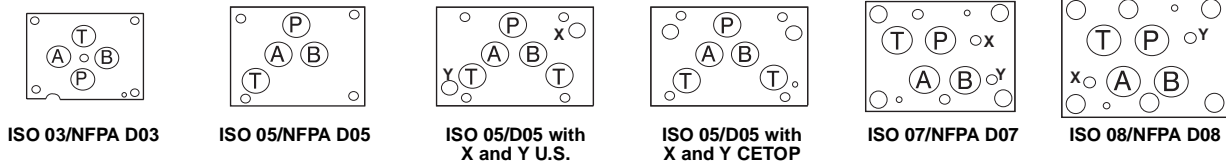


TECHNICAL PRODUCT INFORMATION

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. The sandwich and subplate bodies are available in five different interface patterns as shown below:



Mounting of ISO 03 Sandwiches

Sun’s ISO 03 sandwich bodies are designed for multi-functional use to permit maximum circuit flexibility. Due to this versatility, the ISO 03 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 “NIB” axis and the longitudinal axis as shown in Figure 1.

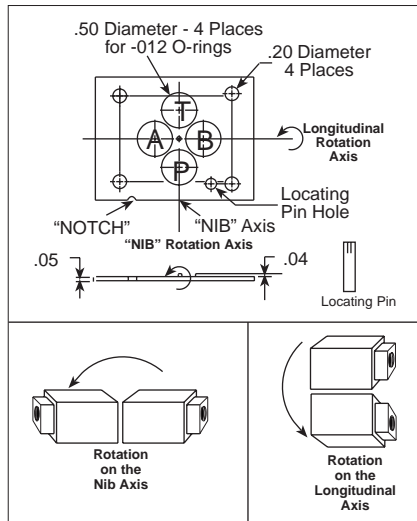


Figure 1: Body Rotation Reference

Rotation about the “NIB” axis enables the “A” and “B” port connections to be interchanged and rotation about the longitudinal axis enables the “P” and “T” ports to be interchanged.

All Sun seal plates are manufactured to current industry standards regarding port and mounting bolt locations. Each Sun D03 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 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 Sandwich Bodies stamped with numbers to orient body for desired function

The function symbols on the data pages for Sun’s ISO 03 sandwich bodies 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.

Some bodies can be mounted in four different orientations, as shown in Figure 1A on the facing page. The example below shows GBA. As demonstrated by the function symbols, this single body can be used to achieve four different functions: Meter-in A, Meter-out A, Meter-in B, and Meter-out B. The body drawing only indicates the Meter-out B and Meter-in A orientations because only one face of the body is shown. 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.

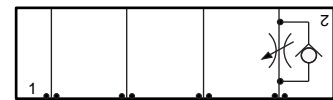
Rotation Example for ISO 03 bodies using subplate GBA.

STEP 1

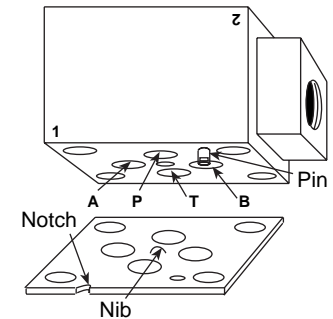
Begin with body view showing stamped number 1 in lower left corner. Note the location of P, T, A, and B ports and the

position of the cavity. This position places the P port of the sandwich nearest to the viewer. The sandwich is now oriented for the meter-out B function.

Meter-out B Function



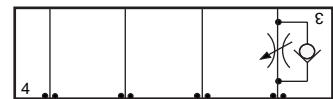
Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.



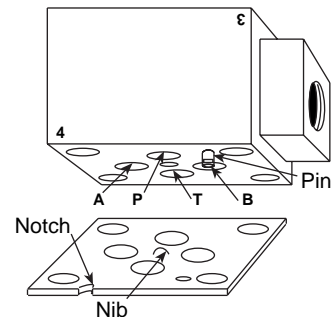
STEP 2

Rotate the sandwich on the longitudinal 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.



TECHNICAL PRODUCT INFORMATION

Sandwich Assemblies

ISO 03 / CETOP 3 FLOW CONTROL VALVES

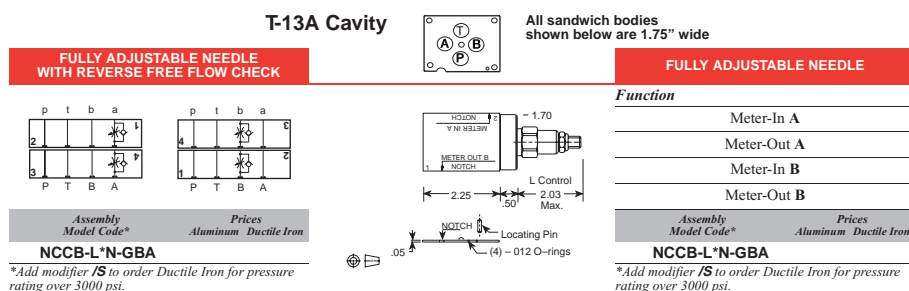
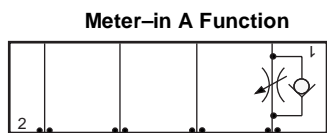


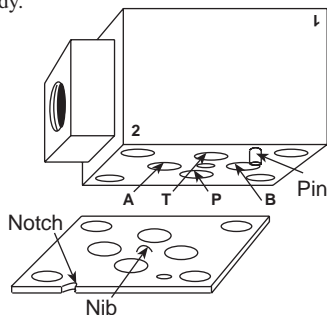
Figure 1A

STEP 3

Rotate the sandwich on the **nib** axis to orient body for meter-in A function.

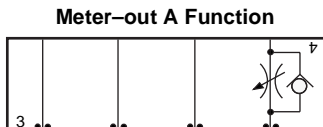


Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.

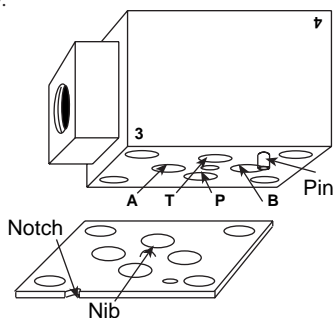


STEP 4

Rotate the sandwich on the **longitudinal axis** to orient body for meter-out A function.



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



Assembly of ISO 03 Sandwiches

1. Place the Sun seal plate, with the “NIB” facing upward, in the proper position to correctly align the mounting holes and fluid ports. At this time, the “NOTCH” in the seal plate must 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.

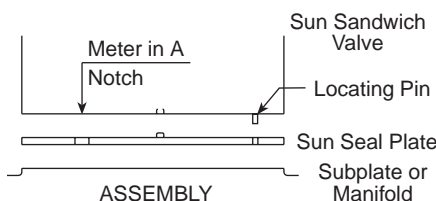


Figure 2: Assembly

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 in the same direction.

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

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 torque of 40-45 lb. in.

Mounting ISO 05 Sandwich Bodies

Sun ISO 05 sandwich bodies are available for many mounting configurations. The standard ISO 05/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 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 sandwich body can only be rotated about the “NIB” axis referred to in the ISO 03 sandwich section. There is no “NIB” on the ISO 05 subplate, it is used only for axis reference. Longitudinal axis rotation is not possible due to the lack of symmetry of the fluid ports.

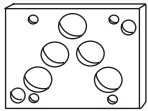
Mounting ISO 05 X,Y Sandwich Bodies

Sun ISO 05 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**

TECHNICAL PRODUCT INFORMATION

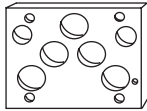
must be ordered separately to correctly match the other valve bodies in the stack. See the chart below for various product brands and part number information.

U.S. for use with		European (CETOP) for use with	
Double A	Q*-02	Rexroth	WEH 10
Parker-Hannifin	D31W	Bosch	
Racine	FD4-**HS-02		
Dynex Rivett	6600-O2H		
Snap-Tite	DG02		



Kit #990-120-009

- Includes:
- 1 - 911-008 seal plate
 - 5 - 500-001-014 Buna-N O-rings
 - 2 - 500-001-010 Buna-N O-rings



Kit #990-120-012

- Includes:
- 1 - 991-009 seal plate
 - 5 - 500-001-014 Buna-N O-rings
 - 2 - 500-001-012 Buna-N O-rings

1. Verify that the correct seal plates have been selected (if required) and position the sandwich body so that the fluid ports are correctly aligned and the correct port (A or B) is being controlled.
2. After determining the proper alignment of all the sandwich bodies, assemble the valve stack in the required functional order. Make sure all the O-rings are properly positioned. Install the directional valve and tighten the studnuts alternately to the proper torque of 105-110 lb. in.

Studkits for ISO 03 and ISO 05 Sandwich Bodies

To simplify the installation of ISO 03 and ISO 05 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:

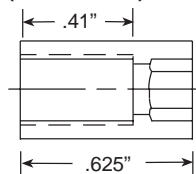
- 125,000 psi minimum tensile strength.
- 105,000 psi minimum yield point.
- 26 -32 Rc hardness.

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.

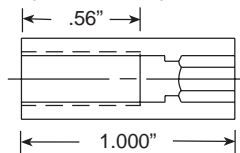
ISO 03

Internal Hex Size
5/32" U.S. 4 mm metric
10-24 (Part #350005) and M5 (Part #350009) Studnuts



ISO 05

Internal Hex Size
3/16" U.S. 5 mm metric
1/4-20 (Part #350004) and M6 (Part #350008) Studnuts



ISO 03 Studkits (recommended torque - 40-45 lb. in.)

Inch Standards

- (4) 10-24 Studnuts and (4) approximately 7" long 10-24 studrods **Kit # 992011**
- (4) 10-24 Studnuts and (4) approximately 12" long 10-24 studrods **Kit # 992012**
- (50) 10-24 Studnuts and (10) approximately 36" long 10-24 studrods **Kit # 992013**
- (50) 10-24 Studnuts only **Kit # 992550**
- (4) 10-24 Studnuts and (4) 10-24 studrods cut to customer specified length (± .062") **Kit # 992650**

Metric Standards

- (4) M5 Studnuts and (4) approximately 7" long M5 studrods **Kit # 992111**
- (4) M5 Studnuts and (4) approximately 12" long M5 studrods **Kit # 992112**
- (50) M5 Studnuts and (10) approximately 36" long M5 studrods **Kit # 992113**
- (50) M5 Studnuts only **Kit # 992750**
- (4) M5 Studnuts and (4) M5 studrods cut to customer specified length (± .062") **Kit # 992850**

ISO 05 Studkits

(recommended torque - 105-110 lb. in.)

Inch Standards

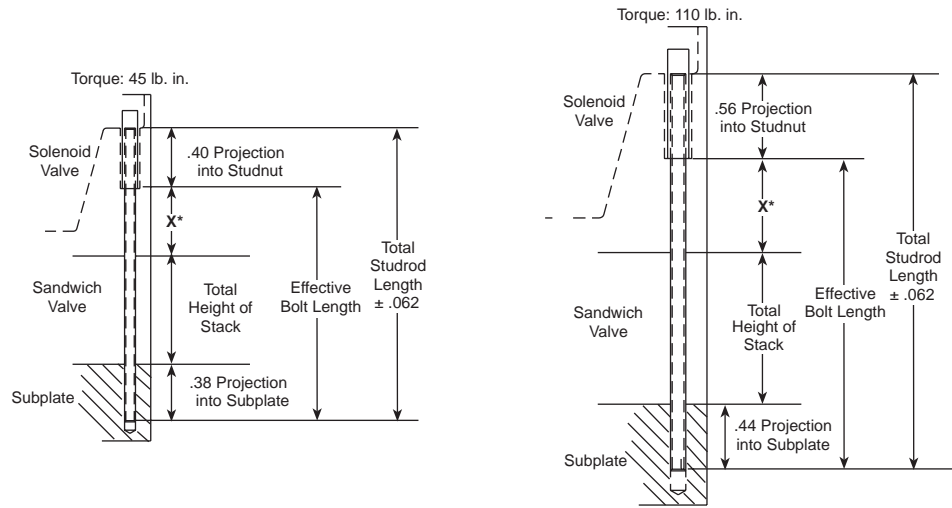
- (4) 1/4-20 Studnuts and (4) approximately 7" long 1/4-20 studrods **Kit # 992001**
- (4) 1/4-20 Studnuts and (4) approximately 12" long 1/4-20 studrods **Kit # 992002**
- (50) 1/4-20 Studnuts and (10) approximately 36" long 1/4-20 studrods **Kit # 992500**
- (50) 1/4-20 Studnuts only **Kit # 992500**
- (4) 1/4-20 Studnuts and (4) 1/4-20 studrods cut to customer specified length (± .062") **Kit # 992600**

Metric Standards

- (4) M6 Studnuts and (4) approximately 7" long M6 studrods **Kit # 992101**
- (4) M6 Studnuts and (4) approximately 12" long M6 studrods **Kit # 992102**
- (50) M6 Studnuts and (10) approximately 36" long M6 Studrods **Kit # 992103**
- (50) M6 Studnuts only **Kit # 992700**
- (4) M6 Studnuts and (4) M6 studrods cut to customer specified length (± .062") **Kit # 992800**

TECHNICAL PRODUCT INFORMATION

STUDROD LENGTH DETERMINATION CHART



ISO 03			ISO 05 and ISO 05 X,Y	
	<i>Model</i>	<i>"X" inches*</i>	<i>Model</i>	<i>"X" inches*</i>
Continental	EP03M	.625	VS12M	1.31
Continental	VS5M	.625	EP05M	1.31
Double A (Vickers)	Q*-3	1.56	Q*-5	1.05
Parker-Hannifin	D1VW	1.50	D3W	1.91
Racine Bosch	.25NG6	.87	1/4"	1.38
Rexroth	4WRA6	1.26	4WE10, 4WEH10	1.18
Dynex/Rivett	6500 Series 03	.44	6500-02	.38
Vickers/40	DG4V	1.56	DG4S4	1.05
Vickers/60	DG4V	.83	DG4V5	1.18
Nachi 1	SSG01	1.44	SSG03,E10,E20	2.38

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