



Owen Oil Tools

Technical Manual

Absolute Pressure Firing Head with Auto Fill & Vent TC-024-2375-100

MAN-TC-024-100

Caution

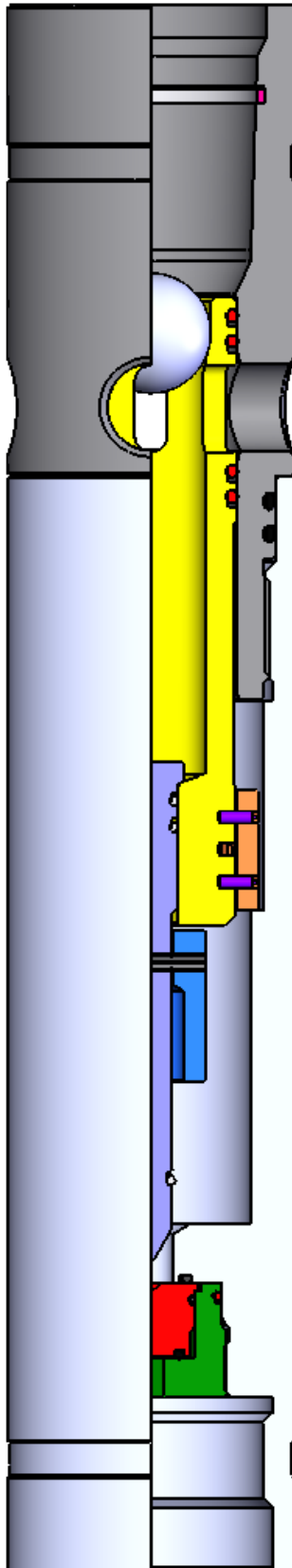
Safety Information

If you are not properly trained in the handling, and use of explosives devices, do not attempt the assembly of any Owen Oil Tools Perforating Systems or Firing Devices.

Technical Assistance

For technical assistance, please call or contact your local support station.

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Description

The Absolute Pressure Firing Head with Auto Fill & Vent is used in TCP applications where pressure is applied internally to the tubing string in order to detonate the perforating guns. The Absolute Pressure Firing Head with Auto Fill & Vent may be converted to the Auto Vent or to the Non-Vented version with conversion kits.

When the firing head is ready for activation, a ball is dropped from surface and seats into the piston. The pressure applied to the tubing string acts on the piston that is held in place by precision shear pins. These shear pins are designed to shear at a predetermined load thereby allowing the operator to accurately determine the firing pressure of the head. When activated, the firing pin drives into the percussion initiator thus detonating the gun system. Simultaneously, the automatic drain allows circulation through the tubing string.

Features and Benefits

- Compact size and rugged design make it ideal for use in horizontal or deviated wellbores
- Fits directly onto any Gun Top Sub with GO, 2.750 Acme thread connection
- Tool may easily be converted between Non-Vented, Auto Vent and Auto Fill & Vent versions
- All three versions use the same redress kit (TC-023-2375-199)
- Operating range 2000 psi (14 000 kPa) to 13,000 psi (89.6 MPa)

Specifications

	2-3/8 in (60.3 mm)	
Maximum OD	3.375 in	85.7 mm
Minimum ID of Housing	2.000 in	50.8 mm
Overall Length	18 in	457 mm
Tensile	201,164 lb (89 482 daN)	
Maximum Temperature ¹	250° F (121° C)	
Flow Area	3.142 in ² (20.27 cm ²)	
Connections	2-3/8 in (60.3 mm) EU Box Up/GO 2.750 Acme Box Down	
Product (with Auto Vent)	TC-023-2375-100	
Product (with Auto Vent and Fill)	TC-024-2375-100	
Product (Non-Vented)	TC-026-2375-100	
Redress Kit	TC-023-2375-199	
Redress Kit (No shear pins)	TC-023-2375-198	
Shear Pin Kit ²	SF-010-0130-BAG	

¹The maximum temperature can be increased to 450° (230°C) by substituting the 90 durometer Nitrile o-rings with 90 durometer Viton o-rings. Refer to the Time vs Temperature chart for Explosives to confirm any explosives requirements

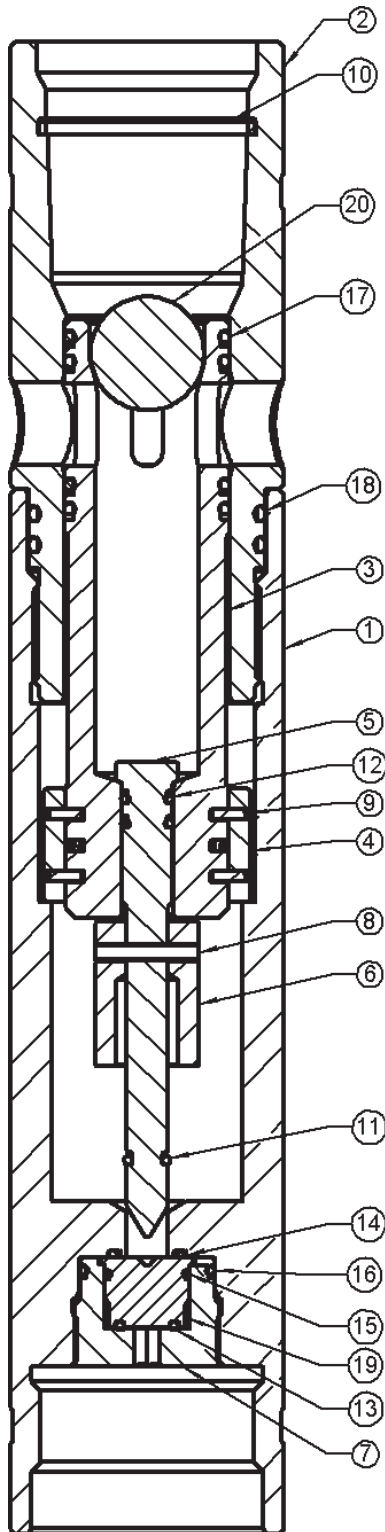
²The shear pin kit contains 36 pins for pressure applications up to 62.5 MPa (9,500 psi). For higher pressures, 2 bags are required

Absolute Pressure Firing Head with Auto Fill & Vent

Owen Oil Tools



TC-024-2375-100



Item	Part Number	Qty	Description
--	TC-024-2375-100	--	Abs. Pressure Firing Head with Auto Fill & Vent
1	TC-023-0100-000	1	Bottom Sub 2-3/8" Hydraulic Firing Head
2	TC-023-0101-000	1	Upper Housing 2-3/8" Hydraulic Firing Head (vented)
3	TC-024-0100-000	1	Piston (Auto Fill and Vent Applications)
4	TC-023-0004-000	1	Outer Shear Ring 2-3/8" Hyd Firing Head
5	TC-023-0103-000	1	Firing Pin (CP Initiator)
6	TC-023-0104-000	1	Impact Dampener
7	TC-011-0002-000	1	Initiator Retaining Nut
8	PF-120-0188-125H	1	Roll Pin (OD 0.188", 1.25 LG, Heavy Duty)
9	SF-010-0130-045	36	Shear Pin 0.130" OD, 0.450" LG.
10	MI-305-2375-000	1	2-3/8" EU Thread API Seal Ring
11	OOO-N569-110	1	O-Ring 90 Durometer Nitrile
12	OOO-N569-111	2	O-Ring 90 Durometer Nitrile
13	OOO-N569-113	1	O-Ring 90 Durometer Nitrile
14	OOO-N569-116	1	O-Ring 90 Durometer Nitrile
15	OOO-N569-020	1	O-Ring 90 Durometer Nitrile
16	OOO-N569-127	1	O-Ring 90 Durometer Nitrile
17	OOO-N569-224	4	O-Ring 90 Durometer Nitrile
18	OOO-N569-231	2	O-Ring 90 Durometer Nitrile
19	Reference	1	Percussion Detonator
20	ST-035-1375-CHR	1	Chrome Ball 1.375"
--	MAN-TC-024	--	Assembly Manual
--	TC-023-2375-199	--	Re-dress Kit for Absolute Firing Head

Item	Part Number	Qty	Description
--	TC-023-2375-199	--	Re-dress Kit for Absolute Pressure Firing Head
6	TC-023-0104-000	1	Impact Dampener
8	PF-120-0188-125H	1	Roll Pin (OD 0.188", 1.25 LG, Heavy Duty)
9	SF-010-0130-045	36	Shear Pin 0.130" OD, 0.450" LG.
10	MI-305-2375-000	1	2-3/8" EU Thread API Seal Ring
11	OOO-N569-110	1	O-Ring 90 Durometer Nitrile
12	OOO-N569-111	2	O-Ring 90 Durometer Nitrile
13	OOO-N569-113	1	O-Ring 90 Durometer Nitrile
14	OOO-N569-116	1	O-Ring 90 Durometer Nitrile
15	OOO-N569-020	1	O-Ring 90 Durometer Nitrile
16	OOO-N569-127	1	O-Ring 90 Durometer Nitrile
17	OOO-N569-224	4	O-Ring 90 Durometer Nitrile
18	OOO-N569-231	2	O-Ring 90 Durometer Nitrile

Item	Part Number	Qty	Description
--	TC-023-2375-198	--	Re-dress Kit for Absolute Pressure Firing Head, w/o Shear Pins
6	TC-023-0104-000	1	Impact Dampener
8	PF-120-0188-125H	1	Roll Pin (OD 0.188", 1.25 LG, Heavy Duty)
10	MI-305-2375-000	1	2-3/8" EU Thread API Seal Ring
11	OOO-N569-110	1	O-Ring 90 Durometer Nitrile
12	OOO-N569-111	2	O-Ring 90 Durometer Nitrile
13	OOO-N569-113	1	O-Ring 90 Durometer Nitrile
14	OOO-N569-116	1	O-Ring 90 Durometer Nitrile
15	OOO-N569-020	1	O-Ring 90 Durometer Nitrile
16	OOO-N569-127	1	O-Ring 90 Durometer Nitrile
17	OOO-N569-224	4	O-Ring 90 Durometer Nitrile
18	OOO-N569-231	2	O-Ring 90 Durometer Nitrile

To convert from TC-024-2375-100 to TC-023-2375-100 replace Item #3 with the following part: TC-023-0102-000

To convert from TC-024-2375-100 to TC-026-2375-100 replace Items #2 & #3 with the following parts: TC-026-0100-000 and TC-023-0102-000

Note: ST-035-1375-CHR is not used in TC-023-2375-100 or TC-026-2375-100

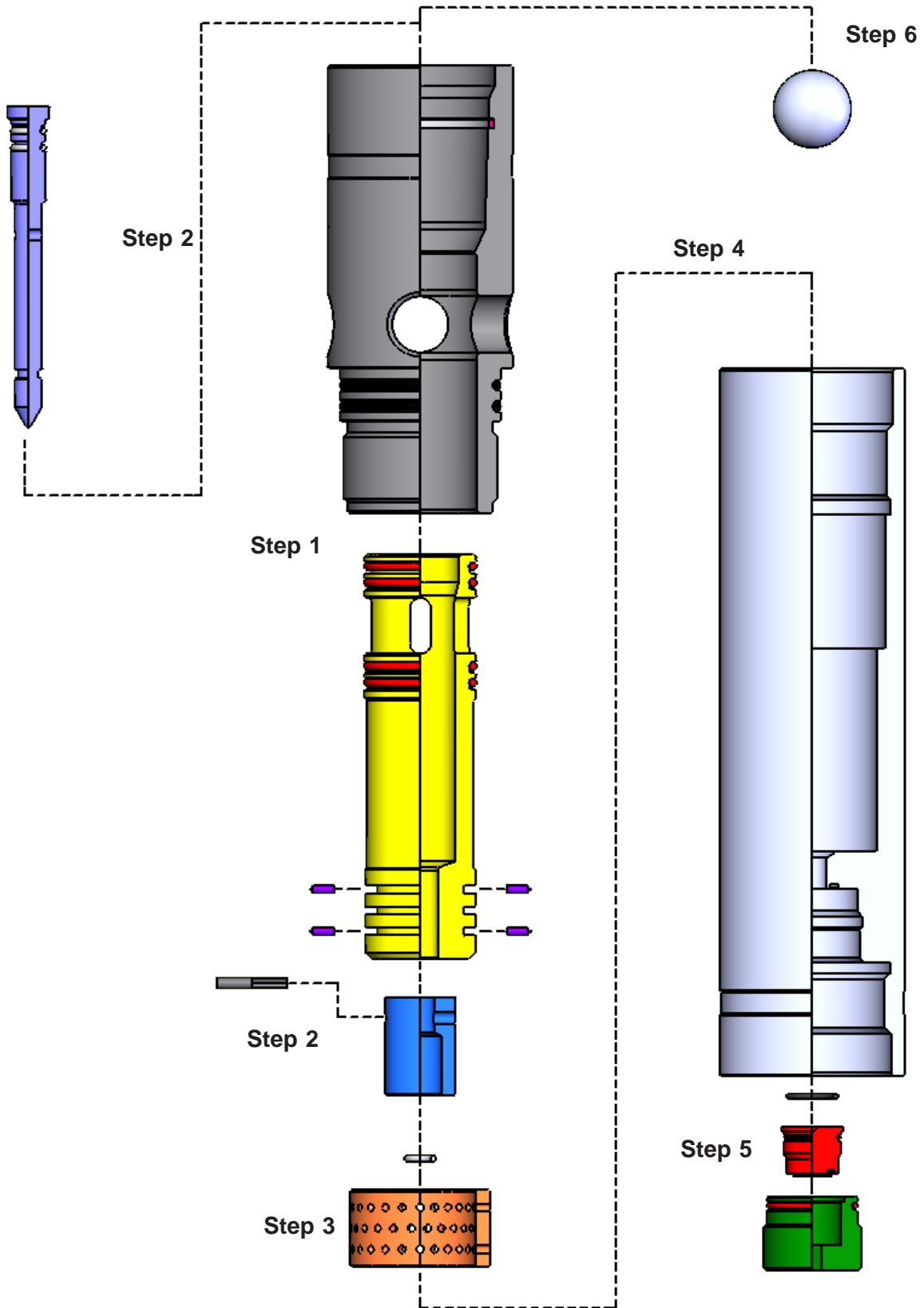


Figure 1

For Assembly refer to Figure 1 (Exploded View)

Step 1: Apply a film of grease onto the O-rings (item 17) and install four onto the piston (item 3). Apply a film of grease onto the O-rings (item 18) and install two onto the upper housing (item 2). Install the piston (item 3) into the upper housing (item 2) from the bottom (threaded side) using a deadblow hammer.

See Figure 2 below

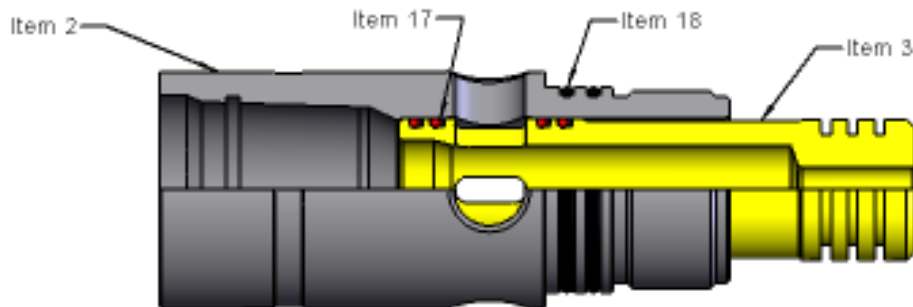


Figure 2

Step 2: Apply a film of grease on the O-rings (item 12) and install two onto the firing pin (item 5). Install the firing pin into the piston (item 3) from the top through the upper housing (item 2). Slide the impact dampener (item 6) onto the bottom end of the firing pin and install the roll pin (item 8). Install the O-ring (item 11) onto the firing pin.

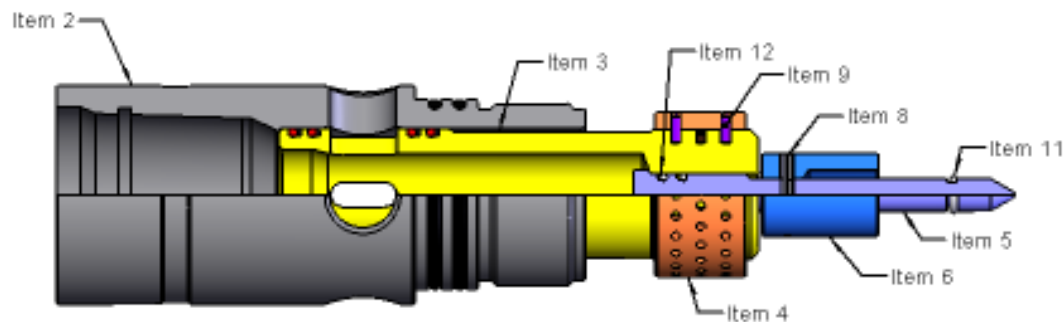


Figure 3

Step 3: Slide the outer shear ring (item 4) onto the piston (item 3). Line up the grooves and the shear ring holes and install the correct number of shear pins (item 9). The correct number of pins are determined by well conditions.

See Figure 3 above

Step 4: Install bottom sub (item 1) onto upper housing (item 2). Install the EU thread seal ring (item 10) into the upper housing.

See Figure 4 below

Installation of Initiator and Initiator Retaining Nut

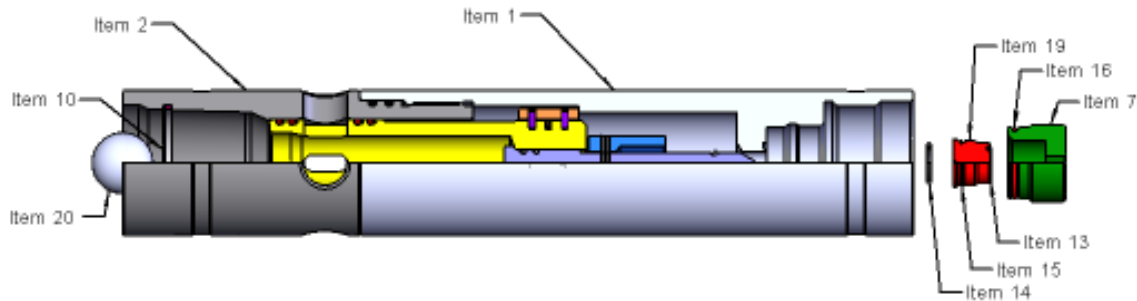


Figure 4

Step 5:

Warning

In order to Maximize Safety, it is proper practice to install the Initiator in the field just prior to running the firing head in the well. Ensure the Perforating Gun is configured so the top shot is below the rig floor when installing the firing head.

Lightly grease all O-rings (items 13 to 16). Install O-ring (item 14) into the bottom sub (item 1). Install O-rings (13 and 15) onto the CP Initiator (item 19). Install O-ring (item 16) onto the retainer nut (item 7). Lightly coat the outside and inside seal bore of the retainer nut with grease.

Caution

Install CP Initiator by hand with gentle pressure. DO NOT use any pointed device to push the Initiator into the retaining nut as it may cause detonation and serious injury.

Install the CP Initiator (item 19) into the retainer nut (item 7) by carefully pressing it by hand until it is flush with the retainer nut. Install the retainer nut with CP Initiator into the bottom sub (item 1) with an allen wrench until it is flush with bottom sub internal face.

See Figure 4 above

The Owen Oil Tools Absolute Pressure Firing Head is now assembled and ready to install on the gun top sub. Install the correct O-rings on the top sub as well as thread lubricant and tighten the firing head onto the gun string. Once tight, lower the tubing string onto the firing head in preparation for the connection make up. Apply thread compound to pin and insert into the upper housing then make up the connection.

Step 6: Once the firing head has been run to depth in the well, the ball (item 20) is dropped down the tubing.

TC-024-2375-100

Pinning Procedures
Imperial Calculations

Step 1 (Data)

- A. Well Temperature (BHT) at perforating depth _____ °F
- B. True Vertical Depth (TVD) _____ ft
- C. Maximum fluid weight in well when tripping _____ ppg (lb/gal) (Annulus)
- D. Fluid Weight in tubing when ready to fire _____ ppg (lb/gal)

Step 2 (Calculate Pressures)

- E. Maximum Hydrostatic at depth
($0.05195 * C * B$) = _____ psi
- F. Tubing hydrostatic when ready to fire
($0.05195 * B * D$) = _____ psi
- G. Greater of E or F _____ psi
- H. Absolute Firing Pressure
($G + 2000$ psi (minimum safety factor) = _____ psi

Step 3 (Calculate number of pins)

- I. Reduction Factor
(Ref. Temp. Reduction Chart with temp from A) = _____
- J. Adjusted Pin rating (.130" diameter)
(_____ psi * I) = _____ psi / pin @ BHT
Reference: pin shipping bag for listed pin value to use
- K. Number of Pins
(H / J) = _____
- L. Roundup K = _____



Pinning Procedures
Imperial Calculations

Step 4 (Calculate Nominal Absolute Firing Pressure)

M. Activation Pressure @ Firing Head
(L * J) = _____ psi

Step 5 (Calculate pressure tolerance)

N. Tolerance (M * 0.05) = _____ psi

Step 6 (Calculate surface pressure) - Pressure applied on tubing

O. Nominal pressure (M - F) = _____ psi

P. Maximum pressure (O + N) = _____ psi

Q. Minimum pressure (O - N) = _____ psi

Shear Pin Temperature Correction Chart

Degrees Fahrenheit	Correction Factor	Degrees Fahrenheit	Correction Factor	Degrees Fahrenheit	Correction Factor	Degrees Fahrenheit	Correction Factor
70	1	180	0.944	290	0.9025	400	0.882
80	0.995	190	0.9395	300	0.898	410	0.884
90	0.988	200	0.935	310	0.897	420	0.885
100	0.9825	210	0.9315	320	0.8945	430	0.886
110	0.9775	220	0.9275	330	0.8925	440	0.888
120	0.9725	230	0.9235	340	0.89	450	0.89
130	0.9675	240	0.9195	350	0.888	460	0.894
140	0.962	250	0.9165	360	0.887	470	0.9
150	0.957	260	0.9125	370	0.886		
160	0.953	270	0.909	380	0.8845		
170	0.9485	280	0.906	390	0.8835		

TC-024-2375-100

Pinning Procedures
Metric Calculations

Step 1 (Data)

- A. Well Temperature (BHT) at perforating depth _____ °C
- B. True Vertical Depth (TVD) _____ m
- C. Maximum fluid weight in well when tripping _____ kg/m³
- D. Fluid Weight in tubing when ready to fire _____ kg/m³

Step 2 (Calculate Pressures)

- E. Maximum Hydrostatic at depth
($0.0098 * C * B$) = _____ kPa
- F. Tubing hydrostatic when ready to fire
($0.0098 * B * D$) = _____ kPa
- G. Greater of E or F _____ kPa
- H. Absolute Firing Pressure
($G + 14000$ kPa (minimum safety factor) = _____ kPa

Step 3 (Calculate number of pins)

- I. Reduction Factor
(Ref. Temp. Reduction Chart with temp from A) = _____
- J. Adjusted Pin rating (.130" diameter)
(_____ kPa * I) = _____ kPa / pin @ BHT
Reference: pin shipping bag for listed pin value to use.
- K. Number of Pins
(H / J) = _____
- L. Roundup K = _____



Pinning Procedures
Metric Calculations

Step 4 (Calculate nominal absolute firing pressure)

M. Activation $L * J =$ _____ kPa pressure @ Firing Head

Step 5 (Calculate pressure tolerance)

N. Tolerance ($M * 0.05$) = _____ kPa

Step 6 (Calculate surface pressure) - Pressure applied on tubing.

O. Nominal pressure ($M - F$) = _____ kPa

P. Maximum pressure ($O + N$) = _____ kPa

Q. Minimum pressure ($O - N$) = _____ kPa

Shear Pin Temperature Correction Chart

Degrees Celcius	Correction Factor	Degrees Celcius	Correction Factor	Degrees Celcius	Correction Factor	Degrees Celcius	Correction Factor
21	1	82	0.944	143	0.9025	204	0.882
27	0.995	88	0.9395	149	0.898	210	0.884
32	0.988	93	0.935	154	0.897	216	0.885
38	0.9825	99	0.9315	160	0.8945	221	0.886
43	0.9775	104	0.9275	166	0.8925	227	0.888
49	0.9725	110	0.9235	171	0.89	232	0.89
54	0.9675	116	0.9195	177	0.888	237	0.894
60	0.962	121	0.9165	182	0.887	243	0.9
66	0.957	127	0.9125	188	0.886		
71	0.953	132	0.909	193	0.8845		
77	0.9485	138	0.906	199	0.8835		