

LINEARCASE: OMEGA X-Z FOR FAST PICK AND PLACE

Customer question:

High Speed Pick and Place of Towels of 1 kg in horizontal and vertical direction.

Horizontal Stroke: 1500 mm

Vertical Stroke: 300mm

Max speed: 4 m/s

Accuracy: 0,5 mm

First analysis:

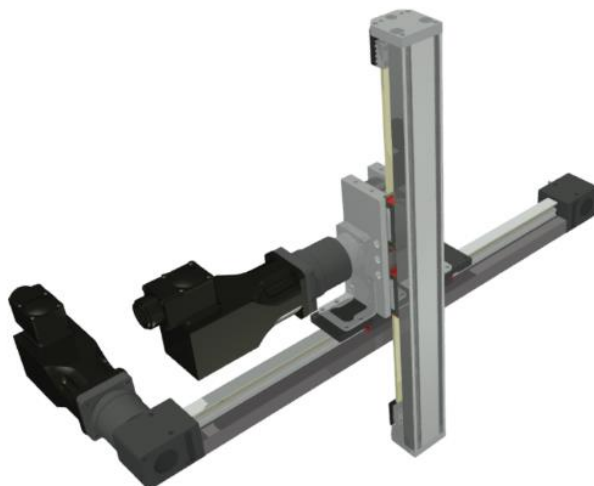
To reach this speed at these short strokes the acceleration and deceleration must be high. Therefore the moving masses must be as low as possible.

Every component should be investigated if there is an alternative with a lower weight.

A component with a high weight is the servomotor with gearbox it is about 2,5 Kg.

In conventional solutions the servomotor will also be placed in the horizontal movement.

Standard X-Z configuration:

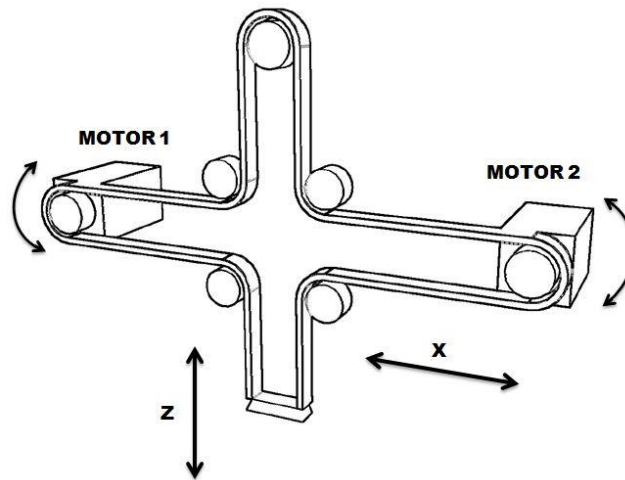


THE SOLUTION

A solution has to be found to take the 2,5 Kg out of the movements.  
 Best is the have the motor/gearbox stationary.  
 The so called "OMEGA BELT STRUCTURE" has both motors mounted "to the world".

Explanation of this system:

The 2 motors are put stationary to the X-axis.  
 There is 1 tooth belt driven both the X-axis and the Z-axis.



The 2 motors should turn at the same time and against each other depending on the requested movement of the Axis.  
 For the control system of the servomotors a program has to be writing according to this Movement diagram.

		Motor 1		
		CW	•	CCW
Motor 2	CW	←	↙	↓
	•	↖	•	↘
	CCW	↑	↗	→

If both motors are powered at the same time it gives the maximum acceleration (deceleration).

## THE MECHANICAL DESIGN

There is a linear guide in the Z-axis that also move up and down and left to right.

If a standard recirculating ball rail guide is chosen, the steel rail is heavy.

Therefore a "Franke" guide will be used.

The Franke guide had an aluminum profile with steel inlays, which gives a weight reduction.

And the Franke guide is a very good guide for high speed application like this.

The basis is formed by two MK aluminum profiles;

Horizontal: 80 x 120 mm (Mk 2040.07)

Vertical: 80 x 40 mm (Mk 2040.02)

The Guide system is Franke:

Horizontal 2 rails with 3 carriages of size -20-

Vertical 1 rail with 1 carriage of size -15-

The tooth belt system:

The same belt construction is chosen as the LT55 linear unit.

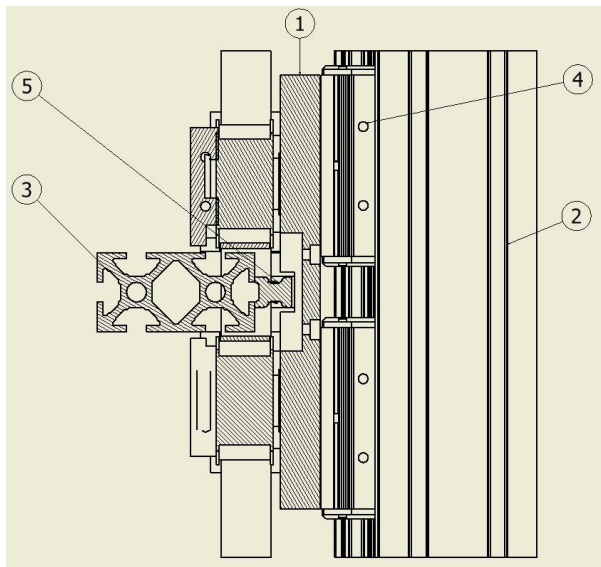
Breco tooth belt 25 mm wide tooth shape AT5.

And the typical Omega parts are from the standard LTZ55 unit.

The design of the Centre Carriage Plate must be light weight and compact.

It should be only 1 Plate to keep the design simple and light weight.

### The Carriage plate with Linear Guides



1 = Aluminum Carriage Plate

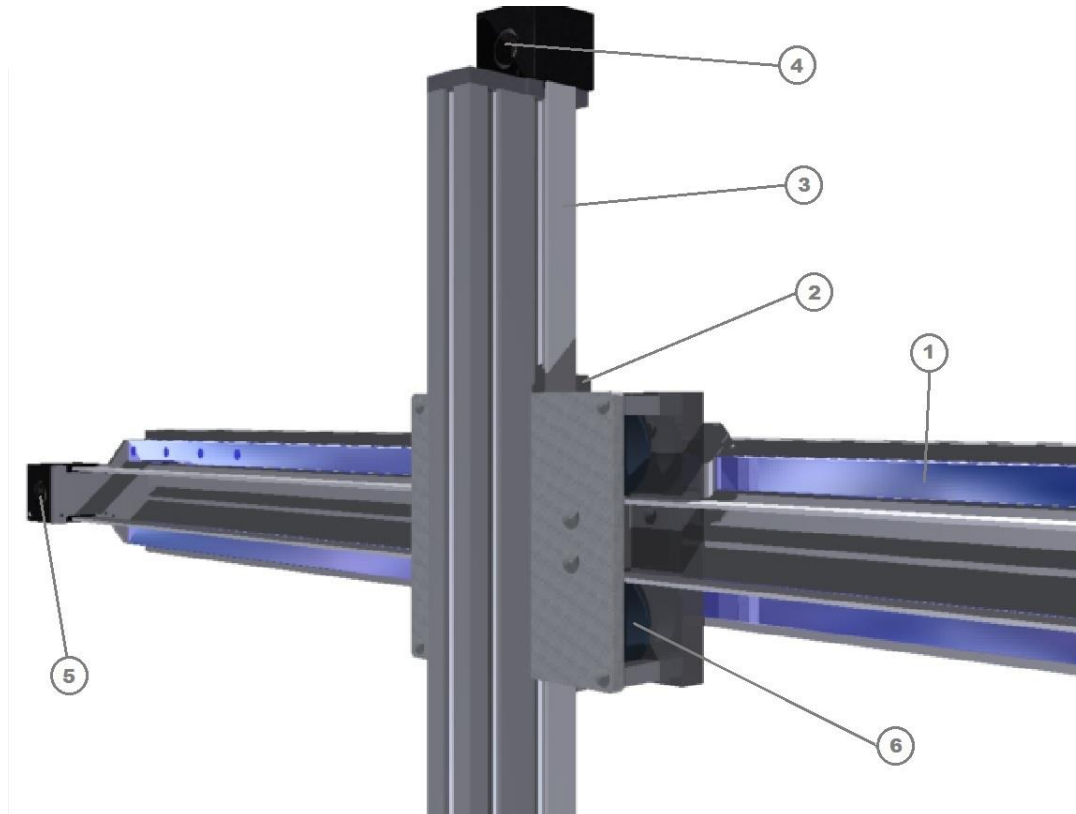
2= MK profile 120x80

3= MK profile 40x80

4= Franke -20- guide

5= Franke -15- guide

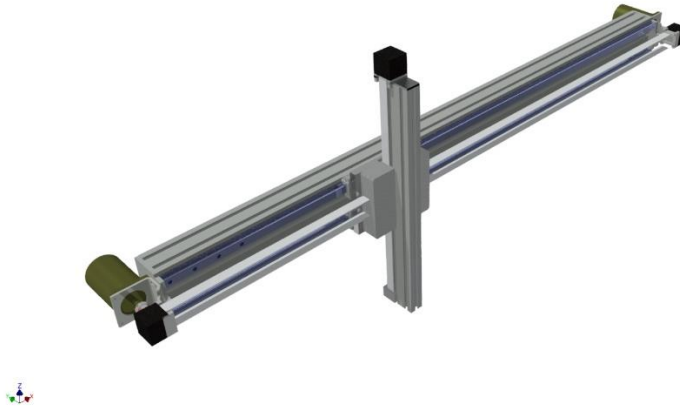
## The design of the system



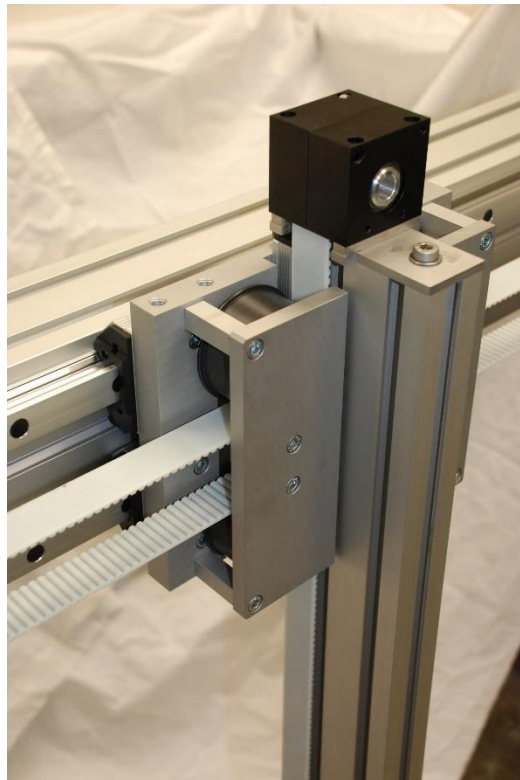
### Major Parts:

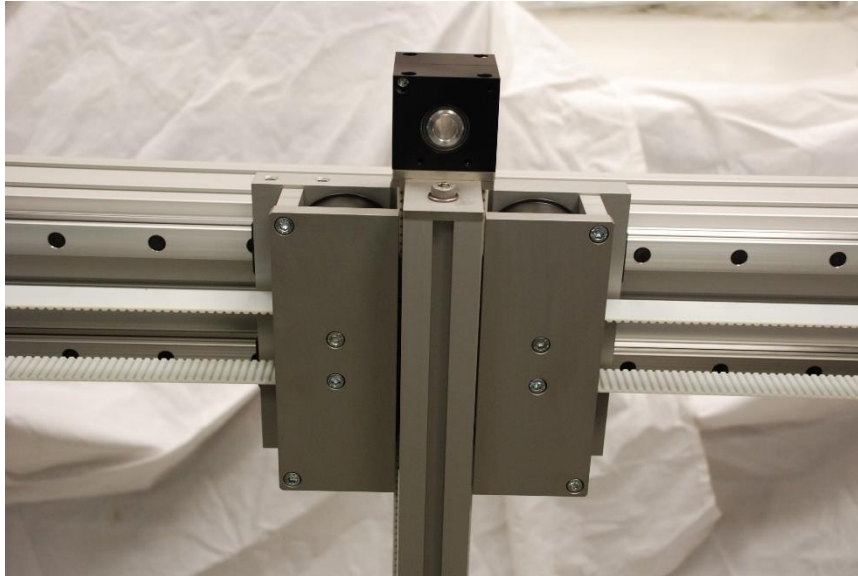
- 1 = Franke -20- guide
- 2= Franke -15- guide
- 3= Toothbelt 25 AT5
- 4= Aluminum Pulley
- 5= Pulley endcap for motor
- 6= Roll for Belt

The design of the complete X-Z system

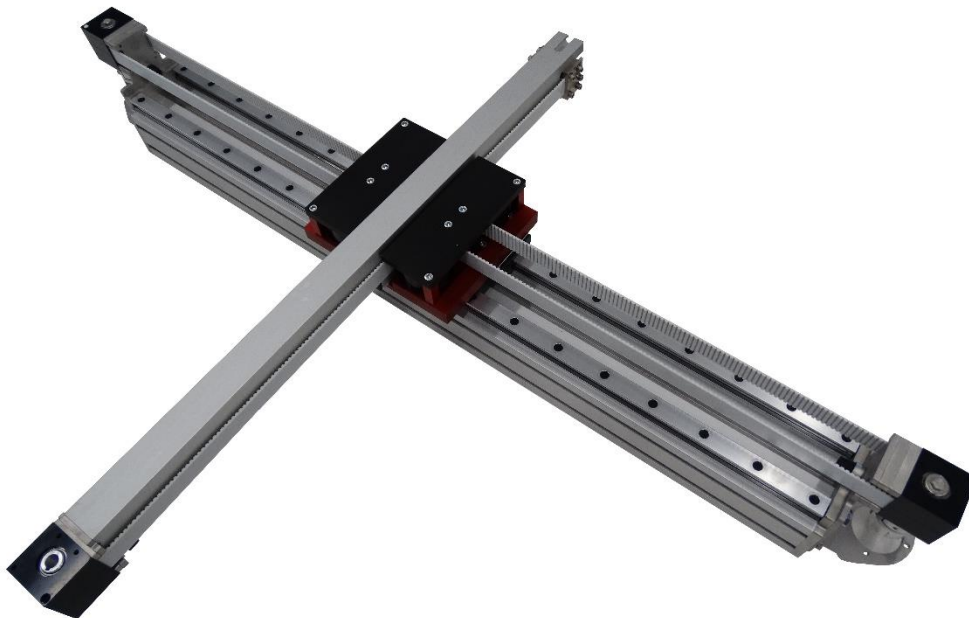


The system was built in December 2013 and is still running well.

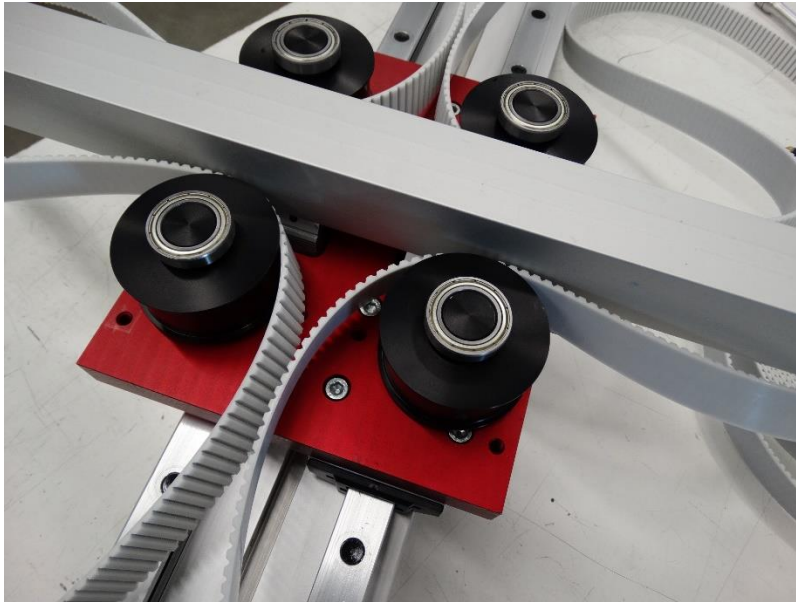




**In 2014 and 2015 several of these systems have been built for other applications;  
And with a 40x40 profile in the Z-axis instead of the original 40x80**



Detail of the Rolls and the tooth belt (unmounted)



Detail of Franke -20- guide on the carriage

