

OPTICAL FIBER
ENGINEERING PAPER

10 Degrees of Bonding Freedom in Fiber Ribbon Design

Enabling Next-Generation Ribbon Architectures with IGF Intermittent Ribbon Bonding Technology

Medek & Schörner
medek.at

DEAR BUSINESS PARTNERS,

In today's fiber market, production speed alone no longer defines competitiveness. True differentiation emerges from how precisely ribbon architecture can be engineered, controlled and transferred into stable high-speed production.

As fiber density increases and installation concepts evolve, structural behavior becomes a strategic design variable. The ability to deliberately define bonding architecture, structural distribution and mechanical response determines how effectively manufacturers can differentiate their product portfolio.

IGF intermittent ribbon bonding technology enables programmable bonding configurations as an integrated architectural design dimension. Bonding is no longer treated as a static production step. Instead, it becomes a controllable parameter that allows bonding sections, intervals and structural distributions to be defined as part of a programmable bonding pattern — reproducible under validated industrial conditions.

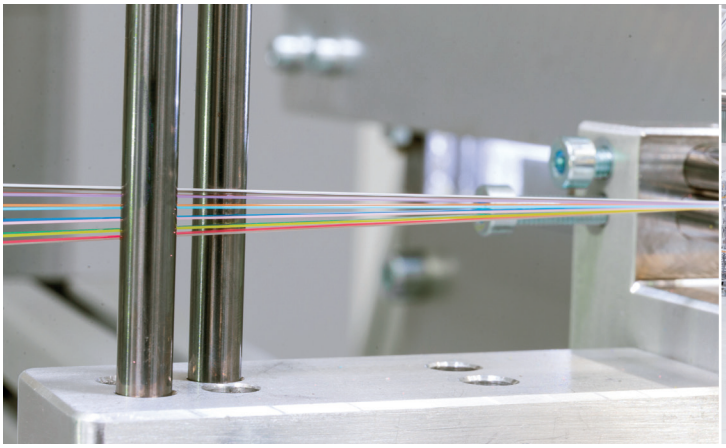
When integrated into a scalable ribbon production environment, these programmable architectures can be executed at industrial speed without compromising structural integrity. This engineering paper outlines ten bonding-related degrees of freedom that influence ribbon performance, industrial scalability and long-term competitive positioning.

For technology leaders, these degrees of freedom bridge the gap between concept development and series production. They reduce iteration cycles, lower ramp-up risks and enable differentiated ribbon architectures to be executed at scale.

We invite you to explore how programmable intermittent bonding control can serve as a foundation for next-generation ribbon concepts.

Best regards,

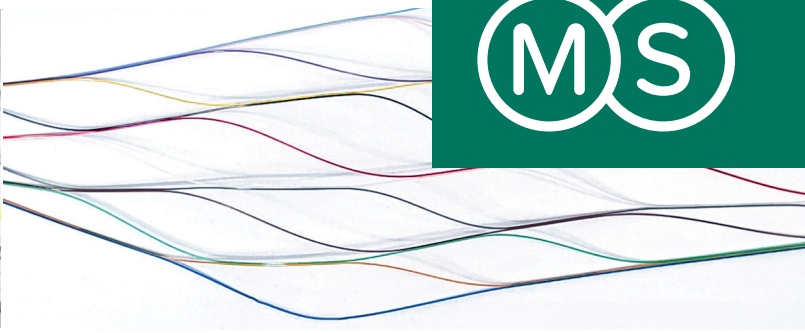
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10 DEGREES OF BONDING FREEDOM





BONDING ARCHITECTURE STRATEGY

Bonding architecture defines how structural cohesion is intentionally engineered within the ribbon. In intermittent ribbon production, fibers can be selectively connected, grouped in defined clusters or bonded across the full width, depending on the required bonding pattern.

Architecture becomes a programmable design variable rather than a predefined structure. Structural engineering transforms ribbon production from standardized manufacturing into deliberate performance design for ribbons containing up to 16 fibers.

LATERAL STRUCTURAL DISTRIBUTION

Independent control of bonding tracks enables selective force distribution across the ribbon width. Structural density and bonding positioning can be defined symmetrically, asymmetrically or in offset (staggered) configurations across the ribbon.

Manufacturers can implement differentiated mechanical concepts without changing hardware platforms.

CONTINUITY AND SEPARATION CONTROL

Programmable bonding intervals define the ratio between bonded and non-bonded sections, directly influencing how cohesion and flexibility interact. Structural separation zones can be digitally specified, repeated and reproduced with high-frequency precision at industrial speeds.

Controlled separation behavior enhances installation performance, ensures reliable fiber accessibility and supports high-density cable architectures.

PROGRAMMABLE BONDING LENGTH

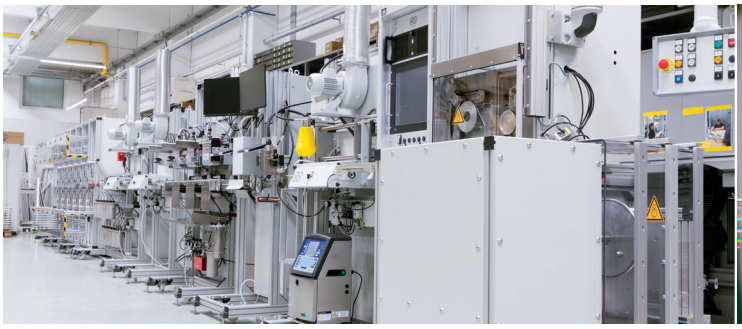
Bond segment length can be precisely defined along the ribbon axis. This directly influences stiffness zones and mechanical response.

Engineered bonding lengths allow performance gradients within a product family while maintaining compatibility with bonding of 250 µm, 200 µm or fiber sizes down to 160 µm..

DEFINED BOND-FREE SECTIONS

Programmable bond-free sections determine localized flexibility and controlled fiber separation. These zones can be precisely defined, repeated and executed at production speeds without compromising structural stability.

Predictable separation behavior and clean fiber accessibility support efficient splicing, reliable installation and application-driven product differentiation.





PATTERN SEQUENCING AND PERIODICITY

Bonding sequences can be repeated, nested or combined. Structural patterns may vary along the ribbon and across its width.

This allows complex intermittent ribbon bonding patterns to be implemented while maintaining stable and reproducible industrial production conditions.

GEOMETRIC BONDING DEFINITION

Segment geometry, transition zones and edge characteristics can be defined within process boundaries. Shape becomes part of performance engineering.

Geometric flexibility expands design space while maintaining compatibility with curing processes and high-speed production of intermittent ribbon structures..

ADAPTIVE BONDING MATERIAL STRATEGY

Different adhesive systems – permanent, releasable, UV-curable, colored or functional – can be integrated into the ribbon concept.

Material adaptability aligns ribbon architecture with environmental, mechanical and regulatory requirements, strengthening long-term portfolio resilience.

PROCESS-LINKED CURING CONTROL

Curing performance is directly linked to bonding configuration and production speed. UV or UV-LED systems ensure consistent structural integrity while preserving optical performance.

Stable curing control bridges the gap between experimental design and high-speed industrialization, enabling scalable innovation.

DATA-DRIVEN REPRODUCIBILITY AND INDUSTRIALIZATION

Integrated process monitoring, camera supervision and real-time parameter control ensure that defined architectures are executed consistently.

The modular system design allows integration into existing ribbon production lines and scalable expansion for future capacity or architectural requirements.

Data-driven reproducibility reduces ramp-up risk, shortens development cycles and strengthens confidence in next-generation ribbon deployment at scale.

MAXIMUM INDIVIDUALITY - WITHIN INDUSTRIAL BOUNDARIES

IGF intermittent ribbon bonding technology enables highly individualized ribbon architectures within defined industrial process windows. If you have a specific intermittent ribbon bonding pattern or architectural concept in mind, our engineering team can provide technical guidance regarding feasibility and support the definition of reproducible process parameters.

Our focus is not on predefined showcase examples, but on the engineering-driven enablement of your individual intermittent ribbon architecture — from programmable bonding pattern definition to stable industrial execution.

Bonding architecture can represent a powerful differentiator in global markets and may influence intellectual property considerations and product concepts. All shown images and mentioned configurations illustrate possibilities enabled by the equipment and are intended to demonstrate its flexibility. Our technology enables a broad range of product designs and manufacturing possibilities. As part of responsible product development, customers are responsible for ensuring that any products developed or manufactured using our equipment comply with applicable intellectual property rights in their respective target markets. **Our engineering team provides engineering expertise focused on technical feasibility and innovation, while freedom-to-operate analyses remain the responsibility of the customer.**

If you are exploring new ribbon concepts or planning your next product generation, we invite you to discuss the capabilities of IGF technology.

Let us explore how IGF technology can enable technically feasible approaches — from programmable bonding design to industrial execution.

From Concept to Industrial Execution

Our bonding technology enables programmable ribbon architectures through:
- Contactless high-precision bond application
- Flattened single-side bond geometry for full ribbon planarity
- Clean fiber separation without affecting color coating

These capabilities demonstrate that programmable bonding freedom does not compromise optical integrity, structural stability or industrial throughput.

LET'S DISCUSS YOUR NEXT RIBBON ARCHITECTURE

If you are evaluating new ribbon concepts or planning your next product generation, we invite you to initiate a focused engineering dialogue centered on IGF technology.

To schedule a discussion, contact our Sales Team for a tailored discussion aligned with your technical and strategic objectives at **sales@medek.at** with your preferred date and time, and we will take care of the rest.

(Further contact details: +43 2245 4694)

Let us explore how IGF technology can support your innovation roadmap — from programmable bonding design to industrial execution.

Best regards,

Your Medek & Schörner Team

