VIKING PUMP®

AD-23

CHOCOLATE & CONFECTIONERY 224A-CHC1 & 224A-CHC2 PUMPS

Viking Pump has a great deal of experience and success using internal gear pumps in chocolate applications. Although the term chocolate refers to many different recipes and some chocolate applications are more difficult to handle, the general construction remains the same. Typically, the more difficult the application is to handle, the more features are required. Viking Pump has developed the guidelines discussed in this document based on decades of successfully handling chocolate with internal gear pumps.

CHOCOLATE PROCESS: FROM BEAN TO BAR

PREPARING THE CACAO BEANS

Growing and harvesting cacao is a time-consuming and labor intensive process. The delicate trees only grow under the shade of larger trees in hot, tropical climates close to the equator. Most of the world's cacao is harvested from small areas of land about two to four acres each. Cacao pods are hand-harvested from the trees, split open, and the beans removed. Each pod contains 30 to 40 beans.

The beans are then fermented. Depending upon the region, fermentation may take place in baskets or wrapped with banana leaves. The fermentation process lasts approximately one week. During this time, the cacao bean begins to develop a sweet, less bitter flavor.

After fermentation, the beans are left in the sun to dry for five to 12 days. The dried beans are referred to as raw cocoa. They are then shipped to a factory to be cleaned and roasted.

Roasting takes place in rotating ovens, similar to the ovens used to roast coffee beans. Most beans are roasted with the shell still intact. This step further develops the chocolate flavor.

WINNOWING, GRINDING & PRESSING

After roasting, the shell and cocoa bean are separated in a process called winnowing. The cocoa beans are 55% cocoa butter, the natural fat found in cocoa beans. The cocoa bean fragments, called "nibs," are then ground down into a slurry called chocolate liquor. This thick paste is the main ingredient in chocolate. The consistency of the slurry is similar to peanut butter.

Viscosities of chocolate liquor can vary between 10,000 to 35,000 SSU (2,200 to 7,600 cSt). Chocolate liquor is typically kept between 100°F to 200°F (40°C to 95°C). The approximate size of the particles in the cocoa slurry is 100 microns. Chocolate liquor that is intended to be made into candy goes to blending. Chocolate liquor that will be made into cocoa powder goes to pressing.

To obtain cocoa powder, the chocolate liquor goes through a pressing process. During this process, cocoa butter is expelled from the liquid. Cocoa butter is another ingredient used in making chocolate. Cocoa butter will solidify below 90°F (32°C), but above that temperature the liquid can be as thin as 50 SSU (5 cSt). The approximate fat content of cocoa powder ranges from 10 – 25%. After pressing, the remaining cocoa cake is left to cool then sifted into cocoa powder.

BLENDING & REFINING

During the blending process, chocolate liquor is blended with other ingredients. The exact proportions vary between chocolate producers. Blending usually occurs over the course of a few hours. The result forms a crumb which is ground with more cocoa butter during refining.

BASIC INGREDIENTS FOR CHOCOLATE

1. **Milk Chocolate:**
   Cocoa butter, chocolate liquor, milk / milk powder, and sugar
2. **Dark Chocolate:**
   Cocoa butter, chocolate liquor, and sugar
3. **White Chocolate:**
   Cocoa butter, milk / milk powder, and sugar

Definitions for other types of chocolate products are found under **"Types Of Chocolate & Confectioneries" on page 3.**

Viking pumps are typically used to pump pressed chocolate liquor which is a mixture of finely milled solids – cocoa, sugar, and milk products. At this point in the process, the approximate size of the particles is 100 microns.

During the refining process, the particle size of both the chocolate liquor and sugar are reduced to approximately 25 – 30 microns, small enough so that the human tongue does not detect grittiness.

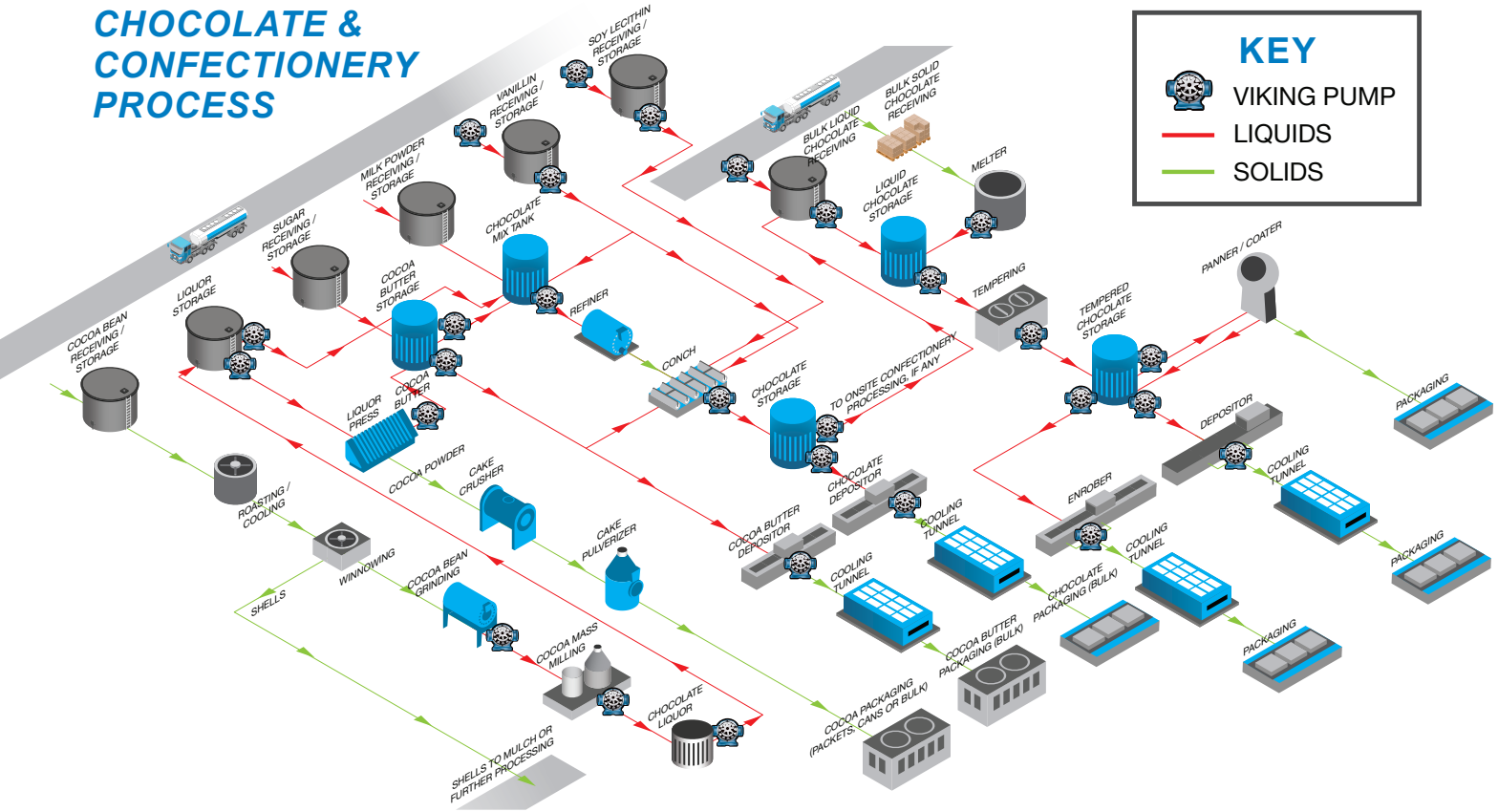
CONCHING, TEMPERING & MOLDING

During the next step in chocolate processing, the blended mixture of chocolate and other ingredients undergo another smoothing process called conching. The chocolate is kneaded and churned by a machine called a conch. The machine grinds the chocolate mixture at a temperature around 180°F (80°C) until the mixture is silky smooth. Fine chocolate melts without any grainy feeling on the tongue.

At this point, it may be pumped to a tank truck or depositor to be sold to confectioners or made into confections on-site. To produce a confectionery, the chocolate must be tempered. During this process, the chocolate is heated and cooled between 105°F to 85° F (40°C to 30°C) repeatedly. This stabilizes the mixture and produces chocolate that is shiny, smooth, and has a “snap” when a piece is broken. The resulting chocolate forms the basis of most finished chocolate products. Tempered chocolate has a variety of uses. It can be molded into bars, used to make truffles, cover pre-shaped candy centers, enrobe nuts or pretzels, or used in a variety of other molding methods.

Rework is one of the more difficult to handle forms of chocolate. Depending upon where the chocolate was taken out of the process, rework could contain other ingredients such as nuts or caramel. When working with this type of chocolate, it is especially important to ensure the idler bushing is well lubricated and the speed and discharge pressure is kept at a minimum.

CHOCOLATE & CONFECTIONERY PROCESS



TYPES OF CHOCOLATE & CONFECTIONERIES

There are many different types of chocolate. Chocolate products are defined by the proportion of cocoa butter, chocolate liquor, sugar, and milk in the final product. The U.S. FDA has regulations pertaining to the proportions and naming of ingredients contained in cocoa products. Chocolate manufactured and/or sold in countries other than the United States are subject to different legislation.

BITTERSWEET CHOCOLATE: This is a mixture of chocolate liquor, sugar, and cocoa butter containing no milk. The U.S. FDA regulates that bittersweet chocolate should contain at least 35% chocolate liquor. This chocolate is similar to semisweet but contains more chocolate liquor and less sugar. Other ingredients, such as vanilla and lecithin, are frequently added to this chocolate.

CACAO NIBS: This refers to the cacao bean without the shell. Nibs resemble roasted coffee beans but in smaller pieces. They are crunchy like macadamia nuts, slightly bitter, and possess an earthy flavor. Nibs can be purchased at most supermarkets either raw or roasted and sweetened and unsweetened. This is the healthiest form of chocolate. Cacao nibs are high in fiber and antioxidants. Nibs can be eaten alone, added to coffee, or baked into pastries, cookies, granola, and many other recipes.

CHOCOLATE EXTRACT: Produced by soaking cocoa nibs in alcohol, chocolate extract adds extra chocolate flavor to various recipes. Its consistency is similar to vanilla and other flavor extracts.

CHOCOLATE LIQUOR: Chocolate liquor is the basis of most chocolate products. It is made from roasted, ground cocoa nibs. It contains approximately 50% cocoa butter, with the other 50% being cocoa solids. Viscosities of chocolate liquor can vary between 10,000 to 35,000 SSU (2,200 to 7,600 cSt). Chocolate liquor is typically kept between 100°F to 200°F (40°C to 95°C.) The approximate size of the particles in chocolate liquor is 100 microns.

COCOA BUTTER: Cocoa Butter is the natural fat in the cocoa bean. It is used in the chocolate making process as well as an ingredient in other foods and consumer products, such as pharmaceuticals and beauty products. It is yellowish-white, has a melting point of 95°F and (35°C) and an approximate viscosity of 1,100 SSU (230 cSt) at this temperature. Cocoa Butter Equivalent (CBE) is a substitute fat with similar properties.

COCOA POWDER: This powder is produced by pressing chocolate liquor. During the pressing, cocoa butter is expelled from the chocolate liquor, leaving a cocoa cake behind that is then sifted into cocoa powder. The approximate fat content of cocoa powder ranges from 10-25%. Cocoa powder is slightly acidic, bitter, and very dark. It is used in a variety of baked goods, as well as the beverage hot cocoa.

COMPOUND CHOCOLATE: Compound chocolate is the term given to chocolate that has been mixed with sweeteners and vegetable fats or oils instead of cocoa butter. This is a non-tempered chocolate used for candy coatings. It is a low cost alternative to true chocolate and cannot be labeled as “chocolate” in many countries.

COUVERTURE: This tempered bittersweet or semisweet chocolate is typically used by professionals for dipping, coating, and molding. Couverture is high-quality chocolate containing a greater percentage of cocoa butter (32-39%) than other types of chocolate. The tempering process and extra cocoa butter produces a solid chocolate with a glossy finish and also gives the chocolate a “snap” when broken.

DARK CHOCOLATE: Chocolate liquor is blended with cocoa butter or another fat and sugar to produce dark chocolate. Dark chocolate does not contain any milk or milk solids. The percentage of cocoa varies from 70-99% in dark chocolate bars sold commercially. The U.S. FDA regulates that dark chocolate must contain no less than 35% chocolate liquor. Other ingredients, such as vanilla, flavorful extracts, lecithin, nuts, and fruit are frequently added to dark chocolate products. Dark chocolate is used to make chocolate bars, candies, truffles, and can also be used in baking. Viscosities can range from 14,000 to 70,000 SSU (3,000 to 15,000 cSt).

DUTCH COCOA POWDER: Dutch cocoa powder is natural cocoa that has been alkalized. This powder has a darker color with a deep red tinge and stronger flavor than natural cocoa powder. Dutch cocoa has a higher pH than natural cocoa powder, causing it to react differently with baking ingredients such as baking powder or soda. This type of cocoa is most typically used in recipes for cakes, cookies, and other baked goods.

LECITHIN: Lecithin is a mixture of triglycerides, fatty acids, and carbohydrates that typically ranges in viscosity up to 5000 SSU, but may be more viscous depending on make-up and temperature. It is typically derived from soybean oil but may also be obtained from egg yolks, corn, or other vegetable seeds. It has a low solubility in water but is an excellent emulsifying agent, so it is used in margarine as well as chocolate and confectionery products as a non-sticking agent.

MILK CHOCOLATE: Sugar, milk solids, milkfat, chocolate liquor and cocoa butter are blended together to produce milk chocolate. As regulated by the U.S. FDA., milk chocolate may contain as little as 10% chocolate liquor. It typically contains at least 12% milk solids. This type of chocolate is used by manufacturers to produce candy bars and other sweet chocolate products eaten alone. Viscosities can range from 14,000 to 70,000 SSU (3,000 to 15,000 cSt).

PEANUT BUTTER: Peanut butter is made from mixing ground up peanuts with various additives and fillers. From the mixer, peanut butter is pumped through a deaerator and/or heat exchanger to remove entrained air and drop the temperature prior to being pumped to the jar filling machines or chocolate enrobers or depositors.

SEMISWEET CHOCOLATE: This is a mixture of chocolate liquor, sugar, and cocoa butter. Semisweet chocolate does not contain milk. Bittersweet and semisweet can be used interchangeably, but typically semisweet chocolate contains less chocolate liquor and more sugar than bittersweet. Lecithin and vanilla may also be included in the final product. This chocolate is frequently used in baking.

UNSWEETENED CHOCOLATE: Unsweetened chocolate is pure chocolate liquor in solid form. It is frequently referred to as baker’s chocolate. It contains no sugar or milk. This type of chocolate is sold as a baking ingredient and it is rarely eaten alone, as it is very bitter. It is typically used in baking cakes, brownies, and other desserts.

WHITE CHOCOLATE: White chocolate does not contain any chocolate liquor or cocoa solids. It is a mixture of cocoa butter, sugar, and milk. The U.S. FDA states that white chocolate must contain at least 14% milk solids, 3.5% milk fat, 20% cocoa fat, and no more than 55% sugar.

YOGURT COATINGS: Yogurt (yoghurt) coatings are composed of a blend of sugar, palm oil, yogurt powder, and emulsifiers. Yogurt powders are a common component of white chocolate and are often used in confectionery products as a coating or enrobing agent to cover nuts, pretzels, and candies to add a tangy flavor to the final products.

CHC1 & CHC2 PUMPS

SERIES DESCRIPTION

Viking's 224A-CHC1 and -CHC2 Series are jacketed, cast iron positive displacement pumps for chocolate and confectionery applications. A unique Double O-Ring shaft seal prevents leakage of chocolate or cocoa butter along the drive shaft. This seal also doubles as the bracket bushing, and prevents chocolate from entering the bracket where it could otherwise build up.

- ***CHC1 for cocoa mass, liquor and chocolate:***

  The 224A-CHC1 pumps feature flush and suckback grooves in the casing that create flow behind the rotor to prevent chocolate from building up there.

- ***CHC2 for cocoa butter, lecithin and other liquids that don't build up:***

  The 224A-CHC2 Series pumps are identical to the -CHC1 pumps, except without the casing grooves.

This commonality of design enables a facility to handle almost any liquid with pumps which can be easily converted from CHC1 to CHC2 or vice versa with just a spare casing. This reduces required spares, while improving reliability and hygiene, and reducing slip and fall hazards from cocoa butter seepage.

TABLE 1: OPERATING RANGE

		CHC-1 Series	CHC-2 Series
Nominal Flow	GPM	2 to 78	7.9 to 400
	LPM	8 to 295	30 to 1,514
Maximum Pressure	PSI	200	200
	Bar	14	14
Temperature Range	°F	To 225	To 225
	°C	To 107	To 107
Viscosity Range	SSU	22,300 to 910,000	28 to 23,000
	cSt	5,000 to 200,000	1 to 5,000

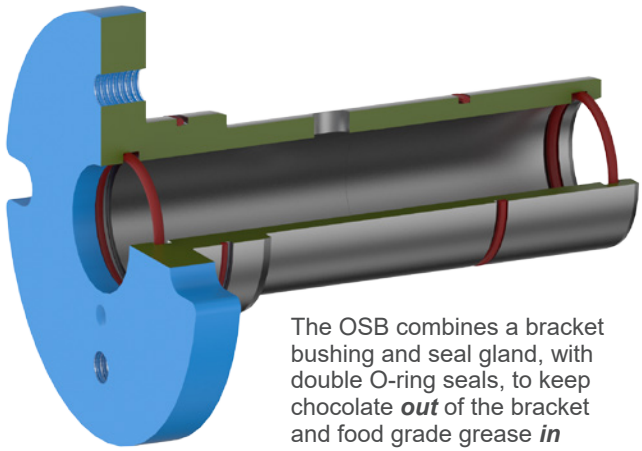
TABLE 2: NOMINAL FLOW RATES

	224A-CHC1 Series			224A-CHC2 Series		
Size	GPM	LPM	RPM	GPM	LPM	RPM
H	2	8	280	7.9	30	1000
HL	4	15	280	16.6	62	1000
K	17	64	190	74	280	780
KK	23	87	190	100	378	780
LQ	25	95	125	141	533	640
LL	32	121	125	141	533	520
LS	37	140	125	206	780	640
Q	54	204	100	260	984	470
QS	78	295	100	400	1,514	470

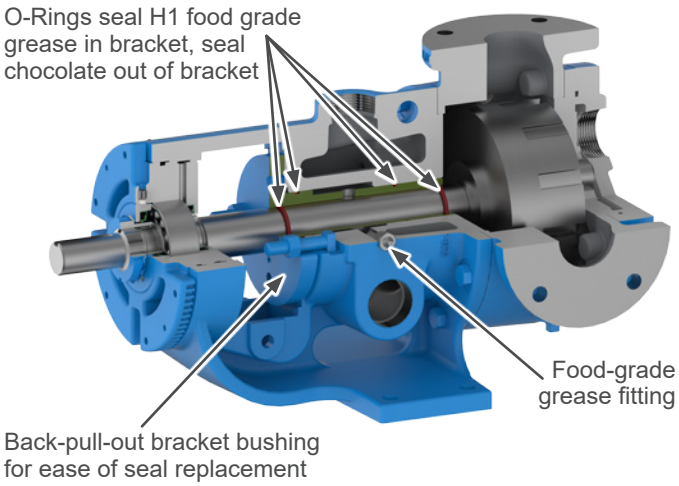
DOUBLE O-RING SEAL

The most innovative feature of the CHC pumps is the Double O-Ring Seal Bushing. This seal was developed to prevent leakage, which improves hygiene and reduces slip and fall hazards. It is a one-piece, hardened iron O-Ring Seal Bushing, which eliminates the bracket bushing, packing washer, braided packing and packing gland in a typical packed pump. Outer O-rings provide static seals between the bushing and the bracket bore, and inner O-rings provide dynamic seals between the bushing and the rotating shaft. The area between O-rings is lubricated with food grade grease, keeping chocolate out of the bracket. The bracket should be re-greased periodically, and a relief fitting enables visual inspection of the grease to ensure no chocolate infiltration. It does not require any periodic re-tensioning, cannot be overtightened like packed pumps, and eliminates the possibility of packing fibers getting into the product. Patent pending.

The O-Ring Seal Bushing may be removed with the pump in place to replace O-rings, by first removing the bearing housing. Spacer coupling are required to provide enough room to remove the bushing completely. Spacer couplings are not needed if the rotor/shaft is also removed from the head end of the pump, which also makes it easiest to re-install the bushing and then re-install the rotor/shaft.

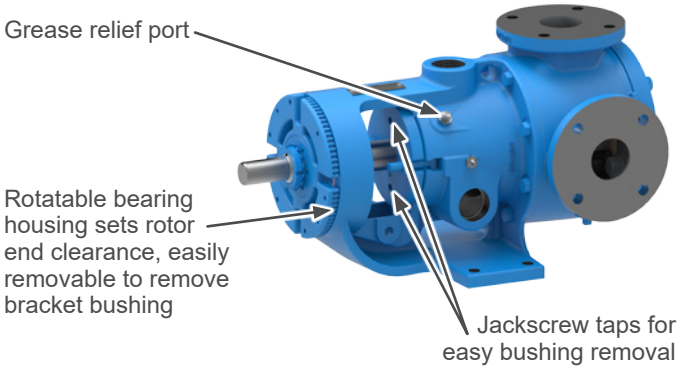


The OSB combines a bracket bushing and seal gland, with double O-ring seals, to keep chocolate ***out*** of the bracket and food grade grease ***in***



RETROFITABILITY

Existing Viking 124A/4124A and 224A/4224A Series pumps may be retrofitted to utilize the Double O-Ring Seal. Seal kits are available with all parts needed for conversion. If shafts are worn, new rotor/shafts may be required for conversion to ensure sealing and are not included in the kits. Q and QS size 224A pumps require replacement brackets, which are not included in the kits. Refer to **ESB 541** for details. For seal conversion kit PNs, refer to **"CHC1 PUMP LMs & KITS" on page 10** or **"CHC2 PUMP LMs & KITS" on page 10**. To see what each kit includes, refer to **"2-EXP-031-000-00 Exploded Diagram" on page 11**.



MODEL NUMBER KEY

L Q 2 2 4 A – C H C 1

Size:
H LL
HL LS
K Q
KK QS
LQ

Jacketing:
Jacketed bracket and head to melt chocolate before startup

Basic Series Configuration

Material of Construction:
4 = Cast Iron

Seal Location:
A = Stuffing Box Seal

Special Liquid Series:
Chocolate

Special Construction
1 = With flush & suckback grooves for all chocolates
2 = No grooves for cocoa butter & lecithin

TABLE 3: MATERIALS OF CONSTRUCTION

Component	Standard Material
Casing, Head & Bracket	Cast Iron ASTM A48, Class 35B
Rotor (Sizes H, HL, K, LQ, LL Q)	Steel, ASTM A148, Grade 80-40
Rotor (Sizes KK, LS, QS)	Ductile Iron, ASTM A536, Grade 60-40-18
Shaft	Hardened Steel, ASTM A108, Grade 1045
Idler (Drilled to lubricate Idler Pin & Bushing) ①	Cast Iron ASTM A48, Class 35B
Idler Bushing	Hardened Cast Iron, ASTM A48, Class 35B
Idler Pin	Hardened Steel, ASTM A108, Grade 1045
O-Ring Seal Bushing	Hardened Cast Iron
O-Rings	FDA Compliant FKM
Head & Bracket Gaskets	EC 1935 Food Grade non-asbestos gasketing material with SBR binder

① H and HL sizes have a powdered metal idler (Powdered metal MPIF 35, FC-0208-45), Q size has a hardened steel idler ASTM A148 Grade 80-40.

TABLE 4: CHC1 SPECIFICATIONS

For Dark, Milk & White Chocolate, Chocolate Liquor, Pastes & Nut Butters (≈ 5,000 to 200,000 cPs)

Double O-Ring Seal Model	Maximum Speed	Capacity at Listed Pressure, 10,000 cPs, 1.25 SG				Ports		
	RPM	GPM	LPM	TPH	PSI	① Size	① Type	Location
H224A-CHC1	280	2	8	0.62	50	1.5”	NPT	90°
	280	2	8	0.62	50	2”	Flange	90°
HL224A-CHC1	280	4	15	1.2	50	1.5”	NPT	90°
	280	4	15	1.2	50	2”	Flange	90°
K224A-CHC1	190	17	64	5.3	100	2”	NPT	90°
	190	17	64	5.3	100	2”	Flange	90°
	190	17	64	5.3	100	3”	Flange	90°
KK224A-CHC1	190	23	87	7.2	100	2”	NPT	90°
	190	23	87	7.2	100	2”	Flange	90°
	190	23	87	7.2	100	3”	Flange	90°
LQ224A-CHC1	125	25	95	7.8	100	3”	Flange	90°
	125	25	95	7.8	100	4”	Flange	90°
LL224A-CHC1	125	32	121	10.0	100	3”	Flange	90°
	125	32	121	10.0	100	4”	Flange	90°
LS224A-CHC1	125	37	140	11.5	100	3”	Flange	90°
	125	37	140	11.5	100	4”	Flange	90°
Q224A-CHC1	100	54	204	16.9	100	4”	Flange	90°
QS224A-CHC1	100	78	295	24.4	100	6”	Flange	180°

① For additional port types and sizes, refer to the available LMs on page 10

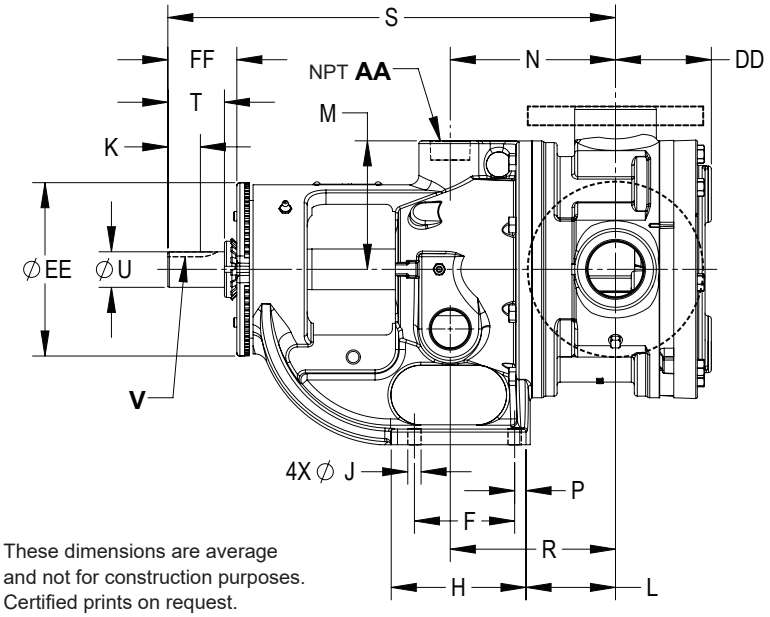
TABLE 5: CHC2 SPECIFICATIONS

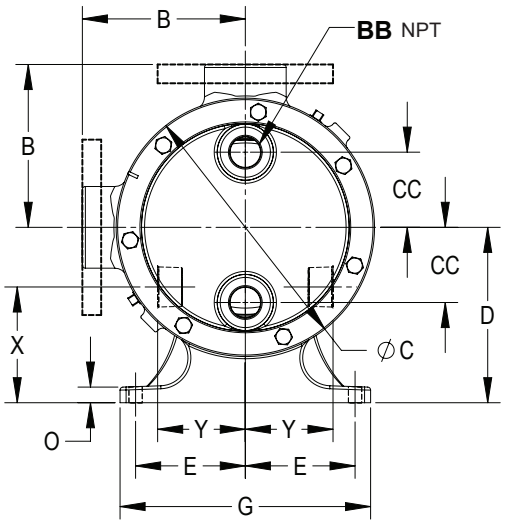
For Cocoa Butter, CBE, Oils, Lecithin (≈ 1 to 5,000 cPs)

Double O-Ring Seal Model	Maximum Speed	Capacity at Listed Pressure, 30 cPs, 0.9 SG				Ports		
	RPM	GPM	LPM	TPH	PSI	① Size	① Type	Location
H224A-CHC2	1000	7.9	30	1.7	100	1.5”	NPT	90°
	1000	7.9	30	1.7	100	2”	Flange	90°
HL224A-CHC2	1000	16.6	62	3.7	100	1.5”	NPT	90°
	1000	16.6	62	3.7	100	2”	Flange	90°
K224A-CHC2	780	74	280	16.6	100	2”	NPT	90°
	780	74	280	16.6	100	2”	Flange	90°
	780	74	280	16.6	100	3”	Flange	90°
KK224A-CHC2	780	100	378	22.5	100	2”	NPT	90°
	780	100	378	22.5	100	2”	Flange	90°
	780	100	378	22.5	100	3”	Flange	90°
LQ224-CHC2	640	141	533	31.7	100	3”	Flange	90°
	640	141	533	31.7	100	4”	Flange	90°
LL224A-CHC2	520	141	533	31.7	100	3”	Flange	90°
	520	141	533	31.7	100	4”	Flange	90°
LS224A-CHC2	640	206	780	46	100	3”	Flange	90°
	640	206	780	46	100	4”	Flange	90°
Q224A-CHC2	470	260	984	58	100	4”	Flange	90°
QS224A-CHC2	470	400	1514	90	100	6”	Flange	180°

① For additional port types and sizes, refer to the available LMs on page 10

DIMENSIONS - SIZES H, HL, K, KK, LQ, LL, LS, Q





These dimensions are average and not for construction purposes. Certified prints on request.

NOTE: Dimensions “P” through “FF” on next page

Model Number / Double O-Ring Seal	A (in)		B	C	D	E	F	G	H	J	K	L	M	N	O
H224A HL224A	① 1.5	in	3.00	4.75	3.50	2.75	2.25	6.75	3.50	0.47	0.99	3.38	2.38	4.00	0.56
		mm	76	121	89	70	57	171	89	12	25	86	61	102	14
K224A KK224A	① 2	in	5.12	8.00	5.50	4.00	2.75	9.25	4.00	0.53	1.42	3.00	4.00	5.75	0.62
		mm	130	203	140	102	70	235	102	14	36	76	102	146	16
LQ224A	② 2.5	in	7.19	10.25	7.00	4.38	4.00	10.00	5.38	0.53	1.42	3.38	5.12	6.56	0.62
		mm	183	260	178	111	102	254	137	14	36.1	86	130	167	16
LL224A	② 3	in	7.19	10.25	7.00	4.38	4.00	10.00	5.38	0.53	1.42	3.38	5.12	6.56	0.62
		mm	183	260	178	111	102	254	137	14	36.1	86	130	167	16
LS224A	② 3	in	7.19	10.25	7.00	4.38	4.00	10.00	5.38	0.53	2.55	4.75	5.12	7.40	0.62
		mm	183	260	178	111	102	254	137	14	65	121	130	188	16
Q224A	② 4	in	8.25	14.00	8.75	4.12	4.00	10.00	6.00	0.69	3.58	6.62	7.00	7.62	0.75
		mm	210	356	222	105	102	254	152	18	91	168	178	194	19

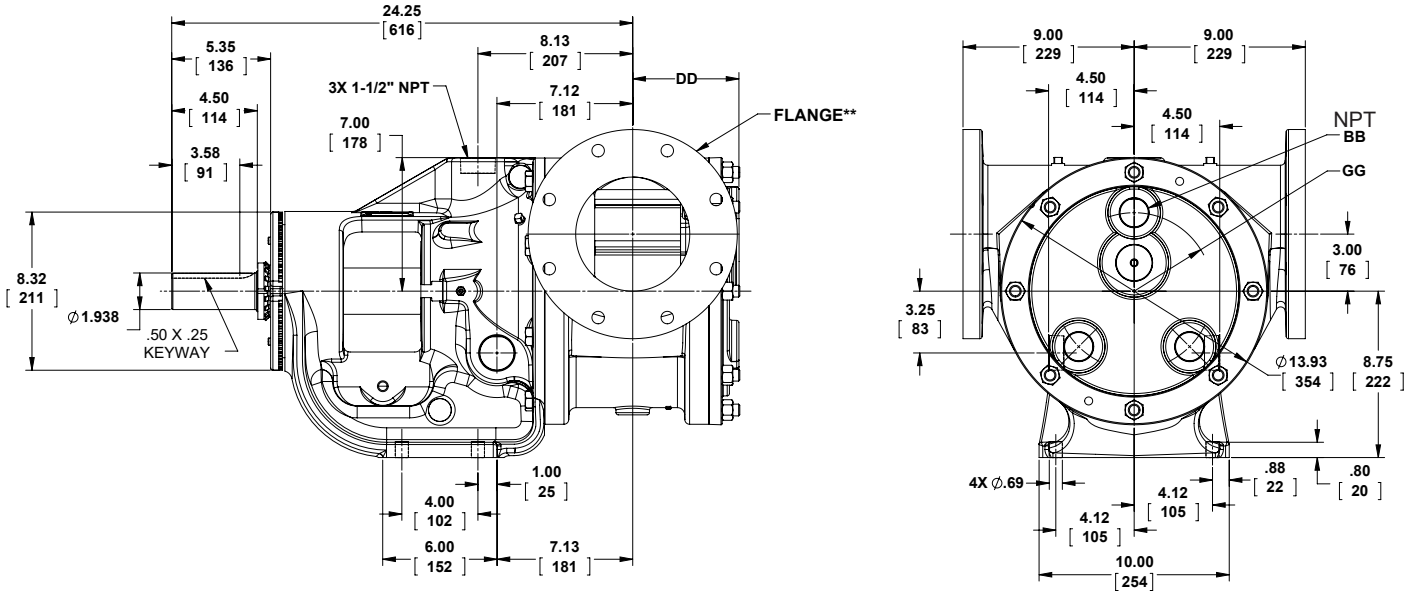
Model Number / Double O-Ring Seal		P	R	S	T	U (in)	V (in)	X	Y	AA (in)	BB (in)	CC	DD	EE	FF
H224A HL224A	in	0.62	4.00	12.06	1.62	0.75	.19 X .09	1.80	1.83	0.75	0.50	0.94	2.41	5.75	2.30
	mm	16	102	306	41			46	47			24	61	146	58
K224A KK224A	in	0.62	5.75	16.38	2.25	1.12	.25 X .12	3.38	2.75	1.25	1.25	1.75	3.25	6.75	2.92
	mm	16	146	416	57			86	70			44	83	171	74
LQ224A	in	0.62	6.56	17.88	2.25	1.12	.25 X .12	4.62	3.25	1.25	1.00	3.00	3.81	6.75	2.93
	mm	16	167	454	57			117	83			76	97	171	74
LL224A	in	0.62	6.56	17.88	2.25	1.12	.25 X .12	4.62	3.25	1.25	1.00	3.00	4.31	6.75	2.93
	mm	16	167	454	57			117	83			76	110	171	74
LS224A	in	0.62	7.00	19.25	3.50	1.44	.38 X .19	4.40	3.30	1.25	1.00	3.00	4.50	7.00	4.03
	mm	16	178	489	89			112	84			76	114	178	102
Q224A	in	1.00	6.62	23.75	4.50	1.94	.50 X .25	5.50	4.50	1.50	1.25	---	4.57	8.38	5.35
	mm	25	168	603	114			140	114			---	116	213	136

① Ports are tapped for standard (NPT) pipe. Other thread standards available.

② Ports are suitable for use with Class 125 ANSI cast iron.

DIMENSIONS - SIZE QS

Dimensions shown in inches with millimeter equivalent shown in parentheses



Model Number Double O-Ring Seal	BB*	DD	GG
QS224A	1.25	5.57 (141)	4.12 (105)

* Ports for steam or hot oil jacketing are inch standard NPT threads.

224A/4224A ports suitable for use with Class 125 ANSI cast iron companion flanges or flanged fittings.

NOTE: Flanges are 6", suitable for use with Class 125 ANSI cast iron companion flanges or flanged fittings. They are studded, not through-bolt.

CHC1 PUMP CONSTRUCTION FEATURES

In order to successfully handle the unique application demands of chocolate and related confectioneries, Viking Pump has developed and incorporated a special construction package into the CHC1 pumps, tailored to prolonging pump life and protecting the liquid integrity.

The Viking cast iron pumps are Generally Recognized As Safe (GRAS) and comply with EC 1935/2004, an EU standard covering materials of construction designed for handling food substances. The CHC1 pumps come standard with FDA compliant O-Rings and gaskets. If FDA compliance is needed for the entire wetted end of the pump, Viking offers stainless steel models that fully comply with FDA material requirements. Please refer to TR-710 for additional details and consult your Viking Application Engineer for more information.

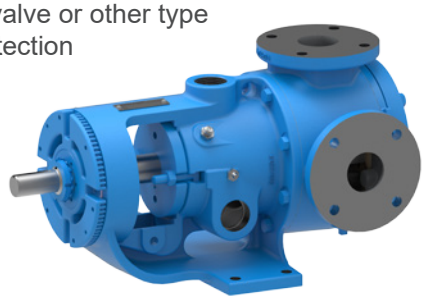
DOUBLE O-RING SEAL BUSHING

Traditionally chocolate has been a difficult liquid to seal without the use of packing, which is designed to leak. However, with the innovative Double O-Ring Seal Bushing (patent pending) design, Viking has revolutionized the chocolate pump configuration, making chocolate leakage a thing of the past. This one-piece hardened iron O-Ring Seal Bushing (OSB) feature combines the shaft sealing element with the bracket bushing, preventing chocolate leakage and providing durable shaft support all-in-one. For more information, refer to **"Double O-Ring Seal" on page 4**.

JACKETED HEAD & BRACKET

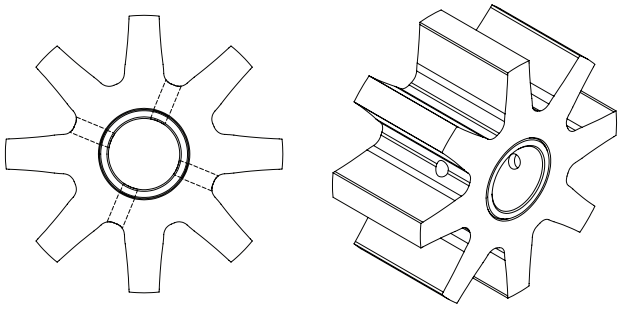
These pumps feature jacketing as standard due to the tendency of chocolate to solidify when it is cooled. The jacketed head and bracket features allow for delivering heat to the pump head and bracket, ensuring that the chocolate is softened in the critical O-Ring Seal Bushing, as well as the idler pin and idler bushing areas prior to start-up and during pump operation. Using heat to keep these areas warm will make the product easier to handle and reduce the chance of product-related lock-up.

We do not recommend using the Viking internal relief valve on pumps in chocolate service, as product can set up in the valve, preventing the valve from operating properly. Using an internal relief valve on the pump would also create a caramelization risk. Should a blockage downstream occur, causing the relief valve to fully open and bypass, the liquid would be moving very rapidly through the relief valve, resulting in caramelization and shear damage of the chocolate. An external system valve or other type of over-pressure protection should be used.



DRILLED IDLER & BUSHING

Due to the thick viscous nature of chocolate, a drilled idler should be used to ensure adequate lubrication to the critical idler bushing and pin. Staggered holes are drilled through the idler gear and bushing (see below) to move fresh product through the pin and bushing for lubrication. This additional circulation helps prevent product build-up between the close clearances between and also reduces the chance of caramelization of the liquid. These are standard in the 224A-CHC1 and CHC2 pumps.



SUCKBACK & FLUSH GROOVES IN THE CASING

With a high viscosity product moving slowly within the pump, there is a risk of product build-up behind the rotor. To prevent this product stagnation from occurring behind the rotor, suckback and flush grooves are machined into the casing to create an internal circulation path for the liquid. These suckback & flush grooves come standard and will promote flow through the area behind the rotor. Additionally, these casing grooves balance the rotor, which reduces stress on the thrust bearing and optimizes bearing life. These are standard on the 224A-CHC1 models, but are not included on the 224A-CHC2 models to enable use on thinner liquids such as cocoa butter.

HARDENED MATERIALS

The CHC1 pumps come equipped with hardened iron idler bushing, the hardened iron O-Ring Seal Bushing, and a hardened steel shaft and pin. These surface hardened materials ensure a robust construction that can withstand the abrasive solids present in chocolate.

EXTRA CLEARANCES

With years of experience successfully handling chocolate, the CHC1 pumps come standard with extra clearances built into the critical areas of the pump, ensuring adequate lubrication to pump parts, while minimizing the shear-stress on the chocolate.

REDUCED SHAFT SPEEDS

Pump speed and discharge pressures should be kept as low as possible due to the cocoa butter, abrasives, and other solids content present in chocolate blends. Pump speed is one of the most important considerations in the successful handling of chocolate. The maximum rotor rim speeds should not exceed 300 ft/min. **"Table 4" on page 6** shoes the maximum recommended pump speeds, and the flows you can expect at that speed, accounting for the custom clearances within the pump. At higher pump speeds, it is less likely that fresh liquid will reach the area between the idler bushing and pin, and there is the risk of liquid shear.

CHC2 PUMP CONSTRUCTION FEATURES

The CHC2 chocolate pump construction incorporates many of the construction features of its CHC1 counterpart, such as the O-Ring Seal Bushing, jacketed bracket and head, drilled idler and bushing assembly, and sanitary O-Rings and gaskets.

However, this CHC2 construction was designed to specifically handle thinner blends of chocolate and related processes, such as cocoa butter and lecithin. So there are no casing grooves and a custom clearance package more suitable for the thinner viscosities typically seen in lecithin and cocoa butter applications. Consult **"Table 5" on page 6** for run speed guidelines and flow rates for these CHC2 Pump constructions.

CHC1 PUMP LMS & KITS

PUMP SIZE	PORT OPTION	PUMP LM	SEAL CONVERSION KIT	O-RING KIT	REBUILD KIT
H224A-CHC1	1.5" Tapped	5-1462-661A-002	3-464-SEAL-K450	3-464-ORG-877-H1	3-464-REBUILD-K467
H224A-CHC1	2" 125# Flanged	5-1462-662A-001	3-464-SEAL-K450	3-464-ORG-877-H1	3-464-REBUILD-K467
HL224A-CHC1	1.5" Tapped	5-1412-661A-004	3-464-SEAL-K450	3-464-ORG-877-H1	3-464-REBUILD-K468
HL224A-CHC1	2" 125# Flanged	5-1412-662A-001	3-464-SEAL-K450	3-464-ORG-877-H1	3-464-REBUILD-K468
K224A-CHC1	2" Tapped	5-2515-661A-001	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K469
K224A-CHC1	2" 125# Flanged	5-2515-662A-008	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K469
K224A-CHC1	3" 125# Flanged	5-2515-662A-009	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K469
KK224A-CHC1	2" Tapped	5-2520-661A-002	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K470
KK224A-CHC1	2" 125# Flanged	5-2520-662A-006	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K470
KK224A-CHC1	3" 125# Flanged	5-2520-662A-007	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K470
LQ224A-CHC1	3" 125# Flanged	5-3320-662A-007	3-464-SEAL-K452	3-464-ORG-877-L2	3-464-REBUILD-K471
LQ224A-CHC1	4" 125# Flanged	5-3320-662A-008	3-464-SEAL-K452	3-464-ORG-877-L2	3-464-REBUILD-K471
LL224A-CHC1	3" 125# Flanged	5-3325-662A-002	3-464-SEAL-K452	3-464-ORG-877-L2	3-464-REBUILD-K472
LL224A-CHC1	4" 125# Flanged	5-3325-662A-003	3-464-SEAL-K452	3-464-ORG-877-L2	3-464-REBUILD-K472
LS224A-CHC1	3" 125# Flanged	5-3330-662A-004	3-464-SEAL-K453	3-464-ORG-877-L1	3-464-REBUILD-K473
LS224A-CHC1	4" 125# Flanged	5-3330-662A-005	3-464-SEAL-K453	3-464-ORG-877-L1	3-464-REBUILD-K473
Q224A-CHC1	4" 125# Flanged	5-4430-662A-004	3-464-SEAL-K454	3-464-ORG-877-Q1	3-464-REBUILD-K474
QS224A-CHC1	6" 125# Flanged	5-4445-662A-007	3-464-SEAL-K454	3-464-ORG-877-Q1	3-464-REBUILD-K475

CHC2 PUMP LMS & KITS

PUMP SIZE	PORT OPTION	PUMP LM	SEAL CONVERSION KIT	O-RING KIT	REBUILD KIT
H224A-CHC2	1.5" Tapped	5-1462-661A-003	3-464-SEAL-K450	3-464-ORG-877-H1	3-464-REBUILD-K467
H224A-CHC2	2" 125# Flanged	5-1462-662A-002	3-464-SEAL-K450	3-464-ORG-877-H1	3-464-REBUILD-K467
HL224A-CHC2	1.5" Tapped	5-1412-661A-005	3-464-SEAL-K450	3-464-ORG-877-H1	3-464-REBUILD-K468
HL224A-CHC2	2" 125# Flanged	5-1412-662A-002	3-464-SEAL-K450	3-464-ORG-877-H1	3-464-REBUILD-K468
K224A-CHC2	2" Tapped	5-2515-661A-002	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K469
K224A-CHC2	2" 125# Flanged	5-2515-662A-011	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K469
K224A-CHC2	3" 125# Flanged	5-2515-662A-010	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K469
KK224A-CHC2	2" Tapped	5-2520-661A-003	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K470
KK224A-CHC2	2" 125# Flanged	5-2520-662A-008	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K470
KK224A-CHC2	3" 125# Flanged	5-2520-662A-009	3-464-SEAL-K451	3-464-ORG-877-K1	3-464-REBUILD-K470
LQ224A-CHC2	3" 125# Flanged	5-3320-662A-010	3-464-SEAL-K452	3-464-ORG-877-L2	3-464-REBUILD-K471
LQ224A-CHC2	4" 125# Flanged	5-3320-662A-009	3-464-SEAL-K452	3-464-ORG-877-L2	3-464-REBUILD-K471
LL224A-CHC2	3" 125# Flanged	5-3325-662A-004	3-464-SEAL-K452	3-464-ORG-877-L2	3-464-REBUILD-K472
LL224A-CHC2	4" 125# Flanged	5-3325-662A-005	3-464-SEAL-K452	3-464-ORG-877-L2	3-464-REBUILD-K472
LS224A-CHC2	3" 125# Flanged	5-3330-662A-007	3-464-SEAL-K453	3-464-ORG-877-L1	3-464-REBUILD-K473
LS224A-CHC2	4" 125# Flanged	5-3330-662A-006	3-464-SEAL-K453	3-464-ORG-877-L1	3-464-REBUILD-K473
Q224A-CHC2	4" 125# Flanged	5-4430-662A-005	3-464-SEAL-K454	3-464-ORG-877-Q1	3-464-REBUILD-K474
QS224A-CHC2	6" 125# Flanged	5-4445-662A-008	3-464-SEAL-K454	3-464-ORG-877-Q1	3-464-REBUILD-K475

2-EXP-031-000-00 EXPLODED DIAGRAM

PN 2-EXP-031-000-00

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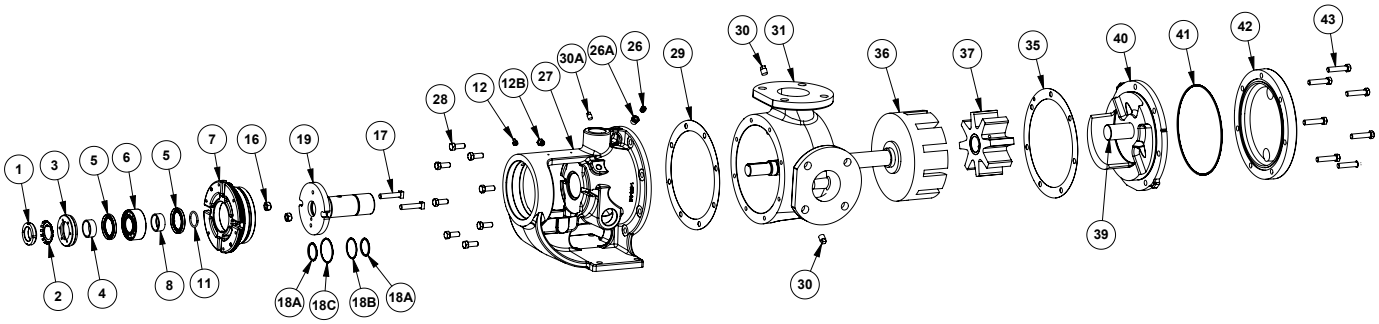
Exploded Diagram for Series 224A-CHC1, 224A-CHC2 – Sizes H, HL, K, KK, LQ, LL, LS, Q, QS



NOTE: Kit may not apply to all models of these pumps. Contact your Viking Pump distributor with pump serial number for correct kit part numbers for that pump. Both a Seal Kit and a Rebuild Kit are needed to completely rebuild the pump. Additional non-kit parts, such as Rotor and Shaft Assembly, may also be required, depending on wear.

ITEM	PART (may not exactly match parts list descriptions)	PART INCLUDED IN:		
		CONVERSION (SEAL) KIT	O-RING KIT	REBUILD KIT
1	Locknut	✓		
2	Lockwasher	✓		
3	End Cap for Bearing Housing			
4	Bearing Spacer Collar (Outer)	✓		
5	Lip Seal for Bearing Housing	✓		
6	Ball Bearing ②	✓		
7	Bearing Housing			
8	Bearing Spacer Collar (Inner)	✓		
11	Ring, Half Round, Qty 2 Req'd (Except H, HL)	✓		
12	Grease Fitting			
12B	Grease Fitting	✓		
16	O-Ring Seal Bushing Nut	✓		
17	O-Ring Seal Bushing Capscrew	✓		
18A	Dynamic O-Ring (Qty 2 Req'd)	✓	✓	
18B	Inner Static O-Ring	✓	✓	
18C	Outer Static O-Ring	✓	✓	

ITEM	PART (may not exactly match parts list descriptions)	PART INCLUDED IN:		
		CONVERSION (SEAL) KIT	O-RING KIT	REBUILD KIT
19	O-Ring Seal Bushing	✓		
26	Pressure Relief Fitting	✓		
26A	Reducer Bushing	✓		
27	Bracket			
28	Capscrew for Bracket ①			
29	Bracket Gasket	✓		
30	Pipe Plug			
30A	Pipe Plug			
31	Casing			
35	Head Gasket	✓	✓	
36	Rotor and Shaft Assembly			
37	Idler and Bushing Assembly			✓
39	Idler Pin (part of 40)			
40	Head and Idler Pin Assembly			✓
41	Jacketed Head Plate Gasket			
42	Jacketed Head Plate			
43	Head Capscrews ①			✓

① Quantity of Capscrews depends on pump size.

② Q & QS size have two roller bearings (not illustrated)

Use food grade grease (not provided) for installing mechanical seal and O-rings.

Important safety information and rebuild instructions are found in the Technical Service Manual.

Download current Technical Service Manuals from vikingpump.com:

TSM 1462 – Series 224A-CHC1, 224A-CHC2
Sizes H, HL, K, KK, LQ, LL, LS, Q, QS

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