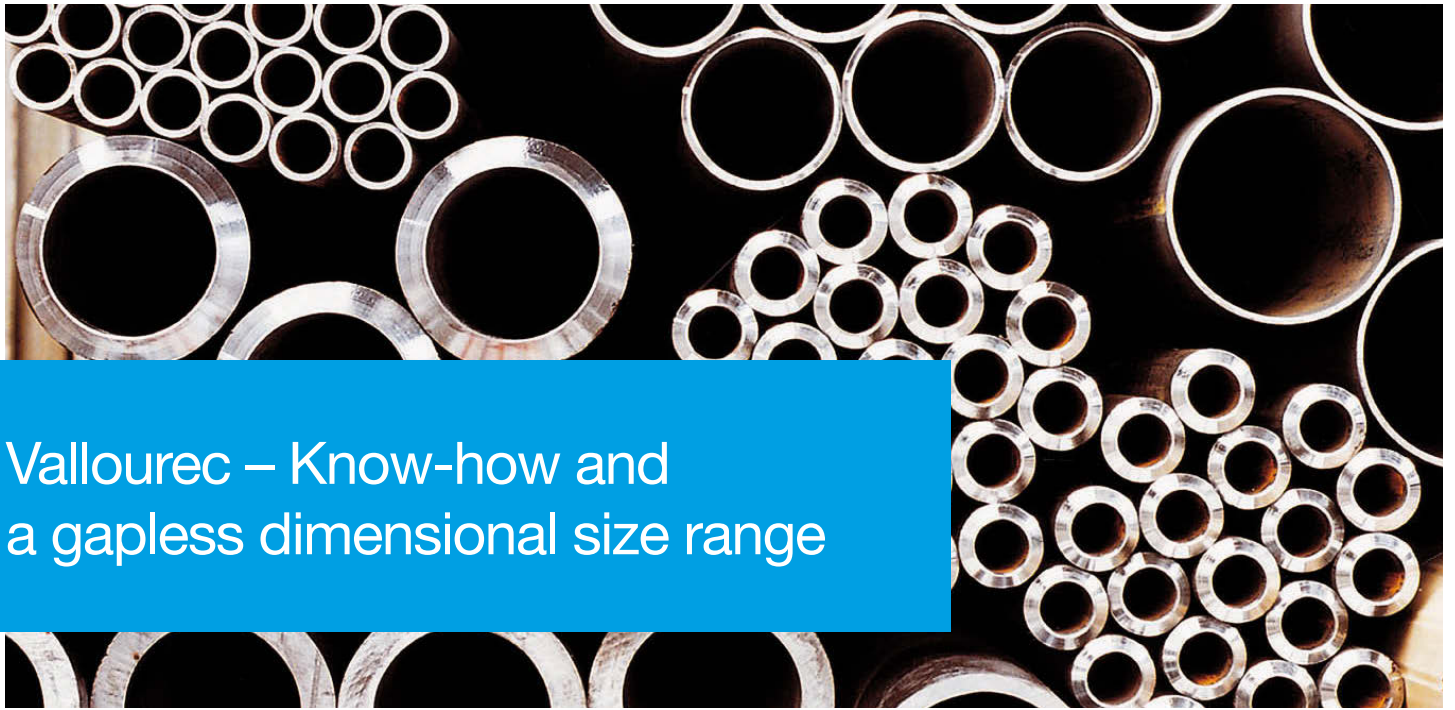




MECAPLUS® Seamless steel tubes for machining

HOLLOW BARS ACCORDING TO EUROPEAN STANDARD EN 10294-1





Vallourec – Know-how and a gapless dimensional size range

Vallourec is the world leader in seamless pipes and tubes with more than ten decades of experience and production facilities all over the world - your guarantees for high quality products and premium tube solutions.

MECAPLUS® stands for a range of tubes specially tailored for the manu-

facture of engineering components by machining. The series features an unequalled dimensional size range of seamless steel tubes.

MECAPLUS® is the logical development of Vallourec's successful MBS tube series for machining into a whole new range of hollow bars. This new series

not only fully complies with European standard EN 10294-1 but also goes far beyond the standard with regard to its gapless dimensional offers and size range.

A reliable partner – worldwide



MECAPLUS® – Hollow bars according to standards ... and far beyond

The introduction of the harmonized European standard EN 10294-1 – hollow bars for machining – formed the technical basis for the development and expansion of our gapless MECAPLUS® size range.

Whether you are producing hollow shafts, flanges or piston rings – you are now able to choose your hollow bars out of a gapless size range with outer diameters between 30 mm and 375 mm which gets you as close as possible to your finished machined part. Your benefits: Savings in materials of up to 50% plus substantially reduced processing efforts.

Your requirements:

- > minimized use of materials
- > fast and smooth machining
- > optimum tool life
- > short-term availability

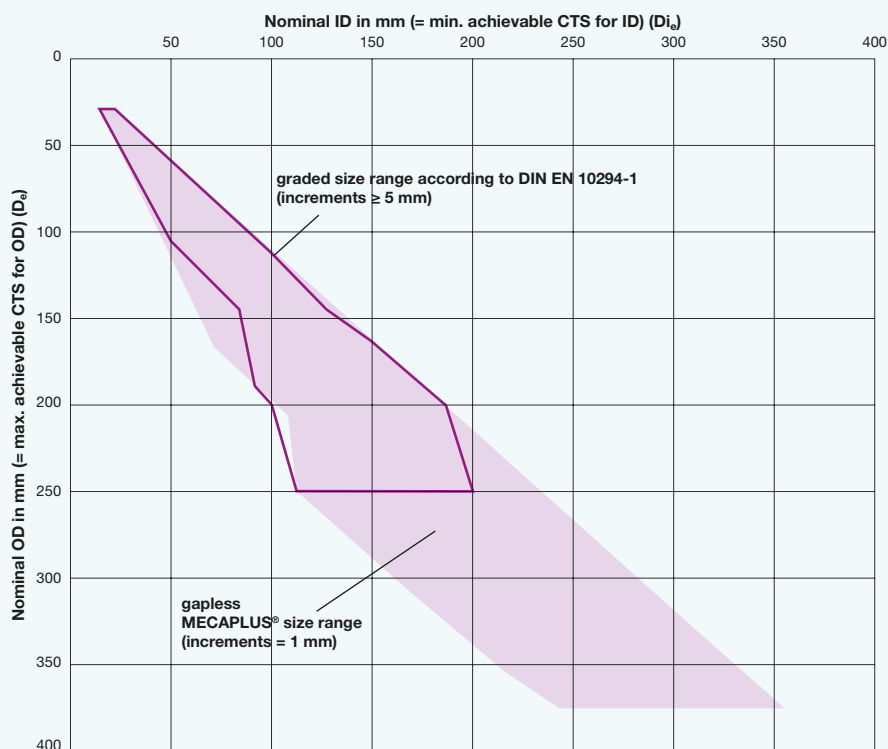
Our MECAPLUS® range:

- > gapless size range: OD = 30 - 375 mm
- > delivery close to clean turned size
- > Spirafort® grade series for hollow bars
- > up to 50% higher cutting speeds
- > up to three times longer tool life
- > increased availability of your processing machines due to optimum chip formation
- > short-term availability of many stock dimensions



> State-of-the-art production technologies such as the PFP forging process and the Assel rolling process open up the possibility of producing hollow bars in a gapless size range. Additionally these processes enable the production of tubes with varying wall thicknesses along the length, so called “shaped tubes”.

Extremely close to the clean turned size:
The MECAPLUS® gapless size range



Seamless hot finished hollow bars that have passed the PFP forging or the Assel rolling process are generally characterized by their excellent geometrical properties, featuring tightest tolerances and excellent straightness. Applying these production processes, especially small diameter tubes with high wall thicknesses may be produced in excellent quality. Combining proven production technology with innovative forging technology opens up wholly new possibilities to produce hollow bars which come extremely close to the clean turned size.

➤ Tolerances (permissible deviations) on the outside diameter (D_o) of the delivered product

Delivered outside diameter (D_o) in mm	Tolerance
$D_o \leq 75$	± 0.5 mm
$75 < D_o \leq 180$	± 0.75 %
$180 < D_o \leq 253$	± 1 %
$D_o > 253$	± 1 %

➤ Tolerances (permissible deviations) on the wall thickness (T_d) of the delivered product, deviations from straightness according to EN 10294-1

Delivered outside diameter (D_o) (in mm)	Delivered wall thickness (T_d) in mm	Tolerance
$D_o \leq 180$	$T_d \leq 15$	± 12.5 % or ± 0.4 mm (whichever is the greater value)
	$T_d > 15$	± 10 %
$180 < D_o \leq 253$	$T_d \leq 30$	± 12.5 %
	$T_d > 30$	± 10 %
$D_o > 253$	$T_d \leq 30$	-12.5 % / $+15$ %
	$T_d > 30$	-10 % / $+12.5$ %

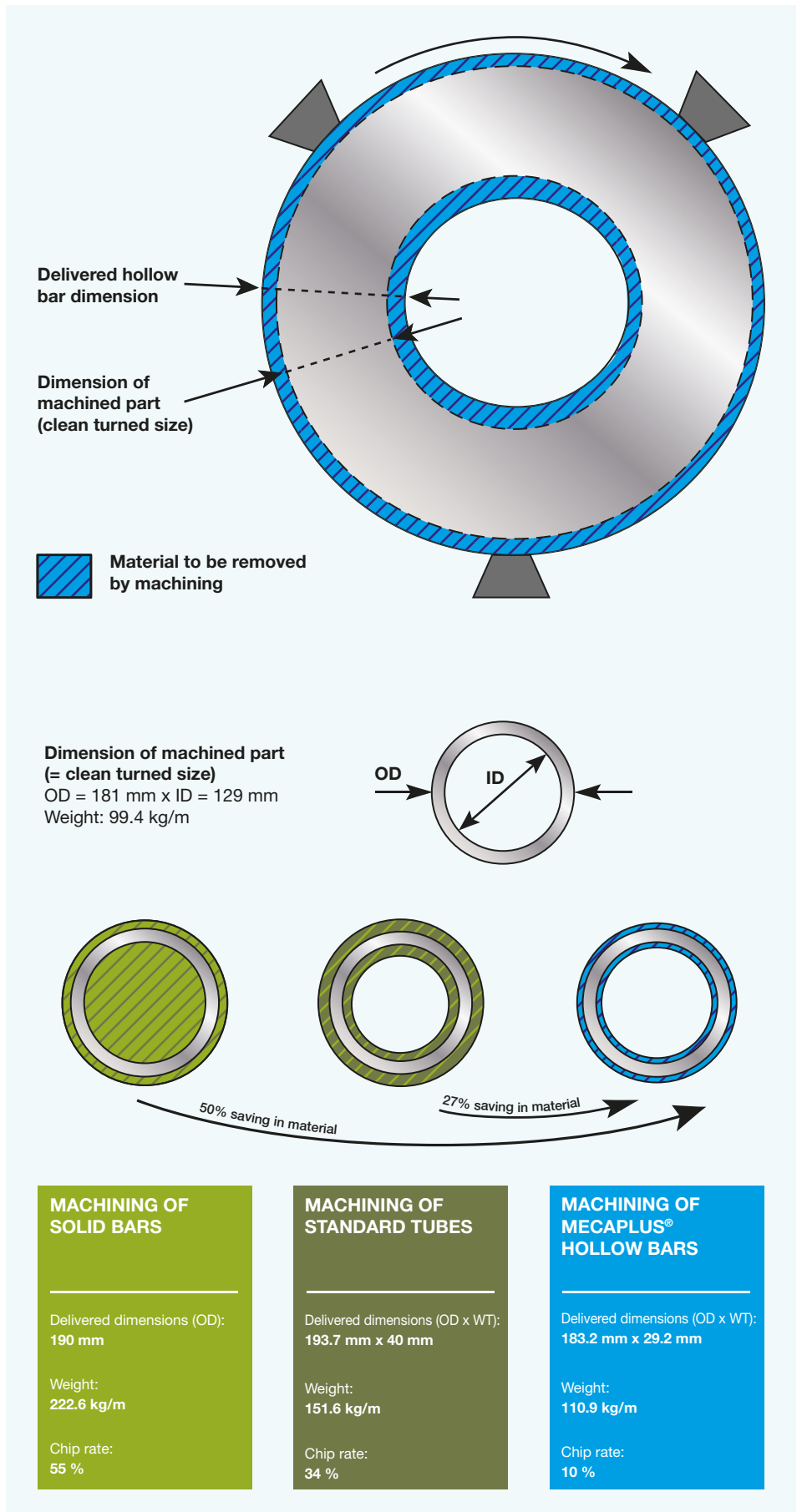
Dimensional fine tuning for more economic efficiency

Vallourec's MECAPLUS® hollow bars feature an exclusive "clean turned size guarantee" for outside diameters between 30 mm and 375 mm – in increments of 1 mm. This dimensional range by far exceeds all present industry standards with increments of ≥ 5 mm.

The application of MECAPLUS® hollow bars for your machining processes will always provide you with the lightest tube for the least possible machining effort to achieve the desired clean turned size.

A concrete example:
 The chip rate in machining solid bars amounts to 55%. Using standard tubes this rate is reduced to 34%.
 With MECAPLUS® the chip rate will go down to only 10%.

› Close to the cleaned turned size via gapless size range: using MECAPLUS® only half of the material has to be removed.

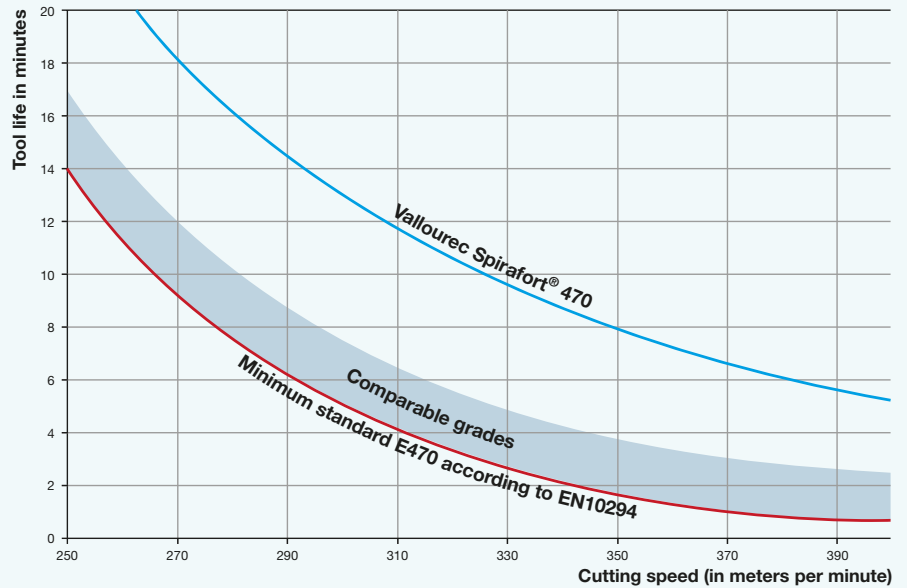


Spirafort® grades: material benefits that save time and money

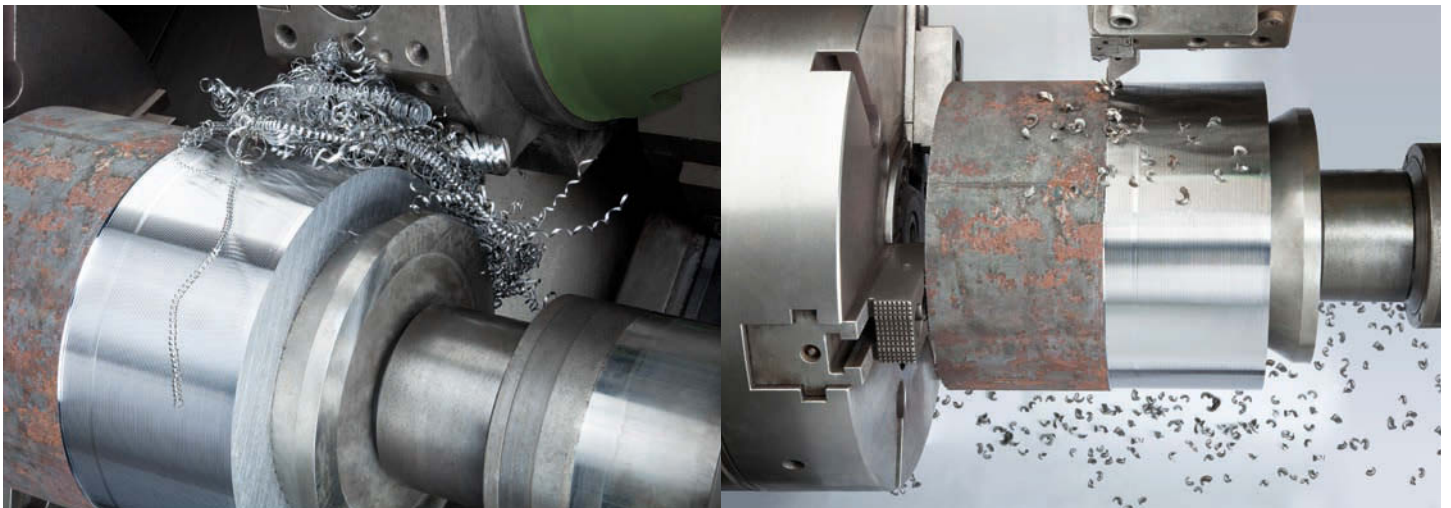
The key to the tailored MECAPLUS® hollow bar not only lies in its gapless size range that guarantees clean-turned sizes, but also in the special alloy used. Vallourec's Spirafort® grade series has been developed having the requirements of the mechanical engineering industry in mind. Produced in the group's own steel plants, Spirafort® grades benefit from Vallourec's proprietary alloy composition which is tailored to specific demands. Excellent machining properties even in combination with high yield strengths therefore are main features of Spirafort® grades.

MECAPLUS® follows a holistic approach. It consists of a combination of innovative production technology with a wide gapless dimensional range and the new Spirafort® grade series, which was developed especially for optimum performance in machining processes. Using the MECAPLUS® gapless size range in Spirafort® grades you will benefit from substantial savings in time and money: Extensive tests have revealed an increase in cutting speed of up to 50% combined with substantially longer tool life using Spirafort® grades. Tests were carried out in conformity with the requirements of standards EN 10294-1 and ISO 3685:

Tool life in function of cutting speed



➤ Taylor-curves of Spirafort® 470 compared with five comparable grades (see area comparable grades)



➤ Long chips have a negative impact on the machining properties of hollow bars.

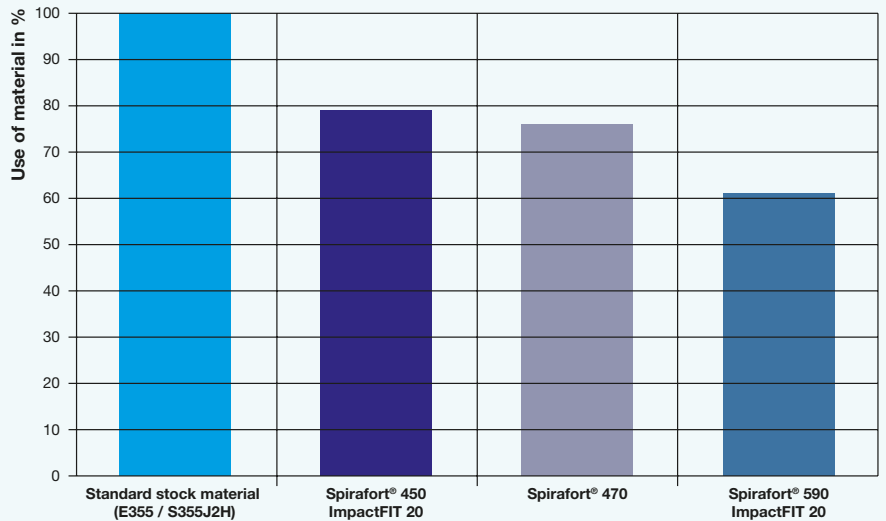
➤ Short chips are characteristic for the optimized chip breaking performance of the Spirafort® grade series.

➤ Mechanical properties of MECAPLUS® hollow bars in Spirafort® grades for wall thicknesses (T_N) up to 16 mm. The mechanical properties of the whole size range as well as further details on these grades are documented in our separate Spirafort® material data sheets.

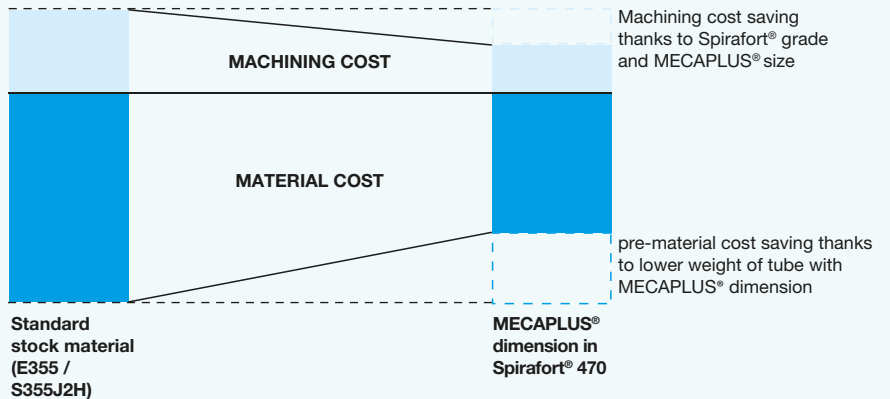
VALLOUREC grade	Delivery condition ¹⁾	Yield strength $R_{eH\ min}$ in MPa	Tensile strength $R_{m\ min}$ in MPa	Elongation $A_{\ min}$ in %		Impact toughness $KV_{\ min}^2$ at -20 °C in J	equivalent according to EN 10294-1	
				longitudinal	transverse		Steel grade	Steel number
Spirafort® 450 ImpactFIT 20	N	450	600 - 750	19	17	27	E420J2	1.0599
Spirafort® 470	AR	470	650 - 800	17	15	–	E470	1.0536
Spirafort® 590 ImpactFIT 20	QT	590	700 - 850	16	14	40	E590K2	1.0644

¹⁾ N = normalized or normalized formed, AR = hot formed (as rolled), QT = quenched and tempered.
²⁾ Minimum average value of a set of three Charpy-V test specimens taken in longitudinal direction

➤ MECAPLUS® hollow bars in Spirafort® grades pave the way for smart, streamlined design: compared to standard grades material savings of up to 40 % may be achieved due to higher yield strength.



➤ The essence of all benefits: using MECAPLUS® hollow bars in Spirafort® grades will substantially reduce material and machining costs.



Any questions?
 Please feel free to call our engineers for individual technical support:
 +49 (0)211 960 3594



Vallourec Deutschland GmbH
Theodorstraße 109
40472 Düsseldorf
Telefon +49 (211) 960-3594
Fax +49 (211) 960-143594
mecaplus@vallourec.com

www.vallourec.com

V D02B0011B-16GB