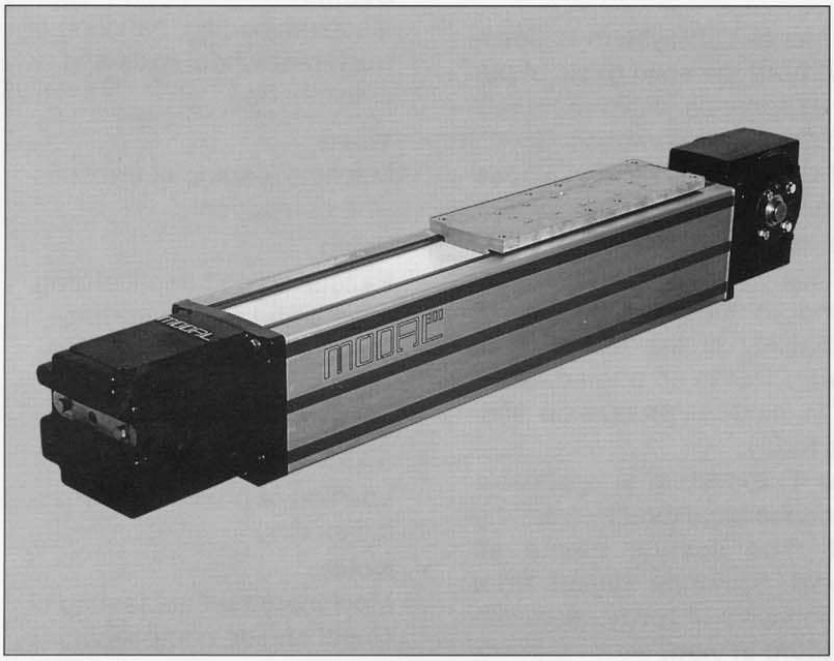
TLE - System survey

MODAL

Linear units

- moving, guiding and positioning



Contents:

The versatile implement

When moving, guiding and positioning:

- at high speeds, up to 7 m/s
- with high torques up to 3.8 kNm, for high acceleration
- long traverse paths, 50 m or longer at inquiry
- with refined precision, repeatability of +/- 0,2 mm
- the heavy loads, 2 000 kgs horizontally or vertically
- with a maximized availability and minimized need of maintenance
- a complete, modular system

Typical applications

In automated manufacturing and materials handling:

- machine loading systems
- building unit in taylor-made equipment and special machines
- automated warehouse technology

As a building unit in box or line gantry robots for

- machine loading
- palletizing
- depalletizing
- pallet and collar sorting
- patterned movements

A mature technology

The well-known principle of the toothed beltdriven units is since many years a proven and verified technology. In combination with extruded aluminium profiles and life lubricated rollers the concept provides:

- a minimized need of service and maintenance
- endurable solutions
- low friction and high degree of efficiency
- excellent precision
- eliminated backlash and play
- low wear and minimal abraded products
- high dynamic qualities with low weight, high stiffness and play-free carriages

Patent No.: 9302690-4 Patent pending No.: 9404501-0, PCT/SE94/00749 Registration of designs No.: 93-1860, 93-1861 July 1997

TLE - a well-proven technology

Versatility

The Transman Modal TLE linear units system offers the complete solution concerning heavy loads and high speeds in the industrial automation. The unit works as a single unit or as a component integrated to a multiple axis system.

In multiple axis systems the units are easily combined to different Modal modules or other component systems.

The system is designed to handle large weights at high speeds over long travelling paths.

As a module the single unit is simple to adapt to the correct function without the need for special knowledge.

The unit is self-supporting and fully integrated to avoid costly constructions when built-in or fitted otherwise.

The structure with few parts benefits to quick and inexpensive fitting.

The system also comprises a wide range of accessories expanding the use of the standard modules.

Our substantial know-how

The Modal TLE system is developed from the solid basis of our vast experience within materials handling and automation.

Others of our self-developed products combined with experience and knowledge of other existing systems form the ground to the high degree of adaptability of the Modal TLE-system. This is so often demanded in modern production systems today.

The TLE-system is applicable and economical directly from the start. The system meets all rational demands raised from the industry of today, also with the future in view.

The modules offer extensive possibilities and are easily adapted in most varying positions.

Reference applications

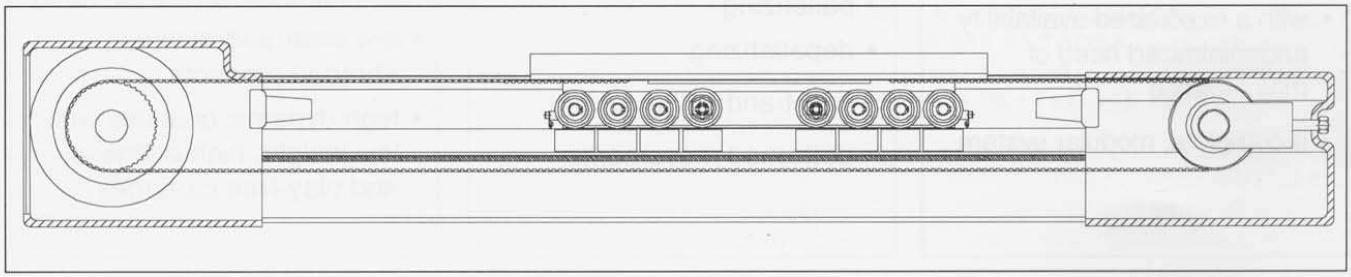
- **Scania**
  Machine loading, handling of truck rear wheel axes and crankshafts.
- **Volvo**
  Machine loading of transmission components
- **Volvo**
  Palletizing and depalletizing, pallets and collars sorting
- **Tetra Pak**
  Depalletizing of packaging materials
- **SAPA**
  Loading of profiles for cross-cut sawing
- **Nolek**:
  Machinery for seal testing of diesel engine components
- **Posten Brev**
  (The Swedish Post Office)
  Gantry robots for loading of small boxes used for automated sorting and mailing
- **Polyclad**
  Handling of laminate boards
- **Sandvik**
  Machine loading
- **Löfquist Engineering**
  Special Machine

Function

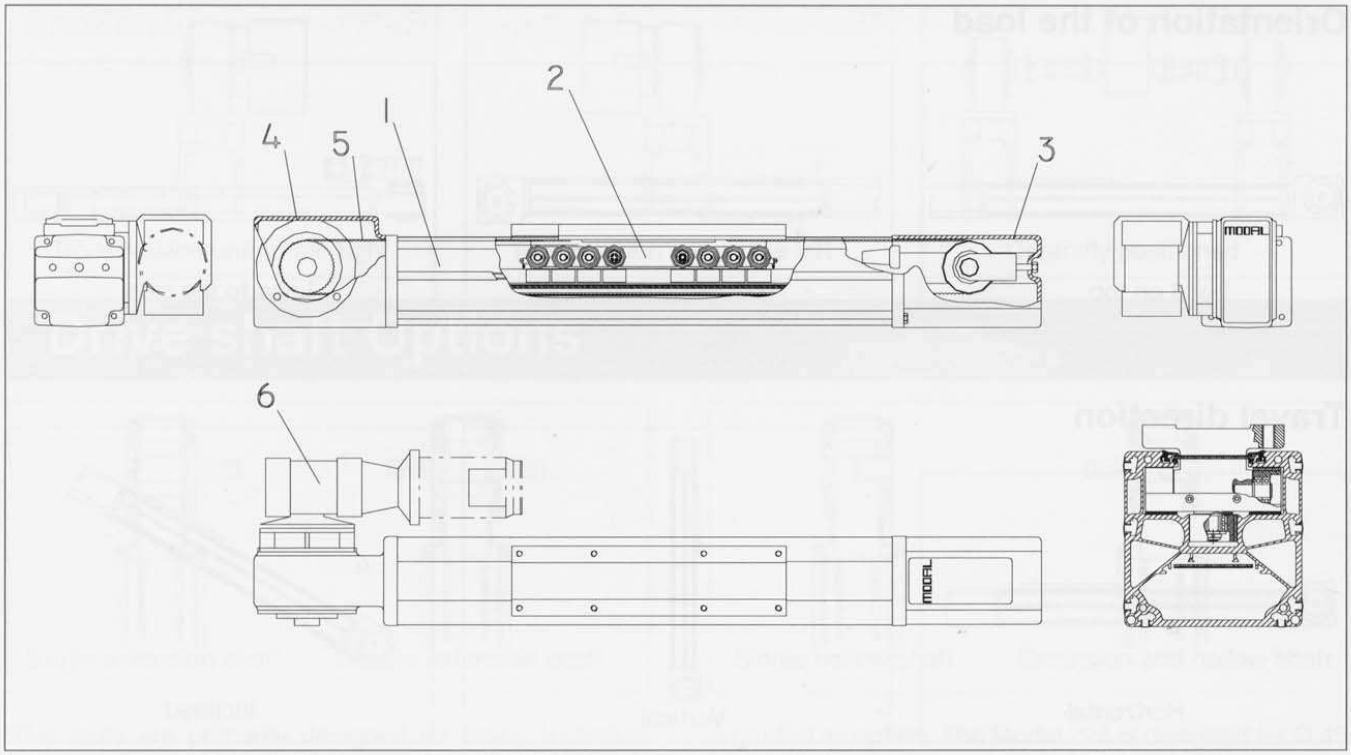
Extruded aluminium profiles form the core in the linear units.

The profile design is self-supporting and designed for further functions. Inside the profiles a carriage travels along roller tracks integrated in the profile cross-section. The carriage itself constitutes the carrier of the load and is positioned by means of a steel corded polyuretane timing belt.

The carriage is adjustable to play-free function. It is available in different models for customized applications.



Elements of the TLE



The profile (1)

Light-weight, stiff and self-supporting extruded aluminium profile - available in two sizes:

TLE 225: 225 x 225 mm
TLE 300: 300 x 300 mm

The longitudinal patent pending slots are used for the fixing of the profile and also serve for smart fitting of additional accessories.

The slots are designed to allow standard t-screws and t-nuts and for the use of slot blocks in the accessories programme.

The slot blocks are designed to instant fitting in the correct position (without being pushed into the grooves from the end of the profile).

The slots are sealed by plastic covers, easy to keep clean.

The carriage (2)

The carriage is sturdily built, moulded in aluminium and fitted with rollers on ball bearings. The rollers are specially developed for Modal, offering high bearing capacity and running smoothly and silently.

With the rollers correctly fitted, the carriage operates play-free with high precision. The carriage handles forces in all directions. The cover of the carriage is equipped with holes for different loads and constructions.

Both the carriage and the cover are available in different models

The tensioning housing (3)

The special drive belt tension tool allows a reliable setting of the preload of the strong drive belt, as well as control of the setting.

To achieve complete accuracy with timing belts, this setting is vital, why the TLE-units are equipped with sophisticated tensioning housings.

The drive housing (4)

The housings for the drive pulley are stable and dimensioned according to the very high torques which are to be transmitted.

Equipped with standardized flanges in both directions many different motors and transmission units can be fitted directly.

The timing belt (5)

Very strong and robust toothed belt with the strongest cord in the market, allows high acceleration and trouble-free handling of heavy loads.

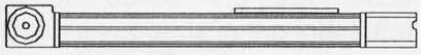
The belt runs well guided and sealed between gliding strips that contribute to keep the system clean and maintenance free.

Transmission unit (6)

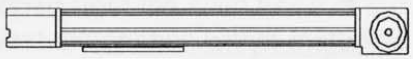
Based on our extensive and long experience as well as the cooperation with the most leading producers in Europe we deliver the TLE-units equipped with transmission units adapted as desired.

Installation possibilities

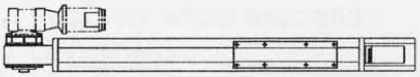
Orientation of the load



Load on top



Load underneath

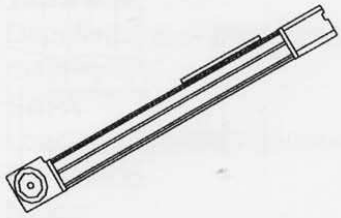


Load to the side

Travel direction

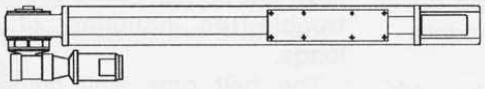
Horizontal

Vertical

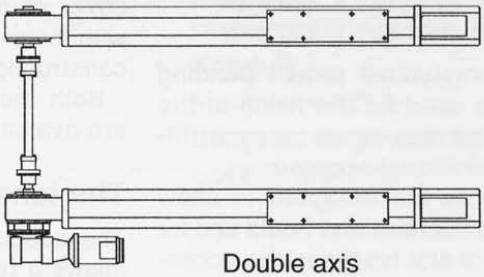


Inclined

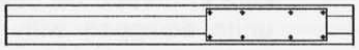
Variants and Options



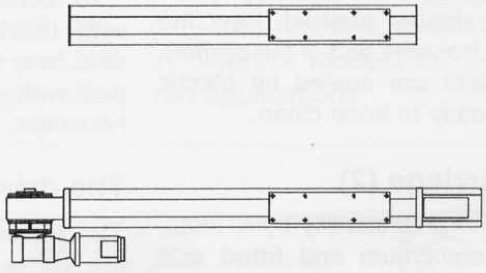
Single axis



Double axis

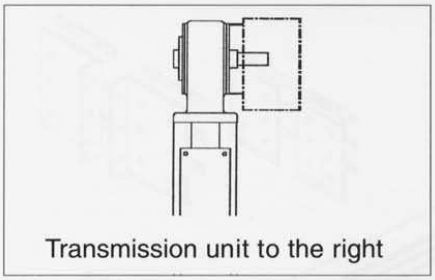


Free running axis

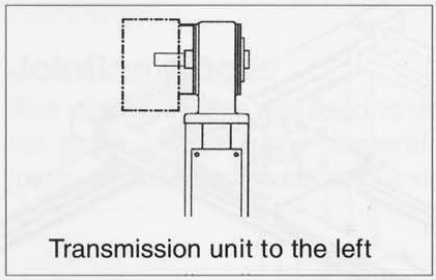


Double axis, one axis free running

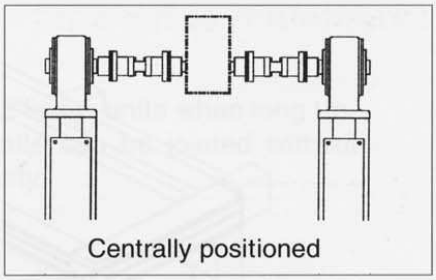
Transmission unit location



Transmission unit to the right

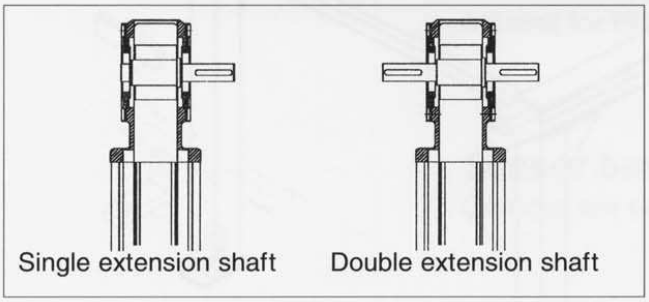


Transmission unit to the left

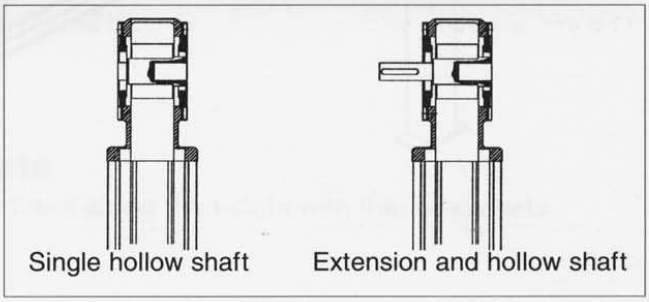


Centrally positioned

Drive shaft Options



Single extension shaft Double extension shaft

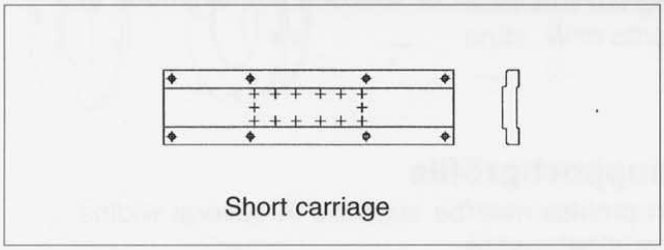


Single hollow shaft Extension and hollow shaft

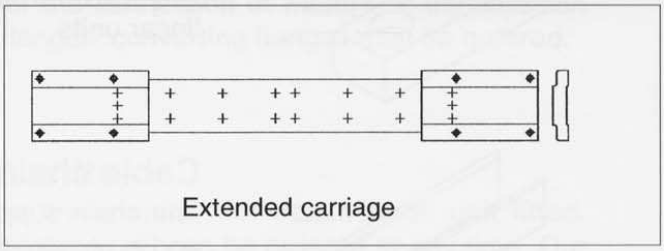
The units are primarily designed for fitting to hollow shaft transmission unit. Alternative models intended for transmission unit with extension output shaft and connection in series for multiple drive can be delivered. Units adapted to extension output transmissions are regarded as option. The Modal 225 is designed for Ø 45 mm and the Modal 300 for Ø 50 mm axle hole.

On request optional shafts are delivered. IEC standard flanges permit a number of different transmission unit fittings.

Carriages and covers



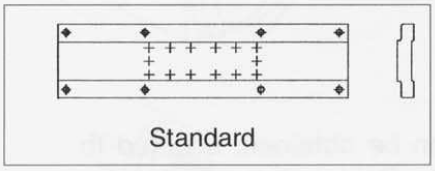
Short carriage



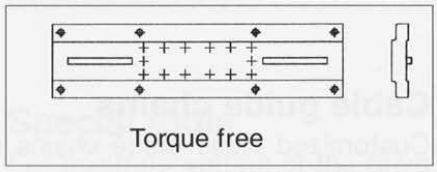
Extended carriage

Carriages are supplied in short or extended model.

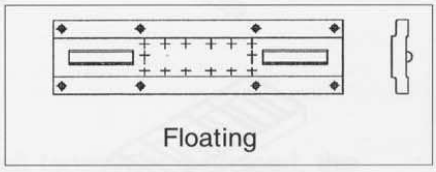
For the extended carriages the middle part is flexible.



Standard



Torque free

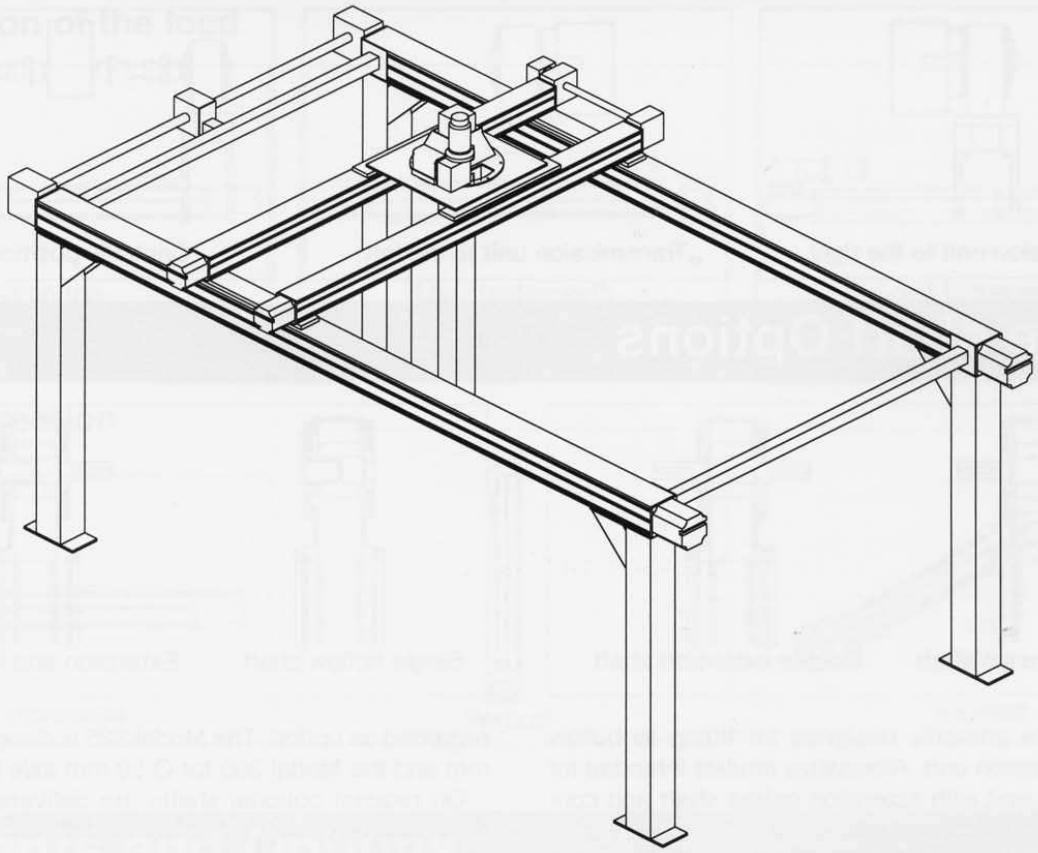


Floating

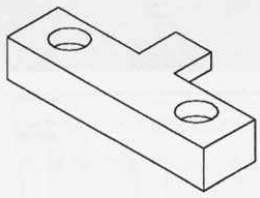
Both extended and short carriage can be supplied in three designs.

The combination torque free and floating covers is used at parallel fitting with longer distance between the units. This combination means that the profiles and the beams, fitted at right angles to the unit, will only transfer a limited torque to the carriage.

Accessories

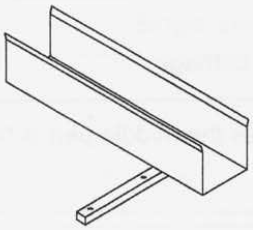


A comprehensive programme of accessories facilitates the use of the linear units in most applications.



Clamping plate

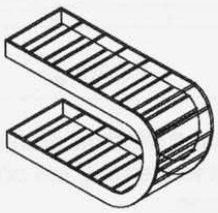
The clamping plate is used when fitting unit to unit perpendicularly. Several options correspond to different combinations of linear units.



Cable chain support profile

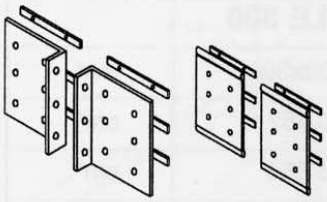
The chain support profiles may be supplied in several widths and in aluminium or steel.

For the fitting of the support profiles there are matching brackets to TLE 225 resp TLE 300.



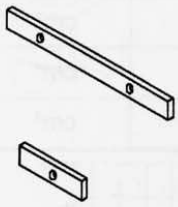
Cable guide chains

Customized cable guide chains can be obtained, adapted to many different designs and demands. Cooperation with the leading producers in Europe combined with our experience as system supplier results in rational and reliable solutions.



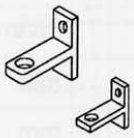
Jointing pieces

The jointing pieces are used to unite linear units when long travel paths are required. Several units can be jointed without lower standards of accuracy or rigidity.



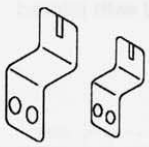
Slot blocks

The slot blocks offer a rational use of the t-slots in the profiles, with one single, or multiple holes. The thread for the TLE 225 is M8 and for the TLE 300 M10.



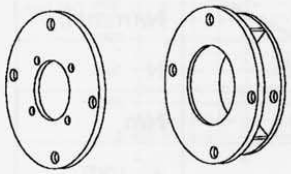
Sensor brackets

Sensors are easily fitted along the t-slots with these brackets.



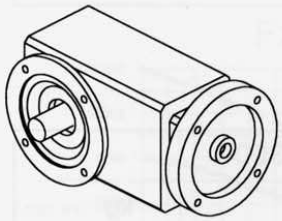
Guidance markers

When programming servo operated units the guidance markers - located in the t-slots - are useful. They can be supplied for both the TLE 225 and the TLE 300.



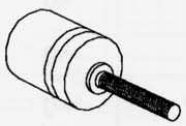
Flanges

The drive stations of the linear units are equipped with IEC standard flange for the connection of motors or transmission units. With other flanges, converting flanges may be ordered.



Transmission units

You can order the linear units with transmission unit fitted. Appropriate transmission unit can be ordered at any time. Our cooperation with leading transmission producers is based on extended experience and the transmission units we use are carefully adapted to the linear units.



Special tools

For accurate setting of the drive belt tension and preload, the special drive belt tension tool is recommended.

Technical Data

Profile sections:	TLE 225	TLE 300	
Cross-section	225x225	300x300	mm
Moment of inertia - I_x	5 472	18 757	cm^4
Moment of inertia - I_y	6 905	23 654	cm^4
Section Modulus - W_x	458	1 250	cm^3
Section Modulus - W_y	614	1 576	cm^3
Torsion Moment of Inertia - I_v	2 500	5 900	cm^4
Torsion section Modulus -W_v	350	600	cm^3

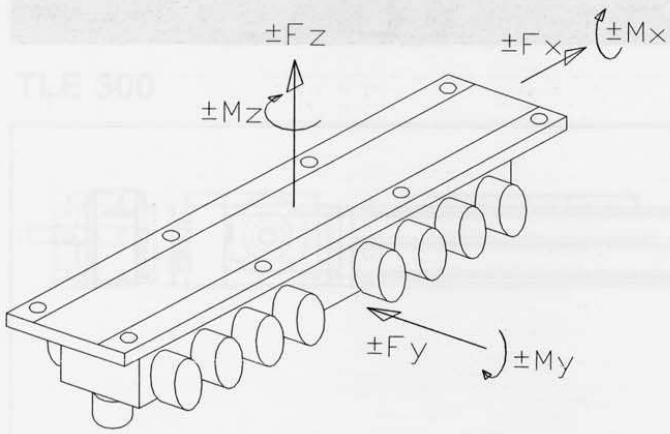
Speed, Travel path:	TLE 225	TLE 300	
Max. travel speed	5	7	m/s
Max. travel path, short cariage, undivided section*	11 000	10 950	mm
Max. travel path, long carriage, undivided section*	10 400	10 300	mm

*This is aquired with stock profiles. Whenever there is a need for longer travel path, this is easily arranged with jointed profiles. On request, longer sections can be extruded.

Belt drive, Accuracy:	TLE 225	TLE 300	
Belt profile	AT 10	AT 10	
Specific belt stiffness	6 250	9 375	N/(mm/m)
Maximum belt force*	25 000	37 500	N
Maximum drive shaft torque	3 500	7 380	Nm
Accuracy (repeatability)	0,2	0,2	+/- mm
Number of pulley teeth	44	62	-

*less than 1/3 of the breaking force.

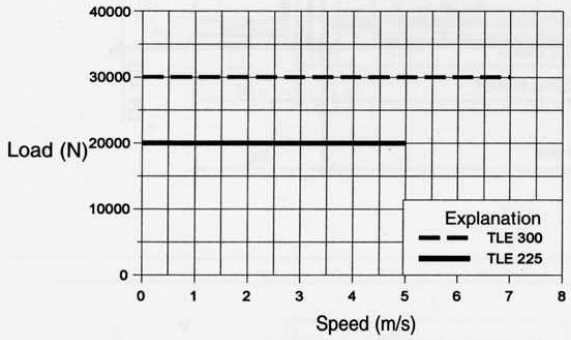
Weights, mass inertia:	TLE 225	TLE 300	
Weight Base unit, travel path o m, short carriage	96,3	157,7	kg
Weight Base unit, travel path o m, long carriage	114	186,2	kg
Weight / m travel path	29,5	58	kg
Mass moment of inertia reflected to drive shaft, short carriage	1 500	6 000	kg cm2
Mass moment of inertia reflected to drive shaft, long carriage	1 530	6100	kg cm2



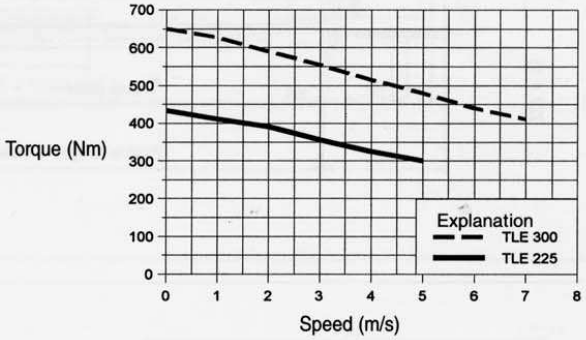
Forces and torques capacity

The capacity of the carriage to handle forces and torques is depending of the speed. The rollers in the carriages can be fitted differently to optimize the carriage for varying load cases and purposes.
The curves are valid for the Short carriage in standard version. Extended carriages have higher load capacity. In general, only one single force is allowed at once in one axis at maximum load and speed.

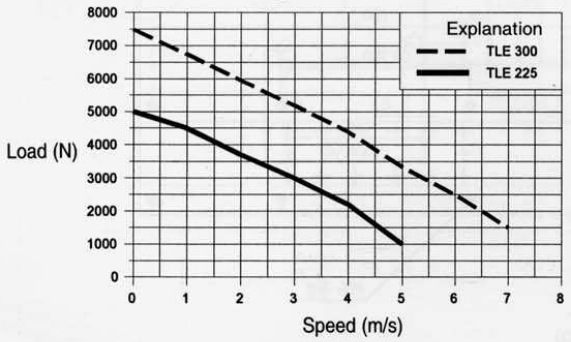
Fx



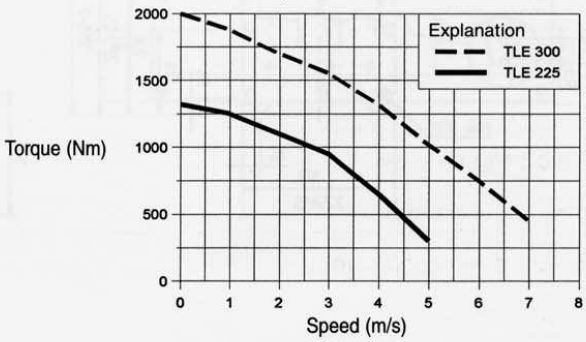
Mx



Fy



My



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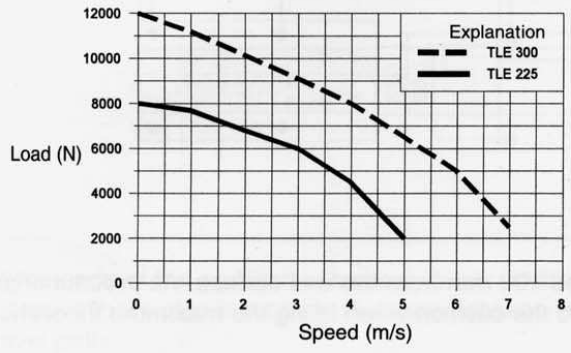
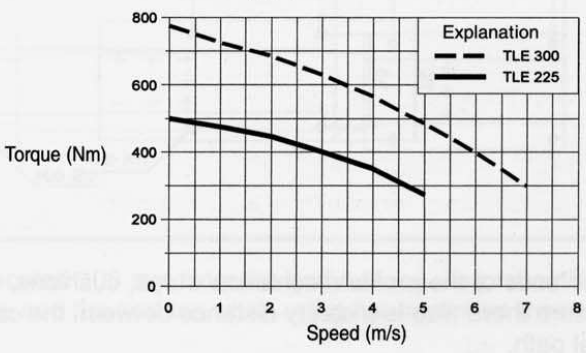
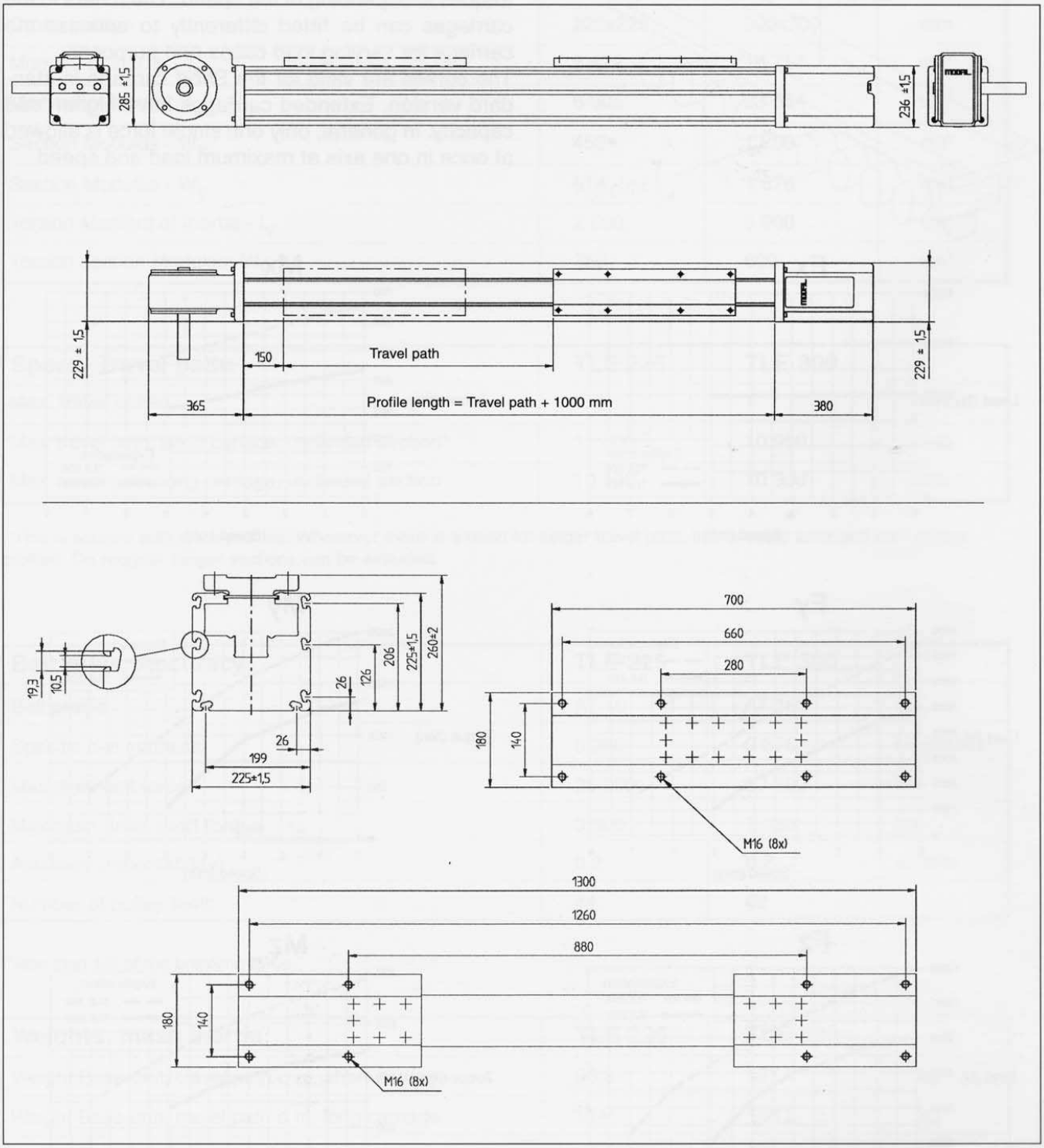


Mz



Installation Dimensions

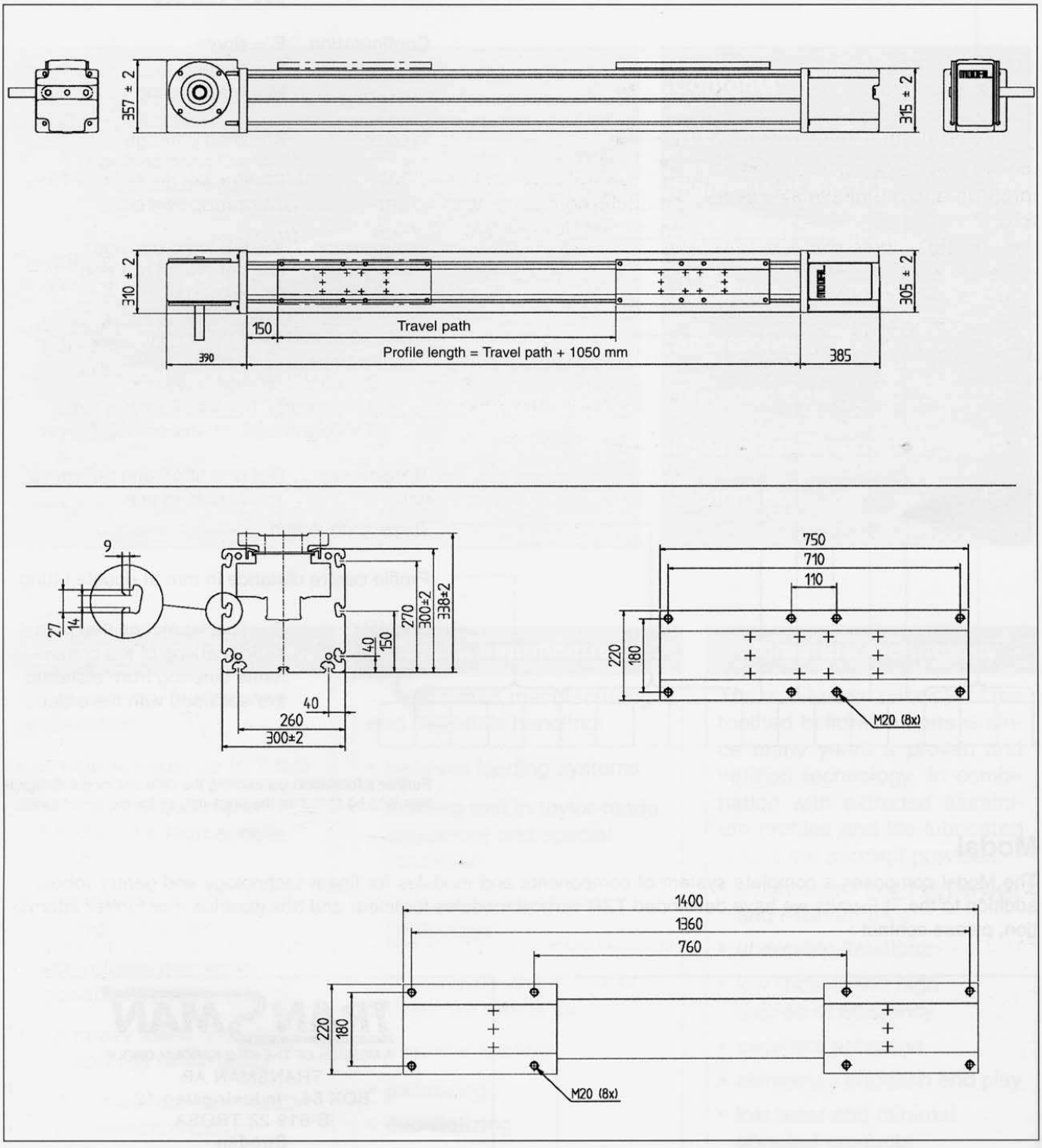
TLE 225



At the ends of the profile mechanical stops, cushions, are located 100 mm from the end surface. As precautionary measure there also is a safety distance between the carriage and the cushion when using the maximum theoretical travel path.

The profile length concerning the short carriage is the travel path + 1000 mm and concerning the extended carriage the profile length is the travel path + 1600 mm.

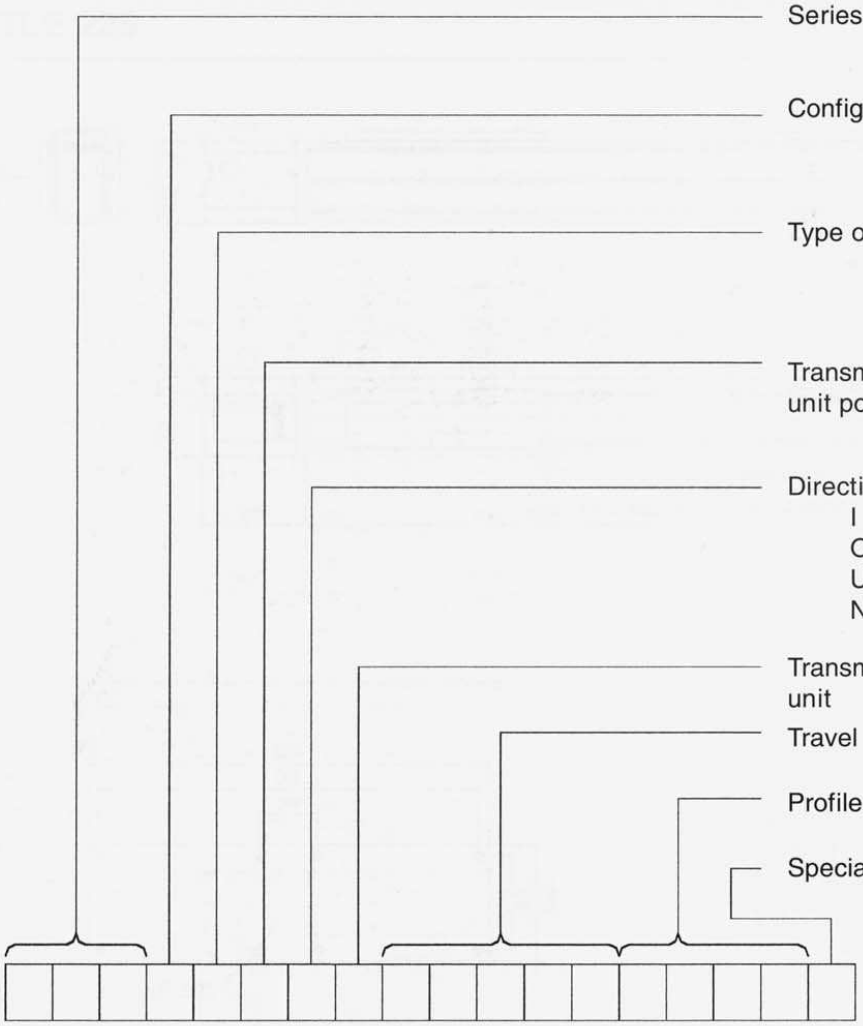
TLE 300



At the ends of the profile mechanical stops, cushions, are located 100 mm from the end surface. As precautionary measure there also is a safety distance between the carriage and the cushion when using the maximum theoretical travel path.

The profile length concerning the short carriage is the travel path + 1050 mm and concerning the extended carriage the profile length is the travel path + 1700 mm.

System Key



Series	225 = TLE 225 300 = TLE 300
Configuration	E = single D = double M = free running
Type of	K = short carriage L = extended carriage F = floating cover T = torque free cover
Transmission unit position	V = left hand position H = right hand position C = central position
Direction of incoming drive shaft	I = towards the tension housing O = off the tension housing U = upwards, towards carriage cover N = downwards, off the carriage cover
Transmission unit	G = unit fitted and delivered Travel path in mm
Travel path in mm	
Profile centre distance in mm at double fitting	
Special	S = special means that plans/ specifications of the components differing from standard are enclosed with the order.

Further information concerning the different model designation is to be found int the price-list, as for the accessories.

Modal

The Modal comprises a complete system of components and modules for linear technology and gantry robots. In addition to the TLE-units we have developed TZR vertical modules for linear and box gantries. For further information, please contact :

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