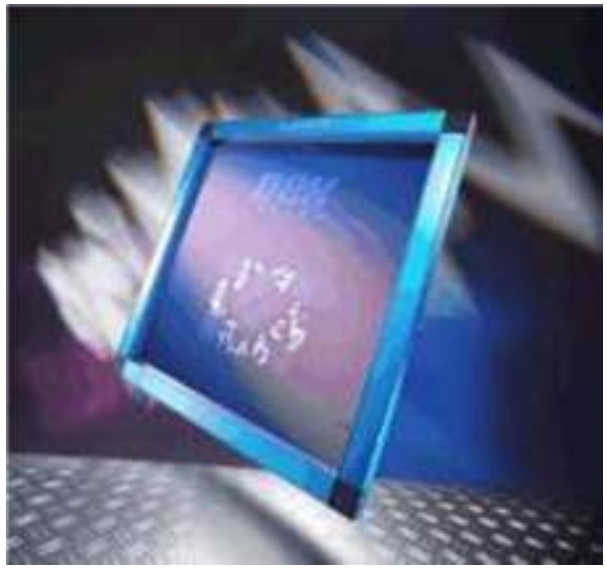
VectorGuard®



The Right Way to Optimize Your Printing Process!

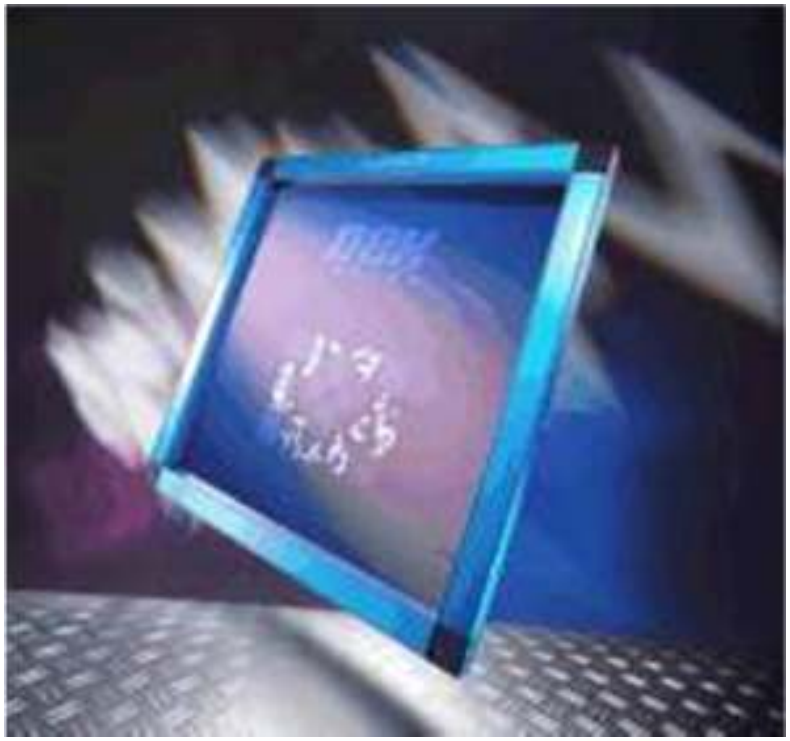
dek®

A DOVER COMPANY

Appendix

In the following slides we will answer the questions below and giving and basic understanding of the VectorGuard System

- What is VectorGuard ?
- How does VectorGuard work ?
- VG Product portfolio
- VG Frame sizes and available print Area
- Why is VectorGuard the best Stencil Frame System ?
- Comparison with other Stencil systems and where can you purchase VG in the world.

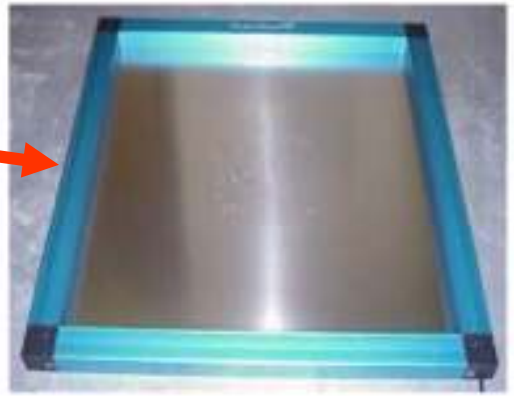


What is VectorGuard® ?

VectorGuard is a two part system

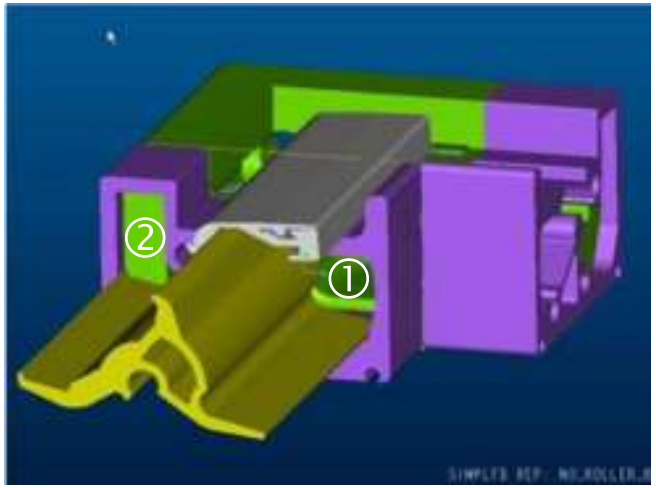
1. A foil that has the image cut into it

2. A reusable frame that the foil goes into during production



How does VectorGuard® Work?

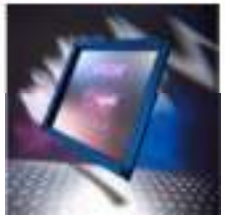
- Rocker motion
  - Air-tube acts as piston to open
  - Springs apply tension to close ①
  - No Air needed to keep stencil under tension ②
  - “Fail Safe”
- Safe operation
  - All springs and air-tubes are protected
- Easy to load
- Works with all printing machines



VectorGuard® Product Curve

VG PumpPrint

Adhesive printing replaces dispensing



VG Blue (Stainless Steel)

Laser Cut Stainless Steel for most SMT applications

VG Silver (Laser cut Ni)

VG Gold (Eform)

Laser Cut Nickel for increased life and performance

VG Platinum

Electroformed Nickel for Fine-pitch SMT and Semiconductor

VG Trace

Ultra-High accuracy Electroformed Nickel for Semiconductor applications

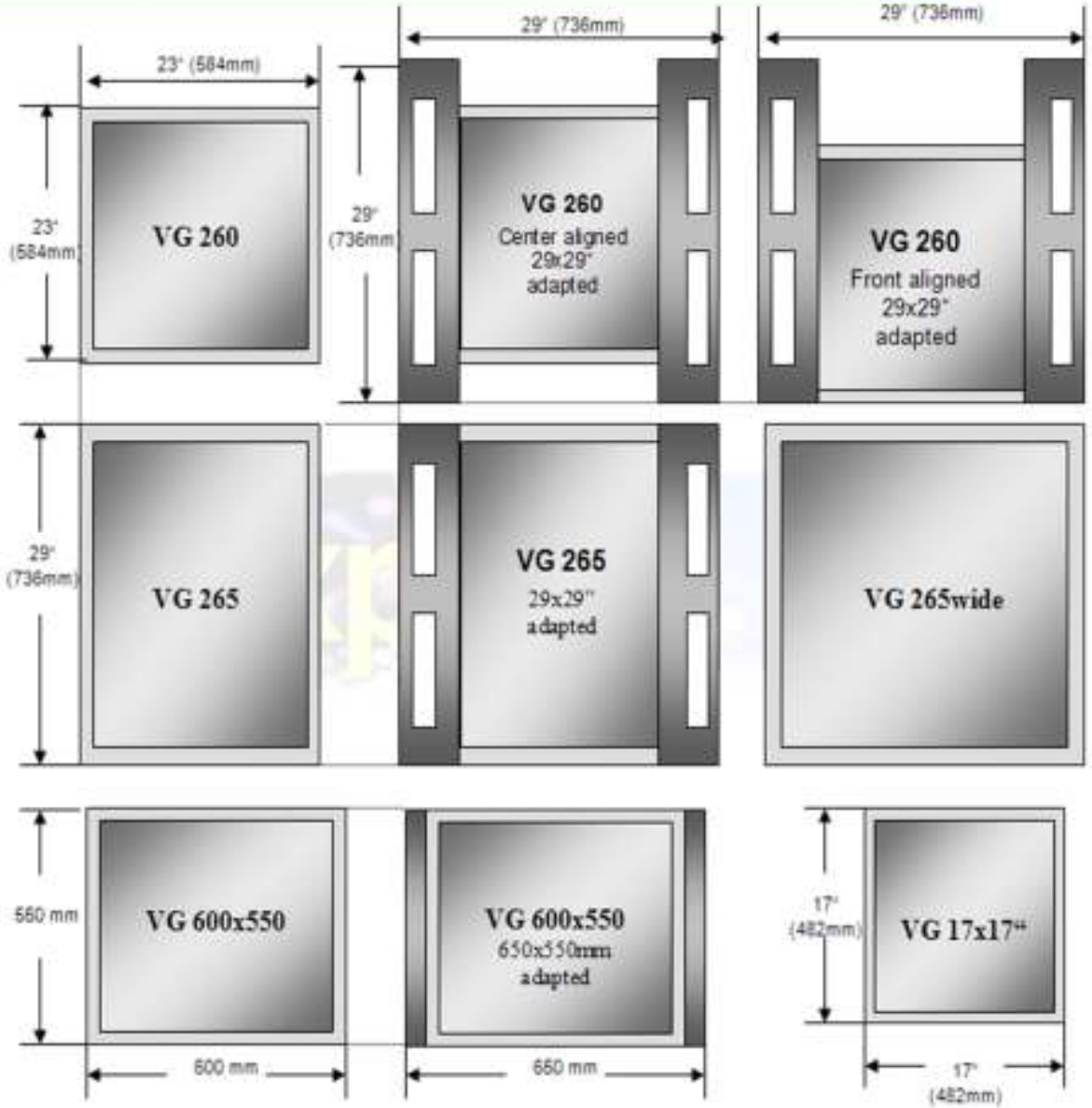
Ultra-High accuracy for printing lines in Semiconductor and Solar applications

Performance, Customer Value

Application Technology

dek

VectorGuard® Frame Sizes



- The sidebar option enable the user to support the larger frame size without having to use a larger frame.
- Mechanical joint between the sidebars and the frame provides tight connection.
- VG Stencils are available in all necessary thickness
  - Stainless Steel from 3mil (75µ) up to 10mil (250µ)
  - Nickel Laser Cut from 3mil (75µ) up to 8mil
  - (200µ)
  - E-formed stencils in all thickness variations.

Print area

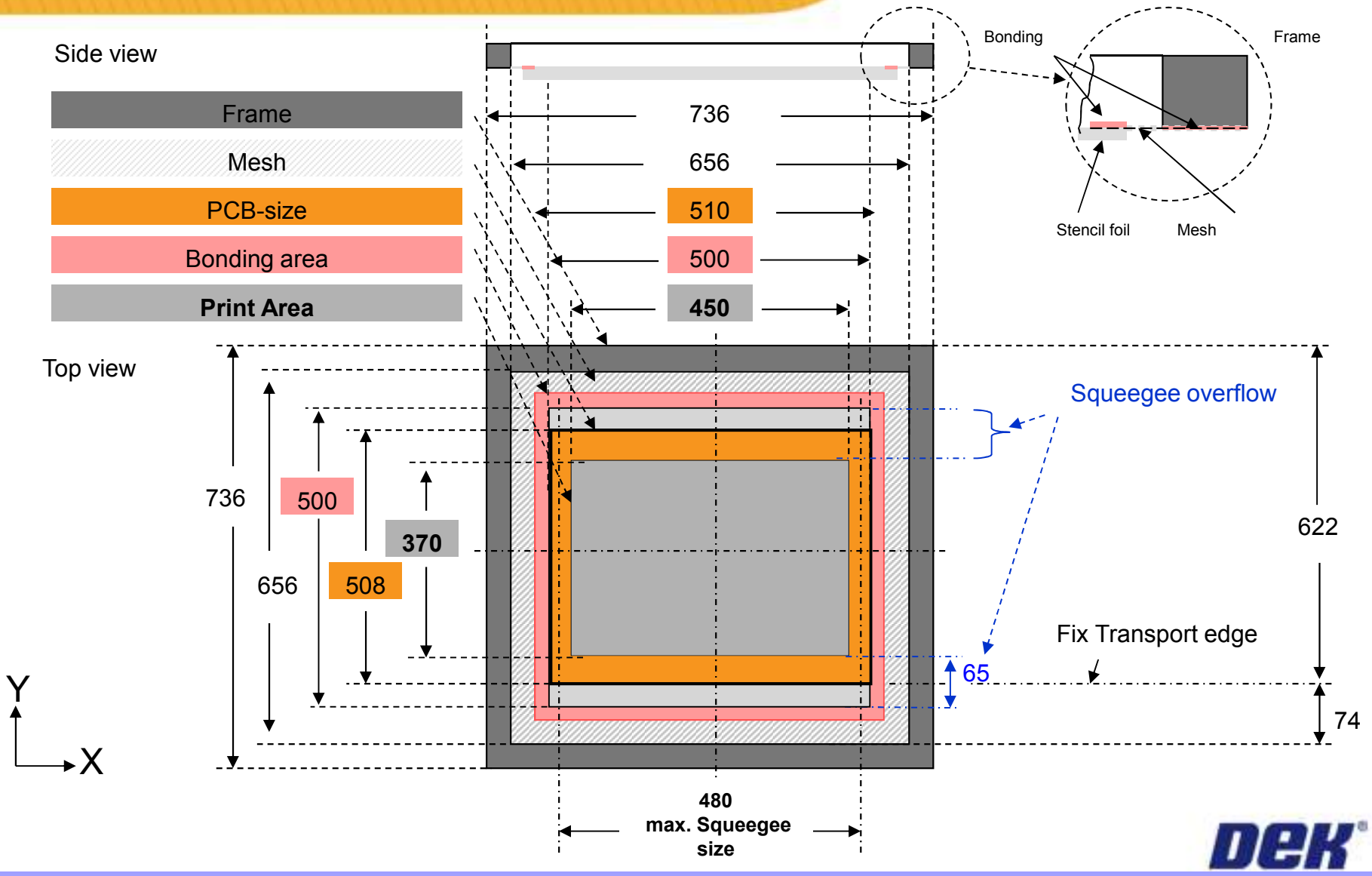
- VectorGuard is giving a bigger print Area even with smaller Frame size
  - 23 X 23 VectorGuard provides the same print area as a 29 X 29 Mesh Mount
  - 29 X 29 VectorGuard provides up to a 24” print area

- See next slides

Print area

DEK 736 x 736 (29x29“)

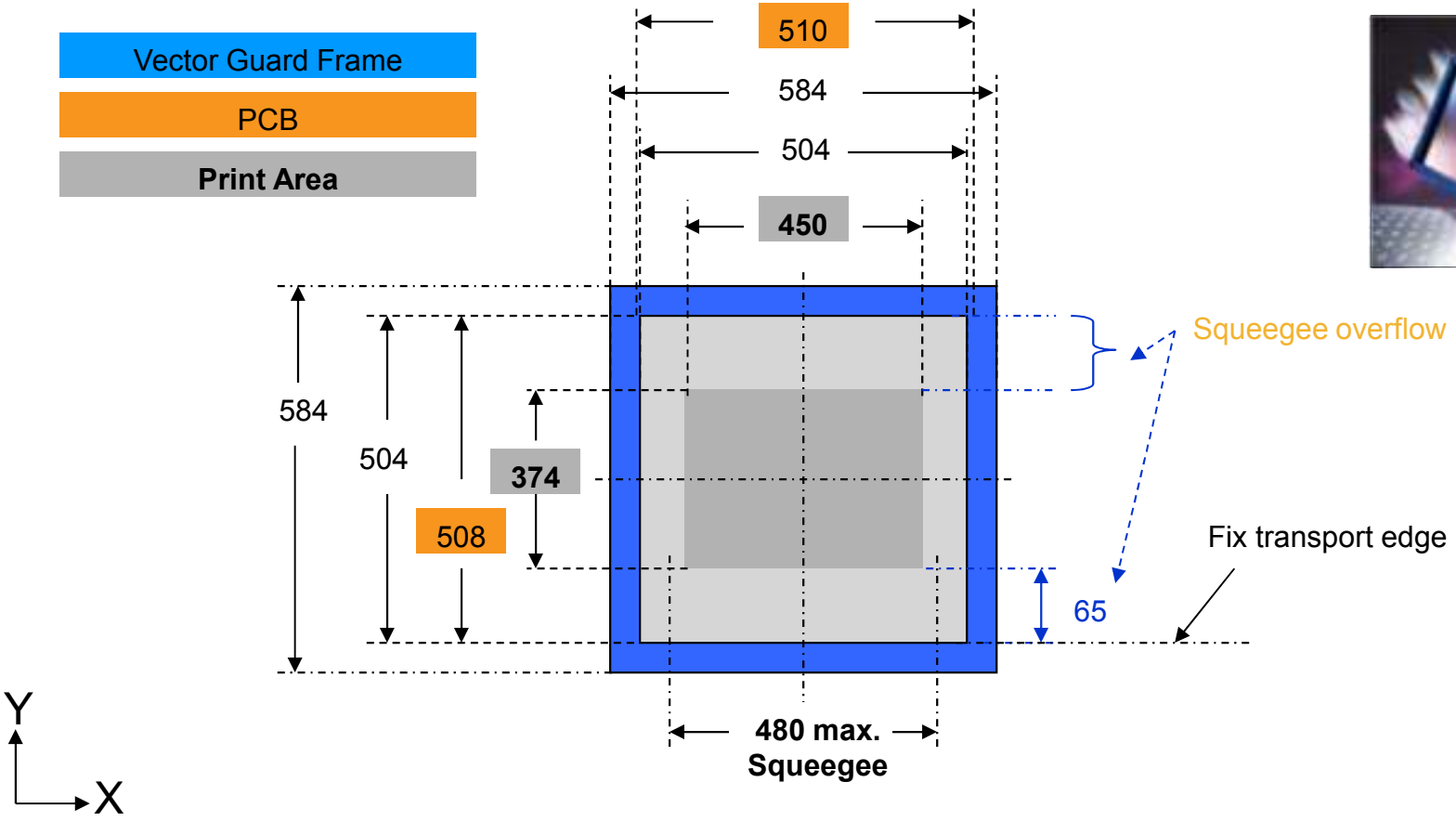
Mesh mounted Stencil

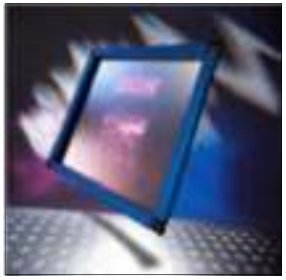


Print Area: max 450x370mm; Squeegee: max. 480mm; USC: max.520mm

23 X 23 VectorGuard provides the same print area as a 29 X 29 Mesh Mount

Vector Guard 584 x 584
(23x23“)

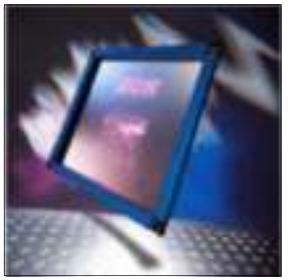


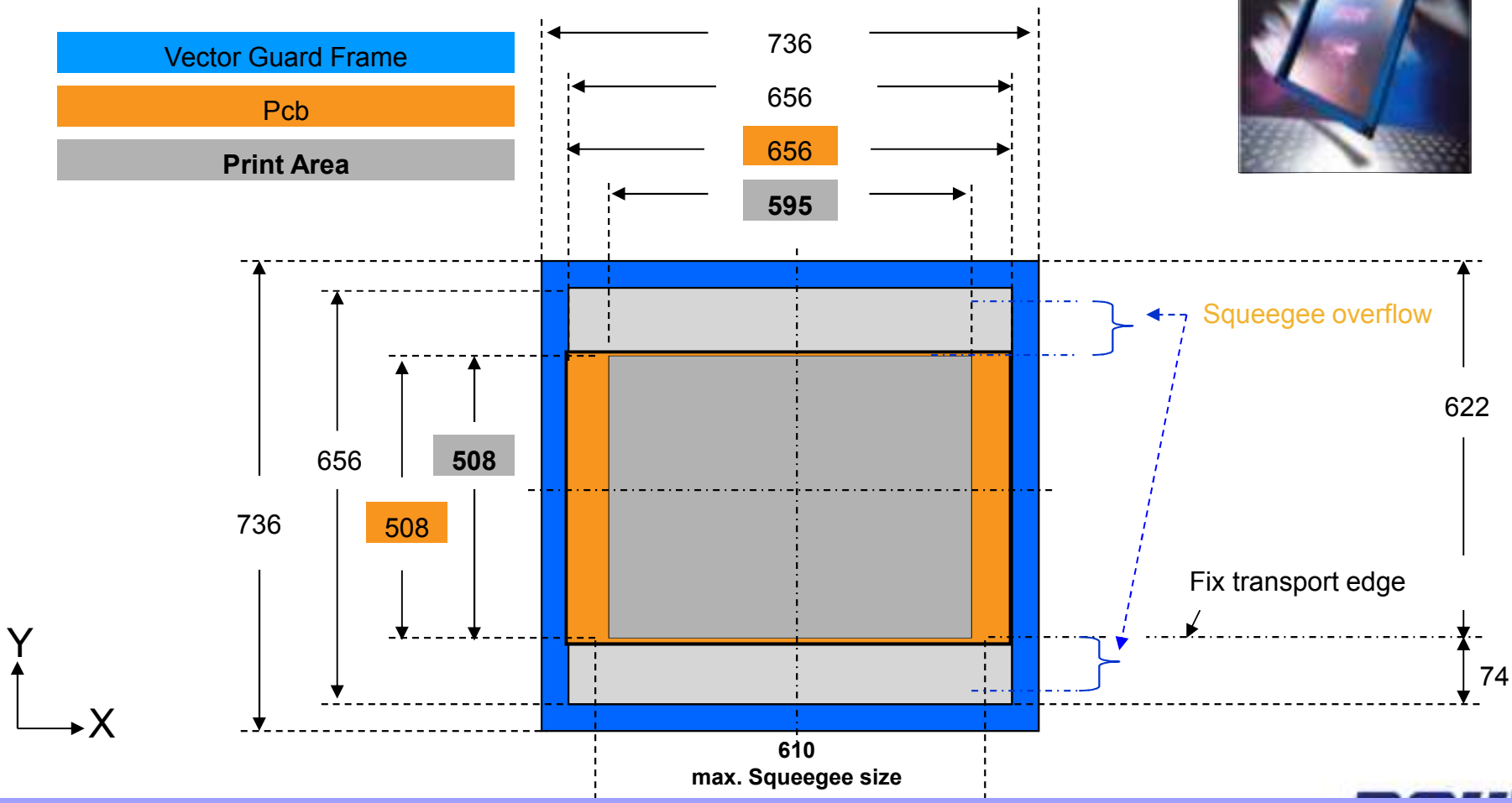


Print Area: max 450x374 mm; Squeegee: max.480mm; USC: max.400mm
PCB: max. 510 x 508mm

29 X 29 VectorGuard provides up to a 24” print area

Vector Guard 736 x 736
(29x29“)





Print Area: max 595x508 mm; **Squeegee: max. 610mm;** **USC: max. 600mm**

PCB: max. 610 x 508mm

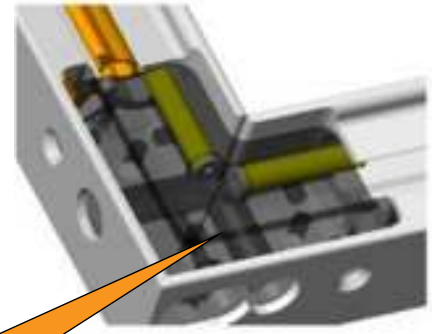
Why is VectorGuard® the best stencil system?

- Print Expertise Engineering
  - Print experience and knowledge used to design the VG System
  - Wide Product portfolio
- Positional accuracy and consistency
  - Stretch and misalignments is minimized in the VG System
- Reliability and Durability
  - All mechanical
  - No glue, No Mesh
  - No plastic to break
  - “Fail Safe” frame and operator usage
- Customer Efficiency
  - Easy, safe and user freindly

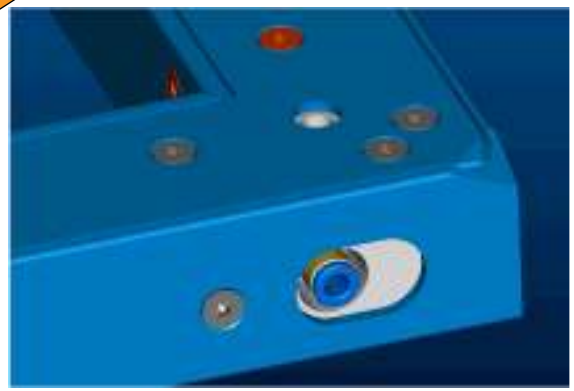
DEK

DEK Printing Expertise used to design VectorGuard

- Print Expertise Engineering
  - Engineered for planarity and accuracy
  - Precise and consistent manufacturing – automated vs. manual
  - Error proof assembly of foil – Poke Yoke



Engineered design



Poke Yoke assembly design

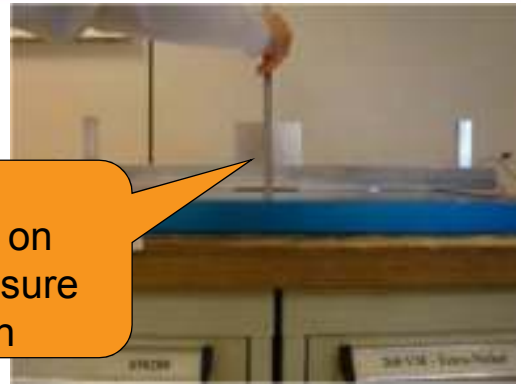
Automatic foil bender

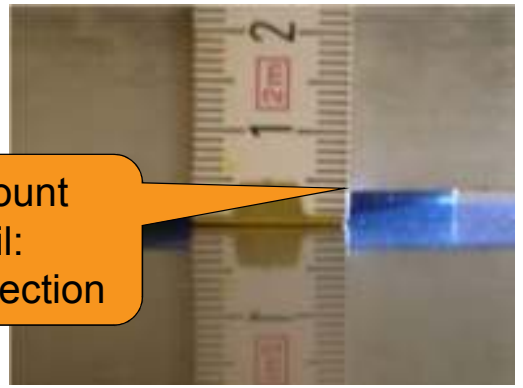
Positional Accuracy and Consistency

- Why do people focus on tension?
  - The view to look at tension is carried over from screens to MM stencils and incorectly promoted by some stencil manufacturers
  - Tension is only measured to calibrate the stretch of the mesh on the frame
  - What is the “right” tension for best print?
  - It is not possible to measure tension once the metal is mounted on the mesh

Positional Accuracy and Consistency

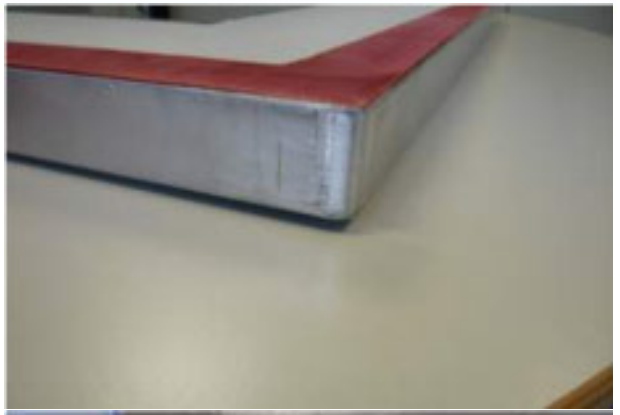
- Deflection is what causes issues (X-Y-Z)
  - This is what is critical to good printing
  - Test, see pictures right hand side
    - MM vs. VG vertical deflection (1 kg weight in center and measure)
- Vertical deflection
  - Dog ears, insufficient, and missing paste
- Horizontal deflection
  - Positional accuracy, offsets

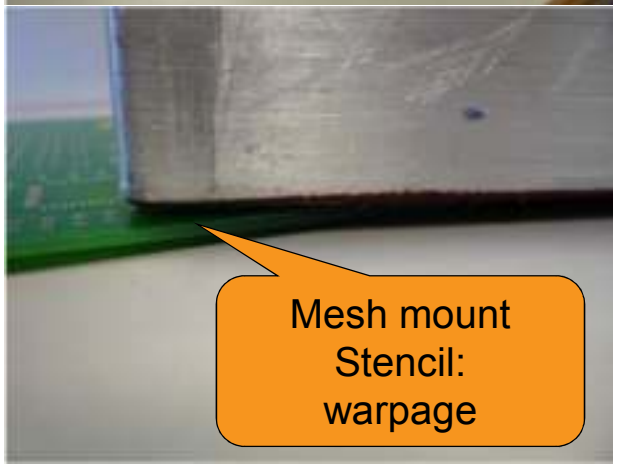




Positional Accuracy and Consistency

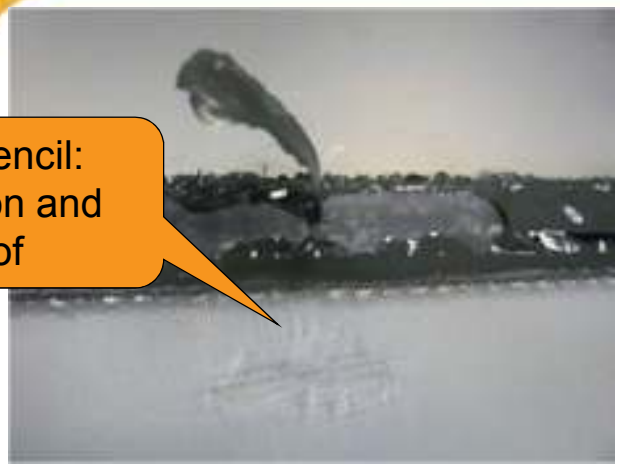
- Planarity of frame
  - The tubular welded frames are more danger in terms of warpage. (see right)
  - Warp due to mesh tension and welded frames
    - No mesh and no welds in a VectorGuard Frame
  - Glue build up on edges of frame
- Benefits to customers
  - Consistency board to board and lot to lot
  - Resolve the root cause of the failures instead of the symptom of the Mesh mounted drawbacks by using Vector Guard

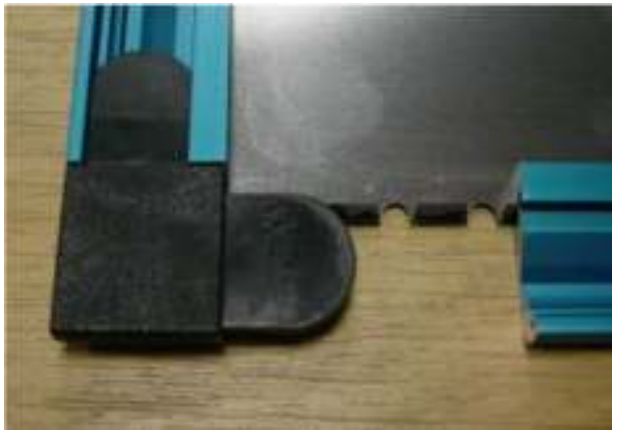


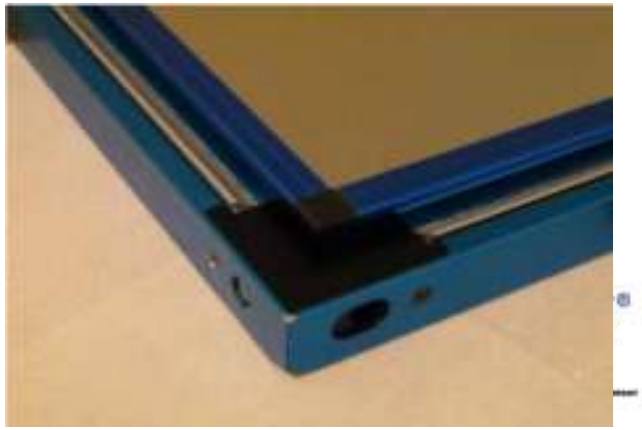


Reliability and Durability

- Stencil
  - No Mesh
    - Tearing of the mesh
    - Stretched mesh over time due to constant tension
  - No glue
    - Mesh mount delamination
    - Glued frame that can de-bond over time
  - No plastic guard to break, aluminum profiles provide the stability
  - Only Mechanical joints between the parts
  - VG is engineered so it is not operator dependent for assembly
  - Stretched image
    - Thin stencils stretching all the time in MM and only when needed with VG – MM stretching the image.
  - No potential for failure due to cleaning
    - Compatible with any chemistry, temperature, ultrasonics







Reliability and Durability

- Frame
  - Air to open, spring to close
  - “Fail Safe” frame, no air leaks
  - No welding, no warp
  - Spring tension does not change with time (see table at the right)
  - Tested to over 10,000 cycles (10+ years life expectancy)
- Delivering since 2003

VG Frame Tension Test Form

Frame Type: VG 265 | Measurement Date: 07/03/2011
Serial Number: 612 | Measurement Done by: Peter Sulyok
Build Date: 20/09/2004 | Árpád Börönd

Frame Specification

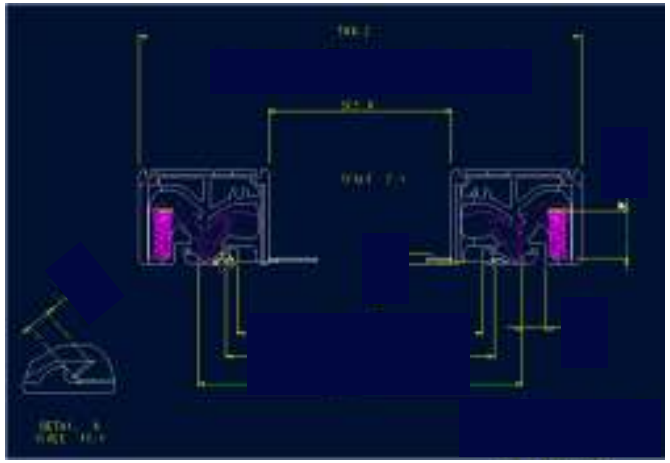
	min	nominal	max	UOM
No of flippers in use	42	42	42	EA
Individual Flipper Force	78.0	105.0	140.0	N
Total Applied Force to Frame	3,534	4,370	5,155	N

Force Measurements

Flipper Number	Side 1	Side 2	Side 3	Side 4
1	99.0	93.1	97.5	97.7
2	133.0	97.0	124.0	96.4
3	129.0	97.2	98.3	102.2
			100.2	99.7
			99.2	99.7
			98.1	99.2
			100.3	99.3
			96.3	101.5
			94.3	96.0
				97.3
				101.1
				96.3
Total Force by side	1034.9	1186.8	908.2	1187.4

Force of Frame				
	Total Frame	4,317	N	PASS
	Flipper Avg	103	N	PASS
	Flipper Max	133	N	PASS
	Flipper Min	93	N	PASS

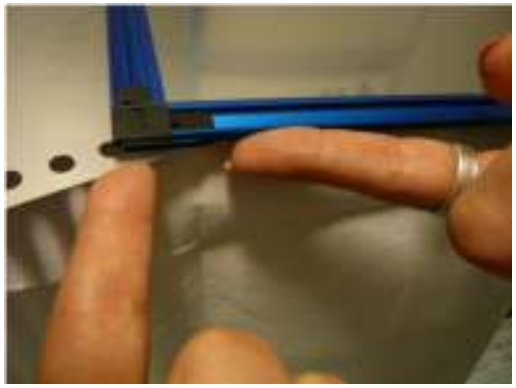
Vector Guard:
Test of a 7 year old Frame,
still with nominal force



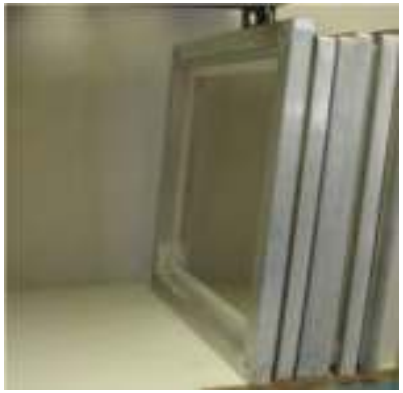
Note: Edit only frame selection cell, frame serial number, build, date, name and flipper measurement fields
All other fields will be automatically calculated

Customer Efficiency

- Customer Efficiency
  - Easy to load
  - Safe for operators
  - Reduced storage

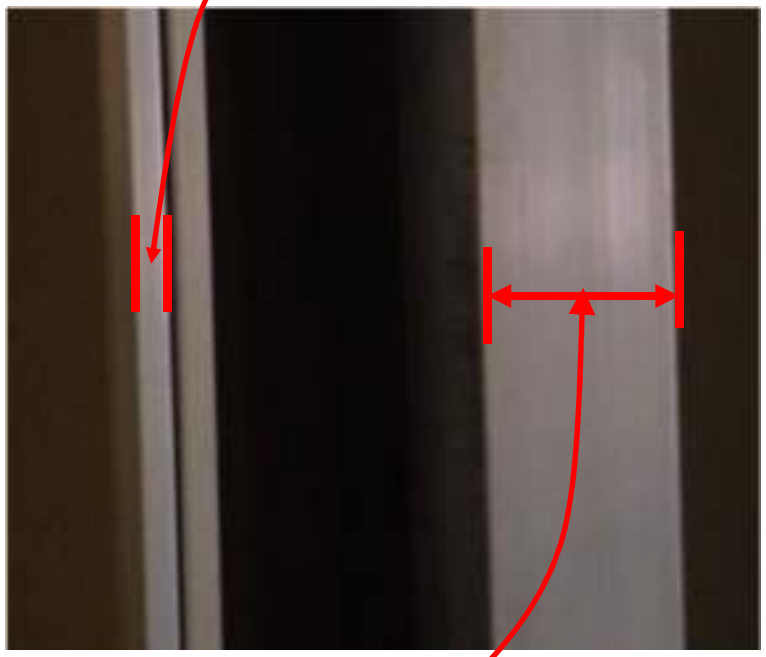


VectorGuard® Storage Advantage



Typical Stencil Storage

VectorGuard foil Thickness .195”



29” x 29”
frame Thickness 1.5”

VectorGuard solves your storage capacity issues by allowing you to store five VG foils in place of one framed stencil.

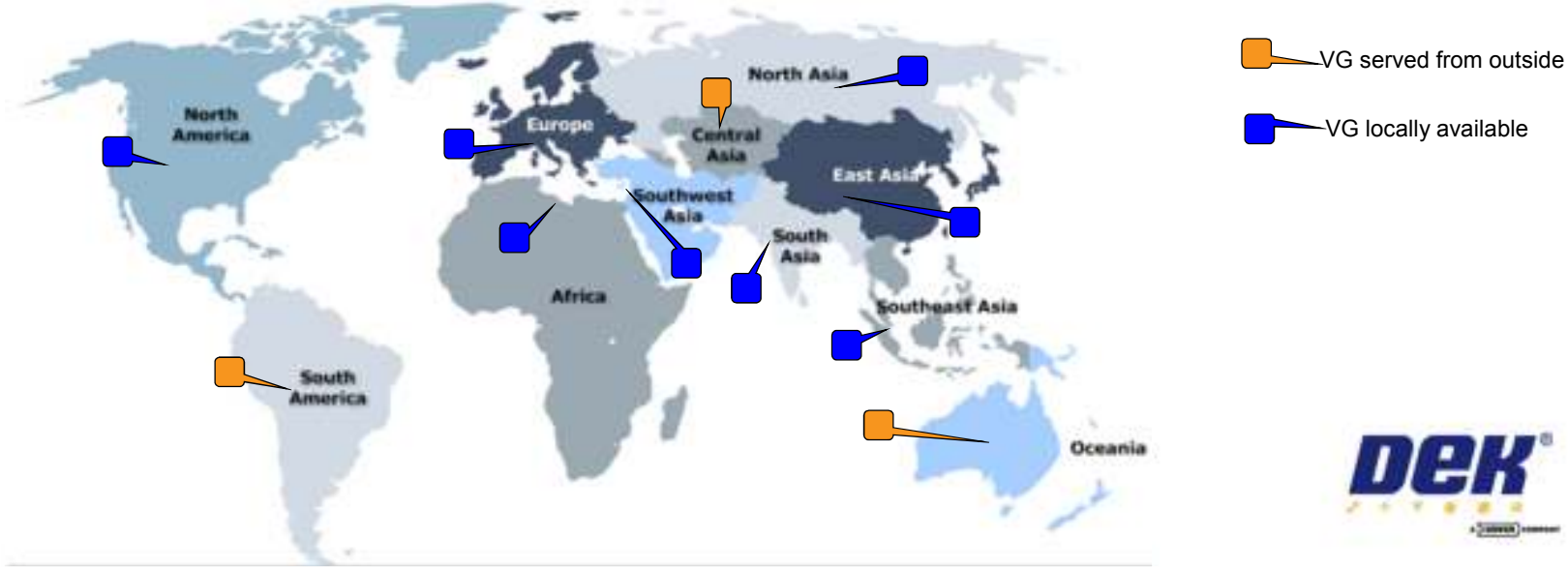
650 VectorGuard Stencils !

Storage

- Cardboard and ESD Cassettes
  - Designed to fit to all different production environments from normal SMT Production to Clean room.
- Storage cabinet
  - To store the VG stencils in a small footprint

Where can you purchase VectorGuard®

- DEK direct stencil manufacturing
- DEK VectorGuard® Franchises
- DEK VectorGuard® Licensees
- Available globally with local support
- More than 5000+ frames in the field
- More than 70,000+ stencils annually



VectorGuard® Value Proposition

- Supported by the market leader in printing technology with a focus on continuous innovation
- Provides the widest range of stencil technology to support any printing requirement
- Ensures the highest quality print that reduces defects and improves yield
- Easily integrated into your manufacturing operation
- Available globally from multiple local suppliers

Value Proposition Matrix

Customer Requirements	Global Provider Network	Failsafe Tension System	Step Stencil Option Offered	Offered in All Sizes	No Epoxy or Glue to Fail	Easily Mounts Foil to Frame	Operator Safety	Structure Integrity in Storage	Reduce Storage Space	No Mesh to Tear or Stretch	Reuse Frames
VectorGuard	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Alpha TetraBond	☒	☒	☒	☒	☒	☑	☑	☑	☑	☑	☑
Vector Micromount / Tetra	☒	☒	☒	☒	☑	☒	☒	☒	☑	☑	☑
Foil Only / AMS4 / QTS	☒	☒	☒	☒	☑	☒	☒	☒	☑	☑	☑
Mesh Mounted	☒	☒	☑	☑	☒	N/A	☑	☑	☒	☒	☒