



**\*) experts for experts.  
Seamless and welded cold drawn  
precision steel tubes**



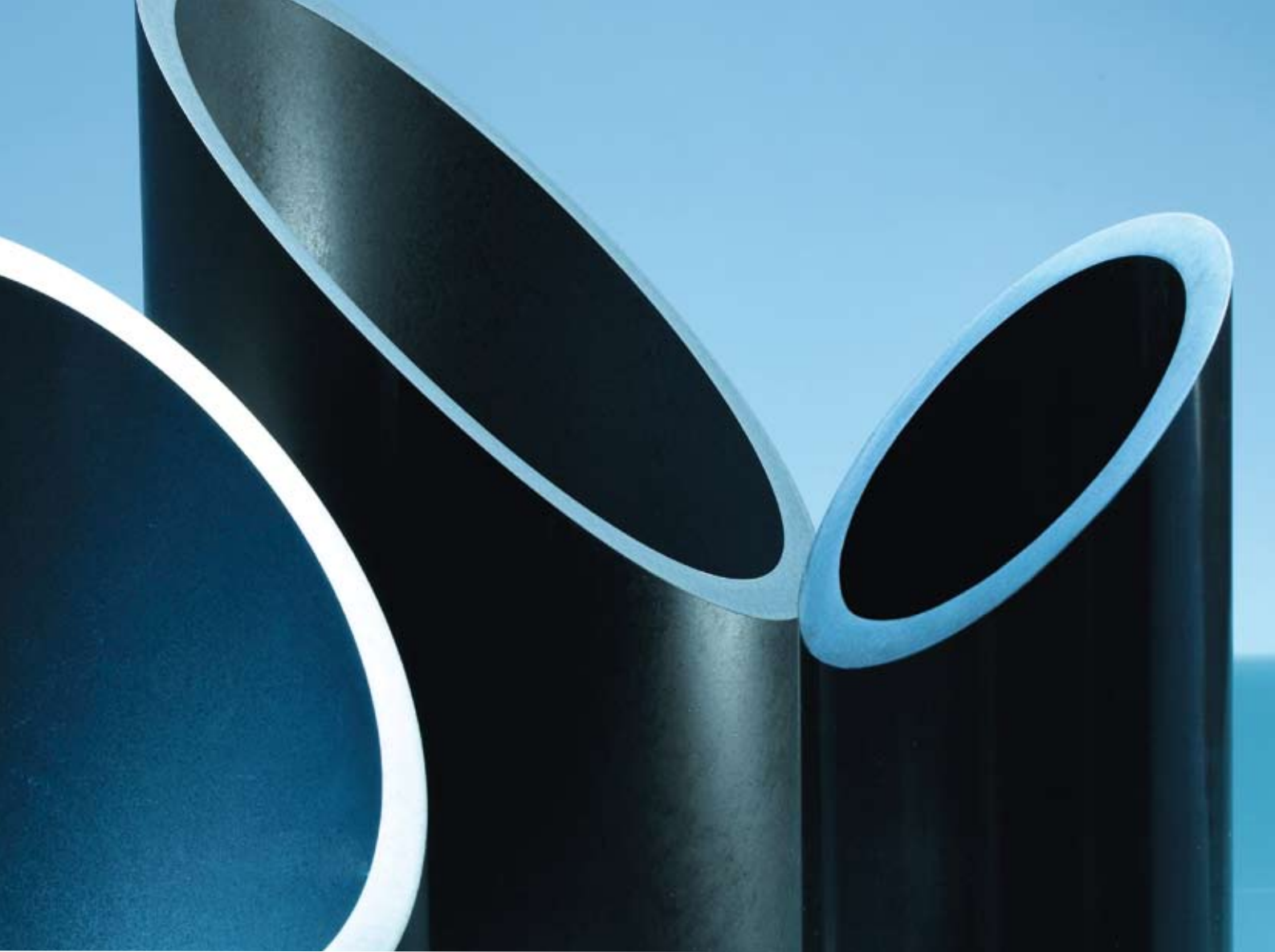
Innovative and successful solutions are always within your reach with voestalpine Rotec, your reliable partner with professional expertise in the development and manufacturing of precision steel tubes and tubular components.



## **\*) experts for experts: Let's talk about precision steel tubes.**

As specialists in processes and materials, we develop product solutions tailored to the individual needs of our customers, adapted to ever-growing requirements and geared toward

ensuring the increased market presence of our customers. Long-term partnerships, high quality standards and innovations make us a professional partner to industry.



## Seamless and welded cold drawn precision steel tubes in acc. with EN10305-1 and EN10305-2

### Area of use

The applications for seamless and welded precision steel tubes are determined by special technical features. These are as follows:

- High dimensional accuracy for inside and outside diameters
- Smooth surfaces achieved by drawing
- Improved strength characteristics due to cold forming
- Closely graduated dimensional range
- Low concentricity in welded precision steel tubes

### Production method

The pre-material for precision steel tubes is selected, fully killed LD or electrical steel cast continuously in slabs. It is first checked and then processed into hollow pre-material tubes.

The hollows are cold formed on state of the art drawing benches. Subsequent heat treatment and passage through high-tech straightening and testing benches complete the production process into cold drawn precision steel tubes.

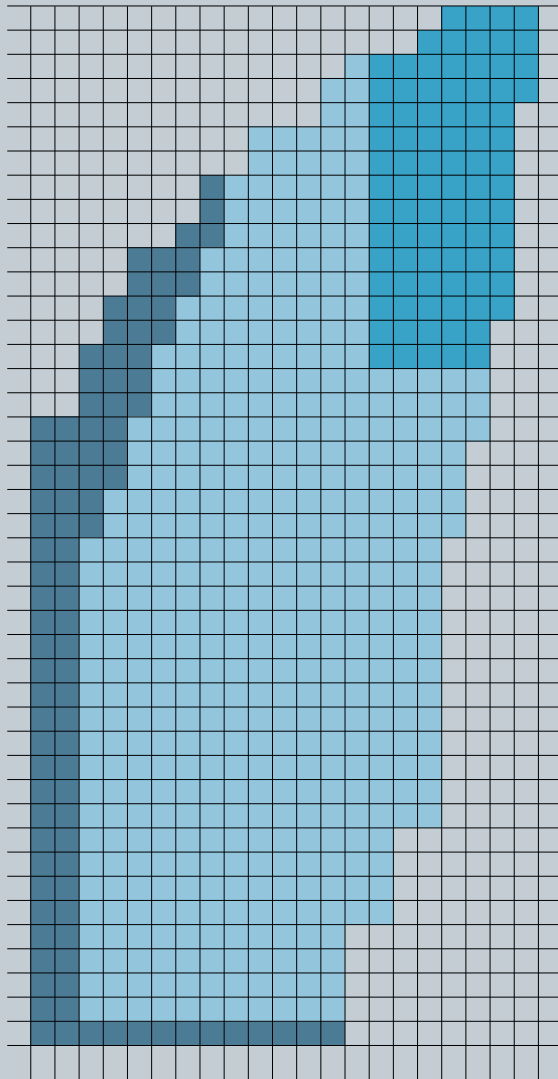
# Dimensional ranges

## EN10305-2

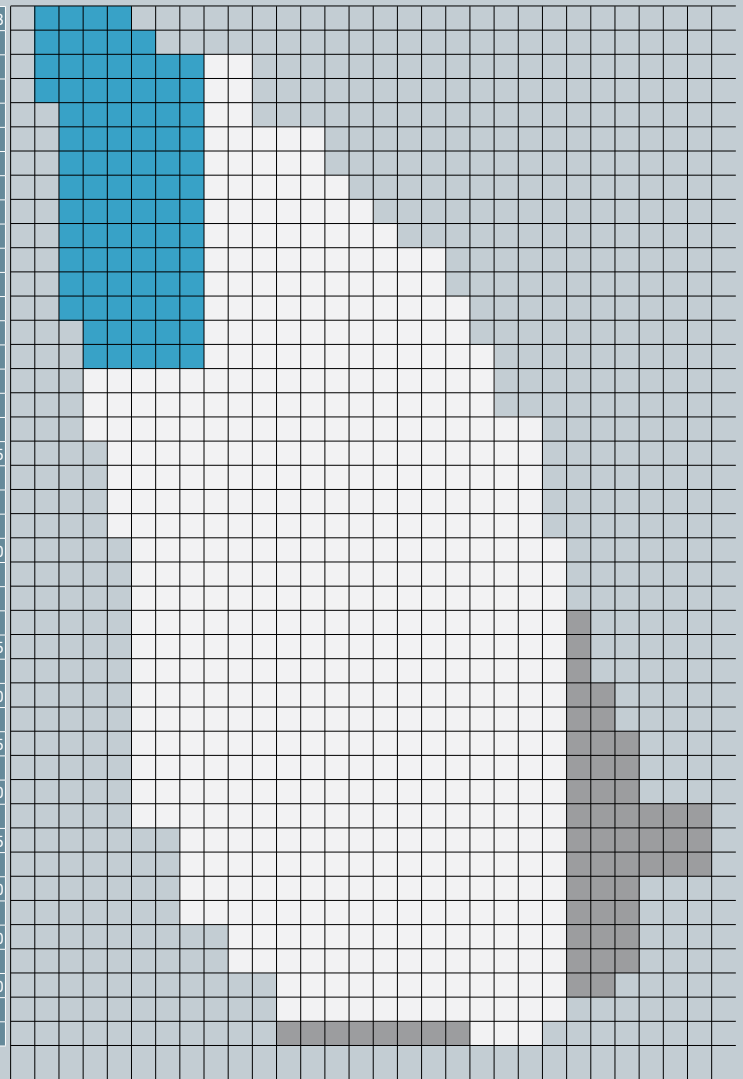
## EN10305-1

Wall thickness in mm (t) welded: Tol. ± 7,5%

Wall thickness in mm (t) seamless: Tol. ± 10%



OD in mm	Tol. in mm
4	± 0,08
5	
6	
7	
8	
9	
10	
12	
14	
15	
16	
18	
20	
22	
25	
26	
28	
30	
32	± 0,15
35	
38	
40	
42	± 0,20
45	
48	
50	
55	± 0,25
60	
65	± 0,30
70	
75	± 0,35
80	
85	± 0,40
90	
95	± 0,45
100	
110	± 0,50
120	
130	± 0,70
140	
150	± 0,80
160	
180	



Special dimensions or intermediate dimensions on request.  
 Weight calculations:  $0,02466 \times t \times (OD-t) = 0$  [kg/m]  
 Random lengths: 4500 - 7000 mm  
 Precision cut lengths: 20 - 3000 mm  
 Max. production in random lengths: up to 17700 mm

### EN10305-02

- Coils on request
- Standard range
- On request

### EN10305-01

- Coils on request
- Standard range
- On request

## Delivery conditions

Following finishes for EN10305-1 and EN10305-2

Designation	Abbreviation	Explanation
cold drawn/ hard	+ C	No heat treatment after the final cold drawing process.
cold drawn/soft	+ LC	After the final heat treatment there is a suitable drawing pass.
cold drawn and stress relieved	+ SR	After the final cold drawing process there is a stress relief heat treatment in a controlled atmosphere.
annealed	+ A	After the final cold drawing process the tubes are annealed in a controlled atmosphere.
normalised	+ N	After the final cold drawing operation the tubes are normalised in a controlled atmosphere.

### Steel qualities in acc. with EN10305-1

Steel quality	
Short name	Material number
E215	1.0212
E235	1.0308
E355	1.0580
Other steel qualities on request	

### Scope of testing

A 100% non-destructive eddy current test in acc. with EN10246-1 is carried out at additional cost. A checking of the mechanical properties also takes place.

The following tests may be carried out in addition to the standard EN tests:

- Ultrasonic test in acc. with EN10246-7, U3
- Factory acceptance test
- Customer/third party acceptance
- Dimensional check using laser
- Impact test
- Material identification test

### Steel qualities in acc. with EN10305-2

Steel quality	
Short name	Material number
E155	1.0033
E195	1.0034
E235	1.0308
E275	1.0225
E355	1.0580
Other steel qualities on request	

### Special qualities of our production range

- C 15
- C 35 E
- C 45 E
- Cm 45
- P 410
- P 460 N
- 16 MnCr 5
- 20 MnCr 5
- 20 MnV 6
- 25 CrMo 4
- 34 CrMo 4
- 42 CrMo 4
- 27 MnCrB 5
- 33 MnB 5
- 16 Mo 3
- 16 Mo 5
- ASTMA 213 T 11
- ASTMA 213 T 12

### Delivery lengths

- Precision cut lengths: 20 - 3000 mm
- Manufactured lengths: 3000 to 17700 mm
- Coils: maximum coil weight: 20 kg



## Seamless cold drawn precision steel tubes for hydraulic and pneumatic lines

### **Area of use**

The tubes are used for hydraulic or pneumatic lines. Assembly may be by means of detachable or non-detachable joints. Changes in the speed and pressure of the flowing medium occur during the operation of hydraulic systems. These changes in speed result in pressure surges which overlay the internal pressure. Thus the tube is subject to cyclic stress. The allowed pressure rates and temperatures are the responsibility of the customer in accor-

dance with the state of the art and in application of the safety coefficients specified in the applicable regulations, codes or standards.

### **Technical delivery terms**

Unlike EN10305-1, we produce these tubes with an inside diameter ranging from 4 - 10 mm with restricted tolerances and improved inner surface. The tubes are free from production residues which could impair the function of a hydraulic system.



## Dimensional range in EN10305-4 in qualities E235 +N, E355 +N

Precision steel tubes for hydraulic and pneumatic lines with special surface protection

Wall thickness in mm  $\pm 7,5\%$

Tolerances mm	Nominal (OD) dimension mm	0,5	0,75	1	1,5	2	2,5	3	4	5	6	8	10
± 0,08	4												
	5												
	6												
	8												
	10												
	12												
	14												
	15												
	16												
	18												
	20												
	22												
	25												
	28												
± 0,15	30												
	35												
	38												
± 0,20	42												
	50												
	65												

Special dimensions or intermediate dimensions on request



### Types of execution

- Normalised, not phosphated
- Normalised, phosphated
- Normalised, additionally galvanized on the outside - blue or yellow chromate coating - max. length: 6,100 mm
- Cr VI free, thick layer passivation - max. length: 6,100 mm

# Seamless cold drawn precision steel tubes for the manufacture of hydraulic, pneumatic and telescopic cylinders and piston tubes

Precision steel tubes for honing, skiving and roller burnishing

## Technical delivery terms

In general EN10305-1 is applicable (EN10305-2 on request). Deviating from this are the tolerances for inside diameter, concentricity and delivery condition plus straightness.

## Cylinder tubes: Dimensions and permissible machining allowances for E355

Precision steel tubes for honing

Nominal wall thickness in mm		5	6	7,5	10	12,5	15
Inside diameter in mm		Outer diameter mm					
Nominal dimension mm		Machining allowance mm					
Standard	Choice						
	30	-0,20	-0,30	40	42	45	
32				42	44	47	
	35			45	47	50	
40		-0,20	-0,35	50	52	55	
	45			55	57	60	65
50		-0,20	-0,35	60	62	65	70
	55			65	67	70	75
60		-0,20	-0,40	70	72	75	80
	63			73	75	78	83
65				75	77	80	85
	70			80	82	85	90
75				85	87	90	95
	80			90	92	95	100
	85			95	97	100	105
90		-0,25	-0,50	100	102	105	110
	95			105	107	110	115
100				110	112	115	120
	110			120	122	125	130
	120			130	132	135	140
125		-0,25	-0,60	135	137	140	145
	130			140	142	145	150
	140			150	152	155	160
	150	-0,25	-0,60	160	162	165	170
	160	-0,25	-0,60	170	172	175	180
	170	-0,40	-0,90	180			

Intermediate dimensions on request.

Precision steel tubes for skiving/roller burnishing

Nominal wall thickness in mm		5	6	7,5	10	12,5	15
Inside diameter in mm		Outer diameter mm					
Nominal dimension mm		Machining allowance mm					
Standard	Choice						
40		-0,40	-0,60	50	52	55	
	45			55	57	60	65
50				60	62	65	70
	55			65	67	70	75
	60			70	72	75	80
63				73	75	78	83
	65			75	77	80	85
	70			80	82	85	90
	75			85	87	90	95
80		-0,50	-0,75	90	92	95	100
	85			95	97	100	105
	90			100	102	105	110
	95			105	107	110	115
100				110	112	115	120
	110			120	122	125	130
	120			130	132	135	140
125		-0,60	-0,90	135	137	140	145
	130			140	142	145	150
	140			150	152	155	160
	150			160	162	165	170
	160	-0,50	-1,00	170	172	175	180
	170			180			

Intermediate dimensions on request.

## Delivery conditions

Designation	Abbreviation
normalised	+ N
cold drawn and stress relieved	+ SR



## Precision steel tubes for the manufacture of piston tubes

### Technical delivery terms

In general EN10305-1 is applicable (EN10305-2 on request).  
Deviating from this are the tolerances for inside diameter, concentricity and delivery condition plus straightness.



### Dimensions and permissible machining allowances for precision steel tubes for piston tubes

Nominal wall thickness mm			3	4	5	6	7,5	10	12,5	15
Outside diameter mm			Inside diameter mm							
Nominal dimension mm		Machining allowance mm								
Standard	Choice									
40		+0,20 +0,30	34	32	30	28	25			
45		+0,25 +0,40	39	37	35	33	30	25		
50			44	42	40	38	35	30		
	55	+0,30 +0,50	49	47	45	43	40	35		
56			50	48	46	44	41	36		
	60		54	52	50	48	45	40		
63				55	53	52	48	43		
	65			57	55	53	50	45		
70			62	60	58	55	50	45		
	75	+0,30 +0,60		67	65	63	60	55	50	
80				72	70	68	65	60	55	50
	85			77	75	73	70	65	60	55
90				82	80	78	75	70	65	60
100		+0,40 +0,80		92	90	88	85	80	75	70
110					100	98	95	90	85	80
	120				110	108	105	100	95	90
125		+0,40 +0,90			115	113	110	105	100	95
	130				120	118	115	110	105	100
140					130	128	125	120	115	110
	150				140	138	135	130	125	120
160		+0,70 +1,30			150	148	145	140	135	
	170	+0,70 +1,30			160	158	155	150	145	
	180	+0,70 +1,30			170	168	165	160		

Intermediate dimensions on request.

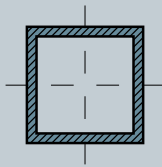
### Delivery conditions

Designation	Abbreviation
normalised	+ N
cold drawn and stress relieved	+ SR

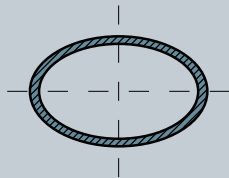
# Cold drawn profile and precision steel tubes in acc. with EN10305-1 and EN10305-2

## Profile shapes from our production

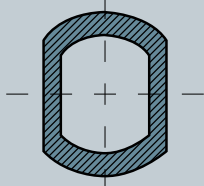
Square tubes



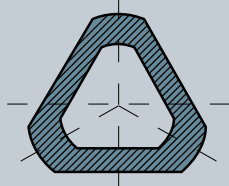
Elliptical tubes



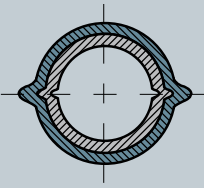
Flat tubes with round narrow sides



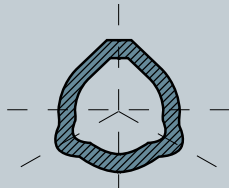
Triangular tubes



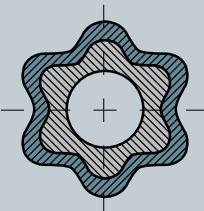
Lemon shape outside/inside



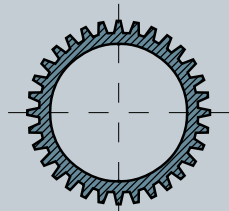
Special profile



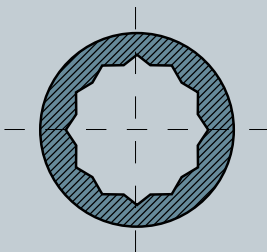
Star profile outside/inside



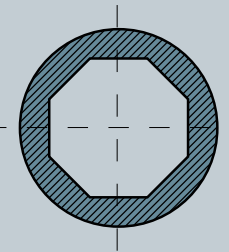
Externally toothed tubes



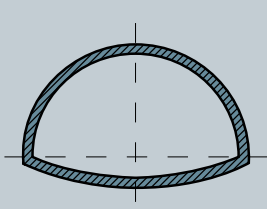
Internal polygon 12 edges



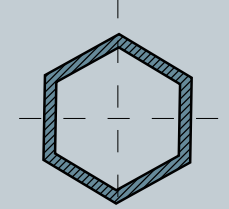
Internal polygon 8 edges



Semi-circular profile



Hexagonal tubes



## Steel qualities from our production range

All low-alloy qualities of structural steel, case-hardened steel and tempered steel, nitrided steel, fine-grained grades, cryogenic qualities, creep-resistant steels.

## Area of use

In accordance with the customer's description and specification, we deliver the solution as a precision shaped part for immediate use. We give substance to what can be achieved by drawing: Profiles with processing up to  $\varnothing$  160 mm and wall thicknesses up to 14 mm.

## Application in the following areas of use

- Agricultural machinery
- General mechanical engineering
- Structural steel
- Automotive industry
- Refrigeration and air conditioning systems
- Wagon building
- Leisure industry

Other profile shapes on request

# Let's talk about your benefits.

## Long-standing material expertise

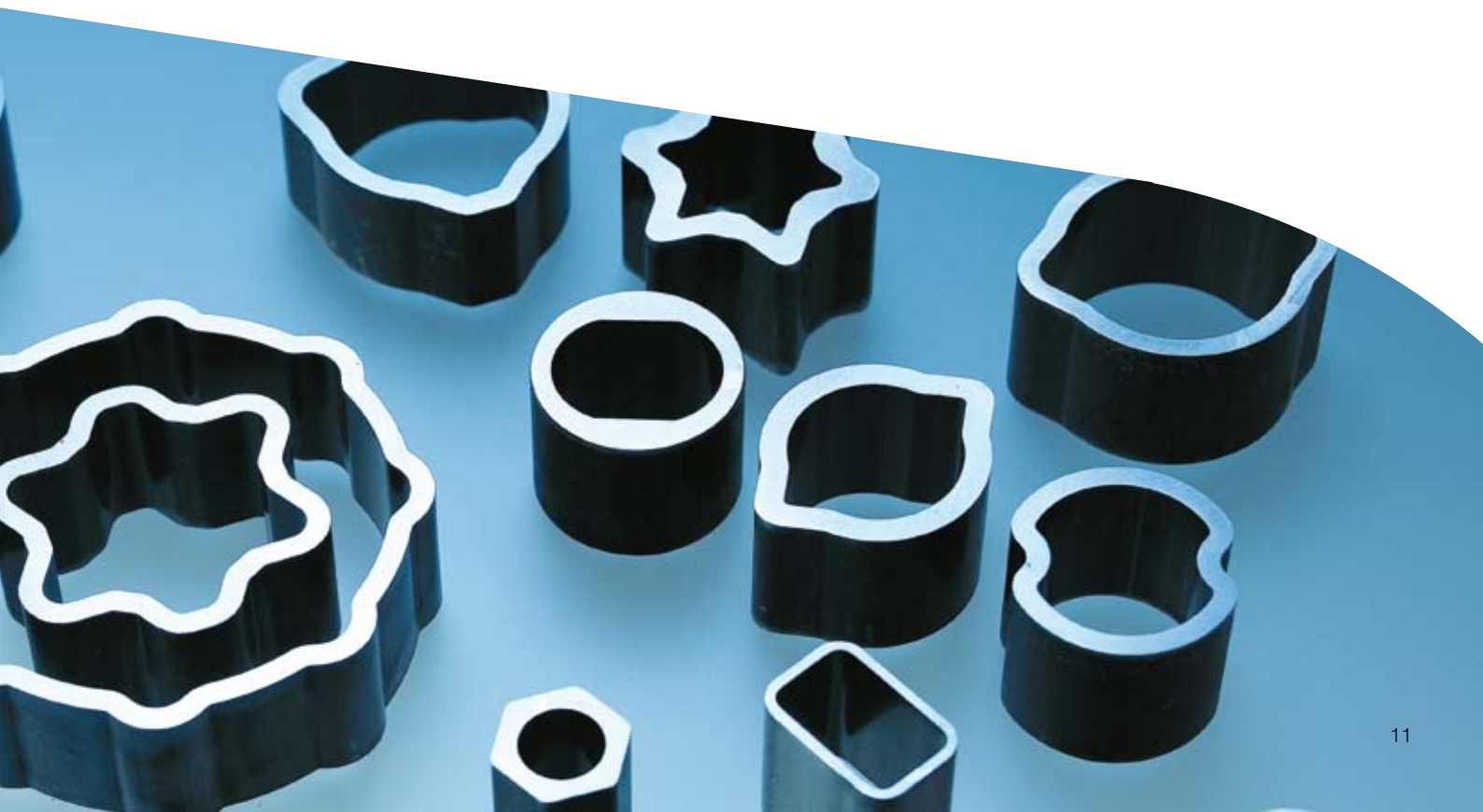
voestalpine Präzisrohrtechnik is part of the globally active voestalpine group with its own crude steel base. It offers material and tube processing know-how from crude ore to cold drawn tube. In addition, it is possible to further process the cold drawn precision steel tubes by using various precision cut length units available in-house: cutting, sawing, chamfering, deburring and washing - everything under one roof from a single-source supplier!

## High quality standards and versatile range of dimensions

Depending on the quality and quantity requirements, tailor-made solutions are developed in collaboration with the customer - from procurement of the pre-material to cold drawing of the tube, from customer-specific testing criteria and methods to packaging and logistics.

Performance-oriented European suppliers of pre-materials guarantee the highest quality. High-tech production and testing systems and highly-qualified, motivated employees create the perfect platform for customer-oriented action. Our plant in Krieglach, Austria concentrates one of the largest ranges of dimensions in Europe into a single location. It illustrates impressively how resource-conserving, environmentally-compatible technology can ensure top-quality products.

Many years of experience, continuous quality improvement and a tried and tested system of sales and distribution create the framework for the flexibility and speediness which helps our customers to be successful. Cooperation with the University of Leoben provides us with the decisive competitive edge in the field of research and development. Our network, know-how and experience make us what we are: **\*) experts for experts.**



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