Cheonsei

KEMPION METERING PUMPS

BKH Series

Hydraulic Bypass Metering Pumps

Instruction Manual

www.cheonsei.co.kr

Thank you very much for purchasing Cheonsei BKH-Series. Before beginning operation, please read this instruction manual carefully. Correct handling, repair, & maintenance are described easily. Please use this pumps safely to be guaranteed performance & long life of the pump after reading this instruction manual. Please keep this instruction manual at the place where you can see it easily.

Contents

3 Notice for safety

1-1 Introduction

- To use the products safely, the signs are showed on the manual like below.
- As it is a matter of safety, please be sure to keep the directions in manual.
- The signs and indication are as follows.

⚠Warning

Person death or serious injury will be occurred, if warning is not kept by wrong handling.

⚠Caution

Person injury or property damage will be occurred, if caution is not kept by wrong handling.

1-2 Cautions for Operating Condition

⚠Caution

- Do not use this pump for other purposes except liquid injection.
  Otherwise it may cause trouble.
- Do not use for kinds of liquid which cause damage to liquid end parts.
- Please keep the followings, otherwise it may cause trouble.
  Ambient temperature : 0~40°C
  Temperature of the handling liquid : Head material of PVC 0~50°C
  Head material of PVDF, SS304, & SS316 0~80°C.
  Piping pressure : Below the max. discharge pressure indicated on the Specifications.

1-3 Cautions for Handling Condition

⚠Warning

- Install this pump beyond the reach of children and/or unauthorized person
- Turn off the power and stop the pump & other equipments when repairing or disassembling pumps. If power is on during work, it may cause electric shock
- Please do not operate when the discharge valve is closed or do not close the valve during operation. Pump and Piping may be damaged with excessive pressure rising and liquid may spout when operation under valve closing.
- Be careful not to insert fingers or any foreign substances into rotating or reciprocating objects during operating pump. If you touch it during operation, you may get injury.
- Do not touch with wet hands. Electric shock may occur.
- Use only designated parts. If undesignated parts are used to the pump, it may cause accident & trouble.
- Do not arbitrarily reconstruct the pump. If the pump is arbitrarily reconstructed, it may cause accident & trouble.

⚠Caution

- Do not use damaged pump. It may cause accident.
- Do not install pump in the heavy moist or dusty place. It may cause electric shock and trouble.
- Do not touch motor with bare hands during operation. High temperatures can cause burns.
- Wear suitable protective clothing(gloves, mask, goggles, working clothes, & etc.) during assemble and disassemble work when pumping hazardous liquids or uncertain liquids.
- Do not use power other than that specified in the motor nameplate. Otherwise, it may cause malfunction or fire.
- Pump should be properly grounded. If pump is not grounded, it may cause electric shock.
- Work after releasing pressure from discharge piping and remove liquid from Liquid End Part prior to repair or maintenance of pump.
- Pump may be damaged when ambient temperature go down below freezing pont of liquid. Be sure to remove the liquid in the pump and piping after operation stop.
- Make proper protection in consideration of indeliberate leakage from damage of pump & Piping.
- Dispose of waste pump in accordance with related national law.

2 Confirmation of Product

2-1 Check Point When Unpacking

Please check following points immediately after receiving the pump.
If the defect is found from pump, please request it to local agent or CHEONSEI.

1 Is specification correct as ordered?

2 Is there any missing parts ?

3 Is there any visible damage caused by vibration or shock during transport?

4 Is there any loosened bolt or nut?

2-2 Standard Accessories

1 Instruction Manual ..... 1 Copy

2 Mounting bolts (M10□40L Including Washers & Nuts) ..... 4 Set

3 Manual Vacuum Pump(Option) ..... 1 Set

3 General

Our BKH Series of Hydraulic Bypass Metering Pumps provide high durability through the adoption of a crank driving method, improve stability with built-in relief valve, and utilize the advantages of both a diaphragm metering pump for general purpose and plunger metering pumps for a high-precision & high pressure.
It can be used for precise injection of liquids containing slurry and liquids of high toxicity.
since the risk of liquid leakage is remarkably reduced in comparison with general diaphragm metering pumps
Furthermore, as an option of liquid end part, a Diaphragm Damage Detection Device is mounted to block infiltration of liquid at the time of breakage of the diaphragm and it can prevent damage between processes, & minimize secondary damage from the chemical contamination.
It can be ideally applied in various industrial fields from petrochemical industry to food industry, since discharge flow can be adjusted by manual control and automatic control with BLDC M/C Unit or Servo Unit.

4 Model Code

①	②	③a	③b	③c	④a	④b	⑤	⑥	⑦
BKH	-		-	10	1	A	-	S	S	-		-	F	S

① Series Name	BKH : Hydraulic Bypass Metering Pumps
② Control Option	No Mark : None
	A : BLDC M/C Unit
	B : Servo Unit
③ Type	a. Plunger Diameter (10, 15, 22, 32, 42, 55, 70)
	b. Gear Ratio (1, 2, 3, 4)
	c. Drive Box Size (A : 0.2kW, B : 0.4kW, C : 0.75kW, D : 1.5kW)
④ Liquid End Material	a. Head Material (P : PVC, F : PVDF, S : SS316, X : Special)
	b. Check Ball Material (C : CERAMIC, S : SS316, X : Special)
⑤ Option for Liquid End	No Mark : None
	1 : Diaphragm Damage Detection Device
⑥ Connection	F : Flange T : Thread X : Special
⑦ Power Supply	S : 3Φ 220/380V A : 3Φ 440V X : Special

5 Specifications

Model	Max.Capacity [L/h, (mL/min)]				Max.Discharge Pressure(bar)		Stroke Frequency (SPM)		Weight (kg)
	50Hz		60Hz						
	PVC · PVDF	STS316	PVC · PVDF	STS316	PVC PVDF	STS316	50Hz	60Hz	
BKH-101A	3(50)	1.8(30)	3.6(60)	2.1(35)	15	110	40	48	36
BKH-102A	6(100)	4.5(75)	7.2(120)	5.4(90)	15	100	80	97	
BKH-103A	9.5(160)	7.5(125)	11.4(190)	9(150)	15	90	120	145	
BKH-104A	12.5(210)	10.3(170)	15(250)	12.3(205)	15	80	160	193	
BKH-151A	7(115)	5.3(78.5)	8.4(140)	6.3(105)	15	70	40	48	36
BKH-152A	14.5(240)	13.3(220)	17.4(290)	15.9(265)	15	50	80	97	
BKH-153A	22.3(370)	21(350)	26.7(445)	25.2(420)	15	40	120	145	
BKH-154A	29.8(495)	28.5(475)	35.7(595)	34.2(570)	15	35	160	193	
BKH-221A	15.0(250)	14.4(240)	18.0 (300)	17.4 (290)	15	32	40	48	38
BKH-222A	31.8(530)		38.4(640)		15	23	80	97	
BKH-223A	47.4(790)		57.0(950)		15	19	120	145	
BKH-224A	62.4(1040)		75.0(1250)		15	16	160	193	
BKH-321A	33.0(550)		39.6(660)		15	15	40	48	40
BKH-322A	67.8(1130)		81.6(1360)		11	11	80	97	
BKH-323A	102.3(1705)		123.0(2050)		9	9	120	145	
BKH-324A	135.0(2250)		162.0(2700)		8	8	160	193	
BKH-101B	4.5(75)	3.3(55)	5.4(90)	3.9(65)	15	120	40	48	48
BKH-102B	9.3(155)	6.5(110)	11.1(185)	7.8(130)	15	120	80	97	
BKH-103B	13.8(230)	12(200)	16.5(275)	14.4((240)	15	110	120	145	
BKH-104B	19.5(325)	15.3(255)	23.4(390)	18.3(305)	15	100	160	193	
BKH-151B	10.8(180)	9(150)	12.9(215)	10.8(180)	15	100	40	48	48
BKH-152B	22.3(370)	19.3(320)	26.7(445)	23.1(385)	15	70	80	97	
BKH-153B	34(565)	31(515)	40.8(680)	37.2(620)	15	58	120	145	
BKH-154B	45.3(755)	77(735)	54.3(905)	52.8(880)	15	50	160	193	
BKH-221B	24.0(400)	22.8(380)	28.8(480)	27.6(460)	15	46	40	48	51
BKH-222B	47.4(790)	46.5(775)	57.0(960)	55.8(930)	15	34	80	97	
BKH-223B	72.0(1200)	69.9(1165)	86.4(1440)	84.0(1400)	15	27	120	145	
BKH-224B	97.5(1625)		117.0(1950)		15	23	160	193	
BKH-321B	49.8(830)		60.0(1000)		15	22	40	48	52
BKH-322B	102.3(1705)		123.0(2050)		15	16	80	97	
BKH-323B	152.4(2540)		183.0(3050)		13	13	120	145	
BKH-324B	204.9(3415)		246.0(4100)		11	11	160	193	
BKH-421B	90.0(1500)		108.0(1800)		13	13	40	48	54
BKH-422B	180.0(3000)		216.0(3600)		9	9	80	97	
BKH-423B	270.0(4500)		324.0(5400)		7	7	120	145	
BKH-424B	360.0(6000)		432.0(7200)		6	6	160	193	

Model	Max.Capacity [L/h, (mL/min)]				Max.Discharge Pressure(bar)		Stroke Frequency (SPM)		Weight (kg)
	50Hz		60Hz						
	PVC · PVDF	STS316	PVC · PVDF	STS316	PVC PVDF	STS316	50Hz	60Hz	
BKH-151C	12.3(205)	9.9(165)	15.0(250)	12.0(200)	15	130	40	48	70
BKH-152C	24.9(415)	21.3(355)	30.0(500)	25.8(430)	15	120	80	97	
BKH-153C	39.0(650)	34.8(580)	46.8(780)	42.0(700)	15	95	120	145	
BKH-154C	52.5(875)	48.3(790)	63.0(1050)	57.0(950)	15	85	160	193	
BKH-221C	30.0(500)	26.4(440)	36.0(600)	31.8(530)	15	80	40	48	73
BKH-222C	60.0(1000)	54.9(915)	72.0(1200)	66.0(1100)	15	55	80	97	
BKH-223C	87.3(1455)	82.5(1375)	108.0(1800)	99.0(1650)	15	45	120	145	
BKH-224C	120.0(2000)	112.5(1875)	144.0(2400)	135.0(2250)	15	40	160	193	
BKH-321C	62.4(1040)	60.0(1000)	75.0(1250)	72.0 (1200)	15	36	40	48	74
BKH-322C	124.8(2080)		150.0(2500)		15	26	80	97	
BKH-323C	187.5(3125)		225.0(3750)		15	21	120	145	
BKH-324C	250.0(4165)		300.0(5000)		15	18	160	193	
BKH-421C	107.4(1790)		129.0(2150)		15	21	40	48	77
BKH-422C	219.9(3665)		264.0(4400)		15	15	80	97	
BKH-423C	330.0(5500)		396.0(6600)		12	12	120	145	
BKH-424C	435.0(7250)		522.0(8700)		11	11	160	193	
BKH-551C	184.8(3080)		222.0(3700)		13	13	40	48	82
BKH-552C	375.0(6250)		450.0(7500)		9	9	80	97	
BKH-553C	564.9(9415)		678.0(11300)		7	7	120	145	
BKH-554C	765.0(12750)		918.0(15300)		6	6	160	193	
BKH-221D	40.0(665)	31.5(525)	48.0(800)	37.8(630)	15	130	48	58	82
BKH-222D	79.8(1330)	72.3(1205)	96.0(1600)	87.0(1450)	15	95	96	116	
BKH-223D	120.0(2000)	114.9(1915)	144.0(2400)	138.0(2300)	15	80	144	174	
BKH-321D	87.3(1455)	82.5(1375)	105.0(1750)	99.0(1650)	15	65	48	58	83
BKH-322D	174.9(2915)	169.8(2830)	210.0(3500)	204.0(3400)	15	45	96	116	
BKH-323D	262.5(4375)	255.0(4250)	315.0(5250)	306.0(5100)	15	38	144	174	
BKH-421D	150.0(2500)	144.9(2415)	180.0(3000)	174.0(2900)	15	36	48	58	85
BKH-422D	294.9(4915)		354.0(5900)		15	26	96	116	
BKH-423D	435.0(7250)		522.0(8700)		15	22	144	174	
BKH-551D	249.9(4165)		300.0(5000)		15	22	48	58	92
BKH-552D	510.0(8500)		612.0(10200)		15	15	96	116	
BKH-553D	774.9(12915)		930.0(15500)		13	13	144	174	
BKH-701D	420.0(7000)		504.0(8400)		14	14	48	58	95
BKH-702D	849.9(14165)		1020.0(17000)		10	10	96	116	
BKH-703D	1290.0(21500)		1548.0(25800)		8	8	144	174	

Note) 1. Max. capacity is the value when Max. discharge pressure is applied(with room temperature & pure water).
2. Effective flow control range is 10~100%, accuracy is ± 1%F.S., and linearity is ± 3%F.S.
3. The weight is based on a standard motor and a flange connection(SS Type).
4. Ambient temperature limit is 0 ~ 40 °C.
5. The limits of liquid temperature are 0 ~ 50 °C for PVC and 0 ~ 80 °C for PVDF & SS316.
6. The Munsell No. of painting is 0.6PB 4.8/10.6 except motor(the color of motor is maker's stnadard).
7. Specifications can be changed for improvement without prior notice.
8. For precise metering, it is required to maintain the back pressure at 2bar or more.

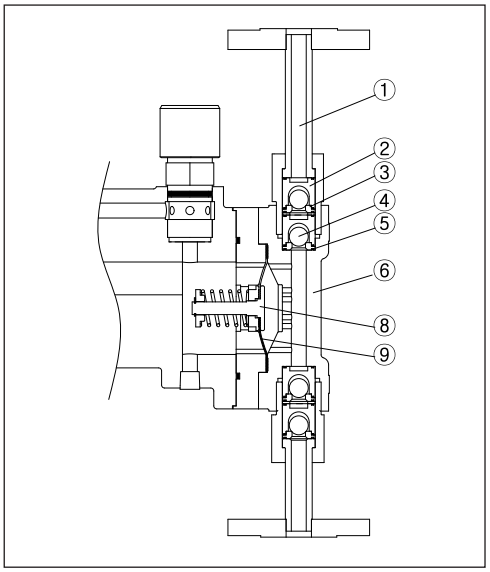
▶ Model Classification

Model	Motor(kW)	Stroke Length(mm)	Plunger Dia(mm)
BKH-101A~324A	0.2	20	10, 15, 22, 32
BKH-101B~424B	0.4	30	10, 15, 22, 32, 42
BKH-151C~554C	0.75	35	15, 22, 32, 42, 55
BKH-221D~703D	1.5	40	22, 32, 42, 55, 70

▶Connection Piping Size

Model	Connection		
	PVC · PVDF	STS316	
	Flange	Thread	Flange(Suction/Discharge)
BKH-101A~104A	KS 10K 15A	Rc1/4	KS 10K 15A / KS 63K 15A
BKH-151A~154A	KS 10K 15A	Rc3/8	KS 10K 15A / KS 40K 15A
BKH-221A~224A	KS 10K 15A	Rc1/2	KS 10K 15A / KS 20K 15A
BKH-321A~324A	KS 10K 20A	Rc3/4	KS 10K 20A
BKH-101B~104B	KS 10K 15A	Rc3/8	KS 10K 15A / KS 63K 15A
BKH-151B~154B	KS 10K 15A	Rc1/2	KS 10K 15A / KS 40K 15A
BKH-221B~224B	KS 10K 15A	Rc1/2	KS 10K 15A / KS 20K 15A
BKH-321B~324B	KS 10K 20A	Rc3/4	KS 10K 20A / KS 20K 20A
BKH-421B~424B	KS 10K 25A	Rc1	KS 10K 25A
BKH-151C~154C	KS 10K 15A	Rc1/2	KS 10K 15A / KS 63K 15A
BKH-221C~224C	KS 10K 15A	Rc1/2	KS 10K 15A / KS 40K 15A
BKH-321C~324C	KS 10K 20A	Rc3/4	KS 10K 20A / KS 20K 20A
BKH-421C~424C	KS 10K 25A	Rc1	KS 10K 25A / KS 20K 25A
BKH-551C~554C	KS 10K 25A	Rc1	KS 10K 25A
BKH-221D~223D	KS 10K 15A	Rc1/2	KS 10K 15A / KS 63K 15A
BKH-321D~323D	KS 10K 20A	Rc3/4	KS 10K 20A / KS 30K 20A
BKH-421D~423D	KS 10K 25A	Rc1	KS 10K 25A / KS 20K 25A
BKH-551D~553D	KS 10K 25A	Rc1	KS 10K 25A / KS 20K 25A
BKH-701D~703D	KS 10K 40A	Rc1□	KS 10K 40A

6 Standard Liquid End Material

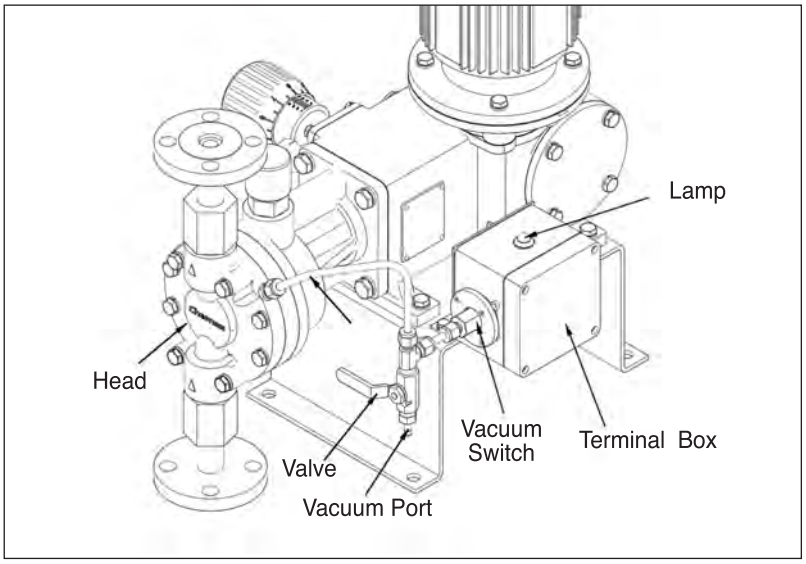


NO	Type / Part	PC		FC	SS
		10,15	22~70		
①	Joint	PVC		PVDF	SS316
②	Ball Guide	PP	PVC	PVDF	SSC14A
③	Ball Seat	FKM	PVC	PTFE	SS316
④	Check Ball	CERAMIC		CERAMIC	SS316
⑤	Gasket	FKM		PTFE	PTFE
⑥	Head	PVC		PVDF	SSC14A
⑦	Diaphragm Support	SSC14A +ETFE		SSC14A +ETFE	SSC14A
⑧	Diaphragm	PTFE		PTFE	PTFE

Note) 1. In case of special materials other than the standard, please contact separately.
2. Above standard material can be revised for improvement without prior notice.

6-1 Option for Liquid End Part

⍞ Diaphragm Damage Detection Device



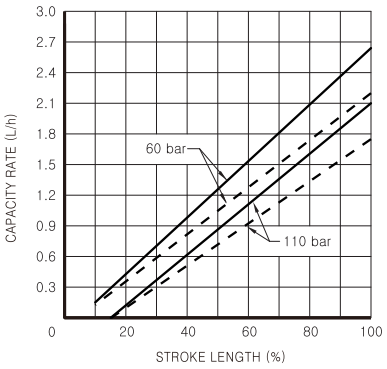
Part	Material
Head	SSC14A
Tube	SS316L
Valve	SS316
Vacuum Switch	SS316

- Diaphragm Damage Detection Device is applied only for SS type of Liquid End material.
- In case of installation and structure, Please refer to the manual of the Diaphragm Damage Detection Device

7 Performance Curves

Condition: Clean Water, Room Temperature, Suction Head -1m —— 60Hz, ----- 50Hz

● BKH - 101A (1)



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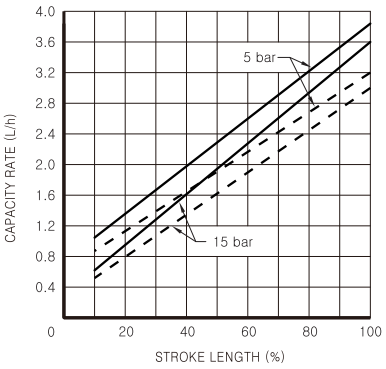

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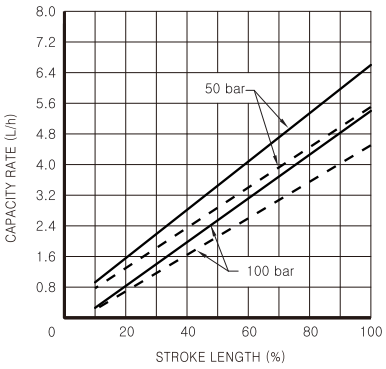

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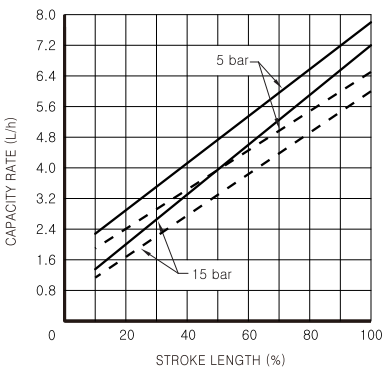

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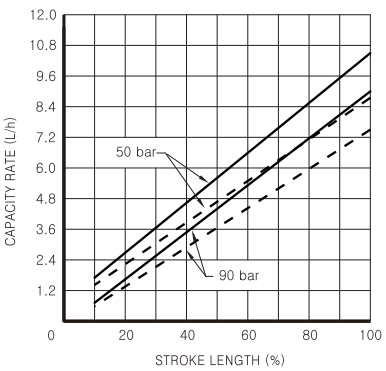

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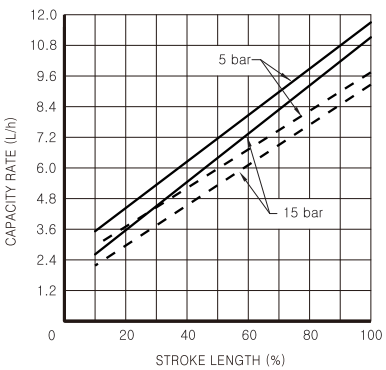

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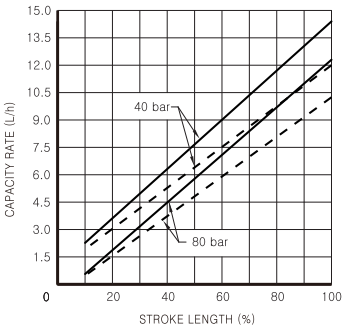

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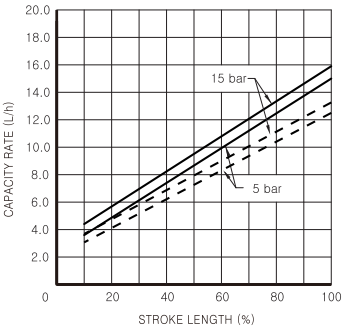

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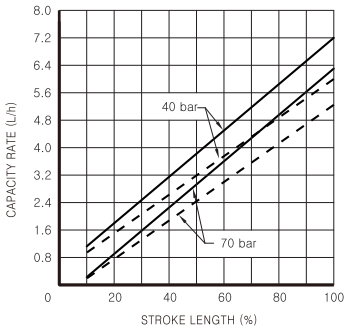

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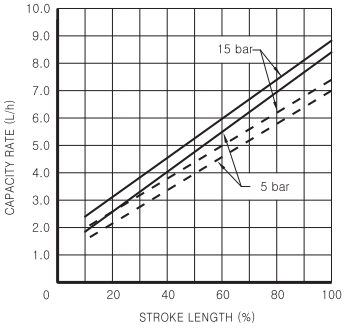

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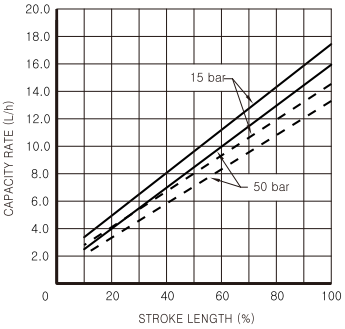

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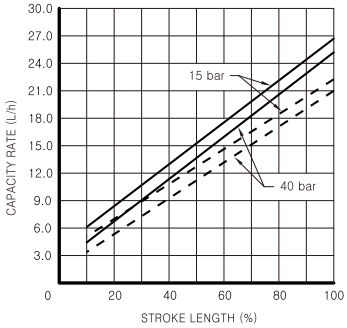

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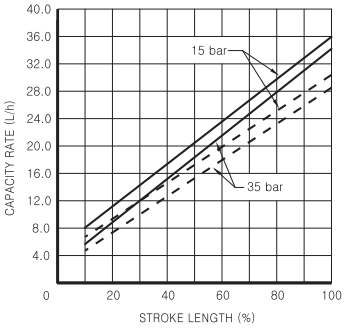

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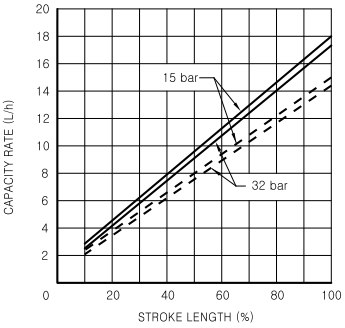
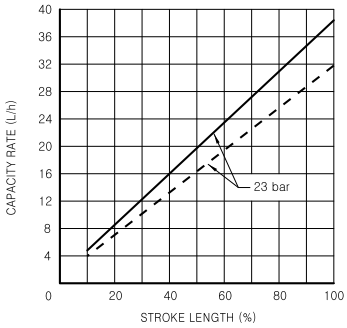
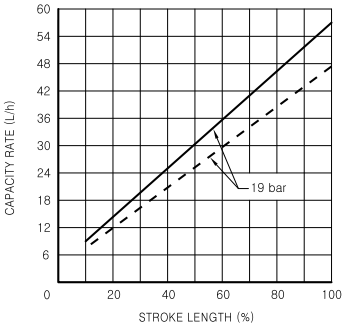


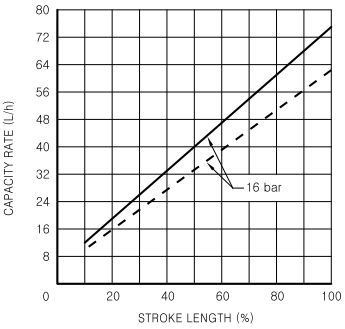
● BKH - 222A



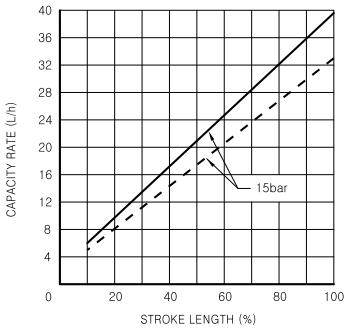
● BKH - 223A



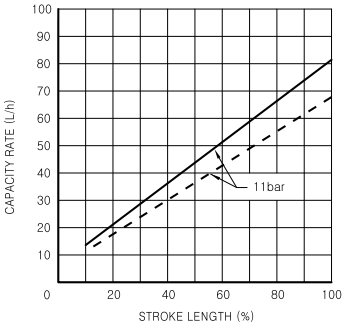
● BKH - 224A



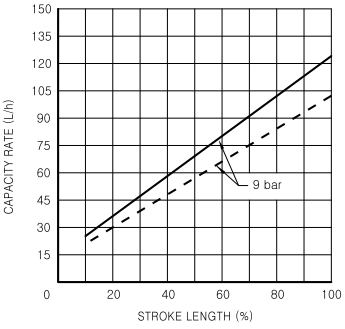
● BKH - 321A



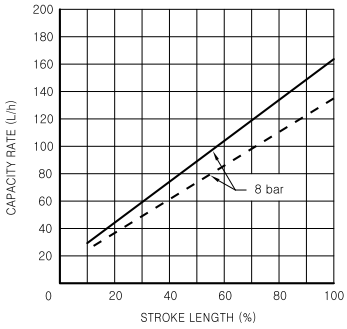
● BKH - 322A



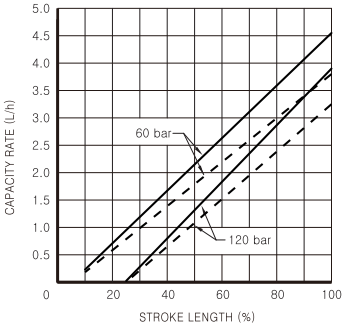
● BKH - 323A



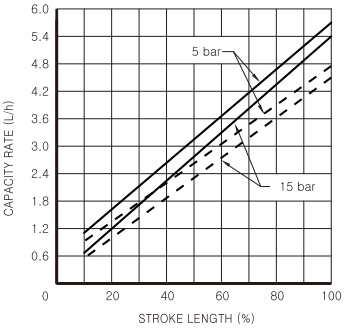
● BKH - 324A



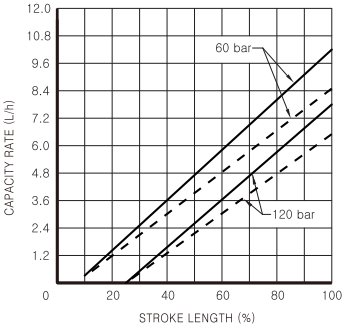
● BKH - 101B (1)



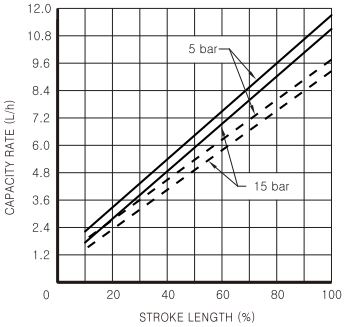
● BKH - 101B (2)



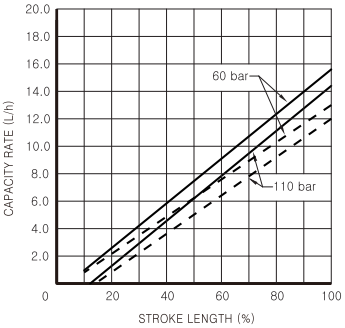
● BKH - 102B (1)



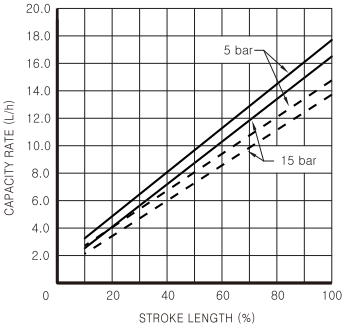
● BKH - 102B (2)



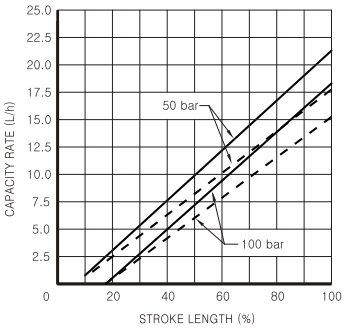
● BKH - 103B (1)



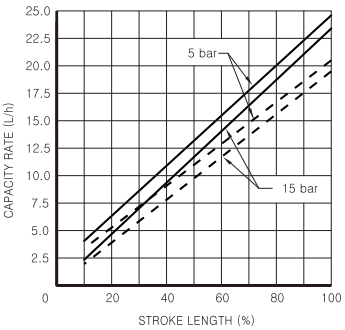
● BKH - 103B (2)



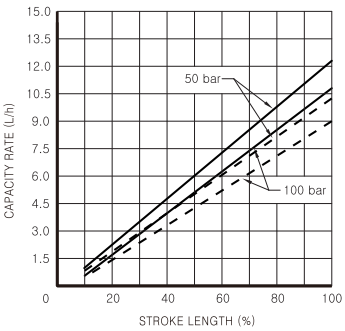
● BKH - 104B (1)



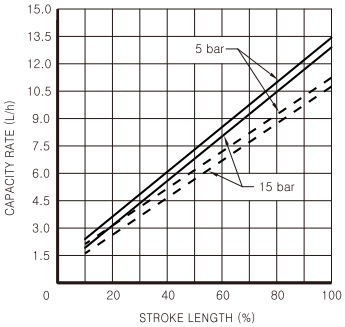
● BKH - 104B (2)



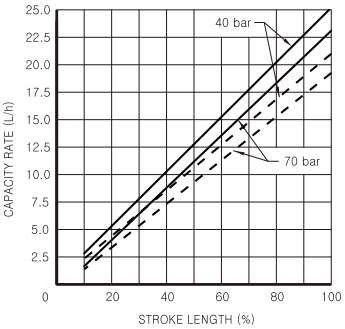
● BKH - 151B (1)



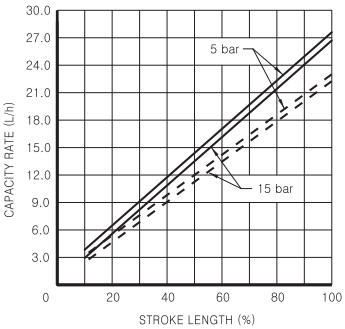
● BKH - 151B (2)



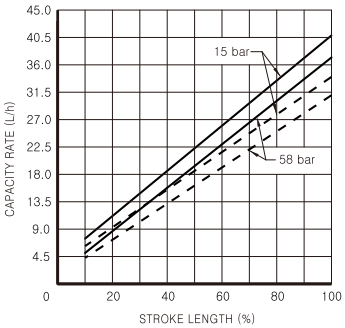
● BKH - 152B (1)



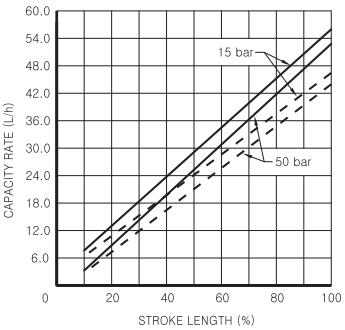
● BKH - 152B (2)



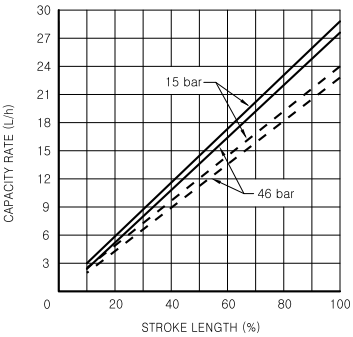
● BKH - 153B



● BKH - 154B



● BKH - 221B



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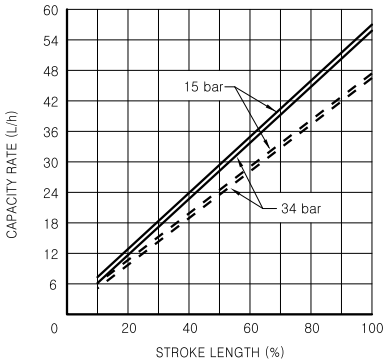
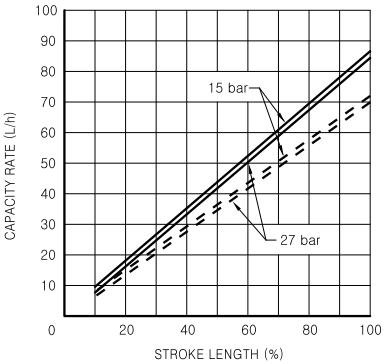
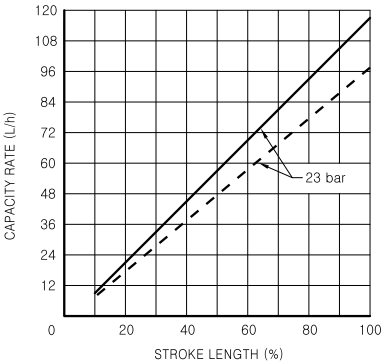


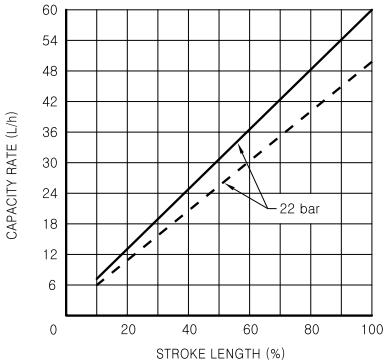
● BKH - 223B



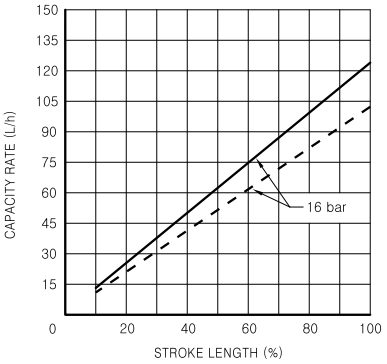
● BKH - 224B



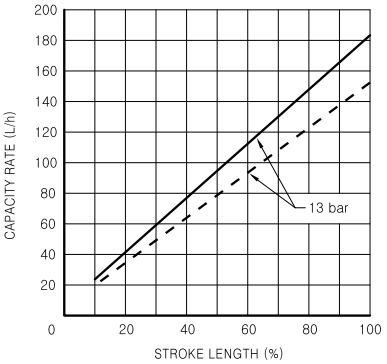
● BKH - 321B



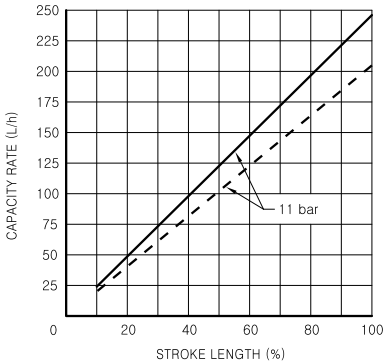
● BKH - 322B



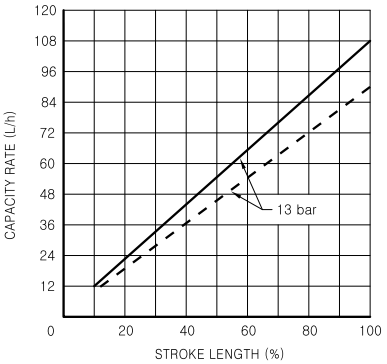
● BKH - 323B



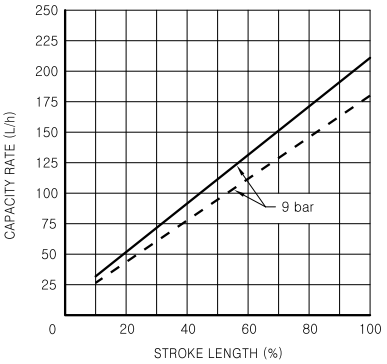
● BKH - 324B



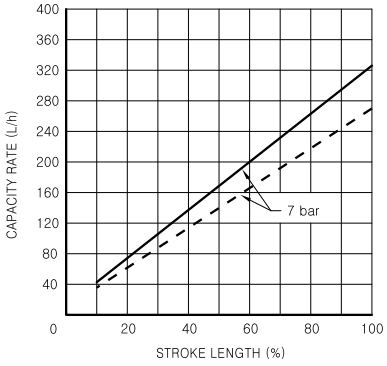
● BKH - 421B



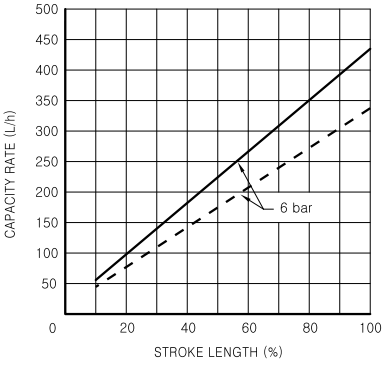
● BKH - 422B



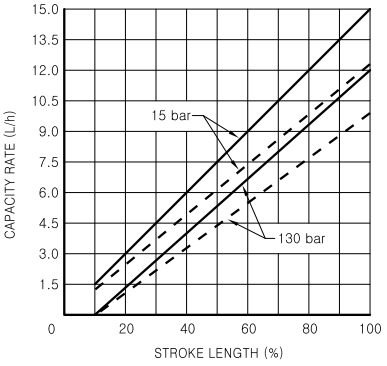
● BKH - 423B



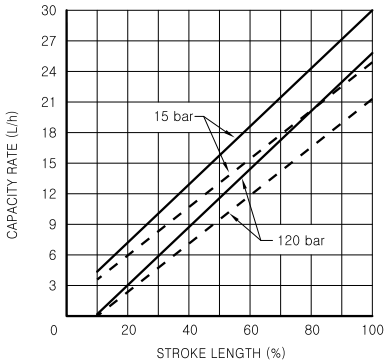
● BKH - 424B



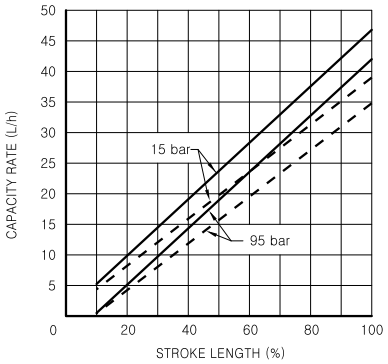
● BKH - 151C



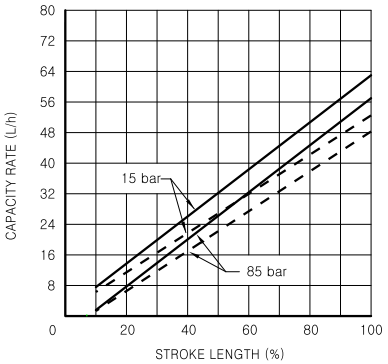
● BKH - 152C



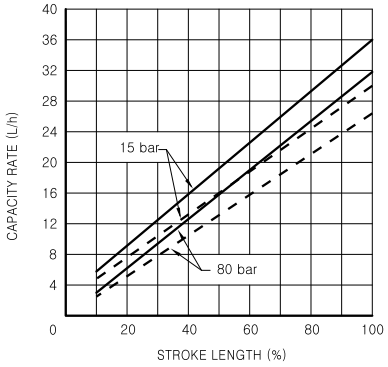
● BKH - 153C



● BKH - 154C

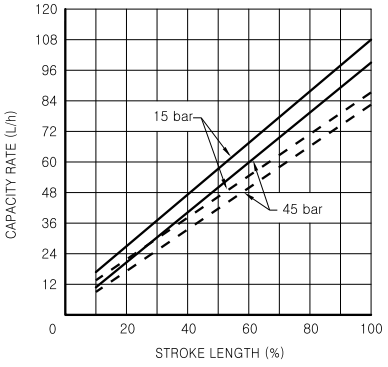


● BKH - 221C

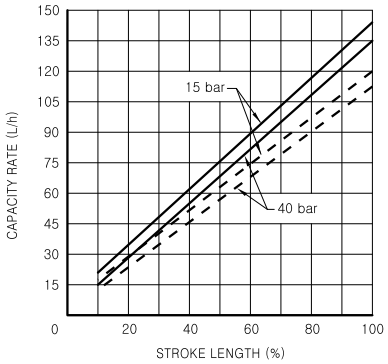


● BKH - 222C

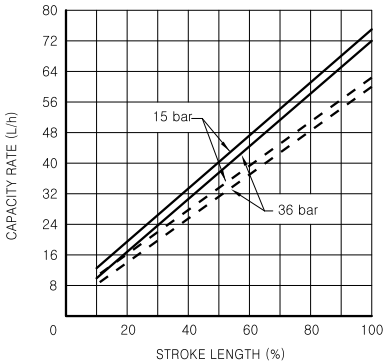
● BKH - 223C



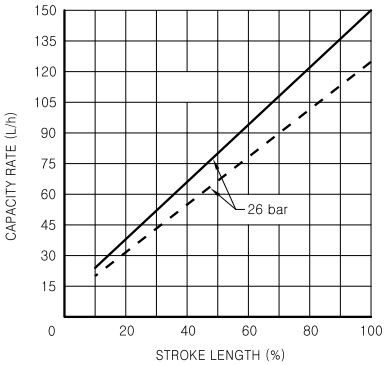
● BKH - 224C



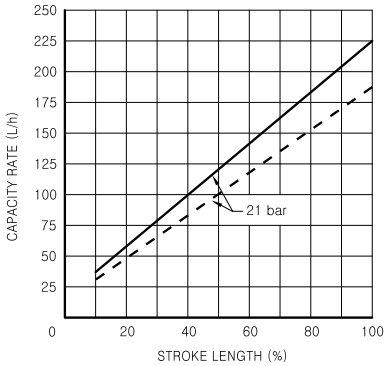
● BKH - 321C



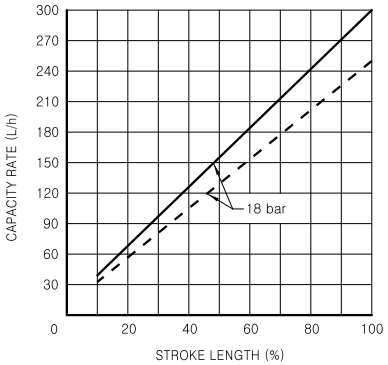
● BKH - 322C



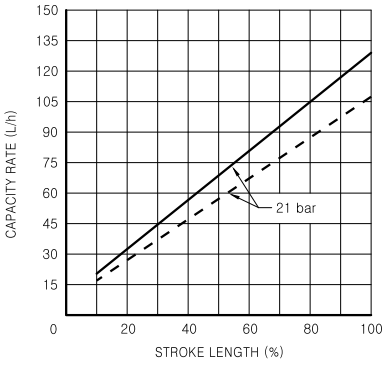
● BKH - 323C



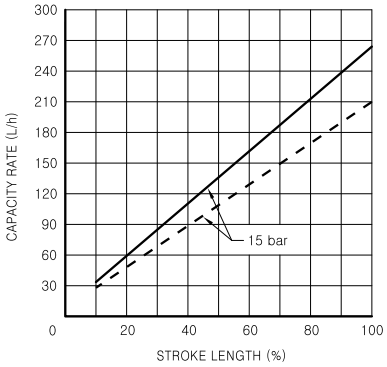
● BKH - 324C



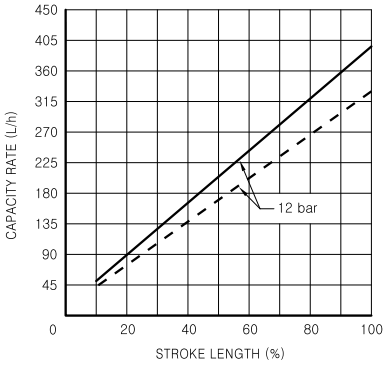
● BKH - 421C



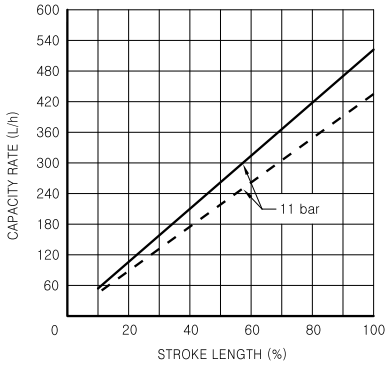
● BKH - 422C



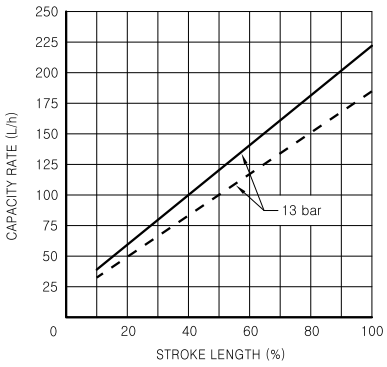
● BKH - 423C



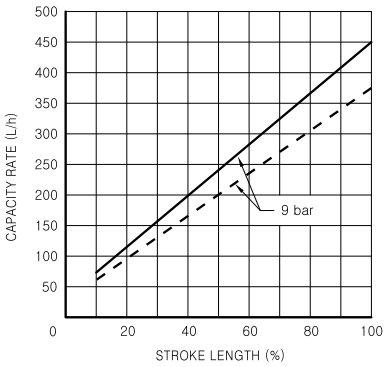
● BKH - 424C



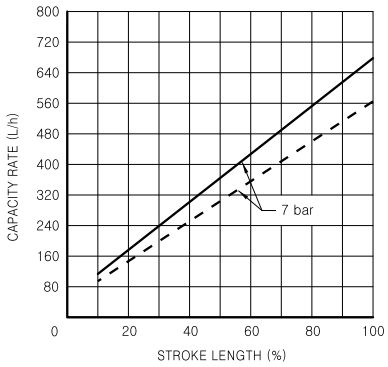
● BKH - 551C



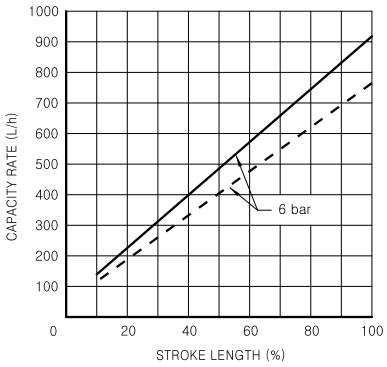
● BKH - 552C



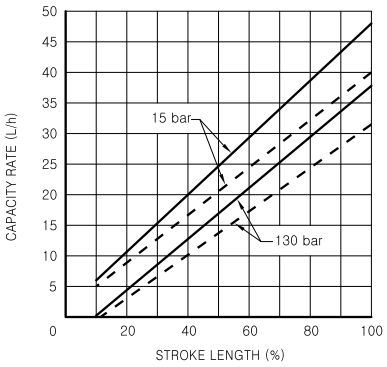
● BKH - 553C



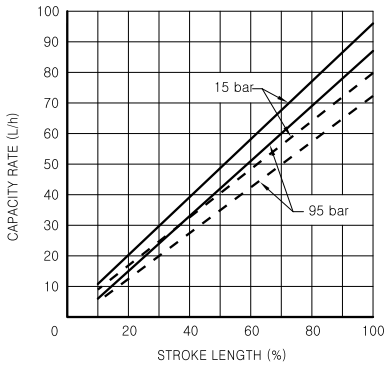
● BKH - 554C



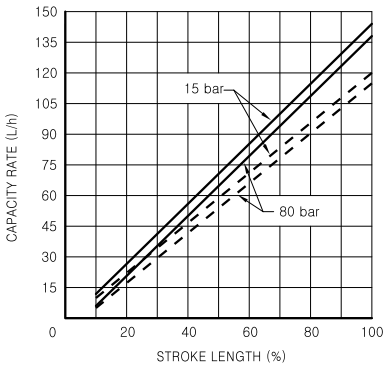
● BKH - 221D



● BKH - 222D



● BKH - 223D



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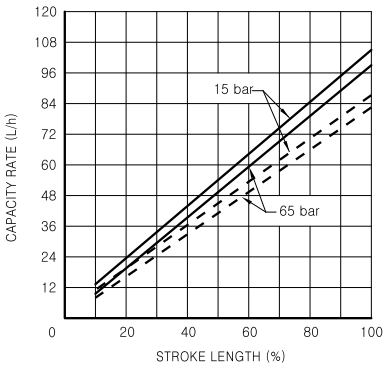
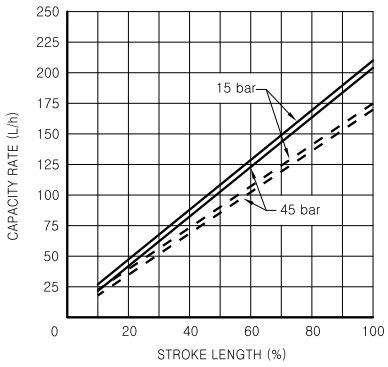
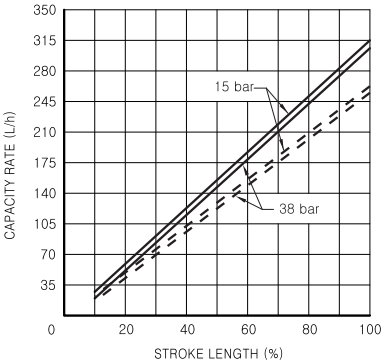


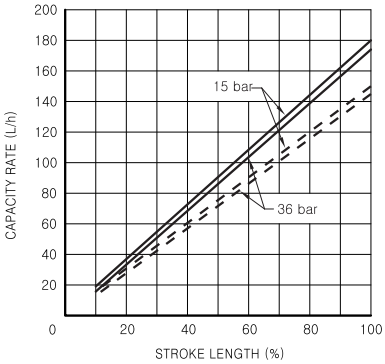
● BKH - 322D



● BKH - 323D



● BKH - 421D



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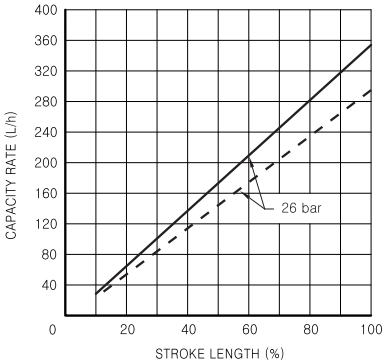

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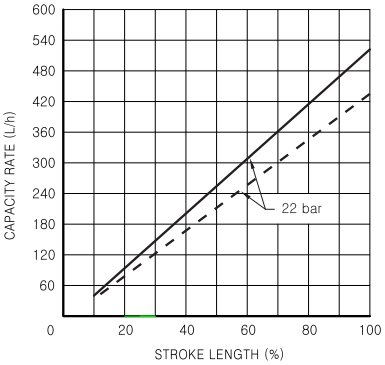

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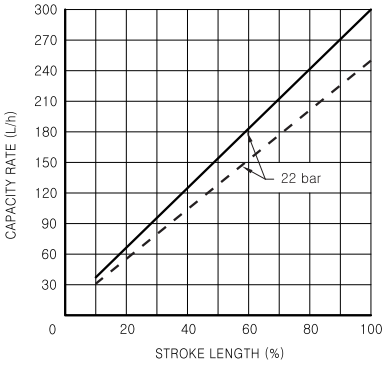

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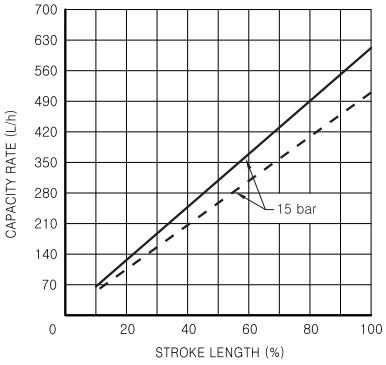

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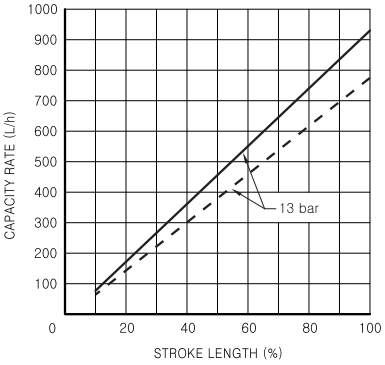

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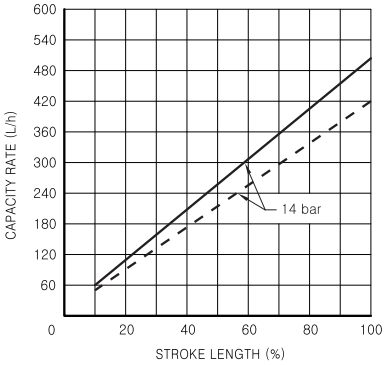

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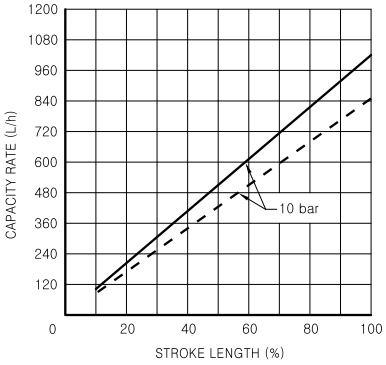

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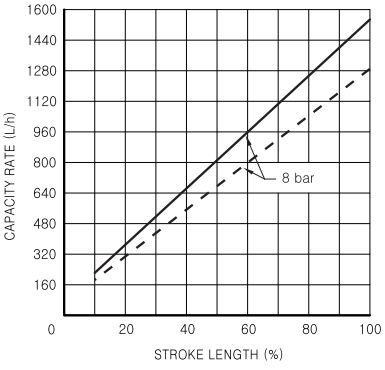
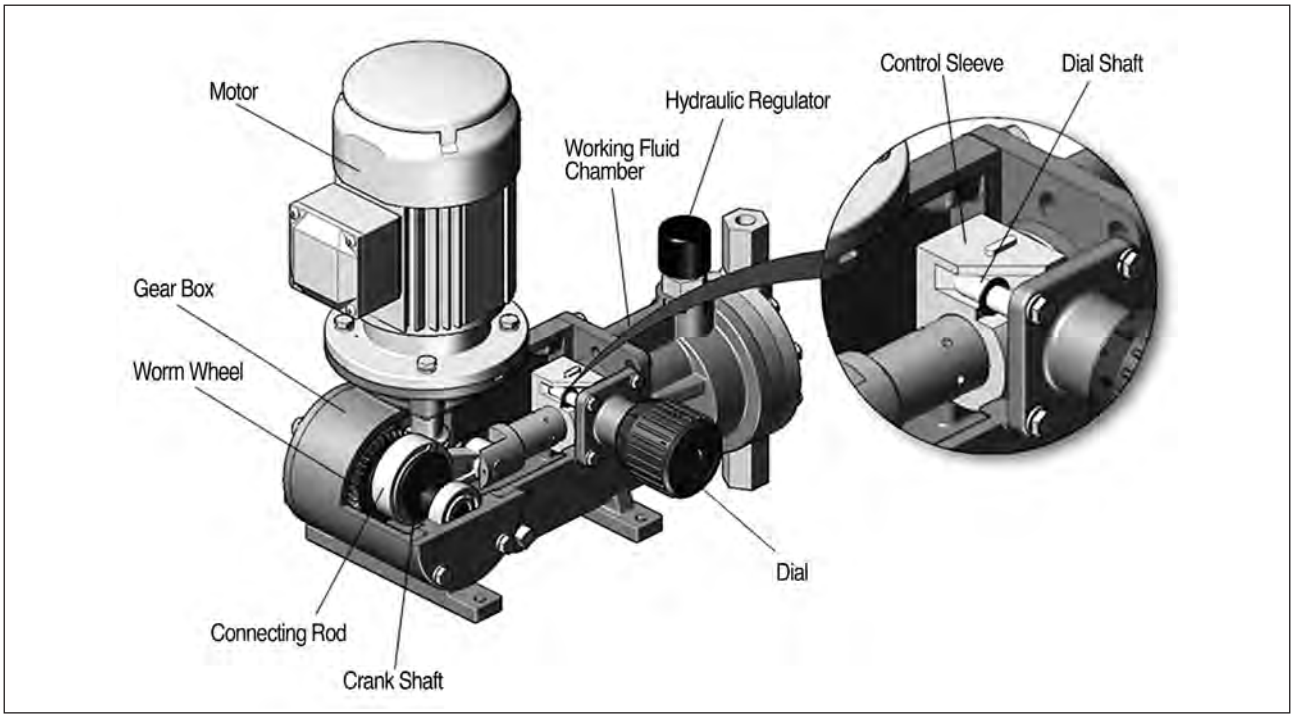


Note) 1.Above performance curves were tested at our testing equipment under the fixed condition(Clean Water, Room Temperature, & 1m of Suction Head).
2.Therefore, performance curves can be somewhat different in accordance with condition of job site. after installation.

8 Operation Principle and Structure

The rotation of the Motor is reduced by the Worm Gear and the rotational motion is converted to reciprocating motion by Eccentric Device(Worm Gear, Rod, & etc.).
While Plunger which is connected to the Rod is reciprocating, the volume of Oil Chamber is changed. This variation is directly transmitted to Diaphragm by Hydraulic Oil, and it makes suction and discharge of pump.
It is principle of flow rate adjustment that Diaphragm momentum is reduced by the amount which hydraulic oil in Oil Chamber is discharged to Bypass Port of Rod and discharge rate is reduced.
Control Sleeve connected to Dial Shaft is moved to Plunger's driving line by Dial setting, and it make open or close the Bypass Port, and emission quantity of hydraulic oil is controlled.



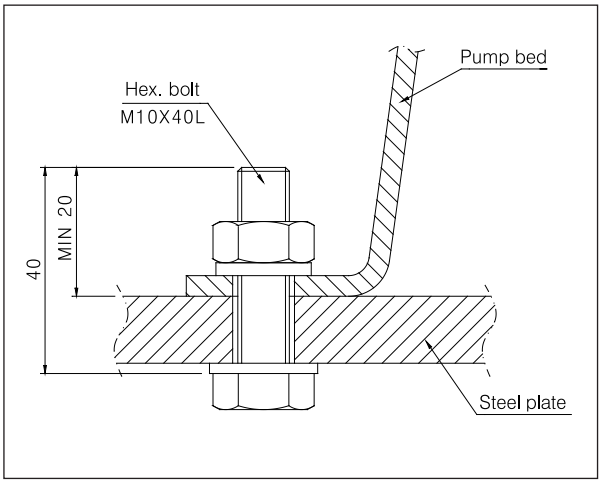
9 Installation

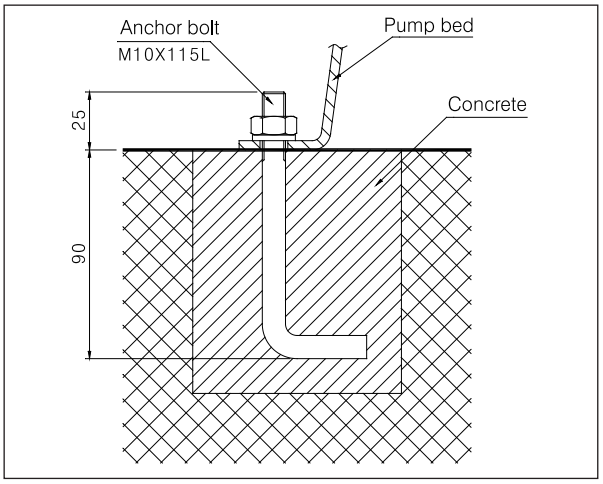
9-1 Installation Place

⚠Caution

- Do not install this pump at the place where ambient temperature is higher than 40°C or lower than freezing point. If the pump is installed at the place, internals of pump may be damaged.
- Do not install pump in place with heavy moisture and dust, or in place with rain, and wind. It may cause electric shock and trouble.

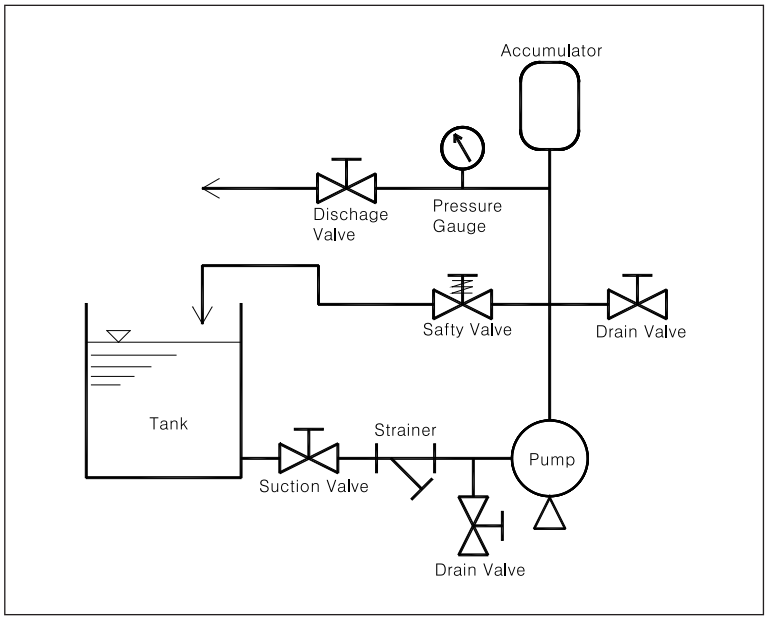
1 If possible, install the pump lower than the minimum level of the tank.
2 Take sufficient space around the pump to facilitate maintenance or repair and also the motor and wiring should be connected safely in consideration of flooding.
3 The pump should be installed at the place where is flat surface and not affected by vibration of other equipments.
4 Pump should be installed on the concrete foundation or on the pedestal can be sufficiently supported. Also, check the level with a leveling instrument so that pump can be installed horizontally.





9-2 Piping

1 Decide the piping system which can sufficiently satisfy suction & discharge condition.
2 Piping should be short and less bending as far as possible and be careful not to make the cavity at which air stay.
3 Install piping support lest piping load fall on the pump. Especially, in case of liquid end material of PVC, be careful about handling.
4 Be careful that pump is not to be influenced with thermal stress of piping when transferring hot liquid or cold liquid.
5 Don't make U shaped bend in the piping when transferring easily precipitable slurry.
(Note) Slurry particle size : below 100㎛, Concentration : below 100wt%.



6 Install a flushing pipe line for maintenance and inspection when transferring viscous liquid, poisonous liquid, or coagulative liquid.
7 Choose the piping material that has sufficient corrosion resistance to the liquid and can endure the pressure applied in the piping.

8 Connect piping after flushing the inside of piping cleanly and remove the inspection sticker for preventing entrance of foreign substance on the discharge port.
9 Although Hydraulic Diaphragm Metering Pump has a built-in Safety Valve, it is recommended to install safety valve on the discharge piping additionally in order to protect the pump & piping.
10 Protect the piping with insulating material or keeping warm device, if the liquid may freeze inside of piping. In addition, Install drain valve at the suction & discharge side in order to drain the liquid inside piping after operation stopped.

9-3 Suction Piping

1 Suction piping is made with drop method as far as possible. Also, the diameter of the suction piping should be larger than or same with the suction diameter of the pump.
2 Carefully connect the joint of suction piping in order to prevent air inflow into the piping. Discharge rate of pump can be destabilized by air Inflow into the piping.
3 Make piping length of suction side as short as possible. If it is too long, cavitation occurs and regular discharge rate can‘t be assured.
4 Install a strainer on the suction piping because it make unstable performance that foreign substances flows into pump head.

9-4 Discharge Pipe

1 Safety valve should be installed at a place near to discharge pipe of the pump and do not install any other valves between the pump and the safety valve.
2 Use a discharge pipe of which internal pressure is higher than the set value of the safety valve. Also, carefully fit the joint of the discharge pipe.
3 It is recommended to install Air Chamber(accumulator) in order to prevent the pulsation & inertial resistance.
4 Install pressure gauge for daily inspection of the discharge pressure.

9-5 Electrical Wiring

⚠Warning

- Do not touch with wet hands. Electric shock may occur.

⚠Caution

- Before wiring, check voltage, phase, & frequency of motor and connect the pump with correct power. It may cause trouble and fire, if connecting with incorrect power.
- Pump should be properly grounded in order to prevent electric shock.
- Entrust the wiring to electrical engineer.
- Install regulated Magnet Switch and Thermal Relay for the adjustment and maintenance of the pump.
- Use standardized parts in wiring and fully pay attention to safety in accordance with the technical standard & wiring regulation of the electrical equipment.

1 Refer to the wiring diagram attached to the cover of motor terminal box and connect wiring according to the voltage which is being used.
2 Connect wiring according to direction indicated by arrow of name plate for rotation direction of motor(clockwise from). If rotation is reverse, change 2 lines among 3 lines.

3 Wiring method(3 phase 220/380V combined)

220V Wiring	380V Wiring
①-⑥ ←	┌⑥ ① ←
②-④ ← (△ Wiring)	├④ ② ← (Y Wiring)
③-⑤ ←	└⑤ ③ ←

10 Operation

10-1 Preparation

⚠Caution

- Some water may be remained in the liquid end part of pump after final performance test. In case of use for some liquids reacting radically to water, remove water in the pump and dry the pump necessarily.

When operating pump for the first time after installation, please check the following conditions.

1 Check if there is oil leakage caused by any damaged parts or loosened bolt. Excessive leakage of working oil may affect the discharge volume.

2 Check the oil gauge to see if the driving part of pump is filled with the oil of regulated amount. The normal position of the oil level is the middle red point of the gauge.

3 Remove the black pin of the oil cap. This is attached to prevent oil leakage during delivery. If the pump is operated without removing the pin, the humidity inside the driving part will be raised and it may cause overflow of the oil.

4 Check if all of accessories, liquid to be transferred, and power supply necessary for pump operation are ready.

10-2 How to Adjust the Stroke Length

⚠Caution

- Be careful not to turn the dial scale below “0%” or over ”100%”.

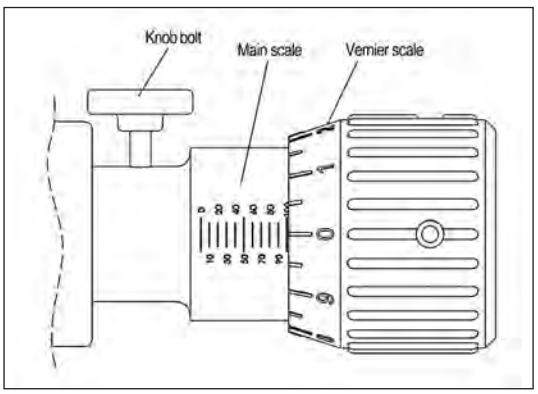
1 Discharge volume can be controlled by adjustment of stroke length and stroke length can be adjusted by rotation of the dial(Control sleeve is moved to Plunger’s driving line by rotation of the dial and bypass quantity of hydraulic oil is controlled).

2 The scale of the stroke length is indicated with % according to test report.

3 Unfasten the knob bolt, which fixes the dial shaft, in counterclockwise.

4 Set the proper stroke length. The setting will be the sum of the main scale(10 digit value) and vernier scale(1 digit value) as micrometer method.

5 After setting of discharge volume, fix the dial with knob bolt tightly.



10-3 Operation

⚠Warning

- Do not operate when suction valve and discharge valve are closed or do not close suction valve and discharge valve during operation.
  Pump and piping may be damaged with excessive pressure rising and liquid may spout when operation under valve closing.

When operating pump for the first time after installation, operate the pump according to following sequency.

1. Turn on the power switch of the motor and check if the motor fan rotates clockwise when operating the pump.
2. Set the dial 0% and operate test run for 10 minute in order to check any abnormal noise and vibration in the motor or driving part.
   Note) In case ambient temperature is low, overload phenomenon may occur temporarily. Since it is caused by the low temperature of the lubricant oil, operate pump under no load and wait until the lubricant temperature increases.
3. After opening the discharge side as condition of atmospheric pressure, set the dial at 100% of stroke length and operate test run for 10~30 minutes.
4. If it is no problem during test run, raise the pressure of discharge side a little by little and slowly until it reaches to the setting pressure. At this time, check if motor current is less than rated current and other parts have no problems.

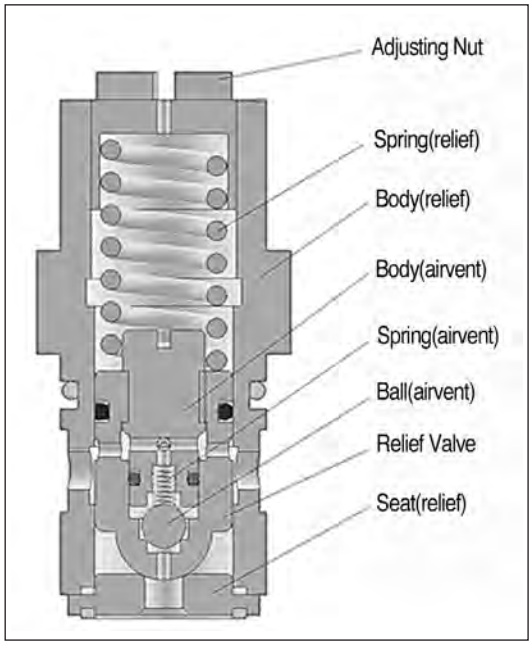
10-4 Check of Discharge Volume

If pump has no problem, check the discharge volume under actual running condition with measuring device such as mass cylinder.

1. If discharge volume had no fluctuation after repeated measurements, the pump is judged to be running normally.
2. Make a graph of relationship between the discharge volume and stroke length under the actual running conditions and determine an optimum discharge volume in accordance with this graph.
3. In case the discharge volume is increased/decreased by the change of the stroke length, measure the discharge volume after passing more than one minute.
   Note) In case customer requests Test Report when placing order, we offer Test Report obtained under room temperature & clean water in our company. Take a note that it is not test result under actual piping & actual liquid.

10-5 Application of Hydraulic Regulator

- Hydraulic control valve in the regulator consists of relief valve and air vent valve.
- The relief valve makes the hydraulic oil to come out when the pressure in the hydraulic oil chamber goes up to higher than the setting pressure and/or max. allowable pressure.
- The air vent valve protect the pump against damage by discharging bubbles in the hydraulic oil and maintain a proper amount of oil.



1 Pressure setting of Relief Valve

- The relief valve is actuated to prevent pump damage caused by over pressure when the pressure in the hydraulic oil chamber is higher than the setting pressure.
- When pump comes out from factory, the pressure of the relief valve is set at 110% of max. discharge pressure of pump. (Please refer to the below table)
- In case the actual operating pressure is considerably lower than the max. discharge pressure of the pump or the internal pressure of the installed piping accessories is lower, adjust the setting pressure of the relief valve in order to meet the field condition by adjusting the control nut (Relief) with the adjusting tool.

<Pressure setting point of Relief Valve>

Max. Discharge Pressure of Pump	1~20bar	21~50bar	51~100bar	101~150bar	150~200bar
Pressure Setting Point of Relief Valve	Max. Discharge Pressure +2bar	Max. Discharge Pressure +5bar	Max. Discharge Pressure +10bar	Max. Discharge Pressure +15bar	Max. Discharge Pressure +20bar

10-6 Restart of Pump

1 In case of stop of pump operation for short period(less than 1 week), it is no problem to start the pump at a desired stroke length & prescribed discharge pressure.

2 However, in case of stop of pump operation for a long period(over 1 week), pump should be run at 0% stroke length & no load for 10 minutes before going into normal operation. Do not start regular operation before above warming up.

3 It is concern that pump is damaged by freezing during winter season. Without regard to stop period of operation, drain the liquids in the piping and pump by operating dry run after opening the drain valve on the suction piping.

10-7 Cautions in Operation

1 Be sure to install a safety valve (relief valve) at the pipe on the discharge side.

2 In case Air Chamber is used in place of an Accumulator due to low pipe pressure, air in the Air Chamber is dissolved into the liquid because air is constantly contacting the liquid. As the time goes by, air decrease little by little and finally the Air Chamber can't be functioned sufficiently. Therefore, supplement air into the Air Chamber periodically.

11 Maintenance

⚠Warning

- Turn off the power and stop the pump & other equipments when repairing or disassembling pump, otherwise it may cause electric shock.
- Be careful of big accidents caused by inserting fingers or cloth in rotator.

⚠Warning

- Wear suitable protective clothing during assembly and disassembly work.
- Work after releasing pressure from discharge piping and remove liquid from Liquid End Part prior to repair or maintenance of pump.

11-1 Check before Operation

1 Check the level of liquid tank and, if it is insufficient, supplement the liquid.
2 Check if the suction & discharge valve are opened.
3 Check if piping is safe and undamaged.
4 Check electrical wiring if there are no electrical short & disconnection.

11-2 Check during Operation(Daily inspection)

1 Check the level of liquid tank and, if it is insufficient, supplement the liquid. Specially, be careful in the process which handle the chemical solution or required Air-Free circumstance.
2 Check if liquid or air is leaked out the Joint or other parts. If necessary, fasten it again. If leakage doesn't stop, check O-ring and/or Packing of each parts and replace the damaged O-ring and/or Packing with new one.
3 Check if noise sounds from the motor or pump.
4 Check if the oil in the driving part is sufficient or leaky. If insufficient, refill the oil up to regulated level of the oil level gauge.
5 Check if there is no problem in the setting discharge rate & discharge pressure.
6 Check if the pressure gauge is normal.
7 If there is standby pump, operate it from time to time and maintain it for using it any time.

11-3 Stop of Operation for Long Time

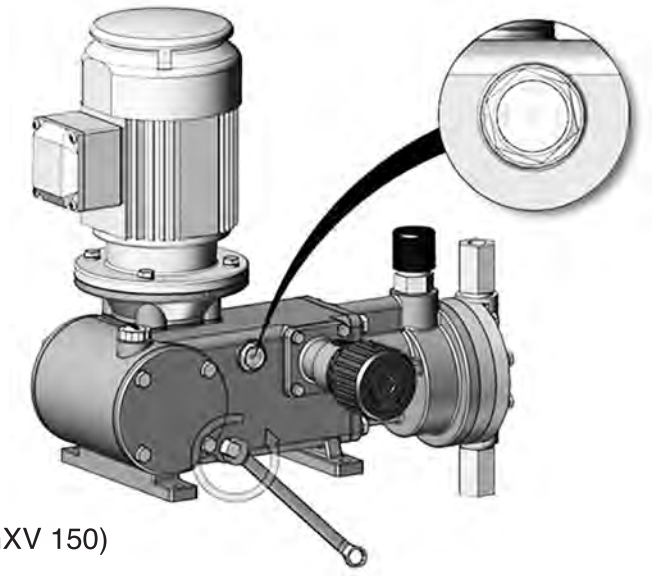
1 Wash inside Pump Head of suction side and flush water or cleansing solution through Pump Head for about 30 minutes.
2 Put the cover on the pump to protect the pump from dust and/or corrosion.
3 Set the dial at 50% of stroke length in order to prevent deformation of diaphragm.
4 Check foreign substances lay on the Check Ball and/or Ball Seat before restarting the pump

11-4 Other maintenance

[1] When diluted liquid is used at freezing place in the winter, install HEAT TRACING to prevent the pump from freezing because it causes the damage of the pump & other devices with freezing on the liquid end part of pump and inside piping.
[2] Clean the inside of tank and joint every 3 months at least.

11-5 Supplement of oil

[1] Change of oil in the driving part and Hydraulic Part
① changing interval
Change oil after 1,000 hours when initial operation after buying it, and thereafter, change oil every 8,000 hours of continuous operation. However, when emulsification or deterioration of the oil occurs, change the oil immediately.
② Changing method
Turn the dial to 0%, loosen the (square) plug with spanner, and drain the used oil.
Next, clean the inside with flushing oil.
After fastening the plug, refill new oil slowly through the oil inlet(Oil Cap) up to the regulated level(Red points) of the oil level gauge



③ Recommended oil quantity

Model	Oil Quantity
BKH-101A ~ 324A	About 1.5L
BKH-101B ~ 424B	About 2L
BKH-151C ~ 554C	About 4L
BKH-221D ~ 703D	About 4.5L

④ Recommended oil
Mobil's Synthetic Gear Oil MOBIL SHC 629
(※ Used by our company)
Shell's Synthetic Gear Oil OMALA S4 GX 150(S4 GXV 150)

12 Cause of Trouble and Troubleshooting

Trouble	Cause	Troubleshooting
No Working	Circuit breaker is open or fuse is broken	Check the cause and take action
	Cable is disconnected	Connection or replace
	Wrong wiring	Check the wiring diagram
	Low voltage	Check the voltage and take action
	Bad insulation	Replacement
	Damaged eccentric bearing	Check or replacement
	Damaged reduction gear	Check or replacement
Working but not discharging	Tank is empty	Fill up liquid
	Cavitation occurs at the pump	Check the cause and take action
	Air flow in the suction side piping	Check the piping and repair
	Precipitates are accumulated in the piping	Clean the piping and check the status of liquid
	Ball seat is clogged by foreign substance	Wash the ball seat & install strainer after checking
	Leakage from the safety valve	Readjust set pressure and check & repair
Insufficient discharge volume	Low speed of motor rotation	Check the voltage frequency and wiring
	Incorrect calibration of discharge volume	Check the method of measurement and measuring device
	Insufficient suction pressure	Raise liquid level of supply tank and enlarge pipe diameter
	Insufficient Discharge pressure	Install back pressure valve
	Clogging of suction piping	Clean the piping
	Air flow in suction piping	Check the piping and repair
	Ball seat or check ball gets dirty or is damaged	Washing or replacement
	Leakage from the piping and liquid end part of the pump	Repair after checking
	O-ring of piston is worn out or hardened	Replacement
	Low setting pressure of relief valve in hydraulic regulator	Readjustment (Within the limit of the pump design)
	Low oil level of the working oil	Supplement of working oil
	Diaphragm is aged or damaged	Replacement
	Chemical change occurs in the working oil	Check the load of pump and temperature
Overheating of motor	Wrong wiring	Check wiring diagram
	Overload of the motor	Check and adjust discharge piping
	Low voltage	Check the voltage and take action
	Trouble in driving part	Check wear and corrosion of the parts of driving unit

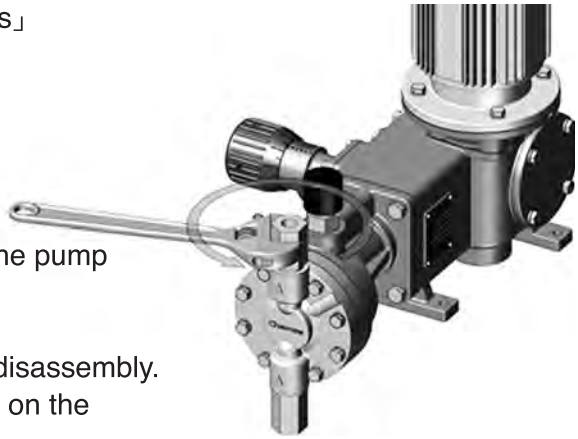
Trouble	Cause	Troubleshooting
oise or vibration from the piping	Piping length is too long or pipe diameter is too small.	Adjust piping or install air chamber
	Air in the air chamber is reduced	Supplement air
	Capacity of air chamber is insufficient	Replace after checking the specification of chamber.
	Cavitation phenomenon occurs in the dosing liquid	Take action after checking NPSH
Leakage of oil	Lubricating oil is overfilled	Check oil level and adjust
	Oil seal is damaged	Replacement
	Lubricating oil is contaminated	Check the cause and replace
	Clogging of the vent in oil cap	Remove the pin of the oil cap
Large leakage of liquid	Damaged pressure gauge	Replacement
	Damaged diaphragm	Replacement
	Damaged o-ring & packing of valve or faulty	Replacement
Noise or abnormal heat from driving part	Ambient temperature is too high	Improve installation conditions
	Setting pressure of relief valve is high	Readjust within the limit of pump design
	Bearing is damaged	Replacement after checking
	Worm gear is damaged	Replacement after checking
	Spring is broken	Replacement after checking
	Insufficient or excessive lubricating oil	Reduce or refill Lubricating oil to the regulated level
	Coupling rubber is worn out	Readjustment after replacement
	L ubricating oil is unsuitable	Replacement with the regulated quality of oil
	Overload	Check discharge piping and adjust
	Hydraulic regulator does not run	Check cause and adjust

13 Replacement of Parts

⚠Caution

- Wear suitable protective clothing during assembly and disassembly work.

Refer to section 18「Structure and Name of Each Parts」 when assembly or disassembly.



13-1 Replacement of Ball Seat, Ball Guide and Check Ball

Ⅰ Disassembly

- Disconnect the piping of suction & discharge from the pump
- Loosen the joint of suction & discharge side and Disassemble each parts.
  Be careful of flowing out the remaining liquid when disassembly.
- Check the damage & sticking of foreign substances on the

each parts and replace or wash if necessary.
- If gasket or packing is damaged, although tighten parts, leakage may occur. Be careful that gasket or packing don't be damaged.

2 Assembly
- Refer to the section 18「Structure and Name of Each Parts」 during assembly and be careful not to change upper part and lower part reversely.
- Tighten firmly after connecting counter piping

⚠Caution
- Be careful to assemble valve parts correctly according to sequence (top : ball guide, middle : check ball, bottom : ball seat). If the sequence is wrong, liquid flow backward and pump may be damaged.

13-2 Replacement of Pump Head

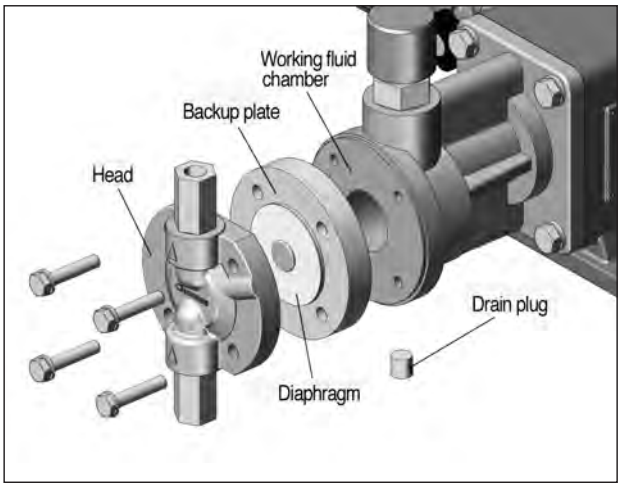
1 Disassembly
- Disconnect the piping from the joint of suction and discharge side.
- Loosen the head fixing bolts with spanner or etc.
- Grip on the upper & lower joint and pull out the head while turning the head from side to side to detach it easily.

2 Assembly
- Assemble the head in the order of right picture and tighten the bolts with equal torque.

Liquid End Material	PVC · PVDF	STS316
Torque N·m(kgf·cm)	9.8 (100)	16.7 (170)

13-3 Replacement of Diaphragms

1 Disassembly
- After Setting the dial of the pump to 100%, remove the drain plug located at the bottom of the hydraulic oil chamber with a wrench spanner, and drain the oil into a beaker.
- Disassemble the head according to the description shown at Section 13-2.
- Refer to Section 18-2 for the construction and name of each part.
- If the shape of diaphragm is inflated & twisted partially, it reached the limit of service life by the fatigue, so it has to be replaced.
- Spring may bounce out when disassembling the snap ring. Be care of it.



2 Assembly
- After Coating the threaded part of the Diaphragm Nut with a screw locking agent(Loctite 243),

assemble the diaphragm.
- After assembling the diaphragm, assemble the head to the hydraulic oil chamber together with the back up plate.
- Reassemble in the reverse order of the disassembly.

14 Consumable parts and Spare parts

14-1 Consumable parts

Part Name	Q'ty	Estimated service life
Check Ball, Ball Guide, Ball Seat	4	1 Year
Diaphragm	1	4,000 Hour
Gasket(Valve)	8	1 Year

Note) 1. The quantity is for 1 unit of Pump.
2. Replacement period is estimated, not guaranteed. The period may depend on the using condition.

14-2 Spare Part

1 Spare parts for 3 years
- Bearing
- Gasket(Driving Part)
- Worm Gear(Worm & Worm Wheel)
- Hydraulic Regulator

2 Spare parts for over 3 years
- Motor
- Plunger
- Rod
- Control Sleeve

15 Warranty

⚠Warning

- If the pump is reconstructed arbitrarily or the undesignated parts are used into the pump, Cheonsei will not warrant and Chensei is not responsible for any expense caused by accident or trouble.

1 Warranty period is one year from purchase date.
2 During warranty period, repair or change of pump is free of charge if trouble or damage of pump due to design or manufacturing of CHEONSEI. (※ Consumable parts are excluded.)
3 Repair or change product due to following reasons will be charged regardless the warranty period.
① Trouble or damage of pump expired warranty period.
② Trouble of using by careless handling.
③ Trouble or damage due to using non-designated part & reconstructing the pump arbitrarily.
④ Trouble by fire or natural disaste

16 Repair Service

⚠Caution

- When the pump is sent to factory for repair service, clean out inside of pump.
- Do not send the pump, if the pump has been used for harmful & fatal liquid to health.

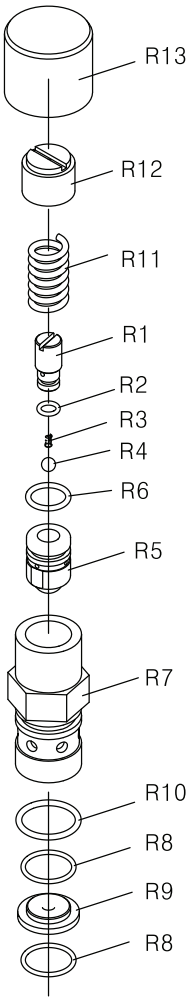
1 Contact to CHEONSEI or local distributor as shown on back of the manual if you have any problem or questions.
2 If you want to repair, please inform the following.
① Model Name & manufacture number written in name plate
② Used period, using condition, state, and transfer liquid
3 If warranty period is over, it may charge according to repair part. Please contact with sales agent for more information.
4 Minimum retention period of parts for repair is 5 years from the date of production.

17 Accessories

1 Back Pressure Valve
According to the conditions of the piping, the discharge rate may be excessive or the pumping liquid may be continuously leaked in spite of stopping the pump which is caused by overfeed or siphon phenomena. The back pressure valve is for preventing such things.
2 Safety Valve(Relief Valve)
When the discharge pressure increases to more than a setting point due to choking the valve with debris or closing the valve, the safety valve will open automatically to relieve the pressure. Relief valve prevents pump and piping from damages.
3 Air Chamber
Reciprocating pump has a peculiar pulsation which results in vibration of piping and overfeed phenomena. Air chamber will be used to solve such problems caused by pulsation.

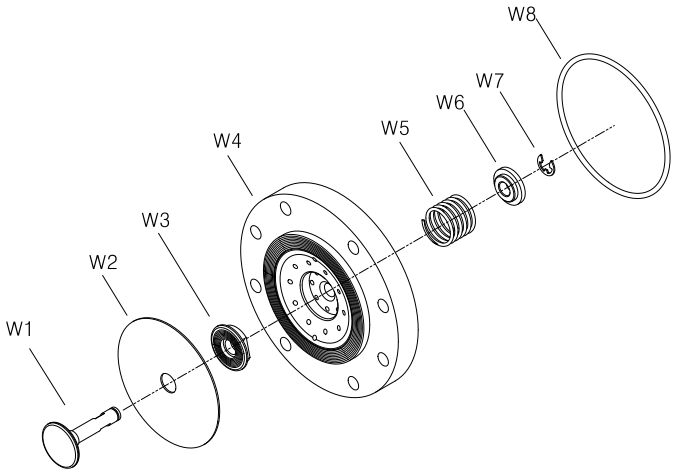
18 Structure and Name of Each Parts

18-1 Hydraulic Regulator



No.	Part Name	Q'ty
R1	Adjust Nut(Air Vent)	1
R2	O-ring	1
R3	Spring(Air Vent)	1
R4	Check Ball	1
R5	Relief Valve	1
R6	O-ring	1
R7	Valve Body(Relief)	1
R8	O-ring	2
R9	Valve Seat(Relief)	1
R10	O-ring	1
R11	Spring(Relief)	1
R12	Adjust Nut(Relief)	1
R13	Valve Cap(Relief)	1

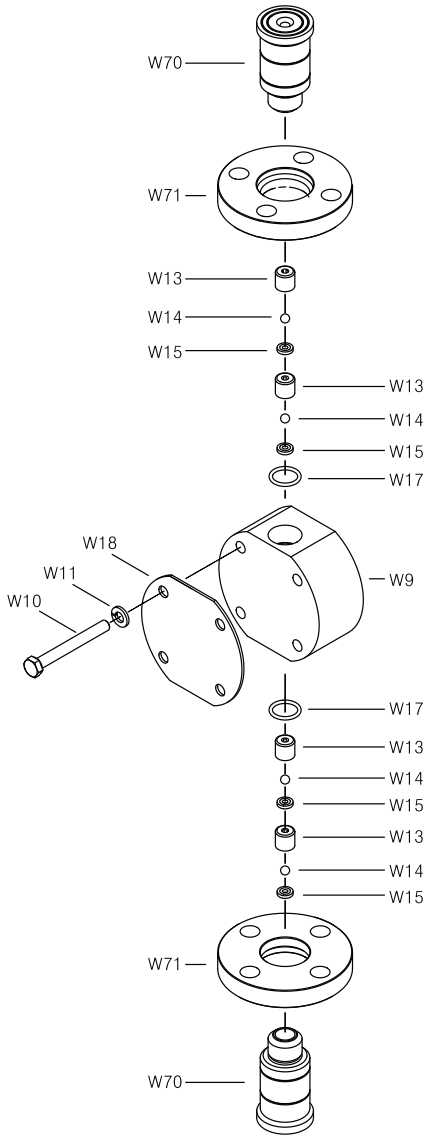
18-2 Liquid End Parts(Diaphragm)



No.	Part Name	Q'ty
W1	Diaphragm Support	1
W2	Diaphragm	1
W3	Diaphragm Nut	1
W4	Back-upPlate	1
W5	Spring(Diaphragm)	1
W6	Spring Seat	1
W7	Snap Ring	1
W8	O-ring	1

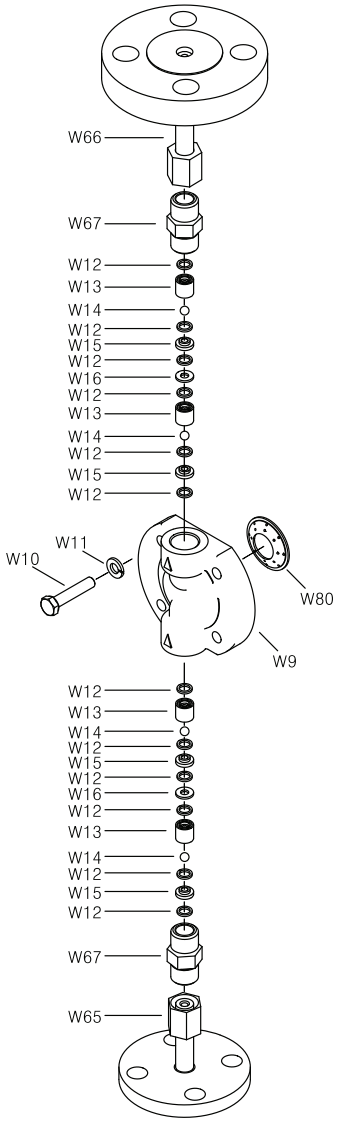
18-3 Liquid End Parts (Check Valve, Connection Part)

[1] Model : BKH-10□-P□, F□



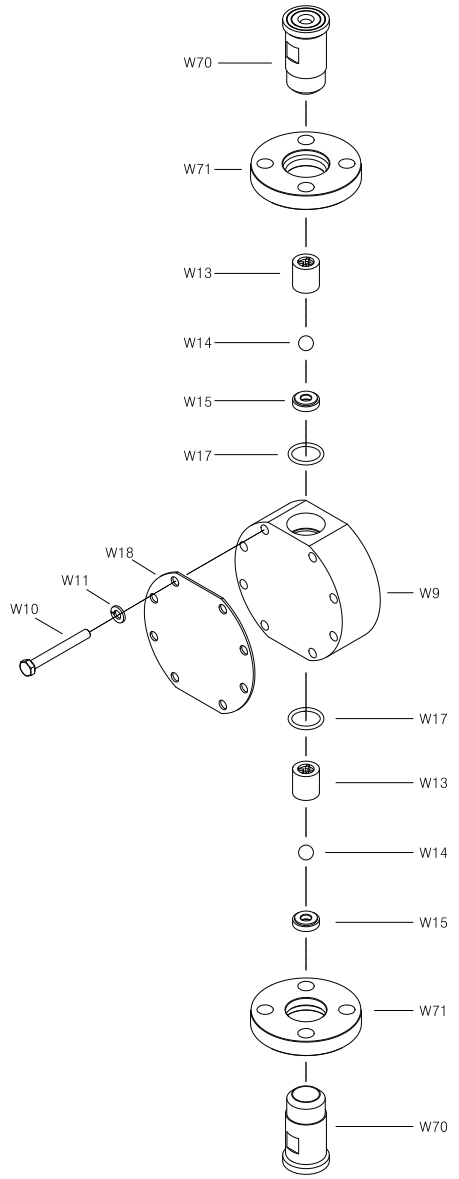
No.	Part Name	Q'ty
W9	Head	1
W10	Bolt(Hex.)	4
W11	Washer(Spring)	4
W13	Ball Guide	4
W14	Check Ball	4
W15	Ball Seat	4
W17	O-ring	2
W18	Head Compression Plate	1
W70	Joint	2
W71	Flange	2

[2] Model : BKH-10□ ~ 15□-S□(Flange Type)



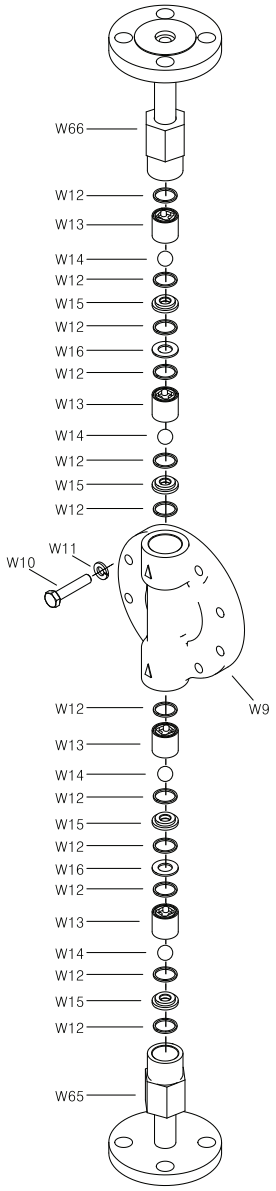
No.	Part Name	Q'ty
W9	Head	1
W10	Bolt(Hex.)	4
W11	Washer(Spring)	4
W12	Gasket(Valve)	12
W13	Ball Guide	4
W14	Check Ball	4
W15	Ball Seat	4
W16	Shim Plate	2
W65	Joint(Flange)(Lower)	1SET
W66	Joint(Flange)(Upper)	1SET
W67	Joint Adapter	2
W80	Front Plate	1

3 Model : BKH-15□~32□-P□, F□



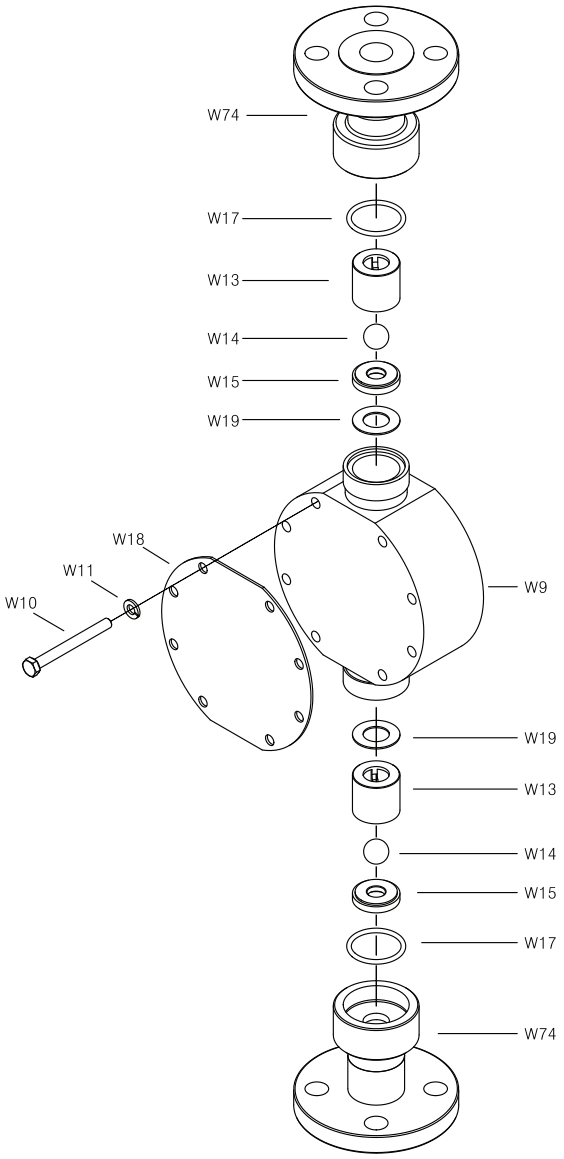
No.	Part Name	Q'ty
W9	Head	1
W10	Bolt(Hex.)	8
W11	Washer(Spring)	8
W13	Ball Guide	2
W14	Check Ball	2
W15	Ball Seat	2
W17	O-ring	2
W18	HeadCompression Plate	1
W70	Joint	2
W71	Flange	2

4 Model : BKH-22□~32□-S□(Flange Type)



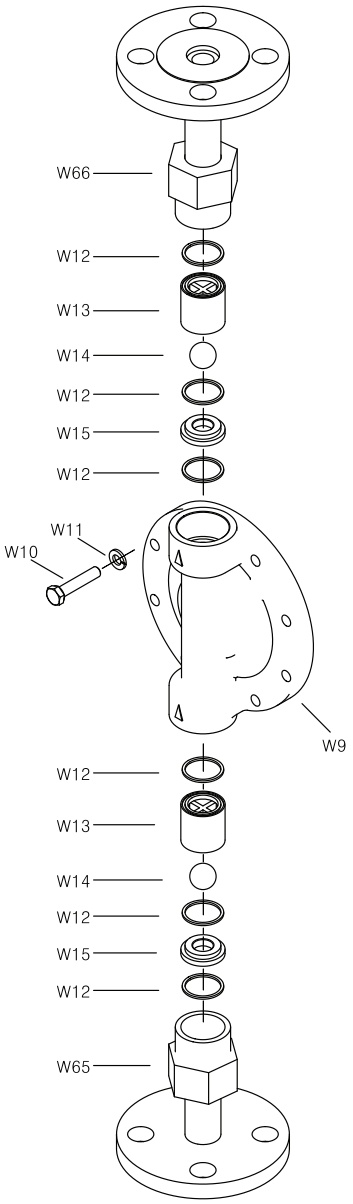
No.	Part Name	Q'ty
W9	Head	1
W10	Bolt(Hex.)	8
W11	Washer(Spring)	8
W12	Gasket(Valve)	12
W13	Ball Guide	4
W14	Check Ball	4
W15	Ball Seat	4
W16	Shim Plate	2
W65	Joint(Flange)(Lower)	1SET
W66	Joint(Flange)(Upper)	1SET

5 Model : BKH-42□-P□, F□



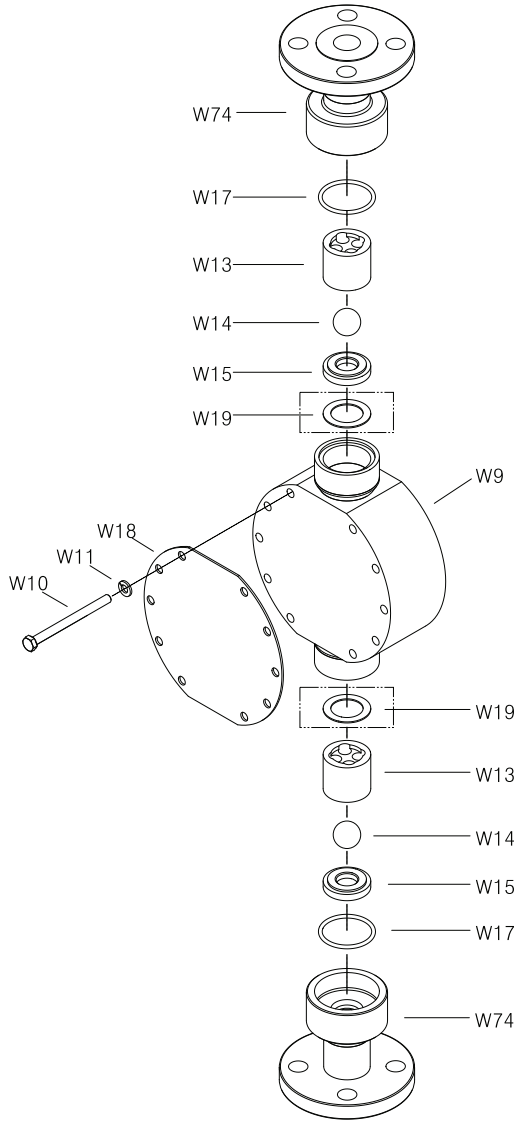
No.	Part Name	Q'ty
W9	Head	1
W10	Bolt(Hex.)	8
W11	Washer(Spring)	8
W13	Ball Guide	2
W14	Check Ball	2
W15	Ball Seat	2
W17	O-ring	2
W18	Head Compression Plate	1
W19	Packing	2
W74	Joint(Flange)	2SET

6 Model : BKH-42□-S□(Flange Type)



No.	Part Name	Q'ty
W9	Head	1
W10	Bolt(Hex.)	8
W11	Washer(Spring)	8
W12	Gasket(Valve)	6
W13	Ball Guide	2
W14	Check Ball	2
W15	Ball Seat	2
W65	Joint(Flange)(Lower)	1SET
W66	Joint(Flange)(Upper)	1SET

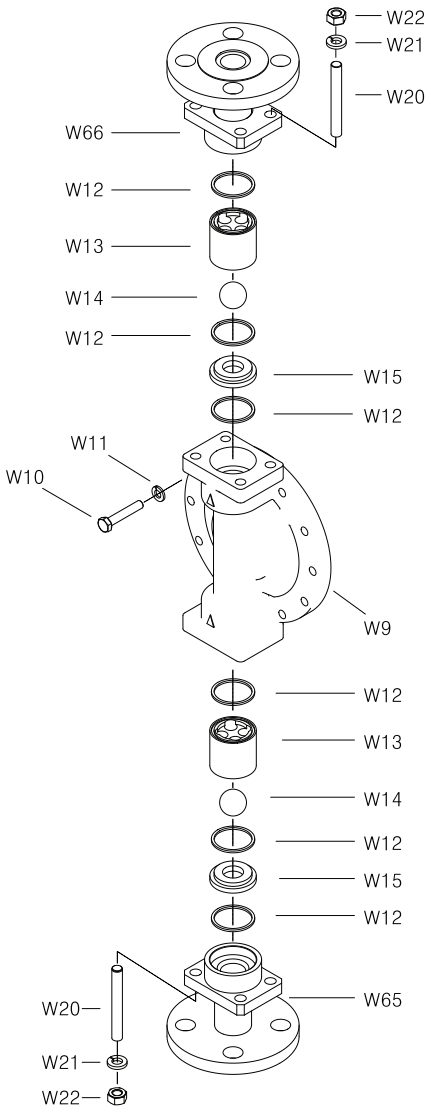
7 Model : BKH-55□~70□-P□, F□



No.	Part Name	Q'ty
W9	Head	1
W10	Bolt(Hex.)	10
W11	Washer(Spring)	10
W13	Ball Guide	2
W14	Check Ball	2
W15	Ball Seat	2
W17	O-ring	2
W18	Head Compression Plate	1
W19(1)	Packing	2
W74	Joint(Flange)	2SET

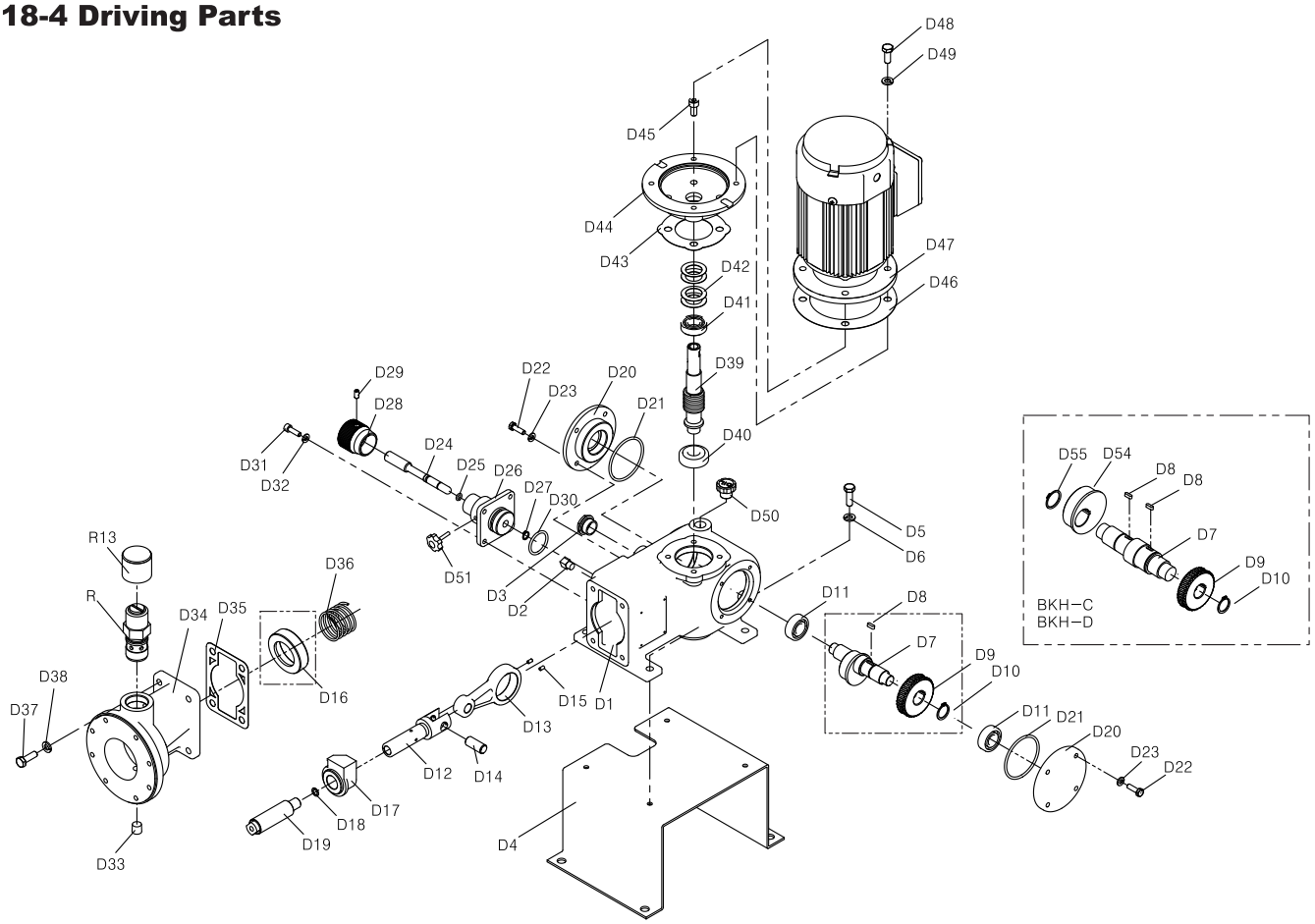
Notice) 1. For only P□ type

8 Model : BKH-55□~70□-S□(Flange Type)



No.	Part Name	Q'ty
W9	Head	1
W10	Bolt(Hex.)	10
W11	Washer(Spring)	10
W12	Gasket(Valve)	6
W13	Ball Guide	2
W14	Check Ball	2
W15	Ball Seat	2
W65	Joint(Flange)(Lower)	1SET
W66	Joint(Flange)(Upper)	1SET
W20	Bolt(Full Threaded)	8
W21	Washer(Spring)	8
W22	Nut(Hex.)	8

18-4 Driving Parts



No.	Part Name	Q'ty
D1	Gear box	1
D2	Bolt(Squ.head)	1
D3	Oil level cap	1
D4	Bed	1
D5	Bolt(Hex.head)	4
D6	Washer(Spring)	4
D7	Crank shaft	1
D8(1)	Key	1(2)
D9	Worm wheel	1
D10	Snap ring	1
D11	Bearing(Ball)	2
D12	Rod	1
D13	Connecting rod	1
D14	Pin	1
D15	Set screw	2
D16(2)	Fixed ring	1
D17	Control sleeve	1
D18	Washer(Copper)	1
D19	Plunger	1
D20	Gear cover	2

No.	Part Name	Q'ty
D21	O-ring	2
D22	Bolt(Hex.head)	4
D23	Washer(Spring)	4
D24	Dial shaft	1
D25	O-ring	1
D26	Scale housing	1
D27	Snap ring	1
D28	Dial	1
D29	Set screw	1
D30	O-ring	1
D31	Bolt(Hex.head)	4
D32	Washer(Spring)	4
D33	Plug(Wrench)	1
D34	Working fluid chamber	1
D35	Gasket "1"	1
D36	Spring	1
D37	Bolt(Hex.head)	4
D38	Washer(Spring)	4
D39	Worm	1
D40	Bearing(Taper)	1

No.	Part Name	Q'ty
D41	Bearing(Ball)	1
D42	Spring(Belleville)	4
D43	Gasket "2"	1
D44	Attachment	1
D45	Bolt(Wrench)	4
D46	Gasket "3"	1
D47	Motor	1
D48	Bolt(Hex.head)	4
D49	Washer(Spring)	4
D50	Oil cap	1
D54	Cam	1
D55	Snap ring	1

Notice) 1. ( )Q'ty For only
BKH-□□□C, □□□D.
2. For only BKH-70□D.

Memo

Cheonsei
전세산업 (주)

90, SINWON-RO 91 BEON-GIL, DANWON-GU,
ANSAN-SHI, GYEONGGI-DO, KOREA
Phone : +82+31+493-1003(REP.)
Fax : +82+31+492-3683
E-mail : cheonsei@cheonsei.co.kr
Homepage : http//www.cheonsei.co.kr