Optinova
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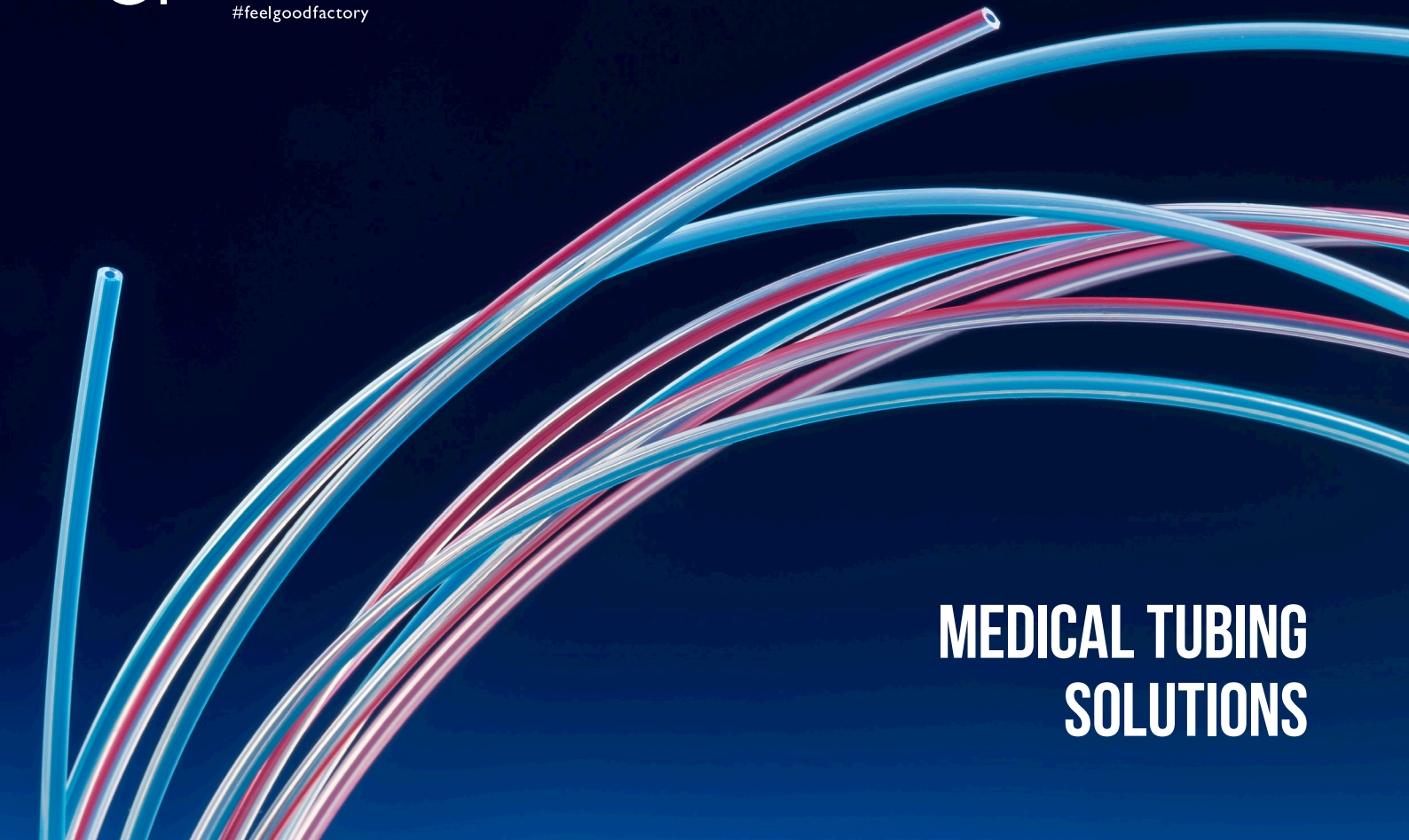

MEDICAL TUBING SOLUTIONS

IN BRIEF

The Optinova Group is a leading global supplier of advanced tubing solutions for the global medical device industry and for challenging industrial applications. We use our experience and knowledge in extrusion, combined with a sustainable business mindset, to develop top quality components which are part of innovative solutions, increasing the quality of everyday life.

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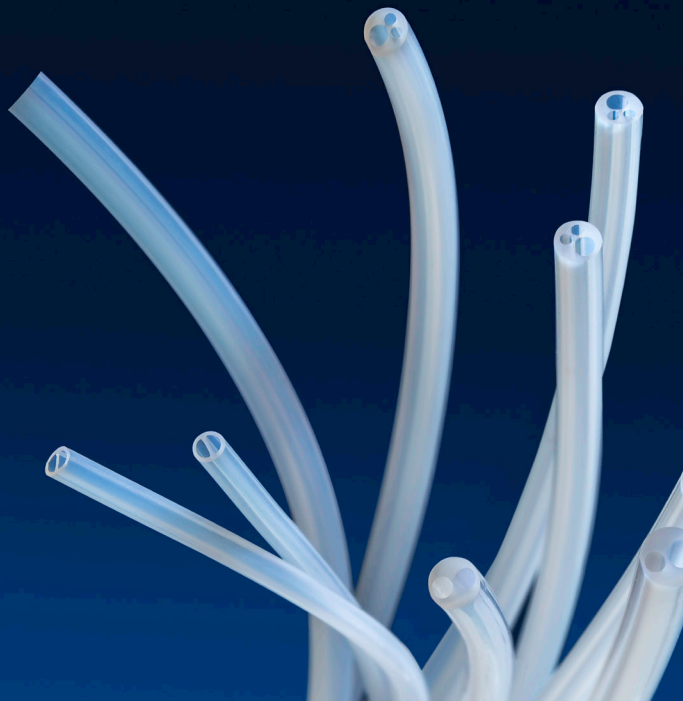


CONTENTS

DECADES OF ADVANCED TUBING

1971
Godby Plast founded by Habia, of Sweden

1982
First clean room

1985
Expansion of plastic material in use

1990
New company name: Optinova

1992
Eriksson Capital acquires 100% ownership

1995
100% focus on medical tubing

1998
Established in China

2000
Established in the USA

2002
Hall 6 finished; 300 m^2 clean room

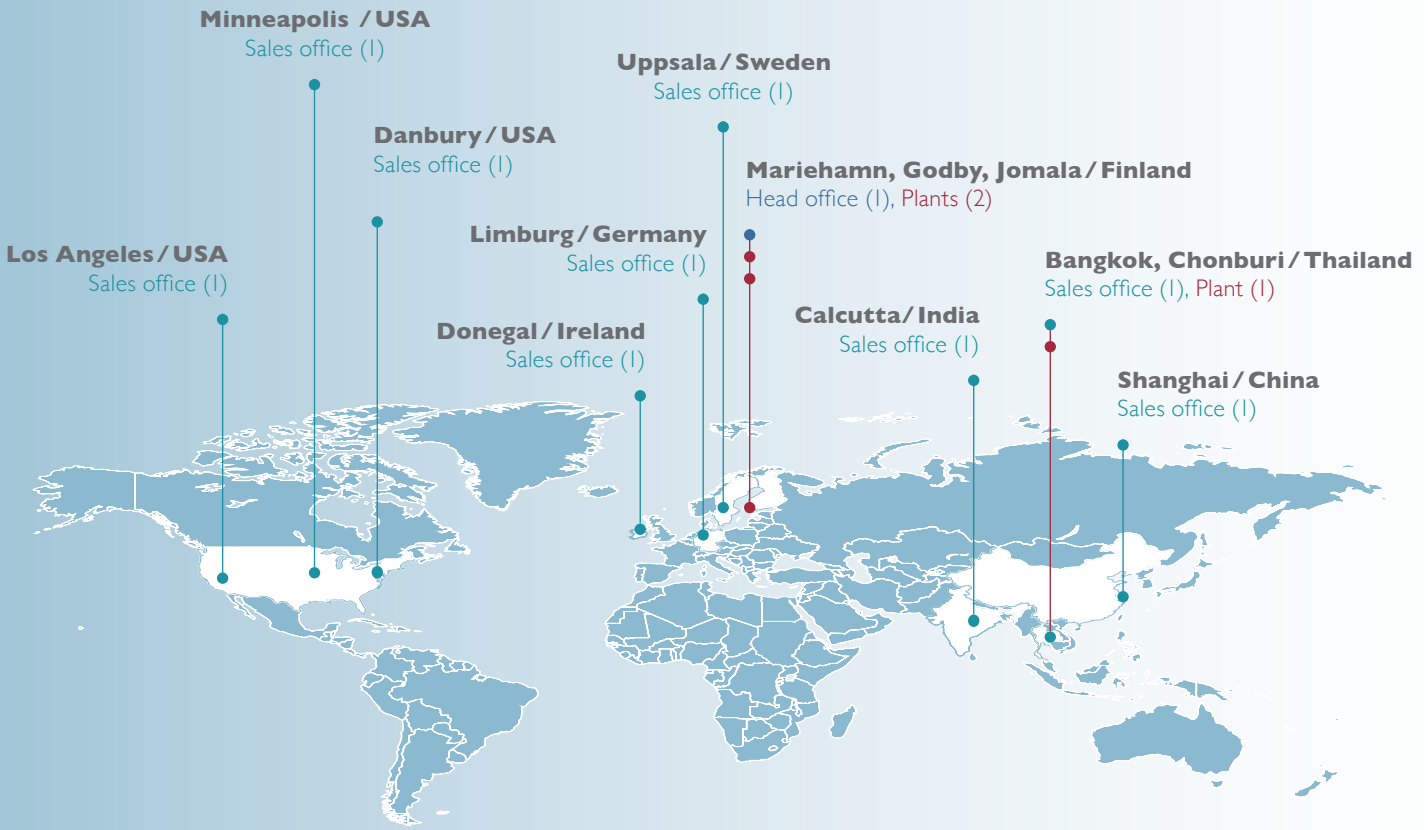
2011
Acquisition of Medicin Lake Extrusion in Minneapolis, USA

2013
Second plant in Minneapolis, USA established

2015
Acquisition of ScanTube Group; industrial tubing added to portfolio

2017
Sales office in Bangkok, Thailand, established

2018
Transition to only one brand: Optinova


Minneapolis / USA
Sales office (1)
Uppsala / Sweden
Sales office (1)
Danbury / USA
Sales office (1)
Mariehamn, Godby, Jomala / Finland
Head office (1), Plants (2)
Limburg / Germany
Sales office (1)
Los Angeles / USA
Sales office (1)
Bangkok, Chonburi / Thailand
Sales office (1), Plant (1)
Donegal / Ireland
Sales office (1)
Calcutta / India
Sales office (1)
Shanghai / China
Sales office (1)

WHY WE ARE IN THE BUSINESS OF EXTRUSION

The Optinova Group is a leading global supplier of advanced tubing solutions for the global medical device industry and for challenging industrial applications.

Our greater purpose

We use our experience and knowledge in extrusion, combined with a sustainable business mindset, to develop top quality components which are part of innovative solutions, increasing the quality of everyday life.

Our guiding star

All in all, we describe how and what we do with our guiding star:

#feelgoodfactory


INCREASING THE QUALITY
OF EVERYDAY LIFE

SUSTAINABILITY

We strive to be at the forefront by operating in a sustainable way within our industry and society. Our efforts are important for the growth of our employees and our overall business. Together we can contribute to a better world and towards a higher purpose. We invite and encourage everyone at Optinova to promote sustainability at every level.

Diversity

The diversity among Optinova employees is a competitive advantage. We are inclusive with respect to gender, age, nationality, culture and experience. With this we can get plenty of different views, ideas and input to help us make the best decisions.

430+	26	40 / 60 %	41,5 YR.	3,200
Employees	Nationalities	Women / Men	Average age	Working years

LEADERSHIP

development at all levels to inspire and create engagement and a meaningful everyday

LOWERING ENERGY

consumption in plants and office spaces

SUSTAINABILITY

social, environmental and financial requirements on suppliers and partners

WATER REDUCTION

reducing fresh water and reuse water

OPTIMIZING VENTILATION

in production areas

BRAND BUILDING

for securing new competence attraction

LOGISTICS FOCUS

to optimize transportation paths, touch points and CO_2 emission

RECYCLING

production materials, primarily plastics

QUALITY COMMITMENT

We are committed to achieving customer satisfaction by supplying superior quality tubing and services that are delivered on time. We accomplish this by continuing to improve our capabilities, complying with requirements, and maintaining the effectiveness of our quality management system.

Category	Certificate	Godby	Jomala	Thailand
Quality	ISO 9001	✓	✓	✓
	ISO 13485	✓		✓
	ISO 14001		✓	✓
Material	REACH	✓*	✓*	✓*
	RoHS	✓*	✓*	✓*
	NSF/ANSI standard 51		✓	
Clean room	ISO 14644	✓*		✓
Product specific	UL 224		✓	✓

* Not certified but compliant with self check

Medical Device
ISO 13485

Clean Room
ISO 14644-1,
class 8

Business Management
ISO 9001

Environment
ISO 14001

WHY OPTINOVA?

We strive to create value and celebrate your success #feelgoodfactory

Material knowledge

We possess in-dept knowledge of raw materials, having our own polymer experts (PhD level), as well as, laboratories for research. We combine this with external partner collaborations that ensure our expertise in polymers and raw-material processing.

Extrusion specialist

We know extrusion inside and out; the core of our business with over 100 extrusion lines globally, making us the biggest in the world. We continue to push the limits and develop our processes with new innovations.

Secondary operations

We provide secondary operations according to our partners´ needs, many times custom made just for them. Our Innovation Center provides valuable consultancy, and we've even created the robots needed to make the operations as automatic and efficient as possible.

Magical world of polymers

It all starts in the magical world of polymers. Our PhD-level polymer scientists provide in-depth knowledge of raw material experience in polymer processing. Material properties and purity are investigated in our own polymer laboratory. Can we share some polymer magic with you?

RAW MATERIAL AND ADDITIVES


We dig deeper where
we are really good

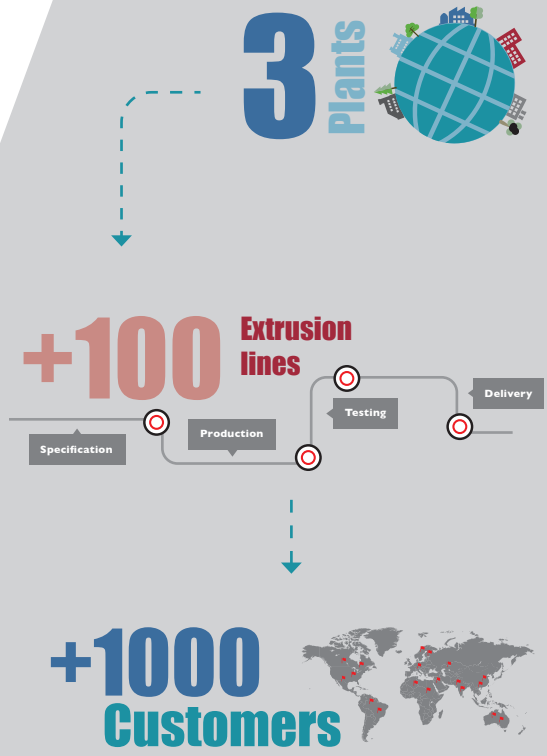
PUSHING THE LIMITS OF EXTRUSION

Extrusion is our passion and our core competence. We have several decades of experience across 100 extrusion lines globally, which has enabled us to accumulate data within our unparalleled knowledge library.

Come feel the passion

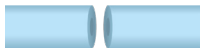
&

push the limits with us



WE DARE TO BE DIFFERENT

Engineering is the basis for customization and creating true value. Automating customization is unbeatable for handling high volume production to meet a wide varying market needs. Creating difference is fun…


Welding

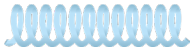

Etching

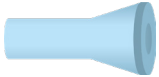

Flanging


Ring marking


Striped


Pebax-Braid-Pebax


Spiral forming


Flaring


Skiving


Tapering

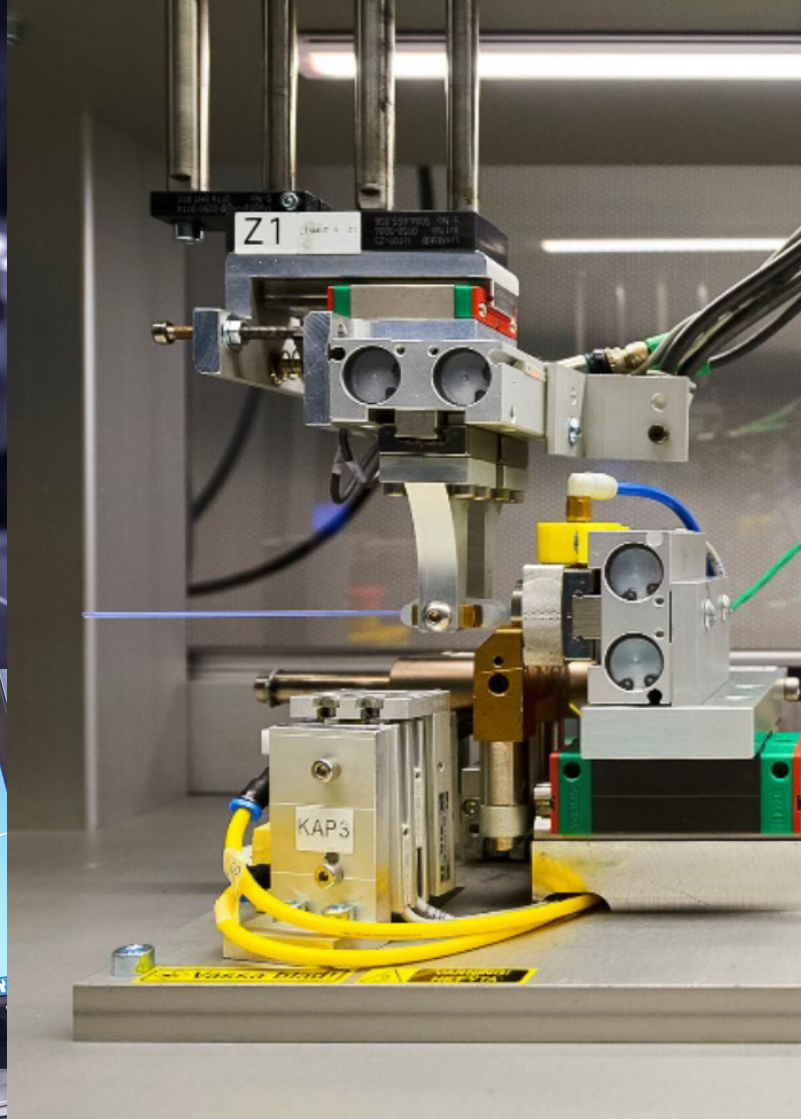

Chamfering


Forming/Fabrication


Hole punching


Spiral cut


D31
DELL

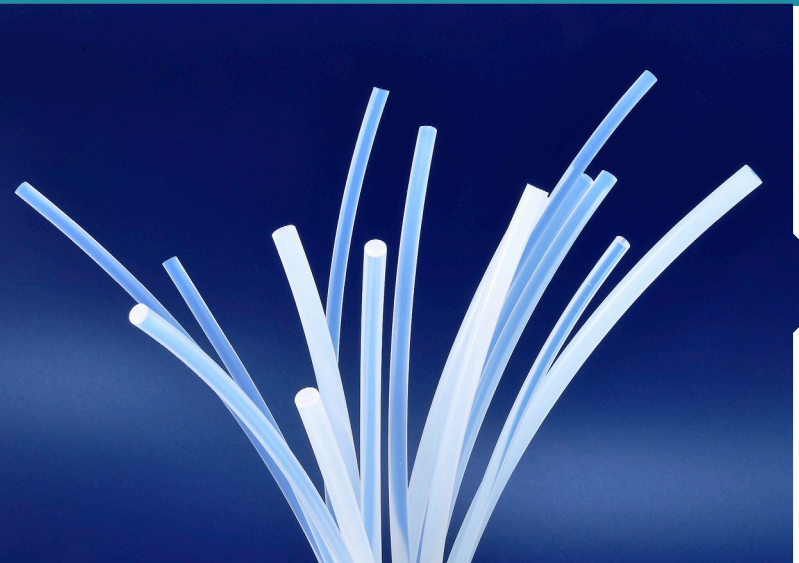

Z1
KAP3

PRODUCT CATEGORIES

Strategic fit for minimally invasive devices.

- Beading, monofilaments, profiles
- Etched OD liner
- Heat Shrink tubing
- Zebra spiral Heat Shrink
- Single- and multi-lumen tubing
- Co-extrusion and multilayer tubing
- Braided reinforced tubing

» CRM lead components
» Balloon tubing
» Stent and balloon protectors
» IV catheter tubing
» Dispenser (protective) tubing



Beading, monofilaments and profiles

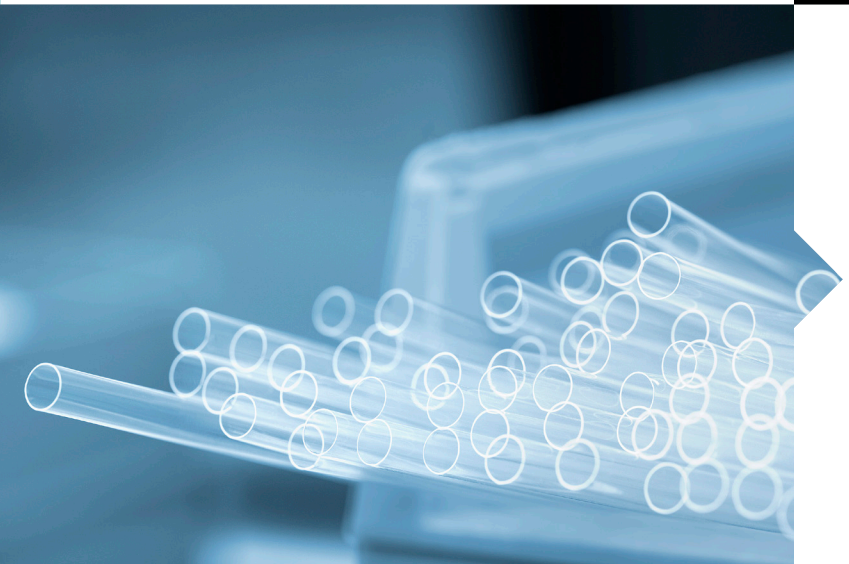
A stable inner core used as a building block for high precision medical catheter shafts, endoscopic devices and more.

- Manufacturing aid for minimally invasive delivery devices
- Braided reinforcement
- Precision extrusion

Etched OD Liner

Lubricious inner layer for medical catheter shafts used in reflow manufacturing processes.

- Low Coefficient of friction
- Excellent adhesion
- Outstanding tensile properties



Heat Shrink and QuickShrink™ 2.0 tubing

FEP Heat Shrink is used to reflow the jackets over the braid, as a protective covering and many more.

- Reflow processing tool
- Recovery temperature from 80°C–205°C to
- Splicing, tipping, bonding

PTFE Zebra Spiral HS

Used in flexible endoscopic devices and urology guide wires.

- Different colour patterns
- Visual aid for surgeons
- Lubricious surface

Single – and multi-lumen tubing

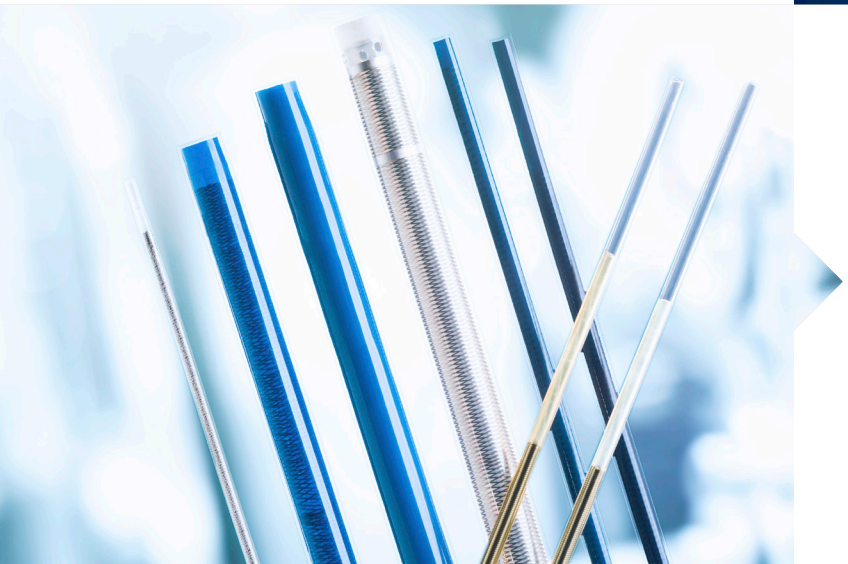
Various polymers extruded into single or multi-lumen cut to length or spooled.

- Value added services/secondary operation
- Delivery device shafts
- Custom design

Multi-layer tube/co-extrusions

Stiff inner layer for torque momentum and kink resistance and a soft inner layer for patient comfort. Various layers can also contain additives or stripes for radiopacity/MRI.

- Various properties in one tube
- Material choices to fit your needs
- Chemically inert and superior mechanical properties



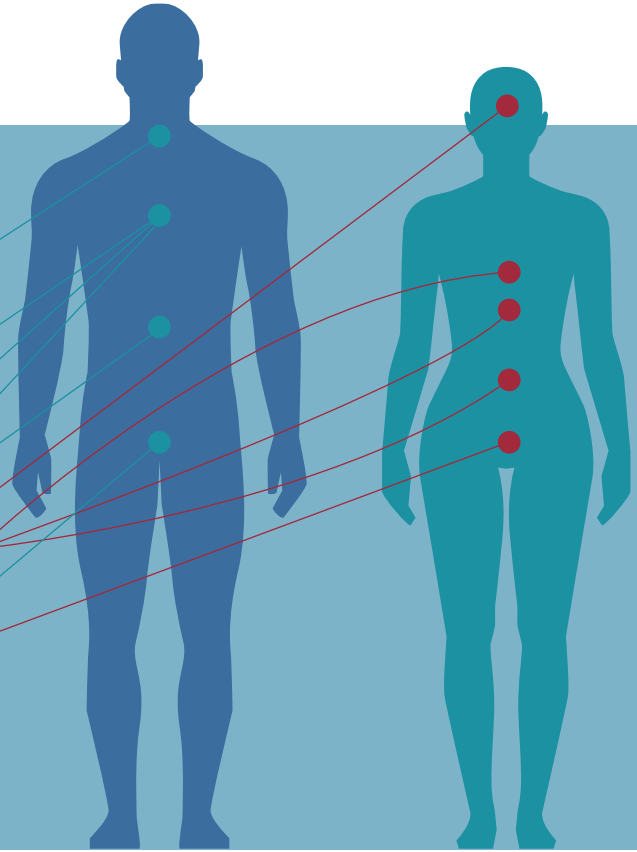
Braided/reinforced tubing

Metal or polymer-based braiding for catheter shafts.

- Torqueability
- Steerability
- Custom design

MEDICAL APPLICATIONS

- Infusion Technology
- Cardiovascular
  - EP
  - CRM
  - Structural Heart
  - Pheripheral Vascular
- Neurovascular
- Endoscopy/Gastroenterology
- Urology
- Gynaecology
- Lab/Analytics



APPLICATIONS EXAMPLES

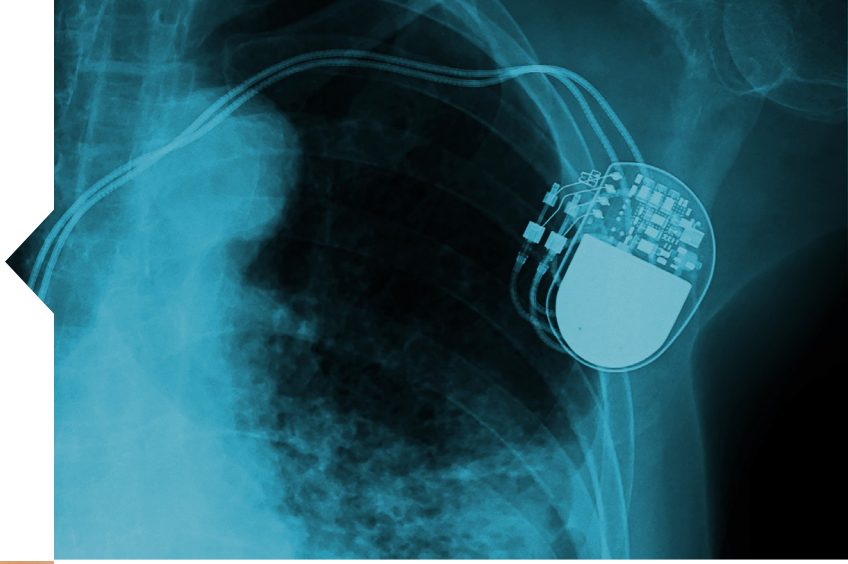
We are a world leader in precision extrusion of tubing for medical applications. We have developed a world-wide reputation of fulfilling customer expectations; not only with fluoropolymer extrusions, but also with a wide variety of thermoplastics.

Balloons that save lives

In order to have a superior balloon, you will need to start with a high quality tube that shows superior concentricity and elongation properties, as well as consistent wall thickness. We also support your engineers to design the custom balloons and stent protector for your device.

Keep up the pace of the heart

Heart rhythm disorders can be addressed in several ways. Our CRM lead tubing components are used as insulating coatings in long term implants. With braid-reinforced shafts for electrophysiology, a physician can map the electrical system of your heart to beat optimally – the Optinova Way.



A tiny tunnel to deliver

Wearable infusion sets have proven to be very convenient for mobile patients, as they are used for delivering fluid, medication, and pain treatment. A tiny-sized polymer tube serves as a "tunnel", through which medication or fluid is delivered to the body. The disposable infusion sets are light and practical medical devices, critical for patients to live their lives to the fullest after a diagnosis.

Fulfilling a dream

In vitro fertilization (IVF) has revolutionized the medical science and boosted the hope for infertile couples. At Optinova we are proud to support life at this early stage.

Oocyte (egg cell) retrieval (OCR) is a critical step during in IVF procedures as it enables fertilization outside the body. The minimally invasive medical device consists of a high quality tube for oocyte retrieval and transportation.

Keeping your inside intact

Optinova´s extrusions are used in various flexible endoscopic surgical devices. The Zebra Heat Shrink is used as a visual aid for physicians, the lubricious PTFE single- or multi-lumen tubing is used for therapy delivery alongside steerability of a flexible tip through wires.

Urology and OB Gyn

Tubing in various sizes, shapes, and lumen designs are used in ureteral access delivery and retrieval devices. Properties such as flexibility, rigidity, and antibacterial play a crucial role for increasing functionality for these application areas, as well as patient comfort.

Into your veins

Intravenous (IV) cannulation provides critical venous access for precise delivery of life-saving fluids, nutrients, and medication. Optinova has collaborated with OEMs for almost 5 decades to increase patient safety and comfort in the field of high-volume IV tubing.

General summary of properties

		Fluoropolymers					Thermoplastic polymers								Thermoplastic elastomers				
		Thermoplastic Fluoropolymers					Polyolefines			Polyamides									
Feature		PTFE	FEP	PFA	ETFE	PVDF	LDPE	HDPE	PP	PA 6	PA 11	PA 12	POM	PET/ PBT	PC	TPE –U	TPE –A	TPE –E	TPE –S	TPE –O
Tensile strength at break	MPa	20–34	20–28	25–30	40–47	35–50	10–20	25–45	20–460	35–80	40–90	38–60	40–70	30–50	70	25–70	30–62	14–25	5–40	
Elongation at break	%	200–400	300–325	300	230	15–50	350–700	50–1000	10–500	40–300	30–400	50–400	10–200	20–350	50–120	160–750	50–700	200–800	400–1000	700–1000
Flexural modulus	MPa	275–620	550–700	590–700	1200	2100	100–600	500–1500	900–2000	500–2900	400–1400	260–1600	1400–3000	1000–2400	2300	70–2300	15–730	40–1200		600–900
Hardness	Shore D	55–65	55–60	55–64	63–75	75–78	49–55	58–65	72–81	70	72	72	85	55–65	90	40–75	25–72	35–80	8–62	5–40
Density	g/cm³	2,17	2,15	2,15	1,7	1,8	0,91–0,94	0,94–0,96	0,90–0,91	1,03–1,17	1,0–1,05	1,0–1,17	1,3–1,4	1,2–1,3	1,20	1,05–1,20	0,96–1,10	1,12–1,27	0,89–1,04	0,85–0,98
Coefficient of friction		0,10	0,25	0,21	0,23	0,30	0,60	0,28	0,30	0,40	0,35	0,40	0,35	0,35	0,30	0,22 /0,5	0,55	0,2–0,8		
Transparency	See note	***	****	*****	***	*	****	***	***	**	***	***	*	*****	*****	****	****	**	****	****
Melting point	°C	330	257–275	300–310	270	175	110	125	134–165	220	175–190	170–185	160–175	230–250	240	170–240	135–275	160–215		125–165
Min/max service temp.	°C	–240 +260	–200 +200	–200 +260	–190 +150	–60 +150	–30 +80	–20 +100	–10 +120	–40 +150	–50 +100	–50 +100	–40 +100	–40 +140	–40 +120	–50 +80	–40 +130	–40 +130	–50 +125	–40 +115
Water absorption	%	<0,01	<0,01	<0,03	0,02	0,04	0,01	0,01	0,01	1–10	0,2–2,0	0,2–1,6	0,2–1	0,1–0,5	0,3	0,1–0,4	0,9–1,2	0,6–2,5		
Chemical resistance	See note	*****	****	*****	****	****	***	***	****	**	**	**	***	****	*	***	***	***	****	****
ETO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Steam		✓	✓	✓	✓	✓	–	–	✓	✓	✓	✓	✓	–	–	–	✓	✓	(✓)	✓
Radiation		–	–	–	✓	✓	✓	✓	(✓)	✓	✓	✓	(✓)	✓	✓	✓	✓	✓	✓	–

Notes: The property data are taken from different sources and are not necessarily typical for any specific grade. This table is unsuitable for specification, since all values are indicative and for guidance only. Optinova Ab takes no responsibility for data given in the table. Excellent: * * * * * Poor: *

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