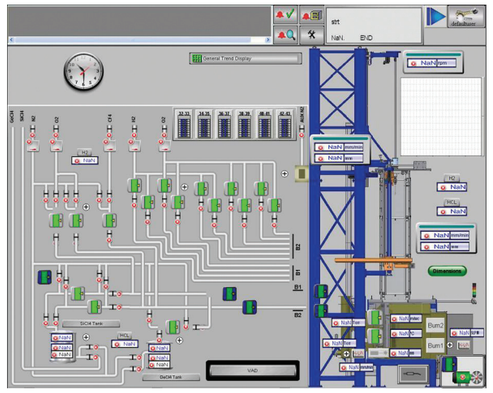
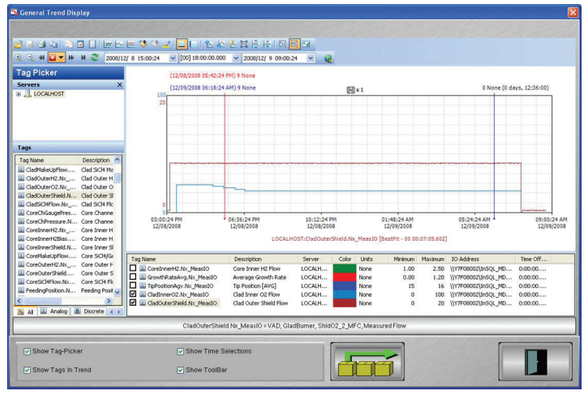
VAD CORE DEPOSITION

MACHINE SPECIFICATIONS	
Height x width x depth	9 x 4.2 x 5.7 meters
Required floor space	7 x 5 meters
Soot preform, max.	Ø 250 mm x 2,000 mm
Number of burners per machine	2
Flame gases	H_2 & O_2
Ambient cleanliness requirement, min.	class 10,000
Cleanliness inside the chamber	class 100

PROCESS SPECIFICATIONS	
Soot preform	Ø 200 mm x 1,400 mm
Sintered preform	Ø 100 mm x 700 mm about 7,500 fkm ZWPF / core preform
Typical machine capacity/year (depending on the B/A, core diameter, ...)	about 1,900,000 fkm/machine
Yielded fiber capacity/year (assuming downstream yield of 70 %)	about 1,200,000 fkm/machine





Advanced control system

- user friendly graphical user interface
- based on plc and PC user interface
- Excel based recipe system
- data logging, trend graphs, etc.

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OFC 04
VAD coredeposition system

For low and zero water peak fiber
(LWPF/ZWPF) production

www.rosendahlnextrom.com

MADE IN EUROPE

VAD CORE DEPOSITION SYSTEM OFC 04

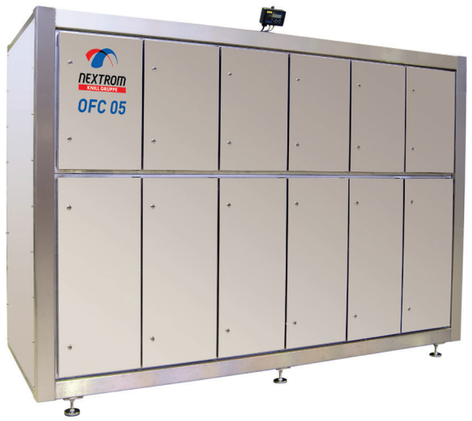
Nextrom VAD Core Deposition System is designed to meet the needs of **mass production** of Optical Fiber at **low production costs.**

The novel, Nextrom developed, VAD process using **metallic aperture burners** and a large forced air flow deposition chamber enables a **precisely repeatable process** with short downtimes.

The design is based on a **separate rigid preform** feeding and deposition chamber which ensures all movements are kept outside the harsh environment and allows for **easy cleaning and fast start-ups.**

APPLICATIONS

Suitable for low/zero water peak core preform production meeting the ITU-T G652C/D specifications.



Gas and vapour delivery system for the VAD

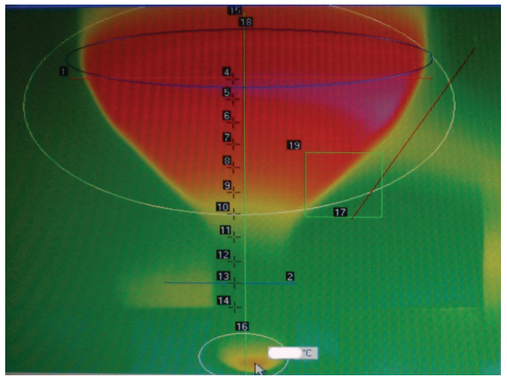
The gas and vapour delivery system is made by using ultra-high purity components, welded/vcr-connections, assembled in a clean room and helium leak-tested.

Accurate gas and chemical flow control is achieved by using digital MFCs and flash evaporators with continuous automatic filling for chemicals.

The velocity controlled air inlet and pressure controlled, separate exhaust for both core and clad enable excellent flame stability and chamber cleanliness.

The chamber has a double wall construction with titanium inner plates.

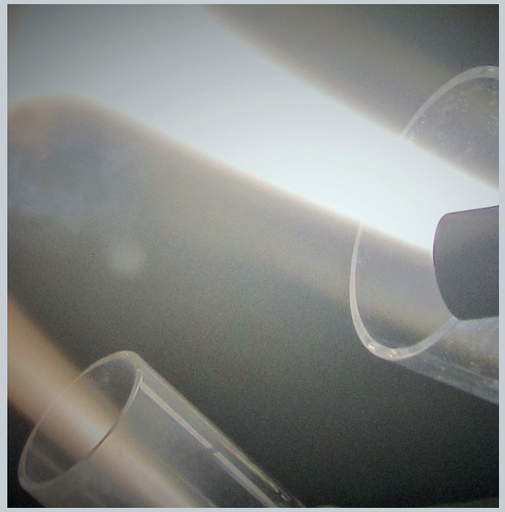
FOR LWP/ZWP FIBERS



Thermal imaging camera for the process optimization

Precision machined metal burners with independent control of flow & velocity allow short down-times during burner changes.

Separate flame detectors for both burners allow maximum safety. Only one double-flame clad burner is needed to achieve to desired B/A, resulting in short end losses.



Core and double flame clad burner

OFC 05
OVD clad deposition system

For SiCl4 or D4 (OMCTS)

www.rosendahlnextrom.com

MADE IN EUROPE

OVD CLAD DEPOSITION

PROCESS SPECIFICATIONS	OFC 05
Soot preform	~ ø 300 mm x 1800 mm
Sintered preform	ø 150 mm x 1800 mm
Deposition rate	240 g/min (120 g/min per spindle)
Typical machine gross capacity/year (depending on the core rod diameter)	~ 3,000,000 fkm/machine

MACHINE SPECIFICATIONS	OFC 05
Height x width x depth	3.7 x 9 x 2.5 m
Required floor space	12 x 6 m
Number of spindles	2
Soot preform, max.	Ø 350 mm x 1,800 mm
Number of burners per spindle	12
Flame gases	H_2 & O_2 or CH_4 & O_2
Ambient cleanliness requirement, min.	class 10,000

The OFC 05 is Nextrom's dual spindle horizontal OVD machine for overcladding two preforms simultaneously with high total productivity.

Precision machined metal burners with independent control of flow and velocity allow short downtimes during burner changes. This allows each machine to run with the same recipe.

For safety reasons there are separate flame detectors for all burners.

Either $SiCl_4$ or environmental friendly D_4 (OMCTS) can be used as a raw material and methane or hydrogen as a burner gas. Use of non-chlorine based D_4 and methane are giving significant savings on the direct raw material and investment costs.

Gas and vapour delivery systems are made using ultra-high purity components, welded/vcr-corrections, assembled in a clean room and helium-tested. Accurate gas and chemical flow control is achieved by using digital MFCs
and flash evaporators with continuous auto-matic filling for chemicals.

The designs are based on the separation of deposition chambers and movements sections which ensure all instruments are kept outside the harsh environment and enable easy cleaning and fast start-ups.

The velocity controlled air inlet, and uniform exhaust allow excellent flame stability and chamber cleanliness. The chamber has a double wall construction with titanium inner plates.

ADVANCED CONTROL SYSTEM

- user friendly graphical user interface
- based on plc and PC user interface
- Excel based recipe system
- data logging, trend graphs, etc.

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SINTERING SYSTEM

MACHINE SPECIFICATIONS	OFC 08 CORE	OFC 08 CLAD
Height x width x depth	~12 x 7.2 x 4.3 m	~ 13.5 (16.7) x 7.2 x 4.3 m
Required floor space	~ 9 x 7.6 m	~ 9 x 7.6 m
Soot preform, max.	Ø 250 mm x 2,000 mm	Ø 300 (400) mm x 2,000 (2,500) mm
Used gases	He, O_2, Cl_2, N_2	He, O_2, Cl_2, N_2
Ambient cleanliness requirement, min.	Class 10,000	Class 10,000

PROCESS SPECIFICATIONS	OFC 08 CORE	OFC 08 CLAD
Soot preform	Ø 180 - 200 mm x 1,400 mm	Ø 160 - 270 mm x 1,800 mm Ø 160 - 300 mm x 1,500 mm
Sintered preform	Ø 90 - 100 mm x 700 mm 7,500 fkm L(Z)WPF/Core Preform	Ø 80 - 135 mm x 1,800 mm Ø 80 - 150 mm x 1,500 mm 2,000 fkm/preform
Sintering speed (depending on the core/preform sizes)	~ 3 mm/min	~ 6 mm/min
Typical machine capacity/year (depending on the core rod diameters)	2,800,000 - 3,800,000 fkm/machine 1,400,000 - 1,900,000 fkm/line	2,000,000 - 2,500,000 fkm/machine 1,000,000 - 1,250,000 fkm/line
Yielded fiber capacity/year	1,900,000 - 2,600,000 fkm/machine (assuming a downstream yield of 70%)	1,600,000 - 2,000,000 fkm/machine (assuming a downstream yield of 80%)

ADVANCED CONTROL SYSTEM

- user friendly graphical user interface
- based on PLC and PC user interface
- Excel based recipe system
- data logging, trend graphs, etc.

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OFC 08
sintering system

For LWPF VAD core production
For OVD cladding
For laboratories

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MADE IN EUROPE

SINTERING SYSTEM OFC 08

Nextrom sintering systems / processes are designed to meet the needs of **mass production of optical fiber at low production costs.**

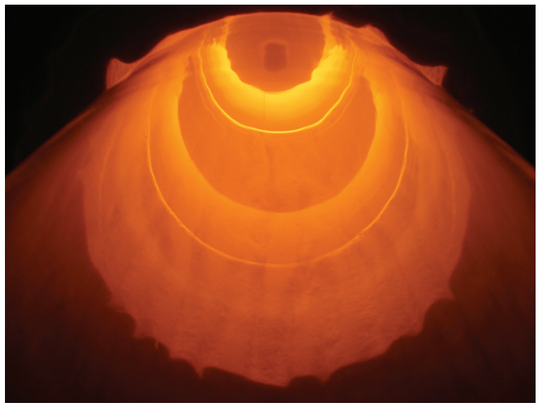
The well controlled process conditions mean the sintering system can be used on the **L(Z) WPF core preform production.**

The powerful furnace enables fast sintering speeds on the **clad sintering.**

Emphasis has been drawn to the design which allows a **precisely repeatable process with short downtimes.**

APPLICATIONS

- low/zero water peak core prefrom production
- clad sintering



FOR CORE OR CLAD SINTERING

Rigid and sturdy construction of the sintering equipment frame ensures reliable and precise operation. The frame supports the muffle tube and gas cabinet.

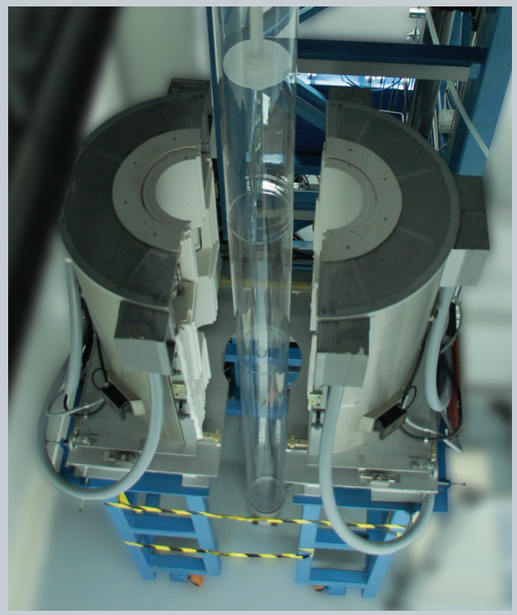
The sintering systems have a safety fence around the loading and unloading area. Safety interlocks with critically located sensors guarantee safe operation.

The gas and vapour delivery system is made using ultra-high purity components, welded/vcr-connections, assembled in a clean room and helium leak-tested. Accurate gas flow control is achieved with digital MFCs.

The system can be configurated either for core or clad sintering. The special cap design for the low water peak fiber production prevents moisture penetrations into the process.

To maintain the muffle tube shape during operations at high temperatures, a pressure control is integrated.

Muffle tube cap



Split furnace

Powerful and well insulated furnace provides short ramp-up times. Single hot-zone furnace for the core sintering allowing precise process control.

The split furnace design on the both systems allows easy maintenance and easy muffle tube changes. High quality heating elements minimize down times.

TECHNICAL DATA

MACHINE SPECIFICATIONS	OFC 12 MCVD/FCVD SYSTEM (LATHE AND NGC)
Length x width x height	7.4 x 2.1 x 2.7 meters
Required floor space	9 x 5 meters
Number of bubblers	up to 4 pcs. ($SiCl_4$, $GeCl_4$, $POCl_3$,...)
Number of additional gases	up to 7 pcs. (C_2F_6, SiF_4, SF_6, Cl_2, BCl_3,...)
Substrate tube outer diameter	20 - 42 mm
Working lenght between heat shields	2400 or 3000 mm
Min. ambient cleanliness requirement	class 10,000

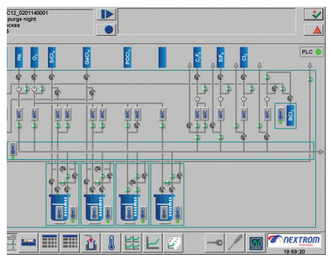
	NRF REFILLING CABINET
Length x width x height	2.6 x 0.8 x 2.0 meters
Required floor space	3 x 2.6 meters
Number of materials	2 pcs. ($SiCl_4$, $GeCl_4$)
Number of tanks/material	1 or 2 pcs.

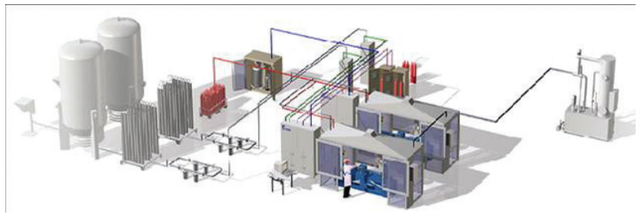
The bulk delivery system enables refilling of the SiCl4, GeCl4 and POCl3 bubblers. System is designed to supply up to four MCVDs and includes compartments for three large raw material supplier containers. The reagent delivery between the containers and the bubbler is carried out through slight pressure differential, thus requiring no mechanical pumps.

	NHS VAPOR PHASE DOPING SYSTEM
Length x width x height	1.1 x 0.8 x 2.0 meters
Required foor space	1 x 4 meters
Number of bubblers	Up to 4 pcs. (Al, Er, Yb,...)
Bubbler temperature	max. 250°C

ADVANCED CONTROL SYSTEM

- user friendly graphical user interface
- based on plc and PC user interface
- Excel based recipe system
- data logging, trend graphs, etc.





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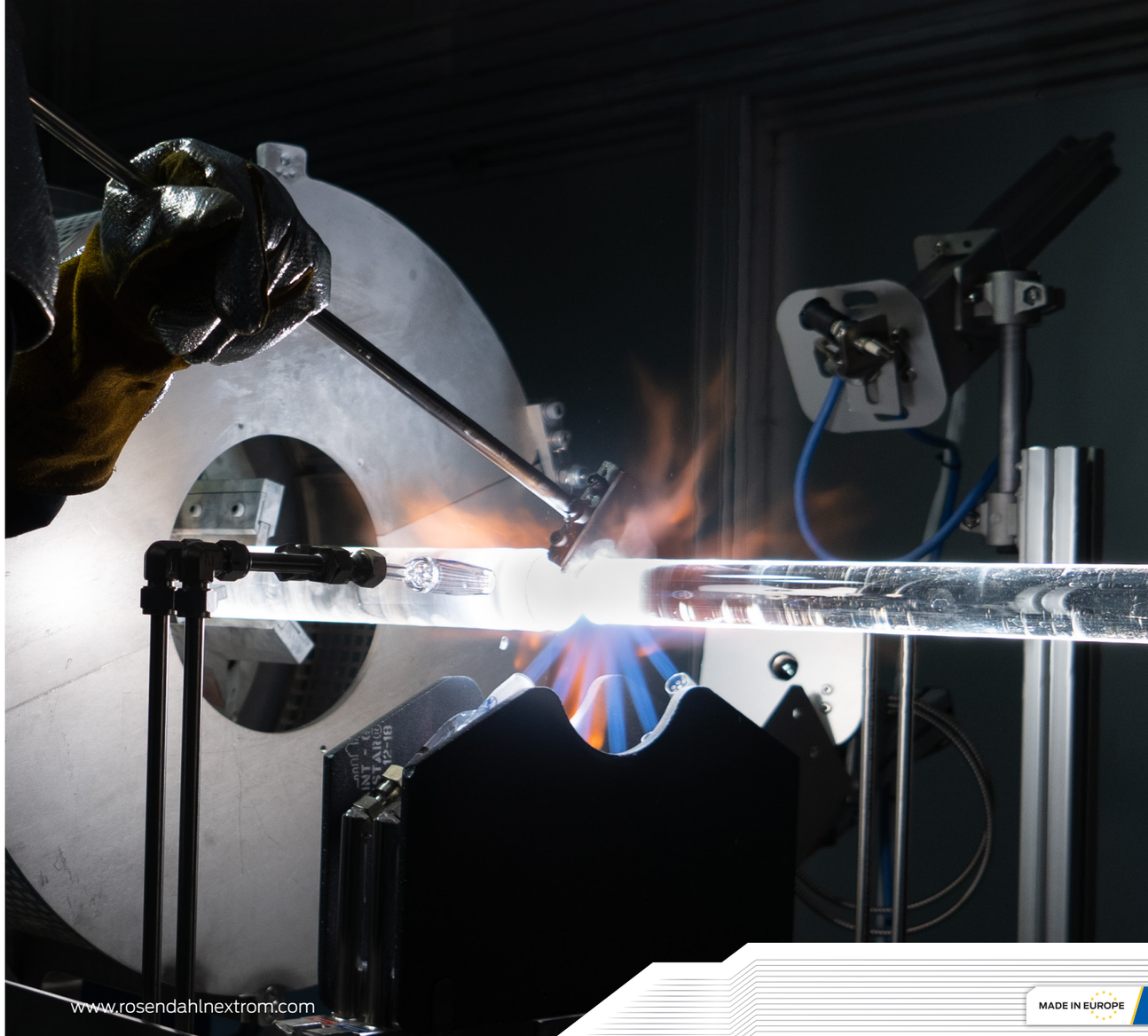
PR 10084 09E/07.15

OFC 12
MCVD system

For specialty and telecom preform



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MADE IN EUROPE

OFC 12
MCVD SYSTEM

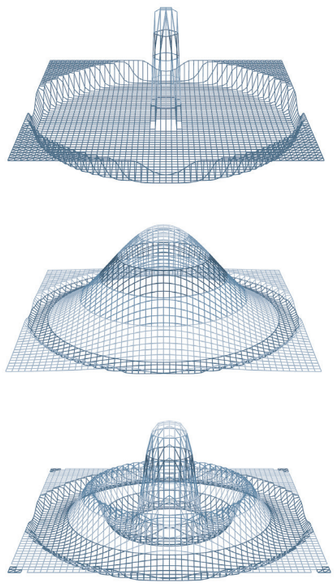
Modified Chemical Vapor Deposition (MCVD) is a well-known and widely used method for the fabrication of high-quality optical fiber preforms. Since the requirements and configuration are always customer specific, the Nextrom MCVD system offers a wide variety of options and configurations. Requirements and functionality are defined closely together with the customer, often leading to new developments to meet the customer's toughest demands.

The latest technology and high quality components used in OFC 12 MCVD System results in long lifetime, low cost of ownership, quick set-up, and easily customized solutions. The Nextrom MCVD system includes only state of the art components and all high purity stainless steel lines ensure no leakage or moisture intrusion and enables the highest possible in complexity and quality of optical fiber preform production. The State of the art process monitoring and control enables the most complex recipes for production of the widest product range and optimizes preform yields.

- **high purity material delivery lines in stainless steel** for highest purity and long life time
- **dual MFCs** for fine control of RI profile
- **metal bubblers** for safe operation and lower cost of ownership
- **high precision diameter measurement in the hot zone**
- **Spindle rotation angle control** required for making and etching special preforms such as bowtie

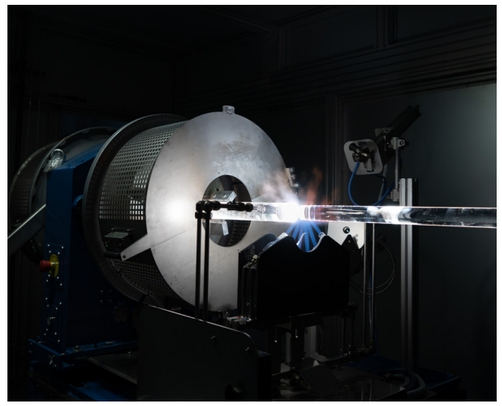
APPLICATIONS

- ITU-T G 651 graded index multimode fibers
- ITU-T G 652D single mode low water peak fibers
- ITU-T G 655 non zero dispersion shifted fibers (NZDS)
- doped fibers
- polarization maintaining fibers (Panda)
- select cut-off fibers
- step index multimode fibers
- boron rods for PM fibers
- etc



Vapor phase doping

The Nextrom vapor phase doping system (NHS) is specially designed for such low vapor pressure reagents such as Al, Er, Yb, etc, which are used for preform doping. The control is fully integrated into the basic MCVD system so the NHS cabinet can be utilized for feeding of rare-earth metal solutions and aluminium chloride to the deposition process. The material delivery is carried out by up to 4 bubblers and massflow controlled helium, which is used as an inert carrier gas. Bubbler temperatures and carrier gas flows are precisely controlled to provide repeatable and accurate material feed. The vapor phase doping gives increased uniformity across the preform, excellent repeatability, high concentration levels and user-friendly operation.



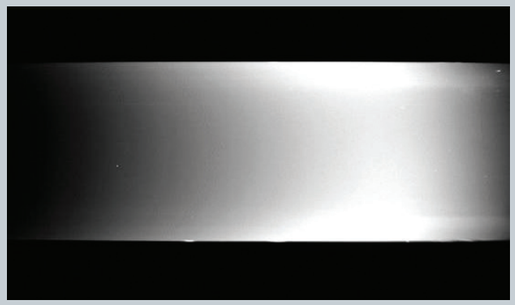
The preform lathe is optimized and tested in industrial scale production. The special design of the inlet and outlet rotary joints ensure low contamination. Control of the substrate tube inner pressure, diameter control, pyrometer, automatic soot remover, and burner or furnace enable enhanced control of the deposition and collapsing processes.

FOR SINGLE MODE & SPECIALTY FIBERS

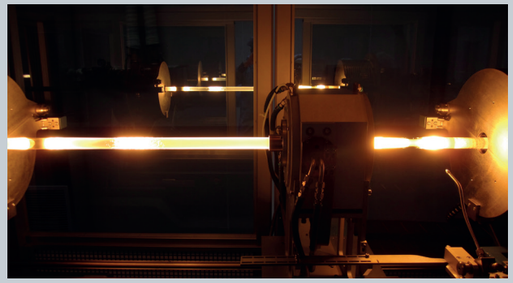
Gas cabinet

The gas control cabinet is designed to deliver ultra-high purity raw materials used in the MCVD process. To eliminate contamination sources, ultra-high purity components and all metal piping with welded/vcr-connections are used. The cabinet is assembled in a clean room and is helium leak-tested before delivery.

The latest mass flow and vapor source control technology combined with precise temperature control improves accuracy and repeatability of the precursor flows. The gas control cabinet can be equipped with 4 bubblers in different sizes and a variety of different vapor sources.



The optional preform diameter camera measurement and control system enhances the deposition efficiency and radial homogeneity. It improves thermal transfer conditions and enables high CSA deposition in SM, MM and special preforms.



The system can optionally be equipped with the FCVD Furnace instead of or in addition to the H_2/O_2-burner.

Reduced production costs, increased productivity and higher fiber quality (LWPF) are examples of the advantages which are achieved with this furnace.

DFT 2500/55i
dual fiber take-up

www.rosendahlnextrom.com

DUAL FIBER TAKE-UP

Winding at high speeds
Continuous operation
Change-over at full speed

DFT 2500

The DFT2500 is an automatic dual take-up designed for winding at high speed the optical fiber during the draw process.

Automatic change over at full line speed allows a continuous drawing process and minimizes the scrap with long fiber lengths. The take-up suits all applications where a dual take-up for fiber is needed.

Due to the size and weight of the machine's base frame, the construciton is sturdy to eliminate vibration. The motors and braking are sized for fast stopping after the change-over. Fast stopping and the whipping cover eliminate fiber whipping to the full reel after the change-over.

PRODUCTS		**DFT 2500 SM and MM fiber**
Speed	constructional process	3500 m/min. 3200 m/min.
Winding tension		0.50 - 1.00 N
Reel specification	flange diameter width barrel diameter bore diameter weight (full reel) capacity, max.	535 mm 495 mm 317.5 mm 50.8 mm 100 kg 1000 km

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OFC 02

Deuterium treatment and hydrogen testing system

MADE IN EUROPE

NDS and NHS

The Deuterium Treatment System is needed to ensure that the low water peak fiber's attenuation stays low throughout the lifetime of the fiber.

For low water peak single mode fiber

Modular multi-chamber system

Automated chamber filling and venting

NDS SPECIFICATION	REEL SIZE 1000 KM	REEL SIZE 50 KM	REEL SIZE 25 KM
Annual fiber capacity per chamber*	up to 480 000 km	up to 190 000 km	up to 190 000 km
Number of chambers per system, max.	10	10	10
Number of reels per chamber	3	24	48
Chamber capacity, f-km	3000 km	1200 km	1200 km
PreMix gas supply	.	.	.
Gas recycling	.**	.**	.**
Gas mixing station	on request	on request	on request

* Depending on time and degree of filling

** Only if there is more than one chamber

Nextrom's deuterium treatment system is designed for mass production facilities producing low water peak single mode fiber according to ITU-T G.652D specifications.

Optical fibers typically have structural defects created during the fiber drawing. Also, hydrogen can diffuse into the fiber and form OH-bonds, which increase the fiber's absorption peak level around the 1383 nm wavelength region. Instead the deuterium treatment causes the formation of OD-bonds in the fiber and eliminates possible sites for formation of OH-bonds. This prevents the OH-ion absorption peak from increasing during the fiber lifetime.

Nextrom's dual chamber frame structure is a modular multi-chamber system. The dual chambers can be stacked in a row of up to 10 chamber systems. Side panels cover the frame to make the system look compact. The PLC based control system, power distribution and gas supply section are common to the whole system. Operation of the system can be controlled via the latest HMI solution.

Necessary alarms are included in the system and data acquisition of important parameters is available. Several interlocks are built in as well to prevent unsafe operation and damage to the system.

OPTIONAL: the hydrogen ageing test

- The hydrogen ageing test is a type of test for optical fibers that is not done for each reel.
- Hydrogen ageing is done to determine the optical fiber's hydrogen sensitivity.
- Fibers are kept in a 1% hydrogen atmosphere for several days.
- After the fibers have been removed from the hydrogen atmosphere, they are kept in a normal room atmosphere for 14 days.
- After 14 days of degassing, the 1383 nm attenuation is measured to determine the permanent attenuation increase caused by hydrogen.

Nextrom NHT for hydrogen sensitivity testing of fibers

- One chamber system capable of testing 4 fiber reels simultaneously.
- Fiber ends can be pulled out of the chamber so that attenuation can be measured with OTDR during the hydrogen soaking phase.
- NHT system is PLC controlled and hydrogen concentration is measured automatically on-line.
- NHT is designed to be used with premixed H2/N2 inlet gas.

The Hydrogen Testing System is needed to test if the deuterium treatment of fiber has been carried out successfully.

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PR 1005906E/03.18

TECHNICAL DATA

TECHNICAL SPECIFICATIONS	
Maximum preform size	8.8 m, including handle
Maximum preform diameter	230 mm
Tower height	up to 30/33/35/38 m higher towers with larger footprint, quad tower opt-in available
Stuctural speed	up to 3500 m/min
Process speed	up to 2500 / 3000 m/min depending on the tower configuration and coating conditions

Dual fiber take-up DFT 2500

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OFC 20
fiber draw tower

For high speed production

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MADE IN EUROPE

FIBER DRAW TOWER OFC 20

The Nextrom telecom fiber draw towers are suitable for a wide range of **large preforms** for **single mode** production.

The **modular construction** provides a good standard solution for manufacturing but also **flexibility in customizing draw towers** to your specifications.

Long and extensive experience in fiber draw has accumulated a lot of know-how, which is built into Nextrom's fiber draw products.

Offering **end-to-end support**, from plant analysis and design through personnel training to support from the installation supervision.

Production start-up of a telecom production plant with **expertise and technology-transfer** for the final goal of performing in all production phases.

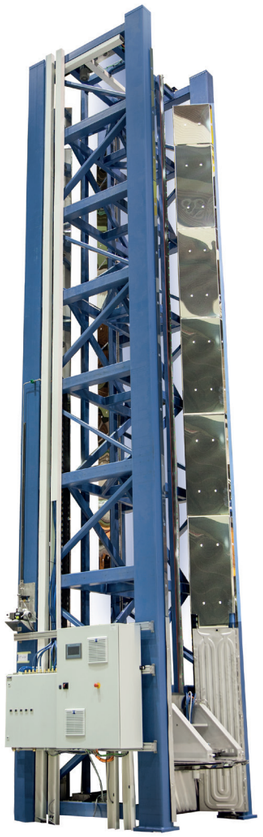
Continuous developments are done on a daily basis on Nextrom's R&D draw tower.

This means you have the latest technologies and processes to stay on the cutting edge of the industry.

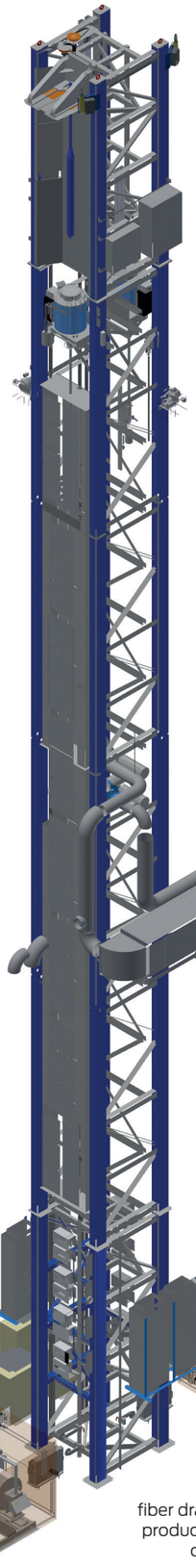
Nextrom has been supplying fiber draw towers since 1985.

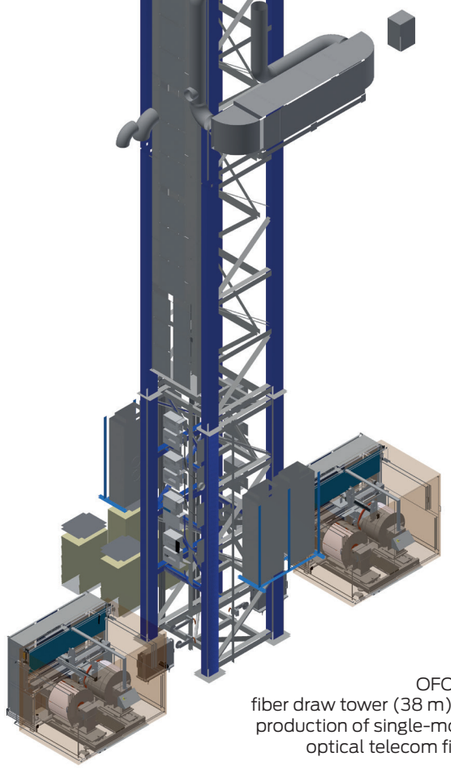
Nextrom has delivered more than 270 draw lines.

OFC 20



Tall preform feeding unit for up to 230 mm preforms





OFC 20
fiber draw tower (38 m) for production of single-mode optical telecom fiber

COMPONENTS

HIGH CAPACITY DRAW

- preform feeding system for long and heavy preforms
- induction furnace for large diameter preforms
- acrylate pumping system

HIGH SPEED FIBER DRAWING

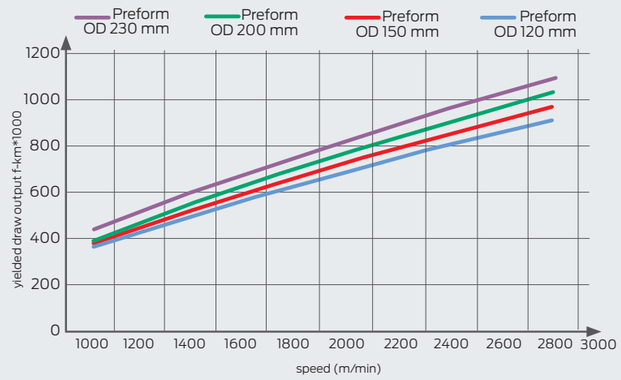
- induction furnace for high speed process
- fiber cooling system with effective helium recovery
- wet-on-wet coating system
- high speed fiber capstan
- dual take-up for high speed winding and change-over

FLEXIBLE CONSTRUCTION

A variety of components are available to fulfill different customer requirements:

- furnace solutions for large and small preforms
- dynamic Iris for preforms with large outer diameter variations
- fiber cooling solutions
- helium Recovery Unit
- wet-on-wet coating systems
- refilling cabinet for coating system
- acrylate delivery system
- several different diameter measurement gauges
- non-contact tension measurement systems
- a variety of start-up and master capstans
- single and dual take-ups
- advanced process control and data logging system

ANNUAL YIELDED CAPACITY WITH ONE DRAW LINE (Preform 2 m)

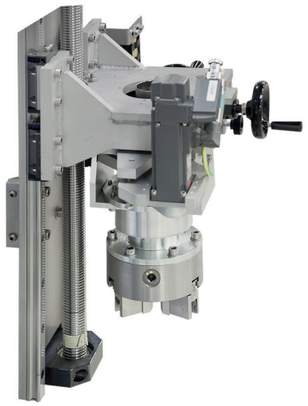


SPECIALTY FIBER DRAW

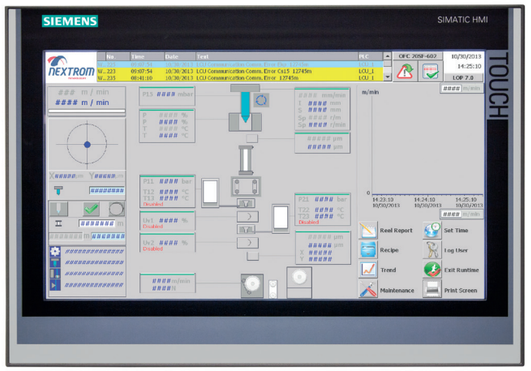
TECHNICAL CHARACTERISTICS for SILICA FIBERS	
Preform diameter	15 mm to 50 mm, typically
Preform feeding length	100 cm to 200 cm, typically
Process speed	1 to 500 m/min depending on tower configuration and coating conditions
Fiber diameters	80 µm to 1000 µm glass diameter
Coatings	Acrylate, Silicon, Polyimide
Fiber types	step index MM, graded index MM, single mode, microstructured PCF

TECHNICAL CHARACTERISTICS for SOFT GLASS	
Preform diameters	10 mm to 50 mm, typically
Preform feeding length	100 cm to 200 cm, typically
Process speed	1 to 300 m/min depending on tower configuration and coating conditions
Fiber diameters	80 µm to 1000 µm glass diameter
Coatings	Acrylate, Silicone

TECHNICAL CHARACTERISTICS for CANES and TUBES	
Preform diameters	15 mm to 50 mm, typically
Preform length	100 cm to 200 cm, typically
Cane/tube diameters	80 µm to 15mm
Process speed	0.01 to 30 m/min



SPF – preform feeding



Line control screen

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PR 10084O9E/03.18

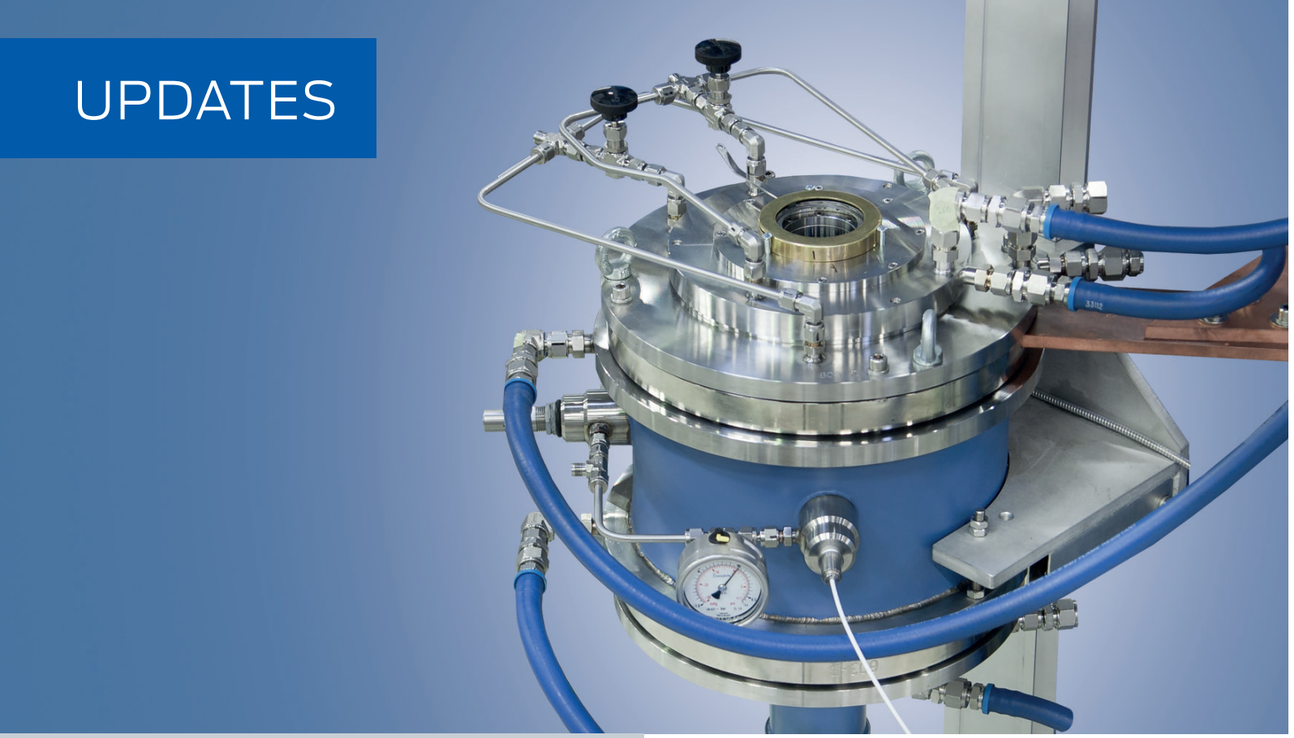
OFC 20SF
fiber draw tower

For specialty fiber drawing

www.rosendahlnextrom.com

MADE IN EUROPE

UPDATES



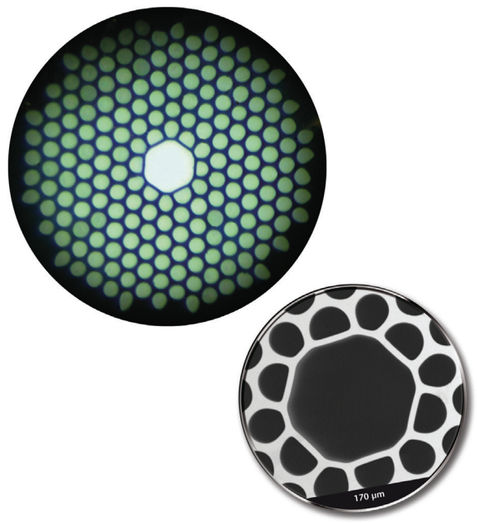
Nextrom's continuous development of the specialty draw tower ensures that the Nextrom tower is always at the forefront of technology.

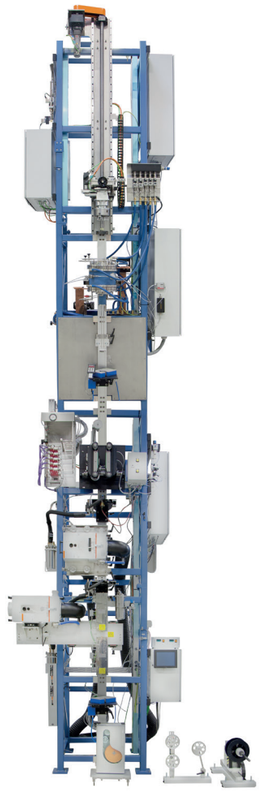
- Resistive furnace design gives larger flexibility to customer requirements
- Advanced temperatures controller delivers very precise temperature stability
- Caterpillar capstan ensures concentric pulling of canes and fiber with low contact stress
- Take-up offering for specialty fiber towers accepts a wide range of reels with a smaller footprint. A selection of frame sizes allows winding of large diameter fibers
- Extremely stable furnace temperature Variation < +/-0.5 C at 2100 C
- Proven bare fiber diameter variation of up to +/-0.1 µm
- Line control system dedicated to the specialty draw tower gives user specified functionality and interfaces
- Automated fiber defect system
- Applicator cooling system
- Small footprint saves valuable clean room space

APPLICATIONS

The Nextrom fiber draw towers are suitable for a wide range of specialty fibers:

- single-mode
- multi-mode
- amplifier fiber
- bragg fiber
- laser fiber
- holey fiber
- chalcogenide fiber





FOR SPECIALTY FIBERS

Several different diameter measurement gauges, non-contact tension measurement systems and coating concentricity monitor together with Nextrom's advanced process control and data logging system guarantee the quality of the produced fiber.

Both single and dual take-ups are available. With a dual take-up continuous production is ensured.

The Nextrom OFC 20 SF fiber draw tower can be delivered in either single or dual face versions. The dual face version saves expensive clean room area.

The Nextrom OFC 20 SF fiber draw tower for specialty fibers is available with different furnaces and precise preform feeding solutions for soft glass, silica and plastic optical fibers for preforms with 15 – 50 mm diameter and 10 – 200 cm length.

Optical fiber coating can be done single or multiple layers for acrylate, silicon and polyimide. Both UV and heat curing systems are available.

In addition, Nextrom offers a variety of components to fulfil different customer requirements:

- preform internal pressure / vacuum system
- preform rotating equipment
- gas purification (Ar/N2)
- a variety of start-up and master capstans
- clean air system options
- fiber defect marking
- online extrusion

Cane/tube caterpillar & cane/tube cutting system

Nextrom offers solutions for cane and capillary tube pulling as well as solutions for micro structured (or holey) fiber drawing.

OFC 35
proof testing and rewinding line

Comprising a testing unit, a pay-off and take-up with dancers

www.rosendahlnextrom.com

MADE IN EUROPE

PROOF TESTING AND REWINDING LINE

OFC 35

Proof testing of optical fibers and rewinding fibers. A maximum speed of 3,000 m/min. High winding quality at all speed ranges. The OFC 35 ensures controlled stopping after fiber break at max. speed.

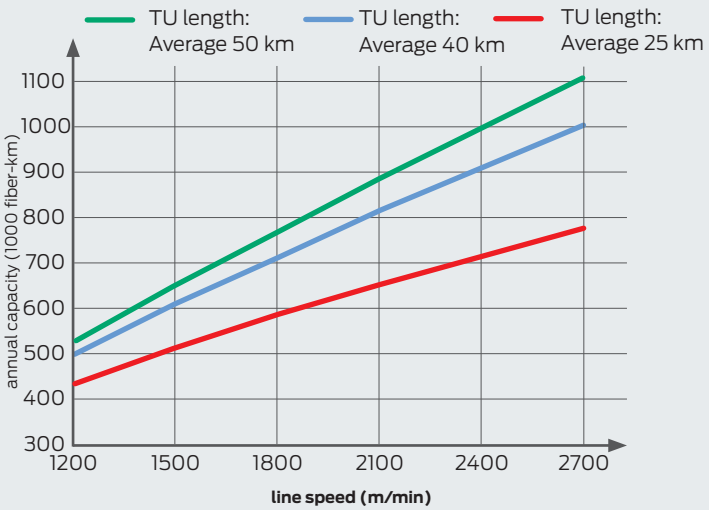
Precise automatic turning correction reduces operator errors.

Accurate proof testing tension and accurate length measurement are guaranteed.

The OFC 35 has a small footprint and long operating life.

Ergonomics and user-friendly design enable comfortable and simple operation.

340 days, 3 shifts, 95 % usage
300 km PO Spool capacity, 50 km tu spool capacity



PAY-OFF AND TAKE-UP

Effective winding even at high speeds is guaranteed by efficient servo motors and dancers with horizontal loops.

The take-up has an automatic turning point control, which corrects the winding during the run.

All two pay-off and take-up alternatives have traversing movement. The lighter version is used with small reels.
The heavy version is mainly used with big reels coming straight from the drawing tower.

A variety of options are available to fulfill different customer requirements.

Metallic 100 kg Spool

TECHNICAL CHARACTERISTICS	
Products	Standard SM and MM Fibers
Speed, max.	3,000 m/min (Standard Fiber Proof Testing) 2,100 m/min (Standard Fiber Rewinding)
Ramp Time, adjustable	from 30 s up
Proof Testing Tension	5 - 20 N (< ffl3 %) optionally 1-30 N
Test Length	2.5 - 12.0 m (long)
Length Measuring Accuracy	better than 0.05 %
Pay-off and Winding Tension	0.30 - 1.00 N (Fiber)

PAY-OFF AND TAKE-UP SPECIFICATION	SMALL PO/TU	HEAVY PO/TU
Reel Weight, max.	10 kg	100 kg
Flange Diameter, max.	305 mm	600 mm
Width, max.	250 mm	500 mm
Barrel Diameter, min.	150 mm	150 mm
Bore Diameter (standard), min.	25.4 mm (1")	25.4 mm (1")

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PR 10057 08E/08.20

TECHNICAL DATA

ON-LINE COLORING

For more efficient production Nextrom has developed a production method where coloring and ribbon processes are combined. This eliminates separate coloring processes and the need for coloring machines before the ribbon process.

OTHER OPTIONS

For continuous production the line can be equipped with dual ribbon take-up. An optional automatic acrylate filling system allows continuous production with no need to refill the process tank.

TECHNICAL CHARACTERISTICS	
Products	2 - 24 Fiber Ribbons Split Type Ribbons up to 36 Fibers
Process Speed, max.	1,000 m/min
Ramp Time, adjustable	30 - 120 s
Length Measuring Accuracy	better than 0.3 %
UV Curing System	2 x Heraeus (600W/inch)
Acrylate Temperature Range	up to 55ºC
Acrylate Pressure Range	0 - 6 bar

PAY-OFF AND TAKE-UP SPECIFICATION	KAP Fiber Pay-Off	RAP Ribbon Pay-Off	FRT 55 Single Take-Up	NKP 450 Dual Take-Up
Speed, max.	1,000 m/min	500 m/min	1,600 m/min	1,000 m/min
Reel Weight, max.	5.5 kg	20 kg	30 kg	25 kg
Flange Diameter, max.	265 mm	450 mm	550 mm	450 mm
Width, max.	260 mm	400 mm	500 mm	450 mm
Barrel Diameter, min.	150 mm	158 mm	150 mm	310 mm
Bore Diameter (standard), min.	25.4 mm (1”)	25.4 mm (1”)	25.4 mm (1”)	25.4 mm (1”)

KAP

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OFC 21
high speed ribbon line

Designed for Manufacturing
Optical Fiber Ribbons

www.rosendahlnextrom.com

MADE IN EUROPE

RIBBON MANUFACTURING

Long term process development together with proven production technology enables **reliable and flexible** ribbon production.

The coating process is controlled through the **line control.**

Different recipes can be created to **ease operation** when **different products** are made with the **same line.** This also minimizes operator errors during preparation.

After coating the ribbon is cured in a **high power UV-system.**

The power of each lamp is **adjusted automatically** according to line speed and product type.

Various **product parameters**, such as product tension, ribbon dimensions, process pressure, etc. can be **monitored**.

For process optimization the line can be equipped with a **data logging system.**

RIBBON COATING

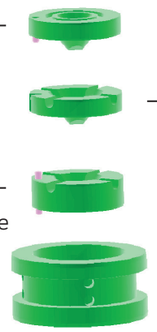
The Nextrom ribbon coater has three separate dies that are designed to minimize tension increase during ribbon processing.

This allows higher production speed with minimal stress on fibers.

Inlet Die
- Keeps the air outside
- Guides the fibers

Guide Die
- Guides the fibers accurately ensuring good planarity

Outlet Die
- Gives the desired dimensions for the end product

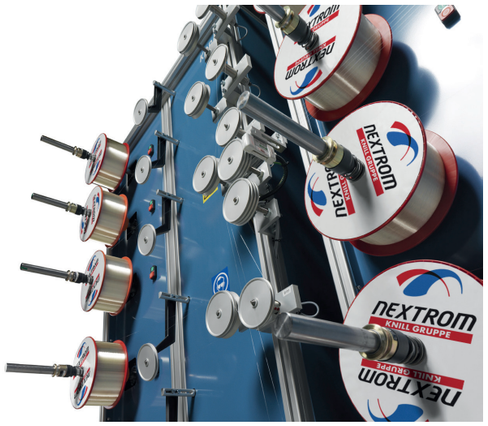


Coating Die Assembly

PAY-OFF

The fiber pay-off (KAP) is equipped with the latest dancer design and it provides precisely controlled tension levels. Tension for each fiber can be adjusted independently. This feature is essential for quality ribbon production. The tension control can also be automatic and controlled by line control

The ribbon pay-off (RAP) is made for large ribbon spools. It enables ribbon rewinding and split ribbon production with the same line.



Pay-Off Unit

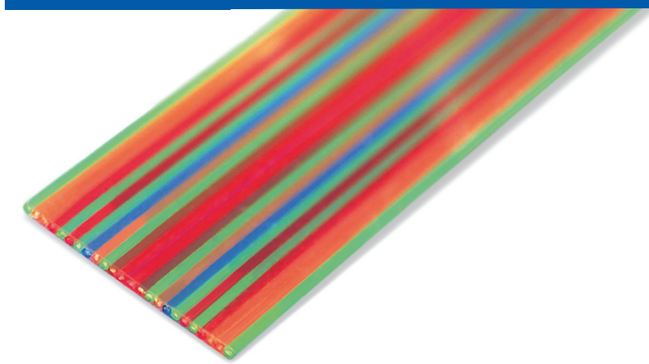
FRT 55 RIBBON TAKE-UP

Our ribbon take-up is designed for precise ribbon winding. Traverse can be adjusted for various spool types. Typically, a conically widening traversing pattern is used to make a tight package that is easy to handle in subsequent processes.

Depending on the product, the line recipe system automatically loads correct parameters into the take-up before start.

FRT 55

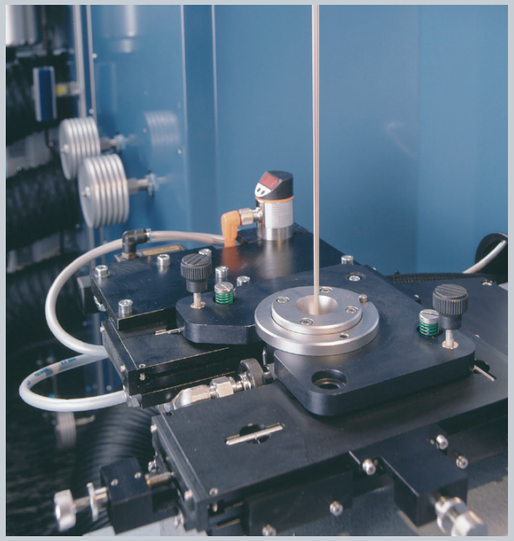
RELIABLE AND FLEXIBLE PRODUCTION



RIBBON COATING APPLICATORS

Ribbon dies are easy to clean with the additional cleaning station. If necessary the dies can be dismantled and assembled easily without any special tools.

This proven coating technology is made for continuous and robust production. It allows a wide range of materials to be used with optimum results.



Coating Applicator

TECHNICAL DATA

FRT TAKE-UP

The take-up is designed for fiber bundle winding. It has specially designed pulleys for the fiber bundle products. One loop dancer allows fully adjustable tension for each application. Traversing can be adjusted for various spool types. FRT take-up requires minimum operator attention.
All the critical product parameters are automatically loaded into the take-up control system from main line control.

OTHER OPTIONS

For continuous production the line can be equipped with our take-up NKP 450. The optional automatic acrylate filling system allows continuous production with no need to refill the process tank. The ultrasonic coater cleaning station is designed for effective die cleaning.

Ribbon dual take-up NKP 450

TECHNICAL CHARACTERISTICS	
Products	2 - 12 fiber EPFU or bundle
Process speed, typical	4-fiber EPFU, 300 m/min 12-fiber EPFU, 150 m/min
Ramp time, adjustable	30 - 120 s
Length measuring accuracy	better than 0.3 %
UV curing system	primary, 1 x fusion VPS 10" (600W/inch) secondary, 1 x fusion VPS 10" (600W/inch)
Acrylate temperature range	up to 55ºC
Acrylate pressure range	0 - 6 bar

PAY-OFF AND TAKE-UP SPECIFICATION	KAP fiber pay-off	RAP ribbon pay-off	FRT 55 single take-up	FRT 100 single take-up	NKP 450 2 - 24 ribbon or bundle
Speed, max.	1,000 m/min	500 m/min	1,600 m/min	1,500 m/min	1,000 m/min 800 m/min (12-fiber ribbon)
Reel weight, max.	10 kg	20 kg	30 kg	100 kg	25 kg
Flange diameter, max.	265 mm	450 mm	550 mm	550 mm	450 mm
Width, max.	230 mm	400 mm	500 mm	500 mm	450 mm
Barrel diameter, min.	158 mm	158 mm	150 mm	300 mm	310 mm
Bore diameter (standard)	25.4 mm (1")	25.4 mm (1")	25.4 mm (1")	25.4 mm (1")	25.4 (1") or 50.8 mm (2")

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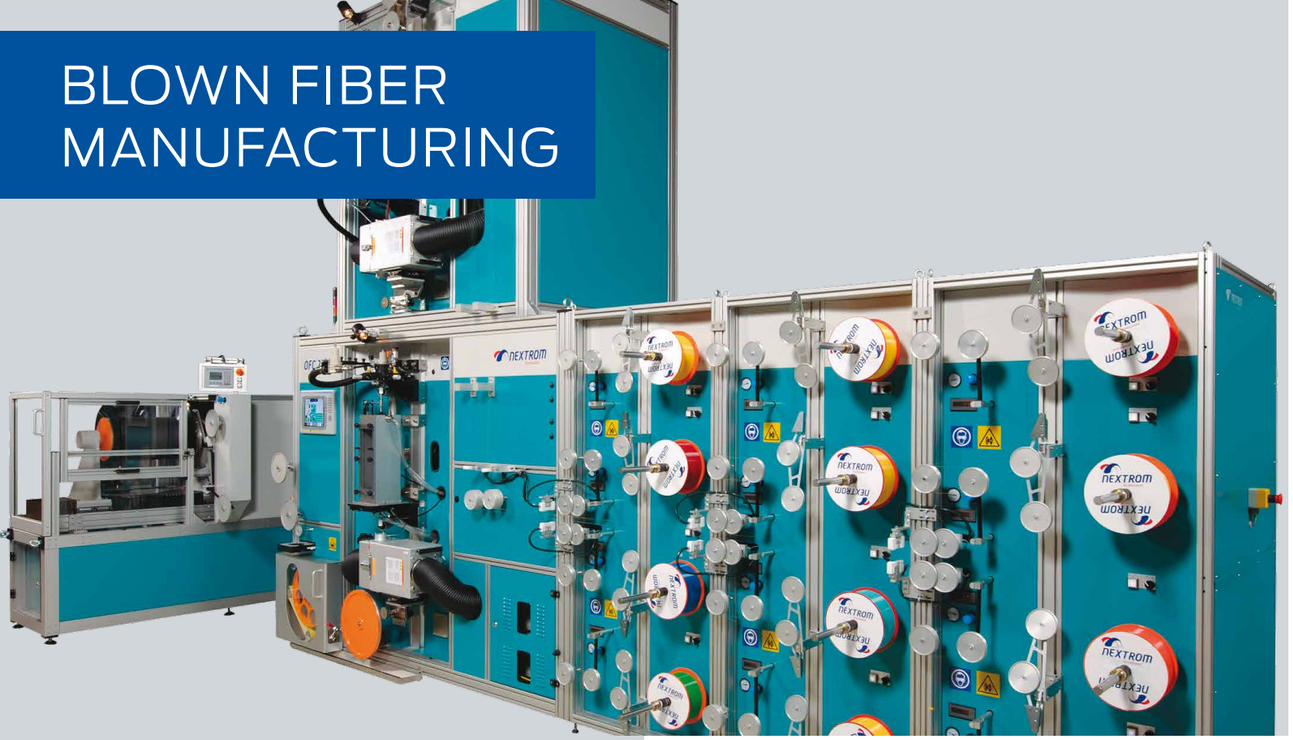
PR 10054408E/08.20

OFC 22
fiber bundle and blown fiber line

For manufacturing fttx applications

MADE IN EUROPE

BLOWN FIBER MANUFACTURING



The OFC 22 is a **reliable solution** developed from extensive experience in process development and know-how in ribbon coating technology.

Blown fiber products consist of **two acrylate layers:** the soft primary layer provides **sufficient protection** for fibers and the harder secondary protects the inner layer and gives **good handling properties** for the final product.

In blown fiber applications the **glass beads** are embedded into the **secondary layer.**

For this unique product structure Nextrom has developed a **dual layer process** where both layers are applied **in one run.**

BLOWN FIBER COATING APPLICATORS

The blown fiber coating technology is based on Nextrom's long experience with ribbon coatings.

Acrylate coating and three die system as in ribbon line.

Special attenton has been paid to the material feed. Automatic material purge helps to minimize scrap during start up.

inlet die

- keeps the air outside
- guides the fibers

guide die

- guides the fibers accurately ensuring good planarity

outlet die

- gives the desired dimensions for the end product

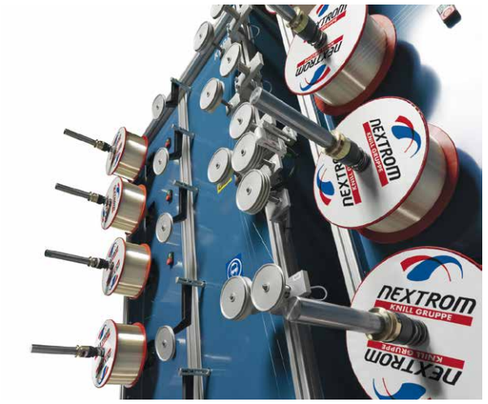
coating die assembly

DUAL LAYER PROCESS IN ONE RUN

PAY-OFF

Fiber pay-off (KAP) is equipped with the latest dancer design ensuring the desired tension level is precisely maintained. Tension for each fiber can be adjusted independently. This feature is essential for quality ribbon production. The tension control can also be automatic and controlled by line control.

Ribbon pay-off (RAP) is made for large ribbon spools. It enables ribbon rewinding and split ribbon production with the same line.



Pay-off unit

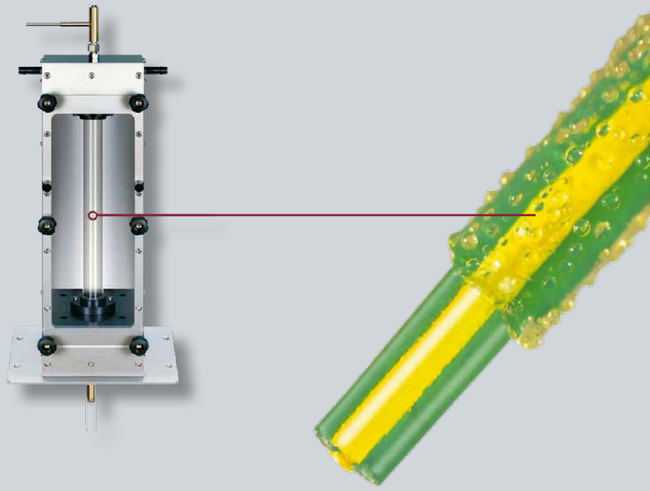
Coating applicator

GLASS BEAD SPRAYING CHAMBER

For applying the glass beads onto the surface of the secondary layer, Nextrom is uses a patented technology from BTexact.

This special spraying technology has been designed for Nextrom blown fiber lines and it offers fully integrated control over the whole spraying process.

Like other production settings, the spraying parameters can also be individually set for each product from the recipe system. Line control will then start and stop the spraying, adjust the amount of the glass beads and clean the system after finishing the run.



TECHNICAL DATA

TECHNICAL CHARACTERISTICS	
Products	standard SM and MM fibers UV upcoating up to 900 microns (optional)
Typical production speed (depends on ink and desired curing level)	3,000 m/min (constructional) 2,000 - 3,000 m/min (3 x 600 W/inch lamps) 1,500 - 2,500 m/min (2 x 600 W/inch lamps)
Attenuation increase	< 0.01 dB/km
Ramp time (adjustable)	60 s
Fast stop	0.5 - 5.0 s
Length measuring accuracy	better than 0.05%
Pay-off and winding tension	0.20 - 1.00 N

PAY-OFF AND TAKE-UP SPECIFICATION	standard two side support	large two side support
Reel weight, max.	7 kg	25 kg
Flange diameter, max.	270 mm	410 mm
Width, max.	250 mm	400 mm
Barrel diameter, min.	150 mm	150 mm
Bore diameter (standard), min.	25.4 mm (1")	25.4 mm (1")

OFC 52i upcoating

OTHER OPTIONS

There are a variety of alternatives and options available. Pay-off and take-up come with two alternative sizes to cover all commonly used reel sizes.

Previous developments in UV upcoating and ring marking are incorporated into the new design to provide the flexibility to manufacture a wide variety of products.

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OFC 52i
advanced coloring system

Improves productivity and provides flexibility

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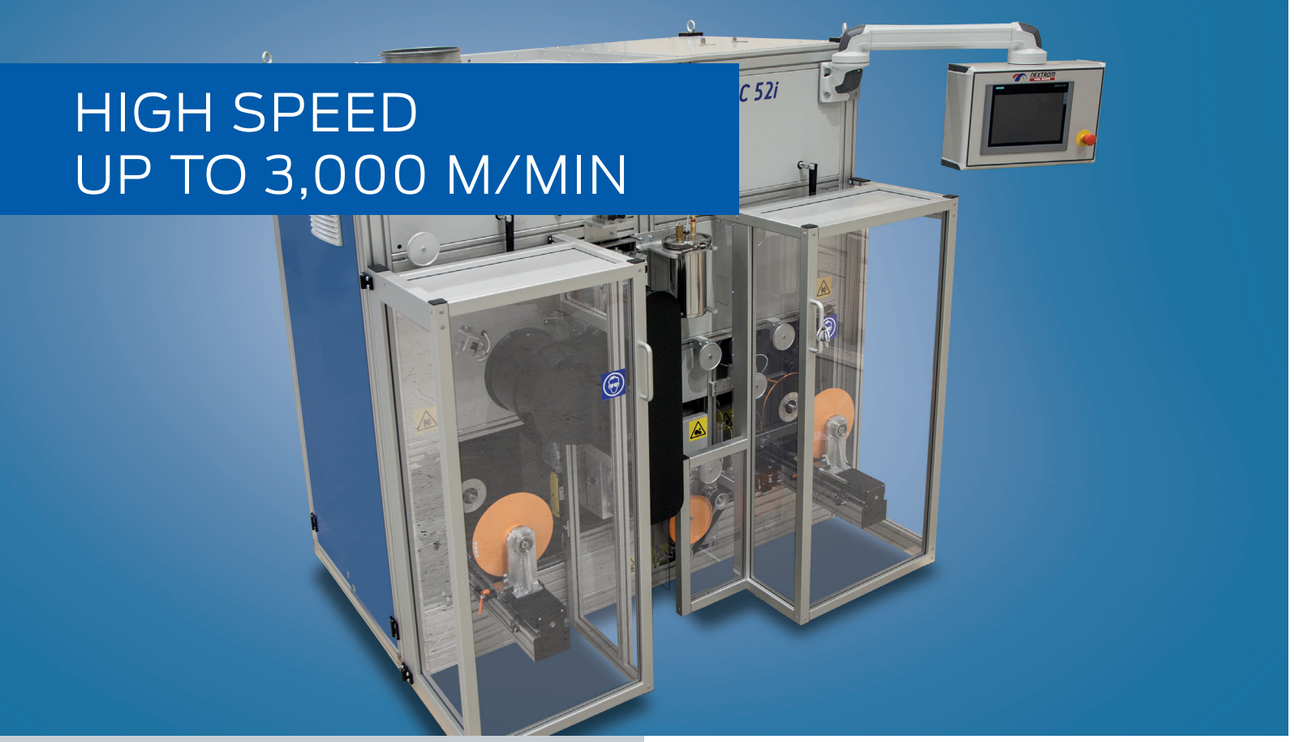
MADE IN EUROPE

HIGH SPEED
UP TO 3,000 M/MIN



The advanced OFC 52i enables **high speeds up to 3,000 m/min.**

A **robust machanical** and **electrical design**, in combination with optimized tooling.

UV lamp system, UV monitoring instrumentation and **increased spool sizes** provide the capability to **produce longer fiber lengths** with faster set-ups.

The equipment allows **optional ring marking** and **UV-upcoating.**

Efficient ink delivery system with **accurate winding** is guaranteed.

The OFC 52i has a **small foot print** and a **long operating life.**

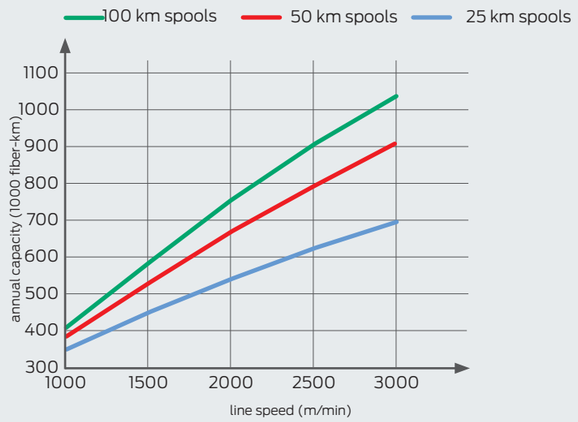
APPLICATIONS

The high speed manufacture of colored fibers requires improved designs for key line components.

Development focused upon the pay-off and take-up design to allow larger and heavier spools, improved coater tooling to facilitate setup and fiber string up, as well as a robust precision motor drive and control system.

The efficient UV lamps provide sufficient power at the corrrect wave length to assure proper cure from start-up to 3,000 m/min.

340 DAYS, 3 SHIFTS, 95 % USAGE



COLORING APPLICATOR

A coloring applicator has been developed and tested for operation up to 3,000 m/min.

The challenge is to create the appropriate pressure inside the coater to seal the die entrance while maintaining acceptable fiber tension levels.

The manifold length is shorter than that used in fiber coating, but longer than that used in a typical coloring die to enhance ink recirculation, temperature uniformity and to create moderate fiber tension at high speeds. The simple design also facilitates die cleaning and string-up.

UV CURING SYSTEM

The UV power supplies provide continuous and stable power at 50 % or 100 % level.

The results are improved magnetron and lamp life. Instrumentation is provided to measure the nitrogen flow rate, the oxygen level, and the UV intensity through the center tube to signal the need for center tube changes to assure proper cure.

Up to three 10 inch long 600 W/inch lamps are used with type D lamps to provide excellent depth of cure. Optionally, an H bulb can be substituted for one D bulb to improve surface cure.

A single center tube is inserted from above through all UV lamps, which are mounted together on a slide that moves outwards to facilitate tube changes.

CONTROLS AND DRIVES

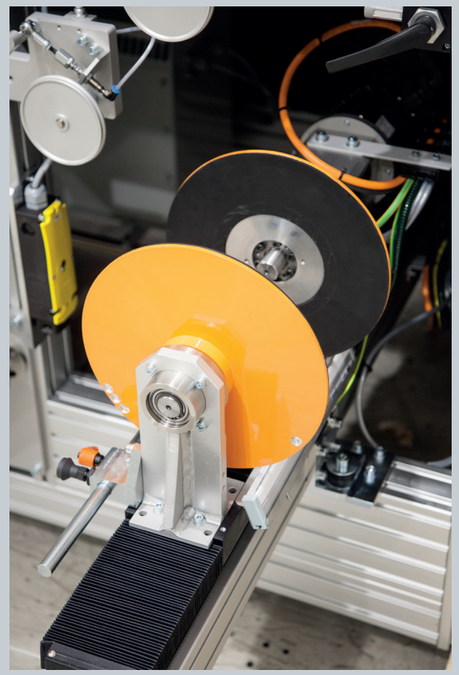
To improve the responsiveness and accuracy of critical motors, a separate motion controller is used to control the capstan, the dancer, spool rotation loops and the traverse motor.

A PLC provides overall line coordination via Siemens Profibus or Allen-Bradley DeviceNetTM for the motion controller, the UV lamp system, the coater and other components.

The result is a 10 to 1 improvement in control response times, which is critical during rapid ramps and to assure precise fiber winding. In addition, an automatic turning point correction is provided at reel flanges. An algorithm varies both pitch and reversal points to assure level winding.

POWERFUL UV SYSTEM

Coloring applicator and UV curing system



Take-up