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Specifications, descriptions and illustrative material contained herein were accurate as known at the time this publication was approved for printing.

Sun Hydraulics Corporation reserves the right to discontinue models at any time, or change prices, specifications or designs without notice or incurring obligation.

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Service Instructions

Servicing 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.

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.

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.
- 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

	Installation Torque Values	_		
Series	Nm	Hex	Thread	Cavities
Z	11 - 14	4,8 mm	M20	T-382A
Р	27 - 33	22,2 mm	M16	T-8A, T-9A
0	27 - 33	19,1 mm	M16	T-162A, T-163A
1	40 - 50	22,2 mm	M20	T-10A, T-11A, T-13A, T-21A, T-31A, T-51A, T-61A
2	60 - 70	28,6 mm	1"-14 UNS	T-2A, T-3A, T-5A, T-22A, T-32A, T-52A, T-62A
3	200 - 215	31,8 mm	M36	T-16A, T-17A, T-23A, T-33A, T-53A, T-63A
4	465 - 500	41,3 mm	M48	T-18A, T-19A, T-24A, T-34A, T-64A

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



Cartridge Control Options

4,0 mm He

4.0 mm

29.7 mm

diameter

31.8 mm diameter

Panel

Hole

2,3 mm 7,6 mm

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 19,0 mm dia. Series 2 cartridges 25,4 mm 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.)



Zero Indicator

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	20,7 mm	55,1 mm	41,1 mm	41,1 mm
Series	1	2	3	4
	NCCB	NCEB	NCFB	NCGB
	NCCC	NCEC	NCFC	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)

4.0 m

J Socket Head Set Screw with Cap

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

nm Hex	(\sim
L/JJD_		
	۱H	N
<u> </u>	\sim	<u> </u>
14,3 mm	Hex	

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.





Service Kit No. Description	Use specifically with Control/Cartridge	Description	Notes
Adjustment Screw Kit 991-006 Adjustment Screw Kit 991-010	All F controls (Zinc plated steel) All J controls (Zinc plated steel)	Adjust Screw Q Q Seal Cap Q Q Adjust Locknut Screw	To assure a complete seal on the stem - release all pressure on the cartridge after setting. Then tighten locknut (and cap, on J).
Tamper Resistant Cover (Zinc plated steel) 991-000 991-001 991-002 991-003 991-001-A00 991-002-A00 991-003-A00 991-004-A00	All Sun Models with L adjustment (Except Counterbalance, Series 1 and 2) Series 0 - 19,0 mm hex Series 2 - 28,6 mm hex Series 3 - 31,8 mm hex Series 4 - 41,0 mm hex Series 1 - 22,2 mm hex Series 2 - 28,6 mm hex (Stainless steel) Series 3 - 31,8 mm hex (Stainless steel) Series 4 - 41,0 mm hex (Stainless steel) Series 1 - 22,2 mm hex (Stainless steel)		 Adjust valve to desired setting and tighten locknut. Using an arbor press or a soft hammer, install cover until it seats on cartridge hex. Cover is a press fit on cartridge shoulder.
991-032 991-033 991-032-A00 991-033-A00	For Series 1 and 2, Counterbalance Series 1 - 22,2 mm hex (Zinc plated steel) Series 2 - 28,6 mm hex (Zinc plated steel) Series 1 - 22,2 mm hex (Stainless steel) Series 2 - 28,6 mm hex (Stainless steel)		
Key Lock Kit 993-008	For all Sun cartridges with L adjustment (except Series 0 and counterbalance cartridges).	Adapter Lock Assembly Key Wire Stop Ring	 Remove original wire stop ring and locknut. Thread on the adapter locknut and install new wire stop ring through slot provided. Adjust valve to desired setting and tighten adapter locknut. Slide lock assembly over adapter, lock and remove key.
K Handknob Kit (Plastic) 991-211 991-222 (Plastic) Panel Handknob Kit (Plastic) 991-215 Panel Handknob Kit (Plastic) 991-216	Use this kit to adapt all L controls to K controls (except Series 0 and counterbalance cartridges). K control for Series 0 O controls All Series 1 cartridges 22,2 mm hex, M20 thread O controls All Series 2 cartridges 28,6 mm hex, 1"-14 thread	Handknob Handknob Handknob Handknob	Only cartridges date stamped "41" or later and originally supplied with plastic knobs. Lock knob snaps onto locknut furnished on cartridge.
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, NCFC, NCGB, NCGC, NFEC, NFED, NFFC, NFFD only FDBA, NCCB, NCCC, NECC, NECD only	Handknob Lockring O-ring Existing Cartridge	Only for cartridges originally supplied with an H handknob. Valves can not be modified in the field. Note: The H control is Only available for the cartridges shown to the left.

Cartridge Control Kits continued on next page.





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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 <u>www.sunhydraulics.com</u> 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.)

500



* 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.

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.

Cartridge and Seal Detail
\frown
for T–382A Cavity



Series P Cartridges T-8A Cavity Viton Kit Buna-N Kit Number Number 990-008-006 990-008-007 Model Code CXAA NFAB XACC DAAA RBAE XAOA DAAC RBAR XACA See page 23 for Coil Seal Kits T-8A Cavity Viton Kit Buna-N Kit Number Number 990-108-006 990-108-007 Model Code DAAM No Coil Seal Kits required. Mechanically actuated. T-8A Cavity Viton Kit Buna-N Kit Number Number 990-508-006 990-508-007 Model Code DAAH DAAP No Coil Seal Kits required. Pneumatically and Ĥydraulically 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







Series 0 Cartridges

T-162A Cavity

	Vi. N	ton Kit umber		Bund Nu	ı-N Kit mber	
	990-	162-006		990-1	62-007	
Model C	ode					
CDAP CDAQ CKBM CKBP CNAC CNBC	COBM CSAM CSAN CSAW CSAY CXAD	CXBA CXBB CXBG CXBM FCBB FQBA	FXBA NCBB NFBC RBAG RBAM RDBA	RDBX RPCC RQCB XZCA XZCC XZCA	XZOC	

Cartridge and Seal Detail



T-163A Cavity								
	Vi N	ton Kit umber		Bund Nu	ı-N Kit mber			
	990-	-163-006		990-1	63-007			
Model C	ode							
CKBB CKBD CKBG COBA	COBG CSAX CSAZ FRBA	LPBA LPBC LPBD LRBA	LRBC PBBB RSBC RVBA	RVBB SQBB XZAA XZCB	XZOB XZOD			

Cartridge and Seal Detail







SUN

Cartri	idge Se	eal Kit	S				
Series	1 Cartr	idges					
T-11	A Cavity	/					Cartridge and Seal Detail
	Vi N 990	iton Kit J umber)-311-006		Bun Nu 990-3	a-N Kit umber 311-007		
Model C	Code						
CKCV	DKDC	DODC					- for
T-11	A Cavity	/					T-11A Cavity
	Vi N	iton Kit Jumber		Bun Nu	a-N Kit ımber		
	990	-211-006		990-2	211-007		
Model C	Code						
CACA	CACG	CACK	CACL				=
T-21	A Cavity	/					Cartridge and Seal Detail
	Vi N	iton Kit lumber		Bun Nu	a-N Kit umber		For Models:
	990	-021-006		990-0	021-007		
Model C	ode						PVDA QCDD
CVCV CWBG CWCA CWCG CWCK CWCL DKDP	DKDR DKDS DODP DODR DODS DPBM DPBN	DPBO DPBP DRAX DRAY DRBM DRBN DRBO	DRBP DRBR DVBM DVBN DVBO DVBP FVCA	HVCA MWCA MWCB MWCG PSDB PSDL PSDP	PSDT PVDA PVDB PVDH QCDA QCDB QCDC	QCDD QCDE RVCD XMBA XMCA XMCA XMOA XMOB	PVDB For All Other Models for T-21A Cavities
T-3 1	A Cavity	/		P	37.77%		Cartridge and Seal Detail
	N N	iton Kit Jumber		Bun Nu	a-N Kit imber		
	990	-031-006		990-0	031-007		
Model C	Code	ES A A	FORD	FROD			- \ \ \
DSCL DSCO	DSCS DSCX DSCY	FSAA FSAS FSBA	FSBS FSCA	FSCH FSCS	LHDA LHDT XRCA		for T-31A Cavity
T-31	A Cavity	/					
		iton Kit lumber		Bun Nu	a-N Kit umber		
	990	-431-006		990-2	431-007		
Model C	ode						_
DNDC			C	22 Fr C .	I Coal Vit		
T-61	A Cavity	,	See page	e 25 jor Col	i Seat Kus		Cartridge and Seal Detail
	Vi	iton Kit		Bun	a-N Kit		
	A 990	umber		Nu 990-0	1061-007		
Model C	790 Tode	001-000		27 0 -0	501-007		$\gamma \gamma \gamma \gamma \gamma$
DCCA DCCB DCCC	DCCD DCCF XRCC						
							\frown

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



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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 (28,6 mm hex, 1"–14 thread).

- The seals were changed from 2,38 mm cross-section to 1,59 mm 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 1.59 mm 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 1.59 mm seal kit should be used.
- If the series 2 cartridge you are servicing is date stamped 1985 or earlier, the 2,38 mm 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.)

Buna-N: #990-103-007

Buna-N: #990-003-007

Ordering Seal Kits for Series 2 Cartridges (2 port):

These Combination Kits contain both 1,59 mm and 2,38 mm Seal Kits.

Order these kits if you are unsure about which seal sizes are required:

Order these kits if the Series 2 Cartridge is date stamped

T-3A and T-5A Cavities

December 31, 1985 or earlier:

Viton: #990-103-006

Viton: #990-003-006

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: Buna-N: #990-102-007

Viton: #990-102-006

These Combination Kits contain both 1,59 mm and 2,38 mm 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 1,59 mm Seal Kits if the Series 2 Cartridge is date stamped January 1, 1986 or later:

Viton: #990-202-006 Buna-N: #990-202-007 T-2A Cavity Cartridge and Seal Detail Buna-N Kit Viton Kit 2,38 mm s–section Seals Number Number Cros 990-202-006 990-202-007 For Models: COFA PBFC COFE PPFA COFC PPFB LPFA PPFC LPFC PPFD PBFA PPFE PBFB Model Code Special Cross-section: CBDA DVCA DVCB DVCC CBEY COFA LOFA PBFC XBAA 2,38 mm note proper Nominal orientation PPFB PPFC CBDB CBDC CCEA CKEA COFB COFC LOFB XBBA XBCA CKEB CKEC CKED PPFD CBDD COFO DVCD XBOA LOFD 1.59 mm CBDG CBDH CXEE FAFA FBFA LOFO LPFA **XROR** Cro section Seals PRFB Ъď For All Other Models CKEE LPFC LPFR DKFC FRDA CBDL PRFR CBEA CBEB FRDB FRDC DKFD RSFC Пe DOFC LRFA CKEG RSFE 22,9 21.6 17.5 CKEH CKEI CKEV 1,59 mm Nominal CBEG DOFD FRDD LRFC RSFH LKFA LKFB LKFC DPCA DPCB MBEA MBEB RVEA RVEB CBEH for T-2A Cavities CBEI CNED DPCC CBEJ MBEG SCEA LKFD LKFO CBEL CNEE DPCD MBEM SQFB 24.4 23.1 19,3 CBEW CNFF DRCD PRFR SXFA

T-2A Cavity Cartridge and Seal Detail Viton Kit **Buna-N** Kit GLYD® Ring* Number Number For Models: 990-302-006 990-302-007 RSFS **RVFS** Model Code RVET CAEA CAEG CAEK CAEL ЪC. For All T-2A Cavity Viton Only **Other Models** Viton Kit Buna-N Kit for Number Number T-2A Cavity 990-402-006 990-402-007 Model Code GLYD® Ring is a registered trademark of W.S. Shamban RSFS RVES RVET & Co., Los Angeles, California, USA.

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



for T-2A Cavities

Cartr Series	idge So 2 Cartr	eal Kit idges	S				
T-3	A Cavit	V					Cartridge and Seal Detail
	V	iton Kit		Bun	a-N Kit		2,38 mm Cross-section Seals
	99()-203-006		990-2	203-007		For Models:
Model (Code						
CNFB CXFB CXFD	CXFF LRGE NQEB	NQED RBAA RBAB	RGFA RPGB RPGC	RPGD RPGE RQGB	XCCA XCOA		Nominal Special Cross-section: Note proper orientation
See note stamped unsure a	on page 17 f Dec. 31, 198 bout which s	or ordering 5 or earlier a seal sizes are	Seal Kits for and for Com required.	Series 2 Car bination Kit	tridges date s if you are		For all Other
T-5	A Cavit	V					Models
	V N	iton Kit Number		Bun Nu	a-N Kit mber		21.6 17.5 Cross-section Seals
	990)-203-006		990-2	203-007		for T-3A/T-5A Cavities
Model (Code						- 1,59 mm (FDel)
CNEC CNFA CNFC CXEB CXEC	CXED CXFA CXFG DFDA DFDB	FCAB FCDB FDCB FLFA FQEA	FXDA LRFE NBFA NCEA NCEC	NFDB NFDC NFDD RCFB SCEB	XDCA XDCB XCOA		
See note stamped unsure a	on page 17 f Dec. 31, 198 bout which s	or ordering 5 or earlier a seal sizes are	Seal Kits for and for Com required.	Series 2 Car bination Kit	tridges date s if you are		for T-3A/T-5A Cavities
T-3	A Cavity	y					Cartridge and Seal Detail
	V M	iton Kit Number		Bun Nu	a-N Kit mber		GLYD® Ring*
	99()-303-006		990-3	303-007		
Model (Code						
RBFA	RDFA	RDFT	RPGS	RPGT			
See note stamped unsure a	on page 17 f Dec. 31, 198 bout which s	or ordering 5 or earlier a seal sizes are	Seal Kits for and for Com required.	Series 2 Car bination Kit	tridges date s if you are		T-3A Cavity
T-2	2A Cavi	ty					Cartridge and Seal Detail
	V	iton Kit		Bun	a-N Kit		\sim
	990)-022-006		990-0	022-007		
Model (Code						
CVEV	DKFR	DPCN	DVCO	MWEG	PVFC	XNCA	— (<u>```````````````````````````````````</u>
CWEA	DOFP	DPCP		PSFB	PVFH	ANOA	T-22A Cavity
CWEL	DOFS	DVCM	MWEA MWEB	PVFA PVFB	SXEG		
T-3	2A Cavi	ty					Cartridge and Seal Detail
	V	iton Kit		Bun	a-N Kit		$\frown \frown \frown \frown$
	990)-032-006		990-0	32-007		
Madel (Code	. 0.52 000		<u> </u>			\uparrow \uparrow \uparrow \uparrow \uparrow
DSDD	DSES	FSDC	FSDR	XSCA			
DSEH DSEL DSEO	DSEX DSEY FSDA	FSDD FSDG FSDH	FSDS LHFA LHFT				T-32A Cavity
T- 6	2A Cavi	ty					Cartridge and Seal Detail
	V	iton Kit Sumber		Bun	a-N Kit mber		
	990)-062-006		990-0)62-007		
Model (Code						
DCDA DCDB	DCDC DCDD	DCDF XSCC					for T-62A Cavity

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

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



(......)

(.....)

Series 3 Cartridges

T-16	T-16A Cavity							
	Vi N	iton Kit Jumber		Buna-N Kit Number				
	990	-016-006		990-016-007				
Model C	ode							
CNGC CNHC CXGB CXGD CXHA CXHF DFEA DFEB FCEB FDEA	FLHA FQGA FXEA LRHE NCFB NCFC NCGA NFEB NFEC NFED	NHEA NHEB NHEC NHED RPIC RPID RQIB SCGB XICA	XIOA XIOB XIOC					
Viton Kit Number				Buna-N Kit Number				
	990	-316-006		990-316-007				
Model C	ode							

Model Code

RDHA RPIT RPIS

T-17A Cavity						
	Vi N	ton Kit umber		Bund Nu	ı-N Kit mber	
	990	-017-006		990-0	017-007	
Model C	ode					
CBFA CBFB CBFC CBFD CBFG CBFH CBFH CBGA CBGB CBGG CBGH CBGL	CBGY CCGA CKGA CKGB CKGC CKGC CKGE CKGF CKGG CKGH CKGI	CKGV CNGD CNGE CNGV CNHE COHA COHB COHC CXGE CXGE CXHC DKHD	DOHC DOHD FAHA FBHA FREA FXEV LKHA LKHB LKHC LKHD LOGC LOHA	LOHB LOHC LOHD LPHA LPHC LRHA LRHB LRHC MBGA MBGB MBGG	MBGM PBHB PBHF PPHB PPHC PPHE PRHB PRHB PRHR RSHC RSHE	RSHH RVGA RVGB RVGF SCGA SQHB XHBA XHCA XHOA XHOC
	Vi N	ton Kit umber		Bund Nu	ı-N Kit mber	
	990	-117-006		990-1	17-007	

Model Code

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

Viton Kit

Number

990-023-006

T-17A Cavity						
Viton Kit Number	Buna-N Kit Number					
990-217-006	990-217-007					

Buna-N Kit

Number

990-023-007

Model Code

RSHS RVGT RVGS

T 00	A 0 !!
-23	A Cavit

Model Code

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

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.



Series 3 Cartridges



for T–63A Cavity

DCEA DCEB DCEC DCED DCEF XTCC



Series 4 Cartridges

T-19A Cavity

Viton Kit

Number

990-019-006

T-1	T-18A Cavity								
	V N	iton Kit Number		a-N Kit ımber					
	990)-018-006	990-018-007						
Model C	Model Code								
CNIC CNJC CXIB CXID	CXJA CXJF DFFA FCFB	FDFA FLJA FQIA FXFA	NCGB NCGC NCIA NFFC	NFFD RPKC RPKD RPKE	RQKB XKCA XKOA XKOC				
	Viton Kit Number			Buna-N Kit Number					
	990)-318-006		990-	318-007				
Model C	Code								
	RPKS BPKT								

Cartridge and Seal Detail



Cartridge and Seal Detail



Model Code CBHA CBHG CBIA CBIB CBIG CBIH CBIL CBIY CCIA CCIA CKIC CKID CKIE CKIF CKIG CKIH CKII PRJB PRJR RSJC RSJE RSJH RVIA RVIB RVIF XJCA XJOA XJOB XJOC COJB COJC CXIE CXJC DKJB DKJC DKJD DOJC DOJD FAJA FBJA FRFA FXFV LKJA LKJB LKJC LKJD LOJA LOJA LOJB LOJC LOJD LPJA LPJC LRJA LRJB LRJC PBJB PBJC PBJF PPJB CNID SCIA SQJB XJBA CKIB COJA PPJF Buna-N Kit Viton Kit Number Number 990-219-006 990-219-007 Model Code RSJS RVIS RVIT Buna-N Kit Viton Kit Number Number 990-119-006 990-119-007 Model Code CAIL CAIA CAIG CAIK

Buna-N Kit

Number

990-019-007

Buna-N Kit

Number

990-024-007

XQOC

PVJH RVID XQCA 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.

Viton Kit

Number

990-024-006

DOJP DOJR DOJS FVFA

PVJA PVJB PVJC

PVJD

T-24A Cavity

CWIL DKJP DKJR DKJS

Model Code

CVIV CWIA CWIG CWIK



Series 4 Cartridges



T-64A Cavity Cartridge and Seal Detail Buna-N Kit Number Viton Kit Number heo/ 990-064-006 990-064-007 Model Code DCFA DCFB DCFC DCFD DCFF XVCC





Coil Seal Kits for Solenoid Cartridges

Series P Cartridges

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



Series 1 Cartridges

770-' Kits	*** Coils for Metal	Hous	ing (Ro	und) Co	oils		Coil Detail
	Manu Overri Optio	ıal ide on		Kit I	Number		'M' Nut Option
M X Model Code			990-770-006 990-770-006				
DAAL DBAL DLDA DMDA	DNDA D DNDC D DNDY FI DTCA FI	TDA WDA PCC PCH	HDDA PRDL PRDM PRDN	PRDP PSDL PSDP RBAN	RBAP		



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.

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- 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	ISO/DIN 43650 Form A	SAE J858A	AMP Junior Timer ¹	Twin Lead	Metri-Pack 150-2M ²	Deutsch DT04-2P ³
Vollage	Voltage Range	Coil Part Number Only	Coil Part Number Only	Coil Part Number Only	Coil Part Number Only	Coil Part Number Only	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.



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

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.



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	



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

	Coil Nut O-ring Weatherized Coil (not included in Kit)	D-ring Spacer O-ring
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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Int'l Service Bulletin Web Rev 09/2009 #999-901-278

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



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.

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

			All Ports Open	All Ports Blocked	
	Series	Cavity	Cavity Plug Model Code*	Cavity Plug Model Code	
	Р	T-8A	XAOA-XX*	XACA-XX*	
2	0	T-162A	XZOA-XX* +XZOC-XX*	XZCA-XX* XZCC-XX*	
	1	T-10A		XFCA-XX*	
	1	T-13A	XFUA-XX"	XGCA-XX*	
(1)	2	T-3A		XCCA-XX*	<u> </u>
\odot	2	T-5A	ACUA-AA	XDCA-XX*	\bigcirc
	3	T-16A	XIOA-XX*	XICA-XX*	
	4	T-18A	XKOA-XX*	XKCA-XX*	
			+ Flush Style Plug. Tighten via 5/16" Al	llen Wrench	



+ Flush Style Plug: Tighten via 5/16" Allen Wrench									
	Port 1 Open to External SAE-4 Port, Port 2 Blocked	Port 2 Open to External SAE-4 Port, Port 1 Blocked							
\$ Cavity	Cavity Plug Model Code*	Cavity Plug Model Code							
T-8A	XACA-EX*	XACC-EX*							
T-162A	XZCA-EX*								
T-10A	XFCA-EX*								
T-13A	XGCA-EX*								



Plugs for Three Port Cavities

Serie P

0

1

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

			All Ports Open	Port 1 Open to External SAE-4 Port, Ports 2 and 3 Blocked	kr − − − − 7 i
3 0	Series	Cavity	Cavity Plug Model Code*	Cavity Plug Model Code	
	Р	T-9A		XACB-EX*	
2	0	T-162A	XZOD-XX*		
	1	T-11A	XEOB-XX*		
	2	T-2A	XBOB-XX*		
(1)	3	T-17A	XHOB-XX*		(1)
	4	T-19A	XJOB-XX*		

Cavity Plugs continued on next page.

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



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

Plugs for Three Port Cavities (continued)

Plugs for Four Port Cavities (Internal Locating Shoulder)





Ser

		All Ports Open			
ries	Cavity	Cavity Plug Model Code*	Buna-N	Viton	
1	T-21A	XMOB-XX*			

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 Buna-N Viton Code*	
4	1	T-31A	XFOA-XX*	XRCA-XX*	
	2	T-32A	XCOA-XX*	XSCA-XX*	
	3	T-33A	XIOA-XX*	XTCA-XX*	
(2)	4	T-34A	XKOA-XX*	XVCA-XX*	
				(avity 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 Six Port Cavities

			Ports 1, 2, 3 and 4 Open Ports 5 and 6 Blocked	All Ports Blocked	
	Series	Cavity	Cavity Plug Model Code*	Cavity Plug Model Code*	
	1	T-61A	XMOA-XX*	XRCC-XX*	
4	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*		
	1	T-61A	XMOB-XX*		
(5) (4) (4)					

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



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





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



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

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

For detailed and complete information on Sun's full list of cavity plugs visit <u>www.sunhydraulics.com</u>. **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

4,8 mm Internal Hex, 3/8 x 24 UNF - 2B Thread

Cavity	Cavity Form Tool	HIGH SPEED STEEL	TITANIUM NITRIDE COATED	
Curuy	Description	Sun Part Number	Sun Part Number	
CXZA T-382A 2 Port	Form Drill TD-382A Form Reamer TR-382A Metric Tap 3/8 x 24 UNF-2B	994-382-001 995-382-001 998-801 4,0 mm Internal Hex, 3/8 x 24 U	994-382-101 995-382-101 998-801-101 VNF - 2B Thread	
CSZN T-382A 2 Port	Form Drill TD-382A Form Reamer TR-382A Metric Tap 3/8 x 24 UNF-2B	994-382-001 995-382-001 998-801	994-382-101 995-382-101 998-801-101	

Series P Cartridges

22,0 mm Hex, M16 x 1.5 Thread

T-8A 2 Port	Form Drill TD-8A Form Reamer TR-8A Metric Tap M16 x1.5-6H	994-008-001 995-008-001 998-991	994-008-101 995-008-101 998-991-101
T-9A 3 Port	Form Drill TD-9A Form Reamer TR-9A Metric Tap M16 x 1.5-6H	994-009-001 995-009-001 998-991	994-009-101 995-009-101 998-991-101

Series 0 Cartridges

19,0 mm Hex, M16 x 1.5 Thread

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



Cavity Form Tools

Series 1 Cartrid	ges	22,0 mm Hex, M20 x 1.5 Thr	ead
Cavity	Cavity Form Tool	HIGH SPEED STEEL	TITANIUM NITRIDE COATED
Curity	Description	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	994-010-001 995-010-001 998-998	994-010-101 995-010-101 998-998-101
T-11A 3Port	Form Drill TD-11A Form Reamer TR-11A Metric Tap M20 x 1.5-6H	994-011-001 995-011-001 998-998	994-011-101 995-011-101 998-998-101
T-13A 2 Port (Short)	Form Drill TD-13A Form Reamer TR-13A Metric Tap M20 x 1.5-6H	994-013-001 995-013-001 998-998	994-013-101 995-013-101 998-998-101
T-21A 4 Port	Form Drill TD-21A Form Reamer TR-21A Metric Tap M20 x 1.5-6H	994-021-001 995-021-001 998-998	994-021-101 995-021-101 998-998-101
T-31A 4 Port	Form Drill TD-31A Form Reamer TR-31A Metric Tap M20 x 1.5-6H	994-031-001 995-031-001 998-998	994-031-101 995-031-101 998-998-101
T-61A 6 Port	Form Drill TD-61A Form Reamer TR-61A Metric Tap M20 x 1.5-6H	994-061-001 995-061-001 998-998	994-061-101 995-061-101 998-998-101

Series 2 Cartridges

28,6 mm Hex, 1"-14 UNS Thread

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



Cavity Form Tools

Series 3 Cartridges

31,8 mm Hex, M36 x 2 Thread

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

Series 4 Cartridges

41,0 mm Hex, M48 x 2 Thread

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

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



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.
- 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



Mounting and Assembly of Sandwich Bodies

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.

5. 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 torgue of 40-45 lb.in. (4,5–5,0 Nm).

Steps to Avoid Seal Plate Leaks

- 1. Make sure the mounting surface is flat and without burrs.
- 2. Do not polish the mounting surface. (Machining marks help to keep the O-rings from acting as pumps.)
- 3. Remove any dings on the corners of seal plates that could create gaps.
- 4. Studrods or cap screws must not bottom out in the threaded mounting holes.
- 5. 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



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	Seal Retainer Only		Saala	Seal Kit Only		Seal and Seal Retainer Kit
Interface	Seal Retainer	Retainer Number	Seals	Kit Container	Kit Number	Kit Number
ISO 03	/			Vito	on	Viton
(CETOP 3) NFPA D03		001 012		4) 500-101-012	990-105-003	990-106-003
Was NFPA D01:		991-013		Buna	a-N	Buna-N
ISO 03 (CETOP 3)				4) 500-001-012	990-105-007	990-106-007
ISO 05				Vito	on	Viton
(CETOP 5) NFPA D05	$\circ \circ \circ$	001 005		5) 500-101-014	990-110-003	990-111-003
Was NFPA D02:		991-005	0000	Buna	a-N	Buna-N
(CETOP 5)				5) 500-001-014	990-110-007	990-111-007
				Vito	on	Viton
ISO 05 x. v				5) 500-101-014	999-120-003	9990-120-010
"02H" U.S.		991-008	ြုံလိုလ်ျ	<i>Buna-N</i>		Buna-N
				5) 500-001-014	000 120 007	000 120 000
				2) 500-001-010	990-120-007	990-120-009
	°°°°°	991-009	° 0 ° 0 0 0		on	Viton
ISO 05 x, y				2) 500-101-012	990-120-004	990-120-011
(CETOP 5) RPS5H				Buna-N		Buna-N
				5) 500-001-014	990-120-008	990-120-012
				2) 500-001-012		Viter
ISO 07	6			2) 500-101-111	on	Viton
(CETOP 7) NFPA D07			0°0 •	4) 500-101-118	990-140-002	990-140-003
Was NFPA D04:	$\mathcal{O}_{\mathcal{O}}$	990-140-001	႞ႝ၀ၟ၀ႋ႞	Buna	Buna-N	
ISO 07 (CETOP 7)				2) 500-001-111	990-140-007	990-140-008
				4) 500-001-118	20	
ISO 08			000	2) 500-101-114	///	
NFPA D08				4) 500-101-121	990-130-003	
Was NFPA D06:				Buna	a-N	
ISO 08 (CETOP 8)			2) 500-101-114	990-130-007		
				4) 500-110-121		



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



INCH STA	INDARDS	METRIC STANDARDS		
Kit Contents	Kit Number	Kit Contents	Kit Number	
4) 1/4-20 Studnuts		4) M6 Studnuts		
4) approximately 7" (178 mm) long 1/4-20 Studrods	992-001	4) approximately 7" (178 mm) long M6 Studrods	992-101	
4) 1/4-20 Studnuts		4) M6 Studnuts		
4) approximately 12" (305 mm) long 1/4-20 Studrods	992-002	4) approximately 12" long (305 mm) long M6 Studrods	992-102	
50) 1/4-20 Studnuts		50) M6 Studrods		
10) approximately 36" (914 mm) long 1/4-20 Studrods	992-003	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) M6 Studnuts		
 4) 1/4-20 Studnuts 4) 1/4-20 Studrods cut to customer specified length: <u>+</u> .062" (<u>+</u> 1,5 mm) 	922-600	4) M6 Studrods cut to customer specified length: <u>+</u> .062" (<u>+</u> 1,5 mm)	992-800	

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

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.

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.



14	Mounting Bracket Dimensions in inches Kit						
Interface	Thread Size	В	C	D	Ε	Part No.	
CETOP 3	.312-18UNC x .62 lg.	9,4	7,9	25,4	60,5	991-021-001	
CETOP 3	M8 x 1.25 x 16,0 mm lg.	9,4	7,9	25,4	60,5	991-021-002	
CETOP 5	.312-18UNC x .62 lg.	9,4	7,9	25,4	60,5	991-021-003	
CETOP 5	M8 x 1.25 x16,0 mm lg.	9,4	7,9	25,4	60,5	991-021-004	
СЕТОР 5 х, у	.375-16UNC x .75 lg.	14,2	11,2	35,1	104,9	991-021-005	
СЕТОР 5 х, у	M10 x 1. 5 x 20,0 mm lg.	14,2	11,2	35,1	104,9	991-021-006	
CETOP 7	.375-16UNC x .75 lg.	14,2	11,2	35,1	104,9	991-021-007	
CETOP 7	M10 x 1.5 x 20,0 mm lg.	14,2	11,2	35,1	104,9	991-021-008	
CETOP 8	.500-13UNC x 1.0 lg.	14,2	14,2	35,1	124,0	991-021-009	
CETOP 8	M12 x 1.75 x 25,0 mm lg.	14,2	14,2	35,1	124,0	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.

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*	YPFD-***-C*	PBFB-***-B3*	YSHA-***-C*	RSHC-***-H6*
YCGE-***-G*	CBGG-***-HP*	YPFE-***-AB	PBHB-***-BK2	YSHB-***-C*	RSHC-***-H7*
YCGE-***-H*	CBGH-***-HP*	YPFF-***-AB	PBHB-***-BKJ	YSHC-***-C*	RSJC-***-K8*
YCGG-***-A*	CBGA-***-HQ*	YPFG-***-AB	PPHB-***-BK2		
YCGG-***-G*	CBGG-***-HQ*	YPFH-***-AB	PPHB-***-BKJ		
YCGG-***-H*	CBGH-***-HQ*	YPFI-BBN-BB	PBHC-BBN-BK2		
YCGH-***-A*	CBGA-***-HN*	YPFL-BBN-BB	PPHC-BBN-BKJ		

FUNCTIONAL AND PHYSICAL REPLACEMENTS

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 210 bar. **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 350 bar, 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 <u>www.sunhydraulics.com</u> 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.

EXAMPLES OF TYPICAL SUN MODEL CODE STRUCTURE:

CARTRIDGE MODIFIERS Cartridge Modifier Example Configuration Stainless Steel, /AP See below Passivated **MANIFOLD MODIFIERS** To Convert to Viton Body Modifier Examples Configuration Change Modifier to: /VZMO becomes ZMO/V Aluminum None ZMQ/S becomes ZMQ/Y Ductile Iron /S /Y Aluminium-ZMQ/M becomes ZMQ/Z /M 17 metric Ductile Iron-T/\// ZMQ/T becomes ZMQ/W



metric

CWIA LIV - WGZ/Z*

Vented Counterbalance Valve, 480 L/min., 3:1 Pilot Ratio, 70-280 bar, Viton Seals; Direct Mount 1.25" SAE Code 62 Aluminium Body, 1/4" BSPP Ports, Viton Seals. *The Viton Seal Modifier is only applicable if the 3 letter body contains another cartridge or a seal. See table above.

RPEC LAN - 105 bar - FEW

Pilot Operated Relief Valve, 95 L/min., Buna-N Seals, set at 105 bar; Through Port, Aluminum Body, Ports 1 and 2: 3/4" BSPP Ports, 1/4" BSPP Gage Port.

DLDA XCN 612 - GAU/S

Solenoid Operated, 2-position, 2-way, Spool Valve, No Manual Override, Buna-N Seals; 90 Degree, Ductile Iron Body, 3/8" BSPP Ports, 12 V DC Coil, AMP Junior Timer.

FXEA LAN - 60.0 L/min. - ICX

Fixed Orifice, Pressure Compensated Flow Control Valve, Tuning Adjustment, Buna-N Seals, set at 60.0 L/min.; Inline Ports, Aluminum Body, 1.00" BSPP Ports.



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Caution

Sun Hydraulics Limited 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

Warranty

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 Limited 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 Hydraulics Limited 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 cartridges valves are individually tested at the factory and preset to specific pressure or flow settings where indicated in this catalogue. 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 authorised to approve the use of Sun products in any of the following applications:

- Any steering or braking systems for passenger-carrying vehicles or on-highway trucks.
- Aircraft or space vehicles.

- Ordnance equipment.
- Life support equipment.
- Any end product which is used in a nuclear power plant application.

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.

