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Service Instructions

Service Sun Cartridges

Sun cartridges are basic service items; they are easily removed from their mounting in the cavity for cleaning or replacement. It is not necessary to remove an entire Sun valve assembly, i.e. cartridge/body assembly, from the circuit piping or solenoid valve stack. Simply unscrew the Sun cartridge from its mounting configuration for trouble shooting or replacement.

Before removing any Sun cartridge from its mounting, first refer to the equipment manufacturers' service documentation for recommendations relating to precautions for securing any moving elements associated with the equipment. (If documentation does not exist, ensure that all loads are adequately supported and the system is depressurized before performing any service work.)

While considered service items, Sun cartridges are not designed to be disassembled in the field. If, for any reason, a Sun cartridge does not perform as required, follow the trouble shooting steps that follow. If the cartridge still does not function, it should be replaced with a new, factory-tested Sun cartridge.

Non-functioning cartridges should be returned to Sun through your local distributor for evaluation. A full report of our findings will be issued on request.

Returned Materials

For any returned materials, a Sun Hydraulics "Returned Materials Authorization" Number (RMA#) must first be obtained. Prior to sending any product to the factory, notify Sun's Customer Service Department of an intended return. Sun will issue an "Inspection/Evaluation/Repair Form (IERF)", which must first be completed in full and submitted to Sun. An explanation of the problem and the work requested is to be included on the IERF.

Upon review and approval of the materials listed on the IERF to be returned, Sun will issue the RMA#. All returned material, and the completed IERF form, should be shipped freight prepaid to Sun. The RMA# should be referenced on all subsequent return paperwork and correspondence.

Sun products may be returned to Sun for the following reasons:

Repairs (out of warranty)

1. Repair or replace any Sun standard cartridge, maximum charge current list price less 50%, (distributor price equals current list less 50%). Suggested Customer and NFPA price is list less 40%.
2. Complete valve assemblies, valve bodies, customer cartridges, and customer valvepacs will be repaired (or refurbished) on a quotation only basis.

Engineering Analysis

Sun may, upon request, evaluate a product in a specific manner. Sun is very willing to cooperate in such evaluations whenever it might help to improve the performance of a Sun product.

Service Kits

Sun Service Kits contain replacement parts for all external seals on cartridges and sandwich bodies. Additionally, service kits are available for field retrofit of various removable control options for Sun cartridges.

Detailed information on the sizes and locations of external seals are provided in this bulletin. Service kits are arranged according to cavity, with an accompanying listing of Sun cartridges that fit a specific cavity.

Trouble Shooting

The most common cause of failure of a Sun cartridge is contamination in the hydraulic fluid, which can then lodge in

the working parts of the cartridge and interfere with their operation.

If necessary, the following Sun cartridges can be easily cleaned without altering their settings: RP**, RV**, RS**, PB**, PP**, FX**, LP**, and LR**.

1. First refer to the equipment manufacturers' service documentation for recommendations relating to precautions for securing any moving elements associated with the equipment. (If documentation does not exist, ensure that all loads are adequately supported before performing any service work.)
2. Carefully de-pressurize the hydraulic system.
3. Remove the cartridge from its cavity.
4. Inspect the cartridge for visible contaminants and, if found, carefully remove any obvious particles.
5. Through the nose of the cartridge, manually operate the inner working parts several times. Use a piece of plastic tubing to avoid damaging soft seats, sharp edges, finished surfaces or the screen protecting the pilot orifice. All parts should move freely. If possible, this inspection should be done with the cartridge submerged in clean mineral spirits.
6. After flushing, blow dry the cartridge with clean, filtered air.
7. Replace any seals that are worn or damaged, using the appropriate Sun seal kit.
8. Dip the cartridge in clean hydraulic fluid, and then reinstall the cartridge and tighten to the specified torque and retest.
9. If this procedure does not eliminate the operational problem, replace the malfunctioning cartridge with a new, factory-tested Sun cartridge.

Service Instructions

Manufacturing Date Code References

Sun stamps a date code on all products to provide a means for tracking their production history. Date codes are stamped on one of the hex body flats on all cartridges, and on one surface of all standard bodies.

Through December 31, 1985, Sun used a date code system that designated the calendar quarter in which a product was manufactured.

Beginning January 1, 1986, Sun uses a date code system that designates the specific date of manufacture. For months, the letters **A** through **L** designate January through December.

For days, the letters **A** through **Z** designate the 1st through 26th days, and the numbers **5** through **9** designate the 27th through 31st days. For year, the designator is composed of either 2

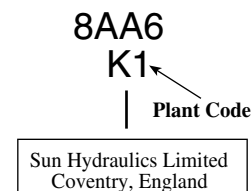
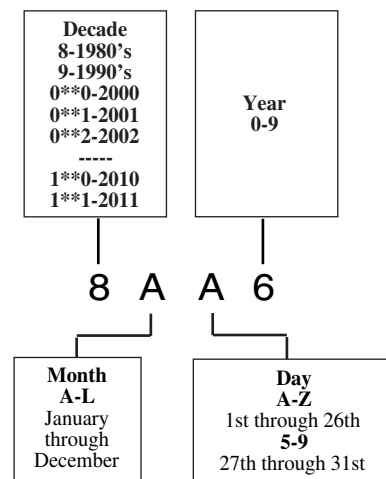
numbers 0-9, with the first number indicating the decade and the second number the individual year.

Beginning 1 January 1994, Sun added a second line to its date code system to identify those products that are manufactured or assembled at specific Sun facilities.

Date Code used through December 31, 1985:

61 = January through March 1985
62 = April through June 1985
63 = July through September 1985
64 = October through December 1985

Present Date Code References used beginning January 1, 1986:



Installation Torque Values

When installing Sun Cartridges, be sure to torque to values shown in this table.

Series	Installation Torque Values			
	lb. ft.	Hex	Thread	Cavities
Z	100-120 (lb.in.)	3/16"	3/8" - 24 UNF	T-382A
P	25 - 30	7/8"	M16	T-8A, T-9A
0	25 - 30	3/4"	M16	T-162A, T-163A
1	30 - 35	7/8"	M20	T-10A, T-11A, T-13A, T-21A, T-31A, T-51A, T-61A
2	45 - 50	1 1/8"	1"-14 UNS	T-2A, T-3A, T-5A, T-22A, T-32A, T-52A, T-62A
3	150 - 160	1 1/4"	M36	T-16A, T-17A, T-23A, T-33A, T-53A, T-63A
4	350 - 375	1 5/8"	M48	T-18A, T-19A, T-24A, T-34A, T-64A

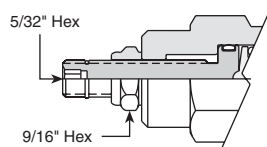
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Cartridge Control Options

General Purpose Controls (for use in systems where adjustment may be changed after installation.)

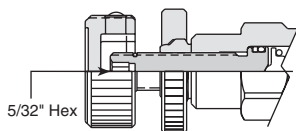
L Standard Screw Adjustment

O-ring seal on adjust screw. Adjust screw positively retained. Overset protection-pilot spring cannot go solid.



K Handknob with Lock Knob

Handknob and lock knob added to L control. Sun handknob kits for field conversion are available. (Except for counterbalance.)

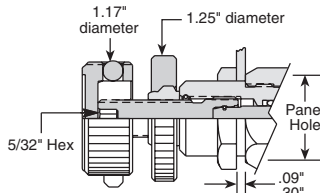


O Handknob with Panel Mount

Special threaded cartridge hex body with panel nut for mounting cartridge through access hole in control panel. Handknob and lock knob included.

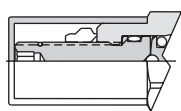
Panel Hole:

Series 1 cartridges .75" dia.
Series 2 cartridges 1.00" dia.
Panel nut hex size identical to cartridge hex size.



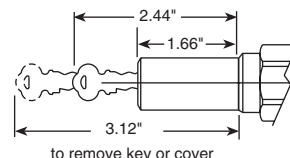
C Tamper Resistant Factory Set

Cover press-fit onto L control cartridge shoulder. Valves may be ordered in this configuration from Sun. **Specify pressure setting on order.** Setting stamped on cartridge hex. Sun kits for field conversion are available.



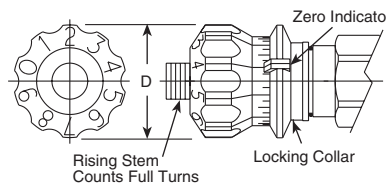
Key Lock Kit

Optional adjustment Key Lock Cover Kit for L controls allows adjustment to be locked with a key to prevent unauthorized changes in valve setting. Adjustment is easily accessible when lock assembly is removed. Requires replacement of standard locknut with special locknut which accepts lock assembly, and a new wire stop ring for overset protection. (Except for Series 0 and counterbalance.)



H Calibrated Handknob with Detent Lock

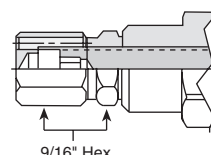
Fully calibrated handknob for flow control cartridges. 40 radial calibrations per turn. Moveable zero indicator. (Minor disassembly required.) Rising detented locking collar positively locks adjustment knob against vibration or accidental tampering. Any desired setting may be recorded and repeated. U.S. Patent #4,577,831.



Diameter Series	1.13" Dia.	1.38" Dia.	1.62" Dia.	1.62" Dia.
	1	2	3	4
	NCCB	NCEB	NCFB	NGB
	NCCC	NCEC	NFCF	NCGC
	NFCC	NFDC	NFEC	NFFC
	NFCD	NFDD	NFED	NFFD
	FDBA	FDCB	FDEA	FDFA

Maximum Setting Limiter

For limiting the maximum setting of cartridges with L adjust within their specified range (except Series 0 and counterbalance). These controls come in two varieties: basic Maximum Setting Limiter and Maximum Setting Limiter with Handknob. Once kit is installed, the setting of cartridges can be adjusted within their specified range not to exceed the new permanent maximum setting.

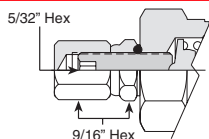


The maximum setting limiters can only be ordered as a kit at this time. Will be available as cartridge control options in future. **Contact your Sun Distributor when ordering as cartridge control option.**

Special Purpose Controls (for use in systems where adjustment is seldom changed after installation)

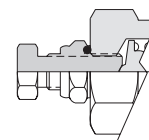
J Socket Head Set Screw with Cap

Stem seal - Seal under locknut. Adjusting screw not retained. No overset protection.



F Wrench Adjustment

Stem seal - Seal under locknut. Adjusting screw is not retained. Overset protection-pilot spring cannot go solid.



Counterbalance Cartridge Controls

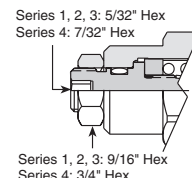
All Sun counterbalance cartridges are built with a leakproof adjustment - O-ring seals are on the adjusting screw-but are not designed for frequent adjustment in the field. Cartridges that are factory pre-set by Sun to a customer specified pressure setting are available and can be installed directly on a machine without the need for further adjustment.

C Tamper Resistant Factory Set

See "C" Control description above.

L Standard Leakproof Screw Adjustment

O-ring seal on adjust screw.



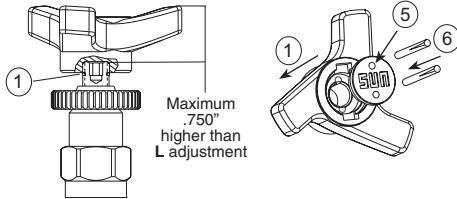
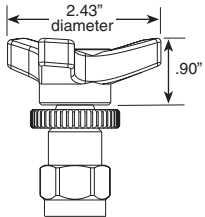
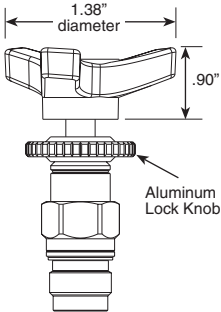
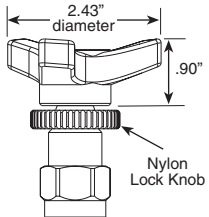
Cartridge Control Kits

Service Kit No. Description	Use specifically with Control/Cartridge	Description	Notes
Adjustment Screw Kit 991-006	All F controls (Zinc plated steel)	Adjust Screw Locknut Seal	To assure a complete seal on the stem - release all pressure on the cartridge after setting. Then... tighten locknut (and cap, on J).
Adjustment Screw Kit 991-010	All J controls (Zinc plated steel)	Cap Locknut Seal Adjust Screw	
Tamper Resistant Cover (Zinc plated steel) 991-000 991-001 991-002 991-003 991-004 991-001-A00 991-002-A00 991-003-A00 991-004-A00	All Sun Models with L adjustment (Except Counterbalance, Series 1 and 2) Series 0 - 3/4" hex Series 2 - 1 1/8" hex Series 3 - 1 1/4" hex Series 4 - 1 5/8" hex Series 1 - 7/8" hex Series 2 - 1 1/8" hex (Stainless steel) Series 3 - 1 1/4" hex (Stainless steel) Series 4 - 1 5/8" hex (Stainless steel) Series 1 - 7/8" hex (Stainless steel)	Cover	<ol style="list-style-type: none"> 1. Adjust valve to desired setting and tighten locknut. 2. Using an arbor press or a soft hammer, install cover until it seats on cartridge hex. 3. Cover is a press fit on cartridge shoulder.
991-032	For Series 1 and 2, Counterbalance Series 1 - 7/8" hex (Zinc plated steel)		
991-033	Series 2 - 1 1/8" hex (Zinc plated steel)		
991-032-A00	Series 1 - 7/8" hex (Stainless steel)		
991-033-A00	Series 2 - 1 1/8" hex (Stainless steel)		
Key Lock Kit 993-008	For all Sun cartridges with L adjustment (except Series 0 and counterbalance cartridges).	Lock Assembly Key Adapter Locknut Wire Stop Ring	<ol style="list-style-type: none"> 1. Remove original wire stop ring and locknut. 2. Thread on the adapter locknut and install new wire stop ring through slot provided. 3. Adjust valve to desired setting and tighten adapter locknut. 4. Slide lock assembly over adapter, lock and remove key.
K Handknob Kit (Plastic) 991-211 991-222 (Plastic)	Use this kit to adapt all L controls to K controls (except Series 0 and counterbalance cartridges). K control for Series 0	Handknob Assembly Lock Knob	Only cartridges date stamped "41" or later and originally supplied with plastic knobs. Lock knob snaps onto locknut furnished on cartridge.
Panel Handknob Kit (Plastic) 991-215	O controls All Series 1 cartridges 7/8" hex, M20 thread	Handknob Assembly Lock Knob Panel Nut	
Panel Handknob Kit (Plastic) 991-216	O controls All Series 2 cartridges 1 1/8" hex, 1"-14 thread		
H Calibrated Handknob Kit (Plastic) 991-219 991-220 991-221	H controls All series of flow controls FDCB, NCEB, NCEC, NFDC, NFDD only FDEA, FDFA, NCFB, NCFD, NCGC, NCFB, NFEC, NFED, NFFC, NFFD only FDBA, NCCB, NCCC, NFCC, NFCD only	Handknob Lockring O-ring Existing Cartridge	<p>Only for cartridges originally supplied with an H handknob. Valves can not be modified in the field.</p> <p>Note: The H control is Only available for the cartridges shown to the left.</p>

Cartridge Control Kits continued on next page.

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Cartridge Control Kits

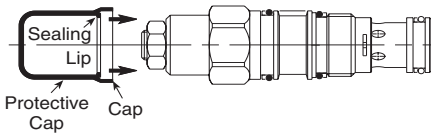
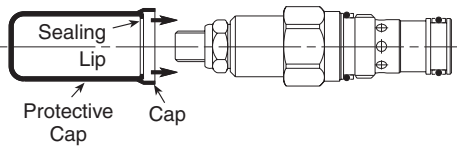
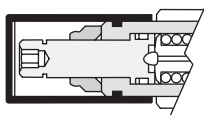


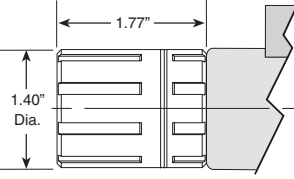
Service Kit Number Description	Use specifically with Control/Cartridge	Description	Notes
Tri-grip Handknob Kit (Plastic) 991-034	For all Series 1, 2, 3, 4 valves with L or O adjustment except Series 0 and counterbalance cartridges.	<p>Install while cartridge is screwed in cavity to prevent damage.</p> 	<ol style="list-style-type: none"> 1. Do not remove stop ring. 2. Install lock knob by snapping onto the locknut. 3. Install star knob until contact is made with the stop ring. (Caution: During installation on flow control valves that have no stop ring, make sure valve can be shut with hand knob installed.) 4. Insert pins in cover so that they project on backside. 5. Put cover on with inserted pins and drive pins in until flush with cover.
	The handknob can be used as a Maximum Setting Limiter.		<p>When knob is used as a maximum Setting Limiter:</p> <ol style="list-style-type: none"> 1. Set valve at desired maximum setting. 2. Tighten lock nut (110 lbs. inch). 3. Remove stop ring. 4. Install lock knob. 5. Install handknob until flush with the lock knob. 6. Insert pins in cover so that they project on backside. 7. Put cover on with inserted pins and drive pins in until flush with cover.
Tri-grip Handknob Kit with Optional Maximum Setting Limiter 1 3/8" diameter (Plastic with aluminum lock knob) 991-039	For all Series 1, 2, 3, 4 valves with L or O adjustment except Series 0 and counterbalance cartridges.		Follow installation instructions described above.
Tri-grip Handknob Kit (Plastic with stainless steel insert) 991-040	For use with corrosion resistant cartridge line.		<ol style="list-style-type: none"> 1. Do not remove stop ring. 2. Install lock knob by snapping onto the locknut. 3. Install handknob until contact is made with the stop ring. (Caution: On flow control valves that have no stop ring, ensure that valve can be shut with handknob installed.) 4. Insert pins in holes in cover until they project through. 5. Install cover by driving the pins into the holes in the handknob until the pins are flush with the top of cover. 6. Follow instructions listed above to install Handknob when used as a Maximum Setting Limiter.

Cartridge Control Kits continued on next page.

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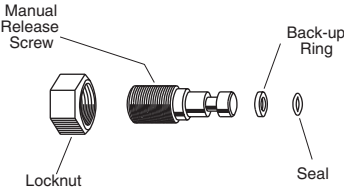
Cartridge Control Kits

Service Kit Number Description	Use specifically with Control/Cartridge	Description	Notes
Protective Cap (Series 1 Counterbalance) 991-026	For all Series 1 Counterbalance with L control. (Constructed of flexible polyethylene plastic).		Installation Instructions (with cartridge already installed in body/manifold): <ol style="list-style-type: none"> 1. Insure that screw adjustment mechanism (L control) is set to proper setting. 2. Press protective cap over end of cartridge assembly as shown in illustration at left. 3. Press firmly against end of protective cap until cap lip stretches over beginning of cartridge hex, expelling air within chamber. 4. To remove protective cap, gently pull away from cartridge hex until cap comes loose. 5. Replace protective cap with new one if any abrasions, nicks, or tears are evident along cap lip including interior edge and sealing lip.
Protective Cap (Series 1 cartridges) 991-027	For all Series 1 with L control. (Constructed of flexible polyethylene plastic).		Installation Instructions: <ol style="list-style-type: none"> 1. Adjust valve to desired setting and tighten locknut. 2. To install, press the cap onto the cartridge's hex body until a snapping sound is heard. Do not force the cap to bottom out against the top of the hex. A small gap should remain. Pull back on the cap to verify a successful installation. 3. This tamper resistant cap is designed to be non-removable. Once removed, it can not be re-assembled to the cartridge.
Tamper Resistant Cap (Series 1 cartridges) 991-035	For all Series 1 with L control. (Black Delrin injection molded cap).		Operating instructions for Momentary Manual Override Assembly 991-225 To manually actuate valve momentarily, hand turn Manual Override Assembly in clockwise direction until it reaches its internal stop. Hold in position to maintain actuated operation. Once released, valve will return to its normal (de-energized) position. <i>The top face of override assembly depicts an arrow pointing in a clockwise direction with smaller arrow pointing to return position indicating momentary operation.</i>
T Twist and Lock Manual Override (momentary/twist operation) (Black plastic) 991-225	Only for use with DAAL, DAAM, DBAL, DBAM, DTDA, DMDA, DNDA, DLDA, DWDA, Sun Solenoid products.	Typical Installation: <ol style="list-style-type: none"> 1. Ensure that O-ring is installed in seat located at the bottom of the assembly. 2. Remove existing coil nut assembled to end of solenoid tube and discard. 3. Thread twist/lock manual override assembly on to end of solenoid tube. Position coil connector to point in desired direction and hand-tighten manual override assembly until it bottoms out on solenoid coil and creates snug fit. 	
L Twist and Lock Manual Override (detent/lock operation) (Black plastic) 991-226	Only for use with DAAL, DAAM, DBAL, DBAM, DTDA, DMDA, DNDA, DLDA, DWDA, Sun Solenoid products.	Note: Depending on operating conditions of valve, thread lock may be applied to override assembly to prevent loosening due to excessive vibration.	
D Twist Momentary/Twist Lock Manual Override (momentary/twist operation) (Black plastic) 991-227	Only for use with DAAL, DAAM, DBAL, DBAM, DTDA, DMDA, DNDA, DLDA, DWDA, Sun Solenoid products.		Operating instructions for Dual (Momentary/Twist) Manual Override Assembly 991-227 To manually actuate valve momentarily, follow the instructions shown above for Momentary Operation. To manually actuate valve and lock, follow the instructions shown above for Locking Operation.

Cartridge Control Kits continued on next page.

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Cartridge Control Kits

Service Kit Number Description	Use specifically with Control/Cartridge	Description
Adjustment Screw Kit 991-112-003 Viton 991-112-007 Buna-N	CKCA-L** CKCD-L** CKCB-L** CPCA-L** CKCC-L**	 <p>Manual Release Screw Locknut Back-up Ring Seal</p>
Adjustment Screw Kit 991-212-003 Viton 991-212-007 Buna-N	CKEA-L** CKED-L** CKEB-L** CPEA-L** CKEC-L**	

Only cartridges date stamped "62" or earlier.

Installation Instructions:

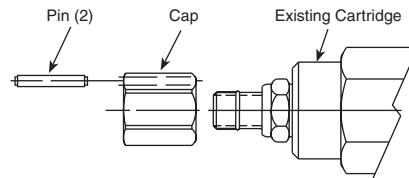
Kit consists of 2 Driv-Lok pins (811-001-011), Hex Cap (375-020). **To prevent any damage to nose end and/or any moving parts, only install this kit while cartridge is screwed into a cavity.**

Maximum
Setting
Limiter
(Zinc plated steel)
991-022

All models with an **L** adjustment control (Except Series 0 and counterbalance.)

The maximum setting limiters can only be ordered as a kit at this time. Will be available as cartridge control options in the future with customer specified settings.

Contact your Sun Distributor when ordering as cartridge control option.



1. Set adjustment to desired level within recommended range of valve and tighten jam nut to 108 lbf in.
2. Remove maximum setting stop ring from the adjust screw.
3. Thread hex cap onto the adjust screw until it bottoms out against jam nut and tighten to 108 lbf in.
4. Insert one of the Driv-Lok pins into the hex cap holes and tap into place using a hammer until flush. Repeat procedure with second Driv-Lok pin.
5. Install is now completed.

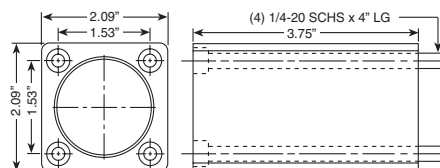
Lockwire Kit
991-012

All **M**, **Q** and **R** controls (except solenoid operated cartridges).



Position Switch
Protective Cover
(6061-T6 Aluminum)
991-043

LOHC-Z**



Installation:

Threaded holes will need to be machined in the manifold to install cover.

Number of Holes: 4

Mounting Hole Thread: .250-20 UNC -2B

Mounting Hole Depth: .53"

Cartridge Seal Kits

O-Ring Installation Guidelines

Sun Hydraulics cartridge seal kits require normal precautions when being installed. Do not use any sharp edged tools that may cut the seal. Care should be taken to minimize the stretch on the seal during installation. Special consideration should be given to any sharp or rough surfaces that the seal must pass over. O-ring installation tools are commercially available from many seal manufacturers and tool suppliers. Screwdrivers and awls are not appropriate installation tools.

Note that the seal materials must be compatible with the hydraulic fluid and assembly lubricants used in the system. If in doubt, consult one of the many seal handbooks available on fluid compatibility. Cartridges cannot be converted from Buna-N to Viton models by simply changing the external seals. Most cartridge valves incorporate internal seals which can only be replaced by first disassembling the valve. Contact your local Sun Distributor if such a conversion is required.

Buna-N seal kits have a shelf life of 10 years. The Viton seal kits' shelf life is 20 years. These dates will be printed on the kit packaging.

Back-up Rings

Most of the back-up rings used by Sun Hydraulics are rectangular in cross-section and have no installation orientation requirements. Use the same techniques and care used to install o-rings.

When replacing spiral back-up rings, take special care that the spiral is wound like a left-hand thread so that the back-up ring will follow the cartridge into the cavity properly when being assembled.

Back-up ring material is Hytrel® with Buna-N seals (as shown in the last 3 digits of the Sun Seal Kit part number: 990-***-007) which is compatible with most petroleum based fluids, and Viton® with Viton seals (990-***-006).

For detailed material information, refer to www.sunhydraulics.com under **Products: Technical Information: Materials of Construction**.

GLYD® Rings

The GLYD® rings used by Sun are Teflon® based and require special care to install properly. Specialized tooling may be needed to properly stretch and then re-size these rings without damaging

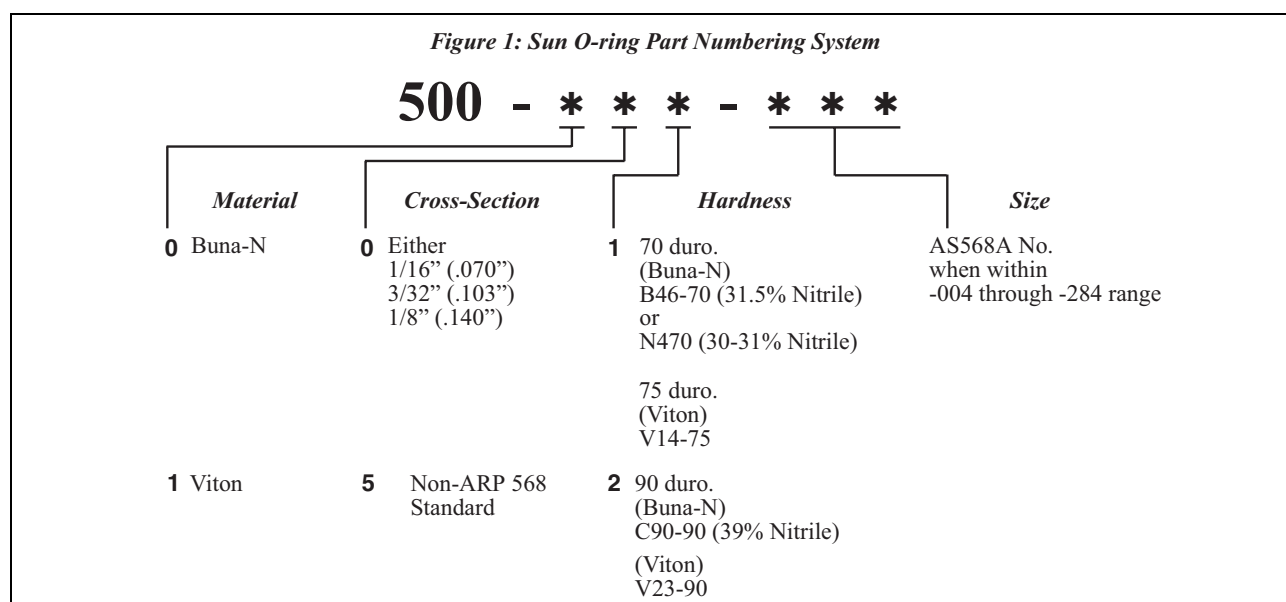
them. In the absence of these tools, careful use of the cartridge (to stretch) and the cavity (to resize) may enable these seals to be successfully installed.

Industry Standard O-Ring Reference

Sun part numbers for most o-rings include the AS568A (ARP568) Uniform Dash Number as part of the numbering system. For field repair when Sun service kits are not readily available, this information may prove useful.

O-ring part numbers are typically a nine-position code, where the 4th position indicates the type of seal material (see below). The 7th, 8th and 9th positions indicate the AS568A Uniform Dash Number when within -004 through -284 range. With the last three digits falling outside of this range, the part number is unique to Sun Hydraulics and bears no reference to the AS568A standard.

Note: O-ring codes with a "5" in the fifth position (e.g. 500-051-590), the cross sectional width is .050" and the last three digits represent the nominal o-ring I.D. (See Figure 1 below.)

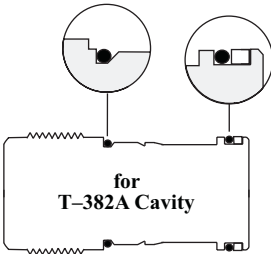


* Hytrel® polyester elastomer and Viton® are E.I. Dupont Company patented products and Teflon® is a registered trademark of E.I. Dupont Company, Wilmington, Delaware. GLYD® Ring is a registered trademark of W.S. Shamban & Co., Los Angeles, California, USA.

Cartridge Seal Kits

The cartridge seal kits listed below and on the following pages are available for replacement of external seals.
Coil Seal Kits are shown on page 23.

Series Z Cartridges

T-382A Cavity		Cartridge and Seal Detail
Viton Kit Number	Buna-N Kit Number	
990-382-006	990-382-007	
Model Code		
CSZN		
CXZA		

Cartridge Seal Kits

Series P Cartridges

T-8A Cavity	
Viton Kit Number	Buna-N Kit Number
990-008-006	990-008-007

Model Code

CXAA	NFAB	XACC
DAAA	RBAE	XAOA
DAAC	RBAR	
DAAL	XACA	

See page 23 for Coil Seal Kits

T-8A Cavity	
Viton Kit Number	Buna-N Kit Number
990-108-006	990-108-007

Model Code

DAAM

No Coil Seal Kits required.
Mechanically actuated.

T-8A Cavity	
Viton Kit Number	Buna-N Kit Number
990-508-006	990-508-007

Model Code

DAAH
DAAP

No Coil Seal Kits required.
Pneumatically and Hydraulically actuated.

T-8A Cavity	
Viton Kit Number	Buna-N Kit Number
990-208-006	990-208-007

Model Code

RBAP
RBAN

See page 23 for Coil Seal Kits

T-9A Cavity	
Viton Kit Number	Buna-N Kit Number
990-509-006	990-509-007

Model Code

DBAH
DBAP

No Coil Seal Kits required.
Pneumatically and Hydraulically actuated.

T-9A Cavity	
Viton Kit Number	Buna-N Kit Number
990-009-006	990-009-007

Model Code

DBAA	XACB
DBAC	XAOB
DBAL	XAOC

See page 23 for Coil Seal Kits

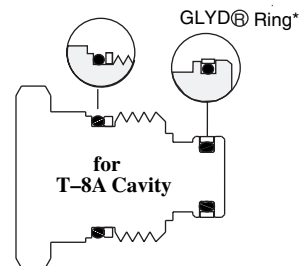
T-9A Cavity	
Viton Kit Number	Buna-N Kit Number
990-109-006	990-109-007

Model Code

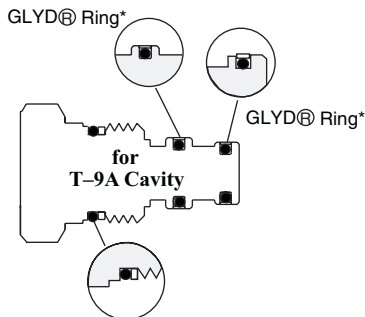
DBAM

No Coil Seal Kits required.
Mechanically actuated.

Cartridge and Seal Detail



Cartridge and Seal Detail

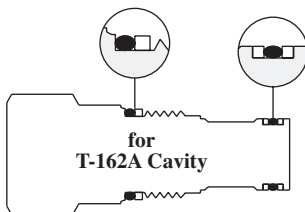
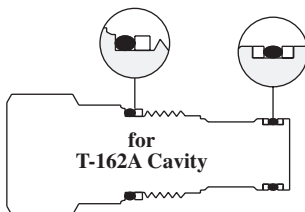


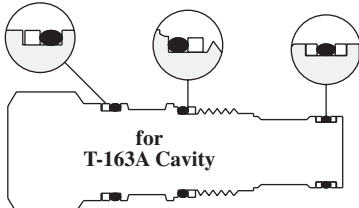
* GLYD® Ring is a registered trademark of W.S. Shamban & Co., Los Angeles, California, USA.

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

Cartridge Seal Kits

Series 0 Cartridges

T-162A Cavity						Cartridge and Seal Detail	
Viton Kit Number			Buna-N Kit Number				
990-162-006			990-162-007				
Model Code						 for T-162A Cavity	
CDAP	COBM	CXBA	FXBA	RDBX	XZOC		
CDAQ	CSAM	CXBB	NCBB	RPCC			
CKBM	CSAN	CXBG	NFBC	RQCB			
CKBP	CSAW	CXBM	RBAG	XZCA			
CNAC	CSAY	FCBB	RBAM	XZCC			
CNBC	CXAD	FQBA	RDBA	XZOA			

T-163A Cavity						Cartridge and Seal Detail	
Viton Kit Number			Buna-N Kit Number				
990-163-006			990-163-007				
Model Code							
CKBB	COBG	LPBA	LRBC	RVBB	XZOB		
CKBD	CSAX	LPBC	PBBB	SQBB	XZOD		
CKBG	CSAZ	LPBD	RSBC	XZAA			
COBA	FRBA	LRBA	RVBA	XZCB			

Cartridge Seal Kits

Series 1 Cartridges

T-10A Cavity	
Viton Kit Number	Buna-N Kit Number
990-010-006	990-010-007

Model Code

CNDB	CXDF	RBAC	RPEC	RQEB	XFAB	XFOA
CXDB	LREE	RBAT	RPEE	XFAA	XFCA	

T-13A Cavity	
Viton Kit Number	Buna-N Kit Number
990-413-006	990-413-007

Model Code

DLDA	DTCA	DTDA	FPCC	FPCH
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See page 23 for Coil Seal Kits

T-13A Cavity	
Viton Kit Number	Buna-N Kit Number
990-010-006	990-010-007

Model Code

CDAA	CSAA	CXDA	FQCA	NCCB	NFCC	XFOA
CDAC	CSAC	FCCB	FXCA	NCCC	NFCD	XGAA
CNCC	CXCB	FDBA	LRDE	NCCD	SCCB	XGCA
CNDC	CXCD	FLDA	NCCA	NFCB	SXCB	

T-10A Cavity	
Viton Kit Number	Buna-N Kit Number
990-310-006	990-310-007

Model Code

RDDA	RDDF	RDDT	RPES	RPET
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T-13A Cavity	
Viton Kit Number	Buna-N Kit Number
990-310-006	990-310-007

Model Code

DACA	DACC	DACD	DFCA
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See page 23 for Coil Seal Kits

T-11A Cavity	
Viton Kit Number	Buna-N Kit Number
990-011-006	990-011-007

Model Code

CABG	CDAF	CODD	DVBA	LODB	PRDB	RVCB
CBBA	CKCA	CODL	DVBB	LODC	PRDC	RVCF
CBBA	CKCB	CSAB	DVBC	LODD	PRDL	SCCA
CBBC	CKCC	CSAD	DVBD	LODO	PRDM	SQDB
CBBD	CKCD	CXCE	FADA	LPDA	PRDN	SQDC
CBBG	CKCE	CXDC	FBDA	LPDC	PRDP	SXCA
CBBH	CKCF	DKDD	FRCA	LPDF	PRDR	XEAA
CBBL	CKCG	DODD	FXCV	LRCC	QPAA	XEBA
CBBY	CKCH	DPBA	HDDA	LRDA	QPAB	XECA
CBCA	CKCI	DPBB	HRDA	LRDC	QPAC	XEOA
CBCB	CKCL	DPBC	HRDB	MBCA	QPAD	XEOB
CBCC	CNCD	DPBD	LKDA	MBCB	QPAE	
CBCH	CNCE	DRBA	LKDB	MBCG	RBAD	
CBCL	CNDE	DRBB	LKDC	PBDB	RHEA	
CBCT	CODA	DRBC	LKDD	PPDB	RSDC	
CBDA	CODB	DRBD	LKDO	PPDF	RSDB	
CBDB	CODC	DSCB	LODA	PPDL	RVCA	

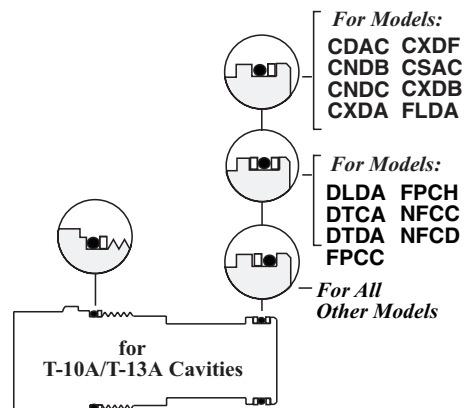
T-11A Cavity	
Viton Kit Number	Buna-N Kit Number
990-411-006	990-411-007

Model Code

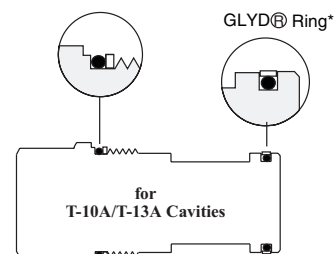
DMDA	DWDA
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See page 23 for Coil Seal Kits

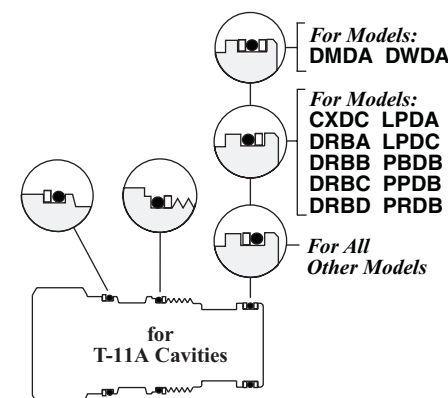
Cartridge and Seal Detail



Cartridge and Seal Detail



Cartridge and Seal Detail



* GLYD® Ring is a registered trademark of W.S. Shamban & Co., Los Angeles, California, USA.

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Cartridge Seal Kits

Series 1 Cartridges

T-11A Cavity	
Viton Kit Number	Buna-N Kit Number

990-311-006

990-311-007

Model Code

CKCV DKDC DODC

T-11A Cavity	
Viton Kit Number	Buna-N Kit Number

990-211-006

990-211-007

Model Code

CACA CACG CACK CACL

T-21A Cavity	
Viton Kit Number	Buna-N Kit Number

990-021-006

990-021-007

Model Code

CVCV	DKDR	DPBO	DRBP	HVCA	PSDT	QCDD
CWBG	DKDS	DPBP	DRBR	MWCA	PVDA	QCDE
CWCA	DODP	DRAX	DVBM	MWCB	PVDB	RVCD
CWCG	DODR	DRAY	DVBN	MWCG	PVDH	XMBA
CWCK	DODS	DRBM	DVBO	PSDB	QCDA	XMCA
CWCL	DPBM	DRBN	DVBP	PSDL	QCDB	XMOA
DKDP	DPBN	DRBO	FVCA	PSDP	QCDC	XMOB

T-31A Cavity	
Viton Kit Number	Buna-N Kit Number

990-031-006

990-031-007

Model Code

DSCH	DSCS	FSAA	FSBD	FSCD	LHDA
DSCL	DSCX	FSAS	FSBS	FSCH	LHDT
DSCO	DSCY	FSBA	FSCA	FSCS	XRCA

T-31A Cavity	
Viton Kit Number	Buna-N Kit Number

990-431-006

990-431-007

Model Code

DNDA
DNDC

See page 23 for Coil Seal Kits

T-61A Cavity	
Viton Kit Number	Buna-N Kit Number

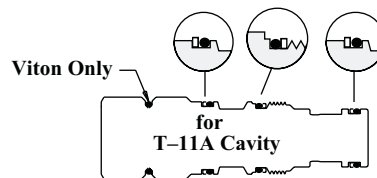
990-061-006

990-061-007

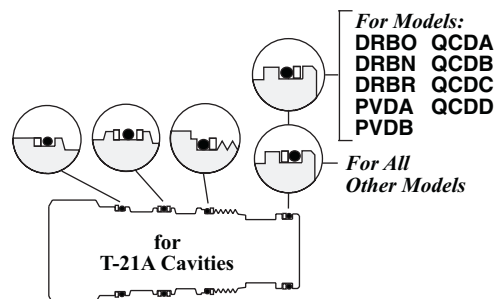
Model Code

DCCA DCCD
DCCB DCCF
DCCC XRCC

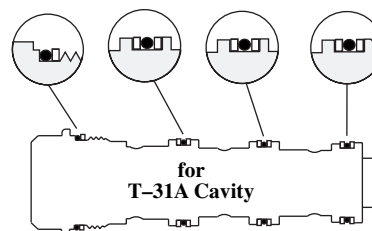
Cartridge and Seal Detail



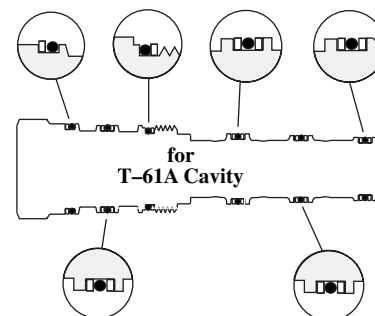
Cartridge and Seal Detail



Cartridge and Seal Detail



Cartridge and Seal Detail



Cartridge Seal Kits

Sun 1985 Design Change in Series 2 Cartridges

During 1985, Sun made a design change to all external seals on then existing Series 2 cartridge (1 1/8" hex, 1"-14 thread).

- The seals were changed from 3/32" cross-section to 1/16" cross-section O-rings and back-up rings.
- Series 2 cartridges that were affected by this change fit the:
 - T-2A cavity, 3 port
 - T-3A cavity, 2 port
 - T-5A cavity, 2 port

Design Change as of January 1, 1986

After the 1985 change, Sun has included both cross-section seals in its T-2A, T-3A and T-5A service kits. While these combined kits are still available, if you are replacing seals on a cartridge that was manufactured from 1986 to present, you may purchase the kit that contains only the 1/16" seals.

Note Date Stamped on Cartridge

It is imperative that the correct cross-section seals be used to guarantee the proper functioning of the cartridge being serviced.

- If the cartridge you are servicing is date stamped 1986 or later, the 1/16" seal kit should be used.
- If the series 2 cartridge you are servicing is date stamped 1985 or earlier, the 3/32" cross-section seal kits should be used. In this case, Sun recommends that the kit containing both cross-sections, be ordered.

When replacing spiral back-up rings, take special care that the spiral is wound like a left-hand thread, so that the back-up ring will follow the cartridge into the cavity properly when being assembled. When installing continuous back-up rings, use the same technique and the same care used to install O-rings. (See Page 10.)

Ordering Seal Kits for Series 2 Cartridges (3 port): T-2A Cavities

Order these kits if the Series 2 Cartridge is date stamped December 31, 1985 or earlier:

Viton: #990-102-006 Buna-N: #990-102-007

These Combination Kits contain both 1/16" and 3/32" Seal Kits. Order these kits if you are unsure about which seal sizes are required:

Viton: #990-002-006 Buna-N: #990-002-007

Order the 1/16" Seal Kits if the Series 2 Cartridge is date stamped January 1, 1986 or later:

Viton: #990-202-006 Buna-N: #990-202-007

Ordering Seal Kits for Series 2 Cartridges (2 port): T-3A and T-5A Cavities

Order these kits if the Series 2 Cartridge is date stamped December 31, 1985 or earlier:

Viton: #990-103-006 Buna-N: #990-103-007

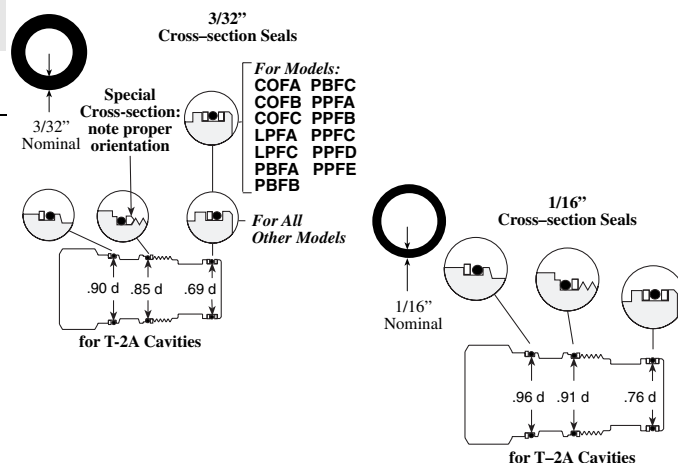
These Combination Kits contain both 1/16" and 3/32" Seal Kits. Order these kits if you are unsure about which seal sizes are required:

Viton: #990-003-006 Buna-N: #990-003-007

T-2A Cavity

Viton Kit Number			Buna-N Kit Number			
990-202-006			990-202-007			
Model Code						
CBDA	CBEY	COFA	DVCA	LOFA	PBFC	XBAA XBBA XBKA XBOA XBOB
CBDB	CCEA	COFB	DVCB	LOFB	PPFB	
CBDC	CKEA	COFC	DVCC	LOFC	PPFC	
CBDD	CKEB	COFO	DVCD	LOFD	PPFD	
CBDG	CKEC	CXEE	FAFA	LOFO	PPFF	
CBDH	CKED	CXFC	FBFA	LPFA	PRFB	
CBDL	CKEE	DKFC	FRDA	LPFC	PRFR	
CBEA	CKEF	DKFD	FRDB	LPFR	RSFC	
CBEB	CKEG	DOFC	FRDC	LRFA	RSFE	
CBEG	CKEH	DOFD	FRDD	LRFC	RSFH	
CBEH	CKEI	DPCA	LKFA	MBEA	RVEA	
CBEI	CKEV	DPCB	LKFB	MBEB	RVEB	
CBEJ	CNED	DPCC	LKFC	MBEG	SCEA	
CBEL	CNEE	DPCE	LKFD	MBEM	SQFB	
CBEW	CNFE	DRCD	LKFO	PBFB	SXEA	

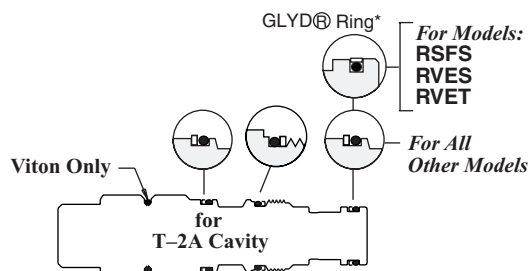
Cartridge and Seal Detail



T-2A Cavity

Viton Kit Number				Buna-N Kit Number			
990-302-006				990-302-007			
Model Code							
CAEA		CAEG		CAEK		CAEL	
T-2A Cavity							
Viton Kit Number				Buna-N Kit Number			
990-402-006				990-402-007			

Cartridge and Seal Detail



* GLYD® Ring is a registered trademark of W.S. Shamban & Co., Los Angeles, California, USA.

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Cartridge Seal Kits

Series 2 Cartridges

T-3A Cavity

Viton Kit Number	Buna-N Kit Number
990-203-006	990-203-007

Model Code

CNFB	CXFF	NQED	RGFA	RPGD	XCCA
CXFB	LRGE	RBAA	RPGB	RPGE	XCOA
CXFD	NQEB	RBAB	RPGC	RQGB	

See note on page 17 for ordering Seal Kits for Series 2 Cartridges date stamped Dec. 31, 1985 or earlier and for Combination Kits if you are unsure about which seal sizes are required.

T-5A Cavity

Viton Kit Number	Buna-N Kit Number
990-203-006	990-203-007

Model Code

CNEC	CXED	FCAB	FXDA	NFDB	XDCA
CNFA	CXFA	FCDB	LRFE	NFDC	XDCE
CNFC	CXFG	FDCB	NBFA	NFDD	XCOA
CXEB	DFDA	FLFA	NCEA	RCFB	
CXEC	DFDB	FQEA	NCEC	SCEB	

See note on page 17 for ordering Seal Kits for Series 2 Cartridges date stamped Dec. 31, 1985 or earlier and for Combination Kits if you are unsure about which seal sizes are required.

T-3A Cavity

Viton Kit Number	Buna-N Kit Number
990-303-006	990-303-007

Model Code

RBFA	RDFA	RDFT	RPGS	RPGT
------	------	------	------	------

See note on page 17 for ordering Seal Kits for Series 2 Cartridges date stamped Dec. 31, 1985 or earlier and for Combination Kits if you are unsure about which seal sizes are required.

T-22A Cavity

Viton Kit Number	Buna-N Kit Number
990-022-006	990-022-007

Model Code

CVEV	DKFR	DPCN	DVCO	MWEG	PVFC	XNCA
CWEA	DKFS	DPCO	DVCP	MWEM	PVFD	XNOA
CWEG	DOFP	DPCP	FVDA	PSFB	PVFH	
CWEK	DOFR	DRCO	HVEA	PSFT	RVED	
CWEL	DOFS	DVCM	MWEA	PVFA	SXEG	
DKFP	DPCM	DVCN	MWEB	PVFB	SXEK	

T-32A Cavity

Viton Kit Number	Buna-N Kit Number
990-032-006	990-032-007

Model Code

DSDD	DSES	FSDC	FSDR	XSCA
DSEH	DSEX	FSDD	FSDS	
DSEL	DSEY	FSDG	LHFA	
DSEO	FSDA	FSDH	LHFT	

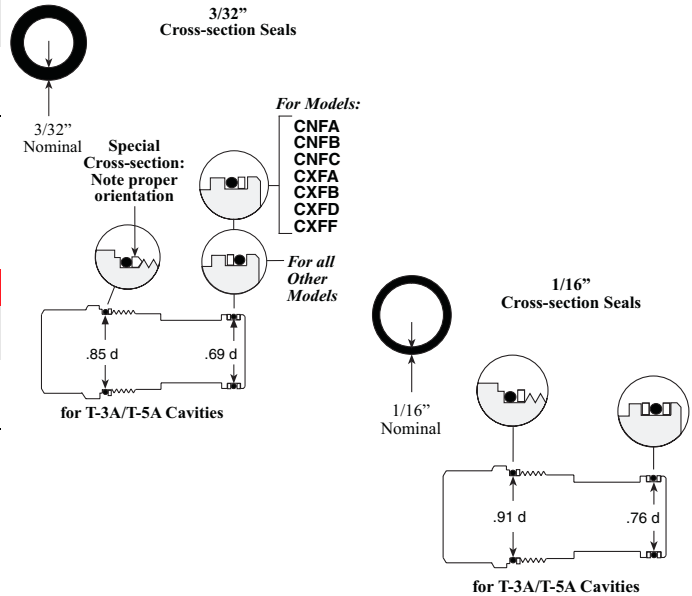
T-62A Cavity

Viton Kit Number	Buna-N Kit Number
990-062-006	990-062-007

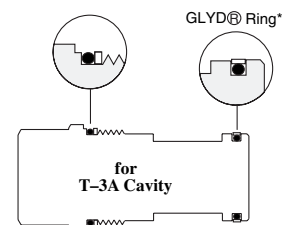
Model Code

DCDA	DCDC	DCDF
DCDB	DCDD	XSCC

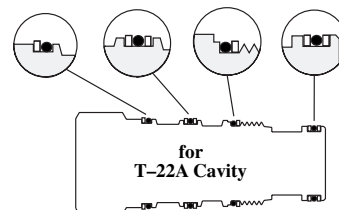
Cartridge and Seal Detail



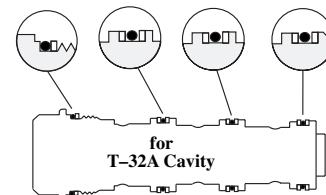
Cartridge and Seal Detail



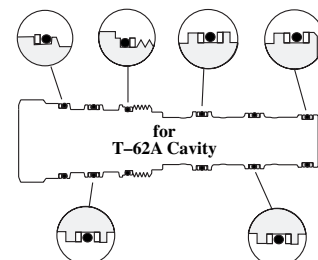
Cartridge and Seal Detail



Cartridge and Seal Detail



Cartridge and Seal Detail



* GLYD® Ring is a registered trademark of W.S. Shamban & Co., Los Angeles, California, USA.

Cartridge Seal Kits

Series 3 Cartridges

T-16A Cavity

Viton Kit Number	Buna-N Kit Number
990-016-006	990-016-007

Model Code

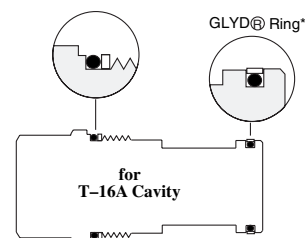
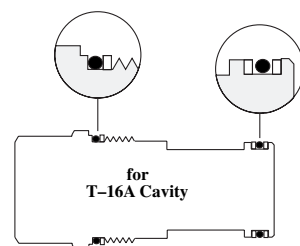
CNGC	FLHA	NHEA	XIOA
CNHC	FQGA	NHEB	XIOB
CXGB	FXEA	NHEC	XIOC
CXGD	LRHE	NHED	
CXHA	NCFB	RPIC	
CXHF	NCFC	RPID	
DFEA	NCGA	RPIC	
DFEB	NFEB	RQIB	
FCEB	NFEC	SCGB	
FDEA	NFED	XICA	

Viton Kit Number	Buna-N Kit Number
990-316-006	990-316-007

Model Code

RDHA	RPIT
RPIS	

Cartridge and Seal Detail



T-17A Cavity

Viton Kit Number	Buna-N Kit Number
990-017-006	990-017-007

Model Code

CBFA	CBGY	CKGV	DOHC	LOHB	MBGM	RSHH
CBFB	CCGA	CNGD	DOHD	LOHC	PBHB	RVGA
CBFC	CCGG	CNGE	FAHA	LOHD	PBHC	RVGB
CBFD	CKGA	CNGV	FBHA	LOHO	PBHF	RVGE
CBFG	CKGB	CNHE	FREA	LPHA	PPHB	RVGF
CBFH	CKGC	COHA	FXEV	LPHC	PPHC	SCGA
CBFL	CKGD	COHB	LKHA	LRHA	PPHE	SQHB
CBGA	CKGE	COHC	LKHB	LRHB	PPHF	XHBA
CBGB	CKGF	CXGE	LKHC	LRHC	PRHB	XHCA
CBGG	CKGG	CXHC	LKHD	MBGA	PRHR	XHOA
CBGH	CKGH	DKHC	LOGC	MBGB	RSHC	XHOC
CBGL	CKGI	DKHD	LOHA	MBGG	RSHE	

Viton Kit Number	Buna-N Kit Number
990-117-006	990-117-007

Model Code

CAGA	CAGG	CAGK	CAGL
------	------	------	------

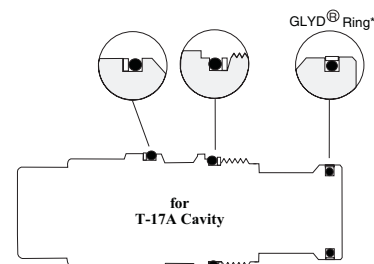
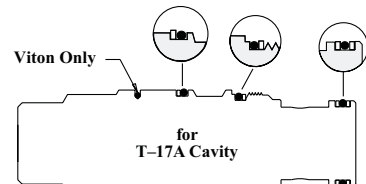
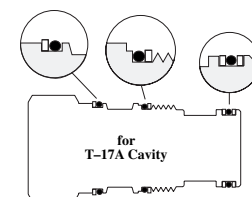
T-17A Cavity

Viton Kit Number	Buna-N Kit Number
990-217-006	990-217-007

Model Code

RSHS	RVGT
RVGS	

Cartridge and Seal Detail



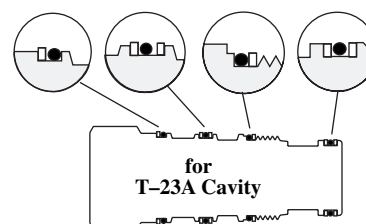
T-23A Cavity

Viton Kit Number	Buna-N Kit Number
990-023-006	990-023-007

Model Code

CVGV	DKHP	DOHS	MWGM	PVHC	XPOC
CWGA	DKHR	FVEA	PSHB	PVHD	
CWGG	DKHS	MWGA	PSHT	RVGD	
CWGK	DOHP	MWGB	PVHA	XPCA	
CWGL	DOHR	MWGG	PVHB	XPOA	

Cartridge and Seal Detail



* GLYD® Ring is a registered trademark of W.S. Shamban & Co., Los Angeles, California, USA.

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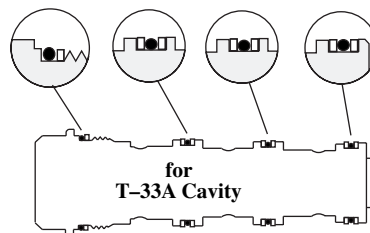
Cartridge Seal Kits

Series 3 Cartridges

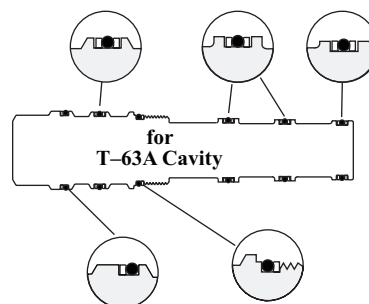
T-33A Cavity			
Viton Kit Number		Buna-N Kit Number	
990-033-006		990-033-007	
Model Code			
DSFD	DSGY	FSEG	LHHT
DSGH	DSGX	FSEH	XTCA
DSGL	FSEA	FSER	XTOC
DSGO	FSEC	FSES	
DSGS	FSED	LHHA	

T-63A Cavity	
Viton Kit Number	Buna-N Kit Number
990-063-006	990-063-007
Model Code	
DCEA	
DCEB	
DCEC	
DCED	
DCEF	
XTCC	

Cartridge and Seal Detail



Cartridge and Seal Detail



Cartridge Seal Kits

Series 4 Cartridges

T-18A Cavity

Viton Kit Number	Buna-N Kit Number
990-018-006	990-018-007

Model Code

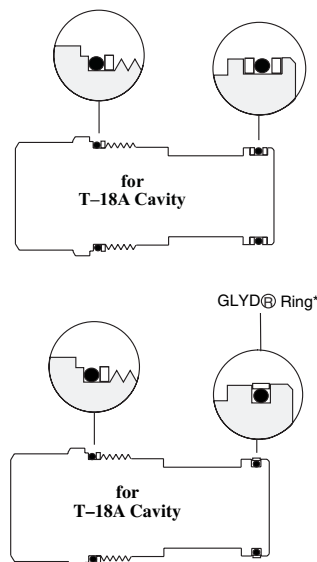
CNIC	CXJA	FDFA	NCGB	NFFD	RQKB
CNJC	CXJF	FLJA	NCGC	RPKC	XKCA
CXIB	DFFA	FQJA	NCIA	RPKD	XKOA
CXID	FCFB	FXFA	NFFC	RPKE	XKOC

Viton Kit Number	Buna-N Kit Number
990-318-006	990-318-007

Model Code

RDJA	RPKS
RDJF	RPKT

Cartridge and Seal Detail



T-19A Cavity

Viton Kit Number	Buna-N Kit Number
990-019-006	990-019-007

Model Code

CBHA	CKIC	COJB	FRFA	LPJA	PRJB	XJCA
CBHG	CKID	COJC	FXFV	LPJC	PRJR	XJOA
CBIA	CKIE	CXIE	LKJA	LRJA	RSJC	XJOB
CBIB	CKIF	CXJC	LKJB	LRJB	RSJE	XJOC
CBIG	CKIG	DKJB	LKJC	LRJC	RSJH	
CBIH	CKIH	DKJC	LKJD	PBJC	RVIA	
CBIL	CKII	DKJD	LOJA	PBJC	RVIB	
CBIV	CKIV	DOJC	LOJB	PBJF	RVIF	
CCIA	CNID	DOJD	LOJC	PPJB	SCIA	
CKIA	CNJE	FAJA	LOJD	PPJC	SQJB	
CKIB	COJA	FBJA	LOJO	PPJF	XJBA	

Viton Kit Number	Buna-N Kit Number
990-219-006	990-219-007

Model Code

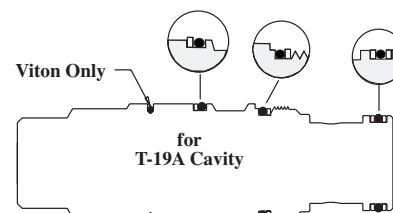
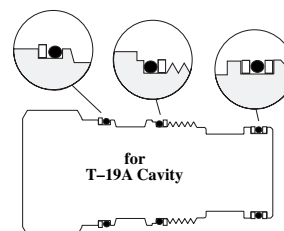
RSJS	RVIS	RVIT
------	------	------

Viton Kit Number	Buna-N Kit Number
990-119-006	990-119-007

Model Code

CAIA	CAIG	CAIK	CAIL
------	------	------	------

Cartridge and Seal Detail



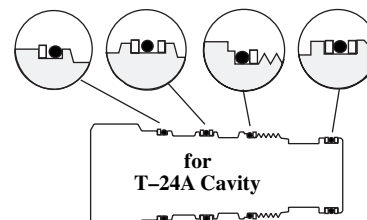
T-24A Cavity

Viton Kit Number	Buna-N Kit Number
990-024-006	990-024-007

Model Code

CVIV	CWIL	DOJP	PVJA	PVJH	XQOC
CWIA	DKJP	DOJR	PVJB	RVID	
CWIG	DKJR	DOJS	PVJC	XQCA	
CWIK	DKJS	FVFA	PVJD	XQOA	

Cartridge and Seal Detail



* GLYD® Ring is a registered trademark of W.S. Shamban & Co., Los Angeles, California, USA.

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

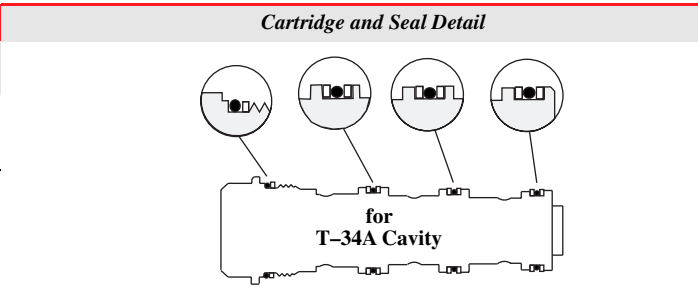
Cartridge Seal Kits

Series 4 Cartridges

T-34A Cavity	
Viton Kit Number	Buna-N Kit Number
990-034-006	990-034-007

Model Code

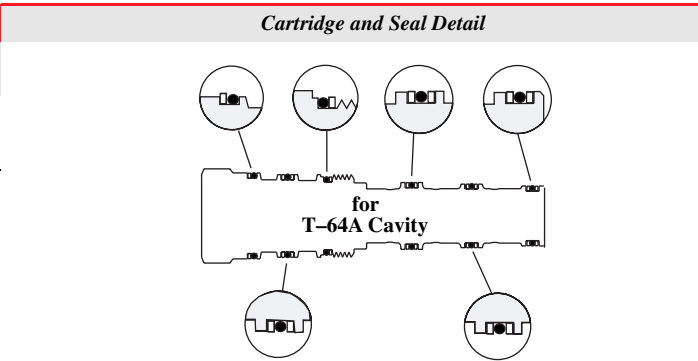
DSIH	DSIS	FSFA	FSFG	FSFS
DSIL	DSIX	FSFC	FSFH	LHJA
DSIO	DSIY	FSFD	FSFR	XVCA



T-64A Cavity	
Viton Kit Number	Buna-N Kit Number
990-064-006	990-064-007

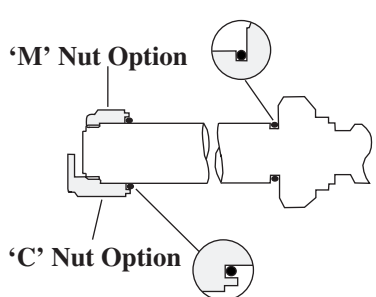
Model Code

DCFA	DCFD
DCFB	DCFF
DCFC	XVCC

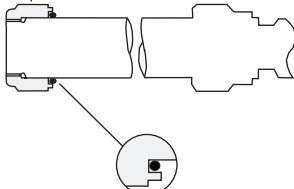


Coil Seal Kits for Solenoid Cartridges

Series P Cartridges

760-*** Coils Kits for Encapsulated (Square) Coils		Coil Detail
Manual Override Option	Kit Number	
M	990-760-006	
C	990-760-008	
Model Code		
DAAA DAAC DACC DACD DBAA DBAC		

Series I Cartridges

770-*** Coils Kits for Metal Housing (Round) Coils						Coil Detail	
Manual Override Option			Kit Number			<div>‘M’ Nut Option</div> 	
M			990-770-006				
X			990-770-006				
Model Code							
DAAL	DNDA	DTDA	HDDA	PRDP	RBAP		
DBAL	DNDC	DWDA	PRDL	PSDL			
DLDA	DNDY	FPCC	PRDM	PSDP			
DMDA	DTCA	FPCH	PRDN	RBAN			

Sun Coil Options for Solenoids (Metal Housing, Round)

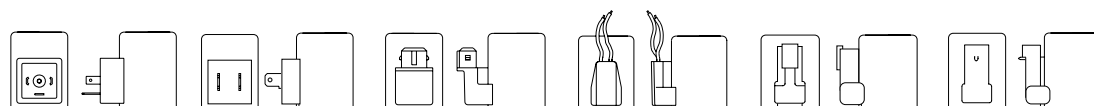
A wide variety of coil options are available for Sun's extensive line of solenoid operated cartridge valves. These metal housing, round coil options are listed in the table below.

Consult the Sun website to view detailed information on our coil options. Every solenoid operated cartridge product page has a Coil Technical Information link and shows a list of cartridge models that use the specific coil that you are viewing.

- Go to Products: Cartridges: Coils: View All Coils
- Or use the Coil Search. Go to Products: Cartridges: Coil Search or Products: Accessories: Coil Search.

19 MILLIMETER TUBED COILS FOR SOLENOID CARTRIDGE VALVES

Standard Coils: Metal Housing, Round



Voltage	Operating Voltage Range	ISO/DIN 43650 Form A Coil Part Number Only	SAE J858A Coil Part Number Only	AMP Junior Timer ¹ Coil Part Number Only	Twin Lead Coil Part Number Only	Metri-Pack 150-2M ² Coil Part Number Only	Deutsch DT04-2P ³ Coil Part Number Only
115 V AC 50/60 Hz	+/- 10% nominal	770-211	----	----	----	----	----
230 V AC 50/60 Hz	+/- 10% nominal	770-223	----	----	----	----	----
12 V DC	+/- 10% nominal	770-212	770-512	770-612	770-712	770-812	770-912
14 V DC	+/- 10% nominal	770-214	770-514	770-614	770-714	770-814	770-914
24 V DC	+/- 10% nominal	770-224	770-524	770-624	770-724	770-824	770-924
24 V AC	+/- 10% nominal	770-297	----	----	----	----	----
28 V DC	+/- 10% nominal	770-228	770-528	770-628	770-728	770-828	770-928
36 V DC	+/- 10% nominal	770-236	770-536	770-636	770-736	770-836	770-936
48 V DC	+/- 10% nominal	770-248	770-548	770-648	770-748	770-848	770-948
127 V DC	+/- 10% nominal	770-299	----	----	----	----	----
220 V DC	+/- 10% nominal	770-298	----	----	----	----	----

¹ AMP Junior Timer mating connections are a product of AMP/Tyco Electronics.

² Metri-Pack mating connections are a product of Delphi.

³ Deutsch mating connections are a product of the Deutsch Company.

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

Sun Coil Options with Embedded Electronic Proportional Amplifiers

A variety of coils are available for Sun's wide line of electro-proportional solenoid operated cartridge valves. These metal housing, round coil options are listed in the table below. Consult the Sun website for our full line of coil options. See page 28 for explanation of part numbering system.

19 MILLIMETER TUBED COILS FOR ELECTRO-PROPORTIONAL SOLENOID CARTRIDGE VALVES

Coils with Embedded Electronic Proportional Amplifiers: Deutsch DT04-6P

Coil Part Number Only	Analog Input Range	Output Current	Voltage		Card Function
790-4A12A	0-20 mA	1200 mA	12 V DC	Proportional Amplifier	includes Separate Command Common, +5V Reference, Enable Switch
790-4A12V	0-10 V	1200 mA	12 V DC	Proportional Amplifier	includes Separate Command Common, +5V Reference, Enable Switch
790-4E12V	-----	(6 sec) 2000 mA Maximum (holding) 1600 mA Maximum	12 V DC	Power Saver	-----
790-4F12V	9-28 V	1200 mA	12 V DC	Ramping Amplifier	
790-4A24A	0-20 mA	600 mA	24 V DC	Proportional Amplifier	includes Separate Command Common, +5V Reference, Enable Switch
790-4A24V	0-10 V	600 mA	24 V DC	Proportional Amplifier	includes Separate Command Common, +5V Reference, Enable Switch
790-4E24V	-----	(6 sec) 2000 mA Maximum (holding) 2000 mA Maximum	24 V DC	Power Saver	-----
790-4F24V	9-28 V	600 mA	24 V DC	Ramping Amplifier	-----

Coils with Embedded Electronic Proportional Amplifiers: ISO/DIN 43560, Form A

790-2B12A	0-20 mA	1200 mA	12 V DC	Proportional Amplifier	(B) Separate Command Common
790-2B12V	0-10 V	1200 mA	12 V DC	Proportional Amplifier	(B) Separate Command Common
790-2C12A	0-20 mA	1200 mA	12 V DC	Proportional Amplifier	(C) +5V Reference
790-2C12V	0-10 V	1200 mA	12 V DC	Proportional Amplifier	(C) +5V Reference
790-2D12A	0-20 mA	1200 mA	12 V DC	Proportional Amplifier	(D) Enable Switch
790-2D12V	0-10 V	1200 mA	12 V DC	Proportional Amplifier	(D) Enable Switch

Coils Table for ISO/DIN 43560, Form A, continued on next page.

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

Sun Coil Options with Embedded Electronic Proportional Amplifiers

19 MILLIMETER TUBED COILS FOR ELECTRO-PROPORTIONAL SOLENOID CARTRIDGE VALVES

Coils with Embedded Electronic Proportional Amplifiers: ISO/DIN 43560, Form A

Coil Part Number Only	Analog Input Range	Output Current	Voltage		Card Function
790-2E12V	-----	(6 sec) 2000 mA Maximum (holding) 1600 mA Maximum	12 V DC	Power Saver	-----
790-2F12V	9-28 V	1200 mA	12 V DC	Ramping Amplifier	-----
790-2B24A	0-20 mA	600 mA	24 V DC	Proportional Amplifier	(B) Separate Command Common
790-2B24V	0-10 V	600 mA	24 V DC	Proportional Amplifier	(B) Separate Command Common
790-2C24A	0-20 mA	600 mA	24 V DC	Proportional Amplifier	(C) +5V Reference
790-2C24V	0-10 V	600 mA	24 V DC	Proportional Amplifier	(C) +5V Reference
790-2D24A	0-20 mA	600 mA	24 V DC	Proportional Amplifier	(D) Enable Switch
790-2D24V	0-10 V	600 mA	24 V DC	Proportional Amplifier	(D) Enable Switch
790-4E24V	-----	(6 sec) 2000 mA Maximum (holding) 2000 mA Maximum	24 V DC	Power Saver	-----
790-4F24V	9-28 V	600 mA	24 V DC	Ramping Amplifier	-----

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.



Sun Weatherized Coils and Coil Kits

Sun weatherized coils and kits are designed for Sun's full flow solenoid operated and electro-proportional cartridge valves. They are protection against high-pressure wash-downs or marine environments for Sun's electrically-actuated cartridge valves.

These coil kits are only available with the Metri-Pack Series 150-2M connector with a choice of four voltages. Weatherized Coil Details:

- Available in four voltages: 12 V DC, 14 V DC, 24 V DC, and 28 V DC.
- Rated for the IP69K which is the Ingress Protection rating for high-pressure, high-temperature wash-down applications. The enclosures are not only dust tight, but must withstand high-pressure and steam cleaning. Additional information about IP ratings can be found on the Sun website.
- Includes a built-in TVS surge suppression diode.
- RoHS compliant.
- Passed a 1000 hour salt fog test, ensuring corrosion resistance for marine applications.

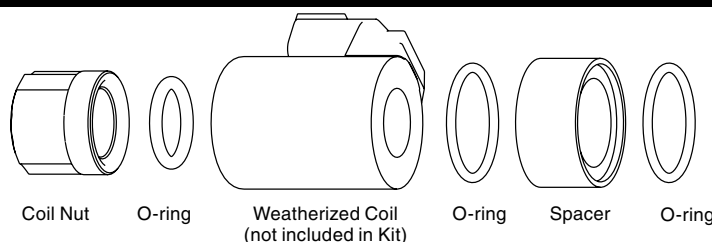
19 MILLIMETER TUBED (ROUND) COILS (Metri-Pack Series 150-2M Connector) FOR FULL FLOW SOLENOID AND ELECTRO-PROPORTIONAL CARTRIDGE VALVES

Voltage	Operating Voltage Range	Metri-Pack 150-2M Coil Part Number Only	Used for Cartridge Models
14 V DC	+/- 10% nominal	773-814	DAAL, DBAL, DLDA, DMDA, DNDA, DNDC, DTCA, DWDA
12 V DC	+/- 10% nominal	773-812	DAAL, DBAL, DLDA, DMDA, DNDA, DNDC, DTCA, DTDA, DWDA, FMDA, FMDB, PRDL, PRDM, PRDN, PRDP, RBAN
24 V DC	+/- 10% nominal	773-824	DAAL, DBAL, DLDA, DMDA, DNDA, DNDC, DTCA, DTDA, DWDA, FMDA, FMDB, PRDL, PRDM, PRDN, PRDP, RBAN, RBAP
28 V DC	+/- 10% nominal	773-828	DAAL, DBAL, DLDA, DMDA, DNDA, DNDC, DTCA

A weatherization kit is required in conjunction with a weatherized coil and a modified cavity (consult the Sun website to view cavity modification instructions for the use of each kit). The coil is not included in the kits and must be purchased separately. Weatherization kits are cartridge model code and cavity dependant. **These kits are intended for new installations only and are not suitable for retrofitting existing equipment or for standard Sun bodies.**

- Consult www.sunhydraulics.com for complete details on weatherized coils and weatherized coil kits. Go to Products: Cartridges: Coils: View All Coils: Weatherized Coils. View individual Weatherized Coil Seal Kit page for detailed installation instructions.

WEATHERIZED (ROUND) COIL KITS FOR METRI-PACK SERIES 150-2M CONNECTOR



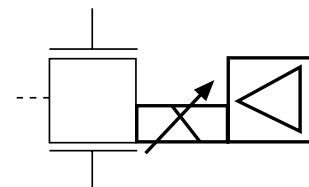
Metri-Pack 150-2M Kit Number Only	Weatherized Kits for Specific Cavities	Used for Cartridge Models
991-055	T-11A Cavity	DMDA, DWDA, PRDL, PRDP, FMDA, FMDB
991-056	T-13A and T-31A Cavities	DLDA, DTCA, DTDA (T-13A), DNDA (T-31A)
991-057	T-31A Cavity (3-position, 4-way)	DNDC
991-058	T-8A and T-9A Cavities	RBAP, DAAL, DBAL
991-059	T-8A Cavity	RBAN
991-060	T-11A Cavity	PRDM, PRDN

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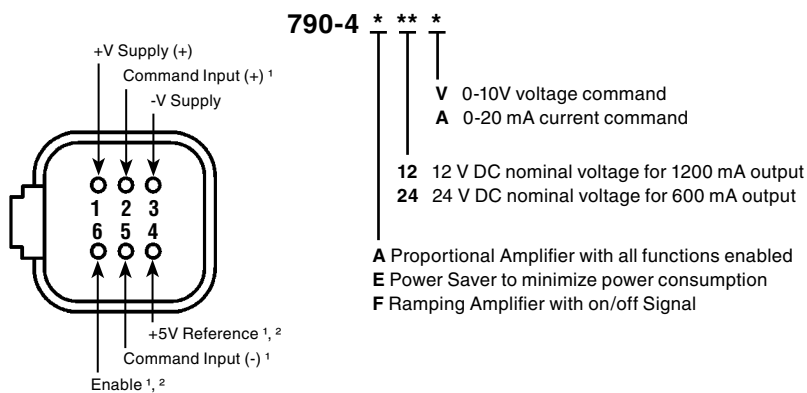
Sun Coil 790-***** Part Numbering System

Sun coils (790-*****) have an embedded amplifier for proportional control. Different versions (see table on pages 25 and 26) include maximum current of 625 mA or 1200 mA. The command Signal is a voltage (0-10 V) or a current (0-20 mA).
Proportional amplifiers:

- 790-4**** (for the Deutsch DT04-6P) use 6 pins and can be used for different wirings.
- 790-2**** (for ISO/DIN 43560, Form A) use 4 pins and is available in version B through F.
- See illustration below.
- 790-***E****** (Power Saver) works automatically when power is applied.
- 790-***F****** (Ramping Amplifier) can be controlled with on/off signals.

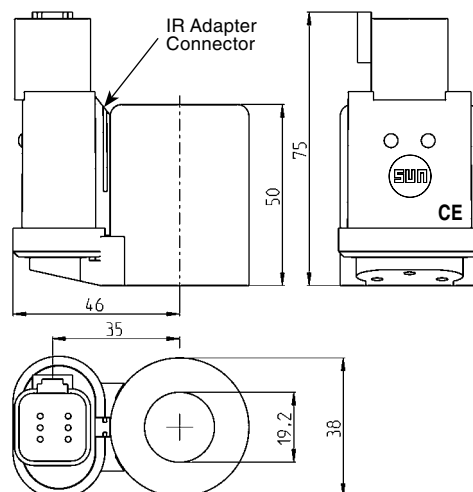


Deutsch DT04-6P Embedded Electronic Amplifier

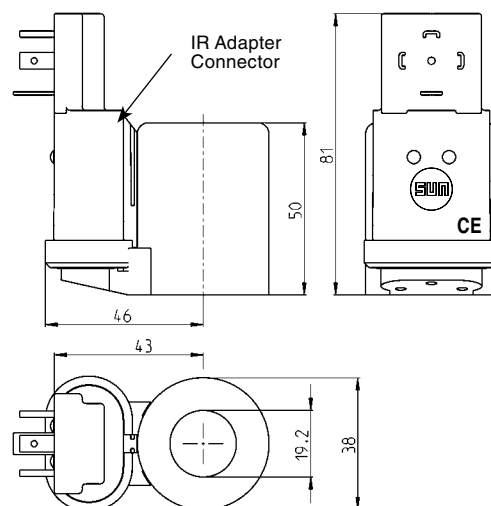
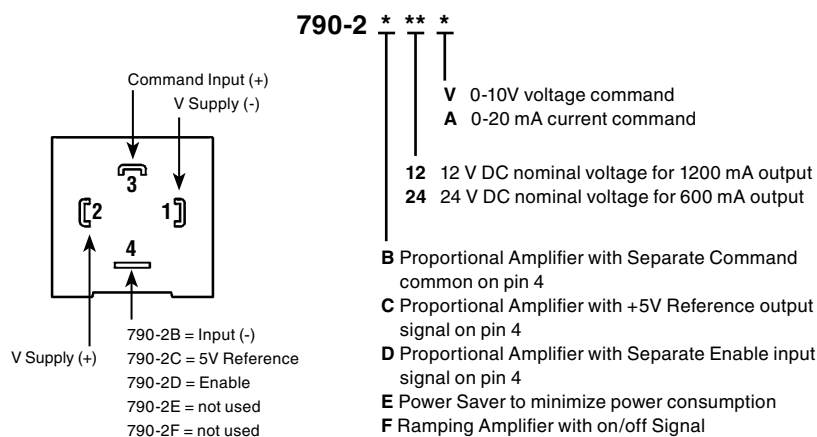


¹ Not used on Power Saver

² Not used on Ramping Amplifier



ISO/DIN 4360, Form A Embedded Electronic Amplifier



Additional Sun Tools for Embedded Electronics:

991-700	Hand Held Programmer (HHP): Access configuration setting in digital proportional valve amplifier, models C1V, C2A, and 790 series.
991-702	Infrared Cable Adapter: Provides Serial interface between 790 series embedded digital proportional amplifier and HHP
991-703	Infrared Cable Adapter: Provides Serial interface between C1V and C2A digital proportional amplifier and HHP
991-704	Infrared Cable Adapter: USB interface for 790-***** (includes Sun Amplifier Set-up Software on CD or download from website*)
991-705	Infrared Cable Adapter: USB interface for C1V***, C2A*** (includes Sun Amplifier Set-up Software on CD or download from website*)
991-706	Deutsch Cable Assembly: Use with 790 series embedded amplifier equipped with a Deutsch DT04-6P connector

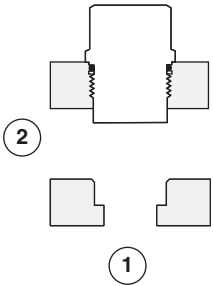
* Go to www.sunhydraulics.com. Products: Amplifiers and Amplifier Accessories.



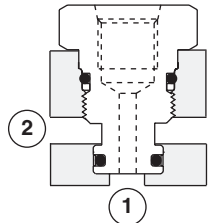
Cavity Plugs

It is sometimes desirable to remove a Sun cartridge valve and still maintain the integrity of the hydraulic system. This may be necessitated by the need to flush a system after repairs or a piping change, or to change an operating function in the circuit. For these requirements, Sun offers two styles of cavity plugs - all ports blocked and main ports open to flow.

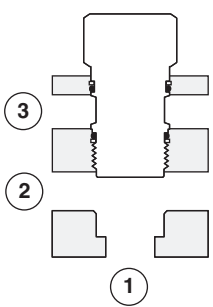
Plugs for Two Port Cavities

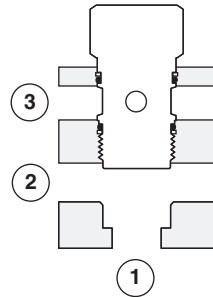
	Series	Cavity	All Ports Open			All Ports Blocked		
			Cavity Plug Model Code*	Buna-N	Viton	Cavity Plug Model Code	Buna-N	Viton
	P	T-8A	XAOA-XX*			XACA-XX*		
	0	T-162A	XZOA-XX* +XZOC-XX*			XZCA-XX* XZCC-XX*		
	1	T-10A T-13A	XFOA-XX*			XFCA-XX* XGCA-XX*		
	2	T-3A T-5A	XCOA-XX*			XCCA-XX* XDCA-XX*		
	3	T-16A	XIOA-XX*			XICA-XX*		
	4	T-18A	XKOA-XX*			XKCA-XX*		

+ Flush Style Plug: Tighten via 5/16" Allen Wrench

	Series	Cavity	Port 1 Open to External SAE-4 Port, Port 2 Blocked			Port 2 Open to External SAE-4 Port, Port 1 Blocked		
			Cavity Plug Model Code*	Buna-N	Viton	Cavity Plug Model Code	Buna-N	Viton
	P	T-8A	XACA-EX*			XACC-EX*		
	0	T-162A	XZCA-EX*					
	1	T-10A T-13A	XFCA-EX* XGCA-EX*					

Plugs for Three Port Cavities

	Series	Cavity	Port 1 to 2 Open, Port 3 Blocked			All Ports Blocked		
			Cavity Plug Model Code*	Buna-N	Viton	Cavity Plug Model Code	Buna-N	Viton
	P	T-9A	XAOB-XX*			XACB-XX*		
	0	T-163A	XZOB-XX*			XZCB-XX*		
	1	T-11A	XEOA-XX*			XECA-XX*		
	2	T-2A	XBOA-XX*			XBCA-XX*		
	3	T-17A	XHOA-XX*			XHCA-XX*		
	4	T-19A	XJOA-XX*			XJCA-XX*		

	Series	Cavity	All Ports Open			Port 1 Open to External SAE-4 Port, Ports 2 and 3 Blocked		
			Cavity Plug Model Code*	Buna-N	Viton	Cavity Plug Model Code	Buna-N	Viton
	P	T-9A				XACB-EX*		
	0	T-162A	XZOD-XX*					
	1	T-11A	XEOB-XX*					
	2	T-2A	XBOB-XX*					
	3	T-17A	XHOB-XX*					
	4	T-19A	XJOB-XX*					

Cavity Plugs continued on next page.

*Insert in the seventh position model code digit N to order Buna-N seals or V to order Viton seals.

Visit www.sunhydraulics.com for current list pricing and complete technical information on all Sun products.

Plugs for Three Port Cavities (*continued*)

	Ports 1 to 3 Open, Port 2 Blocked					Ports 2 to 3 Open, Port 1 Blocked			
	Series	Cavity	Cavity Plug Model Code*	Buna-N	Viton	Cavity Plug Model Code	Buna-N	Viton	
	P	T-9A	XAOC-XX*						
	0	T-163A				XZAA-XX*			
	1	T-11A	XEBA-XX*			XEAA-XX*			
	2	T-2A	XBBA-XX*			XBAA-XX*			
	3	T-17A	XHBA-XX*						
	4	T-19A	XJBA-XX*						

Plugs for Four Port Cavities (Internal Locating Shoulder)

	Ports 1 to 2 Open Ports 3 and 4 Blocked					All Ports Blocked			
	Series	Cavity	Cavity Plug Model Code*	Buna-N	Viton	Cavity Plug Model Code	Buna-N	Viton	
	1	T-21A	XMOA-XX*			XMCA-XX*			
	2	T-22A	XNOA-XX*			XNCA-XX*			
	3	T-23A	XPOA-XX*			XPCA-XX*			
	4	T-24A	XQOA-XX*			XQCA-XX*			

All Ports Open					
<i>Series</i>		<i>Cavity</i>	<i>Cavity Plug Model Code*</i>	<i>Buna-N</i>	<i>Viton</i>
1		T-21A	XMOB-XX*		

Diagram of a four-port cavity with ports 1, 2, 3, and 4. All ports are open. The diagram shows a central cavity with four ports on the left side, labeled 1, 2, 3, and 4 from bottom to top. All ports are open.

Plugs for Four Port Cavities (External Locating Shoulder)

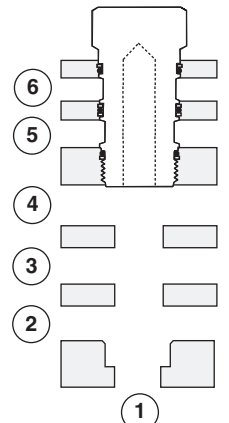
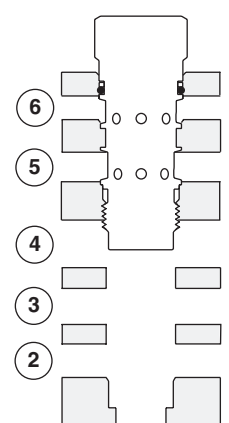
	All Ports Open					All Ports Blocked			
	Series	Cavity	Cavity Plug Model Code*	Buna-N	Viton	Cavity Plug Model Code*	Buna-N	Viton	
	1	T-31A	XFOA-XX*			XRCA-XX*			
	2	T-32A	XCOA-XX*			XSCA-XX*			
	3	T-33A	XIOA-XX*			XTCA-XX*			
	4	T-34A	XKOA-XX*			XVCA-XX*			

Cavity Plugs continued on next page.

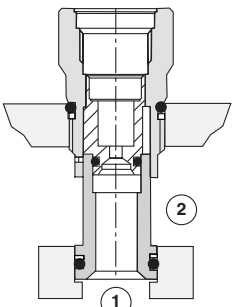
*Insert in the seventh position model code digit N to order Buna-N seals or V to order Viton seals.

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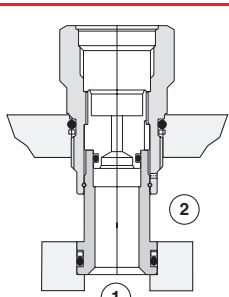
Plugs for Six Port Cavities

			Ports 1, 2, 3 and 4 Open Ports 5 and 6 Blocked			All Ports Blocked		
	Series	Cavity	Cavity Plug Model Code*	Buna-N	Viton	Cavity Plug Model Code*	Buna-N	Viton
	1	T-61A	XMOA-XX*			XRCC-XX*		
	2	T-62A	XNOA-XX*			XSCC-XX*		
	3	T-63A	XPOA-XX*			XTCC-XX*		
	4	T-64A	XQOA-XX*			XVCC-XX*		
			All Ports Open					
	Series	Cavity	Cavity Plug Model Code*	Buna-N	Viton			
	1	T-61A	XMOB-XX*					

Cavity Adaptor (Converts Sun T-10A Cavity to Sun T-8A Cavity)

	All Ports Open					
	<i>Cavity</i>		<i>Cavity Plug Model Code*</i>	<i>Buna-N</i>	<i>Viton</i>	
	T-10A		XFAA-8X*			
	T-10A		+ XFAB-8X*			
			+ with filter screen			

Cavity Adaptor (Converts Sun T-13A Cavity to Sun T-8A Cavity)

			All Ports Open					
	Cavity		Cavity Plug Model Code*	Buna-N	Viton			
	T-13A		XGAA-8X*					

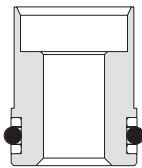
Cavity Plugs continued on next page.

*Insert in the seventh position model code digit N to order Buna-N seals or V to order Viton seals.

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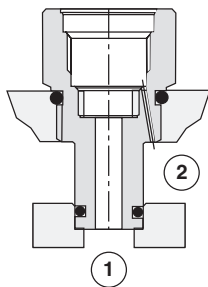
Cavity Plugs

Cavity Adaptor (Converts Sun T-162A Cavity to Sun T-8A Cavity)



Cavity	All Ports Open		
	Cavity Plug Model Code*	Buna-N	Viton
T-162A	XZCA-8X*		

Cavity Adaptor (Converts Waterman 12-2 Cavity to the Sun T-8A Cavity)



Cavity	All Ports Open		
	Cavity Plug Model Code*	Buna-N	Viton
12-2	XAAA-8X*		

For detailed and complete information on Sun’s full list of cavity plugs visit www.sunhydraulics.com.
Products: Accessories: Cavity Plugs

*Insert in the seventh position model code digit N to order Buna-N seals or V to order Viton seals.



Cavity Form Tools

The Sun Cavity

All Sun cartridges fit into a series of standard Sun cavities that are easily machined to exact dimensions using precision form tools available from Sun. Complete cavity detail drawings can be found in all Sun catalogues

and are included with each shipment of tools.

Deep Hex Sockets

Deep and extra deep hex sockets are the preferred tools to use when installing Sun cartridges. Sun offers

Snap-On deep hex sockets as a convenience to our customers. Below are the Sun part numbers with corresponding Snap-On part numbers of deep hex sockets for all Sun cartridges.

Installation Tools: Deep Hex Sockets

Cartridge Hex Size	Cartridge Series	Drive Size	Sun Part Number	Snap-On Part Number
7/8"	P*	1/2"	998-100-006	SIML280
3/4"	0	1/2"	998-100-005	S241
7/8"	1	1/2"	998-100-001	S281
1 1/8"	2	1/2"	998-100-002	S361
1 1/4"	3	1/2"	998-100-003	S401
1 5/8"	4	3/4"	998-100-004	LS522

*Extra Deep Hex Sockets (P/N 998-100-006) used for all Series 1 Solenoids and all Series P cartridges except RBAR-*W, RBAR-*Y and D*AP.

Series Z Cartridges

3/16" Internal Hex, 3/8 x 24 UNF - 2B Thread

Cavity	Cavity Form Tool Description	HIGH SPEED STEEL	TITANIUM NITRIDE COATED
		Sun Part Number	Sun Part Number
CXZA T-382A 2 Port	Form Drill TD-382A	994-382-001	994-382-101
	Form Reamer TR-382A	995-382-001	995-382-101
	Metric Tap 3/8 x 24 UNF-2B	998-801	998-801-101

5/32" Internal Hex, 3/8 x 24 UNF - 2B Thread

CSZN T-382A 2 Port	Form Drill TD-382A	994-382-001	994-382-101
	Form Reamer TR-382A	995-382-001	995-382-101
	Metric Tap 3/8 x 24 UNF-2B	998-801	998-801-101

Series P Cartridges

7/8" Hex, M16 x 1.5 Thread

T-8A 2 Port	Form Drill TD-8A	994-008-001	994-008-101
	Form Reamer TR-8A	995-008-001	995-008-101
	Metric Tap M16 x 1.5-6H	998-991	998-991-101
T-9A 3 Port	Form Drill TD-9A	994-009-001	994-009-101
	Form Reamer TR-9A	995-009-001	995-009-101
	Metric Tap M16 x 1.5-6H	998-991	998-991-101

Series 0 Cartridges

3/4" Hex, M16 x 1.5 Thread

T-162A 2 Port	Form Drill TD-162A	994-162-001	994-162-101
	Form Reamer TR-162A	995-162-001	995-162-101
	Metric Tap M16 x 1.5-6H	998-991	998-991-101
T-162DP 2 Port	Form Drill TD-162DP	994-162-011	994-162-111
	Form Reamer TR-162DP	995-162-011	995-162-111
	Metric Tap M16 x 1.5-6H	998-990	998-990-111
T-163A 3 Port	Form Drill TD-163A	994-163-001	994-163-101
	Form Reamer TR-163A	995-163-001	995-163-101
	Metric Tap M16 x 1.5-6H	998-991	998-991-101

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Cavity Form Tools

Series 1 Cartridges

7/8" Hex, M20 x 1.5 Thread

Cavity	Cavity Form Tool Description	HIGH SPEED STEEL	TITANIUM NITRIDE COATED
		Sun Part Number	Sun Part Number
T-10A 2 Port (Long)	Form Drill TD-10A Form Reamer TR-10A Metric Tap M20 x 1.5-6H	994-010-001	994-010-101
		995-010-001	995-010-101
		998-998	998-998-101
T-11A 3Port	Form Drill TD-11A Form Reamer TR-11A Metric Tap M20 x 1.5-6H	994-011-001	994-011-101
		995-011-001	995-011-101
		998-998	998-998-101
T-13A 2 Port (Short)	Form Drill TD-13A Form Reamer TR-13A Metric Tap M20 x 1.5-6H	994-013-001	994-013-101
		995-013-001	995-013-101
		998-998	998-998-101
T-21A 4 Port	Form Drill TD-21A Form Reamer TR-21A Metric Tap M20 x 1.5-6H	994-021-001	994-021-101
		995-021-001	995-021-101
		998-998	998-998-101
T-31A 4 Port	Form Drill TD-31A Form Reamer TR-31A Metric Tap M20 x 1.5-6H	994-031-001	994-031-101
		995-031-001	995-031-101
		998-998	998-998-101
T-61A 6 Port	Form Drill TD-61A Form Reamer TR-61A Metric Tap M20 x 1.5-6H	994-061-001	994-061-101
		995-061-001	995-061-101
		998-998	998-998-101

Series 2 Cartridges

1 1/8" Hex, 1"-14 UNS Thread

Cavity	Cavity Form Tool Description	HIGH SPEED STEEL	TITANIUM NITRIDE COATED
		Sun Part Number	Sun Part Number
T-2A 3 Port	Form Drill TD-2A Form Reamer TR-2A UNS Tap 1"-14 UNS-2B	994-002-001	994-002-101
		995-002-001	995-002-101
		998-999	998-999-101
T-3A 2 Port (Long)	Form Drill TD-3A Form Reamer TR-3A UNS Tap 1"-14 UNS-2B	994-003-001	994-003-101
		995-003-001	995-003-101
		998-999	998-999-101
T-5A 2 Port (Short)	Form Drill TD-5A Form Reamer TR-5A UNS Tap 1"-14 UNS-2B	994-005-001	994-005-101
		995-005-001	995-005-101
		998-999	998-999-101
T-22A 4 Port	Form Drill TD-22A Form Reamer TR-22A UNS Tap 1"-14 UNS-2B	994-022-001	994-022-101
		995-022-001	995-022-101
		998-999	998-999-101
T-32A 4 Port	Form Drill TD-32A Form Reamer TR-32A UNS Tap 1"-14 UNS-2B	994-032-001	994-032-101
		995-032-001	995-032-101
		998-999	998-999-101
T-62A 6 Port	Form Drill TD-62A Form Reamer TR-62A UNS Tap 1"-14 UNS-2B	994-062-001	994-062-101
		995-062-001	995-062-101
		998-999	998-999-101

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Cavity Form Tools

Series 3 Cartridges

1 1/4" Hex, M36 x 2 Thread

Cavity	Cavity Form Tool Description	HIGH SPEED STEEL	TITANIUM NITRIDE COATED
		Sun Part Number	Sun Part Number
T-16A 2 Port	Form Drill TD-16A Form Reamer TR-16A Metric Tap M36 x 2-6H	994-016-001	994-016-101
		995-016-001	995-016-101
		998-996	998-996-101
T-17A 3 Port	Form Drill TD-17A Form Reamer TR-17A Metric Tap M36 x 2-6H	994-017-001	994-017-101
		995-017-001	995-017-101
		998-996	998-996-101
T-23A 4 Port	Form Drill TD-23A Form Reamer TR-23A Metric Tap M36 x 2-6H	994-023-001	994-023-101
		995-023-001	995-023-101
		998-996	998-996-101
T-33A 4 Port	Form Drill TD-33A Form Reamer TR-33A Metric Tap M36 x 2-6H	994-033-001	994-033-101
		995-033-001	995-033-101
		998-996	998-996-101
T-63A 6 Port	Form Drill TD-63A Form Reamer TR-63A Metric Tap M36 x 2-6H	994-063-001	994-063-101
		995-063-001	995-063-101
		998-996	998-996-101

Series 4 Cartridges

1 5/8" Hex, M48 x 2 Thread

Cavity	Cavity Form Tool Description	HIGH SPEED STEEL	TITANIUM NITRIDE COATED
		Sun Part Number	Sun Part Number
T-18A 2 Port	Form Drill TD-18A Form Reamer TR-18A Metric Tap M48 x 2-6H	994-018-001	994-018-101
		995-018-001	995-018-101
		998-992	998-992-101
T-19A 3 Port	Form Drill TD-19A Form Reamer TR-19A Metric Tap M48 x 2-6H	994-019-001	994-019-101
		995-019-001	995-019-101
		998-992	998-992-101
T-24A 4 Port	Form Drill TD-24A Form Reamer TR-24A Metric Tap M48 x 2-6H	994-024-001	994-024-101
		995-024-001	995-024-101
		998-992	998-992-101
T-34A 4 Port	Form Drill TD-34A Form Reamer TR-34A Metric Tap M48 x 2-6H	994-034-001	994-034-101
		995-034-001	995-034-101
		998-992	998-992-101
T-64A* 6 Port	Form Drill TD-64A* Form Reamer TR-64A* Metric Tap M48 x 2-6H	994-064-001	994-064-101
		995-064-001	995-064-101
		998-992	998-992-101

* All Drills and Reamers have a #3 Morse Taper and all Taps have a straight shank except the Drill and Reamer for T-64A which have a #4 Morse Taper. The Tap for T-64A has a straight shank.

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Mounting and Assembly of Sandwich Bodies



Sun offers sandwich and subplate mounted bodies for most of its cartridge functions. These mounting configurations are complete circuit elements that mount under directional control valves. Similar to other Sun mounting configurations, the sandwich and subplate bodies are available in aluminum and ductile iron material.

Mounting of ISO 03 (CETOP 3) Sandwiches

Many of Sun's ISO 03 (CETOP 3) sandwich bodies are designed for multi-functional use to permit maximum circuit flexibility. With the exception of a limited range of sandwich bodies, Sun ISO 03 (CETOP 3) sandwich bodies do not have a counterbore for installing O-ring seals. Instead, Sun uses a special seal plate with a raised "NIB" and a locating "NOTCH". Sun bodies incorporate oversize, symmetrical mounting holes to allow the bodies to be rotated about the "Y" axis and the "X" axis as shown in *Figure 1*.

Rotation about the "Y" axis enables the "A" and "B" port connections to be interchanged and rotation about the "X" axis enables the "P" and "T" ports to be interchanged.

All Sun seal plates are manufactured to accommodate current industry standards regarding port and mounting bolt locations. Each Sun ISO 03 (CETOP 3) sandwich body is supplied with a "NIB" locating hole which is drilled on each mounting face to position the body in the correct relationship to the ports and mounting holes. To further ensure that all bodies are located properly, all ISO 03 (CETOP 3) sandwich bodies are stamped with an arrow (or arrows) to show the relationship to the notch in the seal plate (see *Figure 2*). Multi-function bodies are "NOTCH" stamped for all possible mounting positions and all positions should be carefully inspected to be sure the intended function is correctly installed.

ISO 03 (CETOP 3) Sandwich Bodies stamped with numbers to orient body for desired function

The function symbols on the data pages for Sun's ISO 03 (CETOP 3) sandwich bodies (see *Figure 3 next page*) are shown with numbers (1,2,3,4) in the upper right and lower left hand corners. These numbers correspond to numbers stamped on the face of the bodies and designate the functionality of the product. Because many of these bodies can be used for different functions, the bodies are stamped to help the user orient the body for the function desired. The Meter-out A and Meter-in B functions are shown in the symbols with the numbers 3 and 4, which correspond to the numbers stamped on the opposite face of the body.

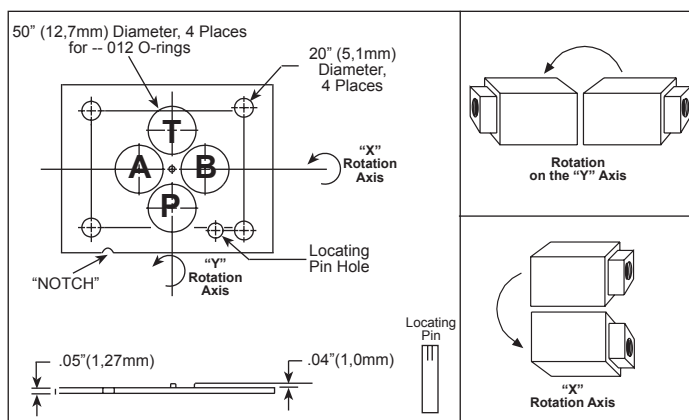


Figure 1. Body Rotation Reference

Assembly of ISO 03 (CETOP 3) Sandwiches

1. Place the seal plate on the subplate mounting surface with the nib facing outward or away from the subplate and the locating pin hole on the seal plate aligned with the pin hole on the subplate mounting surface. At this point, the "NOTCH" in the seal plate should be adjacent to the "P" port of the valve interface. See *Figure 1*.
2. Position the Sun sandwich body so that the control "NOTCH" arrow for the required function points to the "NOTCH" in the seal plate. See *Figure 2*.
3. Move the sandwich body as required to engage the "NIB" on the seal plate with the clearance hole in the body.

NOTE: In every installation, the seal plate nib must be oriented toward the directional control valve and away from the subplate or manifold. All locating "NIBS" in the sandwich valve stack must point away from the subplate.

4. After determining the correct alignment of the sandwich body to the seal plate, lift the body and plate together, turn

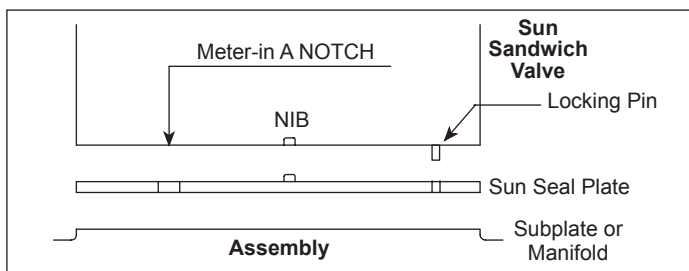


Figure 2. Assembly

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the assembly over and locate the correct hole in which to press the locating pin. The locating pin is shipped separately. Press the pin, serrated end first, into the body until it stops. The pin must protrude below the seal plate to positively align with the mounting surface. If a valve stack requires disassembly at anytime, the pin should not be removed. It will simplify the reassembly of the valve stack.

NOTE: Not all manufacturers of subplates offer a pin clearance hole which requires the pin to be omitted.

- After all the body alignments have been determined and all pins installed, assemble the valve stack in the required functional order. Make sure all the O-rings are properly positioned. Install the directional control valve on top of the stack and tighten the stud nuts alternately to the proper torque of 40-45 lb.in. (4,5–5,0 Nm).

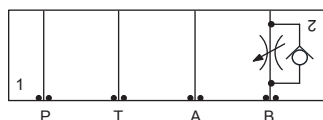
Steps to Avoid Seal Plate Leaks

- Make sure the mounting surface is flat and without burrs.
- Do not polish the mounting surface. (*Machining marks help to keep the O-rings from acting as pumps.*)
- Remove any dings on the corners of seal plates that could create gaps.
- Studrods or cap screws must not bottom out in the threaded mounting holes.
- It is very important to keep all of the o-ring sealing surfaces “dry”. The hydrostatic properties of an oil film under the o-rings, and at the seal plate interface, can

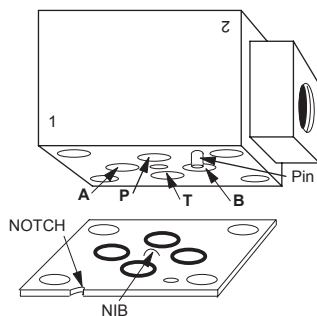
STEP 1

- Begin with body view showing stamped number 1 in lower left corner.
- Note the location of P, T, A, and B ports and the position of the cavity.
- This position places the P port of the sandwich nearest to the viewer.

Meter-out B Function



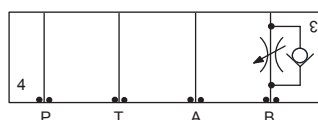
Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.



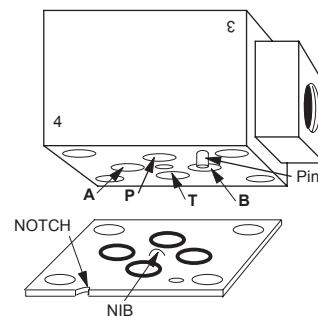
STEP 2

- Rotate the sandwich on the “X” axis to orient body for meter-in B function.

Meter-in B Function



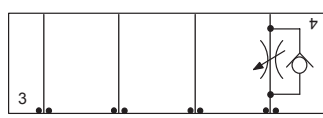
Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.



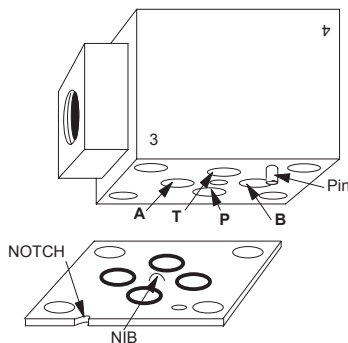
STEP 3

- Rotate the sandwich on the “Y” axis to orient body for meter-out A function.

Meter-out A Function



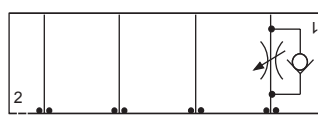
Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.



STEP 4

- Rotate the sandwich on the “X” axis to orient body for meter-in A function.

Meter-in A Function



Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.

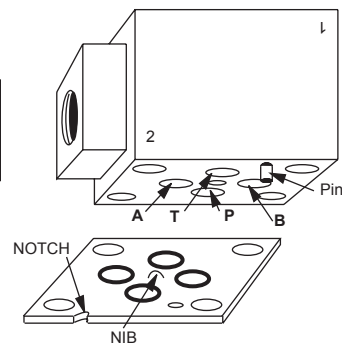


Figure 3: Steps 1 through 4: Orientation Example for ISO 03 (CETOP 3) Sandwich Body GBA

Mounting and Assembly of Sandwich Bodies

create a fluid path leading from the pressurized port to the outside edge of the stack. *(Under this condition, as noted in step 1, an O-ring can actually act as a “pump”.)*

Warning: If you start with a wet seal interface in your stack, there’s a good chance it will always stay wet!

Orientation Example for ISO 03 (CETOP 3) bodies

Steps 1 through 4 in *Figure 3* prev. page describe in detail the steps for the orientation of a GBA sandwich body.

Mounting ISO 05 (CETOP 5) Sandwich Bodies

Sun ISO 05 (CETOP 5) sandwich bodies are available for many mounting configurations. The standard ISO 05 (CETOP 5)/NFPA D05 is offered with two methods of sealing the fluid interface. The sealing method depends

on the ability of the body to be rotated about its “Y” axis. Sandwich bodies that can be rotated will use a Sun seal plate supplied with the body. Non-rotating bodies will have counterbores machined into the body sealing surface for O-ring placement. The ISO 05 (CETOP 5) sandwich body can only be rotated about the “Y” axis referred to in the ISO 03 (CETOP 3) sandwich section. (There is no “NIB” on the ISO 05 (CETOP 5) subplate,) “X” axis rotation is not possible due to the lack of symmetry of the fluid ports.

Mounting ISO 05 (CETOP 5) x, y Sandwich Bodies

Sun ISO 05 (CETOP 5) x, y sandwich bodies are furnished with pilot and drain connections. Due to the differences in the U.S. and European seal plates, none are supplied with these bodies. They must be ordered separately to correctly match the other valve bodies in the stack. See *Table for Retainers* on page 39.

Retainers and Seals for Sandwich Valves

Valve Pattern Interface	Seal Retainer Only		Seals	Seal Kit Only		Seal and Seal Retainer Kit
	Seal Retainer	Retainer Number		Kit Container	Kit Number	Kit Number
<div>ISO 03 (CETOP 3) NFPA D03</div> <div>Was NFPA D01: ISO 03 (CETOP 3)</div>		991-013		<div>Viton</div> <div>4) 500-101-012 990-105-003</div> <div>Buna-N</div> <div>4) 500-001-012 990-105-007</div>	<div>Viton</div> <div>990-106-003</div> <div>Buna-N</div> <div>990-106-007</div>	
<div>ISO 05 (CETOP 5) NFPA D05</div> <div>Was NFPA D02: ISO 05 (CETOP 5)</div>		991-005		<div>Viton</div> <div>5) 500-101-014 990-110-003</div> <div>Buna-N</div> <div>5) 500-001-014 990-110-007</div>	<div>Viton</div> <div>990-111-003</div> <div>Buna-N</div> <div>990-111-007</div>	
<div>ISO 05 x, y “02H” U.S.</div>		991-008		<div>Viton</div> <div>5) 500-101-014 999-120-003</div> <div>2) 500-101-010</div> <div>Buna-N</div> <div>5) 500-001-014 990-120-007</div> <div>2) 500-001-010</div>	<div>Viton</div> <div>9990-120-010</div> <div>Buna-N</div> <div>990-120-009</div>	
<div>ISO 05 x, y (CETOP 5) RPS5H</div>		991-009		<div>Viton</div> <div>5) 500-101-014 990-120-004</div> <div>2) 500-101-012</div> <div>Buna-N</div> <div>5) 500-001-014 990-120-008</div> <div>2) 500-001-012</div>	<div>Viton</div> <div>990-120-011</div> <div>Buna-N</div> <div>990-120-012</div>	
<div>ISO 07 (CETOP 7) NFPA D07</div> <div>Was NFPA D04: ISO 07 (CETOP 7)</div>		990-140-001		<div>Viton</div> <div>2) 500-101-111 990-140-002</div> <div>4) 500-101-118</div> <div>Buna-N</div> <div>2) 500-001-111 990-140-007</div> <div>4) 500-001-118</div>	<div>Viton</div> <div>990-140-003</div> <div>Buna-N</div> <div>990-140-008</div>	
<div>ISO 08 (CETOP 8) NFPA D08</div> <div>Was NFPA D06: ISO 08 (CETOP 8)</div>		-----		<div>Viton</div> <div>2) 500-101-114 990-130-003</div> <div>4) 500-101-121</div> <div>Buna-N</div> <div>2) 500-101-114 990-130-007</div> <div>4) 500-110-121</div>	<div>-----</div> <div>-----</div> <div>-----</div> <div>-----</div>	

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Studnuts and Studkits for Sandwich Bodies

Studkits for ISO 03 (CETOP 3) and ISO 05 (CETOP 5) Sandwich Bodies

To simplify the installation of ISO 03 (CETOP 3) and ISO 05 (CETOP 5) sandwiches, Sun offers uncut (can be cut to length in the field) or precut studkits in both inch and metric standard threaded rod. Once the rods are installed in a subplate or manifold, they act as a guide in assembling the sandwich body stack. After the directional control valve is assembled on top of a stack, Sun studnuts are used to retain the assembled stack.

The inch and metric studrods are both made of high tensile, fully threaded ASTM-A-193 Grade B material with the following mechanical properties:

- 125,000 psi (862 MPa) minimum tensile strength.
- 105,000 psi (724 MPa) minimum yield point.
- 26–32 Rc hardness.

The studnuts are special hex socket nuts with the following features:

- An outside diameter equivalent to a standard socket head cap screw.
- Full thread engagement as shown below.
- Mechanical stop between the internal hex and the thread to prevent the hex wrench from being pushed out of its socket. See Figure 4.

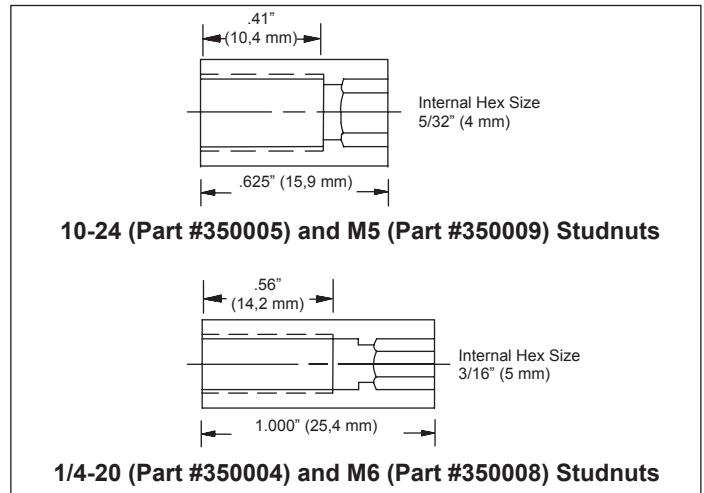


Figure 4. Studnuts

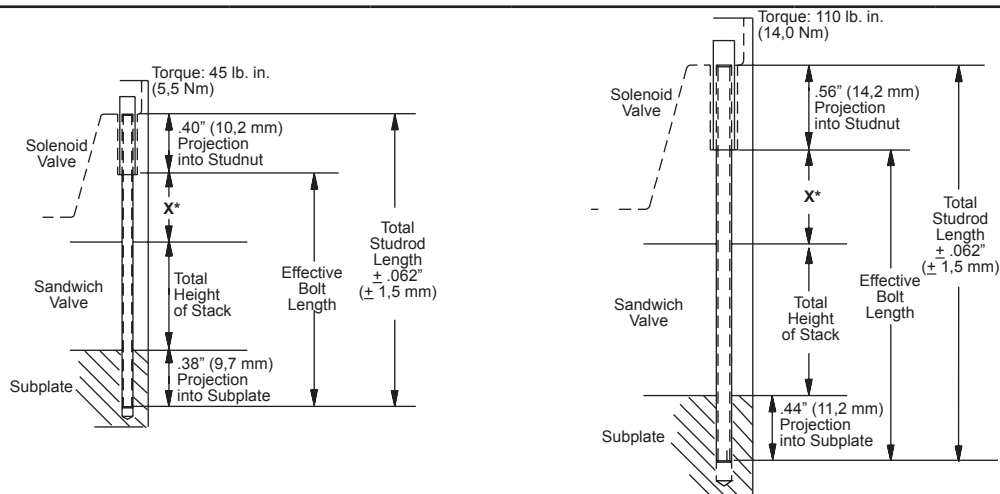
ISO 03 (CETOP 3) STUDKITS: RECOMMENDED TORQUE: 40-45 lb. in. (4,5-5,0 Nm)

INCH STANDARDS		METRIC STANDARDS	
Kit Contents	Kit Number	Kit Contents	Kit Number
4) 10-24 Studnuts	992-011	4) M5 Studnuts	992-111
4) approximately 7" (178 mm) long 10-24 Studrods		4) approximately 7" (178 mm) long M5 Studrods	
4) 10-24 Studnuts	992-012	4) M5 Studnuts	992-112
4) approximately 12" (305 mm) long 10-24 Studrods		4) approximately 12" long (305 mm) long M5 Studrods	
50) 10-24 Studnuts	992-013	50) M5 Studrods	992-113
10) approximately 36" (914 mm) long 10-24 Studrods		10) approximately 36" (914 mm) long M5 Studrods	
50) 10-24 Studrods	992-550	50) M5 Studnuts	992-750
4) 10-24 Studnuts	922-650	4) M5 Studnuts	992-850
4) 10-24 Studnuts		4) M5 Studrods	
4) 10-24 Studrods cut to customer specified length $\pm .062"$ ($\pm 1,5$ mm)		4) M5 Studrods cut to customer specified length: $\pm .062"$ ($\pm 1,5$ mm)	

ISO 05 (CETOP 5) STUDKITS: RECOMMENDED TORQUE: 105-110 lb. in. (12,0-12,5 Nm)

INCH STANDARDS		METRIC STANDARDS	
Kit Contents	Kit Number	Kit Contents	Kit Number
4) 1/4-20 Studnuts 4) approximately 7" (178 mm) long 1/4-20 Studrods	992-001	4) M6 Studnuts 4) approximately 7" (178 mm) long M6 Studrods	992-101
4) 1/4-20 Studnuts 4) approximately 12" (305 mm) long 1/4-20 Studrods	992-002	4) M6 Studnuts 4) approximately 12" long (305 mm) long M6 Studrods	992-102
50) 1/4-20 Studnuts 10) approximately 36" (914 mm) long 1/4-20 Studrods	992-003	50) M6 Studrods 10) approximately 36" (914 mm) long M6 Studrods	992-103
50) 1/4-20 Studrods	992-500	50) M6 Studnuts	992-700
4) 1/4-20 Studnuts 4) 1/4-20 Studnuts 4) 1/4-20 Studrods cut to customer specified length: $\pm .062"$ ($\pm 1,5$ mm)	922-600	4) M6 Studnuts 4) M6 Studrods cut to customer specified length: $\pm .062"$ ($\pm 1,5$ mm)	992-800

STUDROD LENGTH DETERMINATION CHART



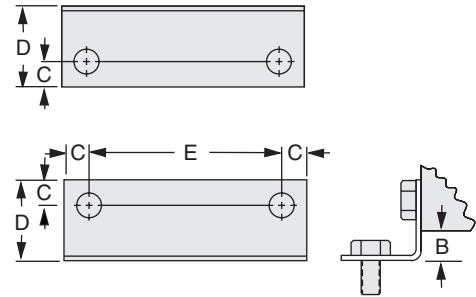
ISO 03 (CETOP 3)				ISO 05 (CETOP 5) ISO 05 x,y (CETOP 5 x,y)		
	Model	"X" inches*	"X" mm*	Model	"X" inches*	"X" mm*
Continental	EB03M	.625	15,9	VS12M	1.31	33,3
Continental	VS5M	.625	15,9	ED05M	1.31	33,3
Double A (Vickers)	Q*-3	1.56	36,9	Q*-5	1.05	26,7
Parker-Hannifin	D1VW	1.50	38,1	D3W	1.91	48,5
Racine Bosch	.25NG6	.87	22,1	1/4"	1.38	35,1
Rexroth	4WRA6	1.26	32,0	4WE10, 4WEH10	1.18	30,0
Dynex/Rivett	6500 Series 03	.44	11,2	6500-02	.38	9,7
Vickers/40	DG4V	1.56	39,2	DG4S4	1.05	26,7
Vicker/60	DG4V	.83	21,1	DG4V5	1.18	30,0
Nachi 1	SSG01	1.44	36,6	SSG03, E10, E20	2.38	60,5

* The X dimension was accurate as of the publication date of this information. Verify in the applicable manufacturers literature.

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Bar Manifold Mounting Brackets

All bar manifolds are parallel circuit type and contain a cavity for a Sun relief valve, pressure to tank, as well as a gauge port. Mounting kits for all bar manifolds must be ordered separately and contain brackets, bolts and washers. Inch and metric mounting kits are available.



Manifold Interface	Thread Size	Mounting Bracket Dimensions in inches				Kit Part No.
		B	C	D	E	
ISO 03	.312-18UNC x .62 lg.	.37	.31	1.0	2.38	991-021-001
ISO 03	M8 x 1.25 x 16,0 mm lg.	.37	.31	1.0	2.38	991-021-002
ISO 05	.312-18UNC x .62 lg.	.37	.31	1.0	2.38	991-021-003
ISO 05	M8 x 1.25 x 16,0 mm lg.	.37	.31	1.0	2.38	991-021-004
ISO 05 x, y	.375-16UNC x .75 lg.	.56	.44	1.38	4.13	991-021-005
ISO 05 x, y	M10 x 1.5 x 20,0 mm lg.	.56	.44	1.38	4.13	991-021-006
ISO 07	.375-16UNC x .75 lg.	.56	.44	1.38	4.13	991-021-007
ISO 07	M10 x 1.5 x 20,0 mm lg.	.56	.44	1.38	4.13	991-021-008
ISO 08	.500-13UNC x 1.0 lg.	.56	.56	1.63	4.88	991-021-009
ISO 08	M12 x 1.75 x 25,0 mm lg.	.56	.56	1.63	4.88	991-021-010

Valve Assembly Package Cross Reference Table

To simplify the ordering process, and add versatility, Sun has replaced many older “Y” assemblies that contained free flow check functionality with new 3 character bodies that have the same hydraulic functionality (still have the checks in them). By using the 3 character body model coding system, in conjunction with the cartridge model code, it allows more versatility in specifying the exact function required, and the model code makes it much easier to determine the main functionality of the assembly. For example, the old YRCA-***-AA is now a RPEC-***-FB2; clearly the main function is a pilot operated relief valve and the body is an FB2. With the old “Y” assembly model code it is not obvious what the functionality is. In most cases the new assemblies are a direct physical replacement for the older equivalent “Y” assemblies.

None of the old “Y” assembly models have been obsoleted, and can be ordered using their original model codes. However, we would prefer that the newer 3 character versions are ordered in place of the old “Y” assemblies.

The cross reference table below indicates the new model codes and the old model equivalents.

FUNCTIONAL AND PHYSICAL REPLACEMENTS

Assembly Model Code	Catalogue Code Cartridge Body	Assembly Model Code	Catalogue Code Cartridge Body	Assembly Model Code	Catalogue Code Cartridge Body
YCCD-***-A*	CBCA-***-EM*	YCGH-***-G*	CBGG-***-HN*	YPFJ-BBN-BB	PBHC-BBN-BKJ
YCCD-***-G*	CBCG-***-EM*	YCGH-***-H*	CBGH-***-HN*	YPFK-BBN-BB	PPHC-BBN-BK2
YCCD-***-H*	CBCH-***-EM*	YCHC-***-A*	RPIC-***-IN*	YPGA-***-C*	PBHB-***-H2*
YCCE-***-A*	CBCA-***-EP*	YCJC-***-AS	RPKC-***-LNS	YPGB-***-C*	PBHB-***-H3*
YCCE-***-G*	CBCG-***-EP*	YPCA-***-AA	PBDB-***-EB2	YPGC-***-C*	PBHB-***-H4*
YCCE-***-H*	CBCH-***-EP*	YPCB-***-AA	PBDB-***-EB3	YPGD-***-CA	PBHB-***-HBK
YCCG-***-A*	CBCA-***-EQ*	YPCR-***-AA	PPDB-***-EB3	YPGE-***-CA	PPHB-***-HBK
YCCG-***-G*	CBCG-***-EQ*	YPCS-***-AA	PPDB-***-EB2	YPJA-***-C*	PBJB-***-K2*
YCCG-***-H*	CBCH-***-EQ*	YPDB-***-C*	PBDB-***-E3*	YPJC-***-C*	PPJB-***-K4*
YCCH-***-A*	CBCA-***-EN*	YPDD-***-C*	PPDB-***-E4*	YRCA-***-AA	RPEC-***-FB2
YCCH-***-G*	CBCG-***-EN*	YPDE-***-C*	PPDB-***-E5*	YRDK-***-A*	RPEC-***-FM*
YCCH-***-H*	CBCH-***-EN*	YPEB-***-BA	PBFB-***-BB2	YREC-***-BA	RPGC-***-CB2
YCDC-***-**	RPEC-***-FN*	YPED-***-BA	PBFB-***-BB3	YRER-***-BB	RPGC-***-CJ2
YCED-***-A*	CBEA-***-BM*	YPEE-***-BB	PBFB-***-BJ2	YRFK-***-A*	RPGC-***-CM*
YCED-***-G*	CBEG-***-BM*	YPEF-ABN-BA	PBFC-ABN-BB2	YRHK-***-A*	RPIC-***-IM*
YCED-***-H*	CBEH-***-BM*	YPEG-ABN-BA	PBFC-ABN-BB3	YSCB-***-AA	RSDC-***-EB5
YCEE-***-A*	CBEA-***-BP*	YPEH-ABN-BA	PPFC-ABN-BB2	YSCC-***-AA	RSDC-***-EB4
YCEE-***-G*	CBEG-***-BP*	YPEI-ABN-BA	PPFC-ABN-BB3	YSDB-***-C*	RSDC-***-E7*
YCEE-***-H*	CBEH-***-BP*	YPEL-***-C*	PPFB-***-B4*	YSDC-***-C*	RSDC-***-E8*
YCEG-***-A*	CBEA-***-BQ*	YPEM-***-C*	PPFB-***-B5*	YSEB-***-C*	RSFC-***-B7*
YCEG-***-G*	CBEG-***-BQ*	YPER-***-BA	PPFB-***-BB2	YSEC-***-C*	RSFC-***-B8*
YCEG-***-H*	CBEH-***-BQ*	YPES-***-BA	PPFB-***-BB3	YSEF-***-BA	RSFC-***-BB5
YCEH-***-A*	CBEA-***-BN*	YPET-***-BB	PBFB-***-BJ3	YSEG-***-BA	RSFC-***-BB4
YCEH-***-G*	CBEG-***-BN*	YPEU-ABN-BB	PBFC-ABN-BJ2	YSEI-***-BB	RSFC-***-BJ5
YCEH-***-H*	CBEH-***-BN*	YPEV-ABN-BB	PBFC-ABN-BJ3	YSEL-***-C*	RSFC-***-B6*
YCFC-***-**	RPGC-***-CN*	YPEW-ABN-BB	PPFC-ABN-BJ2	YSEJ-***-BB	RSFC-***-BJ4
YCGD-***-A*	CBGA-***-HM*	YPEX-ABN-BB	PPFC-ABN-BJ3	YSFB-***-AB	RSHC-***-BK4
YCGD-***-G*	CBGG-***-HM*	YPEY-***-BB	PPFB-***-BJ2	YSFC-***-AB	RSHC-***-BK5
YCGD-***-H*	CBGH-***-HM*	YPEZ-***-BB	PPFB-***-BJ3	YSGA-***-CA	RSHC-***-HB4
YCGE-***-A*	CBGA-***-HP*	YPDF-***-C*	PBFB-***-B3*	YSHA-***-C*	RSHC-***-H6*
YCGE-***-G*	CBGG-***-HP*	YPFE-***-AB	PBHB-***-BK2	YSHB-***-C*	RSHC-***-H7*
YCGE-***-H*	CBGH-***-HP*	YPPF-***-AB	PBHB-***-BKJ	YSHC-***-C*	RSJC-***-K8*
YCGG-***-A*	CBGA-***-HQ*	YPPG-***-AB	PPHB-***-BK2		
YCGG-***-G*	CBGG-***-HQ*	YPPH-***-AB	PPHB-***-BKJ		
YCGG-***-H*	CBGH-***-HQ*	YPFI-BBN-BB	PBHC-BBN-BK2		
YCGH-***-A*	CBGA-***-HN*	YPFL-BBN-BB	PPHC-BBN-BKJ		

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Valve Assembly Package Cross Reference Table

Functional Only Replacements

New nine-position model codes in the following chart are physically different from the old Valve Assembly models. Differences may include physical size as well as port locations, so make sure these products are suitable to your application before ordering.

The new XR** hydrostatic transmission valve assemblies referenced below are not only physically different, but also represent a new design. This new version hydrostatic transmission valve assembly offers superior performance characteristics and greater application flexibility compared to the older version YR** hydrostatic transmission assemblies.

Valve Assembly	Replacement
YPDA-***-**	PBDB-***-E2*
YRDL-LQN-AK	XRDC-LNN-A*
YRDE-LQN-AL	XRDC-LNN-A*
YRDM-LQN-AM	XRFC-LNN-A*
YRDM-LQN-AM	XRFC-LNN-A*
YRGH-LCN-A*	XRFB-LCN-A*
YRGN-LCN-AQ	XRFB-LCN-AQ
YRGP-LCN-A*	XRDB-LCN-A*
YSDA -***-**	RSDC-***-E6*
YPFB-***-**	PBFB-***-B2

No Replacement and Not in Sun Line Mount Body Catalogue

The Valve assemblies listed in the chart below appeared in previous Sun catalogues but do not appear in recent Sun Line Mount Body Catalogues. **These products can still be ordered using the original model code. Contact your distributor for pricing information.**

YCEJ	YFEM	YNEK	YRGD
YDFD	YFEN	YNEM	YRGJ
YFCH	YFEO	YRDC	YRGG
YFCI	YNCF	YREL	YSEH
YFED	YNEJ	YRES	YSEK

Y Assemblies with Parker Solenoid Valves will be discontinued after September 20, 2004

Sun Hydraulics is revising manifold assemblies that utilize Parker/Waterman solenoid valves. Sun part number 750-1*0 (normally open stem only) and 750-2*0 (normally closed stem only). The Parker valves were only rated to 3000 psi. **Parker is discontinuing manufacture of these products and they will no longer be available.**

Sun has changed the manifolds to utilize a Sun DAAL*** solenoid in place of Parker. The Sun solenoid is rated at 5000 psi, manual override standard, and offers an expanded range of coil configurations and connectors. New body part numbers and model codes are assigned to differentiate the revised manifolds. **After December 31, 2004**, old style bodies, assemblies, and solenoid parts will not be available from Sun. Contact Parker Hannifin Corporation for parts to service old solenoids and coils.

Visit www.sunhydraulics.com for complete information and a full conversion table. **Products: Standard Valve Packages (Y Assemblies): Solenoid Operated Assembly Cross Reference or Products: Technical Information: Product Bulletins: September 2004, Y Assemblies with Parker Solenoid Valves.**

Sun Model Code System

Sun cartridges have a seven digit model code. Each of the digits in the seven digit sequence has a significance as shown in the typical model code. If a stainless steel cartridge is required, a slash and two letters must be added. See table on right and example below.

The three letter Body Model Code reference applies to most standard line mount bodies and sandwich bodies.

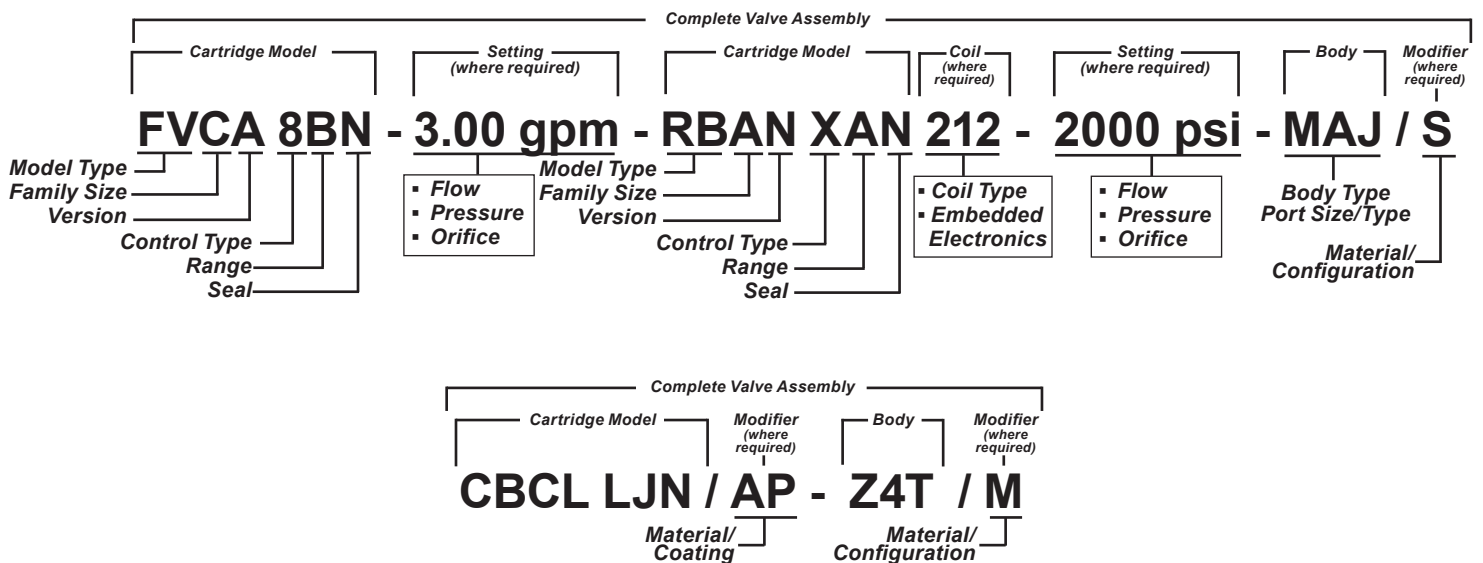
The first two digits of the Body Model Code indicate the body type and the third letter advises the main port size/type.

If the body is required in ductile iron, a slash and a fourth letter is added as shown in the top example. If other requirements are needed refer to the proper modifiers shown in the table.

CARTRIDGE MODIFIERS			
Cartridge Configuration	Modifier	Example	
Stainless Steel, Passivated	/AP	See below	

MANIFOLD MODIFIERS			
Body Configuration	Modifier	To Convert to Viton Change Modifier to:	Examples
Aluminum	None	/V	ZMQ becomes ZMQ/V
Ductile Iron	/S	/Y	ZMQ/S becomes ZMQ/Y
Aluminium-metric	/M	/Z	ZMQ/M becomes ZMQ/Z
Ductile Iron-metric	/T	/W	ZMQ/T becomes ZMQ/W

EXAMPLES OF TYPICAL SUN MODEL CODE STRUCTURE:



EXAMPLES:

RPEC LAN - 1500 psi - FEL

Pilot Operated Relief Valve, 25 gpm, Buna-N Seals, set at 1500 psi;
Through Port, Aluminum Body, Ports 1 and 2: SAE-12, 1/4" NPTF Gage Port.

DLDA XCN 612 - GAJ/S

Solenoid Operated, 2-position, 2-way, Spool Valve, No Manual Override, Buna-N Seals;
90 Degree, Ductile Iron Body, SAE-8 Ports, 12 V DC Coil, AMP Junior Timer.

FXEA LAN - 15.0 gpm - ICM

Fixed Orifice, Pressure Compensated Flow Control Valve, Tuning Adjustment, Buna-N Seals, set at 15.0 gpm;
Inline Ports, Aluminum Body, SAE-12 Ports.

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NOTES

NOTES

WARRANTY INFORMATION, PERFORMANCE ASSURANCE, AND APPLICATION LIMITATIONS

Caution

Sun Hydraulics manufactures a variety of cartridge valves that will fit into the same Sun cavity. Each cartridge is marked with a seven-digit part identification code and a four-digit date code, stamped on the hex surfaces. Designers and users of Sun components are advised that **physical interchangeability of cartridges does not necessarily mean functional interchangeability**. When replacing any Sun cartridges, users

should first check with the manufacturer's service literature, their local Sun distributor, or the Sun factory before making any part substitutions.

NOTE: To avoid serious injury, the manufacturer's service literature must be consulted before working on any hydraulic system.

Limited Warranty

Sun Hydraulics warrants its products free from defects in material, workmanship, and design for a period of three years after their installation, provided the installation date is less than one year after manufacture. **"O-rings" and seals are specifically exempted from this warranty.** In no instance is there any warranty of fitness for a particular use and Sun cannot and does not accept responsibility of any type for any of its products that have been subjected to improper installation, improper application, negligence, tampering, or abuse, or which have been repaired

or altered outside of the Sun Hydraulics factory. Sun liability under this warranty shall extend only to repair or replacement, f.o.b. Sun's factory, of any defective part or product determined by inspection as not conforming to this warranty. Sun makes no other warranties, expressed or implied, and is not responsible for any consequential damages resulting from use by any buyer or user, Sun Hydraulics' liability being limited to the value of product sold or obligation to replace a defective part.

Performance Assurance

All Sun cartridge valves are individually tested at the factory and preset to specific pressure or flow settings where indicated in this product listing. However, as the actual performance of buyers' equipment cannot be reproduced in Sun's testing laboratory, assurance of suitability of Sun products

in the buyer's application is the responsibility of the buyer. This is typically accomplished by the manufacture of a prototype followed by a test or qualification program on the part of the buyer.

Application Limitations

Sun product designs and manufacturing facilities have been specifically developed to provide products for commercial, industrial and mobile hydraulic applications and Sun products are only warranted for these types of uses. **Sun's distributors are not authorized to approve the use of Sun products in any of the following applications:**

- Any product that comes under the U.S. Federal Highway Safety Act, including, but not limited to, steering or braking systems for passenger-carrying vehicles or on-highway trucks.
- Aircraft or space vehicles.

- Ordnance equipment.
- Life support equipment.
- Any end product that comes under the U.S. Nuclear Regulatory Commission rules and regulations, including, but not limited to, products used in nuclear power plant operations.

Specific written approval for any application of Sun products in any of the above named applications should be obtained from Sun Hydraulics. Consultation with Sun distributors or factory engineers is advisable in any situations where applicability is questionable.