

OPTIMA

Automated wire cutting
and identification system



komax

OPTIMA

Automation is the key to increase productivity and quality for high volume and serial production. Having a scalable solution that can also satisfy high-mix low-volume production is ideal for responding to the demands of the market.

The design of the Optima line revolves around this concept. This modular and flexible platform offers automated features while addressing a large variety of production for different materials, work volumes and industry applications.

Performance

The Optima automated wire processing work station is the result of decades of wire processing machine design. Each function is developed and driven by innovation and enhancement from historical competence with laser wire/cable marking to automated sleeving.

Frequently done manually, this new process includes numerous time-consuming steps from printing to insertion. One of the major benefits of the Optima is the significant productivity gains achieved in wire processing.

With its ergonomic and intuitive design coupled with high production speed, the Optima is the most advanced and versatile solution for wire processing that is available today.

Quality

With fully controlled processes, the Optima promises high quality. Demanding manual operations such as labelling and sleeving are now 100% repetitive and fully operator independent. Vision control is integrated with artificial intelligence that verifies the marking and detects the presence of the sleeve.

► **Sleeving process**

Safety

Repetitive manual tasks can, over time, lead to musculoskeletal disorders. Through sleeving and label automation, the manual task of applying sleeves and labels is no longer a health risk to operators. No longer is the heat gun, which can reach very high temperatures, required. Operators can now focus more on other value added tasks.

Flexibility

Multiple tasks are needed throughout the value chain. Many of these tasks will depend on the industry and customer application. The key to finding an automated industrial solution that is appropriate for a variety of demands is flexibility! Having at its core design the ability to upgrade, the Optima encompasses a segmented platform in which various essential functions can be added over time and as production requirements change.

Efficiency

Mindful of economical and environmental concerns, the Optima includes features to minimize wire waste while reducing its power consumption. It features a compact design and energy saving standby mode to start production only when needed.

Standards

The Optima complies with CE Standards and has “CE” label. The Optima machine also complies with European directives:

- Machinery directive 2006/42/CE
- Low voltage directive 2006/95/CE

And with the standards:

- Machine: NF EN 60204-1 – Machine Electrical Security

REVOLUTION IN SLEEVE AND WIRE PROCESSING

WEALTH OF FUNCTIONS
FOR A FULLY SCALABLE MODULAR LINE





▲ Optima 600 configuration with 2-spool dereeler and WCT, WSI, WEL modules

CUTTING OPTIMA C

Performance and quality

Simple and easy to operate, Optima C can process wire from 6 to 26 gauge including single core and twisted wires. Supported by EasyProd software, Optima C provides reliable automation for the processing of wire.

Multiple sensors have been integrated for special detection.

- End of the spool
- Cable cut
- Cable over tension

Cutting unit sensors can detect:

- Cable knots, splices and bare wire*
- Safety enclosure opening
- Pneumatic pressure fault

* Optical detector performance for cable diameter variation of 1/128" (0.2 mm) at 2 m/s (400 ft/min)

A tensioning system (see image 01) integrated before the cutter, works with an electrical motor that applies constant force upon the wire, meeting international de-reeling standards.

Economical and sustainable

The large diameter of the external encoder (see image 02) ensures a constant contact on the wire leading to precision dereeling accuracy. Through the tensioning device with force monitoring, the wire is held in place and speed is reduced by end of the spool detection. End of spool wire waste is considerably reduced. Production startup wire waste is addressed by the pneumatic gripper positioned by the cutter. This allows for reduced waste down to 50 mm (1.97 in).

Low maintenance

While in cutting mode, the reliable motorized double-belt drive pulls the cable in at high speed. EasyProd software controls cable traction for each cable type along with acceleration, deceleration and production speed for the best performance and accuracy. Length tolerances:

- 0 to +20 mm (0 to 0.79 in) for cables under 4 m (13 feet) length
- 0 to +0.5% for cables over 4 m (13 feet) length

Belt lifetime can be doubled since the belts can be turned over due to the cable not being centered on them (see image 03).

Equipped with a powerful cutting system, Optima can process wire up to gauge 6. Specific blades can be used depending on the requirement.

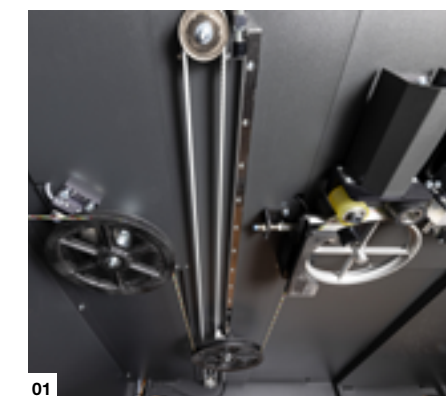
A precision clean cut is made by the cutter utilizing two "V" shaped rounded blades that are mounted head to tail. Blade replacement is made quick and easy with machine optimization and up-time in mind.

Ergonomic

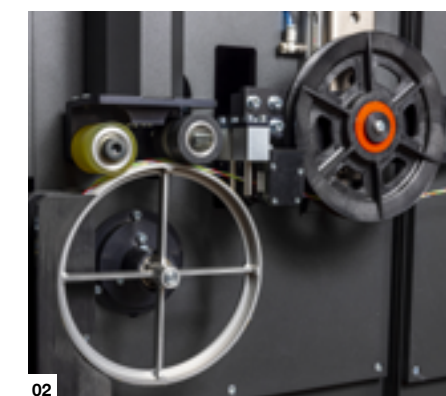
Experience, gathered over the years, has highlighted the need for a more user-friendly machine not just on the software side, but on the hardware side as well. Optima boasts several new features to ease the use and the support of the machine: Human-Machine interfacing options, intuitive LED indicators, wire feeding assistance, adjustable mounted touch screen, and sliding doors for better maintenance access.

The control system which includes the EasyProd software, developed by Komax, is built around the following components:

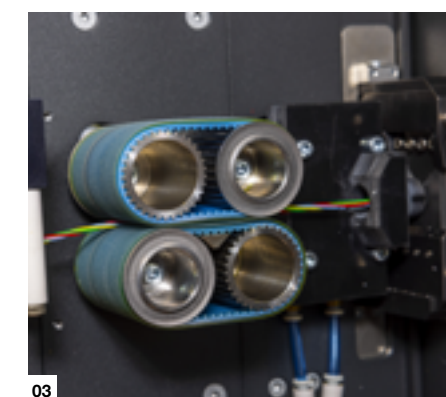
Operating system	Windows® 10 IOT
Case/form factor	Fanless without any rotating part
Memory	4GB min
Hard drive	SSD
Video card	Integrated
Available ports	4 × USB 3.0 1 × RJ-45 (to connect the computer to the factory network)
Standard monitor	24-inch side mounted touch screen



01



02



03



04

- 01 Innovative tensioning device with controlled applied force.
- 02 External coder with large diameter ensuring great accuracy.
- 03 Integrating Komax Kappa driving and cutting unit.
- 04 Intuitive (and visually appealing) LED display along the machine and the dereeler.

OPTIMA

UV LASER MARKING

Ideal for medium and high production volumes, the Optima laser cable marking range combines scalability, modularity and performance at a very competitive price.

UV laser marking has long been the standard in terms of wire/cable identification in the aerospace industry.

Clear, unalterable and permanent marking

UV laser marking provides a safe, permanent, high contrast identification on all cables guaranteed “UV-markable” by cable manufacturers, such as single or multi-wire twisted and jacketed cables with PTFE (Teflon®), FEP (Teflon®), ETFE (Tefzel®), XL-ETFE (Tefzel®).

Non-aggressive marking

Unlike hot stamping and ink-jet methods, the Optima UV laser wire/cable marking process causes a reaction within the wire insulation which results in a safe, permanent and unalterable mark.

Low operating costs

UV laser marking provides fast and efficient identification for UV markable wire/cable without post marking treatment.

The Optima meets the requirements from manufacturers, subcontractors and maintenance centers in the Aeronautics, Space and Ground Vehicle sectors.

Complies with the following standards:

- CE
- FDA “Radiation Control for Health and Safety Act”
- Underwriters Laboratories (UL)

Aeronautics:

- AIRBUS: AIPS / AIPI
- BOEING: BAC 5152
- SAE ARP 5607
- SAE AIR 5468
- SAE AS 5649
- SAE AS 50881 (MIL 5088 L)
- ASD EN 4650
- ASD EN 3475-100
- ASD EN 3475-705
- ASD EN 3475-706
- ASD EN 3838

Machine:

- EN 60204-1

Laser:

- EN 60825-1
- EN 60825-4
- EN ISO 11553-1

Stand-alone machine with low maintenance requirements

The machines in the Optima range are designed to operate without external adjustment nor daily maintenance. The operator’s tasks are limited to changing the spools, selecting the production file and collecting the marked cables. Multiple options and accessories can increase productivity by raising the level of automation and therefore reducing the number of operations to be performed by the operator.

PRODUCTIVITY GAINS THROUGHOUT THE PRODUCTION PROCESS

The productivity gains achieved by the Optima are not only related to high marking speeds but also to production optimization of both hardware and software. Examples:

- Easy, quick spool change and cable set-up

- Identification and font parameters automatically changed during production
- Special features including label printing, traceability, waste reduction, etc.
- The EasyProd software offers flexibility in sorting production data

01

01
UV laser marked wire

02
Contrast measured by the EasyContrast system provided by Komax



02

OPTIMA

Vector marking range

Optima-L220
Optima-L330
Optima-L990

Bringing a new level of scalability for aerospace harness manufacturing, the Optima platform presents 3 models.

Each model is equipped with a diode pumped UV laser which utilizes vector marking technology. Marking occurs by scanning the laser beam directly on the wire. Each machine can be upgraded to one of the higher models in the range according to the client's requirements.

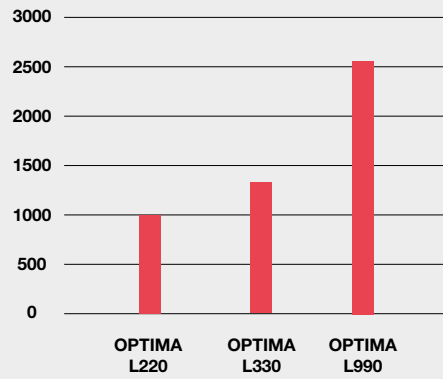
Additionally, for non-jacketed cables, which are not UV markable, all Optima models can be utilized for measure and cut-to-length.

Marking specifications

- ASCII Universal Characters 32 to 126
- Barcode (code 39)
- 3 fonts (other fonts on request):
 - Vertical : 0.7 x 1.4 mm
 - Vertical : 0.6 x 1.4 mm
 - Horizontal : 1.1 x 1.2 mm

PRODUCTIVITY COMPARISON OF THE OPTIMA RANGE

Average number of cables in meters per hour



NOTE: Wire marking speed represents only 30 to 40% of total production time. Numerous other factors determine overall productivity such as:

- spool change
- wire feed and configuration
- production data handling
- software familiarity
- production organization skills

THE BENEFITS OF VECTOR MARKING

The marking process is no longer limited by the hardware. Scanning the laser directly onto the wire provides high flexibility in the creation and choice of font size.

Diode technology requires no consumables for the laser,

reducing the maintenance on the machine and lowering the operating costs.

The air-cooled laser reduces noise level and energy consumption.

▶ Laser marking in progress

QUALITY CONTROL

- Fault Detection
Sensors on the Optima machine interrupt production and display an error message for the operator as soon as a fault occurs. The intuitive LED indicator locates the default.

- Wire waste
The machine is equipped with new devices that significantly reduce the wire waste from the beginning of the production to the end of the spool.

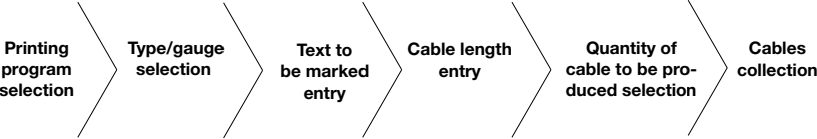
- Laser Auto Calibration
The machine automatically adjusts the laser energy density depending on the cable parameters defined on the EasyProd software. This exclusive feature increases the energy for cables that are difficult to mark and reduces energy on cables that are easily marked. This minimizes consumables, wear, and operating costs while increasing marking quality.

CONTROL SYSTEM

- Hardware: computer running under Windows 10® IOT (64bit) specially adapted for machine control.

- EasyProd software
Automatic or manual entry of marking data (ID, space between markers and cable length, etc.):

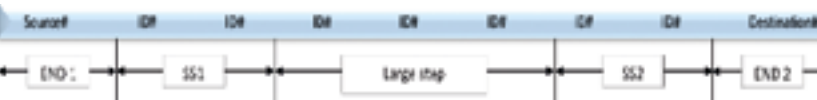
- Manual production mode:



- Automatic production mode:

The automatic production mode is used to mark and cut large amounts of cable through the use of the production file. The software offers different production modes for cables, particularly by type/gauge (to reduce the number of spool changes).

The cable is divided into 5 marking areas that can be easily customized using the EasyProd software.



Technical characteristics

Laser	YAG
Marking technology	Vector marking
Laser security	Class I laser compliant with European (CE) and American standards: suitable for work in covered workshops
Operating temperature range	+ 15 °C to + 30 °C
	For optimal laser operation it is recommended to avoid large temperature variations
Storage temperature	+ 1 °C à + 45 °C
Relative air humidity	80 % (non-condensing)
Input requirements	1 more line if WCT: 208-230 Volts - 50-60 Hz - 20 A
Compressed air	6 bar
Compulsory smoke extraction	The machines in the Optima range are equipped with a smoke extraction system
Cooling unit	The laser head is cooled by means of an integrated autonomous air-cooling unit



01



02

DEREELERS

Adaptable

With flexibility in mind, Optima is designed to adjust and conform to the production environment. One can choose from a single spool up to a 40 spools motorized dereeler with automatic feeding system.

2-spool dereeler

Set on configurable rollers, each station can process spools from a small standard 250 mm (9.84 in) / 25 kg (55 lb) up to a massive 600 mm (23.62 in) diameter / 75 kg (165 lb). Small spools must be positioned exclusively in the upper part of the dereeler. Wire extremities are clamped at the output of the dereeler for manual feeding and optimized for loading/unloading.

Multispool motorized dereeler and automatic feeding system (AFS)

For best production flexibility, the multispool dereeler with AFS eliminates most wire spool loading operations and minimizes wire change-over through complete automation. From a single production file, an entire harness can be produced without manual spool loading.

The dereeling station is automatically selected by the machine software according to the cable to be loaded or unloaded. The multispool is configurable in cabinets of 8 spools (4 on each side). There can be up to 5 cabinets for a total of 40 spools. At any time, the system may be upgraded by adding additional cabinets.

Spool characteristics

	2-spool dereeler	Multispool
	Maximum weight: 75 kg (165 lb)	Maximum weight: 25 kg (55 lbs)
	A: 150 to 350 mm (5.90 to 13.78 in)	A: 150 to 250 mm (5.90 to 9.84 in)
	D: 250 to 600 mm (9.84 to 23.62 in)	D: 250 to 400 mm (9.84 to 15.75 in)
		B: Inner axis: 20 mm (0.79 in), 25.4 mm (1 in) or 38 mm (1.5 in)

- 01 User-friendly software with touch screen interface
- 02 Multispool dereeler (up to 40 spools)
- 03 AFS wire loading section with light location

WASTE REDUCTION

A key feature of the AFS is the waste management offered by the gripper. By stopping in optimized positions for each step, the waste at the beginning of the production is

limited to few centimeters. Coupled with the external coder of the Optima that handles the end of the spool, savings on waste are guaranteed.



03

POST-CUTTING MODULE OVERVIEW

COILING PAN

If post-cutting automation is not an option, the Optima comes standard with a 220 mm (8.66 in) motorized coiling pan.

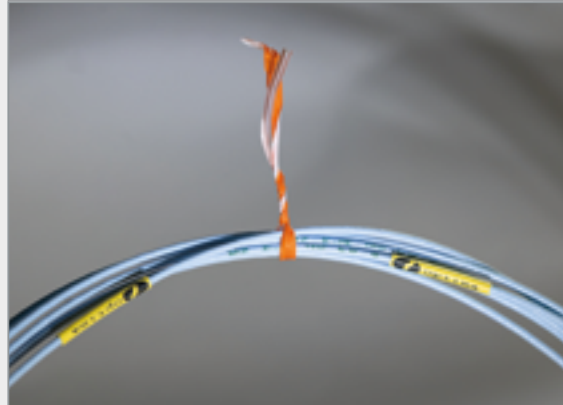
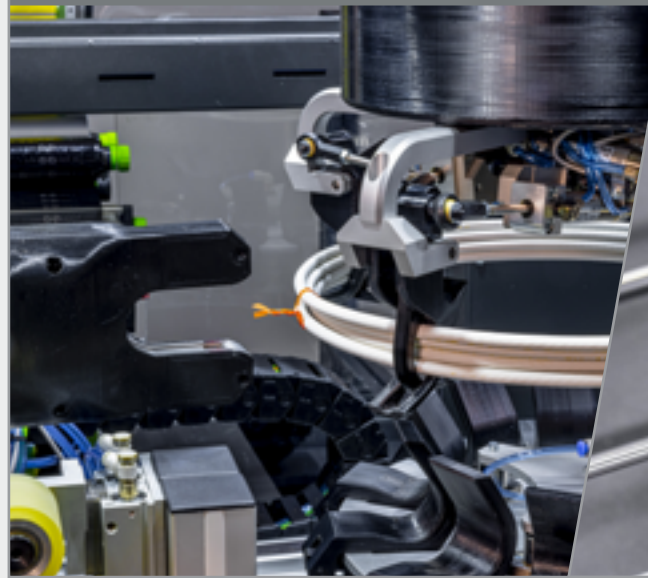
The rotating speed of the coiling pan is adjusted to the cable speed to ensure perfect wire looms. Upgrade options are available to meet ever-changing capacity requirements. 300 mm (11.81 in) and 400 mm (15.75 in) pans are available as an option.



WCT* COILING TYING SYSTEM & STORAGE

In the first step of the post-cutting automation, the WCT system allows users to automatically coil and tie the wire, using plastic twisted ties.

After tying, the coiled cable is automatically placed in a bin at the machine output. This bin is placed on a cart to be transferred to the next processing station.



WSI AUTOMATIC SLEEVE INSERTION

The WSI module brings automation to the manual and time-consuming sleeving process.

With up to 3 printers, the module prints the sleeve, verifies the marking by vision control and positions the sleeve onto the wire. The sleeving can be positioned along the wire or at the extremities. An IR heat shrinking unit can be added optionally.

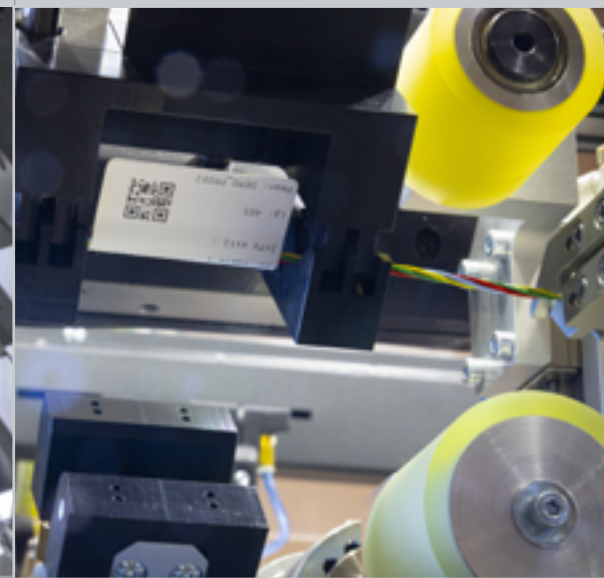
Automation in processes such as these increases quality and productivity along with health and safety.



WEL WIRE EXTREMITY LABELLING

Labelling is the best way to add information on the wire and efficiently guide the operator in the subsequent manufacturing steps.

Fully programmable, the WEL module can label each wire extremity. Labels can contain information from the production file in different forms, including barcode, DataMatrix and QR code.



POST-CUTTING OPTIONS (*WCT MANDATORY)

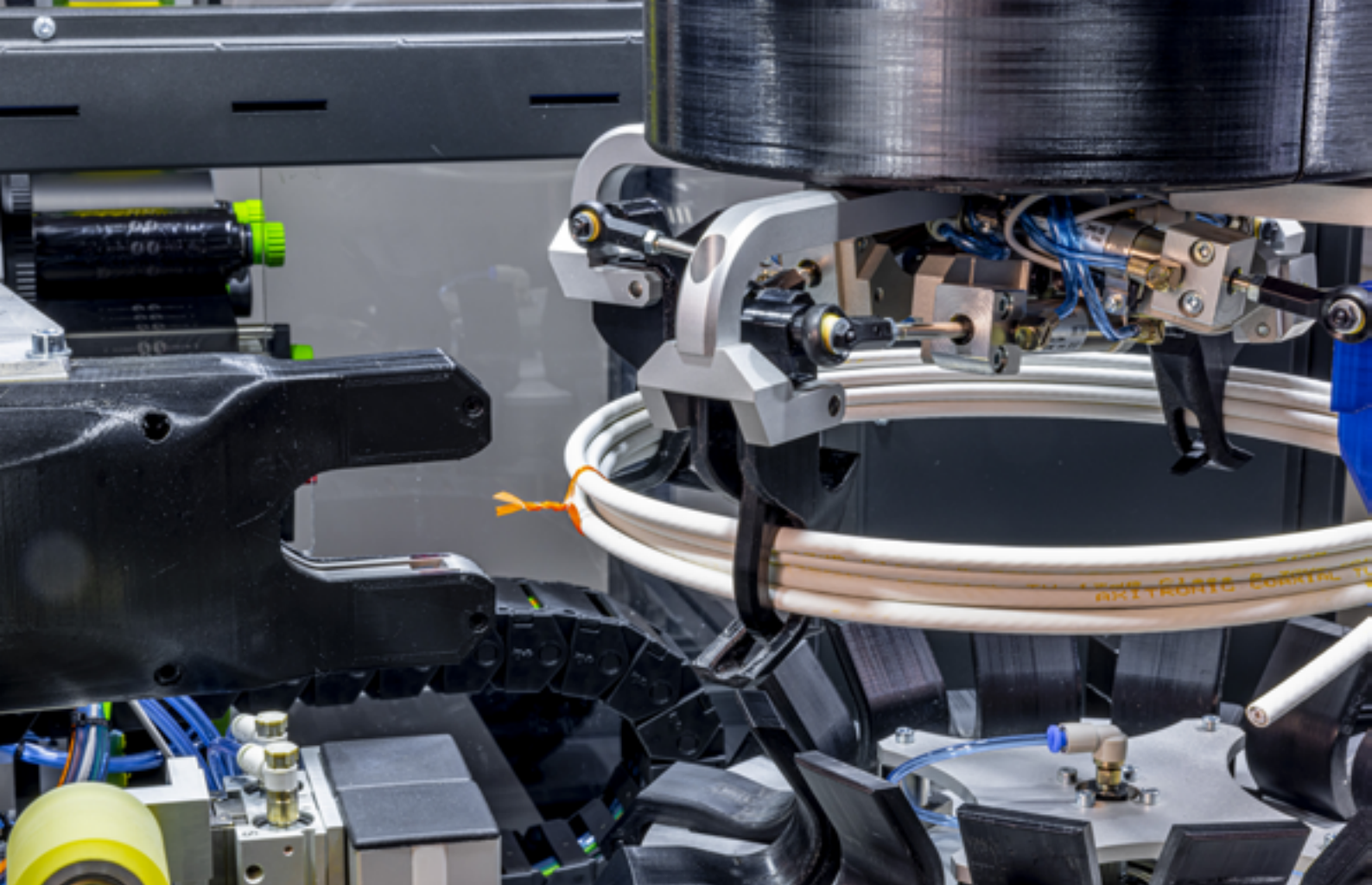
STO* STORAGE

Once produced, the coiled wire is stored in a production bin at the output of the machine. With the WCT, a single bin set on a cart is provided as standard.

Conveyor options are available to meet the workshop production flow.

Traceability is available through bin management with QR-code.





WCT COILING TYING SYSTEM & STORAGE

First automation step

The WCT module, with capabilities of coiling, tying and storing, is the first step of automation after Optima C.

Versatile coiling

Coiling at a diameter of 280 mm (11.02 in), Optima can process lengths from 150 mm (5.90 in) up to 75 m (246 ft) (depending on gauge) to a maximum wire coil section of 35mm (1.38 in). The wire is picked up by two independent and fully programmable grippers that can move the wire from the cutting process onto the coiling and tying process. Optional modules such as sleeving, shrinking and labelling are available. Wires that are too short to be coiled are moved to storage directly.

▲
The WCT module automatically ties the coiled wire with up to 3 non metallic and easy to remove ties.

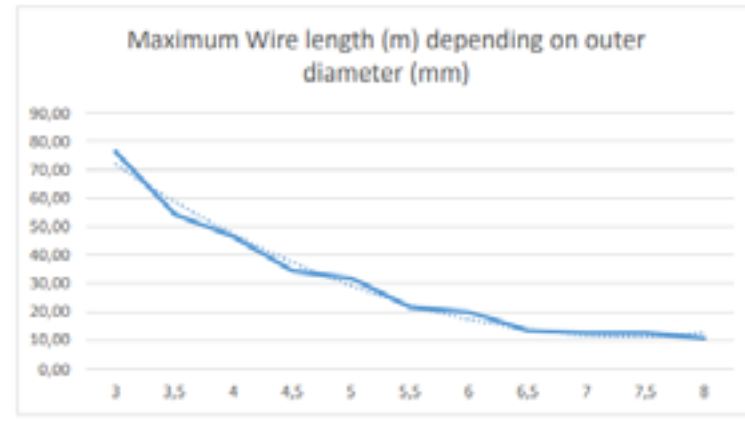
The WCT includes an integrated coiling drum with applied torque that ensure a perfect coil. The drum system is retractable to facilitate the pick up of the wire loom.

WCT tying

In times past, taping was the method used to tie the loom till the next assembly step. Removing the tape could be tedious for the operator and could result in musculoskeletal disorders. The WCT design places up to 3 ties on the loom, with controlled twist for effortless removal with a simple pull. Ties are non metallic to meet FOD protocols.

The minimum length estimated to coil and tie a cable is 1.3 m (3.28 feet).

- Cable type: single core, shielded and unshielded wires, jacketed and unjacketed multi core cables, optical fibers
- Gauges: AWG 26 to AWG 6 (outer diameters from 0.8 mm to 8 mm)
- Cable length processed:
 - from 150 mm (5.90 in) with coiling pan or WCT from 250 mm (9.84 in) with WSI module
- Wire coil diameter: 280 mm (11.02 in)
- Wire coil section: 35 mm max. (1 in)
- Weight: 1 kg max. (2.2 lb)



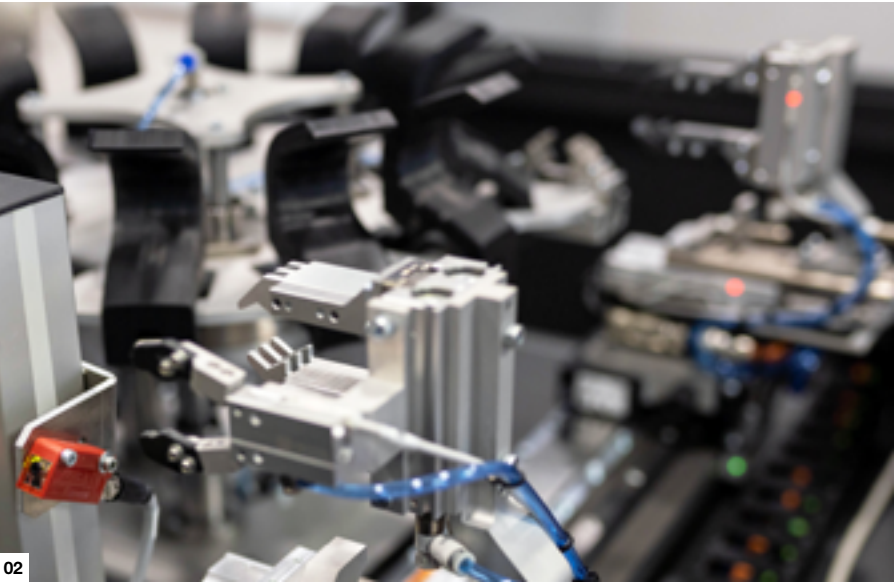
Storage

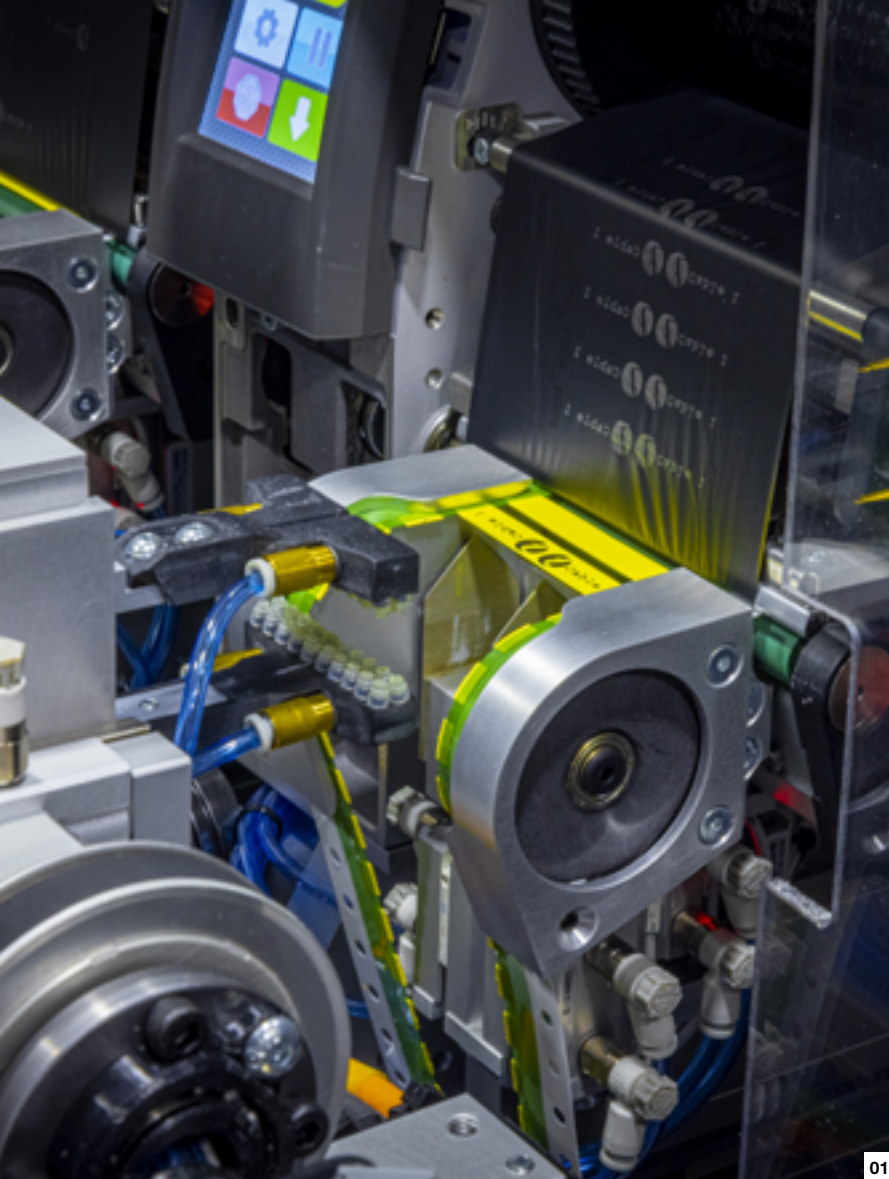
As standard, the WCT comes with a storage system with a single production bin set on a cart. The operator manually retrieves the bin once the production is complete. For a more automated solution, storage configuration can be upgraded with a conveyor system.

01
The 280 mm coiling system in motion.



02
Two independent and fully programmable grippers handle wire extremities.





01

WSI

AUTOMATIC SLEEVE INSERTION ON WIRE

A revolution

From manual to automation, with the WSI module, the Optima offers a major step towards increased quality, productivity and safety.

Flexibility

With up to 3 integrated printers and 5 different sleeve sizes, the machine can process a large variety of production types with no operator intervention.

A carousel of 10 tubes with 5 different diameters supports the sleeves. The carousel also has functions to eliminate the cable waste at the start of production.

With the WSI basic configuration, the module can insert a sleeve at each wire extremity.

With the WSI Multi configuration, the module can increase the number of sleeves along the wire (up to 11 sleeves) but it is limited to the two largest sleeve sizes.

Quality

A vision system to control the marking ensures that each sleeve inserted onto the wire is compliant with specifications, preventing any rework during assembly. Faulty printed sleeves are ejected and reprinted automatically without operator intervention.

Safety

Infrared shrinking can be added just after the sleeve insertion module to shrink the sleeve and hold it in place on the cable. WSI offers a constant, controlled shrinking process that is independent from the operator. Handling of heat gun equipment is no longer required during the sleeving process.

Full production cycle:

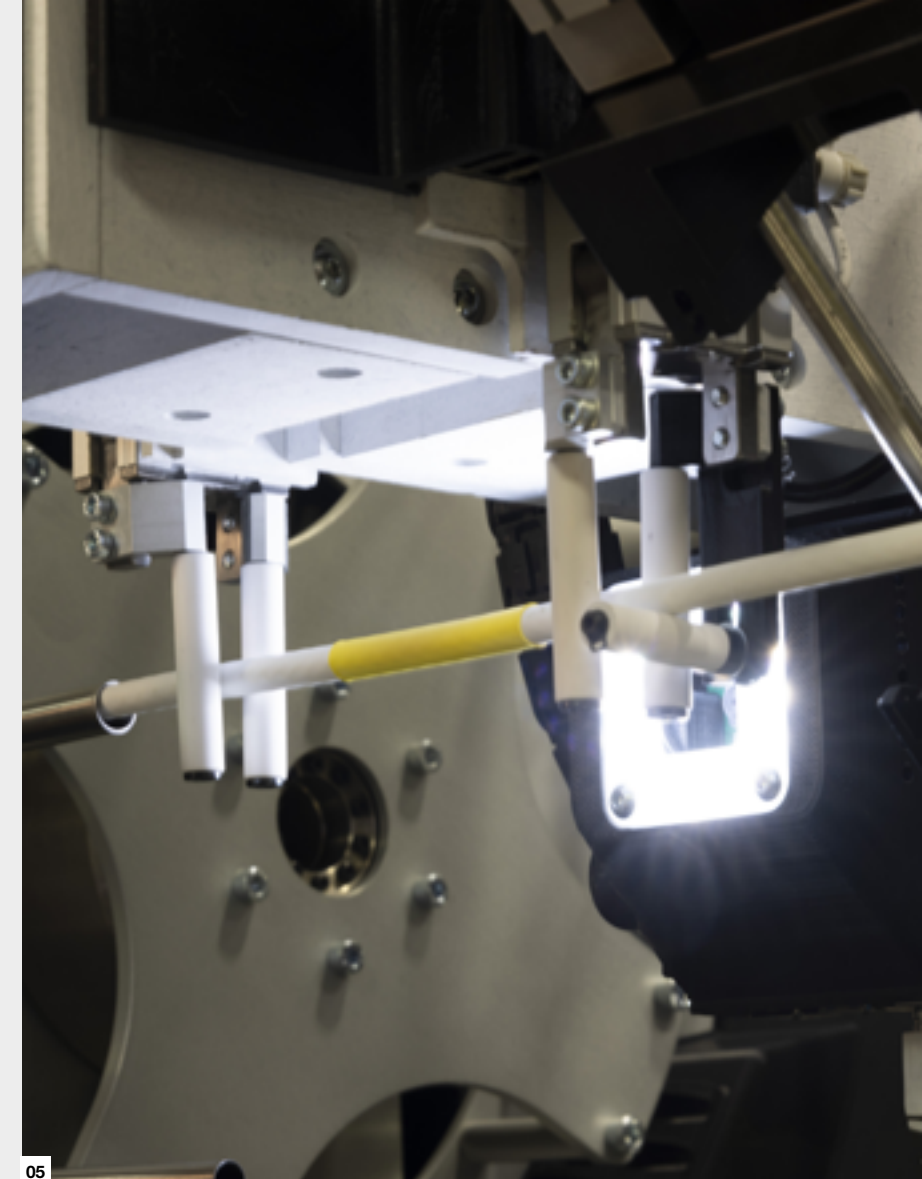
01
The sleeve is printed according to the production file. A vision control is performed to verify the marking.

02
The marked sleeve is carefully picked and loaded onto the tube of the carousel.

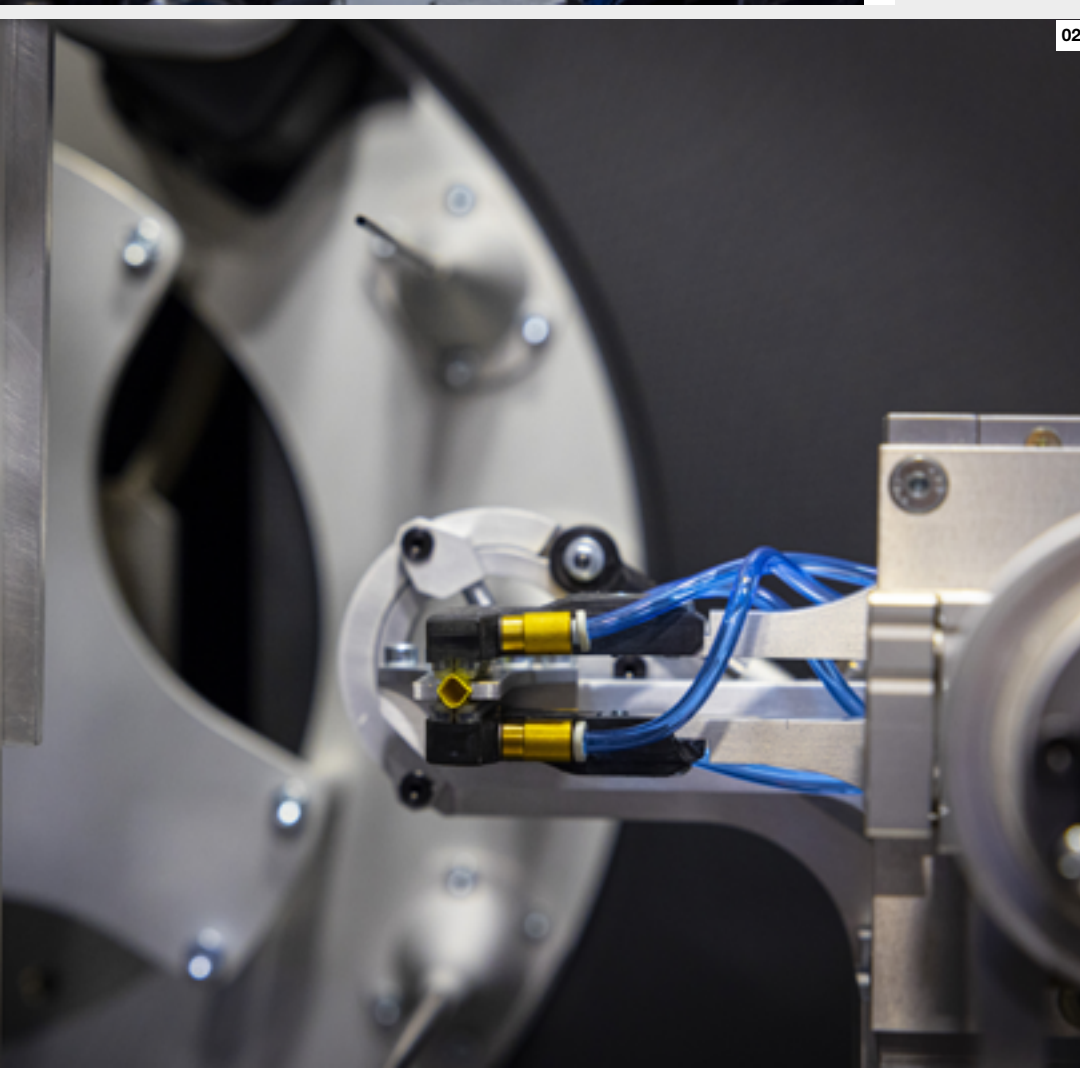
03
Once the sleeve is installed, the carousel rotates to bring the loaded tube to the output of the cutter. Loading is done in the background.

04
Two independent grippers handle the wire extremities and the sleeve positioning.

05
An infrared apparatus can shrink the sleeve after its position has been confirmed by vision control.



05



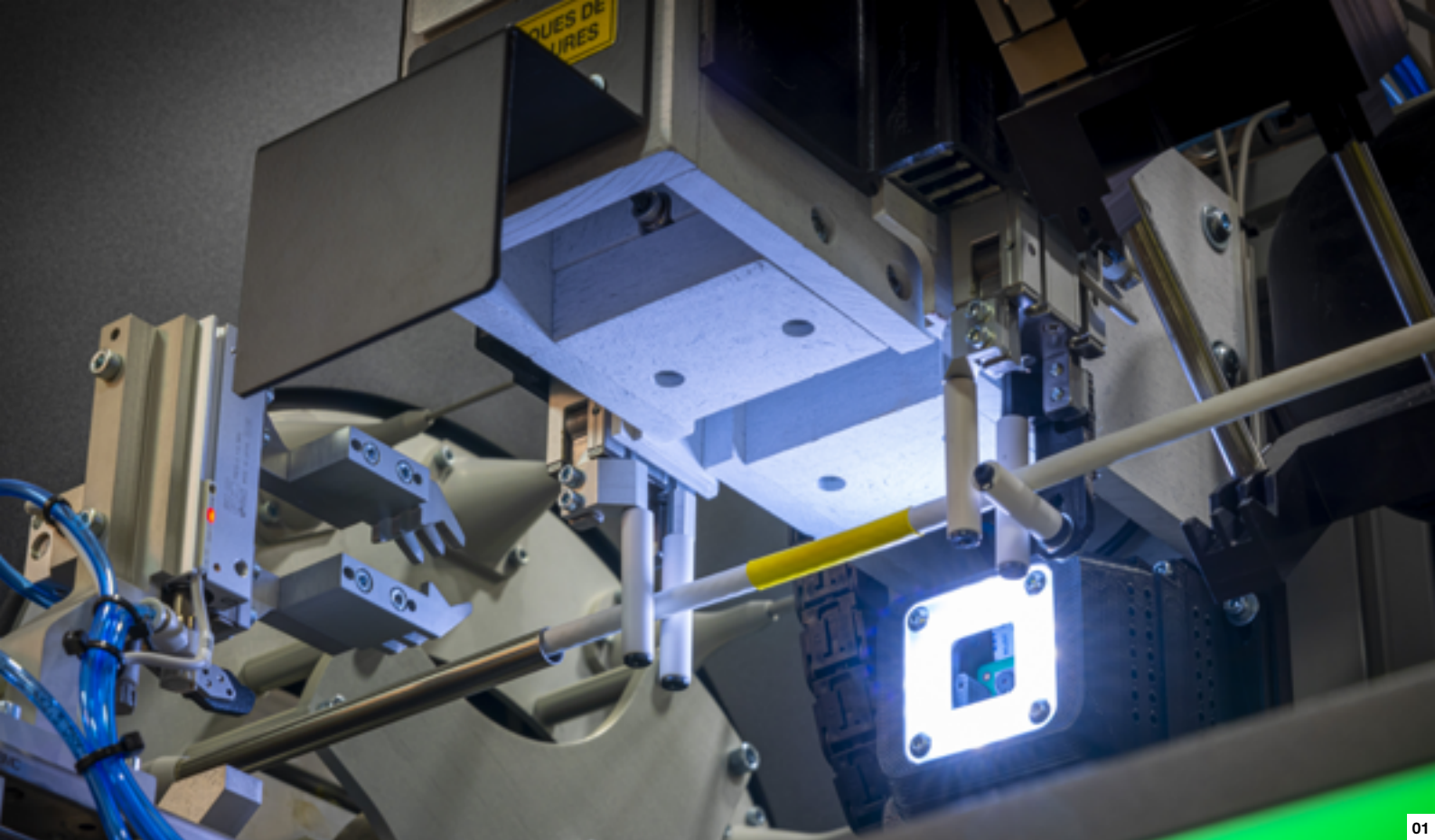
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04



01 04



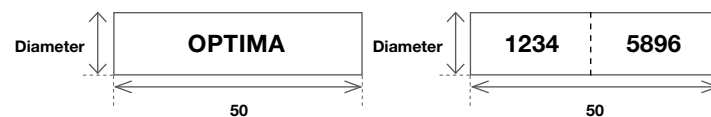
04
The WEL module automatically labels wire extremities with customizable content.

Productivity

The time-consuming manual process of sleeve printing with control, wire cutting, sleeve insertions, heat shrinking, and coiling is now fully automated in the Optima platform. A gain in productivity of up to 45% is expected compared to the manual process. A full-time operator in front of the machine is no longer required.

In line with the standards

The sleeve length is 50 mm (1.97 in), or 2 × 25 mm / 2 × 0.98 in (precut sleeve).



The compatible range includes almost all sleeve dimensions listed in the table.

WSI Base	Sleeve size	Maximum wire diameter
	3.2 mm / 1/8 in	1.8 mm / 5/94 in
	4.8 mm / 3/16 in	2.7 mm / 1/8 in
	6.4 mm / 1/4 in	4.2 mm / 5/32 in
	9.5 mm / 3/8 in	6.9 mm / 9/32 in
	12.7 mm / 1/2 in	8 mm / 5/16 in
WSI Multi	Sleeve size	Maximum wire diameter
	9.5 mm / 3/8 in	6.9 mm / 9/32 in
	12.7 mm / 1/2 in	8 mm / 5/16 in



02



03

01
Heat shrinking performed by infrared shrinking system
02
Wide range of sleeve sizes
03
Optimized sleeve printer access for easy maintenance

WEL WIRE EXTREMITY LABELLING SYSTEM

In addition to the WCT, the wire extremity labelling system allows extremity labels to be positioned automatically on produced wires.

Options for extremity labels include both ends, single end or no label at all. Information printed on the label can be tailored to customer specifications.

The first label is placed at 80 mm (3.15 in) from the first wire extremity. The second label is placed at a minimum of 135 mm (5.31 in) from the second wire extremity.

Benefit

- Faster cable labelling, reduced operating costs and less operator dependence during the process
- Wire identification
- Extremity wire information is printed on labels
- When inserting loose sleeves, extremity labels can prevent the sleeves from sliding off the wire

Label specifications

- Top-coated with permanent adhesive
- Thermal paper for enhanced durability
- Resistant to moisture and surface abrasion
- Printing specification: thermal
- Dimensions max. label size: 1.57 x 1.77 in (40 mm x 46 mm)
- Quantity per paravent packing: 1500 labels



05

05
High ergonomics with label printer set on sliding tray and intuitive LED indicator.

Optima configurator

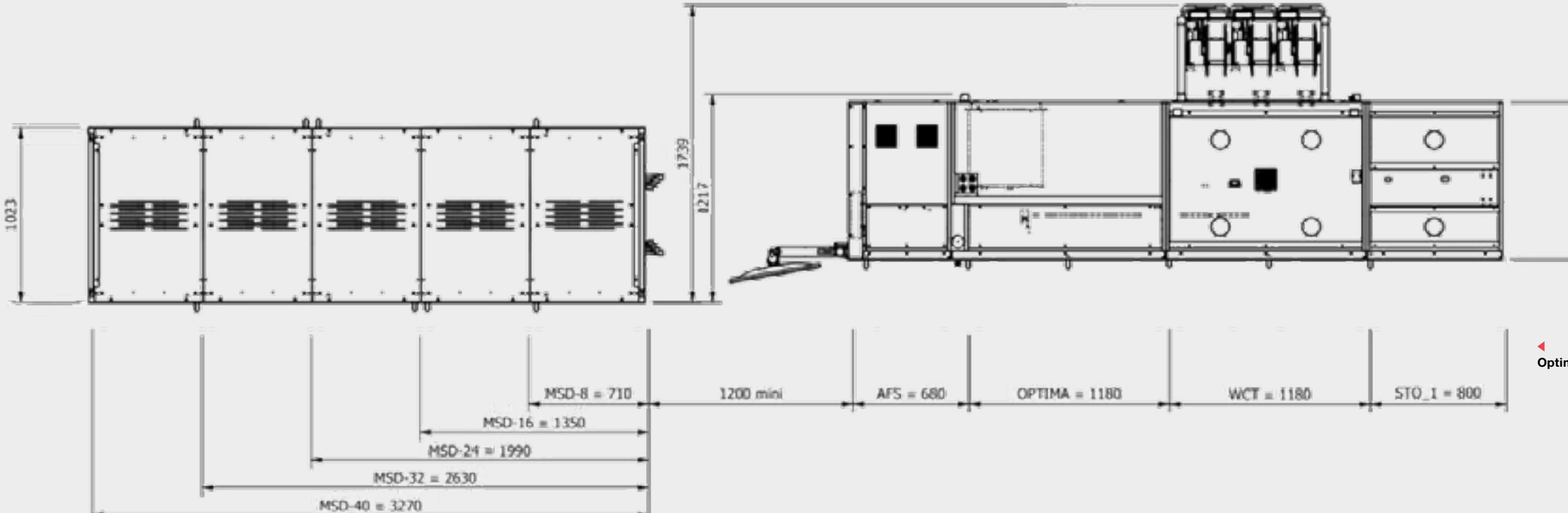
Dereeler	ADS_2-600 - Dereeler with 2 x spools, up to 600 mm		
	Automatic Feeding System with 1 cabinet of 8 spools		
	Additional cabinet of 8 spools – Total 16 spools		
	Additional cabinet of 8 spools – Total 24 spools		
	Additional cabinet of 8 spools – Total 32 spools		
Optima	Optima C		
	Optima-L220		
	Optima-L330		
	Optima-L990		
Output	Coiling Pan (220 mm in standard – 300 mm and 400 mm in option)		
	WCT for Wire Coiling and Tying (comes with STO_1 for storage in 1 box)		
	or	WEL for Wire Extremity Labelling	
		WSI_BASE for Wire Sleeve Insertion on extremities (insertion of 2 x 50 mm printed sleeves on cable)	
		WSI_MULTI for Wire Sleeve Insertion (insertion of printed sleeves for cable up to 11 of 50 mm)	

Options and accessories

Dereeler	ADS 2 spools • Multispool with AFS up to 40 spools
Optima	Label printer • Coiling pan sensor • 220 mm (8.66 in) / 300 mm (11.81 in)/ 400 mm (15.75 in) coiling pan • Traceability • OPC-UA Connectivity • Spool lifter
WCT	Standard 280 mm (11.02 in) coiling
WSI_BASE	Multi sleeves up to 4 (4 × 25 mm / 4 x 0.98 in) • Additional sleeve printer (up to 3) • Sleeve vision control (included) • Heat shrink unit with vision control
WSI_MULTI	Additional sleeve printer (up to 3) • Sleeve vision control (included) • Heat shrink unit with vision control
WEL	Standard extremity labelling
STO	Standard 1 bin • Conveyor 11 bins • Extremity alignment • Bin traceability • Bin divider options

Specifications

	Optima 3XX (Cutting only)	Optima 4XX (Laser marking)	Optima 5XX (Kitting)	Optima 6XX (Sleeving)
Wire size range OD	AWG 26 to AWG 6 - 0.8 to 8 mm (1/34 in to 5/16 in)			
Wire type	Single-core, jacketed, unshielded multi-core, shielded multi-core			
Minimum length	150 mm (5.9 in)			250 mm (9.84 in)
Maximum length			- 10 m (33 feet) for cable with 8 mm OD (5/16 in) - 75 m (246 feet) for cable with 3 mm OD (1/8 in)	
Proceeded sleeves (WSI)				Sleeves in rolls Length: 50 mm or 2 × 25 mm (precut sleeve) / 1.97 in or 2 × 0.98 in WSI Base • Size: 3.2 mm (1/8 in), 4.8 mm (13/64 in), 6.4 mm (15/64 in), 9.5 mm (23/64 in), 12.7 mm (1/2 in) WSI Multi • Size: 9.5 mm (23/64 in), 12.7 mm (1/2 in)
Sleeves printer (WSI)				Up to 3 printers, allowing 3 different types of sleeve to be processed (color and/or size)
Sleeves by cable (WSI)				WSI Base: 0 to 2 (for 50 mm) and up to 4 (for 2 × 25 mm) WSI Multi: 0 to 11 (for 50 mm)
Extremity labels (WEL)			Thermal printing, size: 40 mm × 46 mm (1.57 to 1.81 in) Information printed tailored to customer needs	
Spool characteristics	Refer to dereeler page			
Interface	24” touch screen with EasyProd software			
Operating system	Microsoft Windows 10			
Operating temperature	+ 15 °C to + 40 °C • + 15 °C to + 30 °C with laser marking			
Electrical connection	1 x 200 – 240 V 50/60Hz; 1.2 kVA		2 x 200-240 V ; 50/60 Hz ; 20 A-300 mA; 1,2 kVA	
Air supply	6 bar, dry and oil-free			
Conformity	CE, FDA, UL			



Optima line layout

Komax – leading the field now and in the future

As a pioneer and market leader in automated wire processing, Komax provides its customers with innovative solutions. Komax manufactures series and customer-specific machinery, catering to every degree of automation and customization. Its range of quality tools, test systems, and intelligent software and networking solutions complete the portfolio, and ensure safe, flexible, and efficient production.

Komax is a globally active Swiss company with highly qualified employees and development and production facilities on several continents. It provides local support to customers worldwide through its unique sales and service network and offers services that help them get the most out of their investments.

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