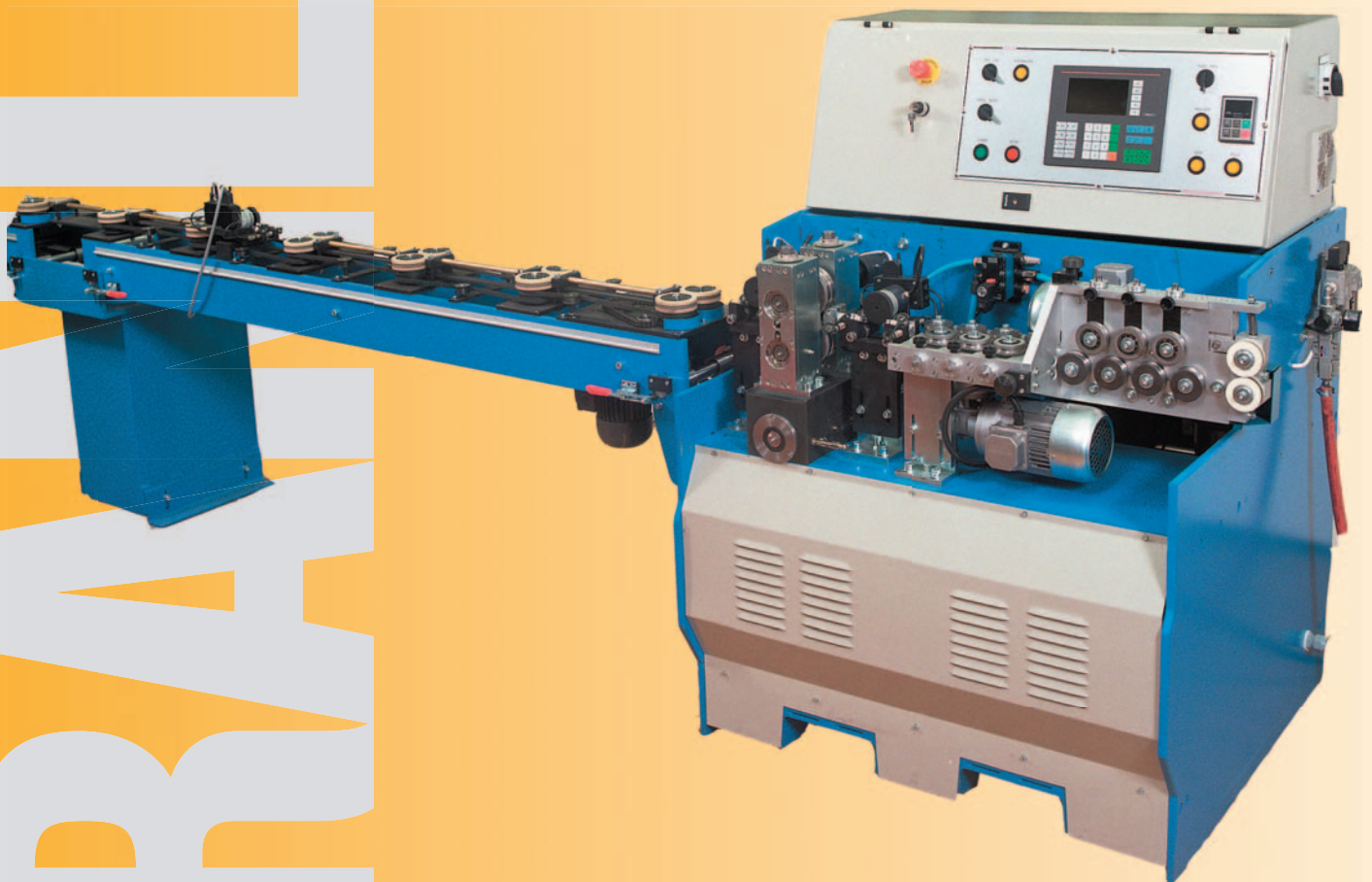


GRANLUND
Machinery

Uniform length at high production rates



GRANLUND KOL-R2 length compensating machine
Corrects length to within less than ± 1 mm.
Saves material. Easy to operate.

Uniform length

The KOL-R2 is capable of reducing the length variation of tubular elements to less than ± 1.0 mm on lengths above 400 mm. This will considerably reduce problems at the later stages of the assembly line.

Saves material

The high accuracy of the KOL-R2 saves up to 2% of the material processed.

Easy to operate

The KOL-R2 is fully automatic and controlled by a programmable controller. The production capacity is independent of tubular element length.

Function

Three factors can cause the length of tubular elements leaving the reducing rolling mill to vary:

- Tube diameter tolerance
- Tube hardness variation
- Tap density of filling powder

Three main sections

The length compensation in the KOL-R2 is achieved by an additional reduction of the diameter of the tubular element in the section where the diameter tolerance is of less importance, i.e. 50-100 mm from the ends. The Length Compensating Machine type KOL-R2 consist of: 1. A measuring path fed directly from the reducing rolling mill or by an automatic feeding device. 2. A station with one pair of reducing rolls. 3. An electronic and hydraulic control system.

Automatic operation

The operator presets the required length of the element on the Electronic Control Box.

The actual length of the tubular element from the Reducing Rolling Mill is measured on the conveyor. Thanks to the advanced control system more than one element can be on the conveyor at the same time.

The tubular element is then fed into the Reducing Station which consists of one pair of rolls and two optical encoders.

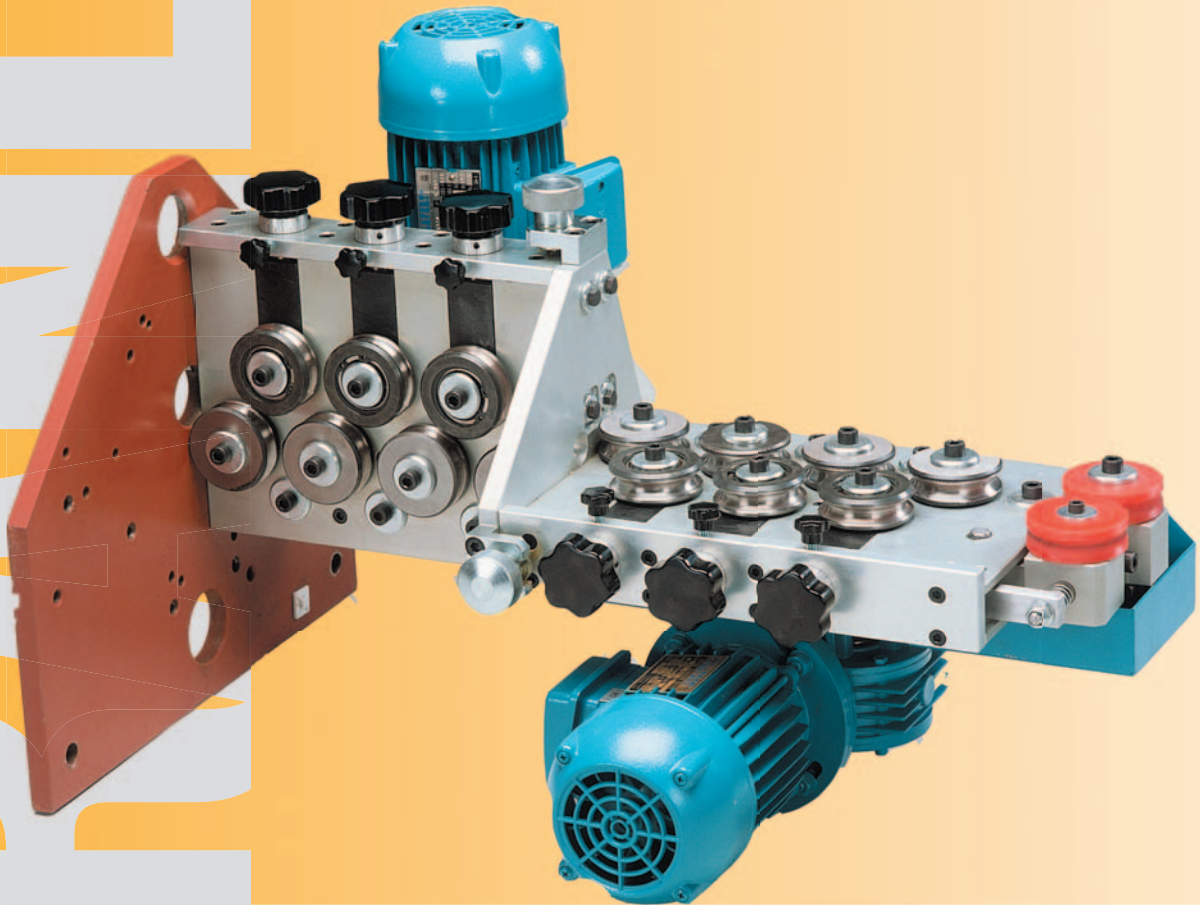
The first encoder in front of the rolls measures the length before reduction, and the other the length after. The setting of the rolls is determined by the difference in the impulses between the front and rear encoders. When elongation is required the rolls are lowered until such time as the required length is achieved.

Should the element be too long or too short after the compensation, a warning signal (either audible or visual) can be built into the system, as can a receiving table with automatic sorting.

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**No more lubricants are required
to obtain straight elements**



**GRANLUND tubular element straightening device,
type KRO**

Eliminates the worst camber

The device is a two plane straightener. The straightener gives a so good straightness that further automatic processes are not affected. Also the cold hardening through cold forming of the annealed material by other methods is avoided. the system is fully motorized and the speed can easily be altered by a frequency converter (optional). The straightening device can be added to the reducing rolling mills of all kinds, KOR-8/ 12, KOL-R or free standing.

Technical data

Dimensions	700 x 350 x 250 mm
Tubular element	Ø 5 - 10 mm
Empty tubes	Ø 5 - 12 mm
Speed	15 - 40 m/min.
Number of rolls	14 pcs.

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9. LENGTH COMPENSATING, STRAIGHTENING, PIN CUTTING KOL-R, KRO, KRH, KPC

Automatic assembly lines require small tolerances on length and straightness of the elements. The pins also have to be cut to correct length. GRANLUND Machinery provides machinery for these operations:

GRANLUND KOL-R	length compensating mill
GRANLUND KRO, KRH	straightening
GRANLUND KPC	pin cutting and plug pulling machine

The straightening devices - KRO, KRH, or the simpler bending type - can be placed in line after several different machines, for straightening empty tubes as well as elements, e.g. after the tube welding machine (KOW), the rolling mill (KOR) and/or the length compensating mill (KOL-R).

Sales Catalogue

KOL-R-2 Length Compensating Machine

After filling and reducing the elements, they always come out with a certain length variation. This variation is caused by:

- tube diameter tolerance
- tube hardness variation
- tap density (amount of MgO in the element)

The most influential factor is the tap density, i.e. the density of MgO in the element after filling.

There are two methods of compensating the length variations:

One method, "cutting and stripping", is to cut the element, uncover the pin and eventually also removing MgO from the end, in order to get space for the plug. **This method is costly and wastes material.**

The other method is length compensating by additional rolling of a part of the element. **This method saves material** (normally 1,5-2% depending on tube material). KOL-R uses this method.

- Same production capacity as KOR
- Working in line with KOR
- Saves material
- Close tolerances on length
- Easy to operate
- Eliminates disturbances in subsequent operations

Construction

The machine consists of the following parts:

- transport path with measuring station
- compensating mill with one pair of rolls and two inductive sensors
- control panel with computer
- hydraulic equipment

The machine will accept stainless steel, mild steel, copper and aluminium.

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Sales Catalogue

Function

The element diameter is reduced additionally 0,1 mm (adjustable). The starting position of the reduction can be programmed. The length of the reduction depends on how much the element length is to be increased. The rolls will automatically go up when 90 mm is left of the element, even if the right length has not been achieved yet.

The length tolerance after compensation is very small, appr. ± 1
Every element is measured as it comes out of the rolling mill, KOR. The length compensating machine, KOL-R, is adjusted to the same speed as the rolling mill. Therefore, **KOL-R causes no slow down of the production**. The transport path is adapted to take care of the maximum element length in the production (to be specified by the customer). The transport path (equals max element length) is 4m as standard, longer available on request.

The operating cycle is:

1.1 Normal Mode Elongation

The first measuring station is placed in the measuring path. The incoming length is measured by the rotary encoder.

When the element reaches the proximity switch in measuring station 2, the rotary encoder in this station starts counting. The encoder in measuring station 3 counts backwards. When the measured difference in length between station 2 and 3 is equal to the difference of length between set point and measured length in station 1, the reducing rolls move apart.

The elongation is done by reducing the diameter of the element by approx. 0,1mm until the right length is reached.

1.2 Fuzzy Mode Elongation

The real time rolling, called normal mode, is a very accurate and secure method to lengthen elements of length 1000mm or longer. For elements shorter than 1000mm, elongation in real time mode can cause problems because of the distance between measuring station 2 and 3. Often the short rolling has to be used and the uncontrolled elongation has a big influence on the result.

In order to optimise the elongation for short elements GRANLUND Machinery AB has developed a rolling mode working with calculated rolling times for certain elongation, here called fuzzy mode rolling.

Sales Catalogue

KOL-R cont.

All rolling is based on the rolling time and no elongation is measured under rolling. This means that the rotary encoder in measuring station 2 is not activated. Uncontrolled elongation does not occur because of the calculated rolling time. With the help of a calibration curve, the rolling time is calculated based on the incoming tube length measured in station 1.

To be able to calculate rolling time for desired elongation, the system has to be calibrated to the relations under production.

For “fuzzy mode elongation” the following parameters must not be changed under work with a calibration curve:

1. The type of material for the elements
2. The tube diameter
3. The speed
4. The rolled tube diameter

The computer is programmed with lengths and tolerances. If the length after compensation is shorter or longer than the desired length, the computer sends an impuls to the receiving table to reject the element.

Other machines can be added to the KOL-R, e g:

- automatic marking devices, type KOP or KBP
- automatic terminal pin cutting, type KPC
- automatic plug removal and pin cutting

Technical data

When soft materials are used, as much as 2,7 - 3% can be compensated. For mild and stainless steel, 1,5 - 1,9% is normal.

Total height	1470 mm
Total width	1000 mm
Total length	5600 mm (for max element length 4000 mm)
Weight	1200 kg
Tube length	00 - 4000mm (longer available on request)
Tube diameter	in 5 mm ax 12 mm
Length tolerance after compensation	appr ± 1 mm
Production speed	10 - 35 m/min (adjustable) (30m/min practical)
Electrical connection	3x400V, 50 Hz

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Sales Catalogue

Required information when ordering

- tube diameter (after reduction)
- maximum element length
- type of plugs
- electrical connection
- placed in line with KOR-8, KOR-108 or KOR-12 or used separately?

The customer should supply appr 50 pcs of elements for testing/calibration before delivery

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Sales Catalogue

KRO Straightening Device

KRO is a two plane roll straightener. It is normally used in line with a welding mill, KOW, a rolling mill, KOR or a length compensating mill, KOL-R. However, it can also be used free standing.

Construction

The straightener is equipped with 14 rolls. The rolls are situated in two planes, seven rolls in the first station, straightening in vertical direction, and seven rolls in the second station for straightening in the horizontal direction. The tube is bent three times in each direction. (Note: do not compare with simpler devices with 6 roll pairs only.)

The straightener is driven by a AC-motor with a stepless speed control. Thereby, it can be synchronized with the machine onto which it is put (KOR, KOL-R, KOW), e g with the drive motor of a welding mill.

Technical data

Dimensions		700 x 350 x 250 mm
Number of rolls		14 pcs
Tube diameter, elements	min	5 mm
	max	appr. 10 mm (depending on wall thickness)
Tube diameter, empty tubes	min	5 mm
	max	appr. 12 mm (depending on wall thickness)
Speed	min	15 m/min
	max	40 m/min
Motors		2 AC-motors, stepless speed control

Alternative

We can also supply a simpler straightener, which works by bending the element between supports. The straightness tolerance is not as good as with KRO and it can only handle bending in one plane, but it is simpler and can take larger tube diameters.

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Sales Catalogue

KRH Straightening Line

KRH is a straightening rolling mill with three pairs of crossed hyperbolic rolls. It is intended for straightening of tubes or elements where the customer wants perfect straightness since it meets very high demands on straightness and roundness.

It is normally placed after a straightening device of type KRO or the simpler bending straightener, and it can be used in line with the KOW welding mill or after a KOR rolling mill.

Construction

The line consists of:

- feeding device
- straightener with three pairs of hyperbolic rolls
- receiving table

The machine is controlled by PLC.

Technical data

Length	min 600 mm
	max 3000 mm (standard)
Speed	max 40 m/min
Tube diameter	min 5 mm
	max 12 mm

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Sales Catalogue

KPC

Pin Cutting Device/Plug pulling device

Device for automatic cutting of terminal pins. It is pneumatically driven and electronically controlled. KPC is equipped with a hopper for appr 20 elements as standard (automatic function, but manual feeding), but can easily be combined with feeding device for automatic in-line operation.

Easy adjustment to a range of tube and pin diameters. Change the guide bushing for the pin for each two mm, the cutting knives for each mm, and the bushing in the movable stop for the tube for each major change in tube diameter. The pin cutting length and the tube length are easily adjustable mechanically.

The main mechanical parts are the feeding hopper, the two cutting heads and the machine stand.

- fast
- saves labour
- short setting time

Technical data

Length x Width x Height	2560 x 650 x 1490 mm (mounted on a stand, incl KMA-20)	
Outlet height	1000 ± 40 mm	
Inlet height	1490 mm (incl KMA)	
Weight	70 kg	
Element tube diameter	min	5,0 mm
	max	12,0 mm
Tube length	min	100 mm (excl pins)
	min	210 mm (incl pins)
	max	2060 mm (incl pins)
Length of terminal pin after cutting	min	9,0 mm (measured from the sealing plug)
	max	50 mm
Tolerance on terminal pin length after cutting	±1,0 mm	
Terminal pin diameter	max	3,5 mm (M4)
Capacity	appr 1000 pcs/hour	
Adjusting time	5 min (tube length)	
	10 min (terminal pin length)	
	10 min (diameter)	
El connection	230 V±10%, 50/60 Hz	
Air connection	6 bar, dry and oil-free	
Air consumption	0,7 l/stroke	

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Sales Catalogue

Required information when ordering

- length and diameter of tube
- terminal pin diameter
- electrical connection

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