Coiled Tubing Pressure Activated Firing System

TC-030-1688-000

MAN-TC-030 (R09)

Owen Oil Tools LP

12001 CR 1000

Godley, Texas, 76044, USA

Phone: +1 (817) 551-0540

Fax: +1 (817) 551-1674

www.corelab.com/owen

Warning: Use of Owen equipment contrary to manufacturer's specifications or operating instructions may result in property damage, serious injury or fatality. If you are not trained in the handling and use of explosive devices, do not attempt to use or assemble any Owen perforating systems or Owen firing devices.

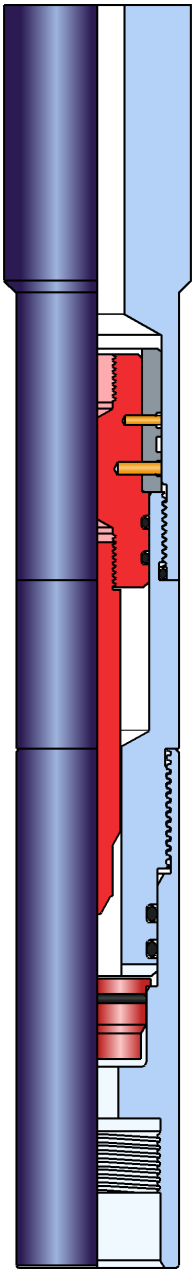
Owen Oil Tools pre-assembles its tools as per the field operating manual. It is the responsibility of the purchaser to insure that this tool is assembled as required, prior to use.

This technology is regulated by and, if exported, was exported from the United States in accordance with the Export Administration Regulations (EAR). Diversion contrary to U.S. law is prohibited. Export and/or re-export of this technology may require issuance of a license by the Bureau of Industry and Security (BIS), U.S. Department of Commerce. Consult the BIS, the EAR, and/or Owen Compliance Services, Inc. to determine licensing requirements for export or re-export of this technology.

This document contains Confidential Information of Owen Oil Tools LP (Owen) and is furnished to the customer for information purposes only. This document must not be reproduced in any way whatsoever, in part or in whole, or distributed outside the customer organization, without first obtaining the express written authorization of Owen. This document is the property of Owen and returnable upon request of Owen.

© 2011 Owen Oil Tools

CT Pressure Activated Firing System



Description

The Coil Tubing Pressure Activated Firing Head was developed for use where pressure firing is required such as horizontal wells, well stimulation or as a backup firing system. This Firing Head utilizes our precision shear pin technology with an accuracy of +/- 5%. This system can be set to activate at predetermined pressures ranging from 2,000 psi to 25,000 psi in increments of 250 psi by utilizing two sizes of precision shears.

Features and Benefits

- Can be used with Owen Time Delay Fuses
- Can be placed top or bottom of all Owen Small Scalloped Gun Systems (1-11/16”, 2-1/8”, 2-1/2”)
- Well Suited for highly deviated wells
- Requires 2,000 psi minimum to fire (Safe at surface - API RP-67)
- The top thread connection is specified when ordering.

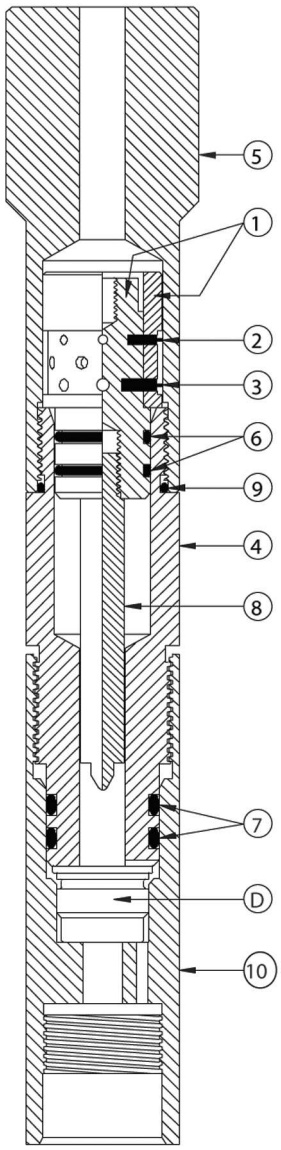
Specifications

O.D.	1.69 in	43 mm
Max. Temperature [1]	250℉ (121℃)	
Max. Hydrostatic	18,000 psi	124 MPa
Min. Hydrostatic	2,000 psi	13.8 MPa
Max. Tensile Strength	33,000 lbs.	14 680 daN

[1]The maximum temperature can be increased to 450℉ (230℃) 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.

Note: Retainer caps, for special applications, are available with a 1” or 1-1/2” AMT Box Thread.

BOM and Schematic



Item	Part Number	Qty	Description
--	**TC-030-1688-000**	--	**Coiled Tubing Pressure Activated Firing Head**
1	TC-020-0003-000	1	Piston/Shear Ring Set (Matched Set)
	TC-020-0004-000		Shear Piston
	TC-020-0005-000		Outer Shear Ring
2*	SF-010-0100-038	8	Shear Pin - small diameter
3*	SF-010-0130-045	16	Shear Pin - large diameter
4	TC-020-0001-000	1	Piston Housing
5	TC-031-0008-000	1	Retainer Cap - Special Application
6*	OOO-N569-118	2	O-Ring, N-90
7*	OOO-N569-214	2	O-Ring, N-90
8	TC-020-0000-000	1	Firing Pin, CP Detonator
9*	OOO-N569-124	1	O-Ring, N-90
10	TC-040-0001-400	1	Detonator Housing
D	Reference	1	Percussion Detonator
--	TC-020-1688-099	--	Redress Kit, PAFH
--	TC-020-1688-399	--	Redress Kit, PAFH HT
--	MAN-TC-030	--	Assembly Manual

* Denotes items in Redress Kit.
High Temperture Kits contain Viton 90 O-rings.

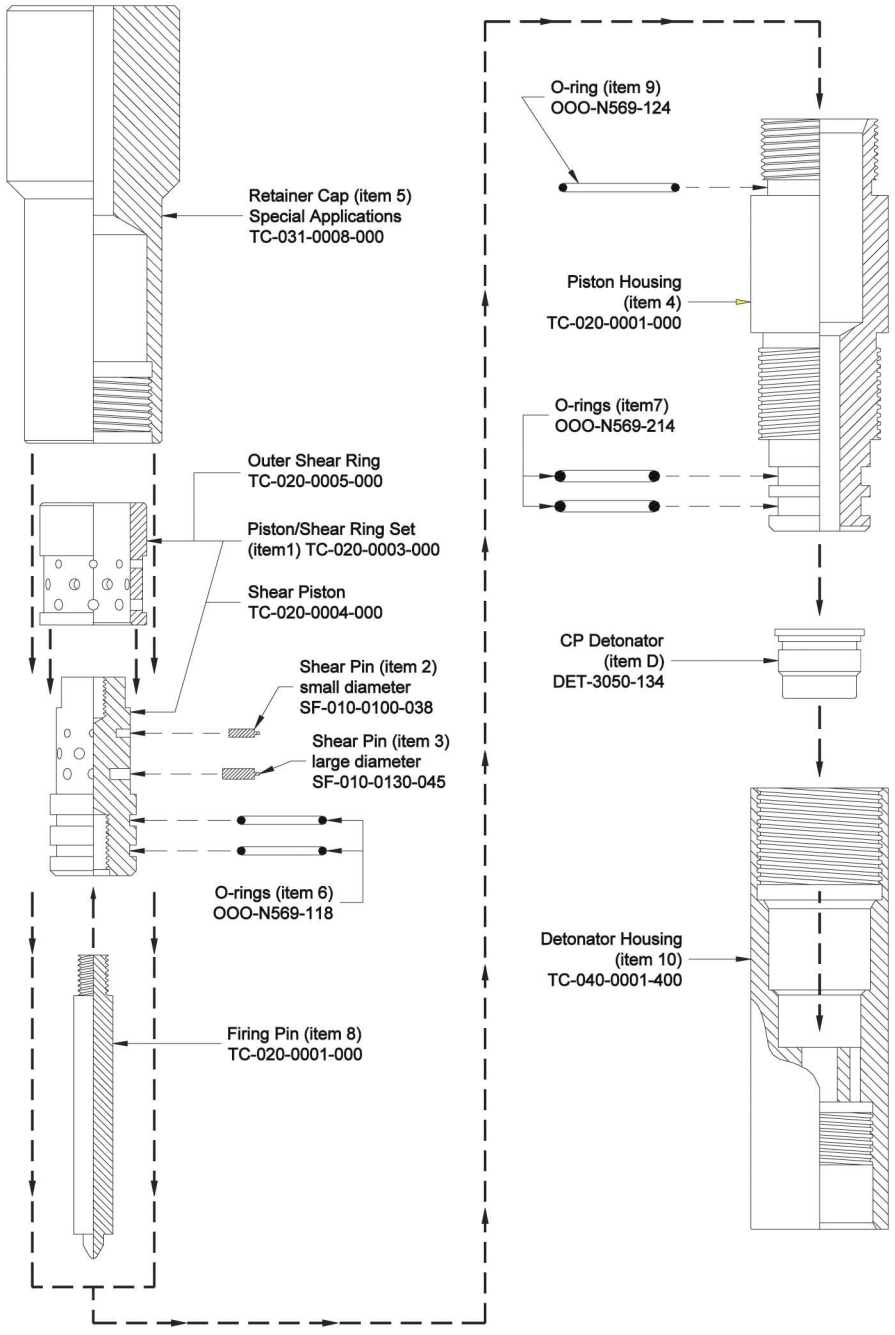
For information concerning the different adapters and crossovers for the downhole devices that can be run with this tool, please contact your local Owen representative.

Note: Retainer caps, for special applications with 1” or 1-1/2” AMT Box Thread (sold separately).

TC-031-0008-004 - 1” AMT Box Thread

TC-031-0008-006 - 1-1/2” AMT Box Thread

Exploded View



Warning: ***The assembly of this tool requires the use of an Explosive Device and all safety precautions must be adhered to and observed! Only personnel trained in explosive handling procedures should be allowed to arm this firing head assembly!***

Caution: ***The shear pin values shown on the package accompanying this tool are valid ONLY for the tools listed in this manual!***

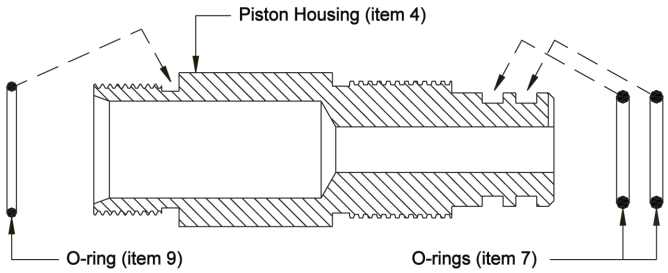
Caution: ***Correct shear pin values will vary between lot dates, always reference the data accompanying the pins!***

Note: *Check all items against the parts list to be sure of having the correct parts and quantities.*

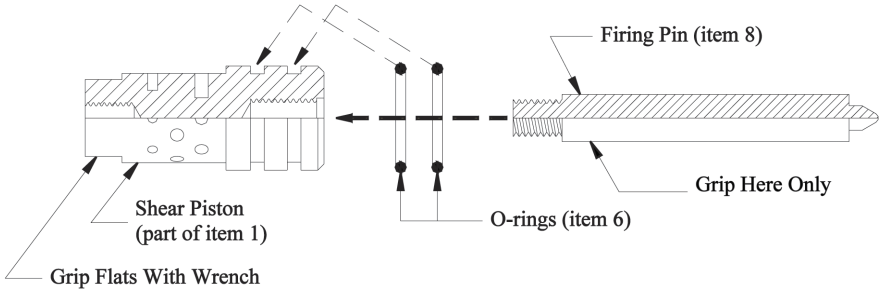
Note: *Check for any damage to the parts which would prevent the part from being assembled correctly, easily and safely.*

1.0 Assembly

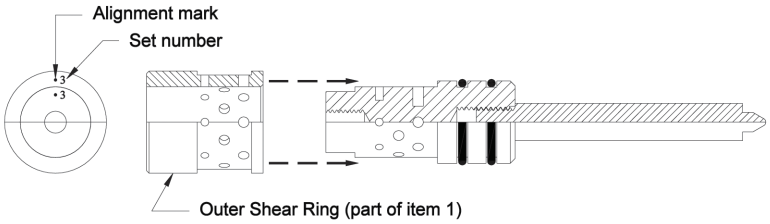
1.1 Install the O-rings (item #7 and #9) onto the Piston Housing (item #4). Set aside.



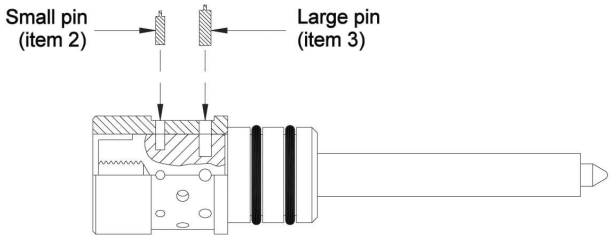
1.2 Install the O-rings (item #6) on the Shear Piston (piston part of item #1). Apply one drop of Blue Loctite® on the threads of the Firing Pin (item 8). Thread Firing Pin into the Shear Piston and tighten.



1.3 Slide the Outer Shear Ring (ring part of item #1) over the Shear Piston, matching the alignment marks and numbers on ring and piston. This will align the holes which were matched drilled.

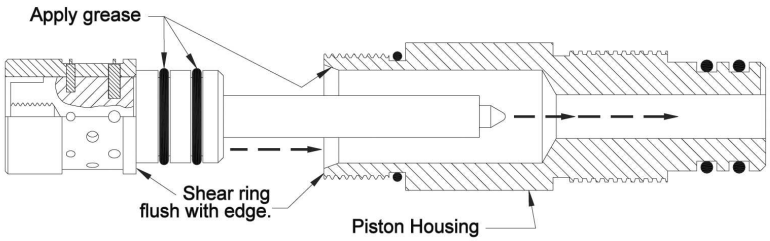


1.4 With the tip of the shear pin facing outward, insert the correct size and quantity of pins as per job requirements (refer to the Pinning Procedures and Temp. Correction Chart in the back of this manual). Owen recommends inserting the Shear Pins (item #2 and #3) as symmetrically as possible around Outer Shear Ring. Starting with the large pins, first fill one (1) row before inserting the small pins in the second (2nd) row.

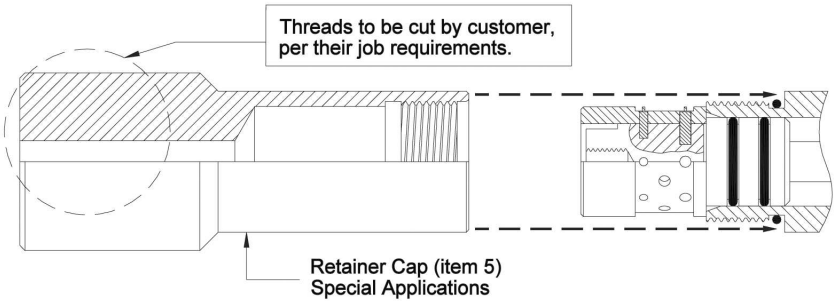


1.5 After pins are inserted, apply a film of grease over the pin tops and ring to help retain pins during further assembly of this tool.

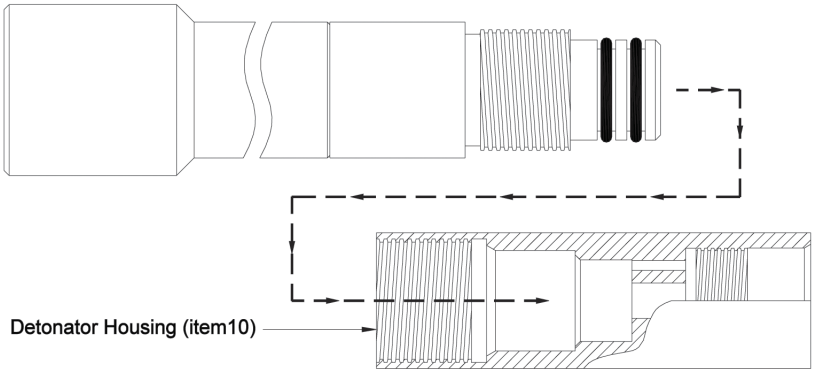
1.6 Apply grease to the O-rings on the Shear Piston and the entry angle of the Piston Housing. Insert the Shear Piston into the housing, until the outer ring is flush with the edge of the housing.



1.7 Apply some grease to the threads and O-ring of the Piston Housing (shear ring end) and thread on the Retainer Cap (item #5). Remember, the retainer cap comes blanked out and must be machine threaded to meet the particular thread requirements of the tubular to be used.

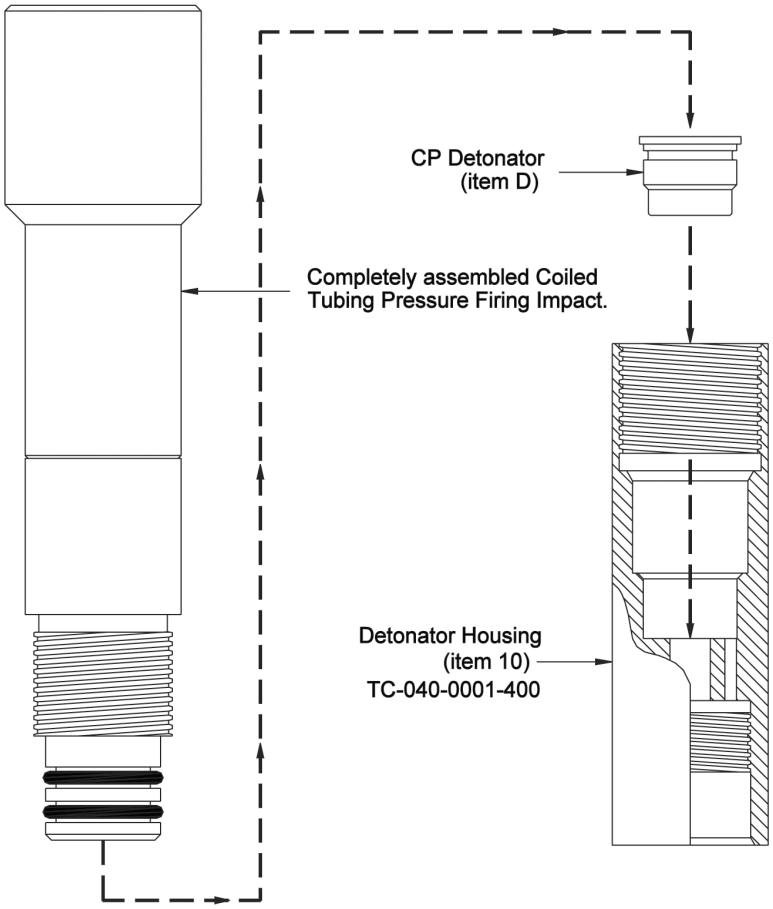


1.8 Apply grease to the threads and o-rings of the piston housing and thread into the Detonator Housing (item 10). This step completes the assembly of this tool, less the detonator. It is highly recommended that the Detonator (item D), not be installed until just prior to the well operation it will be used for.



1.9 With the correct number of shear pins installed as per job requirements, and just prior to the well operation, separate the detonator housing from the firing impact. Install the Percussion CP Detonator (item D) into the detonator housing and re-thread the firing impact, making sure the detonator stays in place.

1.10 The armed firing head can now be attached to the device which is to be used in the well operation, and then attached to the coiled tubing reel or tubular system which is to convey the device downhole. Remember to strictly adhere to all safety rules and procedures when handling these explosive devices.



Imperial Pinning Calculations

Step 1 (Data)

A. Well Temperature (BHT) at perforating depth _____℉

B. True Vertical Depth (TVD) _____ ft

C. Max. fluid weight in well when tripping _____ ppg (lb/gal)

D. Fluid Weight in tubing when ready to fire _____ ppg (lb/gal)

Step 2 (Calculate Pressures)

A. Max. Hydrostatic at depth - (0.05195 * 1C * 1B) = _____ psi

B. Tubing hydrostatic when ready to fire - (0.05195 * 1B * 1D) = _____ psi

C. Greater of 2A or 2B = _____ psi

D. Absolute Firing Pressure - (2C + 2000 psi (minimum safety factor)) = ____ psi

Step 3 (Calculate number of pins)

A. Reduction Factor
(Ref. Temp. Reduction Chart with temp from 1A) = _____

B. Adjusted Large Pin rating (.130 dia.)
(_____ psi * 3A) = ____ psi / pin @ BHT
Refer to the pin shipping bag for listed pin value to use.

C. Adjusted Small Pin rating (.100 dia.)
(_____ psi * 3A) = ____psi / pin @ BHT
Refer to the pin shipping bag for listed pin value to use.

D. Number of Large Pins - (2D / 3B) = _____

E. Number of Small Pins = _____
Take fractional amount of 3D and determine if one small pin is required. (e.g. 11.5 pins 11 large + 1 small)

Step 4 (Calculate nominal absolute firing pressure)

A. 3D x 3B = _____ Large pin psi @ BHT

B. 3E x 3C = _____ Small pin psi @ BHT

C. 4A + 4B = _____ Total absolute pressure @ BHT

Step 5 (Calculate pressure tolerance)

A. Tolerance (4c * 0.05) = _____ psi

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

A. Nominal pressure (4C - 2B) = _____ psi

B. Max. pressure (6A + 5A) = _____ psi

C. Max. pressure (6A + 5A) = _____ psi

Imperial Temperature Correction Chart

	Correction		Correction		Correction		Correction
Deg. F	Factor	Deg. F	Factor	Deg. F	Factor	Deg. F	Factor
70	1.00000	180	0.9440	290	0.9025	400	0.8820
80	0.9950	190	0.9395	300	0.8980	410	0.8840
90	0.9880	200	0.9350	310	0.8970	420	0.8850
100	0.9825	210	0.9315	320	0.8945	430	0.8860
110	0.9775	220	0.9275	330	0.8925	440	0.8880
120	0.9725	230	0.9235	340	0.8900	450	0.8900
130	0.9675	240	0.9195	350	0.8880	460	0.8940
140	0.9620	250	0.9165	360	0.8870	470	0.9000
150	0.9570	260	0.9125	370	0.8860		
160	0.9530	270	0.9090	380	0.8845		
170	0.9485	280	0.9060	390	0.8835		

Metric Pinning Calculations

Step 1 (Data)

A. Well Temperature (BHT) at perforating depth _____℃

B. True Vertical Depth (TVD) _____ m

C. Max. fluid weight in well when tripping _____ kg/m_3

D. Fluid Weight in tubing when ready to fire _____ kg/m_3

Step 2 (Calculate Pressures)

A. Max. Hydrostatic at depth - (0.0098 * 1C * 1B) = _____ kPa

B. Tubing hydrostatic when ready to fire - (0.0098 * 1B * 1D) = _____ kPa

C. Greater of 2A or 2B = _____ kPa

D. Absolute Firing Pressure - (2C + 13790 kPa (min. safety factor)) = _____ kPa

Step 3 (Calculate number of pins)

A. Reduction Factor
(Ref. Temp. Reduction Chart with temp from 1A) = _____

B. Adjusted Large Pin rating (.130 dia.)
(___ kPa * 3A) = ____ kPa / pin @ BHT
Refer to pin shipping bag for listed pin value to use.

C. Adjusted Small Pin rating (.100 dia.)
(_____ kPa * 3A) = _____ kPa / pin @ BHT
Refer to pin shipping bag for listed pin value to use.

D. Number of Large Pins - (2D / 3B) = _____

E. Number of Small Pins = _____
Take fractional amount of 3D and determine if one small pin is required (e.g. 11.5 pins 11 large + 1 small).

Step 4 (Calculate nominal absolute firing pressure)

A. 3D x 3B = _____ Large pin kPa @ BHT

B. 3E x 3C = _____ Small pin kPa @ BHT

C. 4A + 4B = _____ Total absolute pressure @ BHT

Step 5 (Calculate pressure tolerance)

A. Tolerance (4C * 0.05) = _____ kPa

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

A. Nominal pressure (4C - 2B) = _____ kPa

B. Max. pressure (6A + 5A) = _____ kPa

C. Min. pressure (6A - 5A) = _____ kPa

Metric Temperature Correction Chart

	Correction		Correction		Correction		Correction
Deg. C	Factor	Deg. C	Factor	Deg. C	Factor	Deg. C	Factor
21	1.00000	82	0.9440	143	0.9025	204	0.8820
27	0.9950	88	0.9395	149	0.8980	210	0.8840
32	0.9880	93	0.9350	154	0.8970	216	0.8850
38	0.9825	99	0.9315	160	0.8945	221	0.8860
43	0.9775	104	0.9275	166	0.8925	227	0.8880
49	0.9725	110	0.9235	171	0.8900	232	0.8900
54	0.9675	116	0.9195	177	0.8880	237	0.8940
60	0.9620	121	0.9165	182	0.8870	243	0.9000
66	0.9570	127	0.9125	188	0.8860		
71	0.9530	132	0.9090	193	0.8845		
77	0.9485	138	0.9060	199	0.8835		