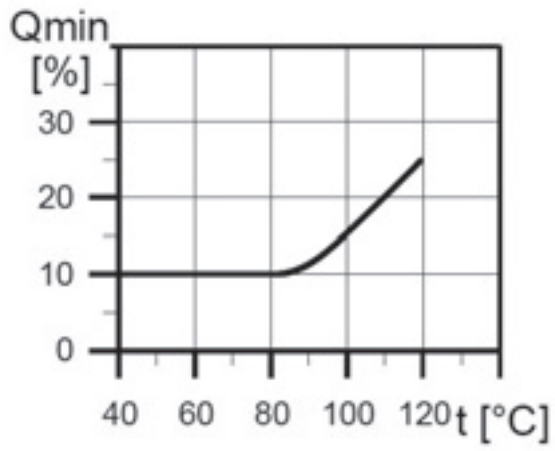


Fig.6/A

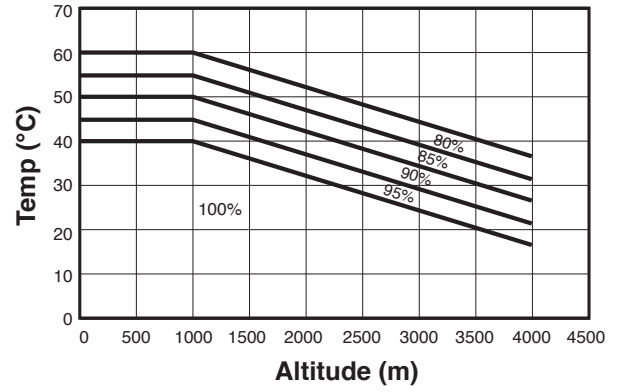
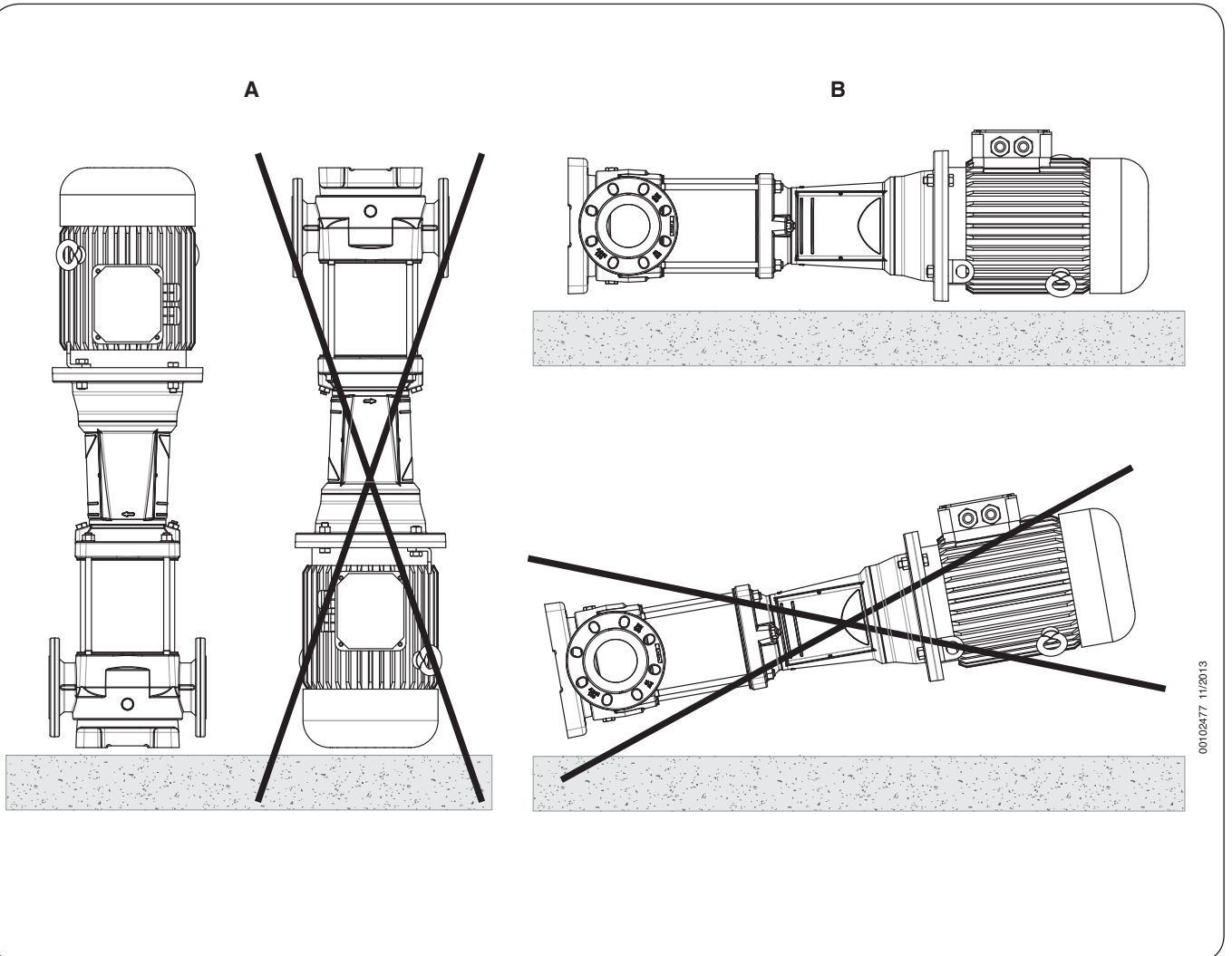


Fig.7



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Fig.8

BASE DIMENSIONS

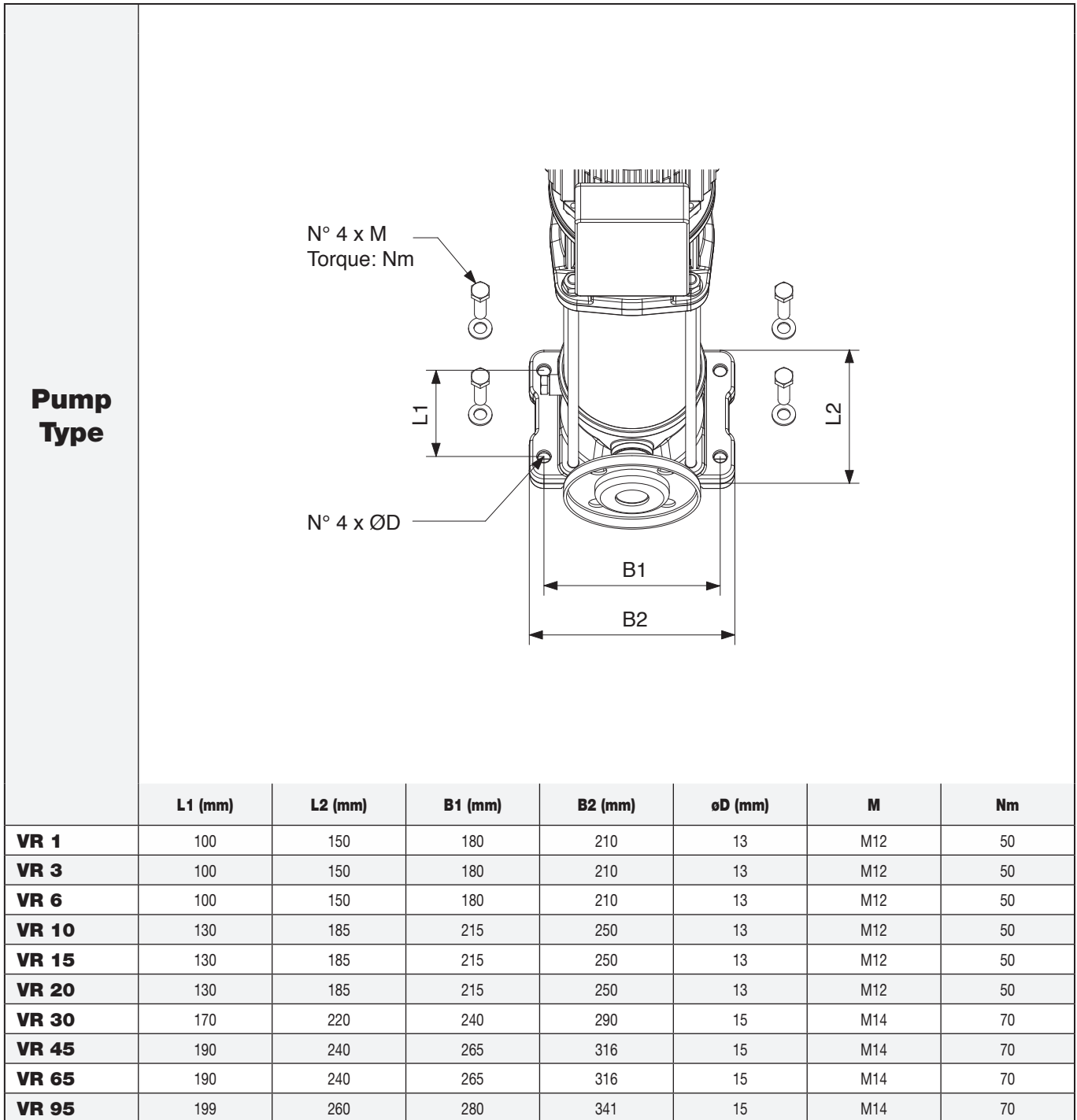


Fig.10

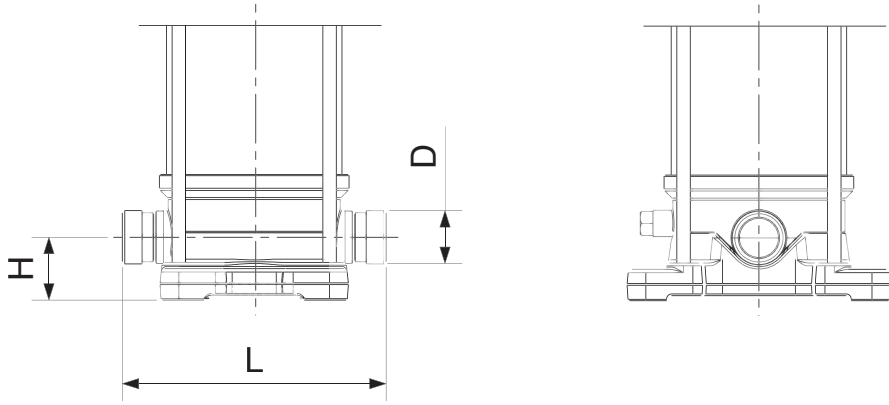
DIMENSIONS

Pump Type	F-Version (Flanged)					
	L (mm)	H (mm)	DN	PN	n° x Mf	Nm
VR 1	250	75	25	16-25	4 x M12	50
VR 3	250	75	25	16-25	4 x M12	
VR 6	250	75	32	16-25	4 x M16	
VR 10	280	80	40	16-25	4 x M16	60
VR 15	300	90	50	16-25	4 x M16	
VR 20	300	90	50	16-25	4 x M16	70
VR 30	320	105	65	16	4 x M16	
VR 45	365	140	80	16-25-40	8 x M16	
VR 65	365	140	100	16	8 x M16	80
VR 95	380	140	100	25-40	8 x M20	
VR 95	380	140	100	16	8 x M16	80

DIMENSIONS

Pump Type	T-Version (Oval)					
	L (mm)	H (mm)	D (Rp)	l (mm)	n° x Mf	Nm
VR 1	160	50	32 (1-1/4)	75	2 x M10	30
VR 3	160	50	32 (1-1/4)	75	2 x M10	
VR 6	160	50	32 (1-1/4)	75	2 x M10	
VR 10	200	80	40 (1-1/2)	100	2 x M12	40
VR 15	200	90	50 (2)	130	2 x M12	
VR 20	200	90	50 (2)	-	2 x M12	
VR 30	-	-	-	-	-	-
VR 45	-	-	-	-	-	-
VR 65	-	-	-	-	-	-
VR 95	-	-	-	-	-	-

DIMENSIONS

Pump Type	V-Version Vitaulic		
			
	L (mm)	H (mm)	D (mm)
VR 1	210	50	42,2
VR 3	210	50	42,2
VR 6	210	50	42,2
VR 10	261	80	60,3
VR 15	261	90	60,3
VR 20	-	-	-
VR 30	-	-	-
VR 45	-	-	-
VR 65	-	-	-
VR 95	-	-	-

DIMENSIONS

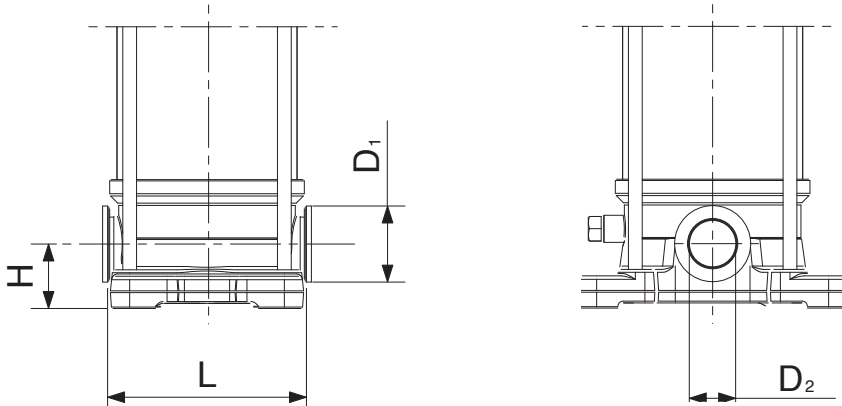
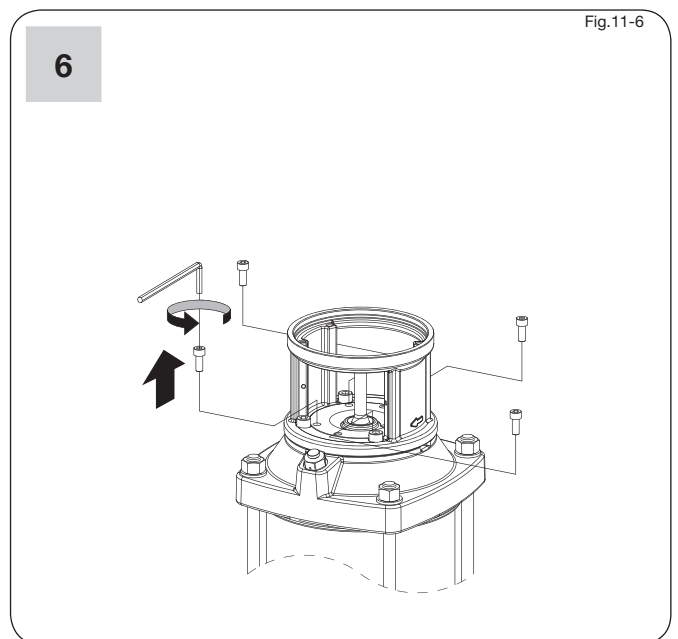
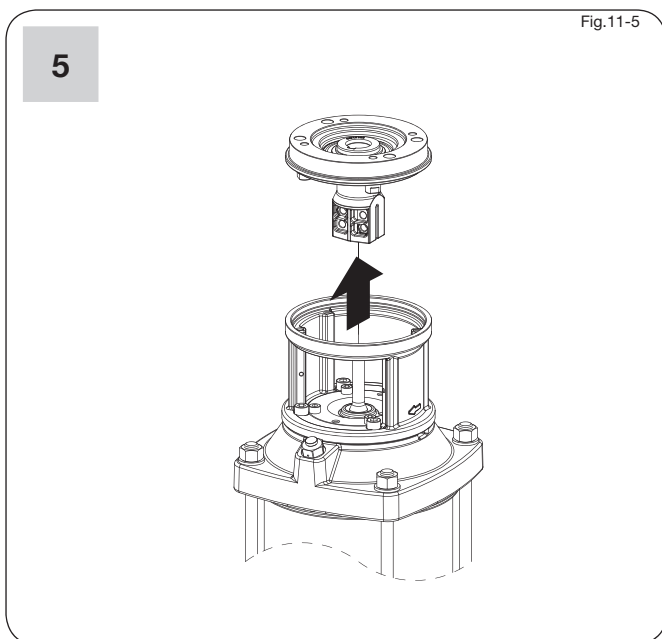
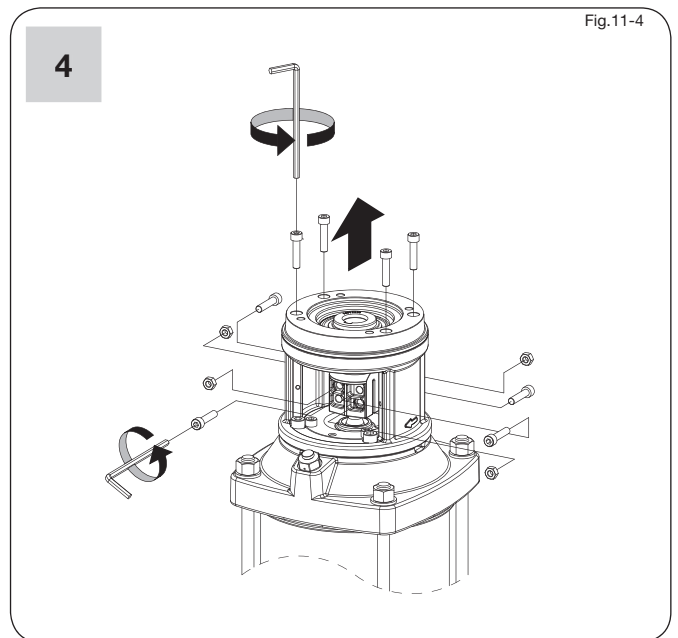
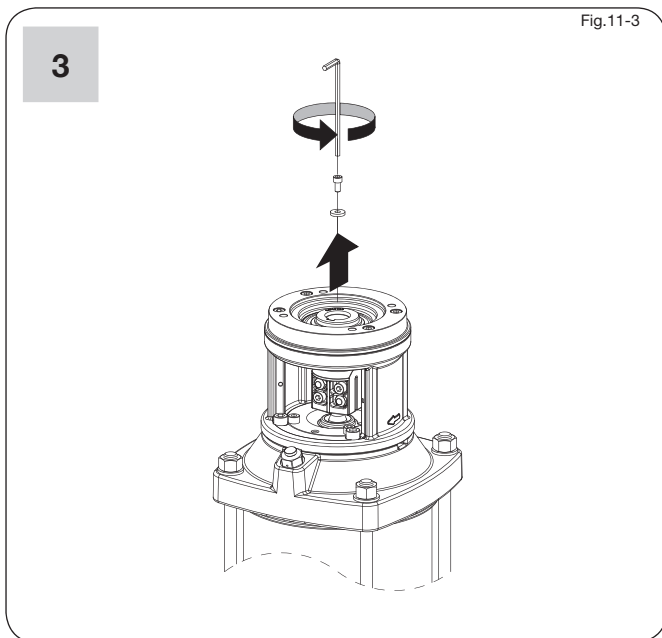
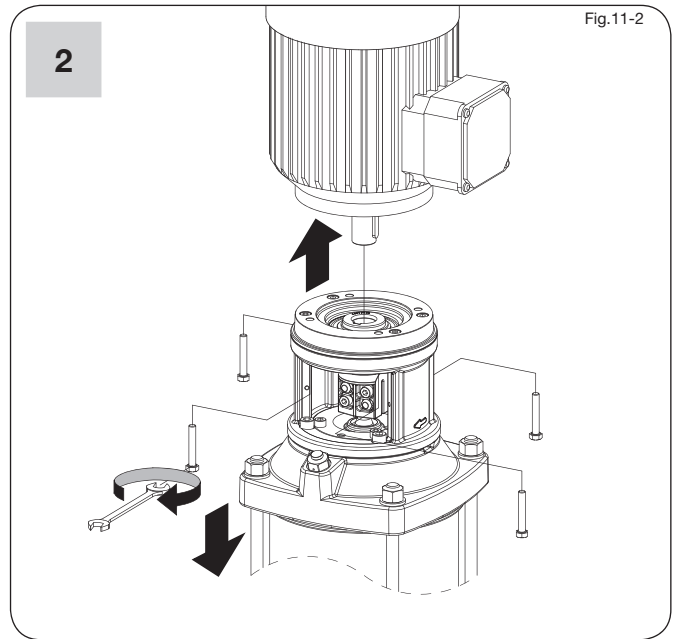
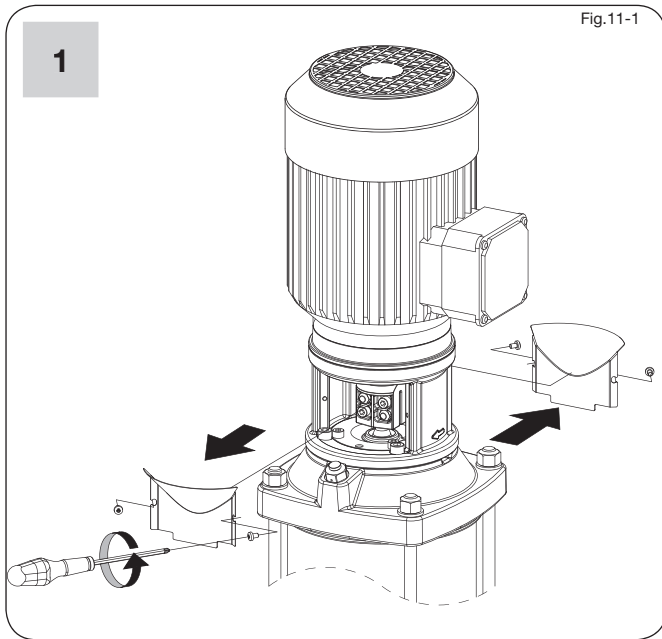
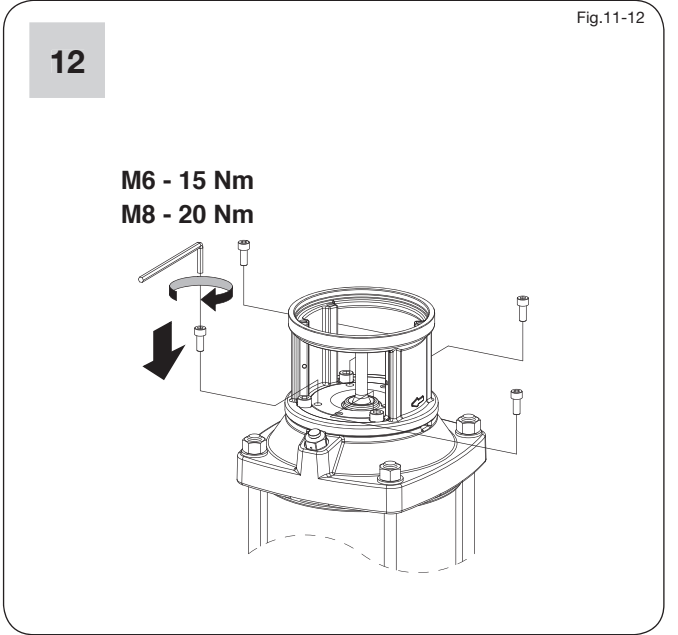
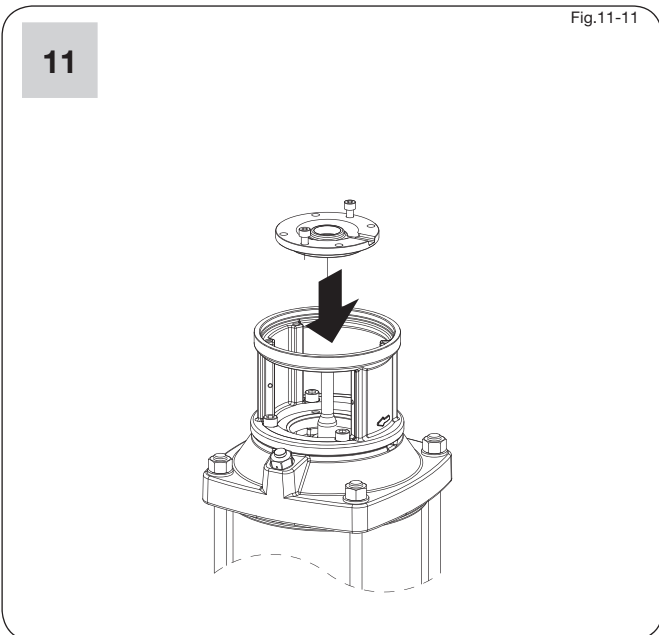
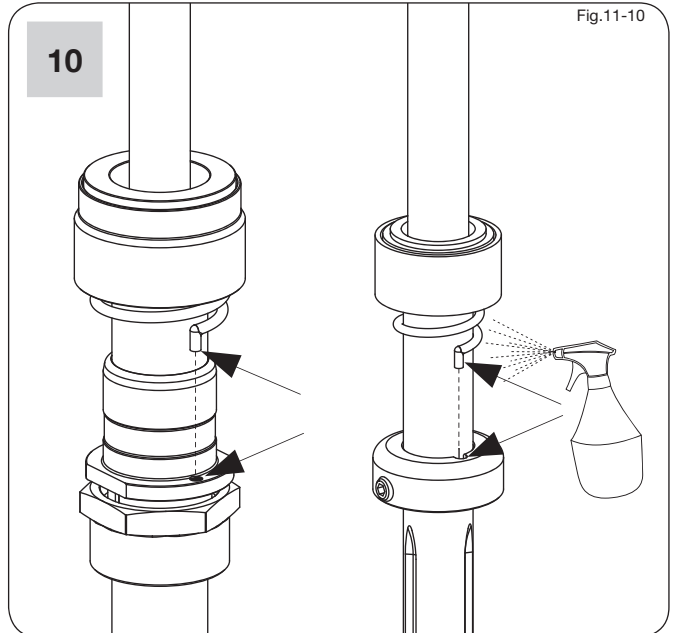
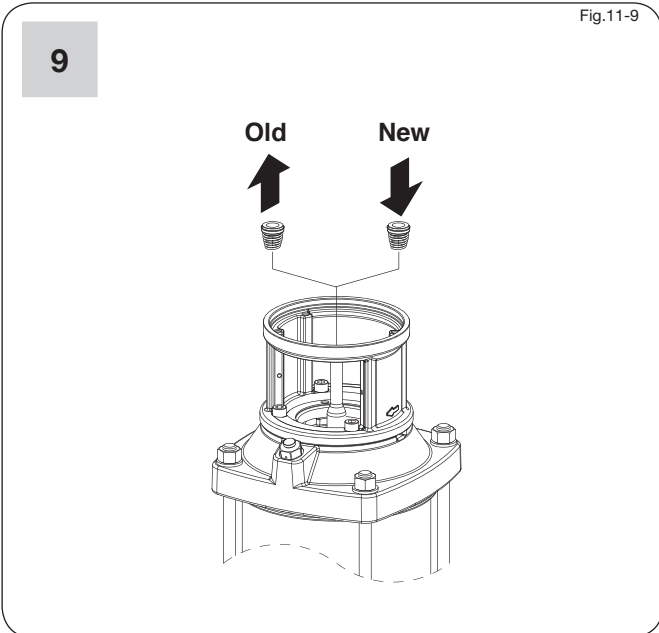
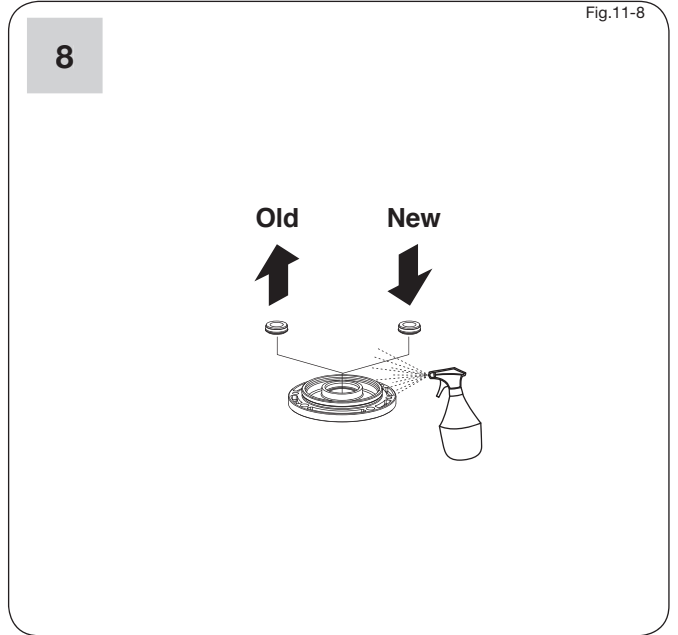
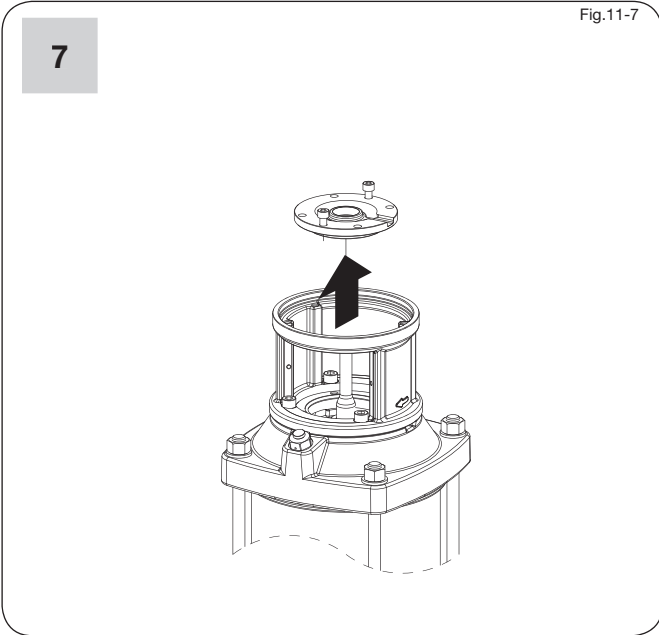
Pump Type	C-Version Flexi-Clamp			
				
	L (mm)	H (mm)	D1 (mm)	D2 (mm)
VR 1	162	50	59	36
VR 1	162	50	59	36
VR 5	162	50	59	36
VR 9	202	80	87	42
VR 15	202	90	87	50
VR 20	202	90	87	50
VR 30	-	-	-	-
VR 45	-	-	-	-
VR 65	-	-	-	-
VR 95	-	-	-	-

Fig.11





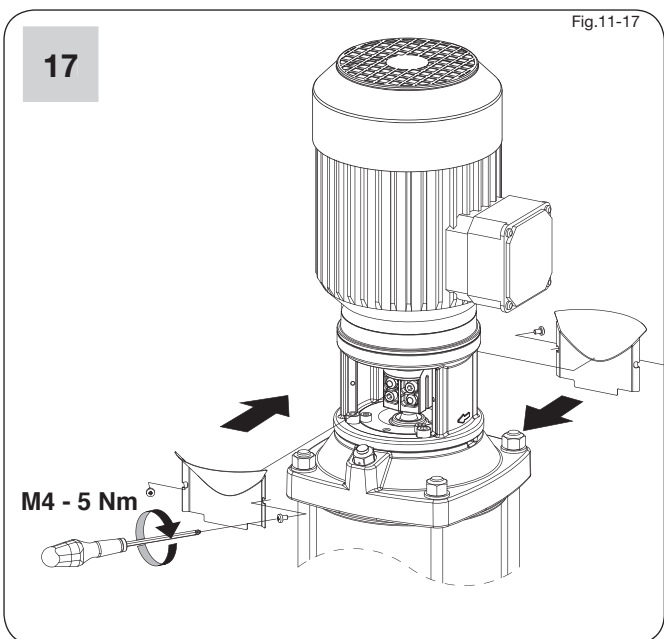
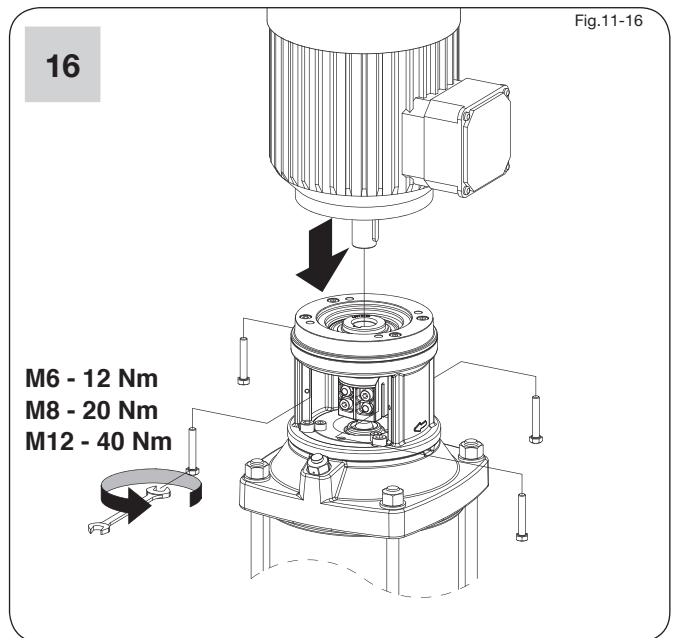
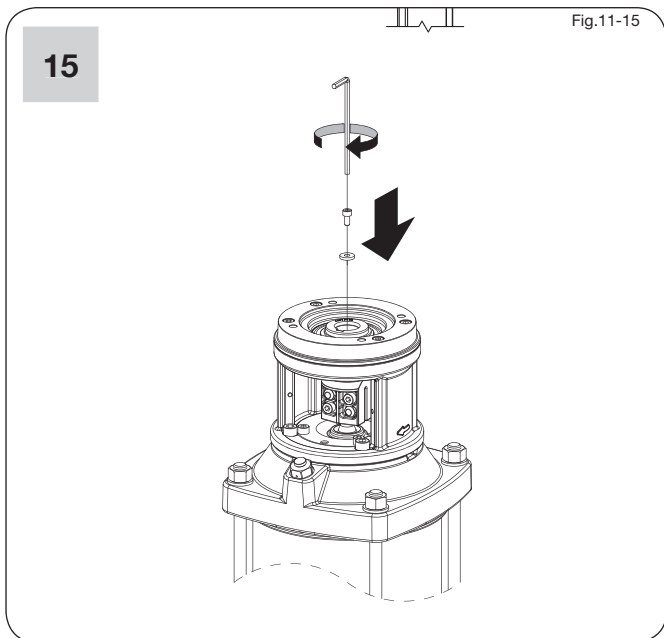
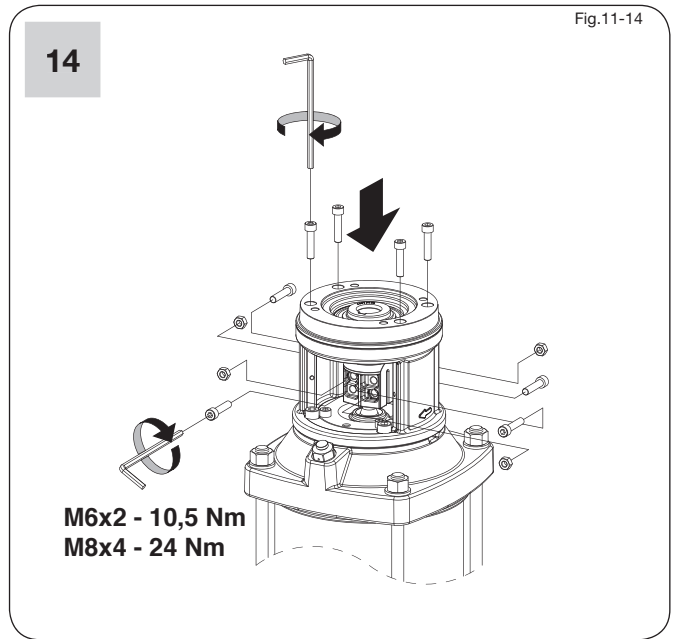
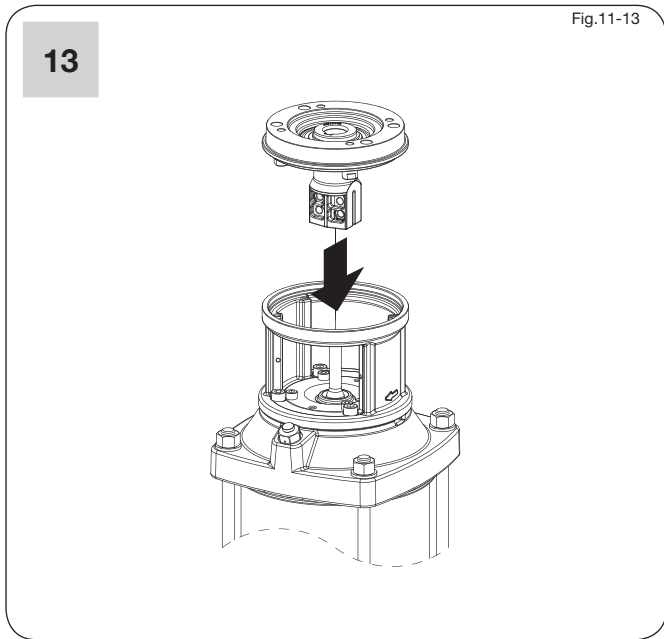
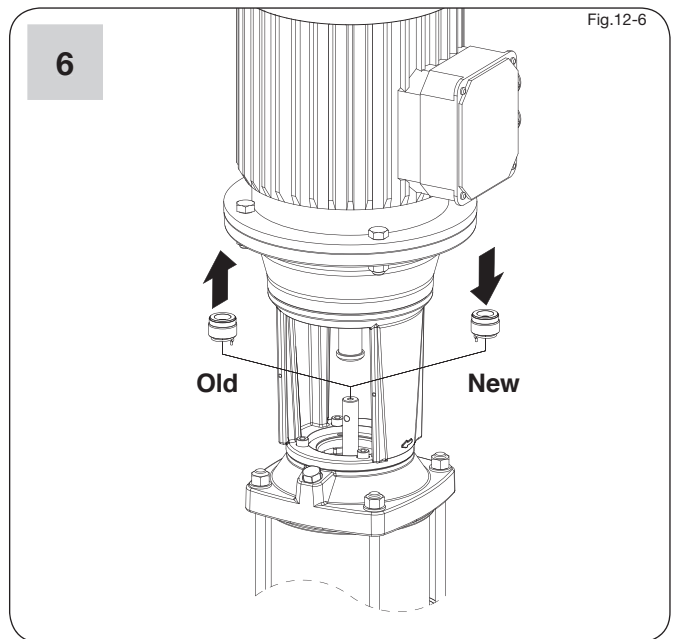
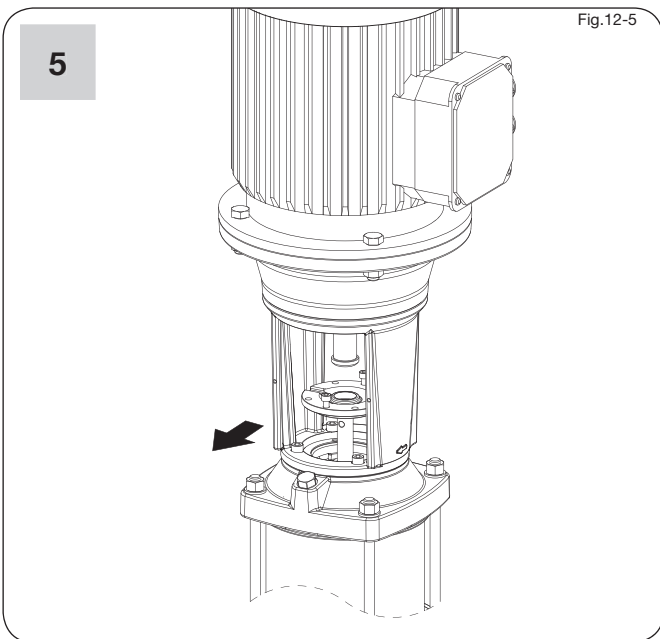
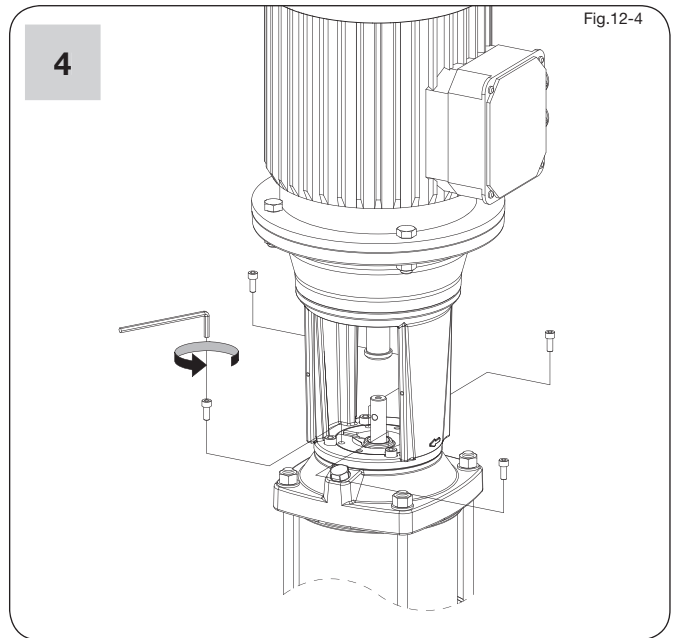
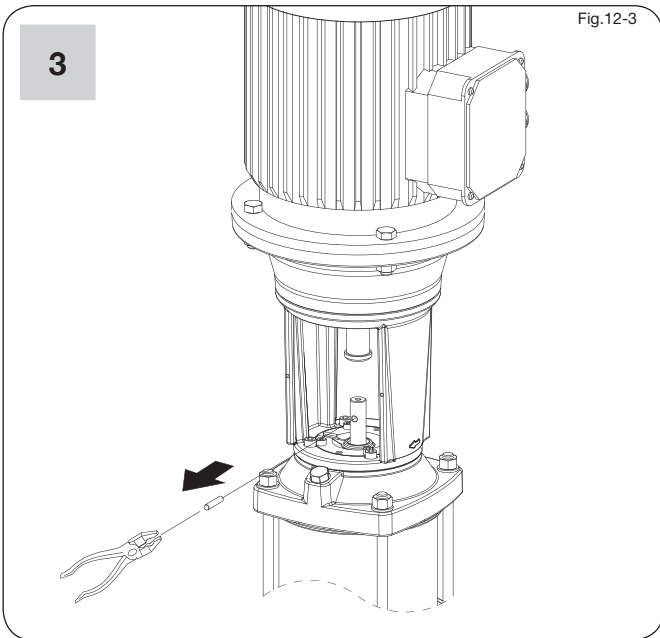
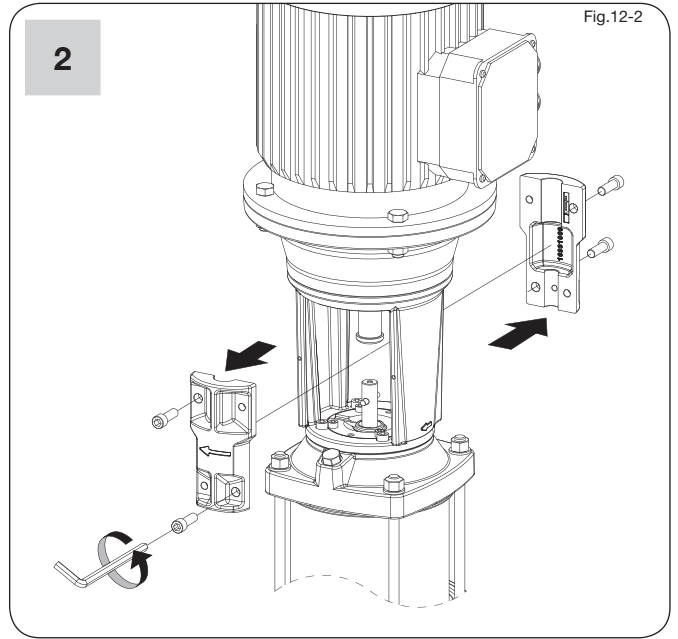
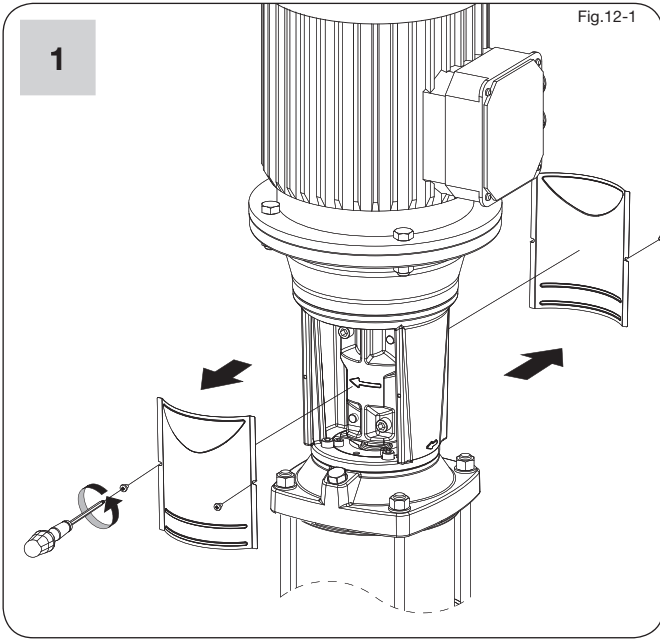
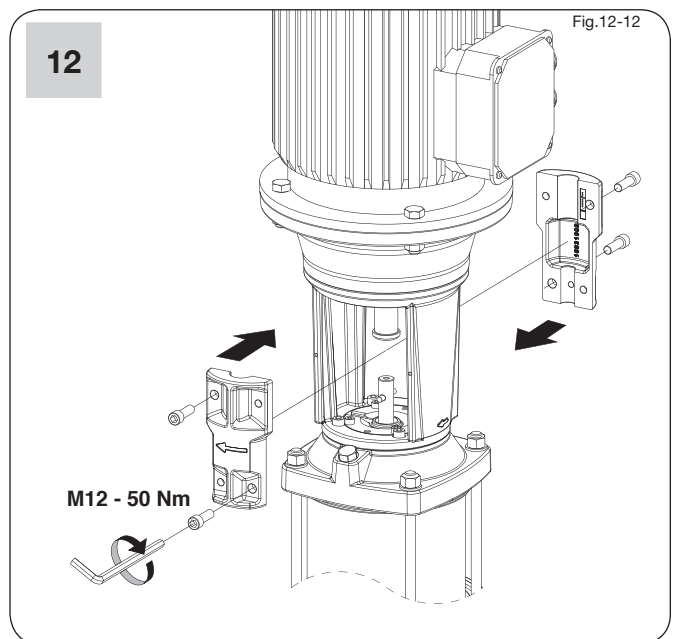
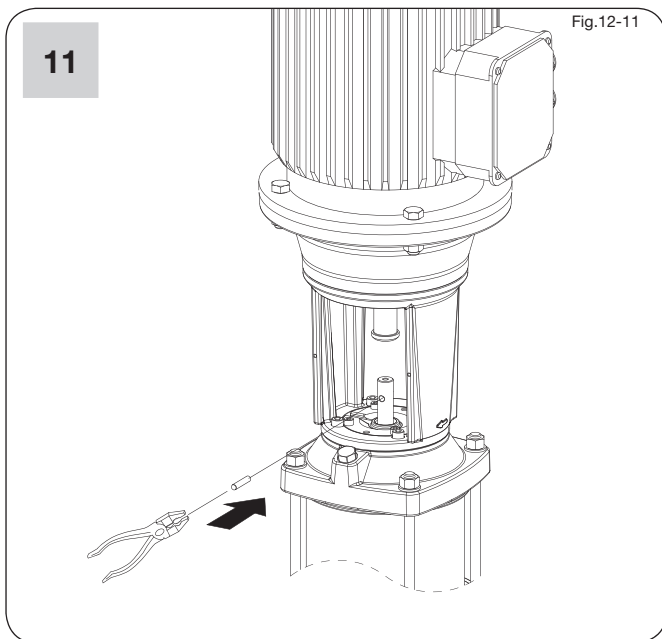
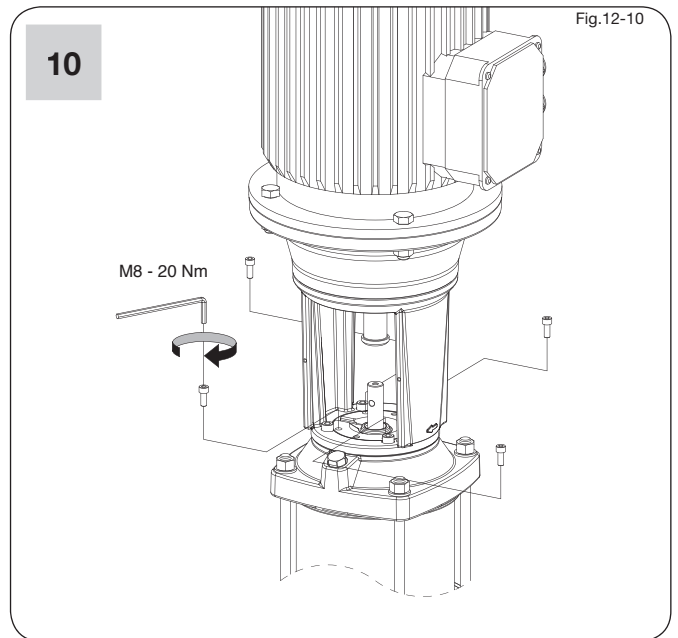
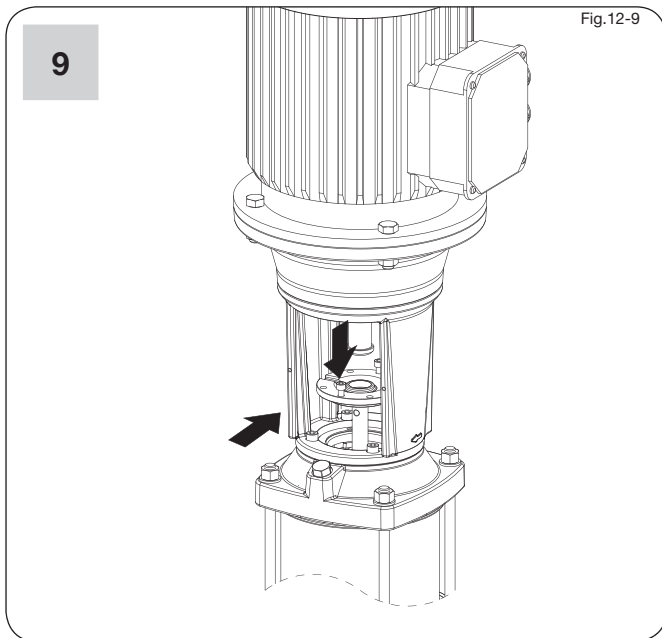
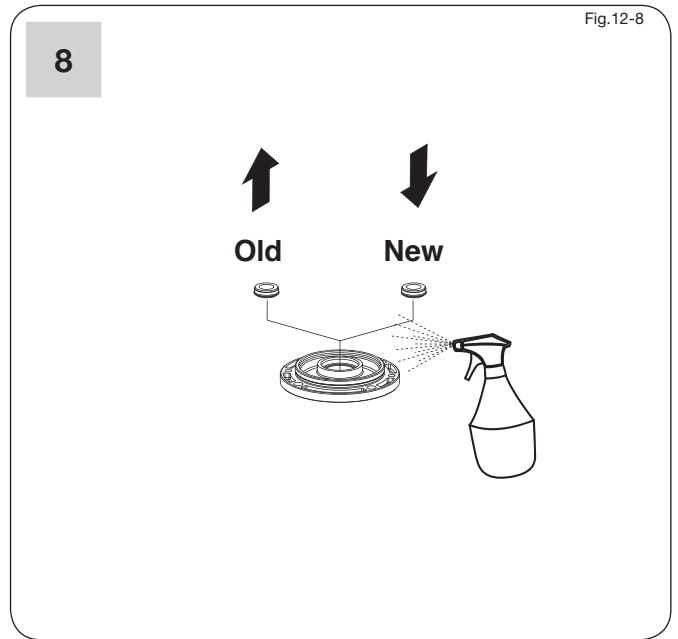
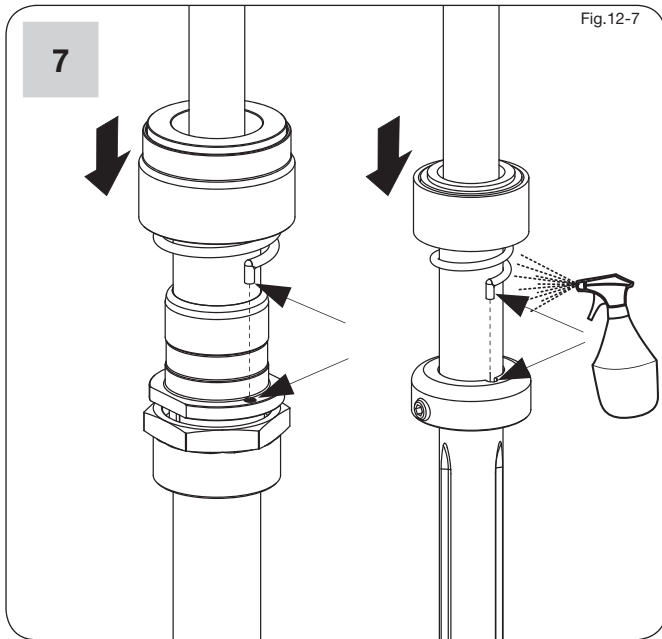


Fig.12





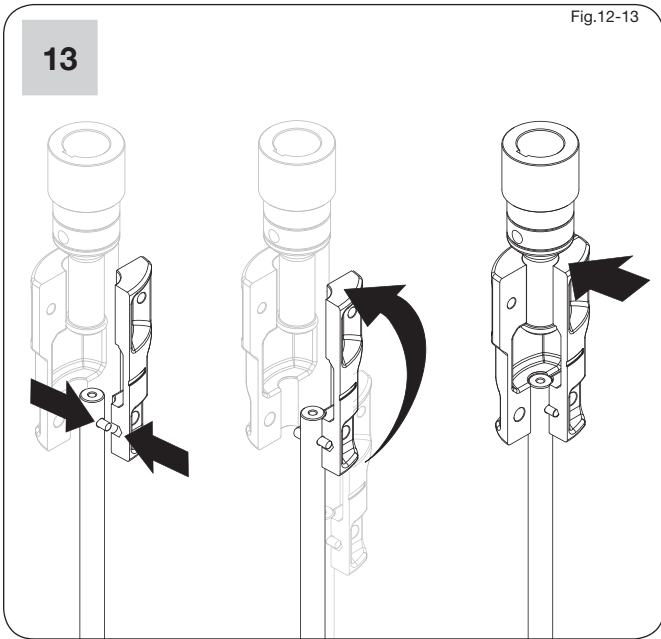


Fig.12-13

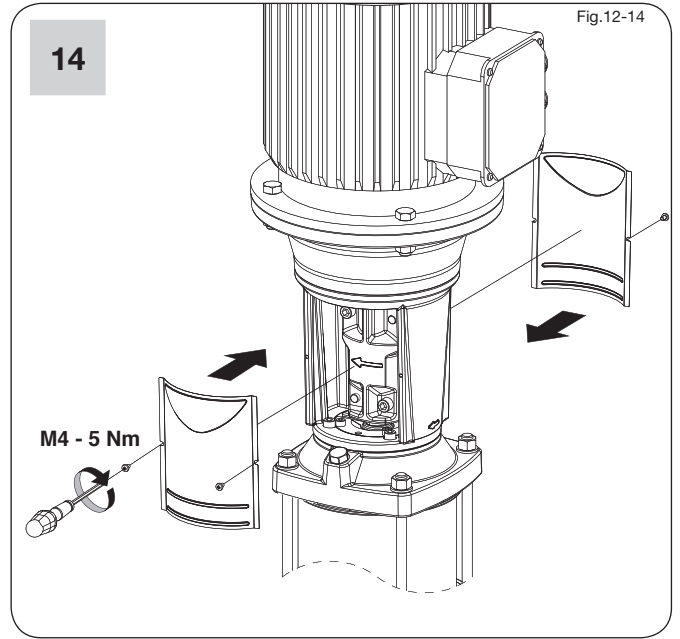
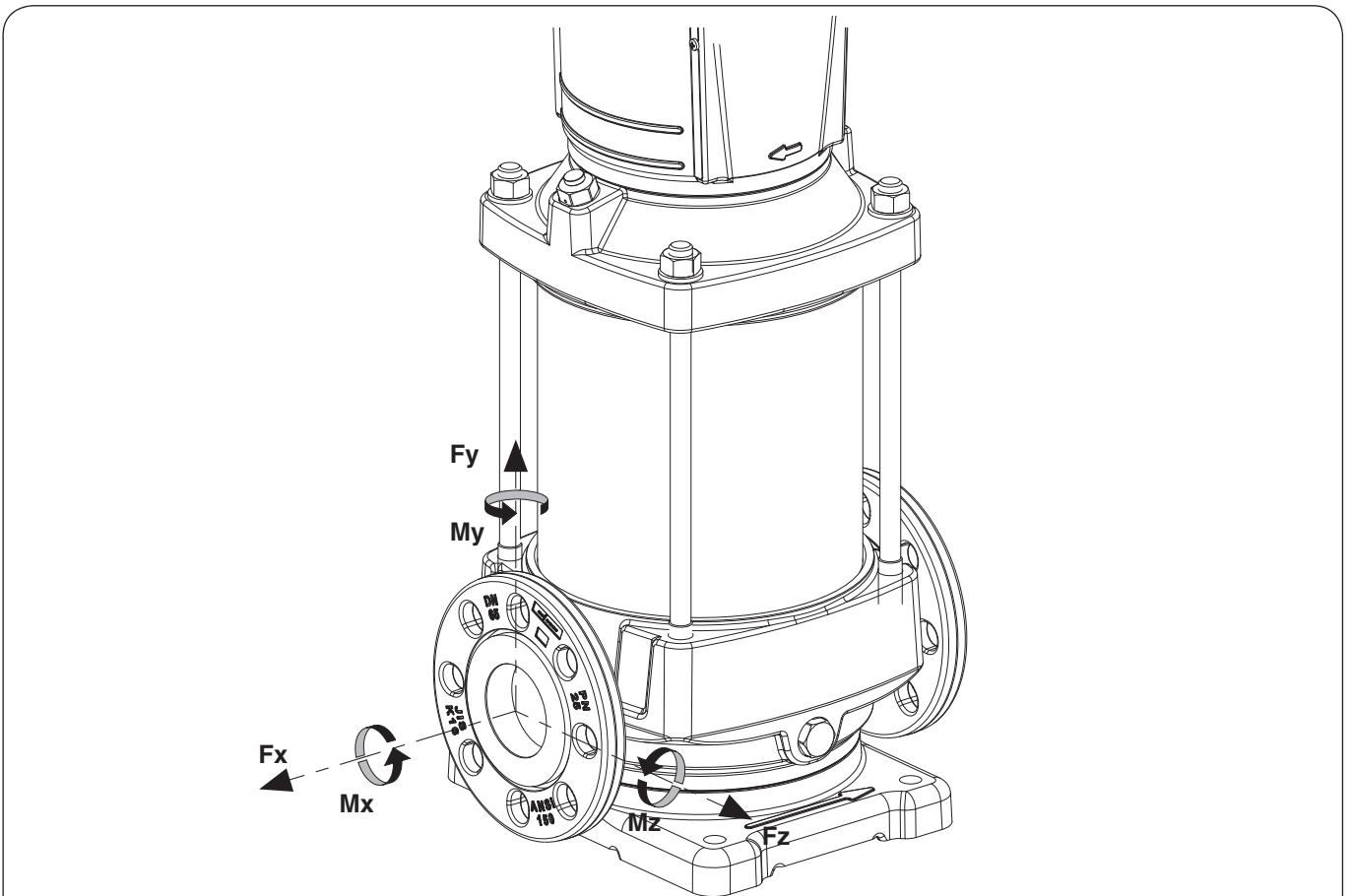


Fig.12-14

Fig.13



Flange, DN	Pump type	Forces (N)			Torque (Nm)		
		Fx	Fy	Fz	Mx	My	Mz
25	VR 1	190	200	250	240	180	210
25	VR 3	190	200	250	240	180	210
32	VR 6	260	250	330	300	220	260
40	VR 10	320	300	390	390	290	330
50	VR 15-20	430	410	510	400	310	360
65	VR 30	1700	2075	1875	1075	1225	1500
80	VR 45	2250	2050	2500	1600	1150	1300
100	VR 65-95	3000	2700	3350	1750	1250	1450

Fig.14

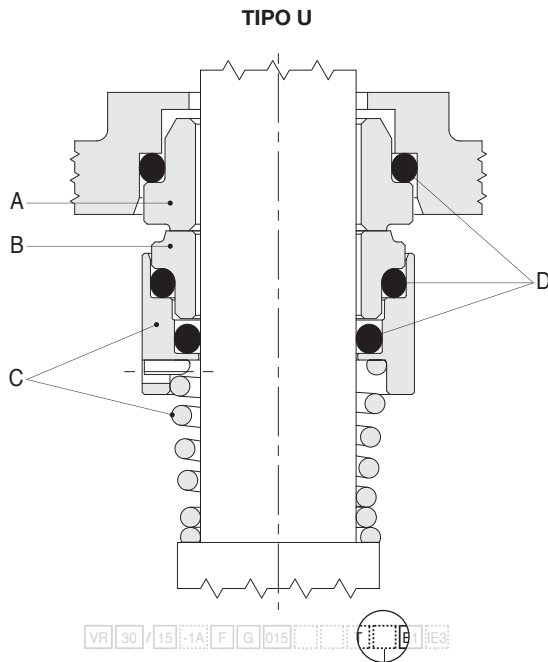
Mechanical seal specifications (in accordance with EN 12756) Version K

Standard version

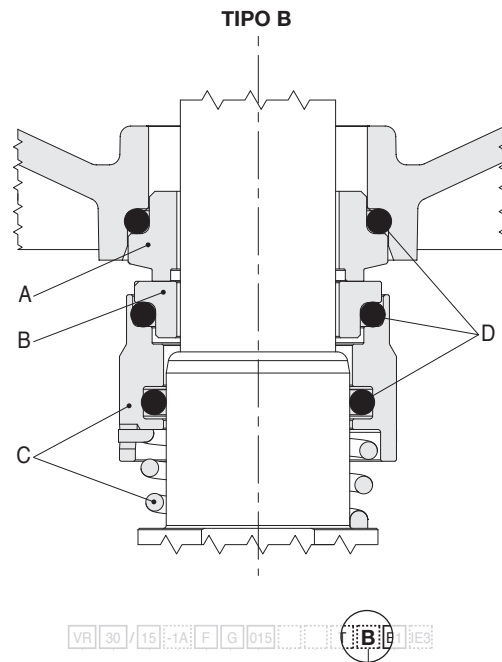
Model	Position				Temperature
	A Stationary part	B Rotating part	C Other components	D Elastomers	
E1	Graphite B	Silicon Carbide Q	AISI 316 G	EPDM E	-30°C +120°C

Available on request

Model	Position				Temperature (°C)
	A Stationary part	B Rotating part	C Other components	D Elastomers	
E2	Silicon Carbide Q	Silicon Carbide Q	AISI 316 G	EPDM E	-10°C +120°C
V3	Silicon Carbide Q	Silicon Carbide Q	AISI 316 G	FKM V	-10°C +120°C
V4	Carbon B	Silicon Carbide Q	AISI 316 G	FKM V	-10°C +120°C
E5	Tungsten Carbide U		AISI 316 G	EPM E	-10°C +120°C



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Fig.15

Power motor P2 (kW)	dB +/- 3							
	50Hz				60Hz			
	2 poli - 2900 rpm		4 poli - 1450 rpm		2 poli - 3600 rpm		4 poli - 1800 rpm	
	Size motor IEC	LpA*	Size motor IEC	LpA*				
0,37	71	<70	71	<70	-	-	71	<70
0,55	71	<70	71	<70	71	<70	80	<70
0,75	80	<70	80	<70	80	<70	80	<70
1,1	80	<70	90	<70	80	<70	90	<70
1,5	90	<70	90	<70	90	<70	90	<70
2,2	90	<70	100	<70	90	70	100	<70
3	100	<70	100	<70	100	70	100	<70
4	112	<70	112	<70	112	72	112	<70
5,5	132	<70	132	<70	132	73	132	<70
7,5	132	72	132	<70	132	74	132	<70
11	160	74	-	-	160	78	160	<70
15	160	75	-	-	160	78	160	<70
18,5	160	75	-	-	160	80	-	-
22	180	75	-	-	180	80	-	-
30	200	75	-	-	200	79	-	-
37	200	75	-	-	200	78	-	-
45	225	78	-	-	225	80	-	-

* Sound pressure level measured in free field at 1 mt distance from the electric pump.

Fig.16

LOGO

Model	_____ A _____	
Serial N°	_____ B _____	Year _____ C _____
Q	_____ D _____	↳ m ³ /h
H	_____ E _____	↳ l/min
Hmin	_____ F _____	m
Hmax	_____ G _____	m
P ₂	_____ H _____	kW
n	_____ I _____	min ⁻¹
MEI ≥	_____ L _____	
Hyd. Eff.	_____ M _____	%
pmax/tmax _____ N / O _____		bar/°C
		CE

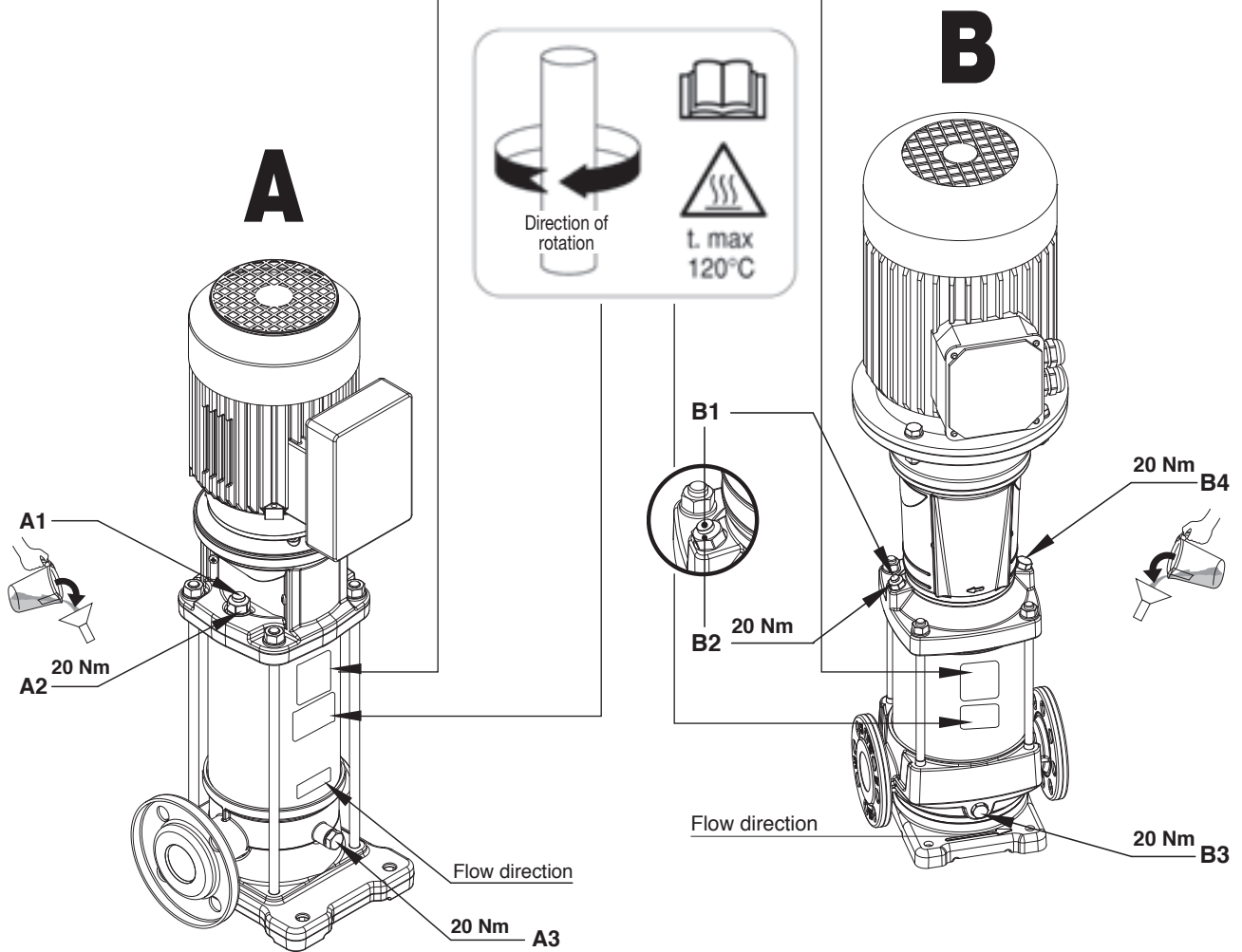


Fig.17

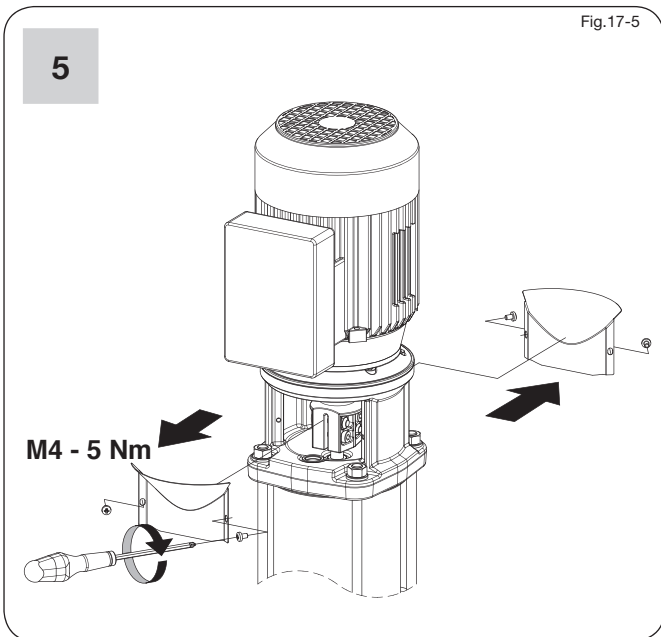
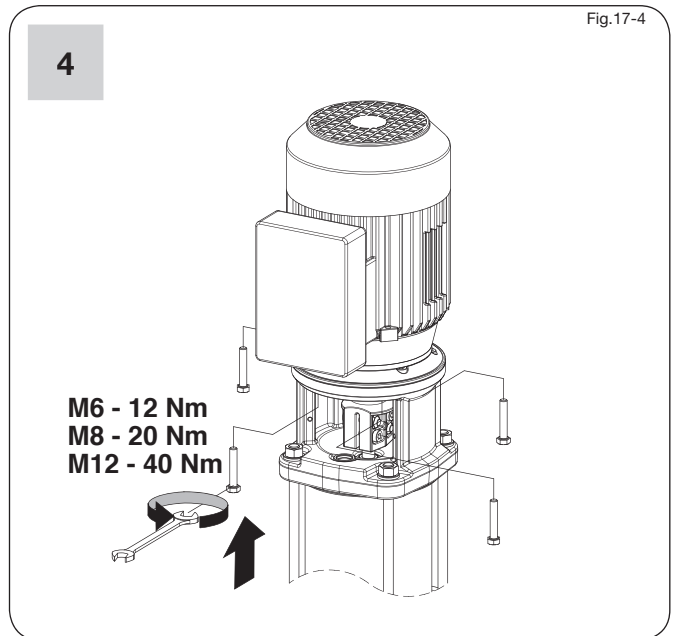
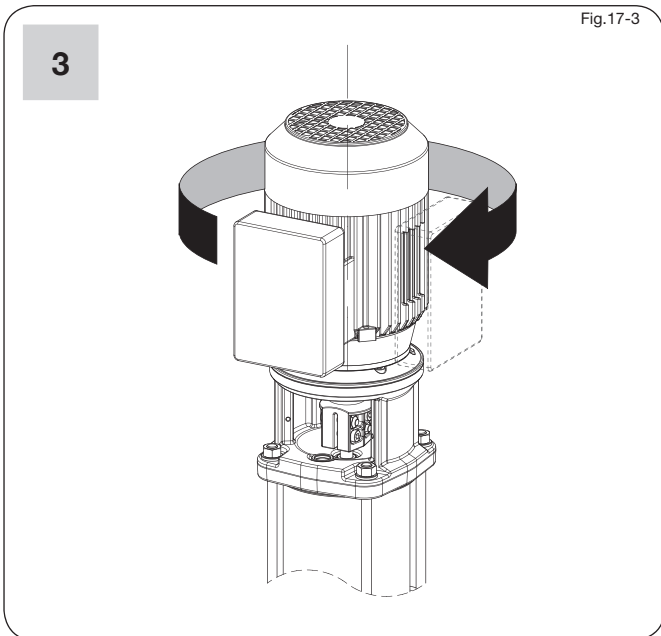
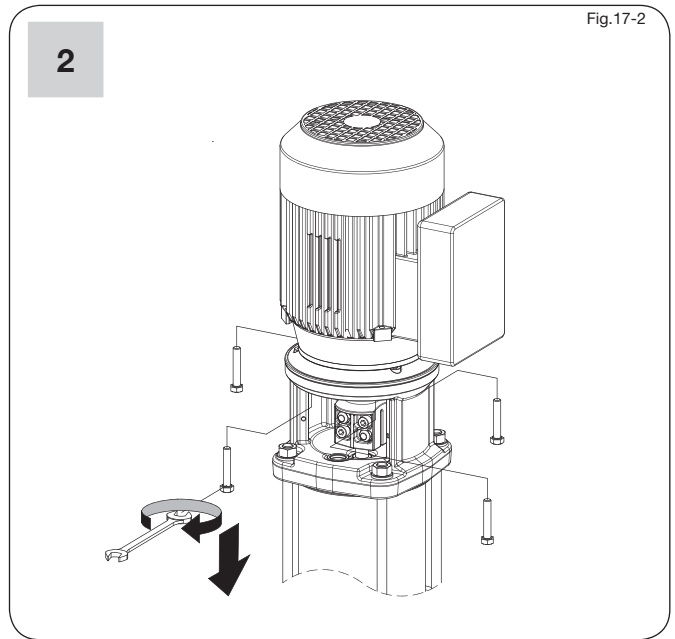
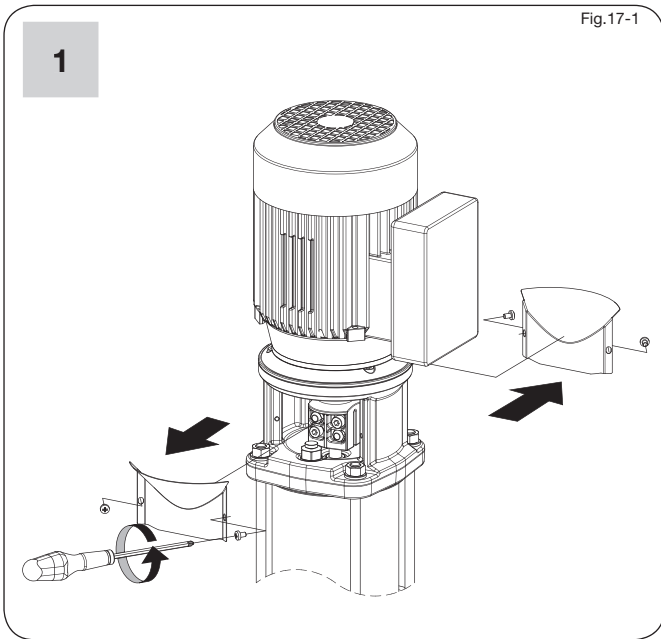


Fig.18

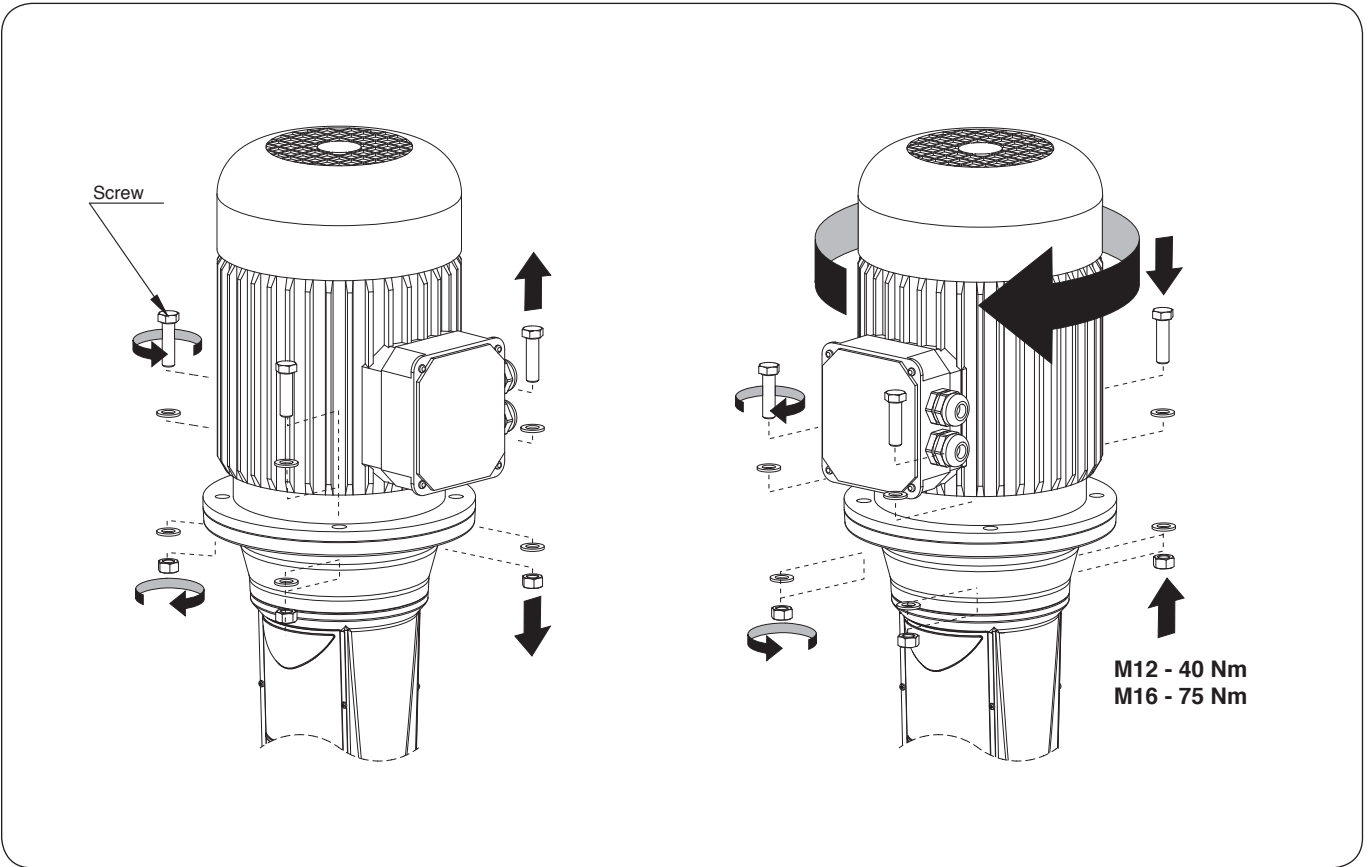
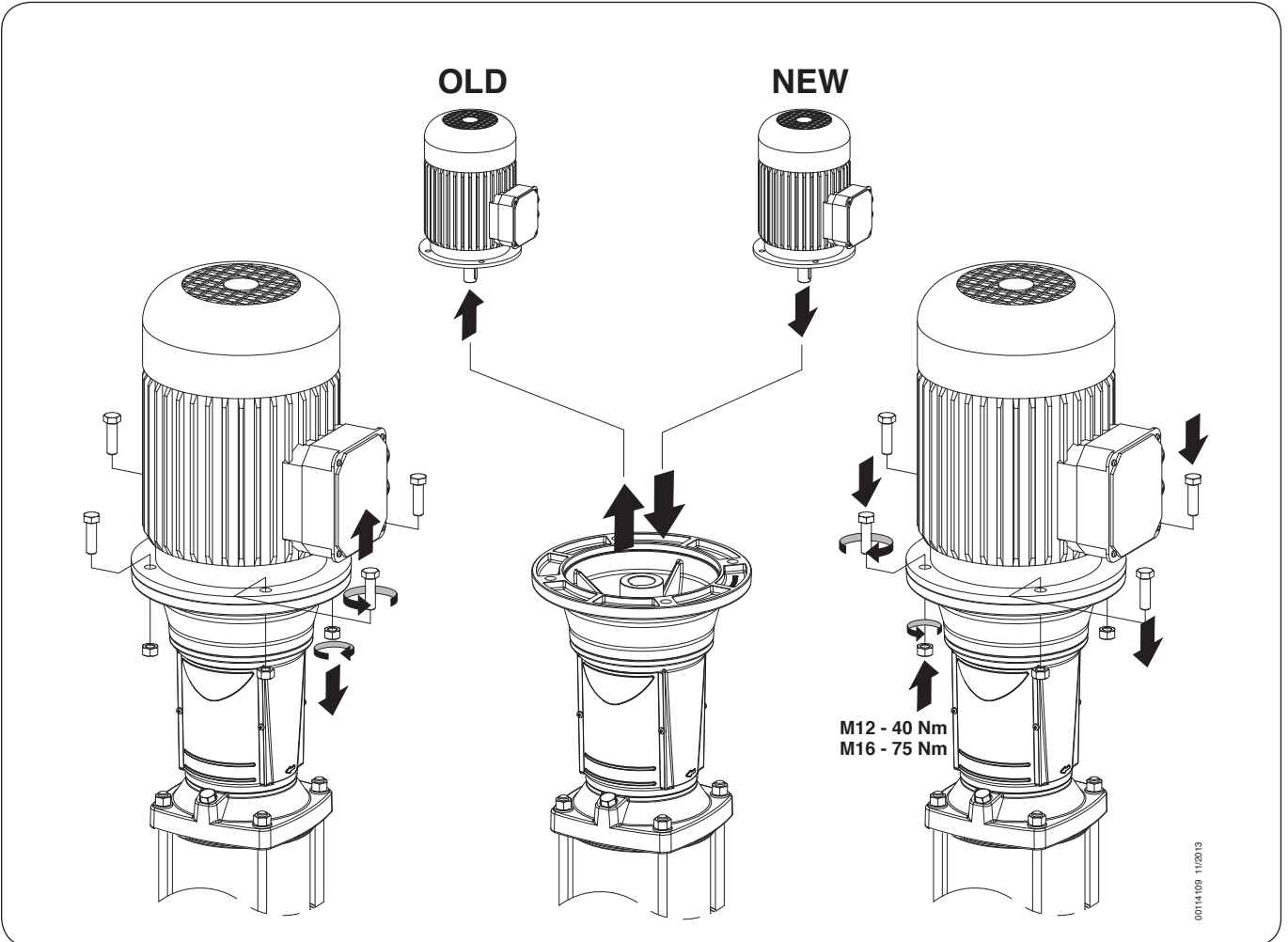


Fig.19



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Fig.20

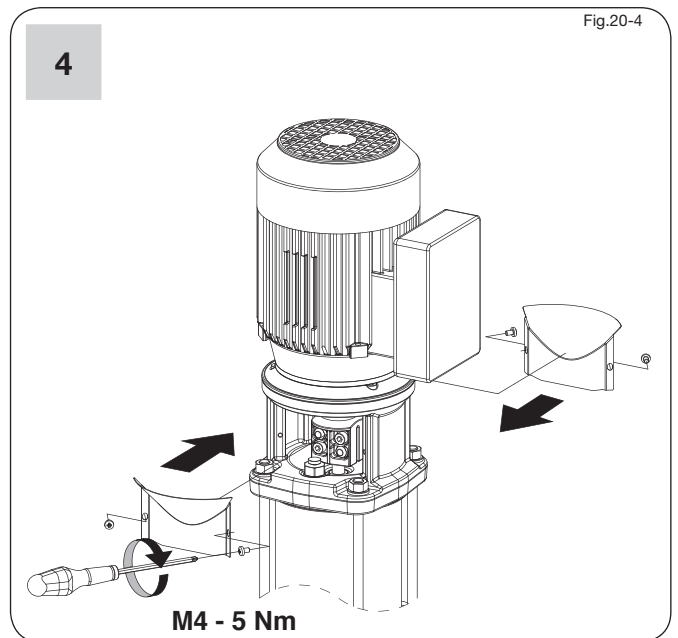
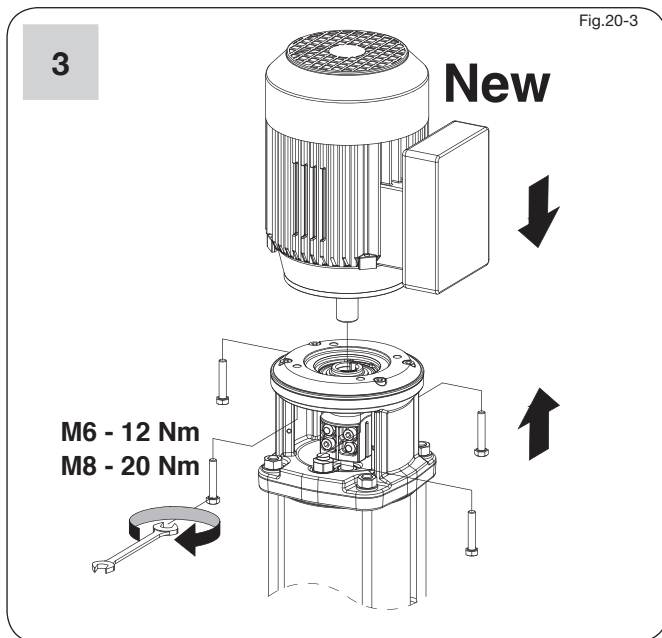
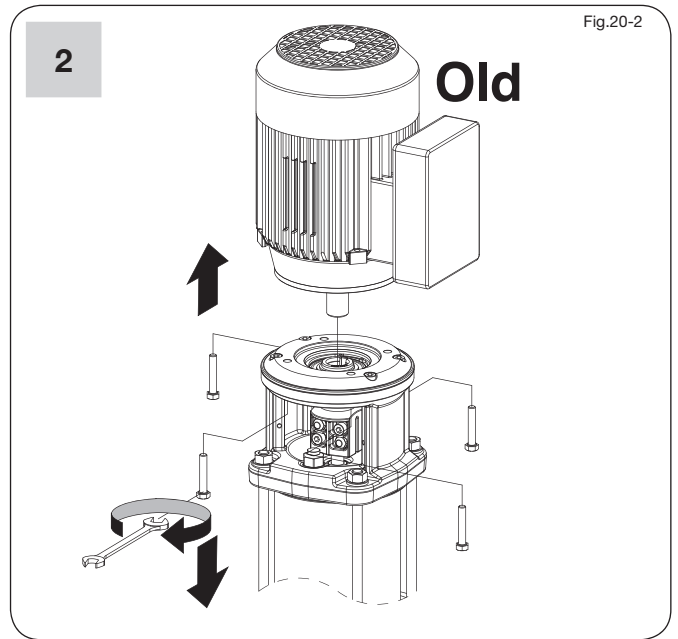
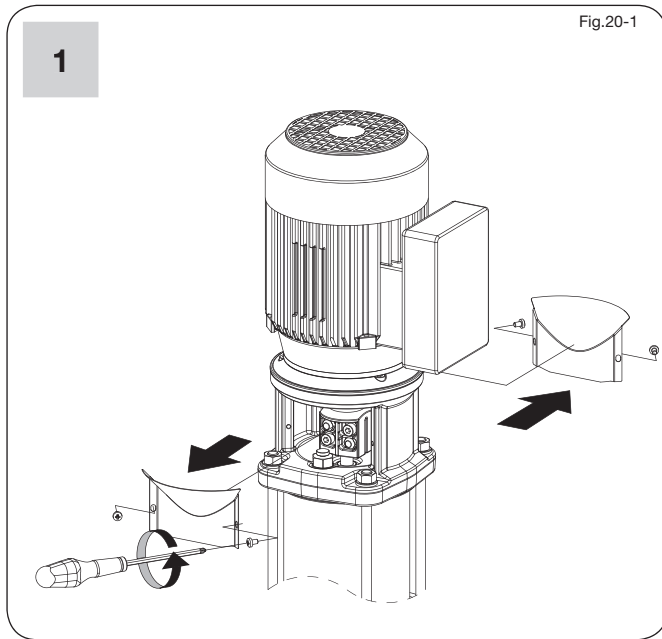
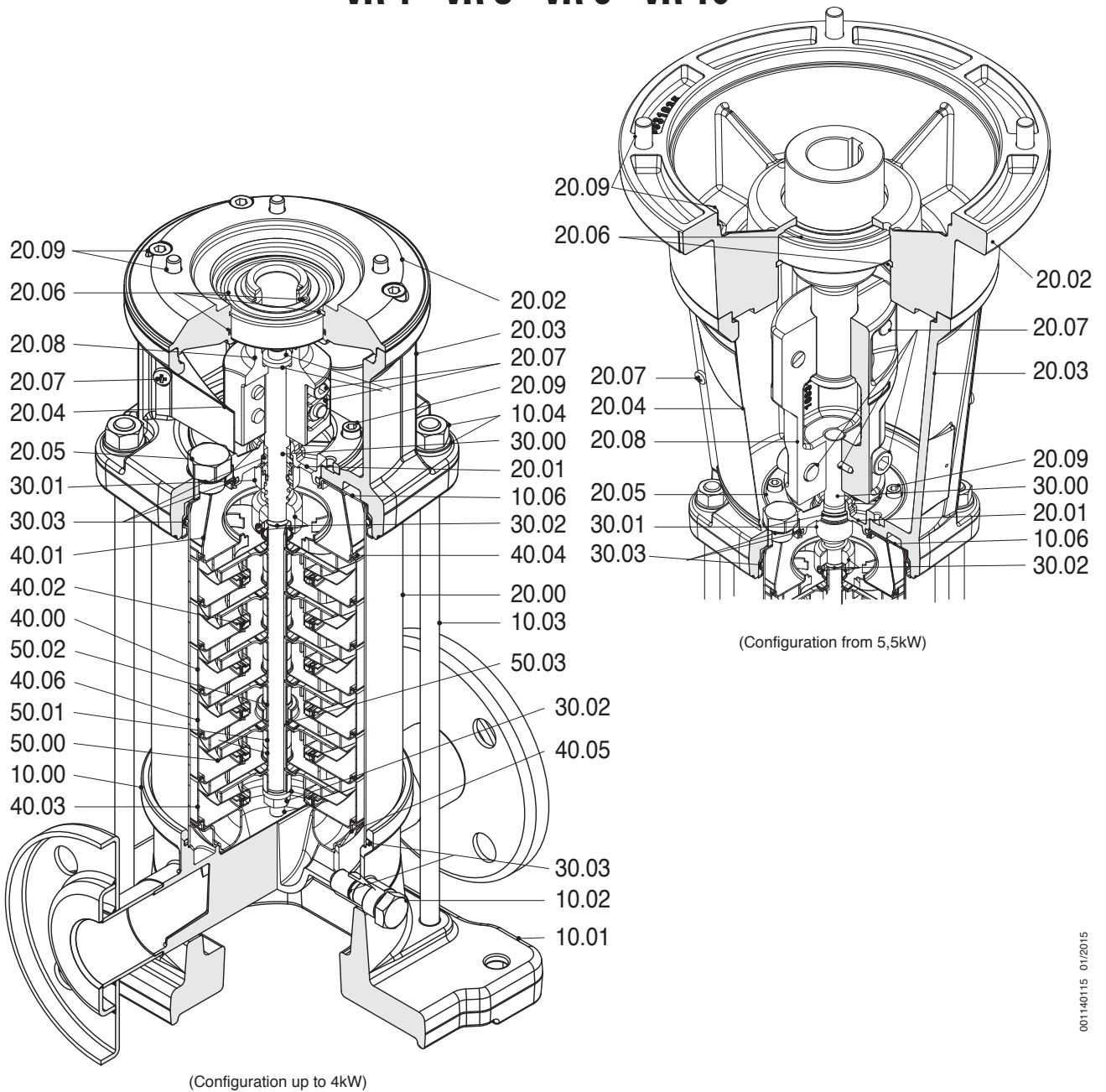


Fig.21

VR Series Pump Section and List of Main Components

VR 1 - VR 3 - VR 6 - VR 10



001140115 01/2015

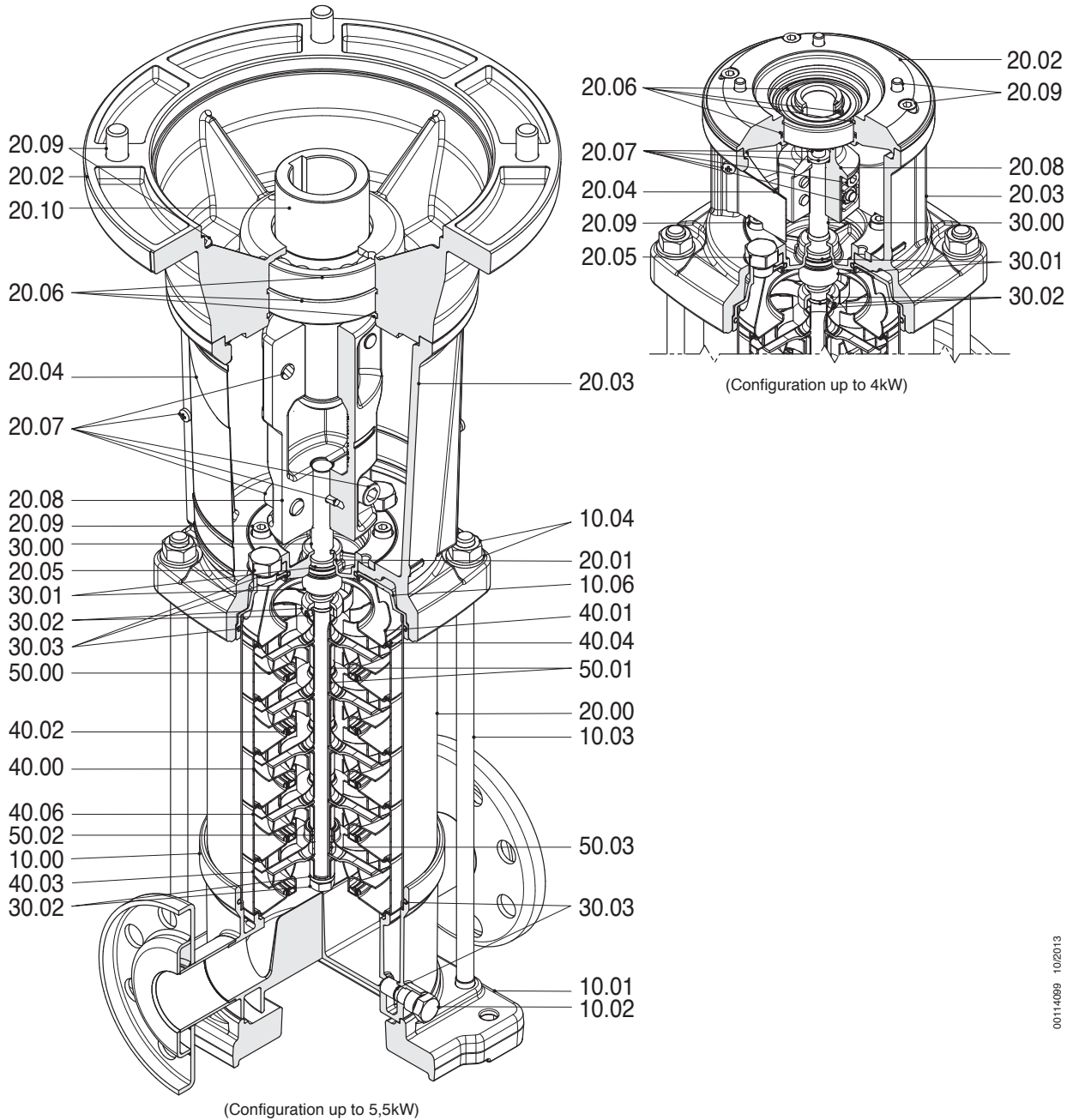
N. rif.	Description
10.00	Pump casing
10.01	Pump flanging plate
10.02	Filling and draining plug
10.03	Tie bolt
10.04	Kit nuts and washers
10.06	Upper flange
20.00	Outer Case
20.01	Mechanical seal housing
20.02	Motor flange
20.03	Motor bracket
20.04	Coupling guard
20.05	Filling plugs
20.06	Circlips and bearings, and O-ring
20.07	Coupling fasteners
20.08	Coupling
20.09	Kit motor screws

N. rif.	Description
30.00	Pump shaft
30.01	Kit Mechanical seal
30.02	Mechanical seal fastening kit
30.03	Kit O-rings
40.00	Stage housing and diffuser
40.01	Stage Centering outlet
40.02	Floating neck ring
40.03	Initial stage housing
40.04	Last Stage with diffuser
40.05	Stage Centering inlet
40.06	Stage housing and diffuser with bearing
50.00	Impeller
50.01	Impeller spacer
50.02	Intermediary sleeve
50.03	Intermediary sleeve spacer

Fig.22

VR Series Pump Section and List of Main Components

VR 15 - VR 20



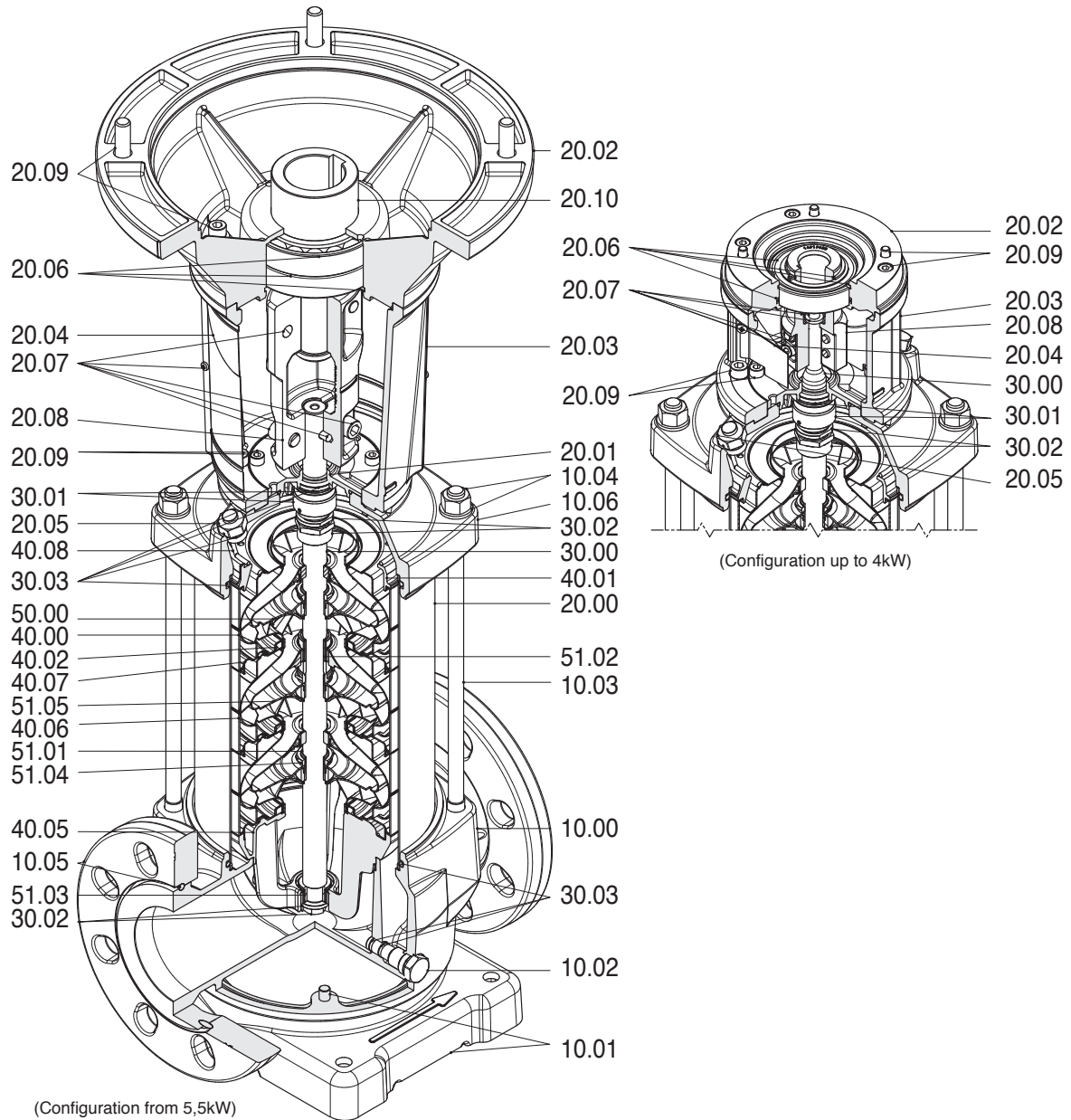
00114099 10/2013

N. rif.	Description
10.00	Pump casing
10.01	Pump fixing plate
10.02	Filling and draining plug
10.03	Tie bolt
10.04	Kit nuts and washers
10.06	Upper Flange
20.00	Outer Case
20.01	Mechanical seal housing
20.02	Motor flange
20.03	Motor bracket
20.04	Coupling guard
20.05	Filling plugs
20.06	Circlips and bearings, and O-ring
20.07	Coupling fasteners
20.08	Coupling
20.09	Kit motor screws

N. rif.	Description
20.10	Motor shaft adapter
30.00	Pump shaft
30.01	Kit Mechanical seal
30.02	Mechanical seal fastening kit
30.03	Kit O-rings
40.00	Stage housing and diffuser
40.01	Stage Centering outlet
40.02	Floating neck ring
40.03	Initial stage housing
40.04	Last Stage with diffuser
40.06	Stage housing and diffuser with bearing
50.00	Impeller
50.01	Impeller spacer
50.02	Intermediary sleeve
50.03	Intermediary sleeve spacer

VR Series Pump Section and List of Main Components

VR 30 - VR 45 - VR 65 - VR 95



N. rif.	Description
10.00	Pump casing
10.01	Pump fixing plate
10.02	Draining plug
10.03	Tie bolt
10.04	Kit nuts and washers
10.05	Kit flanges ring
10.06	Upper Flange
20.00	Outer Case
20.01	Mechanical seal housing
20.02	Motor flange
20.03	Motor bracket
20.04	Coupling guard
20.05	Filling plugs
20.06	Circlips and bearings, and O-ring
20.07	Coupling fasteners
20.08	Coupling
20.09	Kit motor screws
20.10	Motor shaft adapter

N. rif.	Description
30.00	Pump shaft
30.01	Kit Mechanical seal
30.02	Mechanical seal fastening kit
30.03	Kit O-rings
40.00	Stage housing and diffuser
40.01	Stage Centering outlet (only on VR 65/95)
40.02	Floating neck ring
40.05	Stage Centering inlet
40.06	Stage housing and diffuser with bearing
40.07	Flange clamping neck ring
40.08	Spring ring
50.00	Impeller
51.01	Split cone
51.02	Intermediary sleeve nut
51.03	Journal sleeve
51.04	Split cone nut
51.05	Intermediate impeller with screw

00114100 10/2013

VERTICAL MULTI-STAGE PUMPS
Operating and installation manual
Translation of the original instructions

1 INTRODUCTION AND SAFETY

This manual contains basic instructions to be observed during installation, use and maintenance. This manual must be consulted by the installation personnel and by all qualified personnel chosen by the installation manager to follow its operation. Furthermore, the manual should always be at hand in the site where the pump is used.

1.1 Identification of the codified instructions in this manual

WARNING: General danger; failure to observe these safety instructions may cause personal injury.

WARNING: Electrical hazard; failure to observe these instructions may cause an electric shock with consequent risk of serious injury or death.

WARNING: Hot surface; failure to observe these safety instructions may cause personal injury.

Risks deriving from failure to comply with safety regulations

Failure to comply with safety regulations may cause physical injury or material damage as well as possible environmental contamination. Failure to comply with safety regulations may lead to the complete loss of warranty rights.

To cite some examples, non-compliance with the said regulation may cause:

- breakdown of the main functions of the machine or of the installation,
- compromised maintenance operations,
- physical damage of an electrical, mechanical nature.

1.1 General Information

This pump has been made according to the most recent and advanced techniques, in full compliance with current standards and has been subject to strict quality control. This manual will help you understand its function and learn its possible applications. The user manual contains important recommendations necessary for correct and economical operation.

The recommendations should be observed in order to guarantee the reliability, lifespan and to prevent accidents deriving from improper use.

The pump should not be used outside the limits described in the technical specifications. It is necessary to observe the instructions regarding the nature, density, temperature and volume of the pumped liquid, rotation speed and direction, pressure and motor power as well as all the other instructions contained in this manual or the documentation attached to the contract.

The data plate indicates the model, the main service specifications and the serial number. It is important to provide these indications when requesting repairs or support and for requesting spare parts.

The manufacturer declines all liability for any damage that may, directly or indirectly, be caused to people or things as a result of failure to observe all of the provisions indicated in the instructions manual provided and in particular the warnings concerning installation, use and maintenance of the electric pump or in conditions other than those specified on the data plate. The warranty expires definitively in the case of negligence or incorrect use of the product.

WARNING: This equipment must not be used by children or persons with reduced physical, sensory or mental abilities, or lacking in experience and expertise, unless supervised or instructed.

WARNING: Children may not use the equipment, nor may they play with the pump or in the immediate vicinity.

2 PRELIMINARY INSPECTION

2.1 Delivery and packing

The pumps are supplied in their original packing, in which they should remain until the time of installation. Check that the packing is free from damage.

If the product appears to be damaged, inform the retailer immediately. Take care not to bend the pump when the packing has been removed: this may cause misalignment or damage to the pump itself. The pump should not be exposed to needless shocks or impact.

2.2 Packaging contents

The packaging contains the product use and installation manual. In the case of an electric pump, the packaging also contains the motor manual.

3 STORAGE AND HANDLING

3.1 Storage:

Storage temperature: from -5°C to +40°C

The pump and the motor must be kept in a dry, sheltered place, away from heat sources, dirt and vibrations. If the pump has not been packed, it should be kept in storage vertically, to prevent any misalignment.

3.2 Handling:

WARNING: Please observe the current accident prevention standards. Risk of crushing. The pump may be heavy. Use suitable lifting methods and always wear personal protection equipment.

Before handling the product, check its weight (see fig. 2) to identify suitable lifting equipment.

WARNING: The eyebolts supplied with the motors should not be used to handle the whole assembled electric pump (see fig.1.D).

For handling a pump with a motor of up to 4kW, use the belts wound around the pump head, taking special care not to damage the side coupling covers in fig.1.A. For pumps with a motor equal to or over 5.5 kW, use belts or chains attached to the lifting eyes on the motor flange as shown in fig.1.B.

WARNING: There is a risk that the pump may overturn during handling; make sure that the pump remains in a stable position during handling.

If there is no motor, use a belt wound around the pump head, paying particular attention not to damage the side coupling covers (fig.1.E), or the lifting eyes on the motor flange as shown in figure 1.F, if present. The eyebolts on the motor of the pumps must be used exclusively to handle the motor alone (see fig. 1.C). Extract the pump from the packaging and check that it is in good condition. Check also that the plate data correspond to those required. For any defects, contact the supplier immediately, reporting the nature of the same.

4 GENERAL DATA

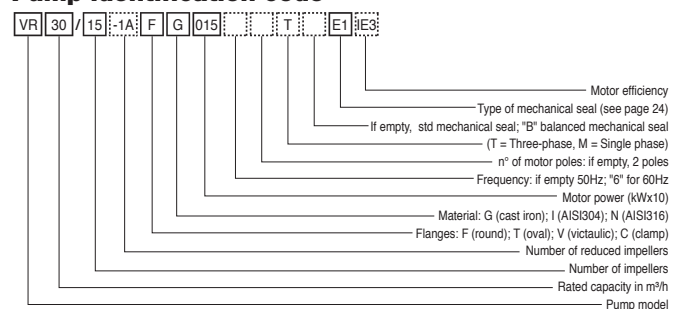
4.1 General description

This product is a non self-priming vertical multi-stage pump, which can be combined with normalised IEC electric motors. The pump is suitable for pumping hot or cold water. The metal materials in contact with the liquid in the standard versions are:

- stainless steel in the models VR 1/3/6/10/15/20,
- stainless steel and cast iron in the models VR 30/45/65/95.

Versions completely in stainless steel are available for the models VR 30/45/65/95. If only the pump has been purchased, please refer to power P2, to the number of revolutions indicated on the data plate and to fig.2 for choosing the correct motor size.

Pump identification code



Permitted Use

The pump is suitable for:

- Civil and industrial water distribution systems,
- Irrigation,
- Water treatment,
- Washing systems,
- HVAC (heating and cooling)

Forbidden use

The pump is not suitable for:

- Pumping liquids not compatible with the product construction materials.
 - Pumping hazardous liquids (for example toxic, explosive, inflammable or corrosive liquids),
 - Pumping food grade liquids other than water (for example wine or milk),
 - Pumping liquids containing abrasive, solid or fibrous substances,
 - Working outside of the rated capacity field specified on the data plate.
- Examples of unsuitable installation:
- Environments with explosive or corrosive atmospheres,
 - Outdoor installations without protection from atmospheric agents (e.g. sun, rain, high or freezing temperatures).

WARNING: Do not use this pump for inflammable or explosive liquids. Misuse may create hazardous conditions and cause personal injury and material damage. Misuse of the product may nullify the warranty.

Special use

Contact the sales and support service in the cases below:

- If the pump is used to pump liquids with viscosity or density greater than water (a motor with a proportionately higher power should be used).
- The water to be pumped has been chemically treated (softened, chlorinated, demineralised etc.),
- In any other situation other than those listed under permitted use.

4.2 Technical data

4.2.1 Liquid temperature

Pumped liquids must remain within certain temperature limits

- with EPDM seals (standard versions): from -30°C to +120°C
- with VITON/FKM seals (special versions): from -10°C to +120°C

4.2.2 Ambient temperature and altitude

In the case of ambient temperatures higher than +40°C, or the installation of the pump at an altitude higher than 1,000 metres, the motor must not work at full capacity to avoid the risk of overheating. Excessive ambient temperatures and low air density reduce the motor's ability to cool down. In these cases, it may be necessary to use a motor with a higher rated power. Below is a non-binding chart of motor capacity percentage based on altitude or temperature (see Fig. 6/A).

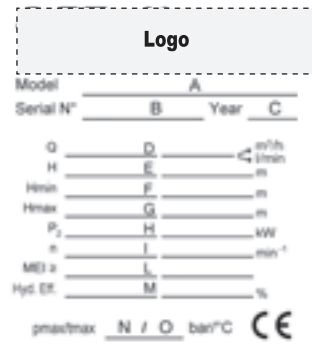
4.2.3 Maximum number of motor start-ups

The table shows the maximum number of start-ups per hour for the electric pumps supplied with a standard motor.

Power (kW)	Start-ups per hour	
	2 poles	4 poles
0,37-0,55	100	250
0,75-3	60	140
4-7,5	30	60
11-22	15	30
30-55	8	15
55-200	4	8

With a motor other than the one supplied as a standard, check the manual for the maximum number of start-ups per hour.

4.3 Pump data plate



The data plate, positioned on the upper part of the pump's outer jacket (fig.16), displays the following information:

- A) Pump identification code,
- B) Serial number,
- C) Year of manufacture,
- D) Working capacity range,
- E) Head range,
- F) Minimum head (IEC EN 60335-2-41),
- G) Head at 0 capacity,
- H) Maximum absorbed power,
- I) Rotation speed at maximum power,
- L) Minimum efficiency index,
- M) Maximum pump efficiency,
- N) Maximum operating pressure (PN),
- O) Maximum temperature of pumped liquid (for uses other than those set out by IEC EN 60335-2-41).

4.4 Motor data plate

See plate attached to the motor.

4.5 Other plates

Under the data plate, a label indicates the rotation direction of the pump shaft and the maximum operating temperature of the fluid, for uses other than those set out by standard EN60335-2-41 (fig.16). For versions VR 1/3/6/10/15/20, a label positioned on the lower part of the jacket shows the direction of flow (fig.16-A). For versions VR 30/45/65/95 the indication of the direction of flow is shown on the pump base (fig.16-B).

5 INSTALLATION AND PREPARATION

For the pump to function correctly and to avoid damage to people or things, some fundamental conditions must be observed, particularly the check of the NPSH and maximum pressure.

5.1 Checking the NPSH

Check the characteristic curves of the electric pump to evaluate the NPSH factor (see Fig. 3) and avoid cavitation problems in the case of an excessively high gap between the pump and the level of the liquid to be drawn or due to an excessively high temperature (fig.4.B).

The maximum height between the pump and the level of liquid "H" can be calculated using the following formula:

$$H = pb \times 10.2 - NPSH - Hf - Hv - Hs$$

- bp: Bar pressure or liquid suction pressure [bar].
- NPSH: Net positive suction head [m] (see fig.3)
- Hf: Friction and entrance head losses in the suction piping [m]
- Hv: Steam pressure [m] in relation to the temperature of the liquid (tm) (see fig.4.A)
- Hs: Safety margin [m] (minimum 0.5)

If the value calculated is less than "0" the pump should be placed below the liquid level.

Example

- bp = 1 bar
- Type of pump: VR 10
- Capacity: 9 m³/h
- NPSH: 1.5 m
- Hf = 2.5 m
- Liquid temperature: +50°C
- Hv: 1.3 m
- H = bp x 10.2 - NPSH - Hf - Hv - Hs [m].
- H = 1 x 10.2 - 1.5 - 2.5 - 1.3 - 0.5 = 4.4 [m]

This means that the maximum height between the pump and the level of the liquid to be sucked is 4.4 metres.

5.2 Checking maximum pressure

Working pressure

It is important to keep the sum of the inlet pressure plus the maximum pressure of the pump at flow Q=0, always lower than the maximum allowed working pressure (PN). The PN value is indicated on the nameplate of the pump.

Case 1:

Single standard pump fig.5.A
 $P1max + P2max \leq PN$

Case 2:

Standard pump + high pressure pump fig.5.B

$$P1max + P2max + P3max \leq PNHP$$

In this case, refer to the maximum pump pressure HP clearly shown on the additional label.

Inlet pressure

The inlet pressure must not exceed the limits indicated in the tables in (fig. 2, H1).

5.3 Minimum rated capacity

The function of the pump at a lower level than the minimum nameplate allowed rated capacity, may cause excessive and detrimental overheating of the pump.

For water temperatures over 40°C, the minimum capacity should be increased according to the temperature of the liquid (see fig.6).

Please contact our sales and service department for liquids other than water.



WARNING: The pump should never operate dry (without liquid inside)



WARNING: The pump must never operate with the delivery valve closed for more than 10 seconds.

5.4 Installation of the pump

WARNING: Please observe current accident prevention standards; use proper protective devices and refer to the regulations, legislation and local and/or national country codes for water and electricity connections.



WARNING: Before starting work on the electric pump, make sure the electrical connection has been disconnected from the power supply network and that it cannot be reconnected accidentally.



WARNING: Ensure all electrical equipment of the pump, motor and monitoring equipment is earthed. The earth connection should be the last connection to disconnect from the terminal. Make sure that the earth connection is longer than the phase connections on both ends of the cable. As extra protection from lethal electric shocks, install a high sensitivity residual current device (30mA).



WARNING: DO NOT USE THIS PUMP IN ENVIRONMENTS THAT MAY CONTAIN INFLAMMABLE/EXPLOSIVE OR CHEMICALLY AGGRESSIVE DUST OR GAS.



WARNING: The installation of the electric pump is an operation that may prove complex. It should therefore be carried out by skilled and authorised installers.

5.4.1 Assembly Guide lines

- Install the electric pump in an accessible area, protected from frost and leaving sufficient space around the electric pump to allow for its operation and maintenance. Horizontal assembly is permitted only if the electric pump is properly supported. Vertical assembly is not permitted with the motor placed on the lower part (see fig.7).
- Check that there are no obstacles blocking the air flow to cool the motor, make sure there is at least 100 mm of space in front of the fan (Fig.9).
- Any liquid leakages or similar events must be drained and should not flood the place of installation and/or submerge the unit.
- The electric pump must **ALWAYS** be firmly fixed to a concrete base or to a metal structure of size and weight to suit the size and weight of the electric pump; use screws suitable for the fixing holes provided (see fig.8 dimensions, tightening torques). To reduce vibrations to a minimum, insert vibration-damping seals between the pumps and the base.
- Make sure the pump is correctly orientated: The flow arrows shown on the pump should point in the direction of flow of the connection pipes.
- The connection pipes must be suitable for the operating pressure and the pumped liquid; between the pipe connections and the pump proper seals should be inserted.
- The pipes should be properly supported (fig.9-1), without resting on the unit. Do not force the position of the pipes by fixing them, using bolts, to the pump (see fig. 13 for maximum forces and stresses applicable to connections). Flexible hoses or expansion joints (fig.9-2) are necessary to avoid vibrations being transmitted from the pump to the piping and vice-versa.
- To prevent air bubbles in the suction pipe, arrange it at an inclination of no less than 2%. The diameter of the pipe should not be smaller than the diameter of the suction vent and should be sealed. If the suction pipe is bigger, install an eccentric reducer (fig.9-6). If the pump is above the liquid to be sucked (negative suction head pump fig.9-A) a foot valve should be fitted to the end of the suction pipe (fig.9-3).
- The end of the suction pipe should be sufficiently immersed to prevent air entering the suction vortex (fig.9-7) when the liquid is at minimum level. Suitably sized gate valves should be fitted to the suction pipes (fig.9-4) and delivery pipes (fig.9-8) to regulate flow and to isolate the pump from the circuit in the case of inspection and maintenance.
- Install a check valve (fig.9-5) to the delivery piping to prevent reflux and water hammers when the pump is switched off.
- See fig.10: pump connections size and bolt tightening torques.



WARNING: Depending on the temperature of the pumped liquid, the surfaces of the electric pump may reach high temperatures. If deemed necessary, provide guards to avoid accidental contact.

5.4.2 Electrical connections



WARNING: Low voltage machines are comprised of rotating, hazardous, live parts and sometimes also hot surfaces.



WARNING: The installer sees to making the connection in compliance with current standards in force in the country of installation.

Guide lines



WARNING: The following information is valid for the standard motor supplied with the pump. If the pump alone is supplied and is coupled with a different

motor, please refer to the relative use and maintenance manual. Protect the electric connections from excessively high temperatures, vibrations and shocks.

The power line must be equipped with:

- A short circuit protection device,
- A residual current device less or equal to 30mA,
- An overvoltage category III all-pole mains isolator in the power supply network according to current standards.

The electric control panel should:

- Be suited to the rated values of the electric pump, to properly protect the motor.
- Protect from motor from overheating (circuit breaker protection);
- Be equipped with a system to protect against dry running, which should be connected to the pressure switch, level sensors, floats and other suitable devices. An inflow pressure switch is recommended if the pump is connected to the water supply or level sensors/floats if the pump draws from a tank.

WARNING: The data regarding the power supply of the motor are shown on the plate of the same. For more information about the use and maintenance of the motor, refer to the "Service instructions" manual.

Before starting up the motor, check that the electrical supply is compatible with the characteristics of the same. Wire the electric cable to the motor according to the diagram shown inside the cover of the terminal box. Check that the earth cable is longer than the phase connections: If the power supply cables are pulled and detached from their cable stay, the last one that should disconnect is the earth cable. Make the connection ensuring there is an effective earth circuit.

WARNING: Once the cables have been connected, replace the terminal board cover; failure to observe these instructions may cause personal injury.

WARNING: Avoid any contact between the electric cables and the pipes or other parts of the pump, carefully insulate cables from damp.

If necessary, the motor may be rotated on its axis to facilitate accessibility for maintenance personnel. For all versions of the pump with motor of rated power less or equal to 4kW, first remove the coupling safety casings to access the motor clamping screws (see fig.17). For all other versions, the motor clamping screws are easily accessible. In this case, it will be necessary to unscrew the clamping screws of the motor on the pump, turn the motor in its place and fix the screws again (fig.18).

WARNING: Having turned the motor and fixed the clamping screws, replace the safety casings where necessary; failure to observe these instructions may cause personal injury.

Electric motors can generally run with a power voltage having a tolerance of:

motor 50Hz, single phase, 230V +/-10
 motor 50Hz, three phase, 230/400V +/-10
 motor 50Hz, three phase, 400/690V +/-10

motor 60Hz, three phase, 220/380V +/-10
 motor 60Hz, three phase, 265/460V +/-10
 motor 60Hz, three phase, 460V +/-10

Use standard power cables with 3 connections (2 + Earth) for the single phase versions and with 4 connections (3 + Earth) for the three phase versions.

5.4.3 Pumps without standard motor

- Use only dynamically balanced motors (IEC 60034-14) and with normal vibration grade (A).
- Use only single or three phase motors whose size and power are in compliance with European standards, with IP55 protection rating and insulation class F or higher;
- Please refer to power P2, to the number of revolutions indicated on the data plate and to table 2 for choosing the correct motor size.
- Check that the coupling surface is flat and even and that the screws are fixed and the alignment exact.
- Before starting up the motor, turn the rotor by hand and check for any sounds of abrasions and/or friction,
- The motor must be equipped with keyed joint,
- For use and connections, refer to the relative "Installations Instructions" manual.

6 START-UP

WARNING: Pay attention to discharged liquid so that it cannot cause damage to people or things. The motor protectors can cause an unexpected restart of the motor, which may cause serious personal injury. Never start up the pump without the coupling safety casings correctly installed.

WARNING: During operation the external surfaces of the pump and the motor could exceed 40°C (104°F) if the pumped liquid is not at ambient temperature. Do not touch the unit without proper protection. Do not put combustible material near the pump.

WARNING: The electric pump must NOT be started without prior filling. Its dry use may irreparably damage the mechanical seal.

6.1 Priming

Case with liquid level above the pump (positive suction head fig.9-B)

- Close the delivery valve (fig.9-8).
- Partially unscrew the pin on the filling cap (fig.16-A-1 o fig.16-B-1).

- Open the inflow gate valve (fig.9-4) to allow the liquid to enter; wait until the water comes out of the side hole of the cap.
- Tighten the pin of the filling cap.

Case with the liquid level below the pump (negative suction head fig.9-A)

- Close the delivery valve (fig.9-8).

For versions VR 1/3/5/10:

- Completely remove the filling cap (fig.16-A-2) and partially unscrew the discharge cap by 3-4 turns (fig.16-A-3).
- Using a funnel, fill the pump until the water comes out, (this operation may need to be repeated several times)
- Replace and tighten the discharge cap and the filling cap (see tightening torques in the figure).

For versions VR 15/20/30/45/65/95:

- Completely remove both filling caps (fig.16-B-4, 16-B-2).
- Using a funnel in one of the two holes, fill the pump until the water comes out, (this operation may need to be repeated several times).
- Replace and tighten both filling caps (see tightening torques in the figure).

6.2 Checking rotation direction

Check the direction of rotation by looking at the arrows on the jacket label, or the arrow on the motor bracket.

Start up the motor for 1-2 seconds, and check the direction of rotation through the motor fan cover.

WARNING: Before any repairs to the electric pump, check that the power supply is disconnected and that it cannot be accidentally reconnected during maintenance operations.

If the direction is incorrect (procedure valid only for three-phase motors):

- Disconnect the power supply,
- In the terminal box or control panel of the motor, exchange the position of two phases of the power cable,
- Close the lid of the terminal box and/or control panel again,
- Check the direction of rotation again.

Note: For single-phase motors, the direction of rotation is already set.

6.3 Starting up the pump

Before start up, check that:

- The electric pump is correctly connected to the power supply,
- The pump is correctly primed (procedure point 6.1),
- The gate valve (fig.9-8) is closed and the inlet valve (fig.9-4) is open,
- Start the motor,
- Gradually open the valve on the delivery side of the pump,
- After a few seconds of noisy operation to expel any air, the pump should function silently and regularly without any changes in pressure.

Otherwise refer to the Troubleshooting table Point 9

Noise level

For information on noise levels for the pump supplied with standard IEC motor see table (fig.15).

6.4 Emptying the pump

If it is necessary to empty the pump for maintenance or for long periods of inactivity, please:

- Close the gate valves of the delivery and suction piping (fig.9-8 and 9-4)
- Discharge the pressure of the pump;
- Partially unscrew the pin on the filling cap (fig.16-A-1, 16-B-1).
- Completely remove the discharge tap (fig.16-A-3, 16-B-3) and wait for the pump to empty;
- Once emptying is completed, replace and tighten the discharge cap again, the pin of the filling cap (tightening torques shown in fig.16).

WARNING: Liquid may remain in some parts inside the pump. To remove all liquid, the pump must be completely disassembled.

WARNING: Pay attention to discharged liquid so that it cannot cause damage to people or things.

7 MAINTENANCE AND SUPPORT

WARNING: Before any repairs to the electric pump, check that the power supply is disconnected and that it cannot be accidentally reconnected during maintenance operations.

WARNING: If the electric pump is used for hot and/or hazardous liquids, inform the personnel who will carry out the repair. In this case, clean the pump so as to guarantee the safety of the operator.

WARNING: Repairing or having the electric pump repaired by personnel not authorised by the manufacturing company means losing the warranty and operating with unsafe and potentially hazardous equipment.

WARNING: Pay attention to discharged liquid so that it cannot cause damage to people or things.


The electric pump does not require any ordinary scheduled maintenance. If the user wishes to prepare a scheduled maintenance plan, bear in mind that the due dates depend on the type of liquid pumped and the running conditions.

For the spare parts and the maintenance instructions, please contact our sales&service dpt. Spare parts see fig. 21/22/23

7.1 Replacing the motor

For all versions of the pump with motor of rated power less or equal to 4kW, first remove the coupling safety casings to access the motor clamping screws (see fig.20). For all other versions, the motor clamping screws are easily accessible. For all other versions, the motor clamping screws are easily accessible on the exterior (see fig.19). The motor shaft must have a key drive.

Note: It is not necessary to carry out any operations on the pump shaft and motor shaft connection joints.

 **WARNING:** Replace the safety casings where necessary; failure to observe these instructions may cause personal injury.

7.2 Replacing the mechanical seal


The type of mechanical seal can be identified from the pump Identification Code point 4.1 and from fig.14.


For the models with motor power less or equal to 4kW, follow the instructions in fig. 11; for motor power bigger than 4kW, instructions in fig.12

8 DISPOSAL

The disposal of this product, or part thereof, must be executed using local public or private waste collection.

9 TROUBLESHOOTING

 **WARNING:** Before any repairs to the electric pump, check that the power supply is disconnected and that it cannot be accidentally reconnected during maintenance operations.

 **WARNING:** If the electric pump is used for hazardous liquids, inform the personnel who will carry out the repair. In this case, clean the pump so as to guarantee the safety of the operator.

For problems and solutions, consult also table below: TROUBLESHOOTING TABLE

TROUBLESHOOTING TABLE:		
PROBLEM	CAUSE	ACTION
9.1 The pump turns but does not deliver	a) <i>The internal parts are obstructed by foreign bodies:</i>	<i>Have the pump dismantled and cleaned.</i>
	b) <i>Suction pipe is blocked:</i>	<i>Clean the pipe.</i>
	c) <i>Air is entering the suction pipe:</i>	<i>Check that the pipe is airtight right up to the pump and seal.</i>
	d) <i>The pump is unprimed:</i>	<i>Re-prime it by filling the pump. Check that the base valve is air tight.</i>
	e) <i>The suction pressure is too low and generally accompanied by cavitation noise:</i>	<i>Excessive loss of head in suction or the suction height is excessive (check the NPSH of the installed pump).</i>
	f) <i>Voltage is insufficient to power the motor:</i>	<i>Check the voltage of the motor terminals and the correct diameter of the connections.</i>
9.2 The pump vibrates	a) <i>Anchorage on a faulty base:</i>	<i>Check and fully tighten the nuts on the bolts of the studs.</i>
	b) <i>Foreign bodies obstructing the pump:</i>	<i>Have the pump disassembled and cleaned.</i>
	c) <i>Obstruction in the pump rotation:</i>	<i>Check that the pump can rotate freely without any abnormal resistance.</i>
	d) <i>Faulty electrical connection:</i>	<i>Check the pump connections.</i>
9.3 The motor heats up abnormally	a) <i>Insufficient voltage:</i>	<i>Check the voltage at the motor terminals. The voltage should be ± 10% of the rated voltage (± 6% si 60 Hz).</i>
	b) <i>Pump blocked by foreign bodies:</i>	<i>Have the pump dismantled and cleaned.</i>
	c) <i>Ambient temperature higher than +40°C:</i>	<i>The motor is designed to function at a maximum ambient temperature of + 40°C.</i>
	d) <i>Connection error in the terminal board:</i>	<i>d) Connection error in the terminal board: Follow the instructions on the motor plate and FIG. 4</i>
9.4 The pump does not deliver sufficient pressure	a) <i>The motor is not rotating at normal speed (foreign bodies or faulty power supply etc.):</i>	<i>Have the pump dismantled and correct the problem.</i>
	b) <i>The motor is faulty:</i>	<i>Replace it.</i>
	c) <i>Pump is not filling properly:</i>	<i>Open the bleed valve of the pump and bleed until all air bubbles disappear.</i>
	d) <i>The motor rotates in reverse (three-phase motor):</i>	<i>Invert the rotation direction by exchanging two phase wires on the motor terminal board or the motor protection breaker.</i>
	e) <i>The discharge-priming cap is not fully screwed on:</i>	<i>Check it and tighten it</i>
	f) <i>Voltage is insufficient to power the motor:</i>	<i>Check the voltage of the motor terminals and the correct diameter of the connections.</i>
9.5 The automatic circuit breaker trips	a) <i>Relay value too low:</i>	<i>Check the intensity with an ammeter or record the intensity value indicated on the motor plate.</i>
	b) <i>Voltage is too low:</i>	<i>Check that the diameter of the conductors of the electrical cable is the right one.</i>
	c) <i>Interruption of a phase:</i>	<i>Check the electrical cable or fuse and replace, if necessary..</i>
	d) <i>The relay is faulty:</i>	<i>Replace it.</i>
9.6 The flow is not regular	a) <i>The suction height is not being observed:</i>	<i>Check the installation conditions and the recommendations contained in this manual.</i>
	b) <i>The suction piping has a diameter smaller than that of the pump:</i>	<i>The suction piping should have the same diameter as the pump suction mouth.</i>
	c) <i>The filter and the suction piping are partially blocked:</i>	<i>Clean the suction duct.</i>



Franklin Electric

Franklin Electric (Aust) Pty Ltd
106-110 Micro Circuit
Dandenong South, Vic 3175
Tel: +61 3 9799 5000

Toll Free: 1300 FRANKLIN
1300 372 655

franklinwater.com/au

UNITED STATES

Franklin Electric Co., Inc.
9255 Coverdale Road, Fort Wayne, IN 46809
Tel: +1.260.824.2900 Fax: +1.260.824.2909