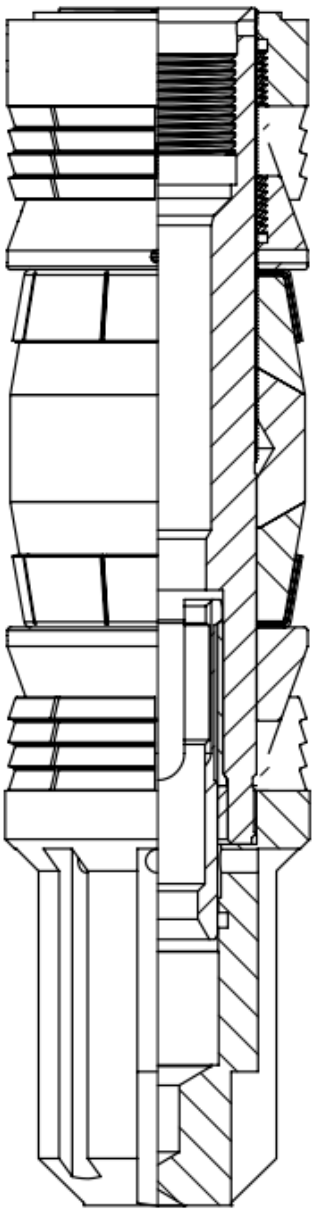
UNIT NO.	Kappa Cement Retainer
DATE	2018-03-14
Revision	2.0

Kappa WHM Cement Retainer

4-1/2” Through 13-3/8”



The Kappa WHM cast iron drillable cement retainer's modular, field proven design makes it a versatile tool in a variety of applications. The Kappa may be set mechanically or on a wireline setting tool by changing the top slips. The Kappa also converts to a Kappa bridge plug.

Features

- Cast iron drillable design
- Simple, surface-controlled valve automatically closes when the stinger is removed
- Converts between mechanical or wireline set by changing top slips
- Components rotationally locked for easy drill out
- Temperature rating to 440° Fahrenheit
- Differential pressure rating to 10,000 psi thru 8-5/8”

Benefits

- Allows pressure-testing before squeeze
- Engineered Valve design protects sensitive zones in low-fluid wells
- Convertibility reduces inventory requirements
- Fast drill out saves rig time

Applications

- Cementing
- Stimulation
- Well abandonment
- Temporary or permanent zone isolation

Related Products

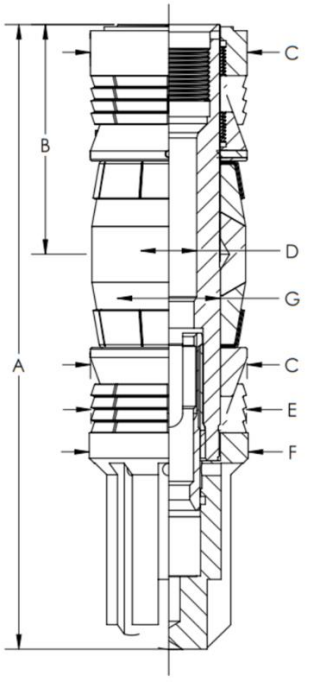
- Stinger Seal Assembly
- MST Mechanical Setting Tool
- HST Hydraulic Setting Tool
- WL Adapter Kits

SPECIFICATION GUIDE

CASING				TOOL	
SIZE IN (mm)	**WEIGHT** LB/FT (kg/m)	**MIN. I.D.** IN (mm)	**MAX. I.D.** IN (mm)	**MAX. O.D.** IN (mm)	**SETTING FORCE** lbs (daN)
4-1/2 (114.30)	9.5-15.1 (14.14-22.47)	3.826 (97.18)	4.090 (103.89)	3.562 (90.47)	33,000 (14,678)
5 (127.00)	11.5-20.8 (17.11-30.95)	4.154 (105.51)	4.560 (115.82)	3.937 (100.00)	33,000 (14,678)
5-1/2 (139.70)	13.0-23.0 (19.34-34.22)	4.580 (116.33)	5.044 (128.12)	4.235 (107.57)	33,000 (14,678)
5-3/4 (146.00)	14.0-25.2 (20.83-37.50)	4.890 (134.37)	5.290 (134.37)	4.700 (119.38)	50,000 (22,240)
6-5/8 (168.30)	17.0-32.0 (25.30-48.00)	5.595 (142.11)	6.135 (155.83)	5.375 (136.53)	50,000 (22,240)
7 (177.80)	17.0-35.0 (25.30 - 52.08)	6.000 (152.40)	6.538 (166.07)	5.604 (142.40)	50,000 (22,240)
7-5/8 (193.68)	20.0-39.0 (29.80-58.00)	6.625 (168.28)	7.125 (180.98)	6.312 (160.32)	50,000 (22,240)
8-5/8 (219.08)	24.0-49.0 (35.70-72.90)	7.310 (185.67)	8.097 (205.66)	7.125 (180.98)	50,000 (22,240)
9-5/8 (244.48)	29.3-58.4 (43.60-56.90)	8.297 (210.74)	9.063 (230.20)	8.125 (206.38)	50,000 (22,240)
10-3/4 (273.05)	32.7-60.70 (48.70-90.30)	9.525 (241.94)	10.325 (262.26)	9.440 (239.78)	50,000 (22,240)
11-3/4 (298.45)	38.00-60.00 (56.50-89.30)	10.641 (270.28)	11.284 (286.61)	10.063 (255.60)	50,000 (22,240)
13-3/8 (339.70)	48.0-84.5 (71.40-125.7)	12.202 (309.90)	12.879 (327.13)	11.880 (301.75)	50,000 (22,240)

Assemblies listed are the standard configuration – **90/70/90 Durometer Packing Element, Cast Iron construction.** Alternative elastomers and construction may be available upon special request. Ratings posted in this document refer to the standard configuration.

PRODUCT NUMBER	DIMENSIONS IN (mm)						
	A	B	C	D	E	F	G
450CR10	20.310 (515.88)	7.180 (182.37)	3.560 (90.42)	1.350 (34.29)	3.500 (88.90)	3.562 (90.47)	2.500 (63.50)
500CR10	20.310 (515.88)	7.180 (182.37)	3.942 (100.13)	1.350 (34.29)	3.882 (98.60)	3.937 (100.00)	2.500 (63.50)
550CR10	20.310 (515.88)	7.000 (177.72)	4.230 (107.44)	1.350 (34.34)	4.180 (106.17)	4.235 (107.57)	2.745 (69.72)
575CR10	20.310 (515.88)	6.959 (176.75)	4.700 (119.38)	1.350 (34.34)	4.650 (118.11)	4.700 (119.38)	2.745 (69.72)
658CR10	22.375 (568.33)	8.293 (210.64)	5.370 (136.40)	2.003 (50.88)	5.309 (134.85)	5.375 (136.53)	3.688 (93.68)
700CR10	22.375 (568.33)	8.227 (208.97)	5.604 (142.34)	2.003 (50.88)	5.557 (141.15)	5.604 (142.40)	3.688 (93.68)
758CR10	22.375 (568.33)	7.993 (203.02)	6.312 (160.32)	2.003 (50.88)	6.265 (159.14)	6.312 (160.32)	3.688 (93.68)
858CR10	23.875 (606.43)	11.158 (283.42)	7.120 (180.85)	2.005 (50.93)	7.059 (179.31)	7.125 (180.98)	5.250 (133.35)
958CR8	23.875 (606.43)	11.145 (283.09)	8.120 (206.25)	2.005 (50.93)	8.000 (203.20)	8.125 (206.38)	6.250 (158.75)
1075CR5	23.875 (606.43)	11.202 (284.52)	9.440 (239.78)	2.005 (50.93)	9.320 (236.73)	9.440 (239.78)	7.375 (187.33)
1175CR4	23.875 (606.43)	11.155 (283.34)	10.063 (255.60)	2.005 (50.93)	9.987 (253.66)	10.063 (255.60)	8.250 (209.55)
1338CR3	23.875 (606.43)	11.145 (283.09)	11.870 (301.50)	2.005 (50.93)	11.750 (298.45)	11.880 (301.75)	10.000 (254.00)



TEMPERATURE RATING FOR KAPPA CEMENT RETAINER

PACKING ELEMENT (NITRILE)	MAXIMUM TEMPERATURE °F (°C)
90/70/90 NITRILE	300 (149)
VITON	440 (227)
THERMAL	800 (427)

PRESSURE RATING

SIZE IN (mm)	PRESSURE RATING PSI (bar)
4-1/2 – 8-5/8 (114.30-219.08)	10,000 (689.48)
9-5/8 (244.48)	8,000 (551.58)
10-3/4 (273.05)	5,000 (344.74)
11-3/4 (298.45)	4,000 (275.79)
13-3/8 (339.70)	3,000 (206.84)

GENERAL OPERATION - Running the Kappa Cement Retainer on tubing or drill pipe with the MST Mechanical Setting Tool

The mechanical set Kappa Cement Retainer is run on tubing or drill pipe using the MST mechanical setting tool. The MST mechanical setting tool contains the upper slips of the cement retainer/bridge plug in a safe retracted position while running to setting depth. The slide valve on the retainer is in the open position while being run in the well to allow the tubing to fill, and to allow circulation if necessary.

The upper slips are released by right hand rotation and slack off on the work string. The cement retainer/bridge plug is anchored to the casing by pulling 25-50,000 lb. tension at the tool. When the setting procedure is completed, the slide valve is closed by picking up (2) two inches at the tool or opened by slacking off (2) two inches. With the slide valve in the closed position, the work string may be pressure tested.

The MST mechanical setting tool contains a built-in snap-out feature which provides approximately 5,000 lb. snap out tension indicator when the work string is picked up to close the slide valve. This tension indicator is reengaged each time the work string is lowered to open the slide valve.

The MST mechanical setting tool is equipped with drag pads or springs to assure positive control during running and setting procedures at all depths or in highly deviated wells. When the Kappa is converted to a Kappa Bridge plug, the mechanical setting tool must be converted as well by changing the top coupling to a ported coupling, bottom stinger sub and removing the stinger seal. Refer to the MST Tech Unit for details.

RUNNING INSTRUCTIONS

1. Make up the top sub of the running tool to the lower pin end of the work string. Use a good quality API approved thread lubricant and torque all work string connections to manufactures torque specifications. During run in, take care to avoid any right hand rotation at the setting tool. As a precaution, one left hand turn should be placed In the work string every 10 to 15 stands.
2. When the desired setting depth has been reached, the tools should be picked up two feet (0.6 m) above the desired setting point. This movement is necessary to provide the required tool stroke to release the upper slips and allow the control nut to move freely.
3. Rotate the work string to the right sufficiently to transmit 10 turns to the tool. This right hand rotation will thread the control nut off of its matching threads on the mandrel and release the control sleeve and setting sleeve from the controlled position.
4. Lower the tools back downward to the desired setting point, the drag blocks or springs will support the control sleeve and setting sleeve. The downward motion of the tool mandrel will move the slips from under the setting sleeve, the slips are forced outward toward the casing wall by the leaf springs attached to the inside of each slip segment. When the slips are released, there is sufficient clearance for the locking dog to move outward and release the control latch from the stinger sub body.
5. Pull recommended tension above pipe weight at the tool to set the slips and affect a pack-off.

TOOL SIZE	MINIMUM TENSION LB (daN)	MAXIMUM TENSION LB (daN)
4-1/2 - 5-1/2	16,000 (7120)	33,000 (14680)
7.0 – 13-5/8	25,000 (11120)	55,000 (24465)

To assure a pack-off you must pull at least the minimum tension shown in the above chart and hold five minutes. Set down an equivalent amount of weight on the tool and then re-apply the recommended tension. The tool should now be set and pressure testing of the cement retainer and tubing may be performed.

6. The setting tool may be released from the cement retainer by pulling 500 pounds of tension at the tool and rotating the work string 10 turns to the right at the tool. The above movement will shear the shear screw and unscrew the setting tool's control latch from the retainer.
7. The setting tool may be re-latched to the cement retainer by setting down 500 to 1.000 pound of work string weight and snapped out again by pulling 5,000 to 8,000 lb. tension at the tool. The seal assembly will remain in the retainer until the control latch retaining force is exceeded. Each time the setting tool is snapped in and snapped out, the snap-in and snap-out values are reduced until they reach 500 pounds (snap-in) and 5,000 pounds (snap-out).

SPECIAL NOTE: In wells where paraffin or suspended solids in the well fluids are present, the dog on the control latch may not fully release from the stinger sub body. This is indicated when the cement retainer sets properly, as in steps 1 thru 4, but the slide valve will not close so that a tubing pressure test may be performed. **In** this event the tubing should be alternately picked up and slacked off. This

movement will cause the dog to move outward on the Inclined edges of the control groove in the stinger sub body, thus freeing the body for the required vertical movement. Two (2) inches of upward vertical movement at the retainer will close the slide valve while two (2) inches of downward vertical movement at the retainer will open the slide valve.

MOUNTING KAPPA CEMENT RETAINER ON THE MST MECHANICAL SETTING TOOL

1. Place top collar of mechanical setting tool in vise with dog of setting tool in an upright position.
2. Move drag block assembly downward until it stops.
3. Rotate drag block assembly to the right until it engages the clutch and stops. Rotate setting sleeve towards drag block assembly until upset on control latch is exposed.
4. Slide upper slips over stinger sub body. Loosen clamp on slips only enough to slide slips over upset on control latch then retighten. Lubricate upper non-wickered portion of slips where setting sleeve contracts slips with grease. Rotate setting sleeve downward over slips until setting sleeve contacts the clamp on slips. Loosen and move the clamp to wickered portion of slips. Continue rotating the setting sleeve downward until sleeve bottoms out against top wicker of slips. Back off 3 turns. Check to ensure that drag block assembly is still engaged with the clutch. Readjust setting sleeve if necessary.
5. Lubricate stinger sub and latch with grease. Place a liberal amount of grease in retainer bore.
6. Slide cement retainer/bridge plug over stinger. Drive retainer over stinger seal until the retainer shoulders out on control latch. Use a wood block to protect lower end of retainer when driving the retainer onto stinger seal.
7. Rotate retainer to make up left hand thread of control latch into left hand thread at top of cement retainer/bridge plug. Make up hand tight.
8. Align screw hole of retainer body and control latch, install shear screw.
9. Rotate setting sleeve downward until it bottoms out on wickered portion of slip. Back up setting sleeve 1/2 turn and secure with 2 set screws.
10. Tighten clamp on upper slips for transport purposes. Remove clamp on upper slips before running in well.

SETTING EQUIPMENT GUIDE FOR ELECTRIC LINE SET KAPPA CEMENT RETAINER

The KAPPA Cement Retainer/Kappa Bridge Plugs are designed to be set utilizing a Gearhart, Pengo, or Baker E-4 or E-5 Electric Line setting tool. A wireline adapter kit is required to adapt the appropriate size electric line setting tool to the cement retainer/bridge plug. Please check the setting equipment guide on for the proper setting and cementing tool requirements.

You will also find included in this unit individual parts lists and dimensional data for each of the electric line setting equipment. Assembly instructions for attaching the cement retainer/bridge plug to the electric line setting tool should be very carefully read and followed.

The setting and cementing tools are designed to be used many times. For maximum utilization, the tools should be disassembled after each usage, carefully cleaned. Inspected and reassembled using new o-rings and seals.

OPERATION

The Kappa Cement Retainer/Kappa Bridge Plug is attached to the wireline pressure setting assembly with the proper size wireline adapter kit and run to setting depth. When the pressure setting assembly is actuated, the tension mandrel moves upward in relation to the setting sleeve of the adapter kit, thus setting and packing off the cement retainer. The pressure setting tool develops force that is in excess of that required to set the cement retainer/bridge plug and the continued upward movement then breaks the release stud allowing the pressure setting tool and adapter kit to be retrieved. The cement retainers sliding valve will be in the closed position after setting and releasing from the pressure setting tool. This provides a high-pressure seal from above or below.

KAPPA CR PLUG EQUIPMENT GUIDE

WIRELINE SET: comes with solid wireline setting slips and shear stud. (See chart, page 6)

MECHANICAL SET; comes with mechanical slips (segmented with internal springs held together w/ clamp until it is assembled to mechanical setting tool. Brass shear screws (1-4) depending on size of tool.

MECHANICAL SETTING TOOL: MST does not come with a thread protector as standard but if the tool is to be used to run a bridge plug, a thread protector is required along with a ported sub to run above tool.

SNAP OUT SEAL ASSEMBLY: SSA requires no additional parts.

WIRELINE ADAPTER KIT: See chart for correct shear stud.

WIRELINE ADAPTER KIT ASSEMBLY

1. Thread shear stud into lower end of tension mandrel (5) and make up hand tight. NOTE; A: On 4-1/2" through 5-3/4" KAPPA, the longer threaded portion of the shear stud must thread into the tension mandrel. B: The 4-1/2" through 5-3/4" TBP use a different shear stud than the KAPPA which can be threaded with either end. C: Do not place a wrench on any threaded portion of a shear stud.
2. Thread shear stud and tension mandrel subassembly into the retainer or bridge plug by inserting this subassembly through the top of the tool. The shear stud should make up 15/16" (12-13 turns) for 4-1/2" through 5-3/4" and 1-1/8" (14-15 turns) for the larger tools.
3. Install lock spring (4) on upper thread of tension mandrel (5). The lock spring must be used to prevent the cement retainer / bridge plug from backing off of the pressure setting assembly during running.
4. Install adjuster sub (3) on pressure setting assembly for size 45 or larger (for 20 Baker Pressure Setting Assembly only). Install set screw (2).
5. Install setting sleeve (1) on pressure setting assembly.
6. Slide upper wireline slip onto upper cone of cement retainer / bridge plug. Thread tension mandrel (5) with lock spring (4) into the adjuster sub (3) until the gap between the cylinder head and cross-link sleeve on the pressure setting assembly closes. CAUTION: DO NOT WRENCH! This operation should be performed by hand. NOTE: This step is easier if performed while the pressure setting assembly is hanging in the derrick. (Size 46 and larger) Proceed by running to setting depth and setting as per wireline operating procedures.
7. When pressure setting tool is removed from the well, remove the wireline adapter kit setting sleeve, adjuster sub and tension mandrel for reuse.

PRECAUTIONS

1. The setting tool should be properly maintained according to manufacturer's instructions and the oil level checked to assure compliance with these instructions before the cement retainer / bridge plug is attached.
2. Confirm that the cement retainer / bridge plug is the proper size for the casing size and weight in which it will be set.
3. Occasionally the situation may arise where the cement retainer / bridge plug must pass thru a heavier weight casing than that for which it is designed or damaged sections of casing with reduced internal diameters. In these situations, the cement retainer / bridge plug should always be sized to the casing size and weight at the setting point.
4. A wireline feeler and junk catcher with an appropriate gage ring size should always be run before running the cement retainer or bridge plug. The wireline feeler and junk catcher will remove debris from the well bore and gage the internal diameter to assure that no obstructions or restrictions exist that could cause problems when the cement retainer / bridge plug is run. The proper gage ring size for each cement retainer is shown in the preceding setting tools specification chart.

RECOMMENDED REMOVAL TECHNIQUES: CEMENT RETAINERS AND BRIDGE PLUGS

GENERAL

Drilling with a medium steel tooth tri-cone bit is the preferred method of removing drillable cement retainers and bridge plugs since drilling can usually be accomplished in less time than mill-out of the same cement retainer or plug. This high relative removal time for the milling technique is explained by the examination and the mechanics of the two methods. Drilling causes a chiseling effect, and milling has a shaving effect of the target. Further, milling yields more debris of the type that causes penetration stoppage. Drilling with a short to medium tooth hard formation rock bit is usually the best combination for cement retainer or plug removal.

SUGGESTED DRILLING TECHNIQUES

Though the best drilling technique will vary with equipment availability, a typical combination would consist of a short or medium tooth hard formation bit (lADC CODES 2-1, 2-2, 2-3,2-4 and 3-1), 75 to 120 RPM rotary speed and drill collars as necessary for weight and bit stabilization.
To drill the retainer or plug:

- Apply 5,000-7,000 lb. until the top end of the retainer mandrel is drilled (4 inches /101.60 mm.)
- Increase weight to 2,000-3,000 lb. per inch of bit diameter to drill out remainder. {Example, use 9,500-14,250 lb. for a 4-3/4" bit.)

When normal circulation is to be used, place a junk basket above the bit. If reverse circulation is planned, casing scraper or other equipment in the tubing string above the bit should have an inside fluid passage as large as the passage through the bit so cuttings will not bridge. Variations in bit speed and bit weight should be made to help break up metal parts to re-establish bit penetration should it cease while drilling.

Penetration may be stopped by "bit tracking" which is usually caused by insufficient weight on the bit. Bit tracking occurs when bit teeth travel in the same indentation of "track" made previously by another tooth. Successive tool impact to the same location will sometimes deepen the track until indentations equal bit tooth length, reducing the impact of the teeth to the point that they will not penetrate. Drilling penetration may be re-established by raising the bit off of the retainer, and then lowering the bit back onto the retainer while maintaining rotation.

NOTE: Drilling times are directly related to tool size, bit stability, drilling weight, pump rate, bit RPM, type of bit, drilling fluid, etc. The combination of high mud viscosity and high pump rates may lift the bit off of the retainer during drilling. The same consideration should be used when drilling cement retainers and bridge plugs as would be given when drilling medium hard rock formation.

SUGGESTED MILLING TECHNIQUE

If equipment availability or other considerations dictate that the milling technique must be used. The recommended combinations a concave face junk type mill tool, rotated at 60-150 RPM with 5,000 - 8,000 lb. on the mill. Use mud viscosity of 60 cps and a minimum annular velocity of 120 ft./min. to assure cutting removal.

When ready to begin milling operations, start the mill above the target and lower It slowly onto the target. Do not apply weight in excess of recommended amount; great weights can tear out chunks of the packer and make a bailer trip necessary to remove the chunks to allow further penetration. Maintain a constant milling rate by adding weight as tool is milled away.