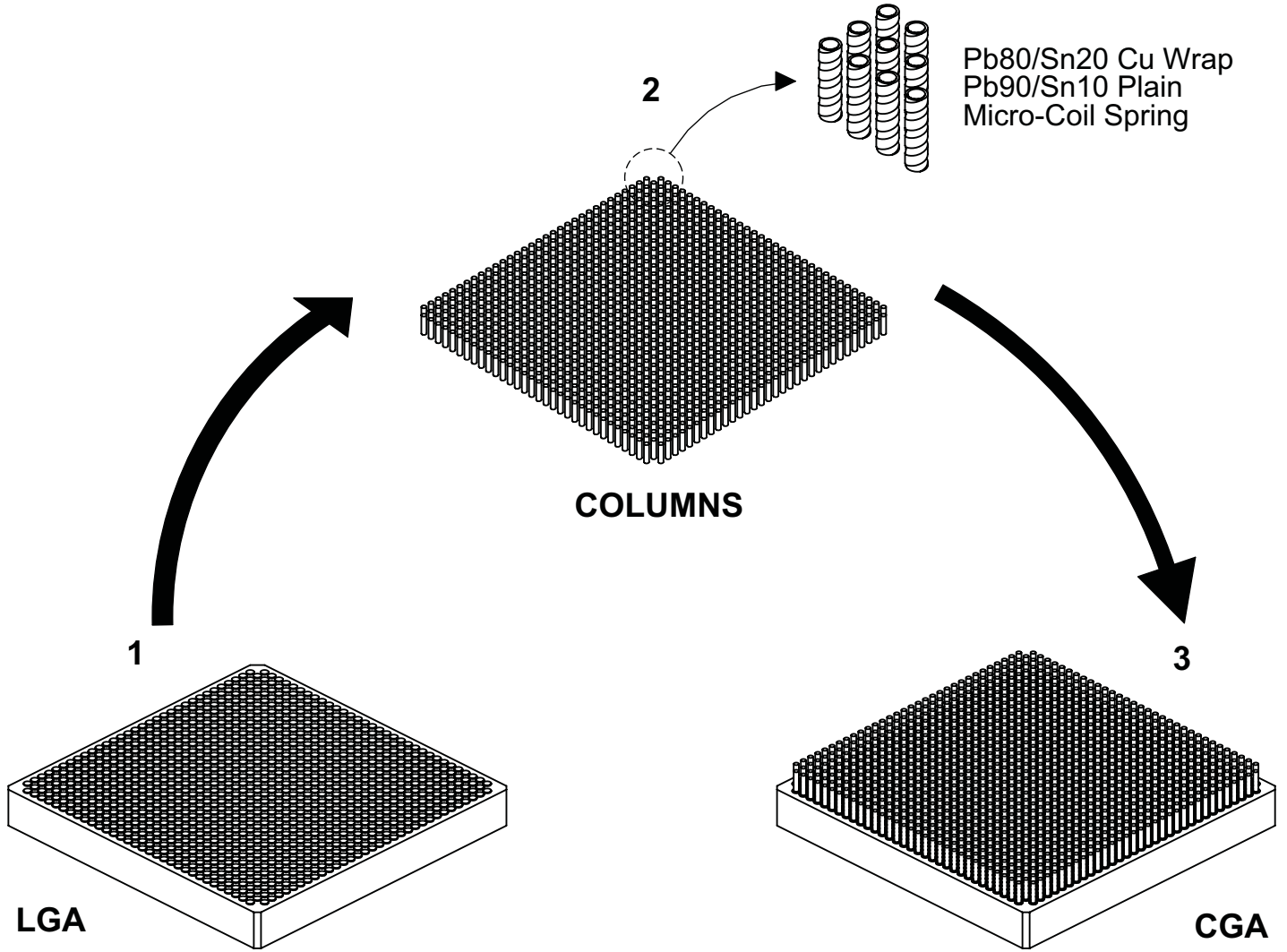


COLUMN ATTACHMENT PROCESS FLOW

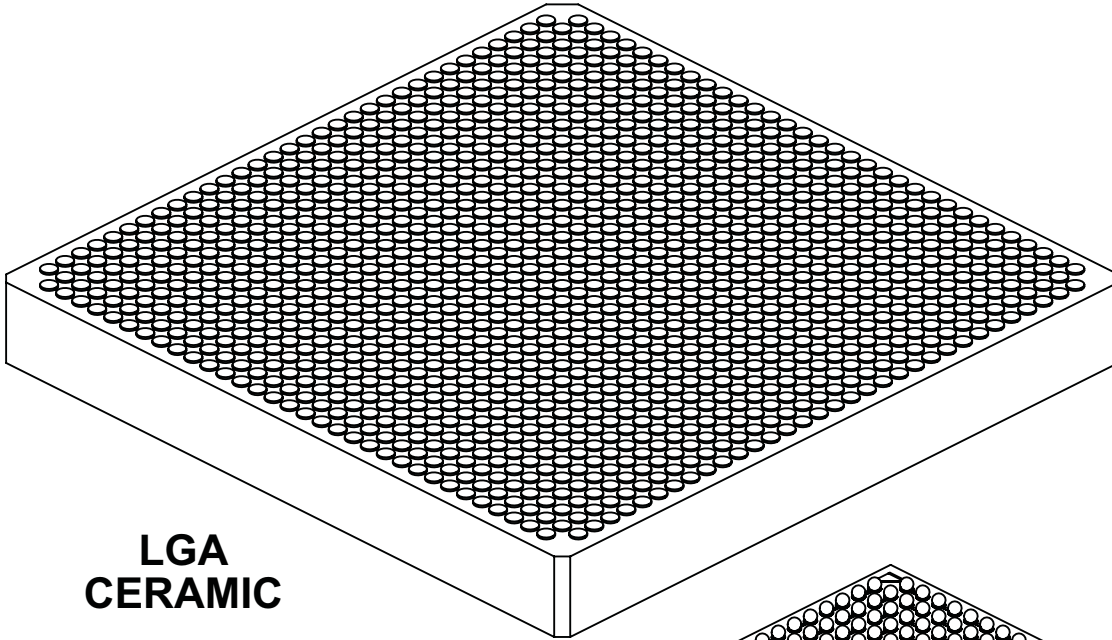


APPROVALS	DATE	TopLine[®]			
DRAWN T.Au	08/27/16	TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
ENG M. Hart	08/27/16				
MFG		SCALE	SIZE	DRAWING NO.	REV
QA		1:1	A	001990	AA
CUST		DO NOT SCALE DRAWING			SHEET 1 OF 28
REVISED					

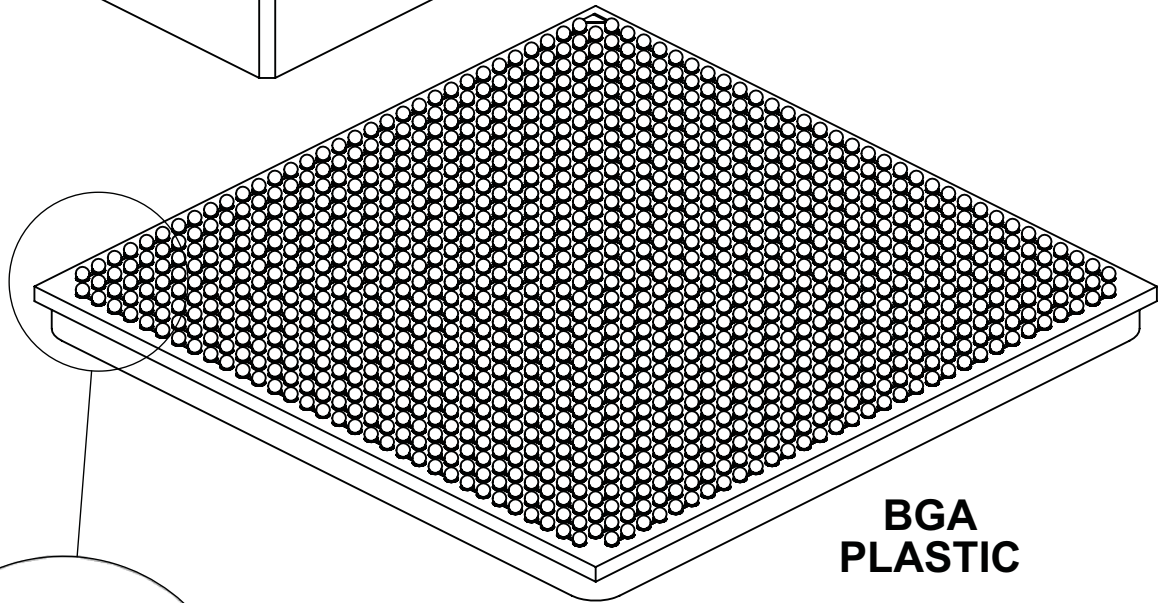
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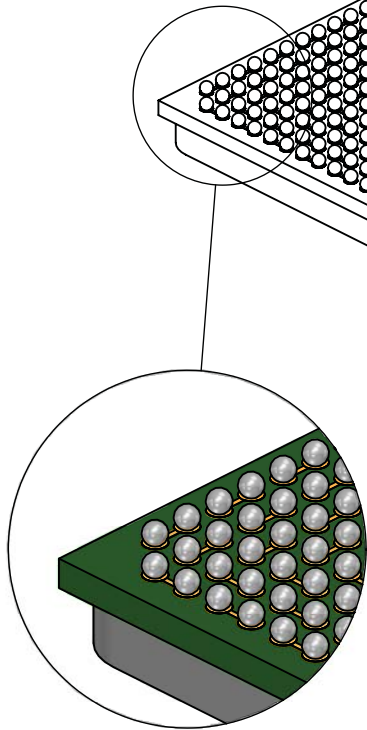
STEP 1 SELECT SUBSTRATE



**LGA
CERAMIC**



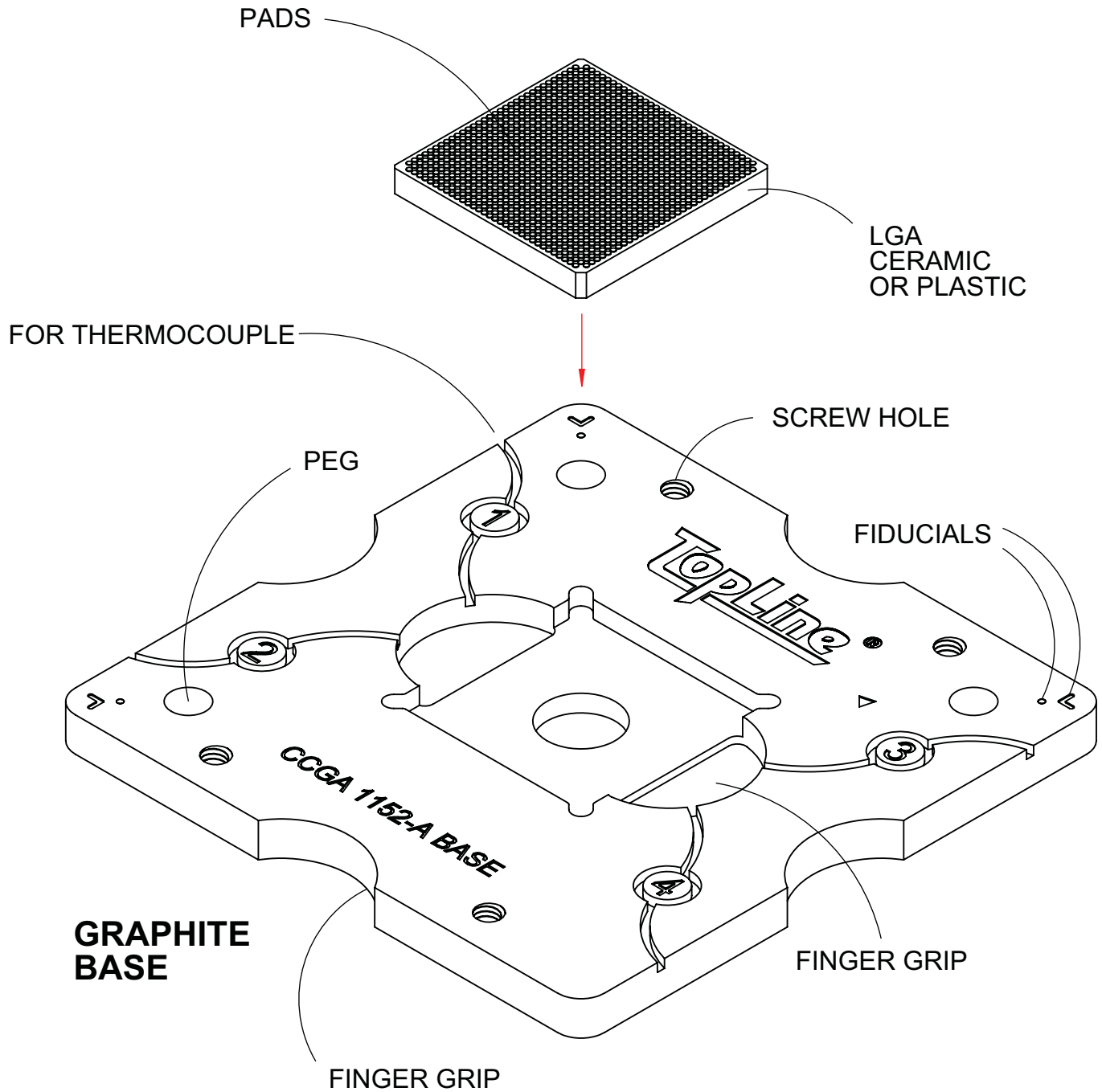
**BGA
PLASTIC**



**NOTE:
REMOVE SOLDER BALLS
BEFORE ATTACHING COLUMNS.**

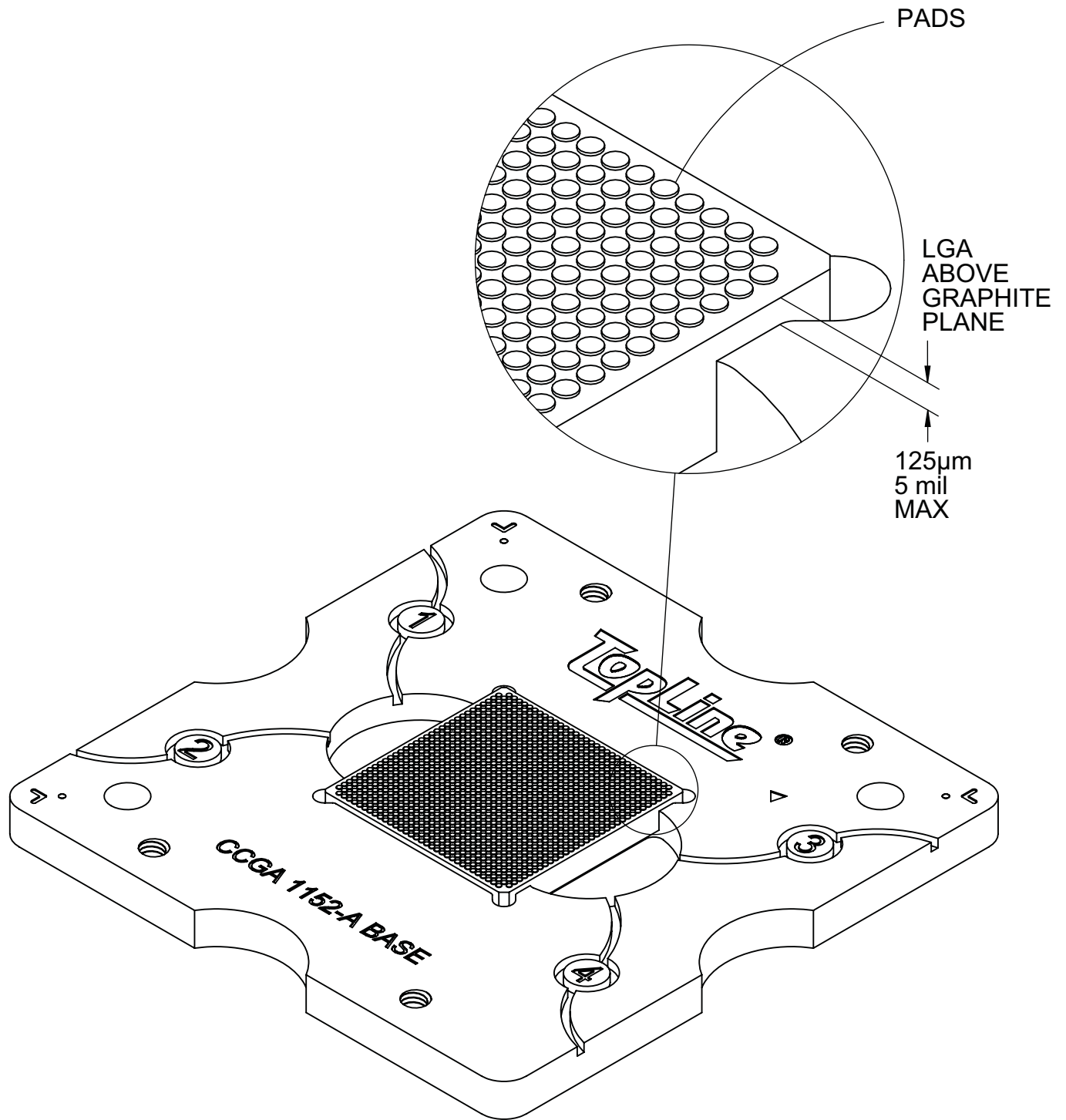
TopLine[®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 3:1	SIZE A	DRAWING NO. 001990	REV AA
DO NOT SCALE DRAWING			SHEET 3 OF 28

STEP 2 PLACE LGA IN GRAPHITE BASE



TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 3:1	SIZE A	DRAWING NO. 001990	REV AA
DO NOT SCALE DRAWING			SHEET 4 OF 28

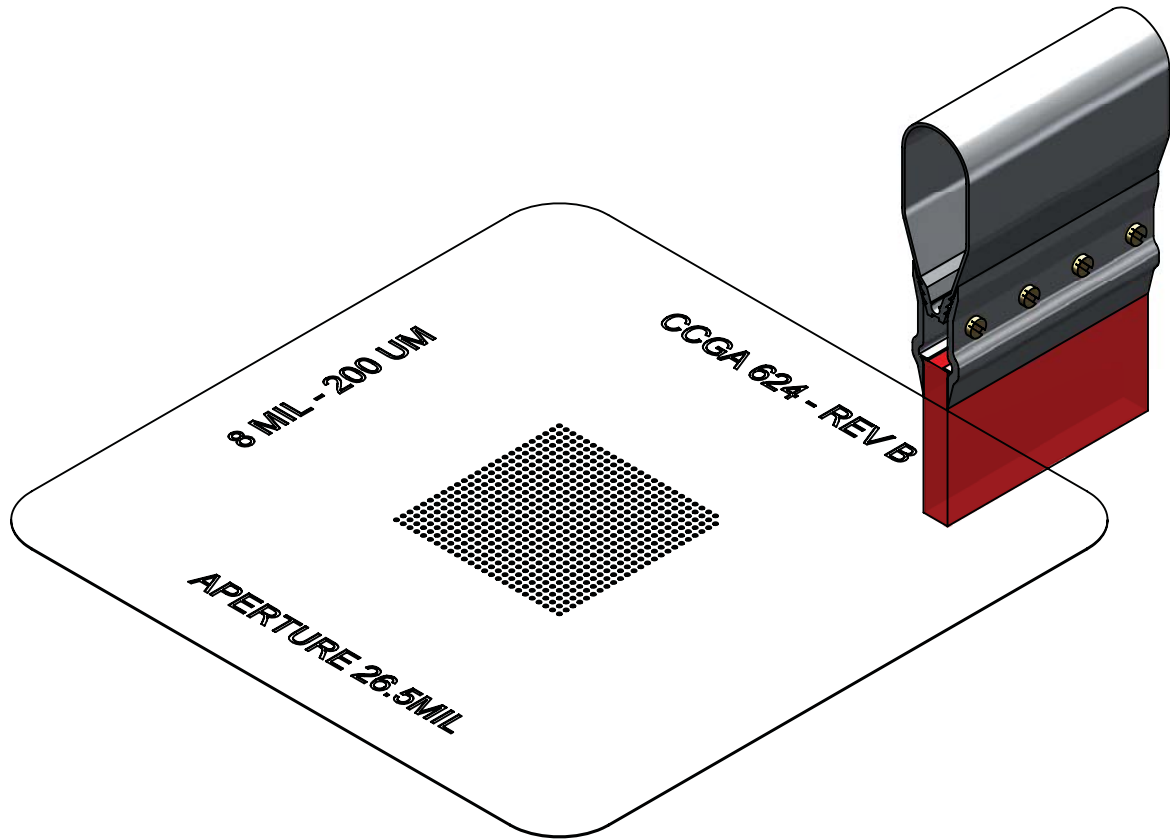
STEP 3 LGA ABOVE PLANE



**NOTE:
USE KAPTON SHIM TO RAISE LGA ABOVE
GRAPHITE PLANE IF NECESSARY.**

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 3:1	SIZE A	DRAWING NO. 001990	REV AA
DO NOT SCALE DRAWING			SHEET 5 OF 28

STEP 4 APPLY SOLDER PASTE



STENCIL THICKNESS PITCH 1.0mm	
THICKNESS	COLUMN TYPE
200µm (8 mils)	Pb80/Sn20 Cu Wrap
200µm (8 mils)	Pb90/Sn10
150µm (6 mils)	Micro-coil Spring

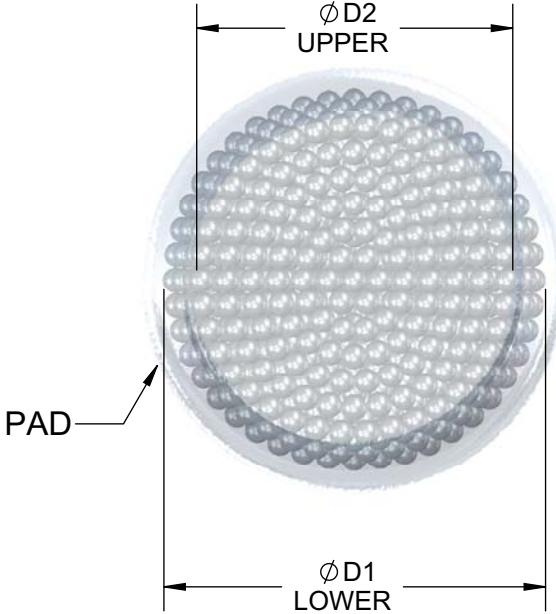
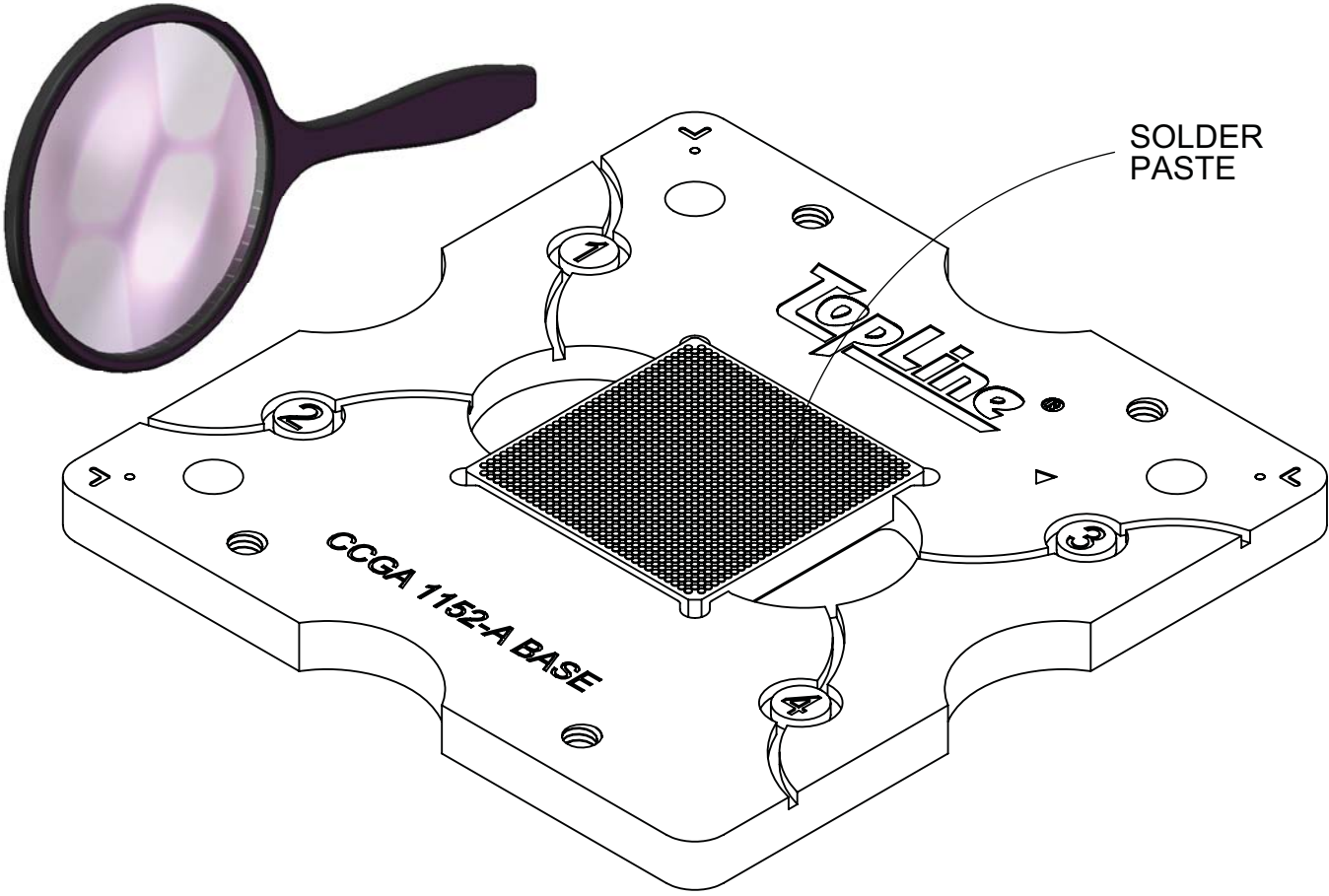
**EUTECTIC SOLDER PASTE:
Sn63/Pb37
Kester EP256 or EQUAL
TYPE 3
ROL0 paste.**

NOTE:

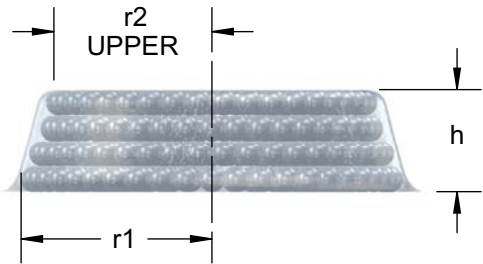
- 1. APPLY SOLDER PASTE TO LGA WHILE SEATED IN GRAPHITE BASE.**
- 2. OPTIONALLY FIRST APPLY SOLDER PASTE TO LGA. THEN PLACE LGA INTO GRAPHITE.**
- 3. STENCIL THICKNESS REQUIRES EXPERIMENTATION.**

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1:1	SIZE A	DRAWING NO. 001990	REV AA
DO NOT SCALE DRAWING			SHEET 6 OF 28

STEP 5 INSPECT SOLDER PASTE



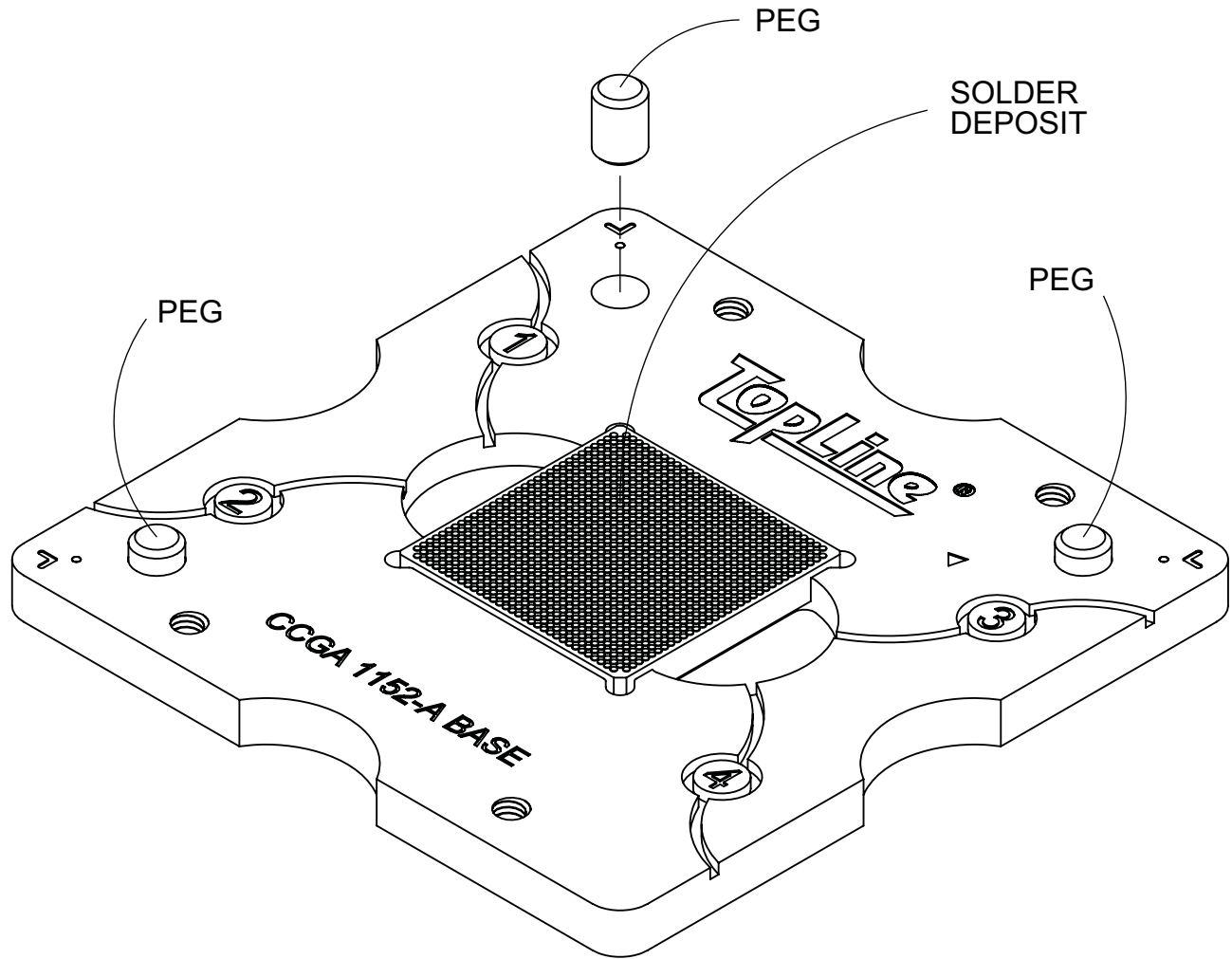
TYPICAL SOLDER PASTE DEPOSIT



$$volume: V = 1/3\pi(r_1^2 + r_1r_2 + r_2^2)h$$

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 3:1	SIZE A	DRAWING NO. 001990	REV AA
DO NOT SCALE DRAWING			SHEET 7 OF 28

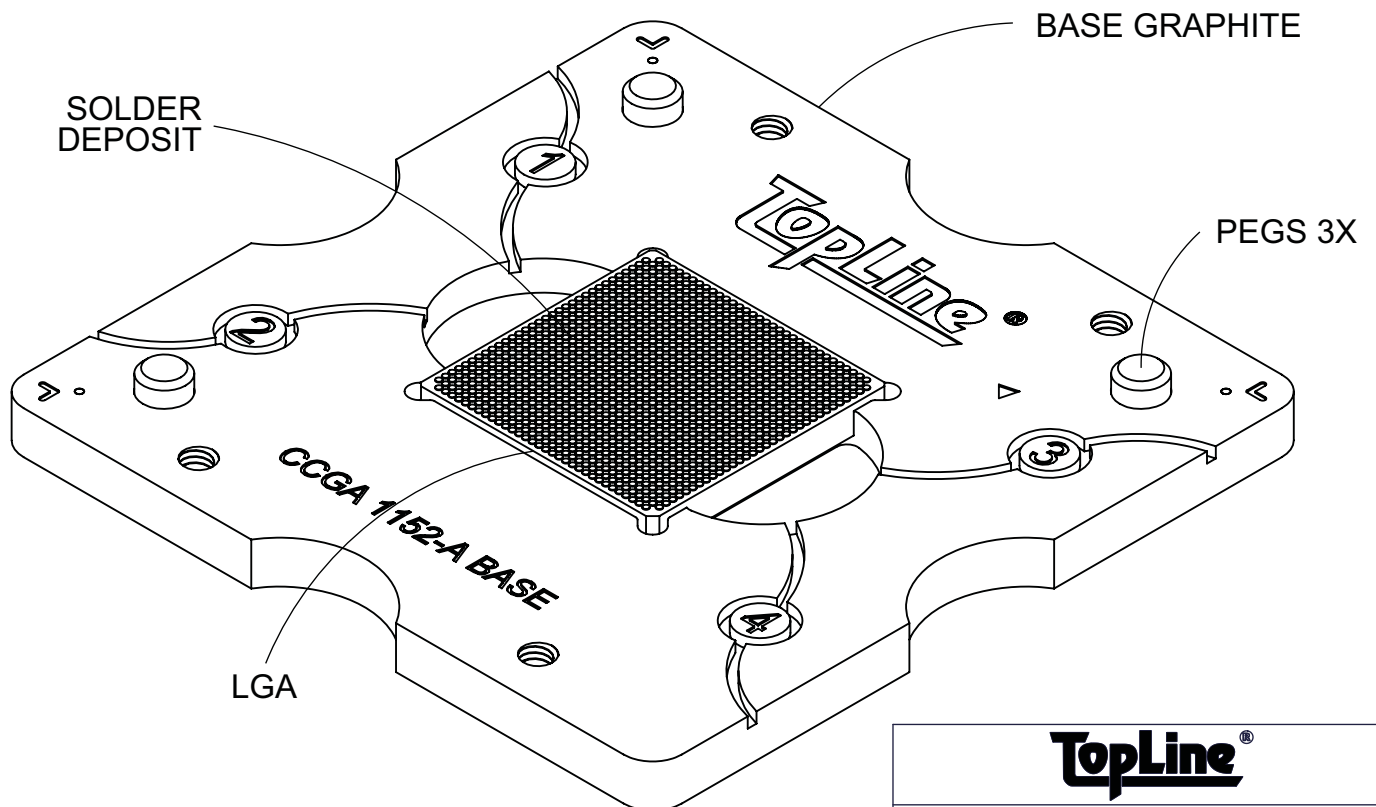
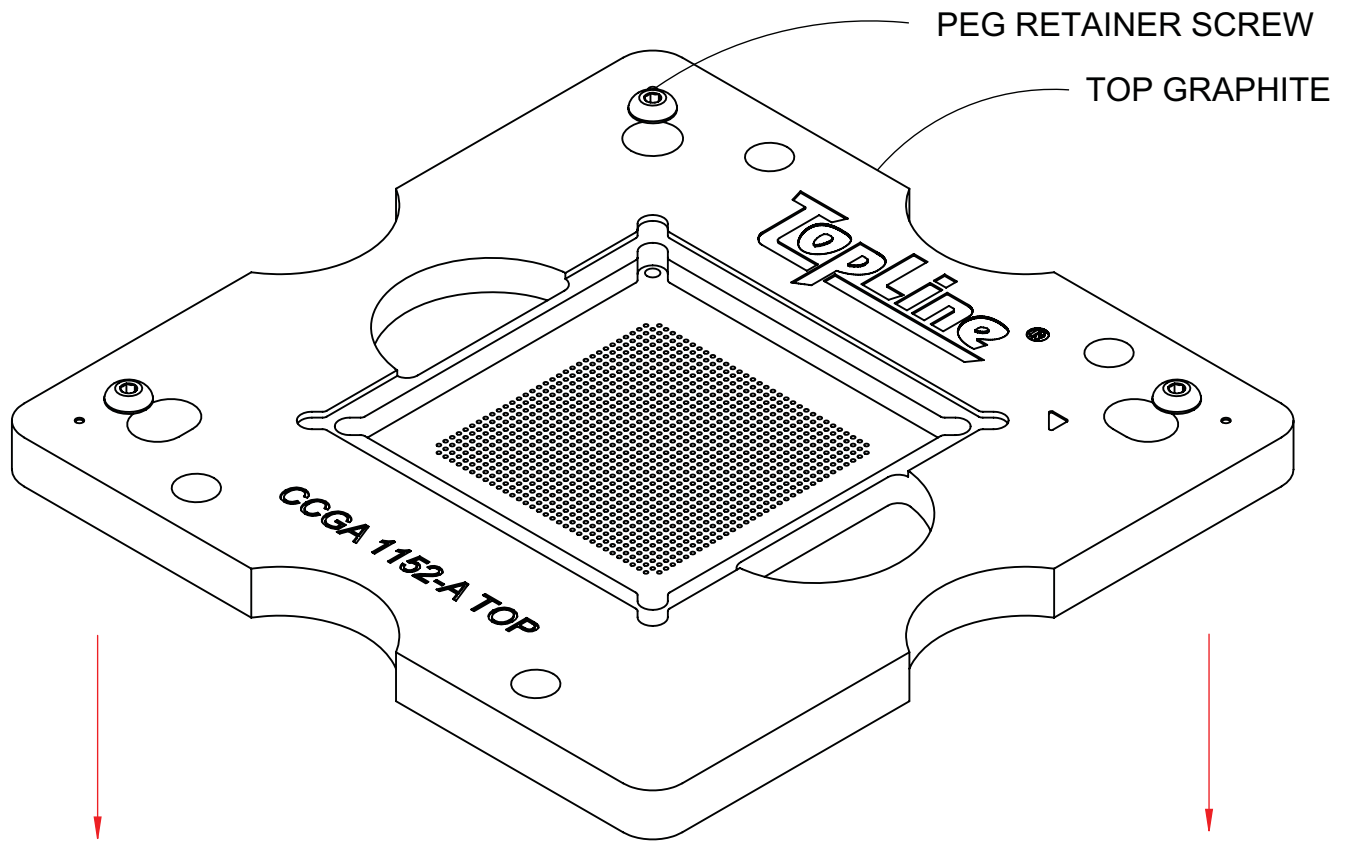
STEP 6 PEGS IN GRAPHITE BASE



**NOTE:
REGISTRATION PINS (PEGS) 3 PLACES.**

TopLine[®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 3:1	SIZE A	DRAWING NO. 001990	REV AA
DO NOT SCALE DRAWING			SHEET 8 OF 28

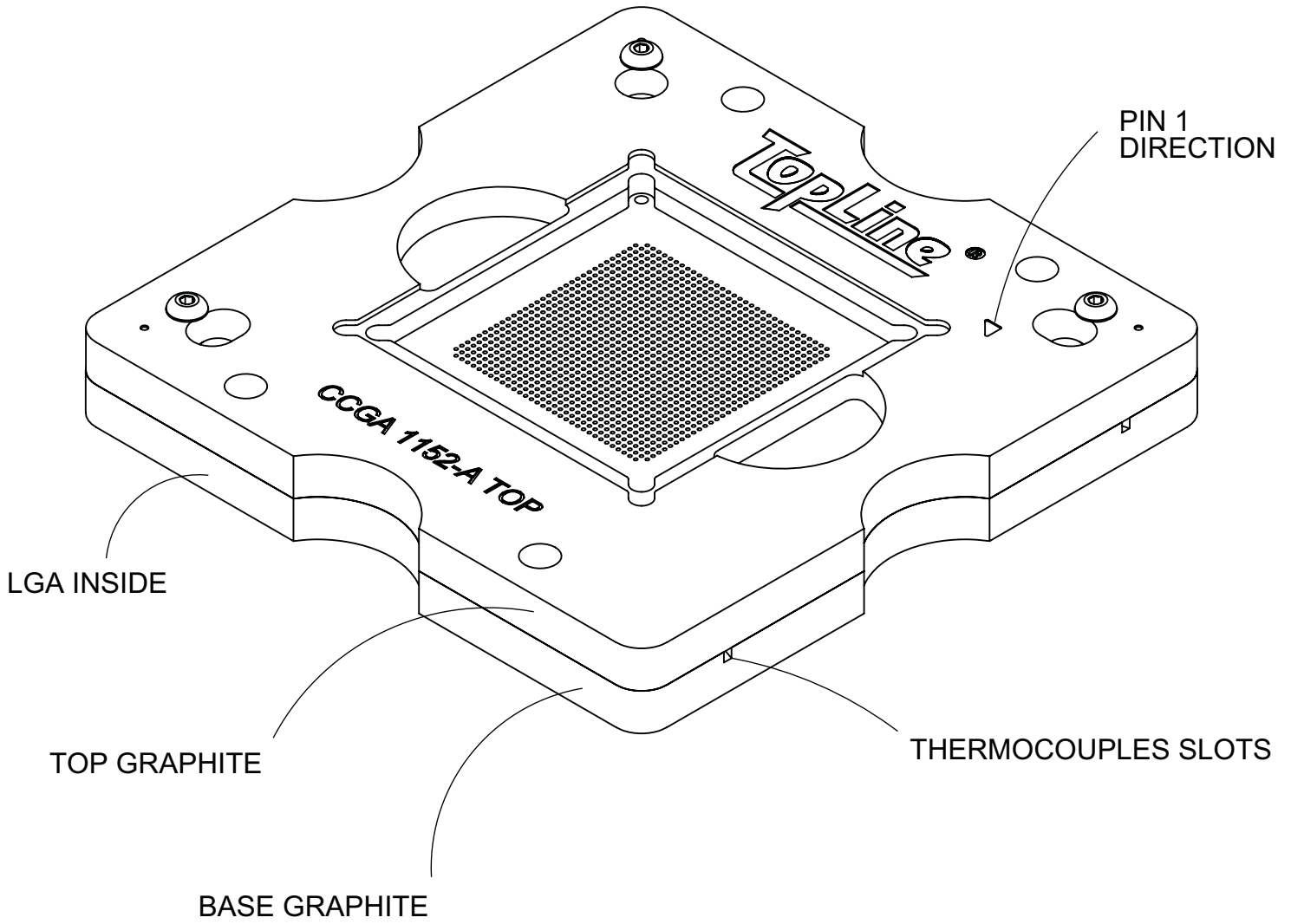
STEP 7 TOP GRAPHITE



NOTE:
OPTIONAL: ADD THERMOCOUPLES BEFORE
PLACING TOP GRAPHITE ONTO BASE GRAPHITE.

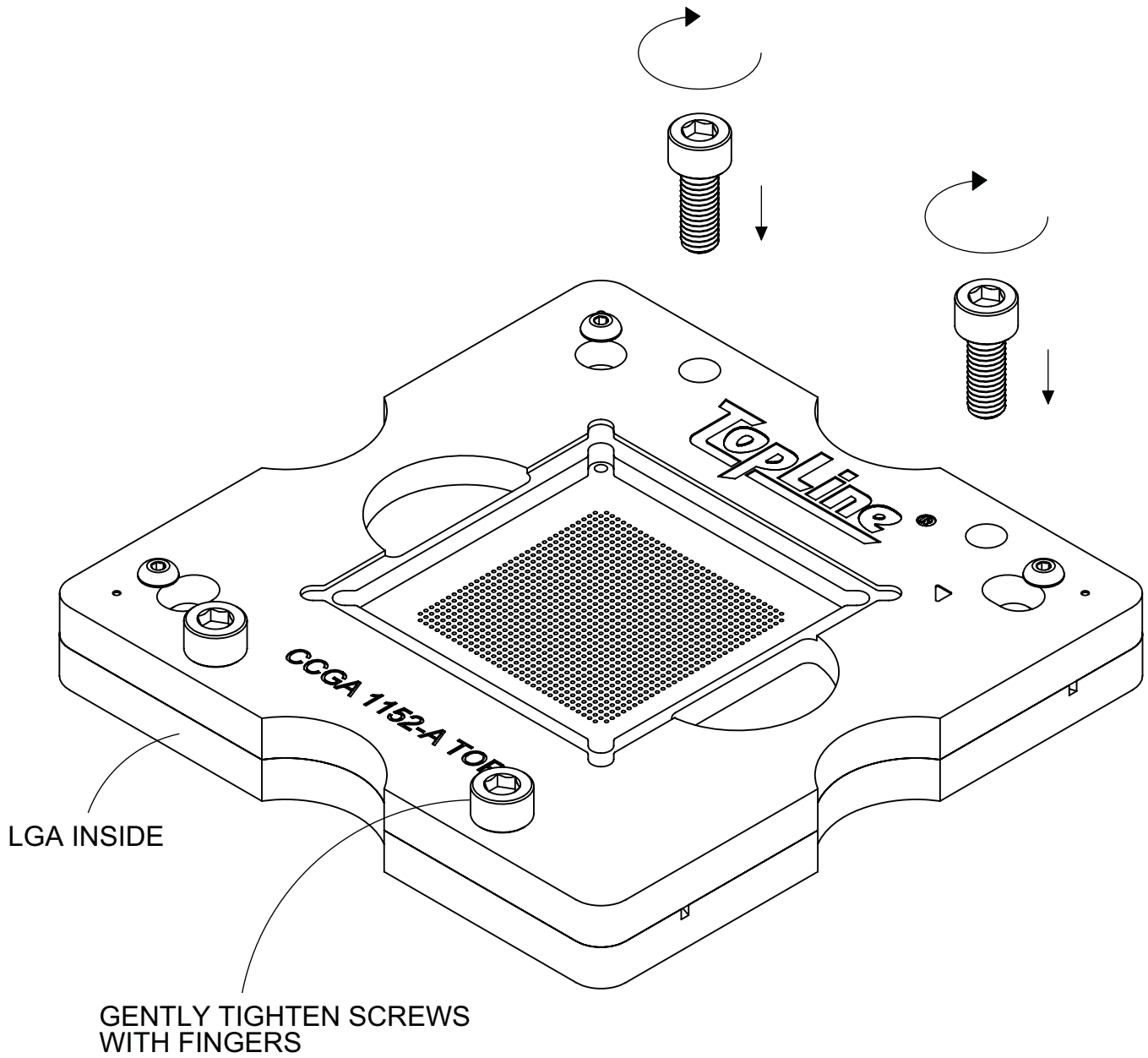
TopLine [®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 3:1	SIZE A	DRAWING NO. 001990	REV AA
DO NOT SCALE DRAWING			SHEET 9 OF 28

STEP 8 GRAPHITE SET



TopLine [®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 10 OF 28

STEP 9 SCREW GRAPHITE TOGETHER



NOTE:
1. DO NOT OVER TIGHTEN SCREWS.
2. DO NOT USE EXCESSIVE FORCE.

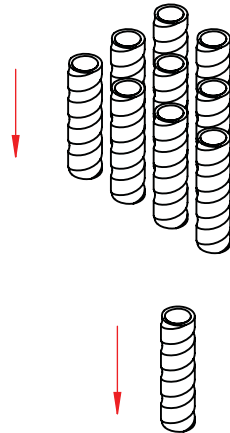
TopLine [®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 11 OF 28

STEP 10 INSERT COLUMNS BY HAND USE TWEEZERS

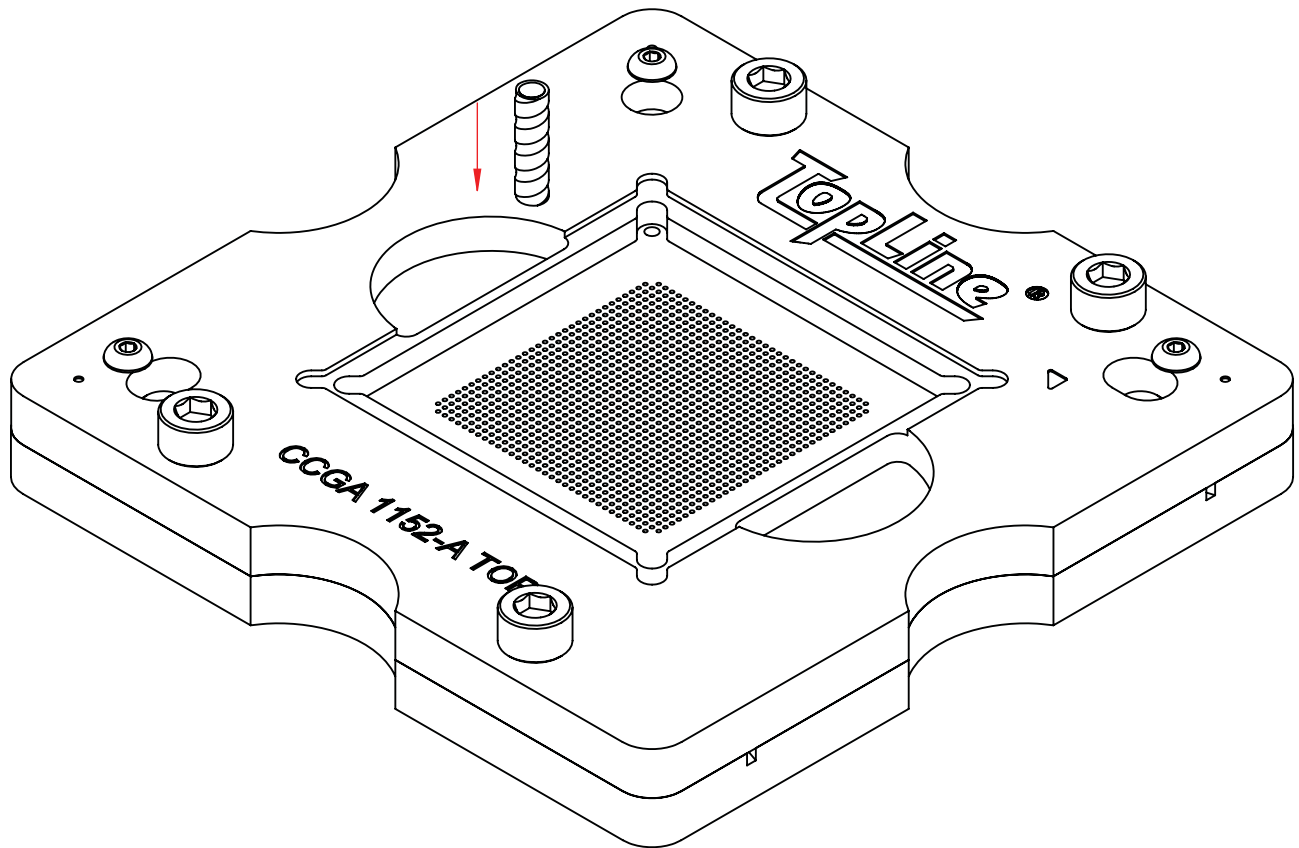
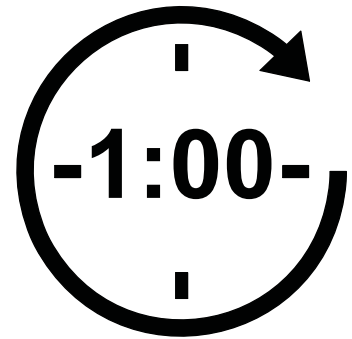
SLOW WAY



COLUMNS



1152 COLUMNS = 60 MINUTES



TopLine[®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 12 OF 28

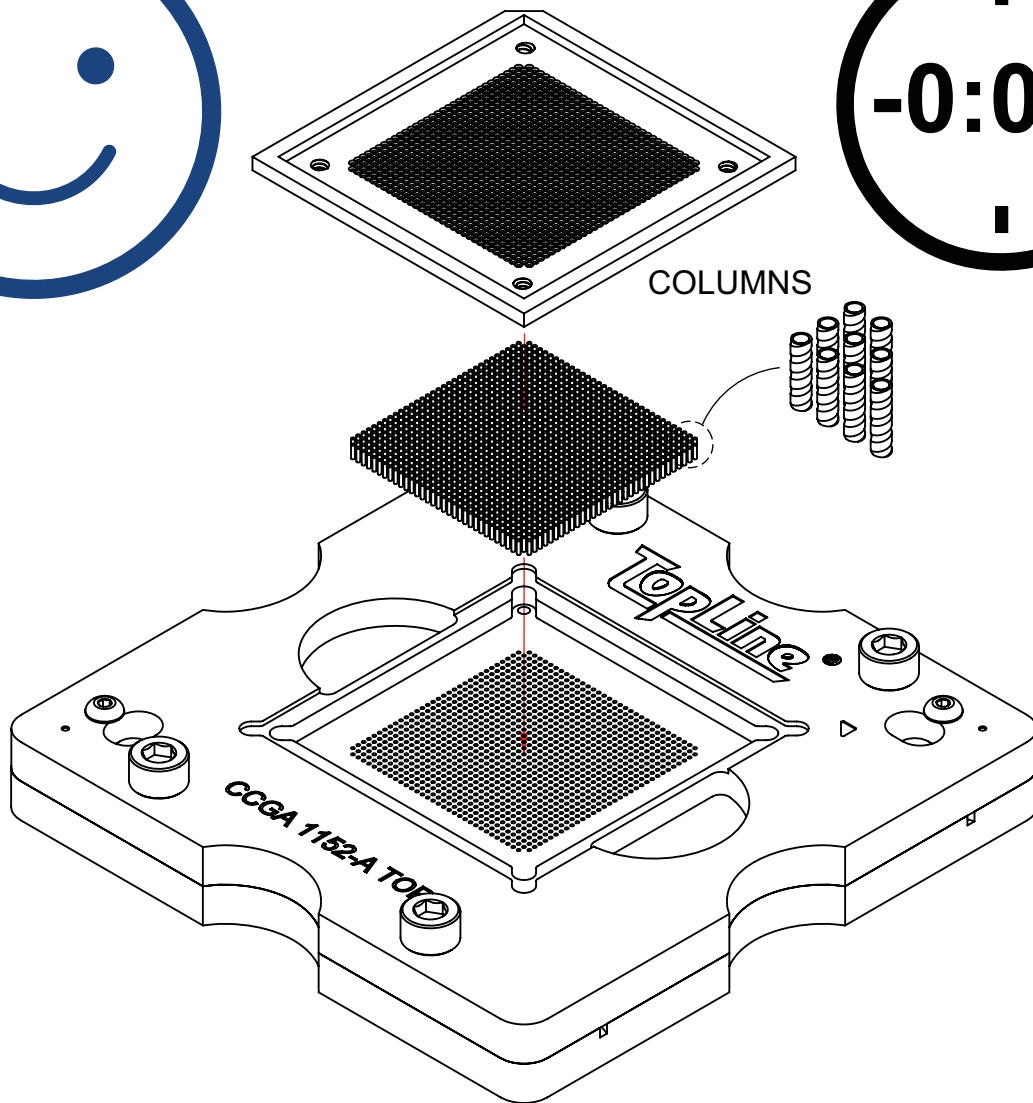
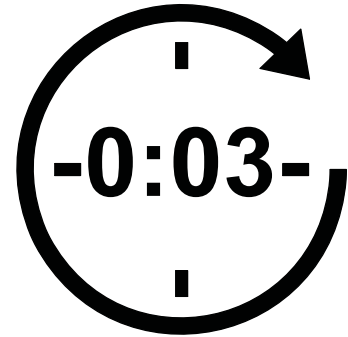
STEP 11 INSERT COLUMNS WITH FLIP-PACK™

FAST WAY !

1152 COLUMNS = 3 MINUTES



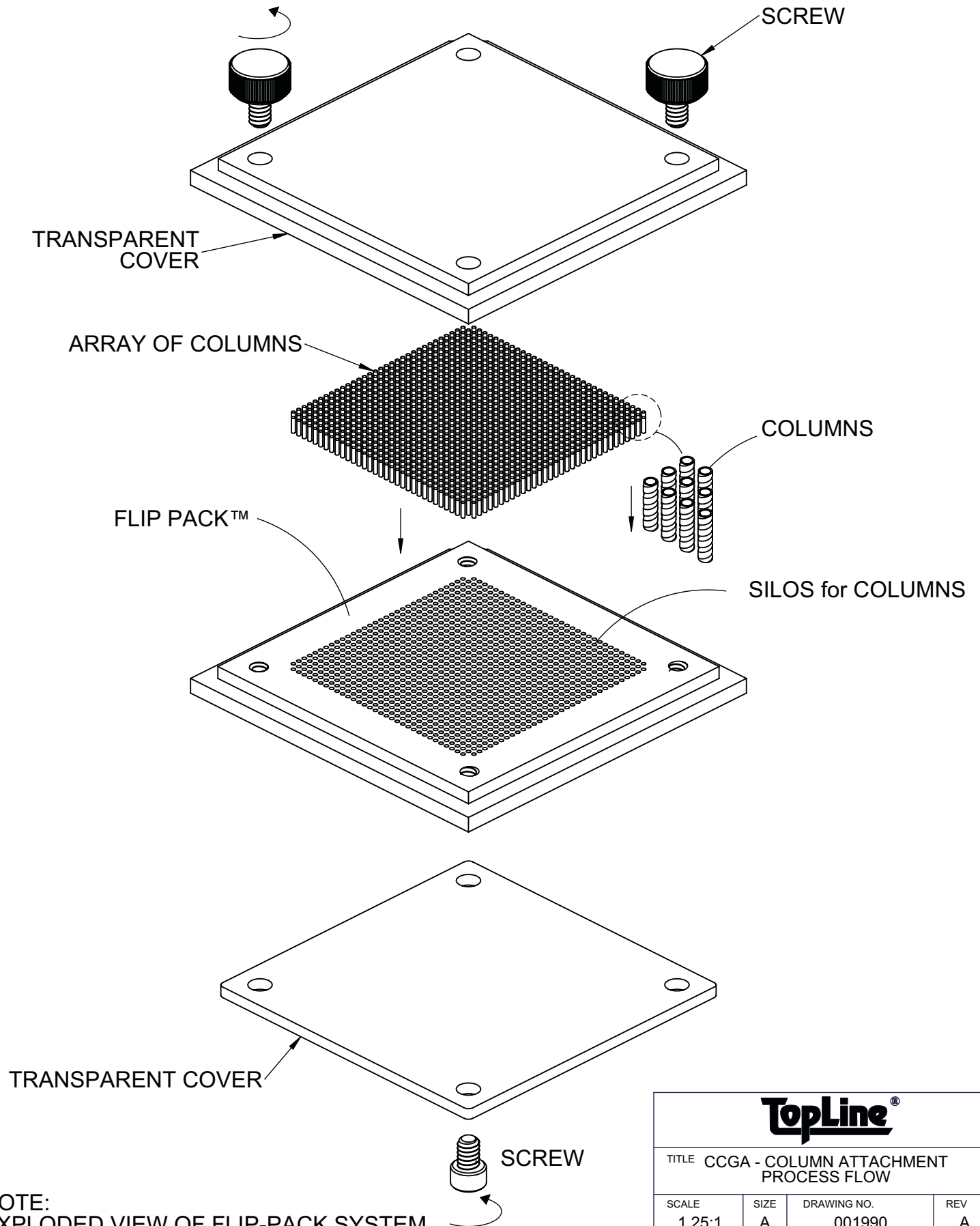
FLIP-PACK™



NOTE:
FLIP-PACK PATENT PENDING.
PIN-PACK U.S. Patent No. 9,108,262

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 13 OF 28

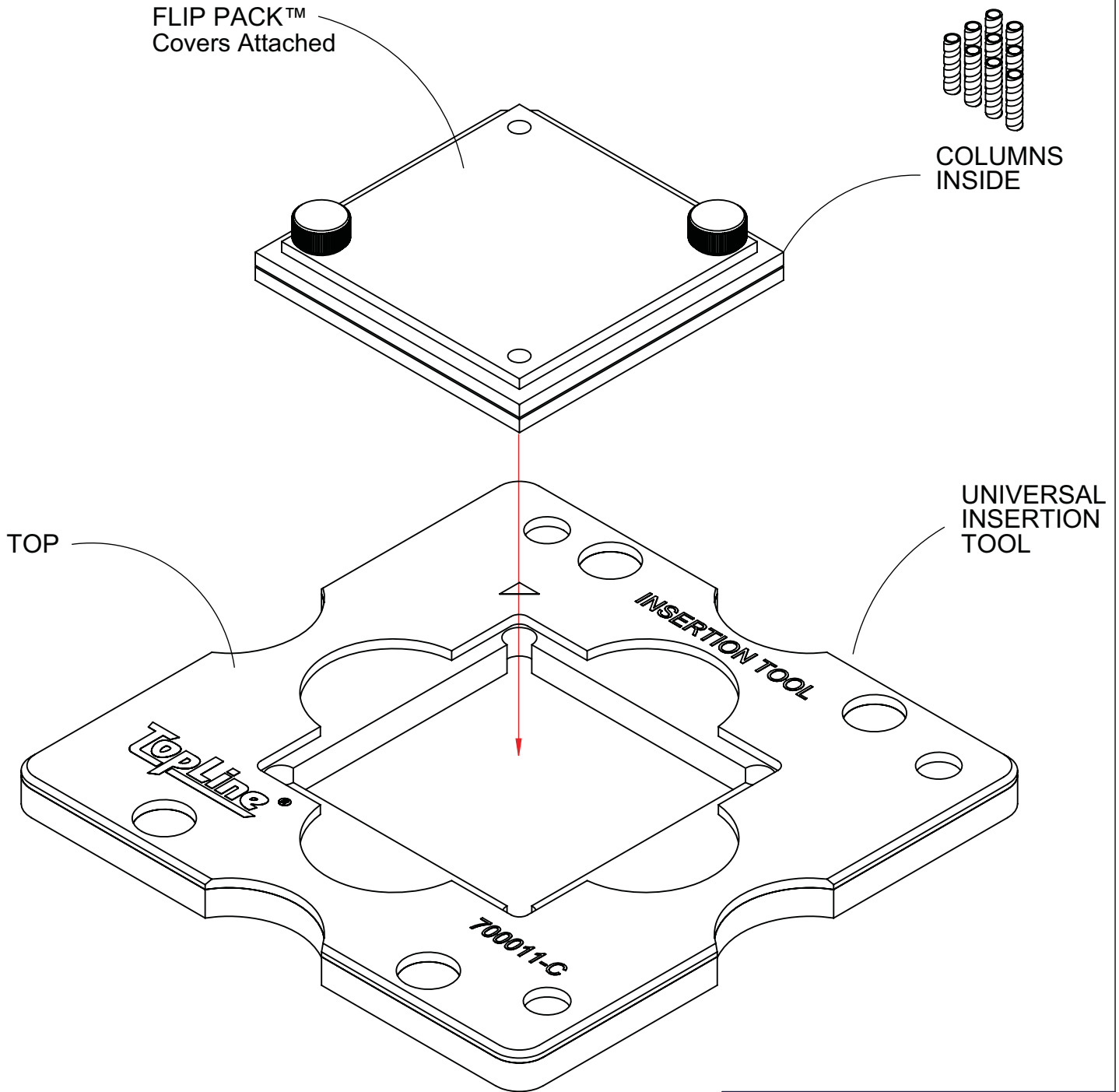
STEP 12 FLIP-PACK™ WITH COLUMNS



NOTE:
EXPLODED VIEW OF FLIP-PACK SYSTEM.

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 14 OF 28

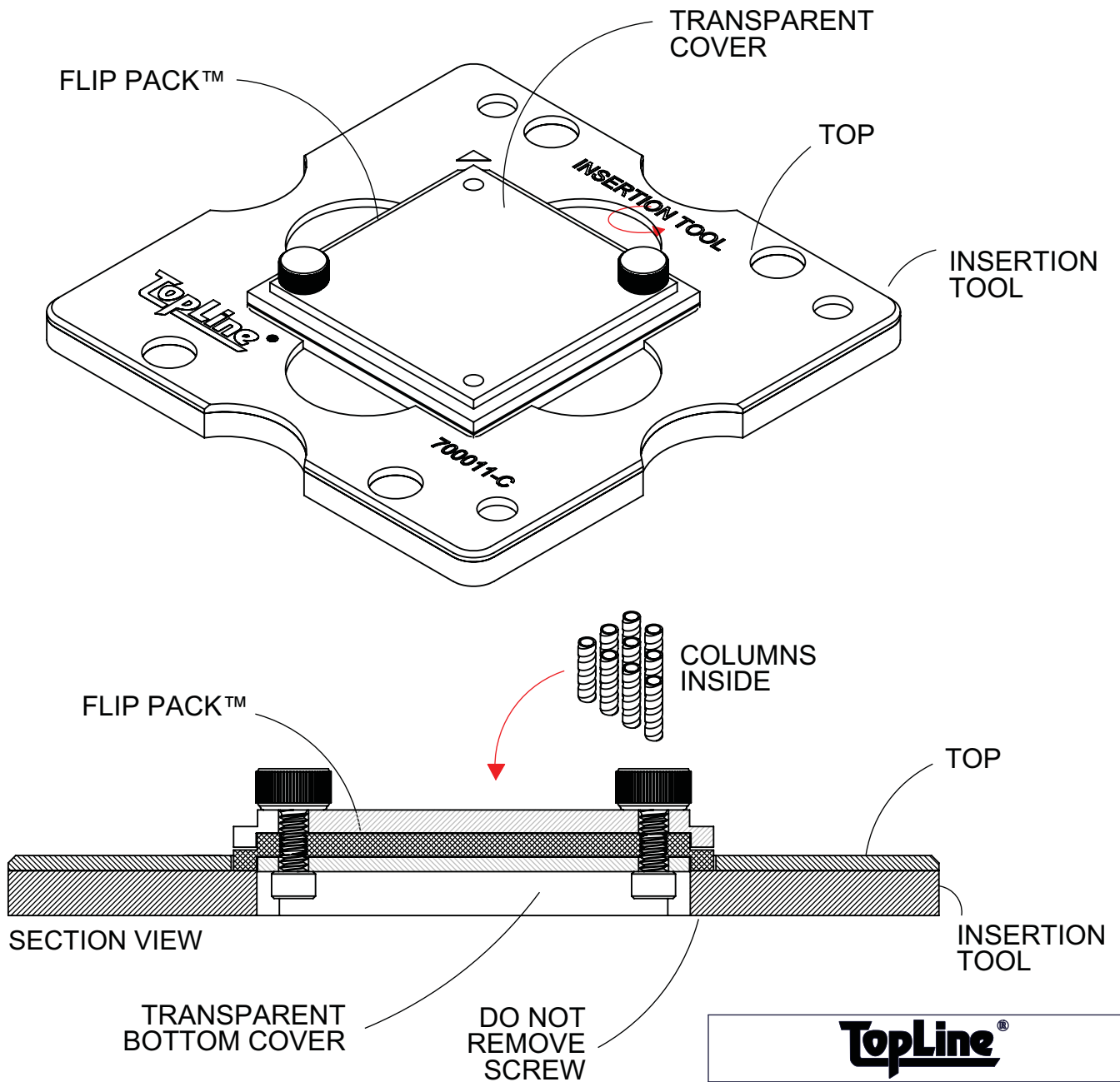
STEP 13 FLIP-PACK™ WITH INSERT TOOL



NOTE:
PLACE INSERTION TOOL ON WORK BENCH.

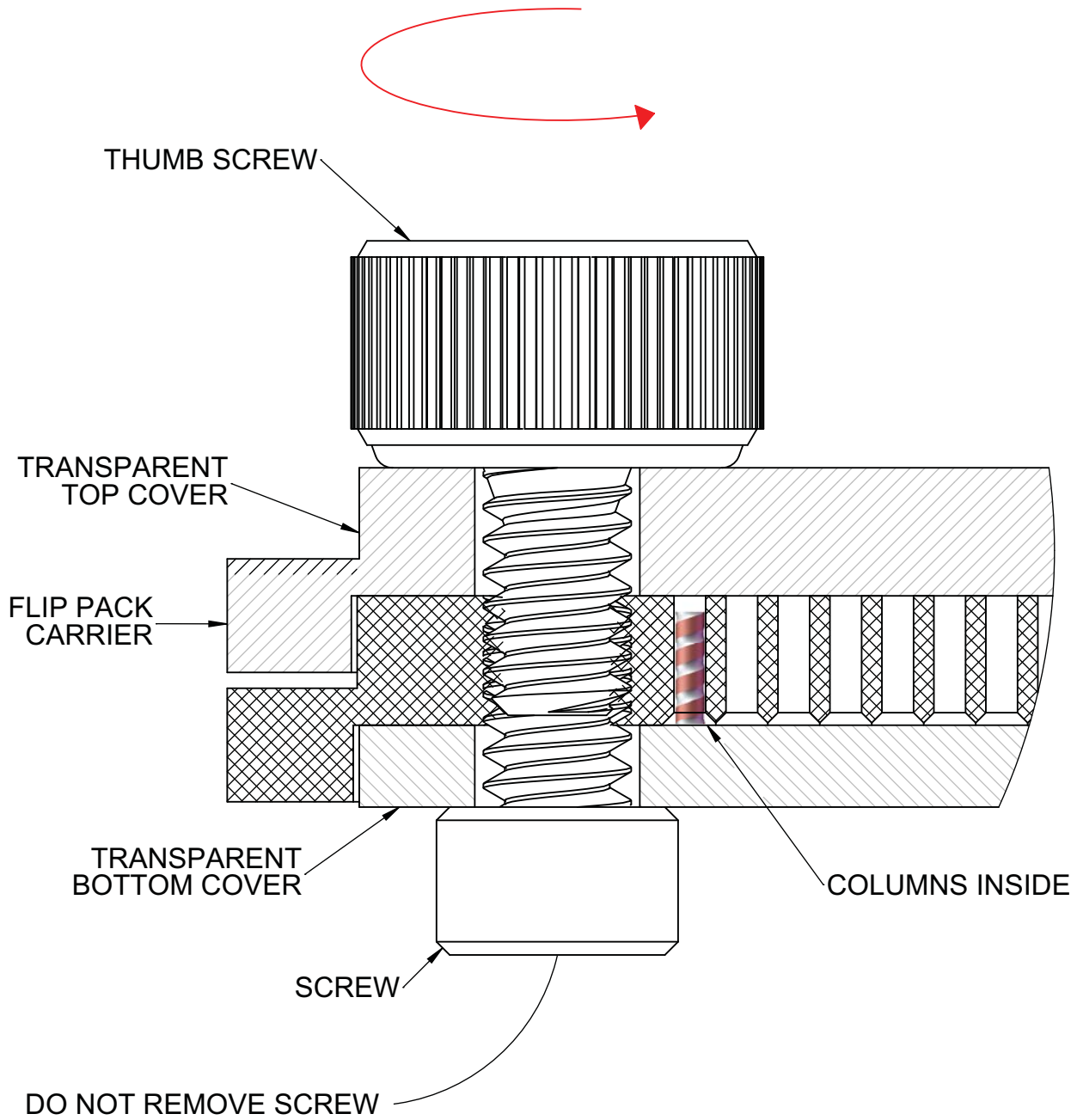
TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 15 OF 28

STEP 14 INSERTION TOOL WITH FLIP-PACK™



TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 16 OF 28

STEP 15 FLIP-PACK™ DETAIL



TopLine®

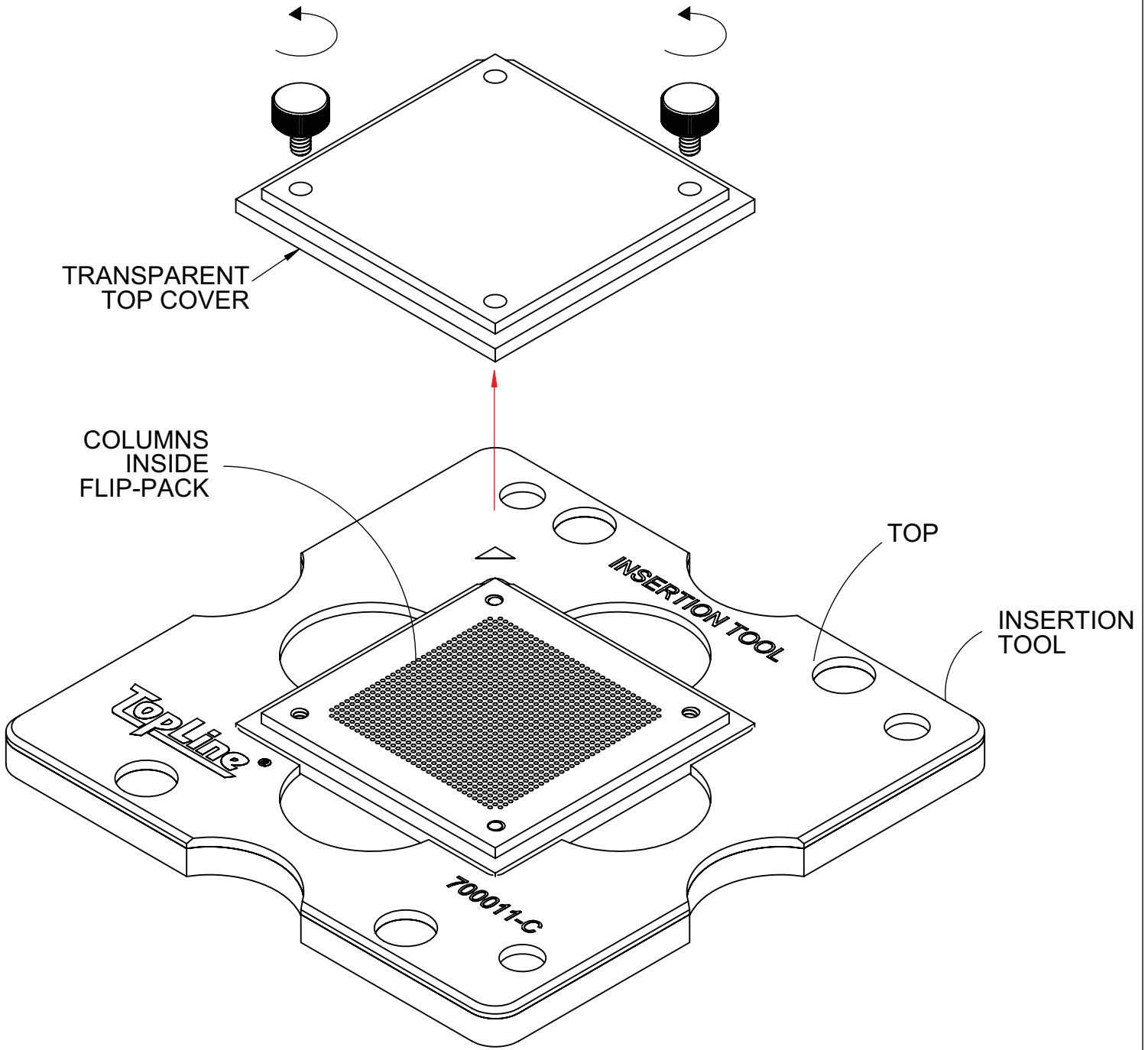
TITLE CCGA - COLUMN ATTACHMENT
PROCESS FLOW

SCALE 8:1	SIZE A	DRAWING NO. 001990	REV A
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DO NOT SCALE DRAWING

SHEET 17 OF 28

STEP 16 REMOVE TOP COVER FROM FLIP-PACK™



NOTE:
KEEP INSERTION TOOL ON WORK BENCH WHILE
REMOVING TOP COVER.

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 18 OF 28

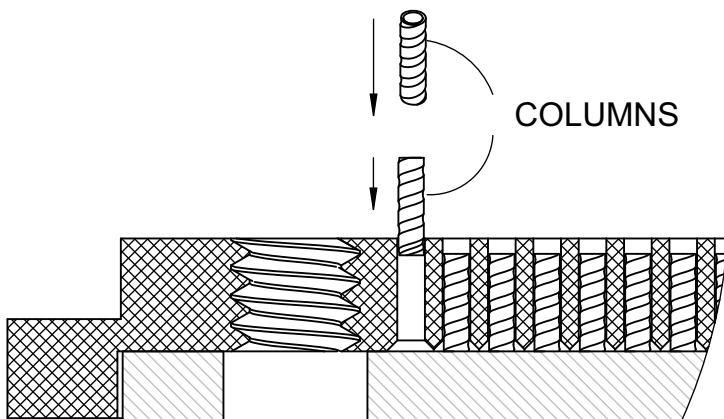
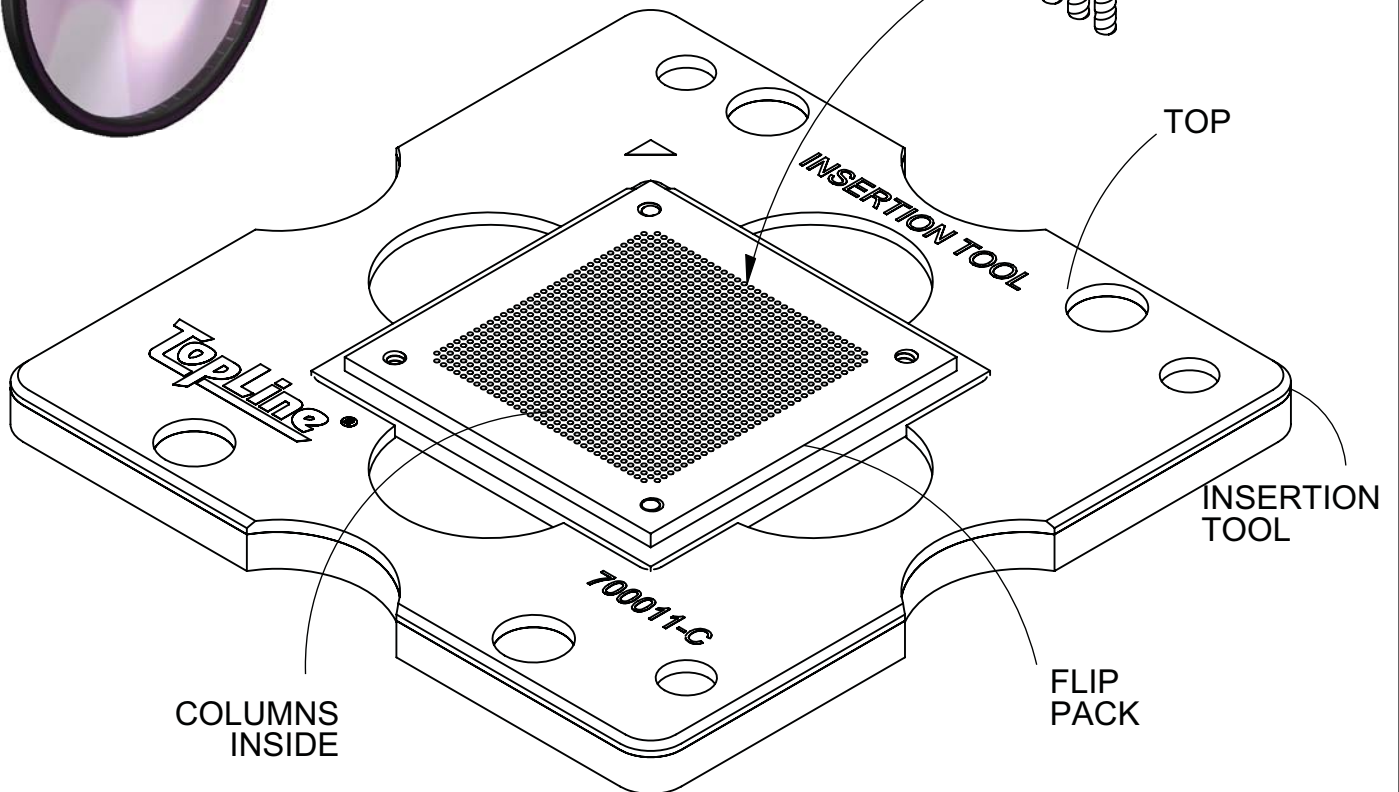
STEP 17 INSPECT COLUMNS FLIP-PACK™



INSPECT 100% FILLED
WITH COLUMNS



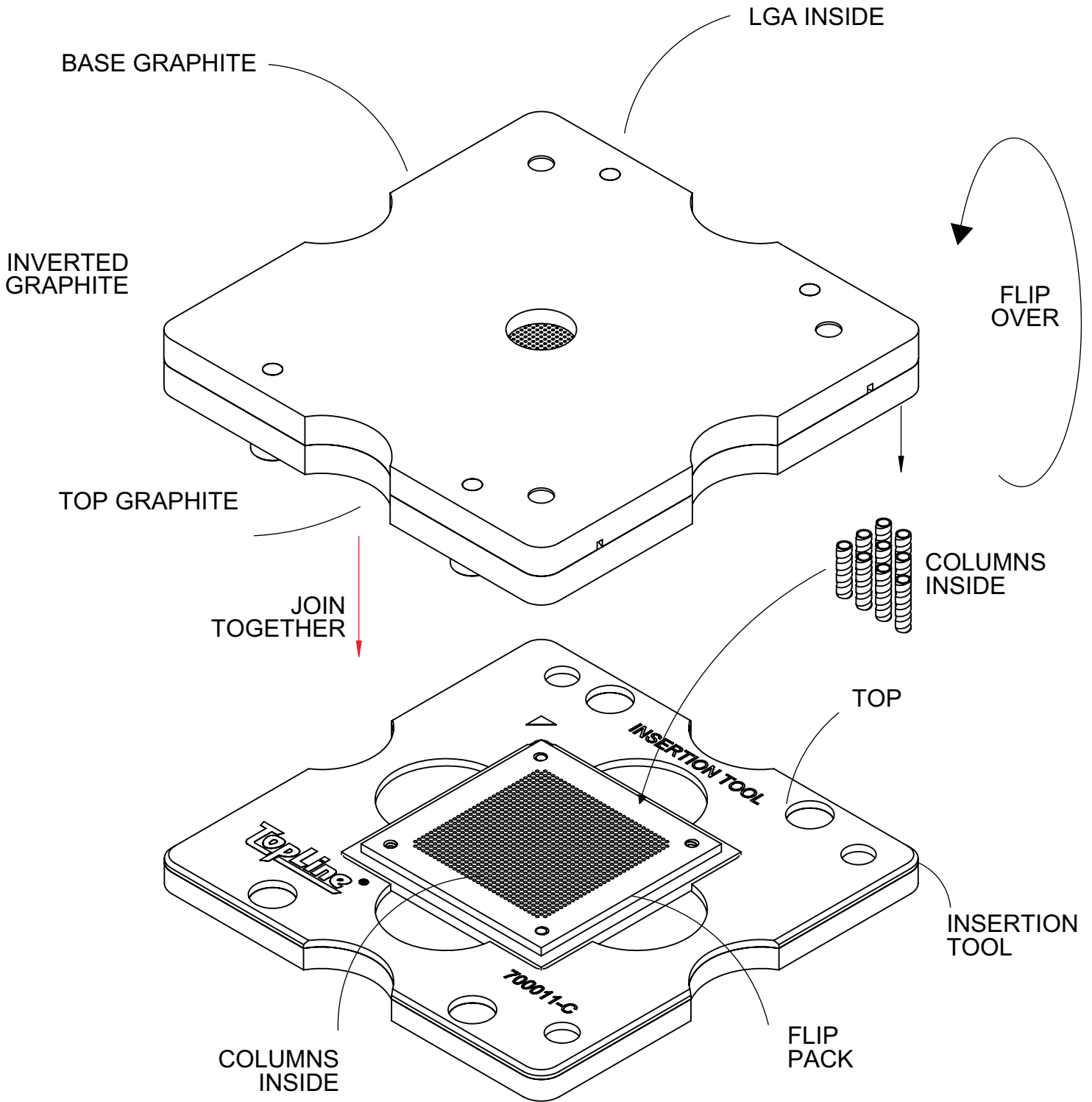
COLUMNS
INSIDE



NOTE: REPLACE COLUMNS (IF ANY MISSING).

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 19 OF 28

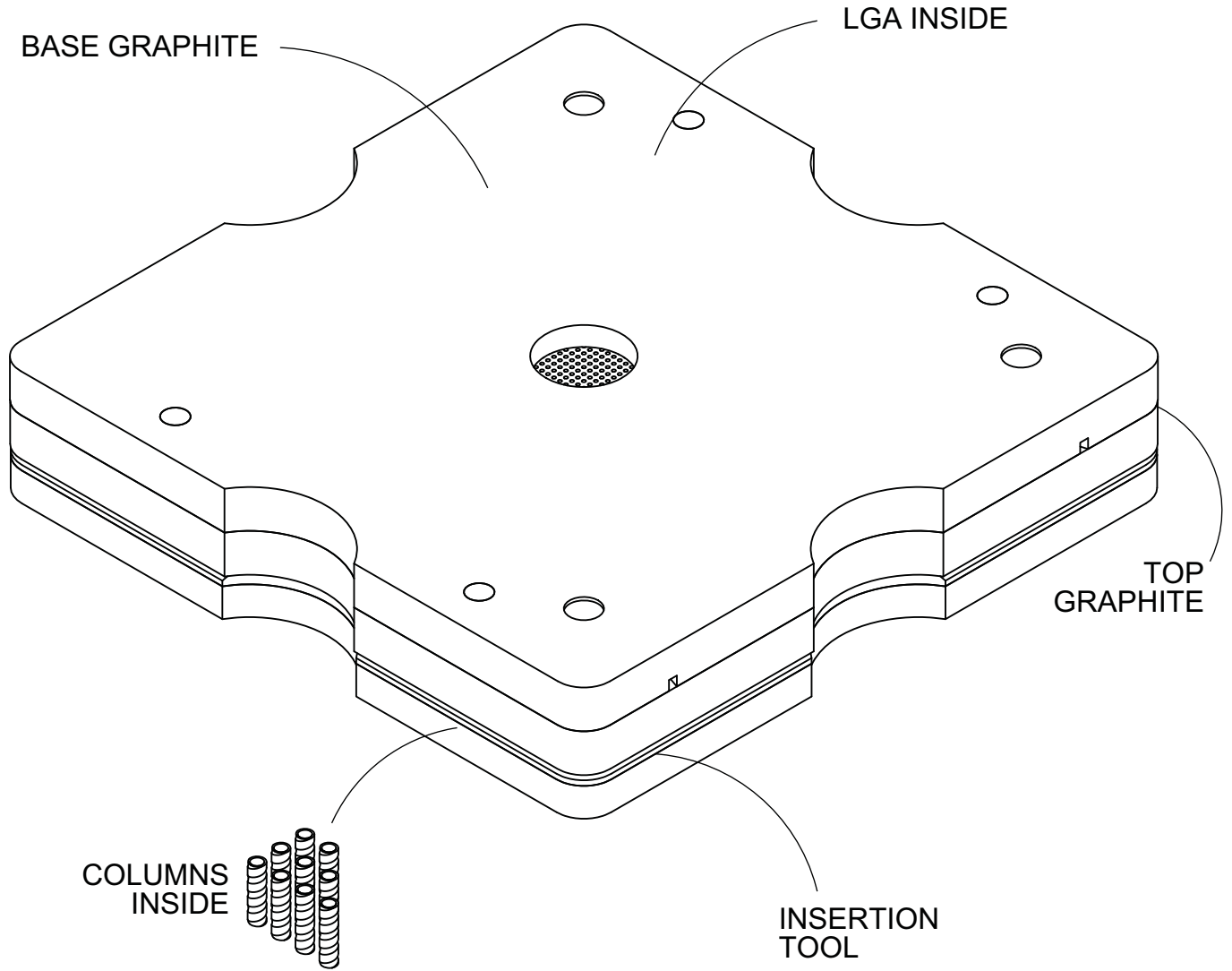
STEP 18 INVERT GRAPHITE UPSIDE DOWN



NOTE:
KEEP INSERTION TOOL ON WORK BENCH WHILE
JOINING GRAPHITE ON TOP.

TopLine [®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 20 OF 28

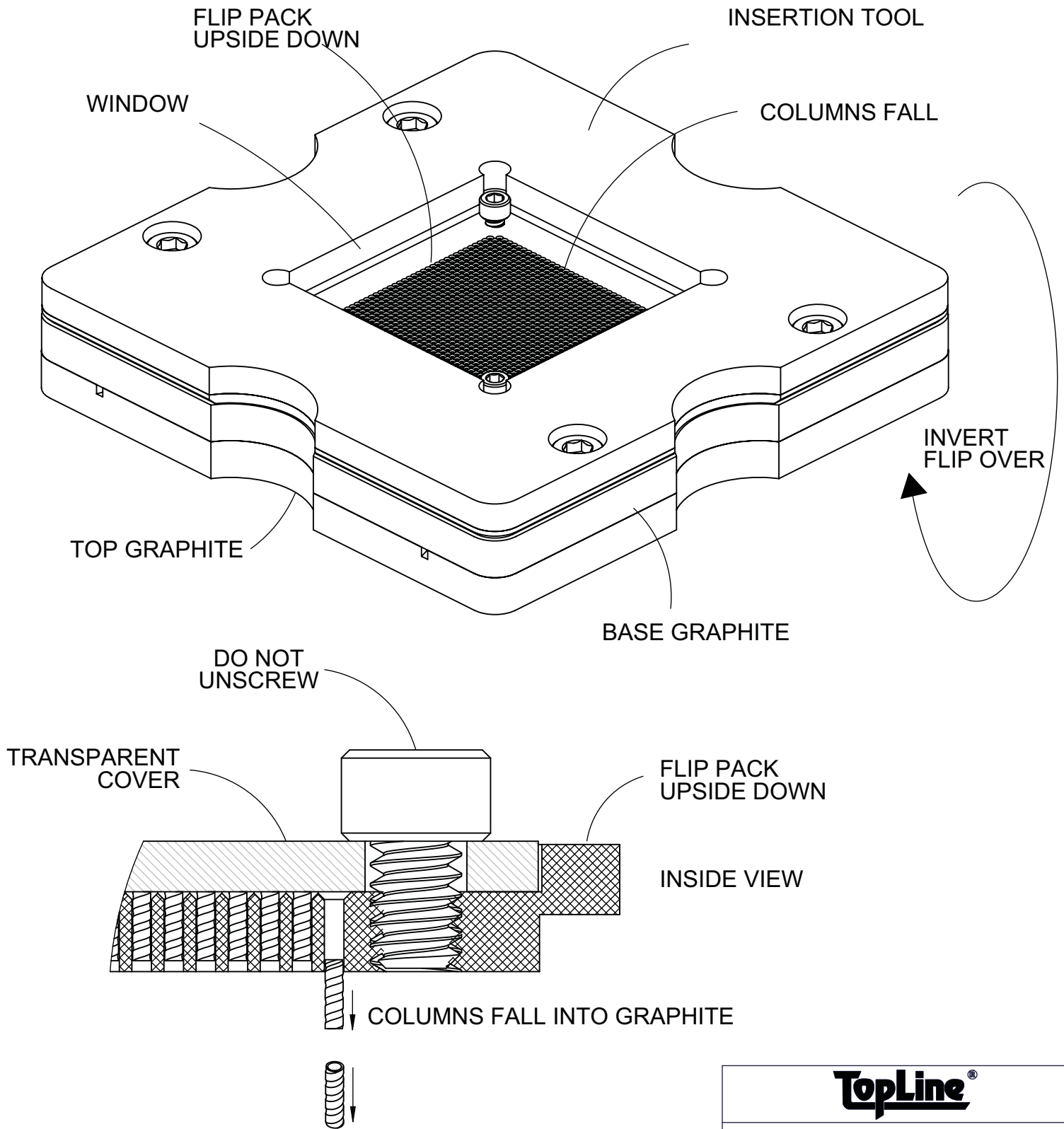
STEP 19 JOINED SET GRAPHITE + INSERTION TOOL WITH FLIP-PACK INSIDE™



NOTE:
KEEP INSERTION TOOL ON WORK BENCH.

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING		SHEET 21 OF 28	

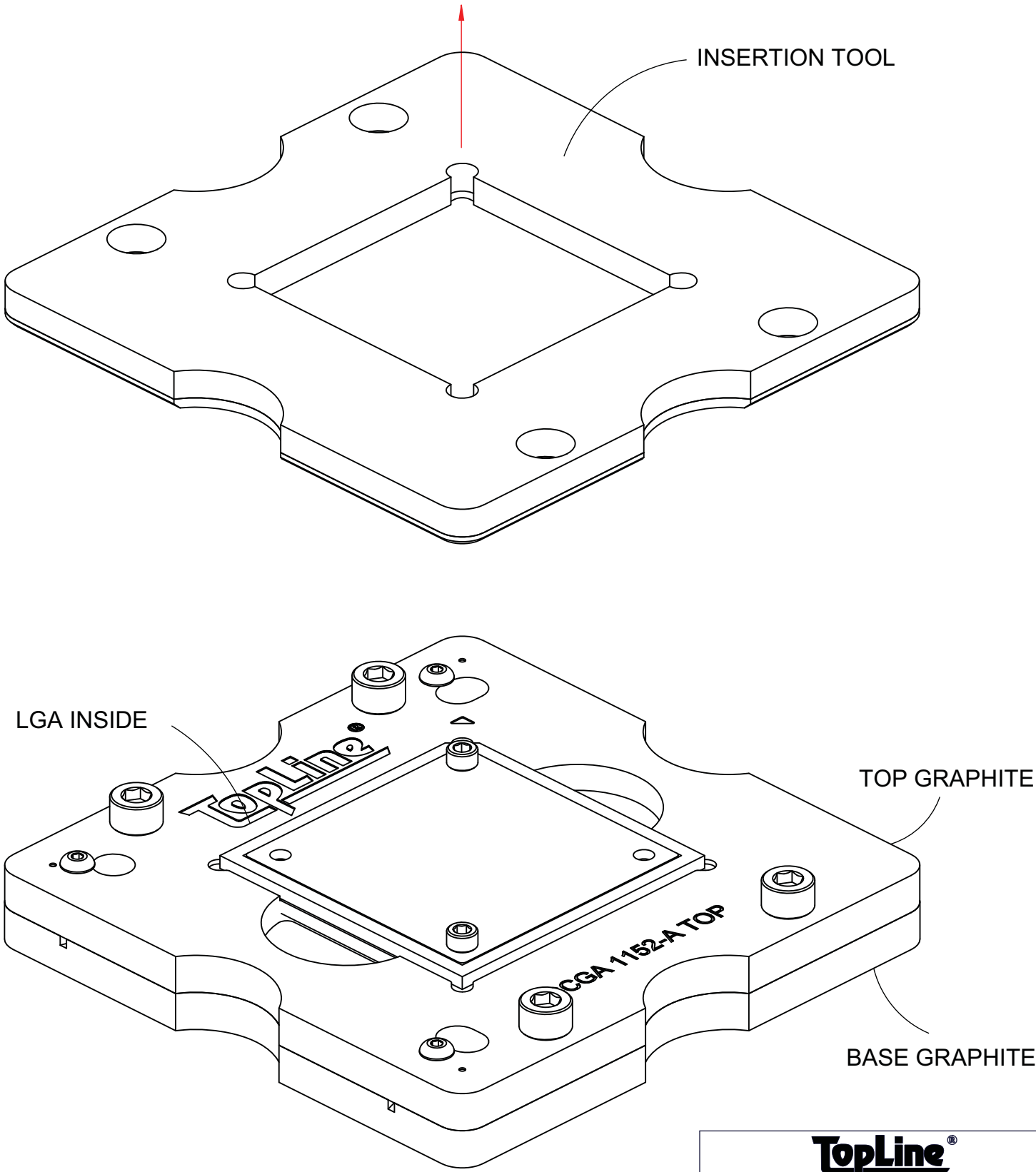
STEP 20 FLIP OVER BY HAND



NOTE:
FLIP OVER GRAPHITE SET + INSERTION TOOL BY HAND.

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 22 OF 28

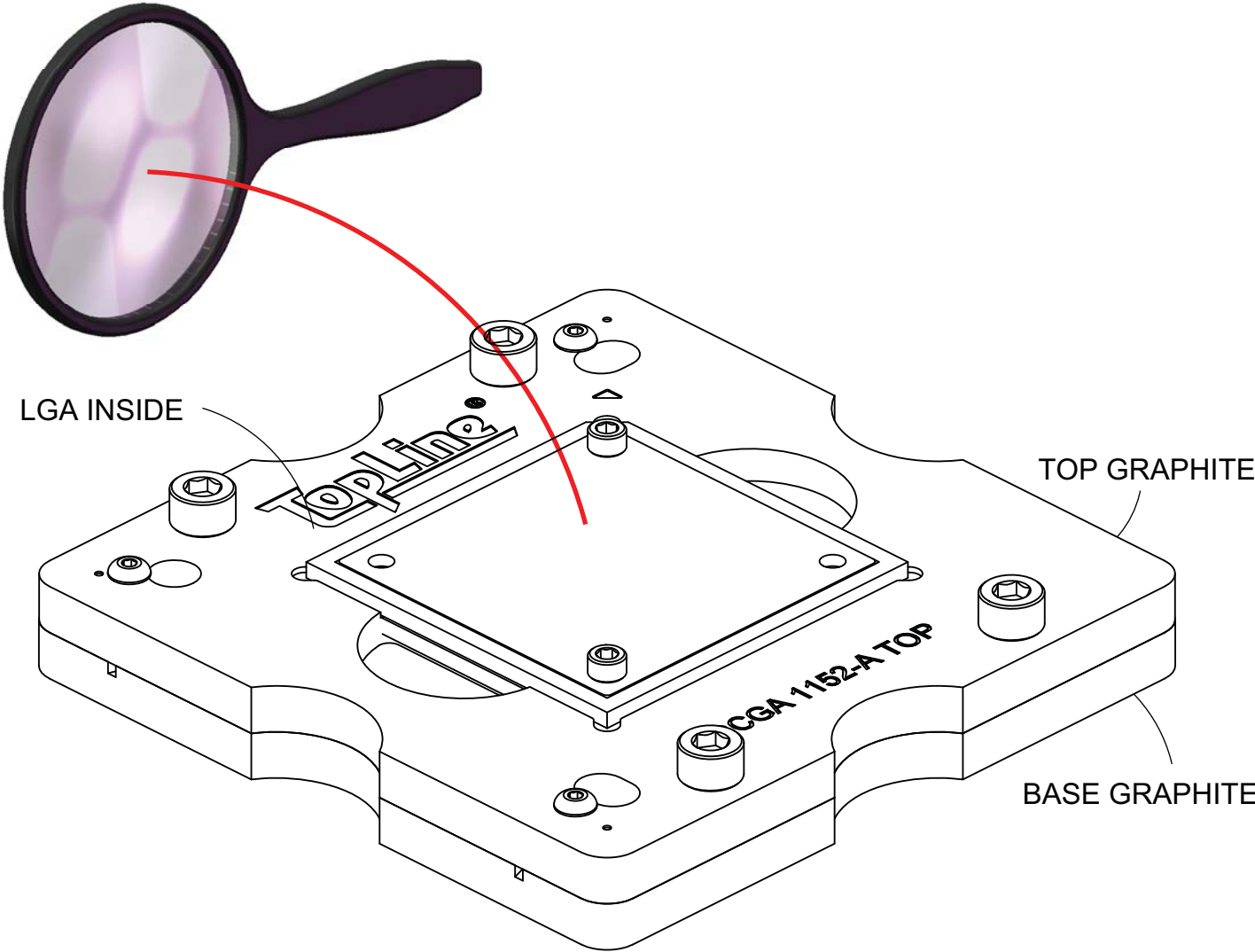
STEP 21 REMOVE INSERTION TOOL



NOTE:
REMOVE THE INSERTION TOOL BY HAND.

TopLine [®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 23 OF 28

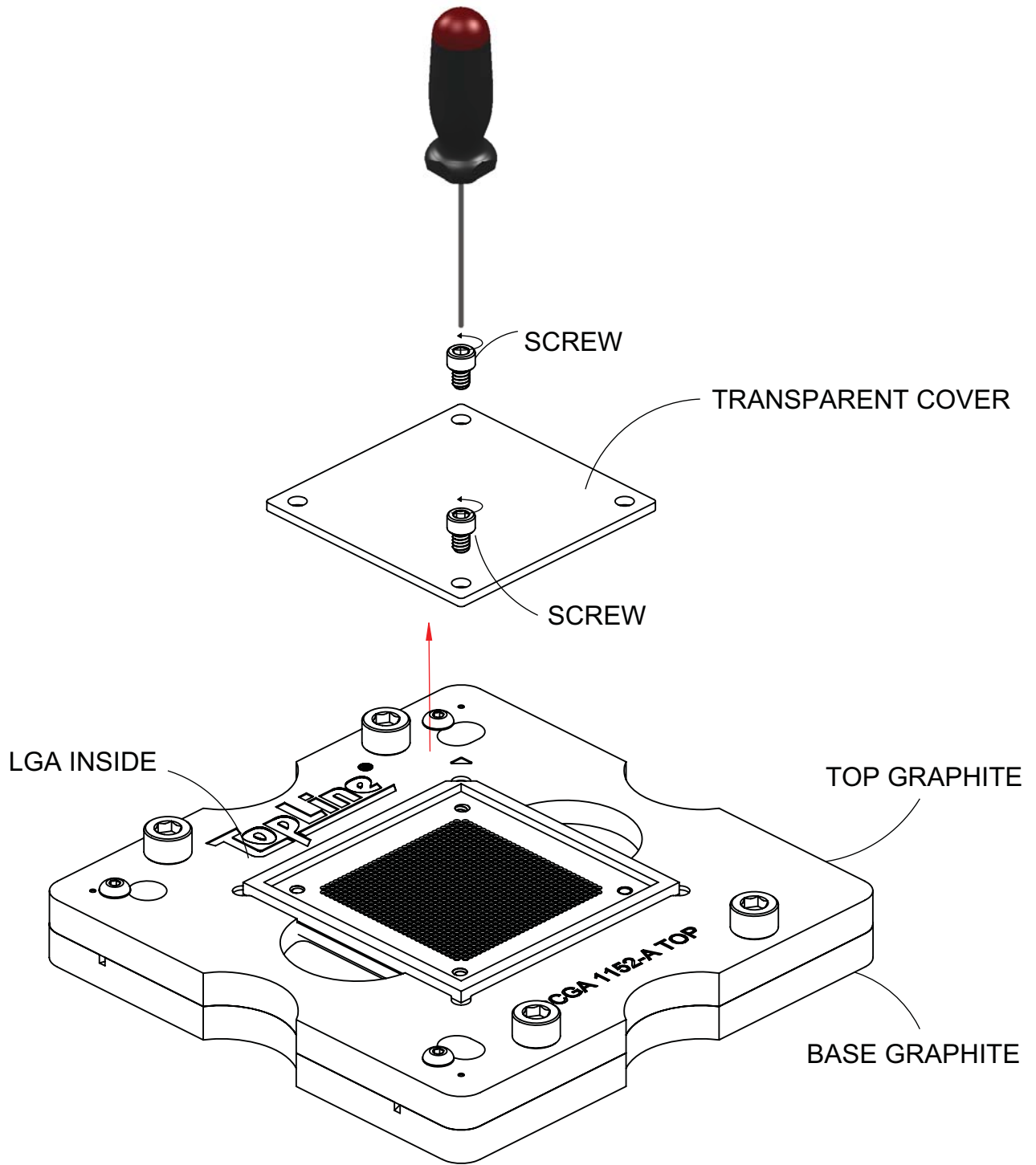
STEP 22
INSPECT COLUMNS
LOOK THROUGH TRANSPARENT COVER



NOTE:
CHECK IF 100% COLUMNS FELL INTO THE GRAPHITE.

TopLine[®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 24 OF 28

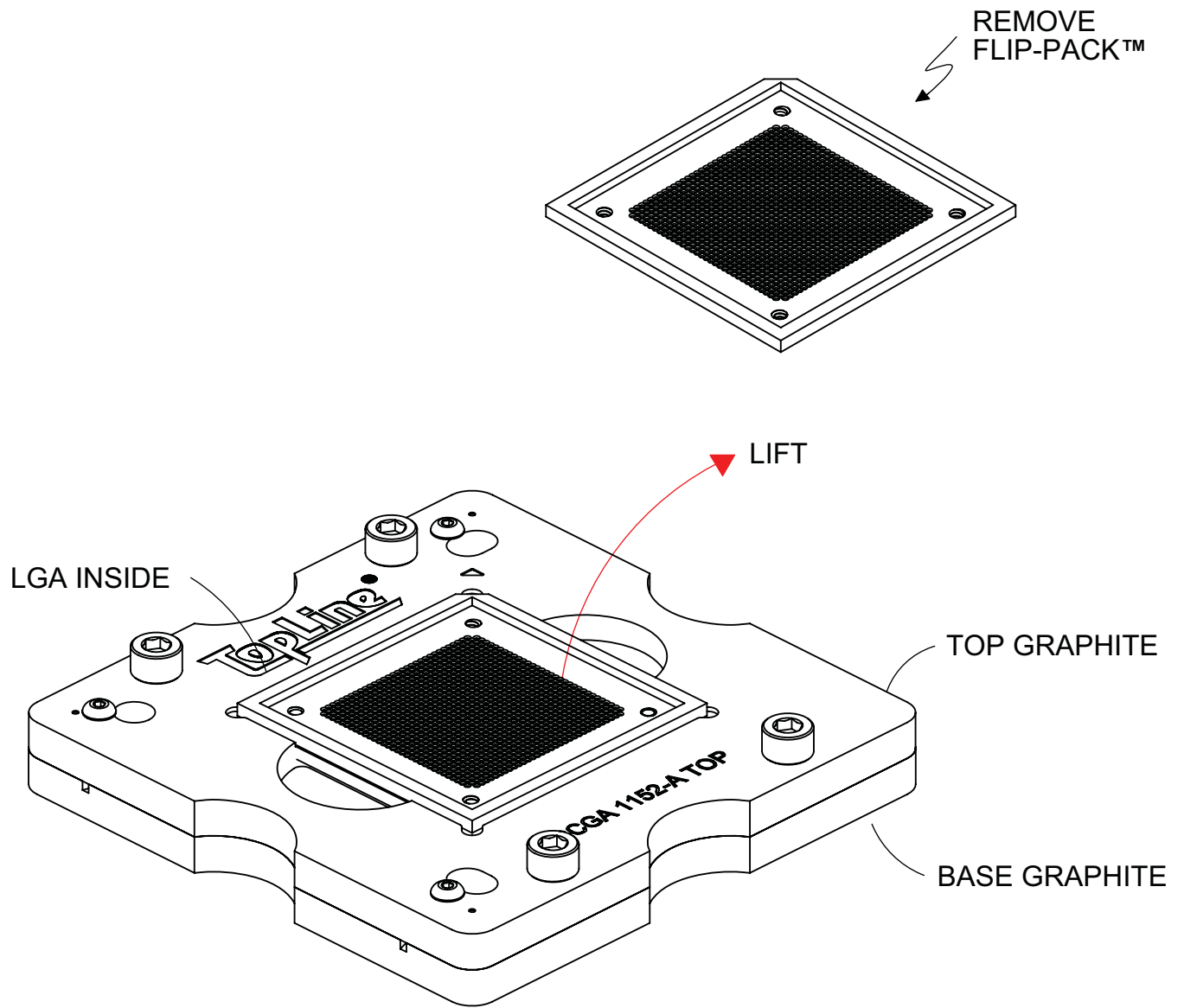
STEP 23 REMOVE TRANSPARENT COVER OPTIONAL STEP



NOTE:
Use small probe tool to gently push columns out of FLIP-PACK™ to fall into graphite.

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 25 OF 28

STEP 24 REMOVE EMPTY FLIP-PACK™

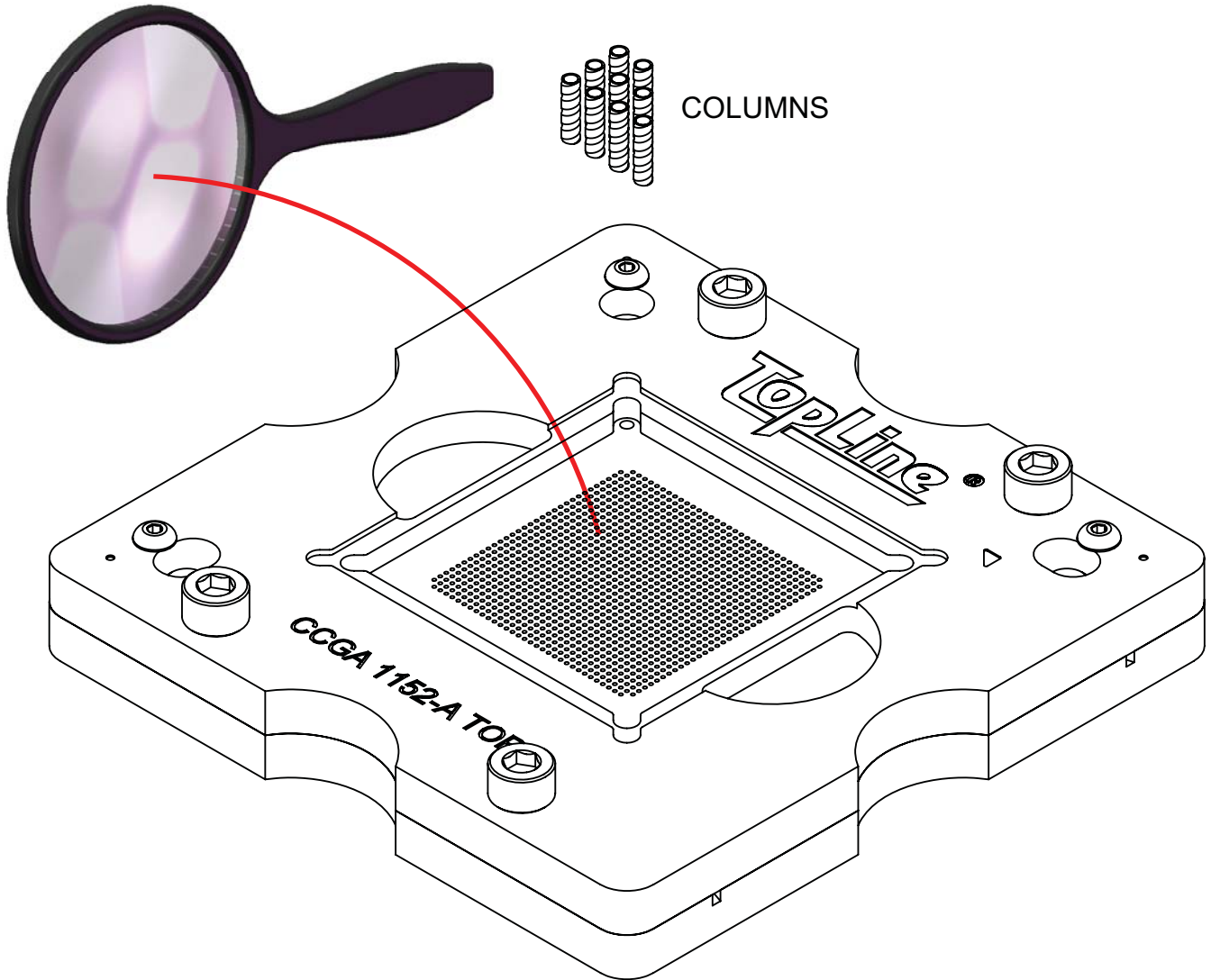


NOTE:

1. Use fingers to lift and remove the empty FLIP-PACK™.
2. Refill or recycle FLIP-PACK™.

TopLine®			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 26 OF 28

STEP 25 INSPECT 100% COLUMNS IN GRAPHITE

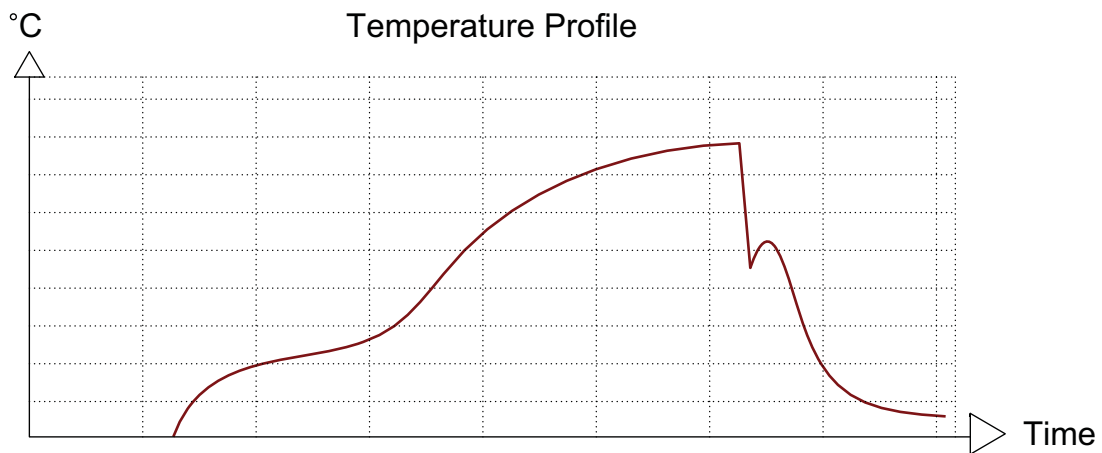
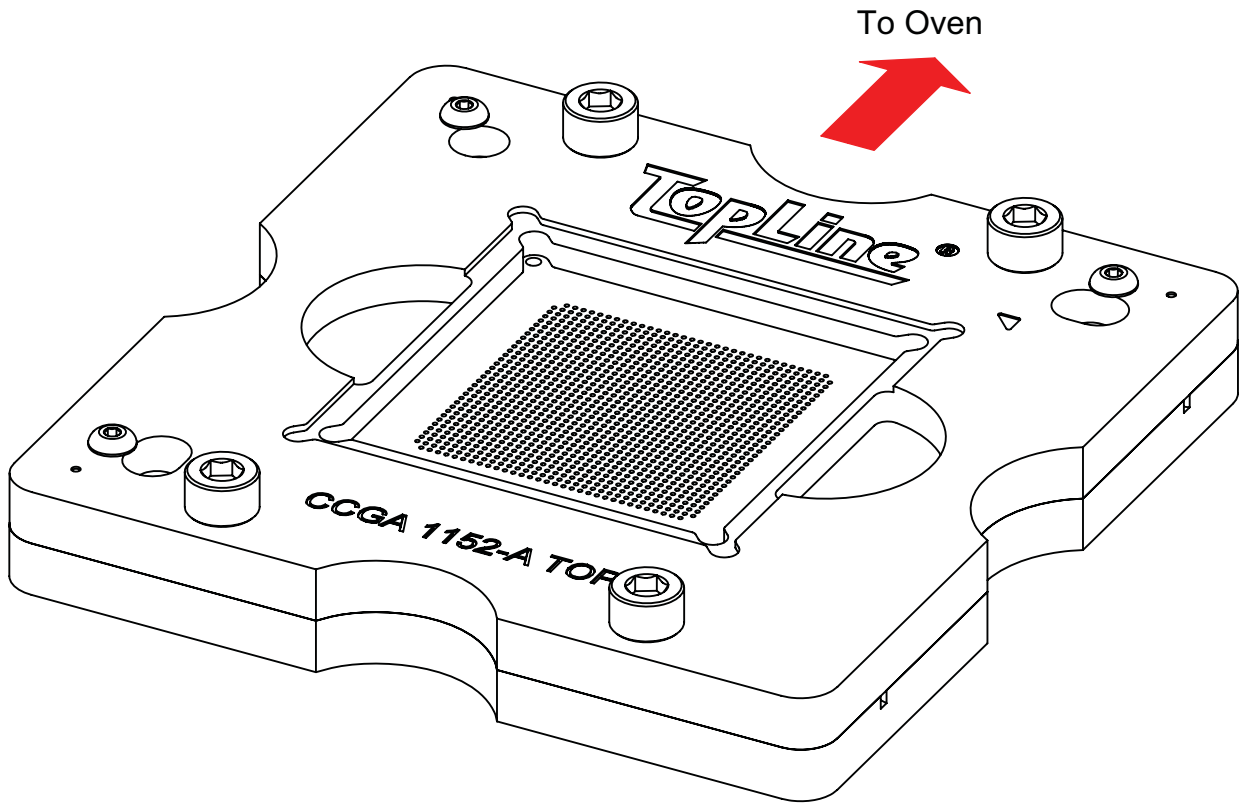


NOTE:

1. Check if all columns are sitting inside the graphite.
2. Insert any missing columns by using tweezers.

TopLine[®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 27 OF 28

STEP 26 REFLOW GRAPHITE IN OVEN



NOTE:
1. Place the graphite in oven to reflow columns to the LGA.

TopLine[®]			
TITLE CCGA - COLUMN ATTACHMENT PROCESS FLOW			
SCALE 1.25:1	SIZE A	DRAWING NO. 001990	REV A
DO NOT SCALE DRAWING			SHEET 28 OF 28