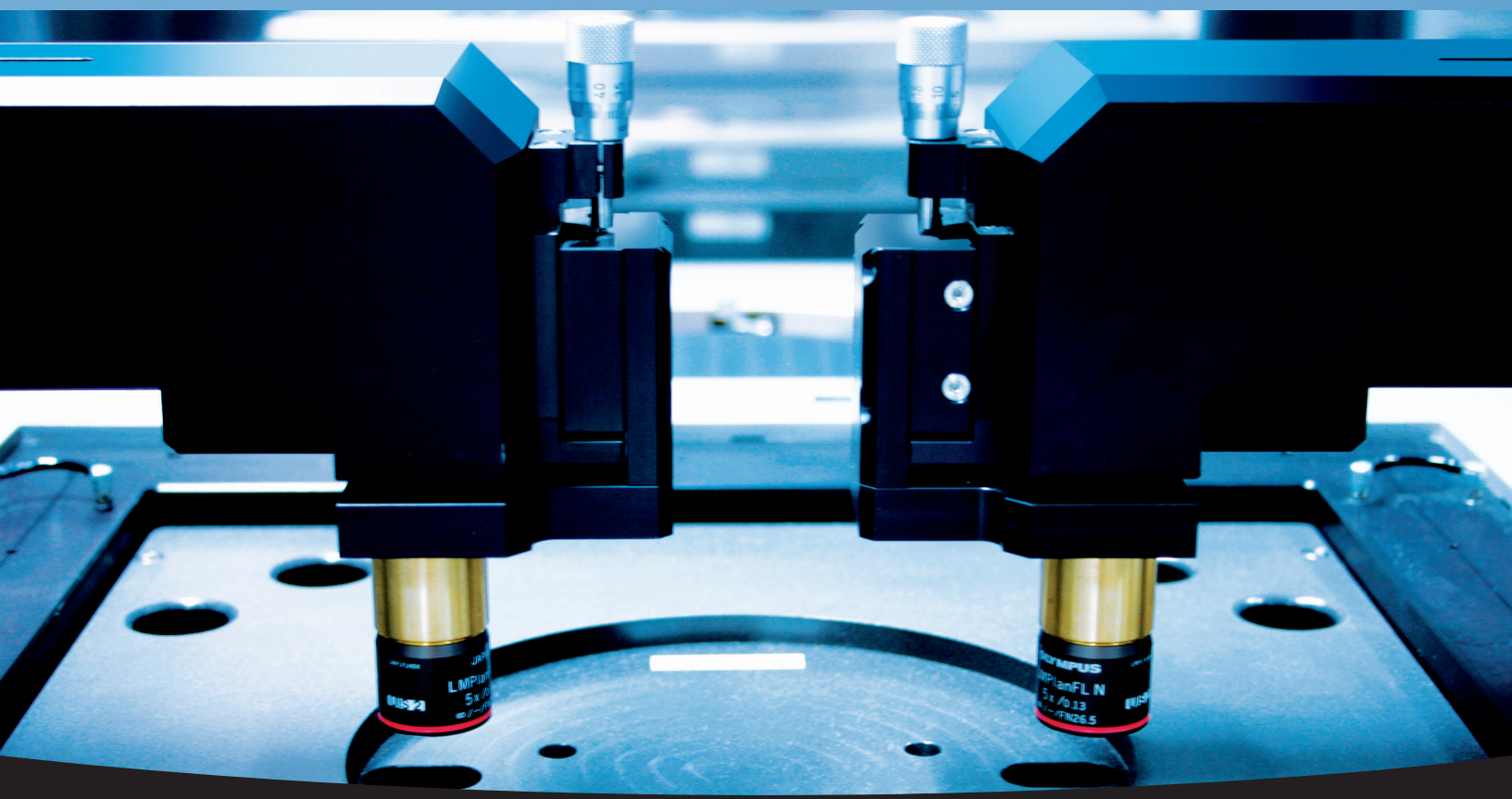
EV Group

Bond Alignment Systems



EVG®

EV Group Bond Alignment Systems

Introduction

With the invention of the world's first double sided alignment system in 1985, EV Group has revolutionized MEMS technology and set worldwide industry standards in aligned wafer bonding by separating the alignment and bonding process. This process separation results in higher flexibility and universal application of the wafer bonding equipment. The EVG bond alignment systems offer highest precision, flexibility, ease of use and modular upgrade capability and have been qualified in numerous high throughput production environments. The precision of EVG bond alignment systems accommodates most demanding alignment processes in MEMS production and in emerging fields like 3D integration applications.

Unique Features / System Configuration

EVG®610 Bond Alignment System

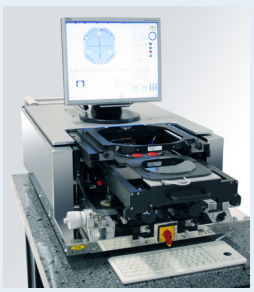
- Wafer and substrate sizes up to 150/200 mm
- Manual high precision alignment stage
- Manual operated bottom side microscope
- Windows® based user interface
- Perfect multi user concept (unlimited number of user accounts, various access rights, different user interface languages)
- Desk top system design with minimum footprint
- Supports IR alignment process
- Optimum total cost of ownership (TCO) for R&D and pilot line production

EVG®620 / 6200∞ Bond Alignment System

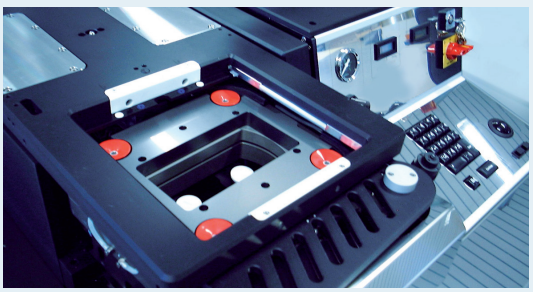
- Wafer and substrate sizes up to 150/200 mm
- Manual or motorized alignment stage with automatic alignment option
- Fully motorized high resolution bottom side microscopes
- Windows® based user interface
- Quick tool change between different wafer sizes and different bonding applications
- Available with system rack and automated wafer loading
- Upgradeable to a mask alignment system
- NT system configuration for improved alignment performance

MBA Wafer-to-Wafer Bond Alignment System

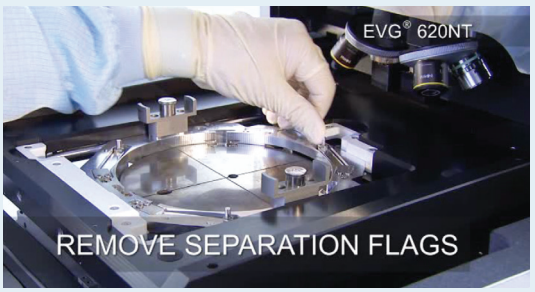
- Bond alignment system for different alignment types (backside-, infrared-, transparent, edge alignment)
- Center-to-Center Alignment without a need of alignment keys
- Wafer and substrate sizes up to 300 mm with different thickness and materials
- Exact parallelism between top and bottom wafer is assured by a wedge compensation system
- IR illumination available
- Turret with different objectives
- Prepared for silicon direct bonding
- Bond pairs are aligned and clamped prior to loading into the bond chamber
- Non-contact wafer handling



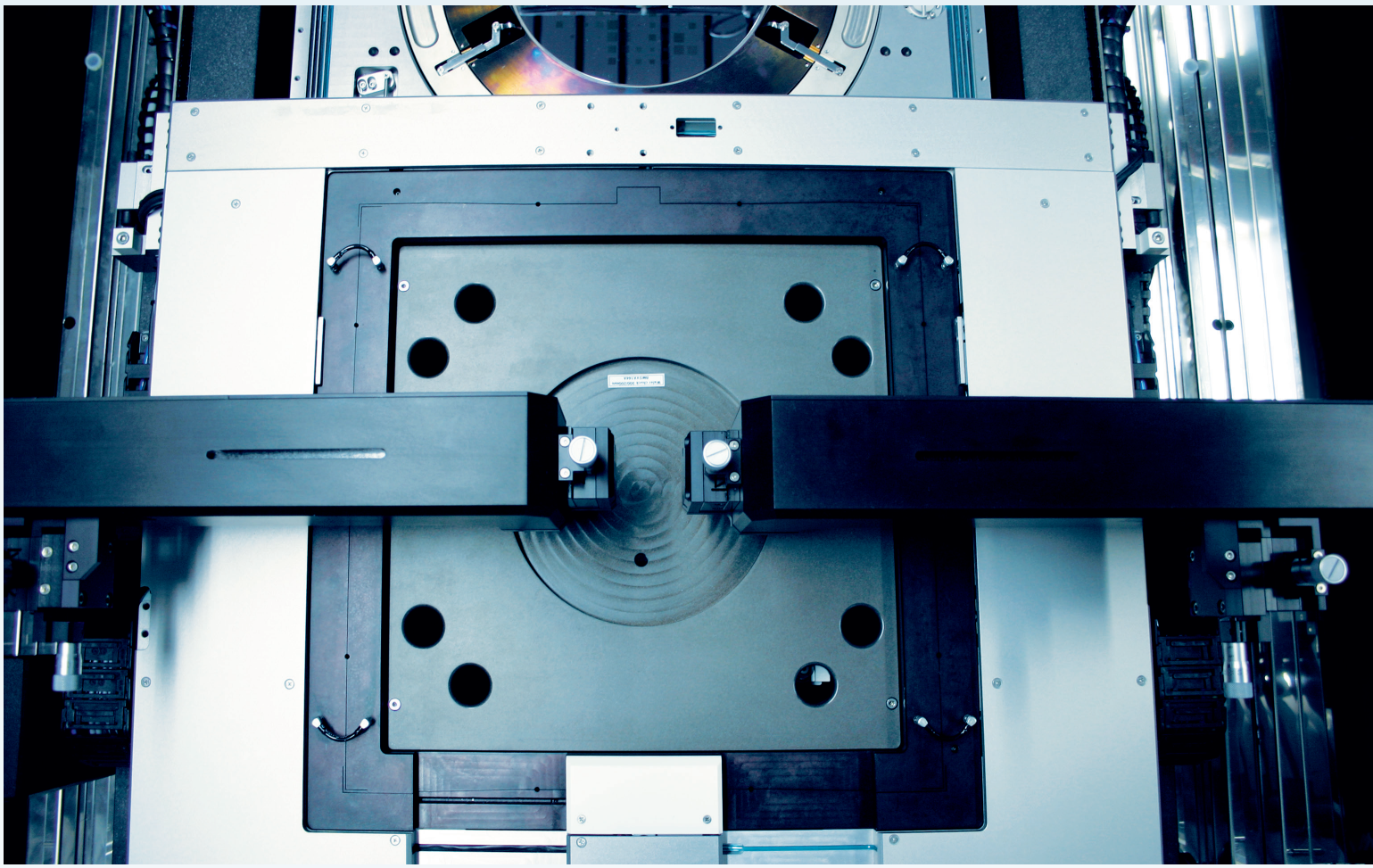
EVG®610 Bond alignment system



EVG®620 Bond alignment system up to 200 mm



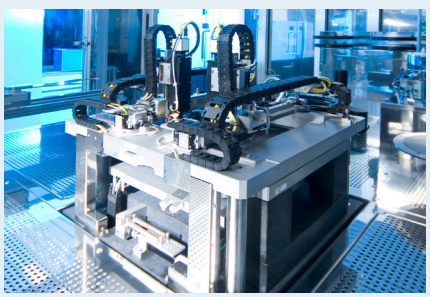
EVG®620NT Manual bond alignment with separation flags



SmartView® NT Nano Alignment stage

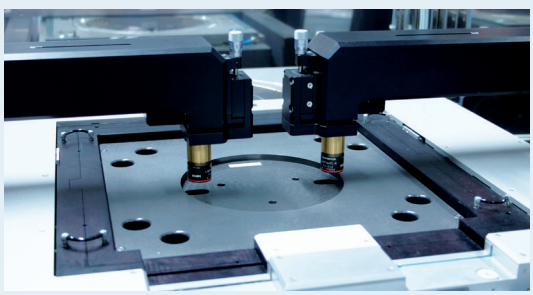
SmartView® Wafer-to-Wafer Bond Alignment System

- Universal bond alignment system
- No Z-axis motion and no refocusing required
- Wafer and substrate sizes up to 300 mm with different thicknesses and materials
- Windows® based user interface
- Exact parallelism between top and bottom wafer is assured by a 3-spindle wedge compensation system
- Aligned wafers are clamped prior to loading into the bond chamber
- Non-contact wafer handling
- Automatic alignment & clamping capability
- Integration possibility for automated wafer alignment & bonding system (GEMINI)



MBA Integrated in Gemini

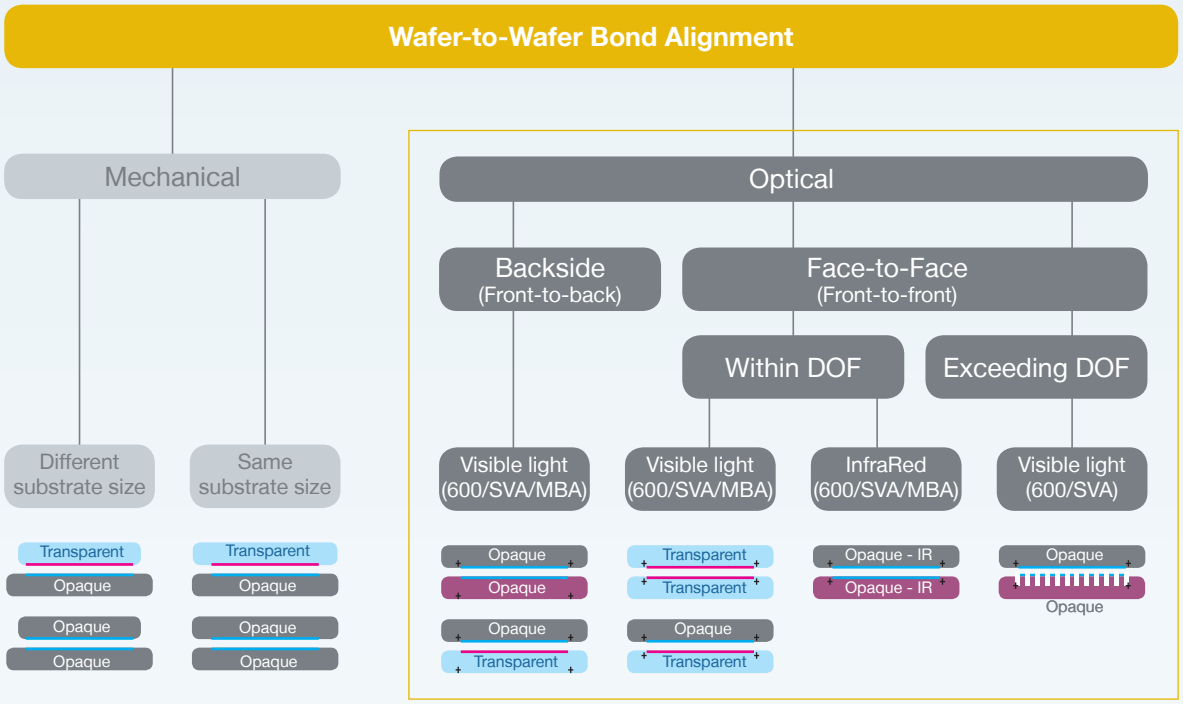
SmartView® NT Bond alignment system for face-to-face alignment up to 300 mm



SmartView® NT Microscope

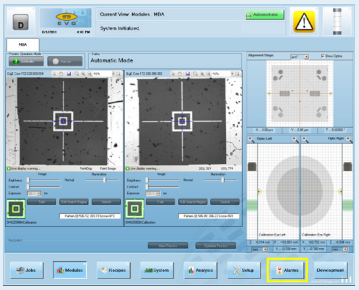
Modular Design

The huge variety of bond alignment system configurations provide multiple advantages for various MEMS and IC applications. A large number of different alignment techniques can be supported by either using direct (live) or indirect alignment methods.



600 ..... EVG®600 Alignment Systems Series
SVA ..... EVG SmartView® Alignment System
MBA ..... Modular Bond Alignment System

SmartView® Alignment stage on **GEMINI®**



EVG® Backside Align Module Software and process control window

Automation option

The EVG bond alignment systems can be equipped with a wafer handling system. Together with EVG's autoalign option, these bond aligners become automated alignment systems without disabling the open access for manual operation.

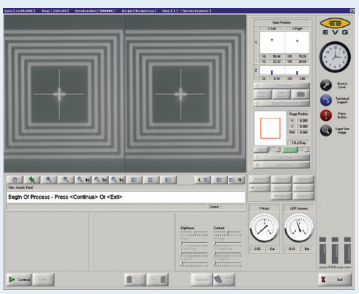
A final step towards an automated aligned bonding process would be the formation of a cluster tool, the so-called GEMINI system, integrating an automated EVG bond aligner and bonder.

Automation features

- Automatic alignment with EVG proprietary key identification feature
- 100% edge handling capability
- Automatic substrate clamping after alignment
- Special robot end effector design for various sizes and materials including ultra thin, bowed and fragile substrates

EVG®6200∞ Bond Alignment System up to 200 mm

EVG®6200∞ Precision Bond Alignment System tooled for 200 mm



EVG®610/620/6200∞ Software and process control window

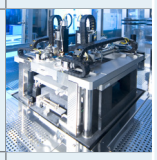
Options

- EVG's SmartView can be combined with EVG500 series wafer bonding systems, EVG300 series cleaning systems and EVG810LT plasma activation systems for automated wafer-to-wafer alignment with cassette-to-cassette operation
- Silicon direct bonding in SmartView

Software and Process Control

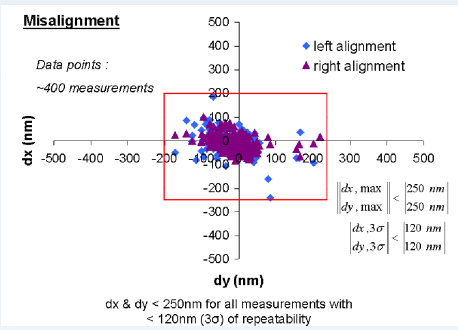
EVG Systems are easy to operate with intuitive Windows® based software. An unlimited number of process recipes can be easily managed and stored for repeatable process results. Manual and automated alignment is available and supported on all EVG bond alignment platforms.

Technical Data

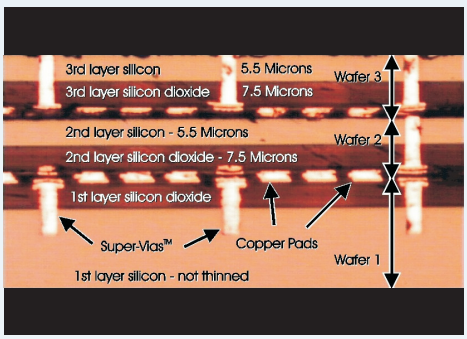
			EVG®610	EVG®620	EVG®6200∞	SmartView®	SmartView® NT	MBA
								
Substrate / Wafer parameters		Size	2", 3", 100 mm, 150 mm, 200 mm	2", 3", 100 mm, 150 mm	3", 100 mm, 150 mm, 200 mm	50 – 150 mm 150 – 200 mm 200 – 300 mm	150 - 200 mm 200 - 300 mm	200-300 mm
		Thickness	0.1 - 10 mm	0.1 – 4 mm		0.2 – 1.5 mm for each wafer	0.1 - 5 mm	0.1 - 5 mm
		Max. stack height	10 mm	4.4 mm		12 mm	10 mm	10 mm
General system configuration		Desktop system	Standard			-	-	-
		System rack	-	Option		Standard		
		Vibration isolation	Passive	Passive (**NT**: active)		Active		
Alignment	Accuracy*	SmartView® alignment	-	-		± 1.3 µm	± 0.5 µm	-
		Backside alignment	± 2 µm	± 2 µm (**NT**: +/- 1.5 µm)		± 2 µm	± 0.5 µm	± 0.75 µm
		Transparent alignment	± 1 µm	± 1 µm		± 0.5 µm	± 0.3 µm	± 0.5 µm
		Transmissive Infrared alignment	Option / substrate depending					± 0.5 µm
		Center-to-center alignment	-					± 10 µm
	Stage	Precision micrometers	Manual	Manual Motorized (Option)		Motorized		
		Wedge compensation	Automated					
Automation Option		Automatic alignment	-	Option		Standard		
		Handling system	-	3 cassette stations Option: 5 stations		3 cassette stations (up to 200 mm) or 2 FOUP load ports (up to 300 mm)		Stand alone module up to 300 mm or integrated in EVG®560 or Gemini® Series

* results achieved with EVG standard process and materials

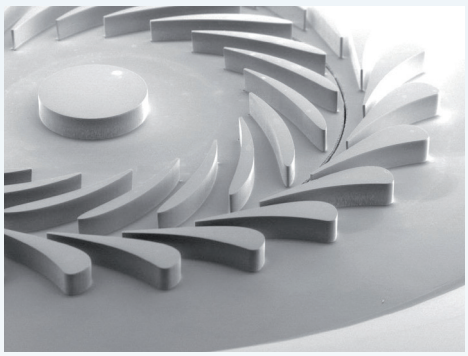
Process Results



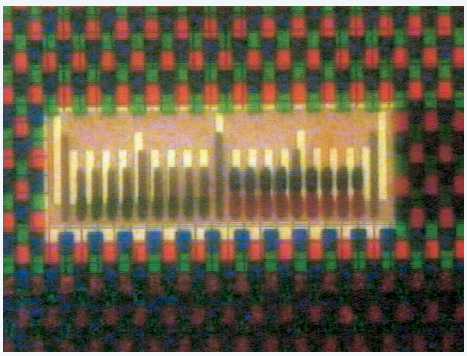
Alignment marathon test data: results of 400 consecutive alignments with EVG SmartView®



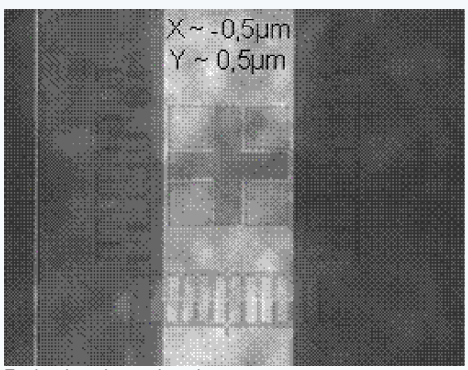
Cu-Cu bond, wafer stacks showing vias (4µm in diameter and 12µm height) | **Courtesy of Tezzaron**

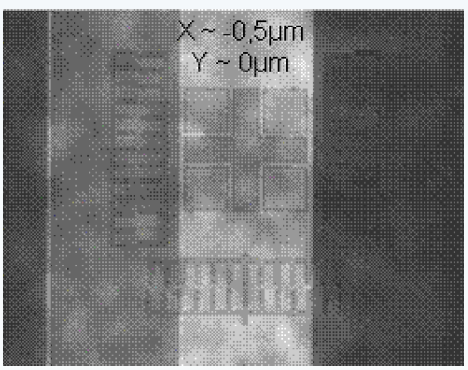


Micromachined turbine
Courtesy of MIT



Sub 0.5µm aligned, bonded color filter
Courtesy of Micro Emissive Displays (MED)





Fusion bond post-bond accuracy
Courtesy of LETI

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