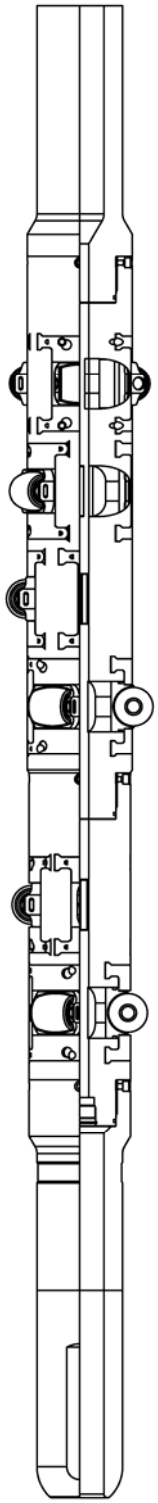
Windchill No.:	00792313
Legacy No.:	572-5502-000-001
Revision / Date:	E / 28-01-08
ECN No.:	55221

5-1/2” Axial Compliant Expander Tool



The Axial Compliant Expansion (ACE™) System offers single trip, compliant EST® expansion, when used in conjunction with a Retrievable Expansion Mandrel (6-5/8" O.D. Cone, either fixed or pre-installed).

The Axial Compliant Expansion tool can be made-up behind the Retrievable Expansion Mandrel via a 3-1/2” API IF connection, or run as a separate trip.

The tool is compliant in that the pistons can extend/retract if an increased/decreased hole diameter is encountered. This allows the EST® to expand fully to give improved wellbore contact, thus providing improved hole support and eliminating any micro-annulus.

Activation of the compliant roller / travelling piston assemblies is achieved by generation of a back pressure within the ACE tool. This back pressure is a result of flow through an integral drill bit jetting nozzle directly in front of the compliant section.

Features

- Compliant expansion system
- Top down expansion
- Retrievable system
- Field Redressable tool

Benefits

- Compliant EST® expansion for improved wellbore contact
- Allows access through restricted I.D.’s
- Improved tool life

Note:

At this present time it is imperative to pre-expand the EST® with a 6-5/8” cone prior to running the ACE Tool Expansion.

EST ® Size	Min. Tool O.D.	Max. Operating Tool O.D.	Operating Pressure	Expansion Speed
5-1/2”	5.875”	8.125”	1500 psi	10 ft/min (max)

Technical Introduction

Assembly Number: 572-5502-000-001

Body Material: AISI 4145 / AISI 4140

Expansion Rollers Material: S7 Tool Steel

Body Coatings: Q.P.Q.

Make-up Connection: 3-1/2" API IF Box-up

Make-up Torque (ft-lb.): Min. / Opt. / Max.; 9,100

Body Interface Connection: 4-1/8" 8TPI Stub Acme

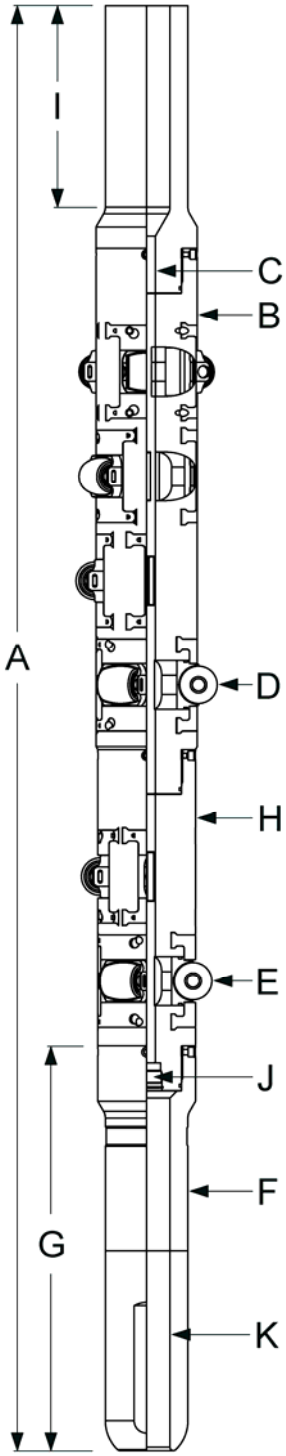
Special Feature: Threaded Nozzle Retainer

Associated Parts

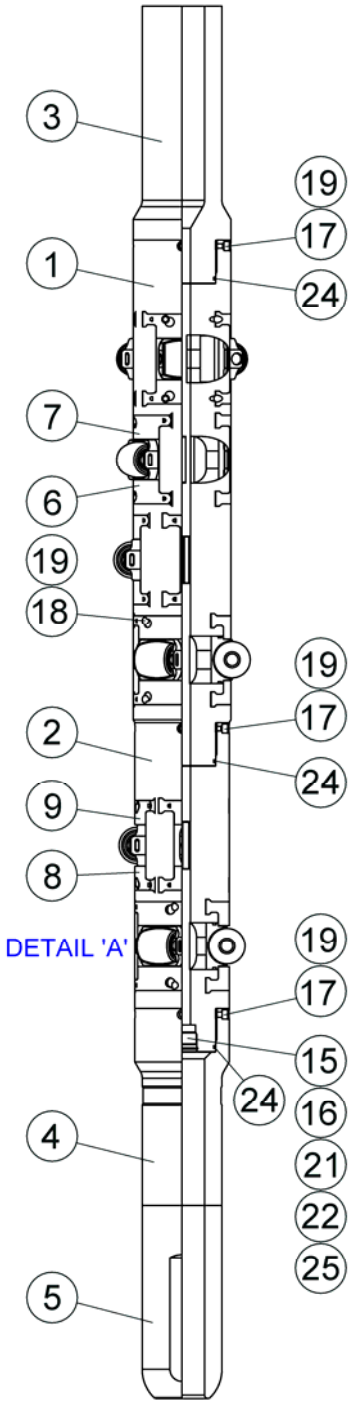
Redress Kit: 572-5502-090-001 / 00792324

Technical Illustration & Dimensional Data

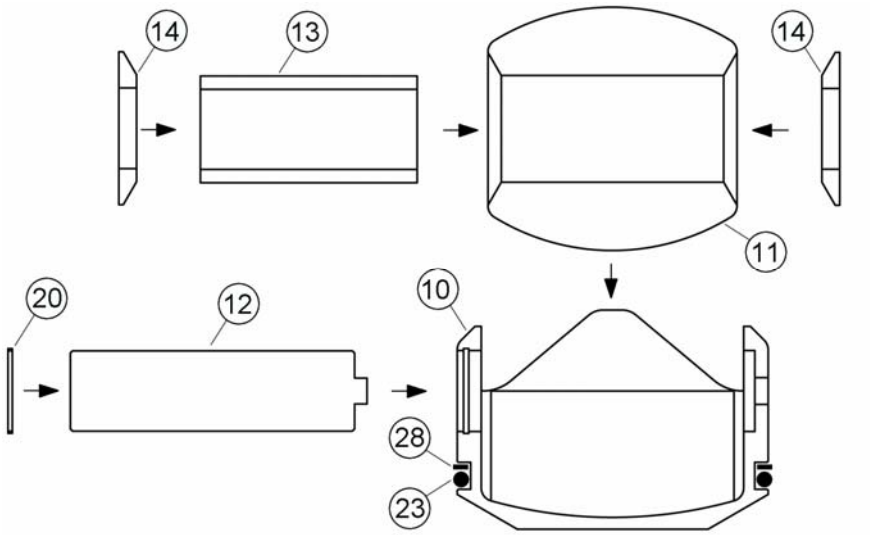
		Size	
Dim.	***Description***	**mm**	**Inches**
A	Overall Length	2119	83.425
B	Max Body O.D.	148.0	5.827
C	Body I.D.	25.4	1.000
D	Rear Rollers O.D. (Out)	206.38	8.125
E	Front Rollers O.D. (Out)	190.5	7.500
F	Nose O.D.	120.65	4.750
G	Nose Length	594.0	23.386
H	Mid Body O.D.	142.9	5.625
I	Tong Area Length	295	11.614
J	Nozzle I.D.	8.7	0.344
K	Nose I.D.	68.3	2.689



Assembly Drawing



Overall Assembly



Carrier Detail View

Assembly List

Item	Qty	Description	Legacy P/No.	Windchill P/No.	Materials	Part of Redress Kit
1	1	UPPER BODY	572-5502-001-412	00791841	AISI 4145	
2	1	LOWER BODY	572-5502-002-412	00792141	AISI 4145	
3	1	CROSSOVER	749505	00749505	AISI 4145	
4	1	EXPANSION MANDREL X-OVER	572-5500-112-015	00323450	AISI 4145	
5	1	BULLNOSE F/X-OVER	572-5500-113-015	00336965	AISI 4145	
6	12	LOWER RETAINER PLATE (Upper)	572-5502-004-412	00791984	AISI 4145	
7	12	UPPER RETAINER PLATE (Upper)	572-5502-005-412	00791985	AISI 4145	
8	6	LOWER RETAINER PLATE (Lower)	572-5502-006-412	00792142	AISI 4145	
9	6	UPPER RETAINER PLATE (Lower)	572-5502-007-412	00792144	AISI 4145	
10	18	ROLLER CARRIER	572-5502-025-412	01122321	AISI 4145	
11	18	ROLLER	572-5500-143-811	00779097	S7 Tool Steel	
12	18	AXLE	572-5500-144-831	00779717	Maraging St.	
13	18	TOUGHMET BEARING	572-5500-125-135	00438349	Toughmet	
14	36	SUPPORT WASHER	572-5500-126-135	00430137	Toughmet	
15	1	NOZZLE RETAINER f/ ACE TOOLS	572-5500-138-412	00760064	AISI 4145	
16	1	NOZZLE	572-5500-139-321	00760221	-	✓
17	12	SOCKET HEAD CAP SCREW	MC-706	00323040	-	✓
18	36	SHOULDER SCREW	733187	00733187	-	✓
19	48	BASIC INTERNAL CIRCLIP	MC-564	00323025	-	✓
20	18	BASIC INTERNAL CIRCLIP	MC-563	00323024	-	✓
21	1	CIRCLIP FOR NOZZLE	MC-810	00762064	-	✓
22	1	O-RING 122	769880	00769880	Viton 75	✓
23	18	O-RING 232	768797	00768797	HNBR 90	✓
24	3	O-RING 240	769976	00769976	Viton 75	✓
25	1	O-RING 127	769823	00769823	Viton 75	✓
26	1	STEEL BALL (Not Shown)	SB-030	00455543	-	✓
27	1	NOZZLE ASS'Y TOOL (Not Shown)	572-5500-141-412	00760484	AISI 4145	
28	18	PARBAK RING 232 WE-122	PB-232-N90	00323227	NBR 90	✓
29	1	Assembly Guide (Not Shown)	572-5500-129-412	00725662	AISI 4145	
30	1	JetLube Grease (Not Shown)	797126	00797126	-	✓

Redress Kit Assembly No.: 572-5502-090-001 / 00792324

Assembly Instructions Tool Assembly

ACE Tools must be assembled using the recommended Grease on both Carriers and Pockets.
Refer to PLB ESS-061.
The Grease is Jet Lube Alco EP 73 Plus (JDE p/no. 00797126) and is part of the Redress Kit.

Tools Required

Internal Circlip pliers
¼" Drive Socket
Soft Mallet (Hide or similar)
6mm Allen key
4mm Allen Key
Hammer
Large Punch (19 > 24mm Dia.)

1) Apply a thin smear of grease to I.D. of Roller *(Item 11)*. Using Hammer and Large Punch, insert Toughmet Bearing *(Item 13)* as shown on Assembly Drawing. It may be preferable to use a Bearing Press for this operation if one is available.
2) Install Support Washers *(Item 14)* using grease to retain them against Roller.
3) Install Roller Assembly into Roller Carrier *(Item 10)*.
4) Lightly grease Axle *(Item 12)* and insert through Carrier and Roller Assembly. Line up rectangular spigot on Axle with mating hole in Carrier and secure in place with Circlip *(Item 20)*.
5) Lightly grease O-ring groove and install O-ring 232 *(Item 23)& Backup Ring (item 28)* around Carrier.
6) Repeat steps (1) to (5) for the remaining Roller Carriers.
7) Lightly grease the Upper Body Nose O-ring groove and install O-ring *(Item 24)* onto the Body.
8) Apply grease onto threads and thread Lower Body *(Item 2)* onto the Upper Body *(Item 1)*.
9) Insert Socket Head Cap Screws *(Item 17)* into Lower Body and retain them with internal Circlips *(Item 19)*.
10) Grease piston chambers on Upper Body *(Item 1)* and place the Guide Assembly Plate over the chamber. Install first Roller Carrier Assembly making sure that the carrier is fully in the chamber.
11) Slide the Upper Carrier Retainer *(Item 7*) through the dovetail profile on the body and secure. Repeat for the Lower Carrier Retainer *(Item 6)*.
12) Insert Socket Head Cap Screw *(Item 18) and tighten*.
13) Install internal Circlip *(Item 19)* into Retainer groove.
14) Repeat steps (10) to (13) for the remainder carriers.
15) Lightly grease the Lower Body Nose O-ring groove and install O-ring *(Item 24)* onto the Body.
16) Insert O-rings *(Items 22 and 25)* onto the Nozzle Retainer *(Item 15)*. Insert Nozzle *(Item 16)* into the Nozzle Retainer and then thread this Nozzle "assembly" into the Lower Body and secure with Circlip *(Item 21)*.
17) Apply grease onto threads and thread Expansion Mandrel X-Over *(Item 4)* onto Lower Body *(Item 2)*.
18) Insert Socket Head Cap Screws *(Item 17)* into Expansion Mandrel X-Over and retain them with internal Circlips *(Item 19)*.
19) Thread Bullnose *(Item 5)* onto Expansion Mandrel X-Over and tighten.
20) Pressure test completed ACE Tool as per Test Procedure **TP-ACE/5500/998-P**

Prior to Running in Hole * Ensure 11/32" Nozzle is installed*

Weatherford

Test Procedure

Subject:	New Style 5.5" ACE Tool Pre-Expansion Pressure Test			No: TP- ACE/5500/998P
Prepared By: Ewan Smith	Eng. Approval: Dave S. Grant	Test Lab Approval: N/A	HSE Approval: N/A	Pg. 1 of 1
Date: 28/08/07	Date: 28/08/07	Date:	Date:	Rev.: D

Objective

This procedure details the preparation and pressure testing of the Axial Compliant Expansion tool (ACE™) before service application. The purpose of this test is to verify the capability of the carrier o-rings to retain a required pressure for a specified time (2,200psi/10mins).

Test Equipment

- 5.5" Axial Compliant Expansion (ACE) Tool: **572-5502-000-001**
- Steel Ball 7/8" Diameter: SB-030 (supplied as part of tool assembly and in redress kit)

Pressure Test

1. Break Expansion Mandrel X-Over at stub acme connection, ensuring o-ring is not damaged.
2. From the nose section of the tool and depending on type of nozzle fitment, remove Circlip and (a) Nozzle or (b) Nozzle assembly.
3. Using a 7/8" diameter ball (SB-030) and with the use of any fine grinding paste, dope, grease, tape, etc… lap the ball into the nozzle seat as close to the centre of the nozzle as possible. Next, re-fit the (a) nozzle back into the tool or (b) nozzle back into the nozzle assembly and screw the nozzle assembly (complete with o-rings) back into the tool, and then fix circlip to nozzle / nozzle assembly.
4. Apply a thin coating of approved grease to the thread area of the Expansion Mandrel X-Over. Check o-ring condition and make-up the X-Over to the tool assembly, taking care not to damage the o-ring.
5. Without breaking any connections, place steel ball (SB-030) inside tool and locate into the nozzle seat.
6. Attach all fittings required for pressure application, and pick up the tool assembly using a suitable crane or apparatus, and orient the tool so it is vertical, with box end up, and nose end down. This will ensure that the ball is seated against the nozzle.
7. SAFETY PRECAUTIONS:
   - Lower ACE tool assembly into a length of 7" or 7-5/8" casing, long enough to house the roller section.
   - All personnel should be removed from the test area.
8. Slowly build pressure up to 500psi to ensure ball is seated correctly. If any leak is noted, bleed-off pressure and inspect tool for signs of where leak is occurring. Repair if required. Set-up to re-test.
9. If no leakage is observed, gradually increase pressure to 2200psi, and hold for 10 minutes.
10. On completion of test, gradually release pressure from the tool, lower tool to horizontal and remove all test fittings. Repeat the test outwith the casing.
11. Without breaking any other connections, remove steel ball from the tool.
12. The ACE Tool is now ready to be used for expansion runs. The circlip or the nozzle should not be removed until the expansion run is complete.

EED-005 Rev: 1

Tested By: …… Date: ……

Witnessed By: …… Date: ……

Disassembly Instructions

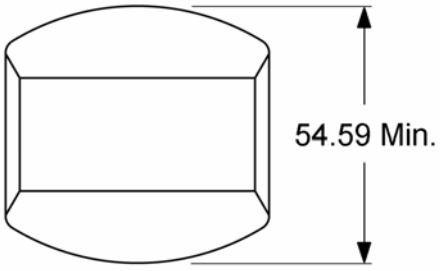
Tools Required

Internal Circlip pliers
¼" Drive Socket
6mm Allen key
4mm Allen Key
Hammer
Small Punch (<6mm Dia.)
Large Punch (19 > 24mm Dia.)

1. Pressure test ACE tool as per TP-ACE/5500/998-P. **Leave Rollers out after pressure test.**
2. Using Circlip pliers remove Internal Circlip *(Item 19)* from retainer groove in Upper Roller Retainer *(Item 7 & 6)*. Ensure safety glasses are worn during this operation. Discard Circlips after removal.
3. Using the 4mm Allen key back out the internal Shoulder Screws *(Item 18)* using a ¼" drive socket. Ensure Shoulder Screws are kept for re-use.
4. Remove Roller Retainer Plate *(Item 7 & 6)* from the Upper Compliant Body *(Item 1)*
5. Use small punch and hammer to evenly tap sides of Carrier lugs in an upwards direction to remove Carrier Assembly from Upper Body *(Item 1)*
6. Using Circlip pliers remove Circlip *(Item 20)* from Carrier *(Item 10)*. Ensure safety glasses are worn during this operation. Discard Circlips. Using small punch and hammer, tap Axle *(Item 12)* to remove from Carrier *(Item 10)*.
7. Remove Roller *(Item 11)* and Support Washers *(Item 14)* from Carrier *(Item 10)*. Remove O-ring & Backup Ring *(Items 23 & 28)* from Carrier. Discard Support Washers and O-Rings and Backup Rings.
8. Tap Bearing *(Item 13)* out from Roller *(Item 11)* using hammer and large punch. Discard Bearings. It may be preferable to use a Bearing Press for this operation if one is available.
9. Repeat steps 2-8 for all remaining Roller Assemblies – including those retained by the Intermediate Retainers *(Item 8 & 9)* in Lower Body Section *(Item 2)*.
10. Using Circlip pliers remove Internal Circlips *(Item 19)* from the Exp. Mandrel X-Over *(Item 4)*. Ensure safety glasses are worn during this operation. Remove Socket Head Cap Screws *(Item 17)* using the 6mm Allen key. Discard Circlips and Cap Screws.
11. Using chain tong or similar, thread off the Exp. Mandrel X-Over *(Item 4)* from the Lower Body *(Item 2)*
12. Remove O-Ring *(Item 24)* from Lower Body. Discard O-Ring.
13. Remove Nozzle Circlip *(Item 21)* from end of Lower Body and discard. Ensure safety glasses are worn during this operation.
14. Remove Nozzle *(Item 16)* and Nozzle O-ring *(Item25)* from Lower Body. Discard O-ring.
15. Using Circlip pliers remove internal Circlips *(Item 19)* from Lower Body *(Item 2)*. Ensure safety glasses are worn during this operation. Remove Socket Head Cap Screws *(Item 17)* using the 6mm Allen key. Discard Circlips and Cap Screws.
16. Using chain tong or similar, thread off Lower Body *(Item 2)* from Upper Body *(Item 1)*.
17. Remove O-ring *(Item 24)* from Upper Body. Discard O-ring.
18. Remove Upper Body from vice. Place and secure Expansion Mandrel *(Item 4)* in vice, and using chain-tong or similar disassemble remaining tool assembly [n.b. either Bullnose *(Item 5)* or Expansion Mandrel Assembly dependant on ACE Tool arrangement].

Inspection of Tool

1. All tools to be fully inspected after each job.
2. Visually inspect complete tool noting any signs of wear, pay particular attention to the following;
   - Upper Body *(Item 1)* – Ensure Premium Connection is fit for purpose and no wear bands are present on any of the Piston Seal Bores.
   - Lower Body *(Item 2)* – Ensure no wear bands are present on any of the Piston Seal Bores.
3. Roller Assembly *(Items 10, 11, 12, 14, 7, 6, 13, 20, 23 & 28)* – Replace *Items 20, 23 & 28*.
4. Check *Items 11, 12, 14 & 13* for wear.
5. Ensure no large amount of wear has occurred on the Carrier *(Item 10)*, particularly at the top of the lugs.
6. Expansion Mandrel X-Over *(Item 4)* – Check Premium Connection is fit for purpose.
7. Using a fluorescent MPI methods inspect the Carrier *(Item 10)* and Roller *(Item 11)*. Report and record findings.
8. Dimensionally check any components that have obvious wear on them and ensure that they are still within the engineering tolerances.



The above shows the minimum acceptable dimensions on these parts and should be used as a guide only.

<u>If in doubt contact an appropriate Weatherford Region Engineer</u>

Optimum Operational Parameters