

Mechbelt

Original instructions

820A

EN



Declaration of incorporation of partly completed machinery / Försäkran för inbyggnad av en delvis fullbordad maskin

According to the Machinery Directive 2006/42/EC, Annex II B / i enlighet med EU:s Maskindirektiv 2006/42/EG, Bilaga II B

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Denomination / Benämning:	Machine type / Maskintyp:	Type / Typ:
Mechbelt	Linear system Linjärsystem	ALS1 ALS2

Applied EC guidelines / Tillämpade EG-riktlinjer:


2006/42/EC	Machinery Directive / Maskindirektivet
2006/95/EC	Low Voltage Directive / Lågspänningsdirektivet
2004/108/EC	EMC Directive / EMC-direktivet

The above mentioned machinery are not allowed to put into service until the machinery, into which it is to be incorporated or of which it is to be a component, has been found and declared to be in conformity with the above mentioned directives.

Ovanstående maskin får inte tas i bruk förrän den maskin eller anläggning, i vilken den skall ingå i, i sin helhet överensstämmer med kraven enligt ovanstående direktiv.

KRISTIANSTAD 2010-02-09

(Place and date)


(Signature)
Staffan Nilsson
Name: _____
Head of engineering department / Konstruktionschef
Position: _____

Although the greatest care was taken regarding the information in this publication, we assume no responsibility for any errors. We reserve the right to make changes.

ILLUSTRATIONS – The illustrations in the publication represent the described products, but the delivered goods may differ in some respects from the illustrations.

SPECIFICATIONS – The right is reserved to make changes in design and dimensions compared with the information in the publication in order not to prevent development of designs, material and manufacturing methods.

The customer is reminded that in the purchase of Movomech's products for application on the job or elsewhere, there is supplementary, current information that could not be included in the publication in terms of recommendations on each product's suitability regarding different combinations of Movomech's comprehensive product line.

All relevant information must be provided to the persons who are responsible for the application of the product.

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1 Safety

Movomech AB's equipment is manufactured in accordance with the latest technological advances.

All products are manufactured according to the latest European standards, e.g. EG Machinery Directive (MD).

The aim of this documentation is to provide the user with practical instructions for safe operation and simple maintenance of the equipment.

Anyone who deals with the installation of the equipment (including related equipment), operational procedure, use, maintenance, and/or repair functions must have read and understood:

- The instruction manual
- The safety regulations
- The safety instructions for each individual section.

In order to avoid misuse and to ensure the reliable operation of the products, we recommend that the instruction manual is always available to the user/operator.

1.1 Intended usage

The equipment is intended exclusively for transportation, lifting and lowering of load. Any other use, including the towing of a load and the transportation of passengers, is prohibited (see below for more examples).

Movomech AB does not accept responsibility for damage caused by such use. All risks are the sole responsibility of the user.

The equipment may only be used in perfect technical condition by trained staff, and in accordance with current safety and work protection regulations. Furthermore, the user must observe operational and maintenance conditions contained in the instruction manual.

Severe personal injury and damage to equipment can be caused by:

- Removal of covers and casings
- Non-professional installation of equipment
- Incorrect usage
- Insufficient maintenance

1.2 Prohibited usage

Certain types of activities and operations are prohibited, as in specific circumstances they can cause personal injury as well as permanent damage to the construction.

For example:

- It is prohibited to convey passengers using the equipment.
- Never transport suspended loads above anyone's head.
- Never drop a suspended load, and make sure it is lifted in a straight line.
- Never loosen secured or fastened loads by using the equipment.
- Do not overload.
- Do not leave a suspended load unattended.

1.3 General safety aspects

The instruction manual should always be kept within easy reach of the equipment. It contains important safety information and sections that relate to guidelines, norms, and regulations. Failure to follow the safety regulations in this instruction manual may result in personal injury or death.

In addition to the instruction manual, generally applicable regulations and rules must be followed and adhered to in order to avoid accidents and protect the environment. This also applies to regulations relating to the handling of products dangerous to the environment and the use of personal safety equipment.

As regards all work associated directly or indirectly with the equipment, the user must follow and adhere to all the above regulations as well as current work protection and safety regulations. In spite of this, a life-threatening risk still prevails in cases where the equipment is used and operated by non-trained or non-instructed staff in a non-professional or non-intended way. The user should supplement the instruction manual with instructions that consider the nature of the operation, e.g. company organisation, work procedures, and number of staff.

The members of staff who are assigned to work with the equipment must have read the instruction manual prior to undertaking any work, and he/she should pay particular attention to the chapters containing safety instructions. It is too late once work has commenced! This applies in particular to members of staff who are working with the equipment on a temporary basis, e.g. for maintenance purposes.

When convenient, the staff should be tested on their knowledge of the manual's contents that relate to safety and accident awareness.

The user is responsible for ensuring that the equipment is used only when it is in perfect condition and that all applicable and relevant safety regulations and requirements are followed.

The equipment should be taken out of operation immediately if functional damage or defects are discovered. Personal safety equipment should be used as and when necessary, or when required by regulations. Safety and warning devices, such as signs, stickers and labels must not be removed or made illegible.

All safety and warning devices on or adjacent to the equipment should be complete and maintained in a legible/functional condition.

All changes, extensions or reconstruction that may affect safety are forbidden without written permission from Movomech AB. This also applies to assembly and adjustment of safety equipment and welding of structural parts.

Spare parts must comply with Movomech AB's stated technical requirements. This compliance is guaranteed when original spare parts are used. The intervals prescribed or stated in the instruction manual for regular testing/inspection must be adhered to!

1.4 Staff selection and qualifications

Reliable staff must carry out work with/on the equipment. Regulations that apply to under-age persons must be followed.

The user is responsible for supplying necessary training and instructions to those that he/she employs, including professionals and/or apprentices.

It is recommended that the user draws up instructions and guidelines relating to the causes of errors, communicates these to the relevant staff, and posts directions on appropriate and clearly visible places.

It is recommended that the user makes sure that the knowledge of the staff is adequate as regards the following points, prior to the operation of the construction:

- Knowledge of the contents of the instruction manual
- Knowledge of the safety and user regulations contained therein
- Knowledge of applicable work protection regulations

Only trained and instructed staff should be permitted to work with the equipment. Parameters relating to use, maintenance, and installation should be clarified.

1.5 Safety instructions for usage

The only persons allowed to work on the electrical equipment are competent staff members who work in accordance with regulations and standards for high-voltage equipment.

No persons under the influence of drugs, alcohol or medication which affects their ability to react, are allowed to use, maintain, or repair the construction.

All stated actions and instructions relating to work protection and issues relating to general safety and protection of workers that should be carried out or studied prior to, during or following operation must be followed to the letter. Failure to do so may result in fatal accidents.

The equipment should be stopped or taken out of operation at the time of detection of faults relating to work protection and operational accessibility.

Safety equipment must not be deactivated, altered or used in a way that conflicts with applicable regulations. Appropriate actions must be taken to ensure safe operation and functional conditions for the user. The equipment should only be used when all protective and safety equipment, such as detachable guards and emergency stop devices, are in place and in working order.

Any type of modification and alteration of the equipment is prohibited. However, this does not apply to lesser changes that do not affect the strength, operational safety or work protection, or to actions which promote an increased level of safety. The fundamental responsibility for these changes lies with the user. If in doubt, contact Movomech AB for written approval of the actions prior to implementation.

The equipment should be stopped and locked immediately when functional faults occur. Faults should be corrected immediately.

Anyone who detects an immediate danger must without delay press the emergency stop button. This also applies to damage to parts of the equipment that demand immediate stoppage of operation.

Following an "emergency stop" the user has to wait for the cause of the disruption to be repaired and for an assurance that there is no further danger before he/she reconnects the equipment and resumes operation.

The equipment should be disconnected immediately in the following cases:

- When electrical equipment, cables, and/or insulation material is damaged
- When brake functions and/or safety equipment are defect

Specific local circumstances or applications may lead to situations that were unknown at the time of writing this document. In such cases, the user must ensure safe operation and disconnect the equipment until measures to maintain safe operation have been carried out in conjunction with Movomech AB or other authorised party.

Ensure that no one can become injured when they use the equipment prior to connecting/activating the equipment.

If the user notices the presence of persons who may become injured during operation, the operation should be discontinued immediately and must not be resumed until these persons have left the dangerous area.

The user must make sure that the equipment is in a perfect and operationally safe condition prior to all operations using the equipment.

The user should carry out all prescribed safety measures and make sure that automated procedures are completed when the equipment is disconnected (e.g. when there are deficiencies as regards operational and personal safety, an emergency situation exists, repair or maintenance is being carried out, damage is noticed or at the completion of work).

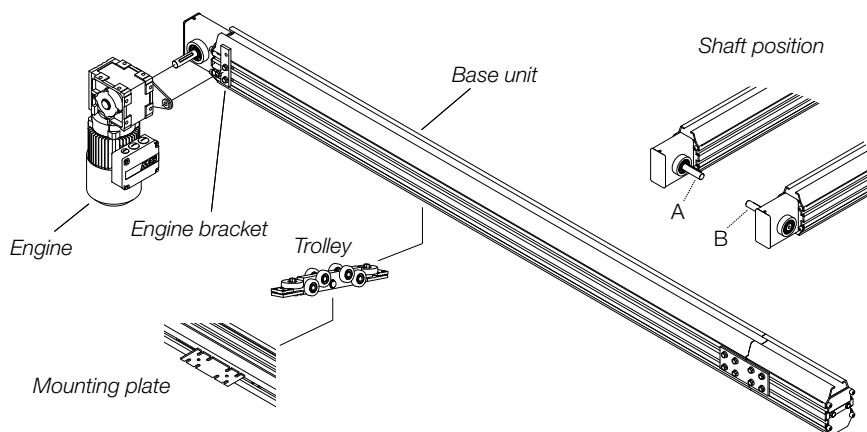
Work with the equipment is only allowed when the operator has been instructed to do so by his superior, and if the operator has knowledge of the equipment and its function.

2 Technical data

2.1 Design overview

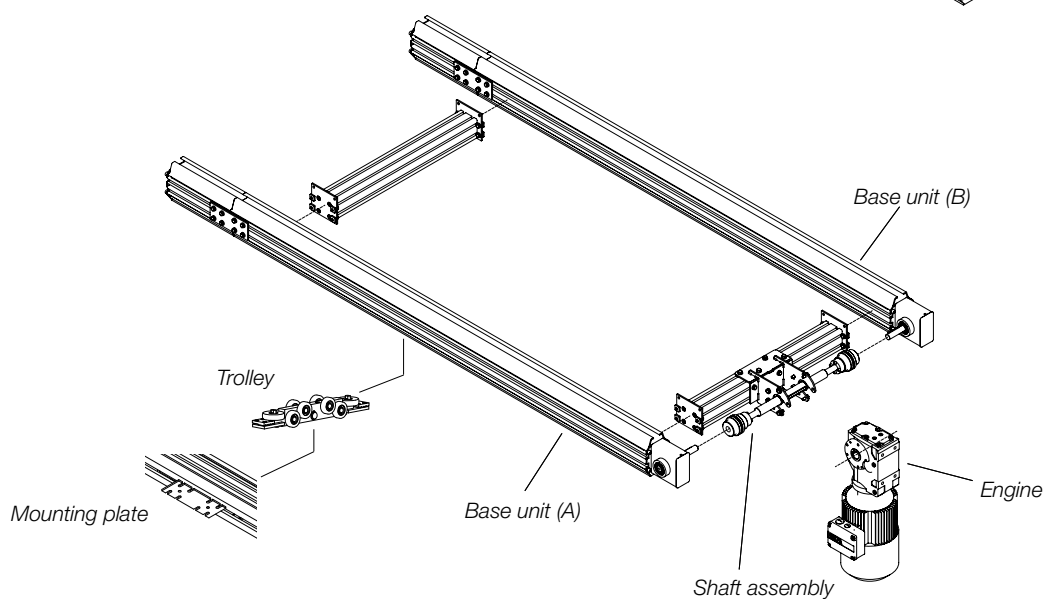
Single Mechbelt

- I. Base unit
- II. Engine bracket
- IV. Trolley
- V. Mounting plate
- VI. Engine

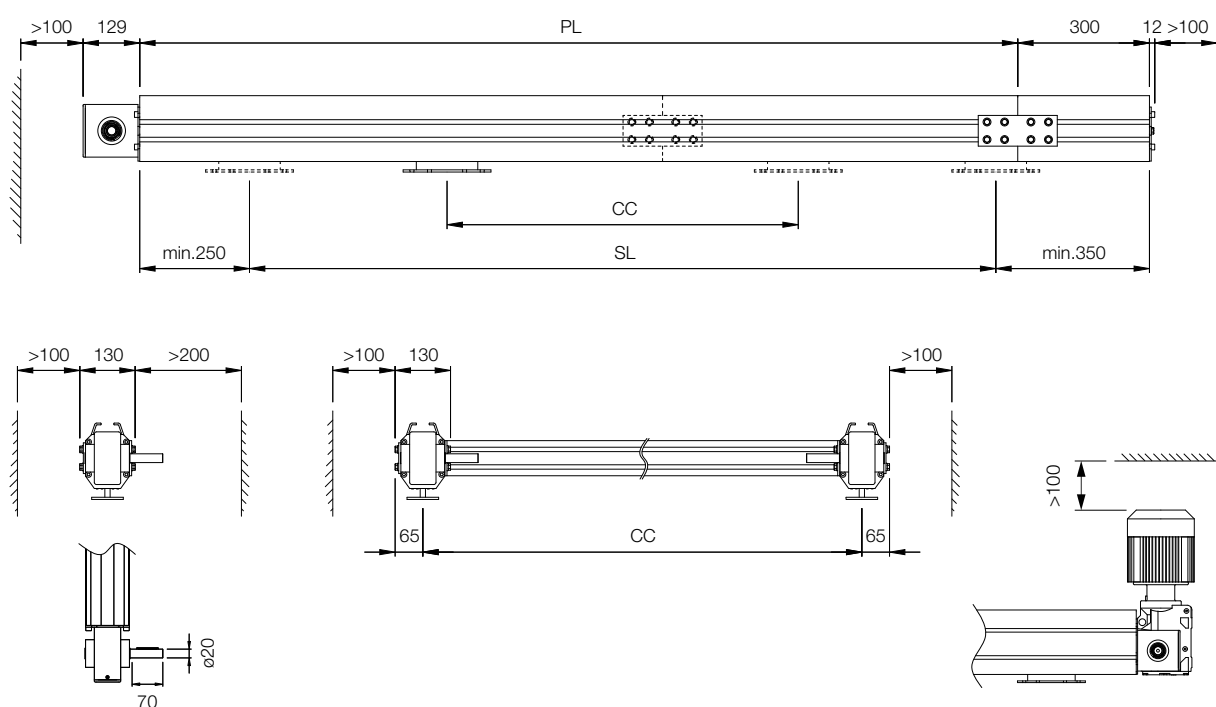


Double Mechbelt

- I. Base units (A+B)
- III. Shaft assembly
- IV. Trolley
- V. Mounting plate
- VI. Engine



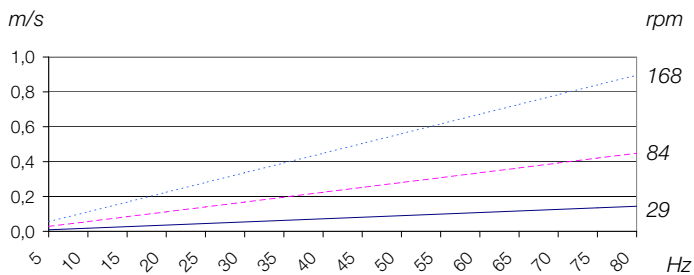
2.2 Dimensions



2.3 Performance

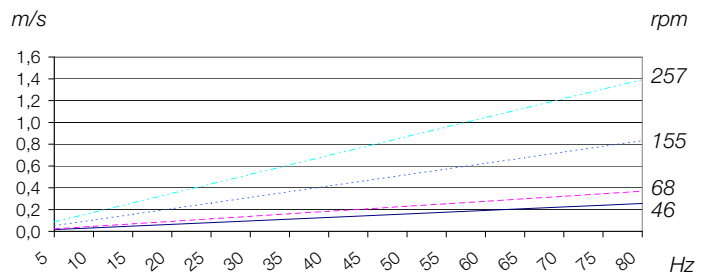
Translation speed*

Single Mechbelt



v [m/s]		
r/min	50 Hz	75 Hz
29	0,09	0,13
84	0,28	0,42
168	0,56	0,84

Double Mechbelt

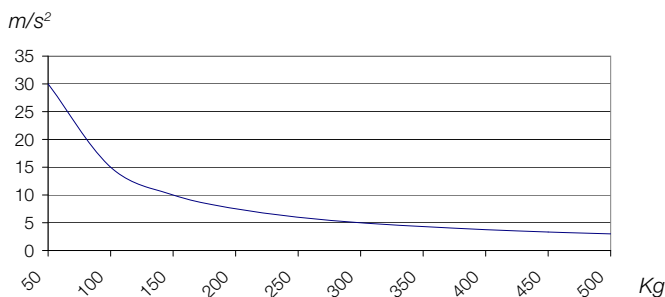


v [m/s]		
r/min	50 Hz	75 Hz
46	0,16	0,24
68	0,23	0,34
155	0,52	0,78
257	0,87	1,3

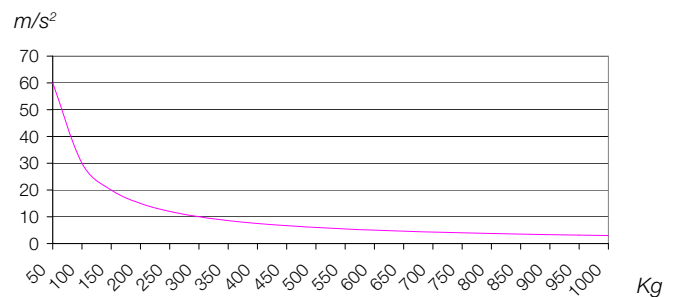
$$\text{Speed } v \text{ (m/min)} \\ v = 0,062 \cdot \pi \cdot n \quad (n = r/\text{min})$$

Allowed acceleration/deceleration

Single Mechbelt

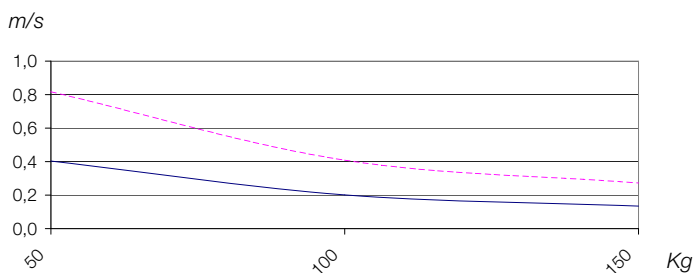


Double Mechbelt

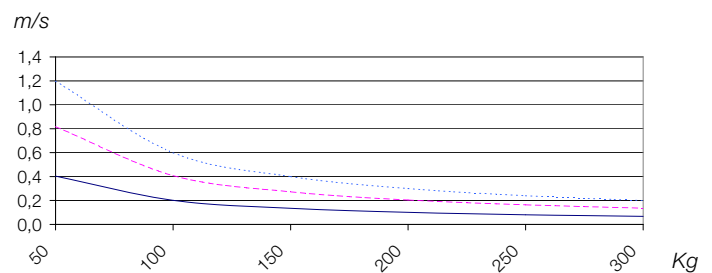


Allowed vertical speed

Single Mechbelt



Double Mechbelt



OBSERVE!

Maximum load:

- Single vertical Mechbelt: **150 kg**
 - Double vertical Mechbelt: **300 kg**
- (dynamic forces included)

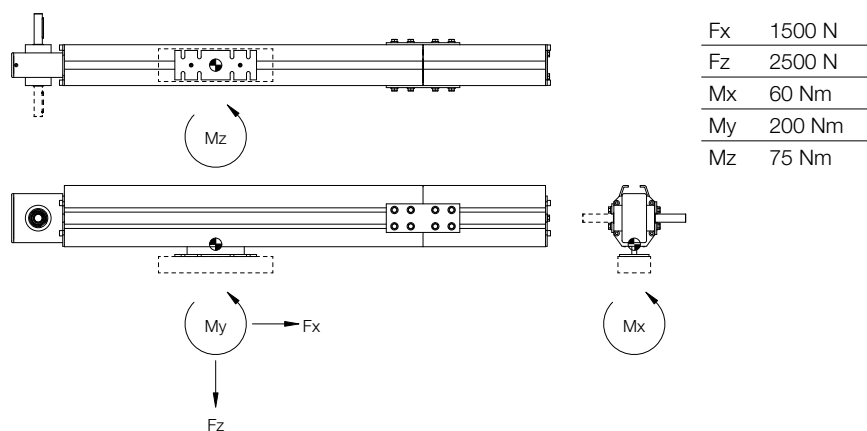
Maximum acceleration of vertical Mechbelt: **2 m/s²**

Vertical drive requires usage of engines with holding brake function!

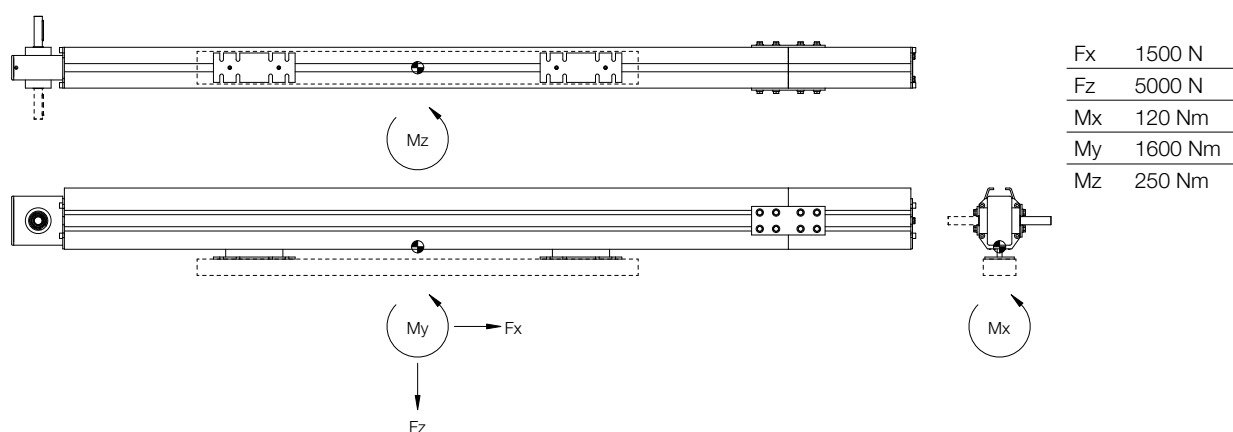
* Data based on engines in chapter 2.5.

2.4 Force and moment retention

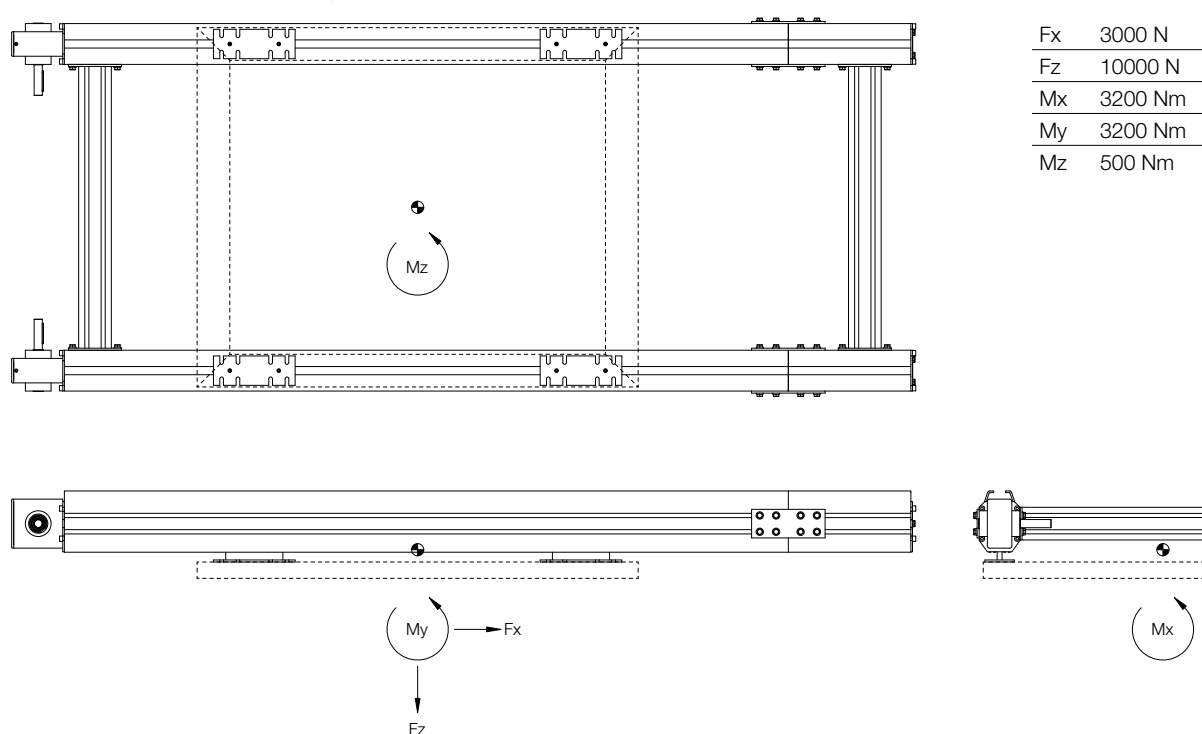
Single Mechbelt with single trolley



Single Mechbelt with double trolley



Double Mechbelt with double trolley



VI. Engine

Single Mehbelt

With brake

	<i>r/min</i>	<i>m/min</i>	<i>Nm</i>	<i>Configuration</i> <i>B01-B09</i>
0,37 kW	29	5,6	69	737771
	84	16,4	33 ¹	737772
	168	32,7	19 ²	737773
0,75 kW	84	16,4	68	737777
	168	32,7	38 ³	737778

¹⁻³ When used for vertical drive,
maximum load is limited to:

¹ 105 kg

² 60 kg

³ 125 kg

Without brake *

	<i>r/min</i>	<i>m/min</i>	<i>Nm</i>	<i>Configuration</i> <i>B01-B03</i>
0,37 kW	29	5,6	69	737774
	84	16,4	33	737775
	168	32,7	19	737776
0,75 kW	84	16,4	68	737779
	168	32,7	38	737780

* Not for vertical drive

Double Mehbelt

With brake

	<i>r/min</i>	<i>m/min</i>	<i>Nm</i>	<i>Configuration</i>								
				<i>B01</i>	<i>B02</i>	<i>B03</i>	<i>B04</i>	<i>B05</i>	<i>B06</i>	<i>B07</i>	<i>B08</i>	<i>B09</i>
0,37 kW	46	8,9	77	737901	737902	737903	737904	737901	737904	737902	737903	737902
	68	13,2	52	737905	737906	737907	737908	737905	737908	737906	737907	737906
	155	30,1	23 ¹	737909	737910	737911	737912	737909	737912	737910	737911	737910
	257	50,0	14 ²	737913	737914	737915	737916	737913	737916	737914	737915	737914
0,75 kW	46	8,9	156	737917	737918	737919	737920	737917	737920	737918	737919	737918
	68	13,2	105	737921	737922	737923	737924	737921	737924	737922	737923	737922
	155	30,1	46	737925	737926	737927	737928	737925	737928	737926	737927	737926
	257	50,0	28 ³	737929	737930	737931	737932	737929	737932	737930	737931	737930
1,1 kW	47	9,1	225	737933	737934	737935	737936	737933	737936	737934	737935	737934
	69	13,4	152	737937	737938	737939	737940	737937	737940	737938	737939	737938
	157	30,5	67	737941	737942	737943	737944	737941	737944	737942	737943	737942
	261	50,8	40 ⁴	737945	737946	737947	737948	737945	737948	737946	737947	737946

¹⁻⁴ When used for vertical drive,
maximum load per Mehbelt is
limited to:

¹ 75 kg

² 45 kg

³ 90 kg

Without brake *

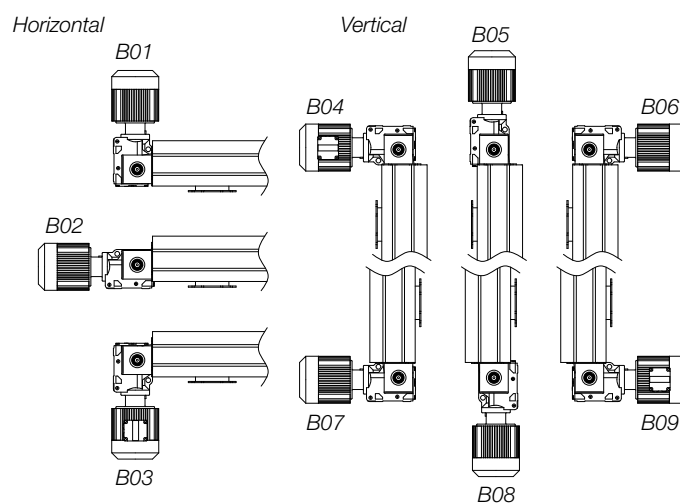
	<i>r/min</i>	<i>m/min</i>	<i>Nm</i>	<i>Configuration</i>		
				<i>B01</i>	<i>B02</i>	<i>B03</i>
0,37 kW	46	8,9	77	737950	737951	737952
	68	13,2	52	737954	737955	737956
	155	30,1	23	737958	737959	737960
	257	50,0	14	737962	737963	737964
0,75 kW	46	8,9	156	737966	737967	737968
	68	13,2	105	737970	737971	737972
	155	30,1	46	737974	737975	737976
	257	50,0	28	737978	737979	737980
1,1 kW	47	9,1	225	737982	737983	737984
	69	13,4	152	737986	737987	737988
	157	30,5	67	737990	737991	737992
	261	50,8	40	737994	737995	737996

Required vertical power $P=m \cdot v(a+16,35)$
Required horizontal power $P=m \cdot v(a+0,245)$

P = power [W]
m = total mass in motion [kg]
v = speed [m/s]
a = acceleration [m/s²]

* Not for vertical drive

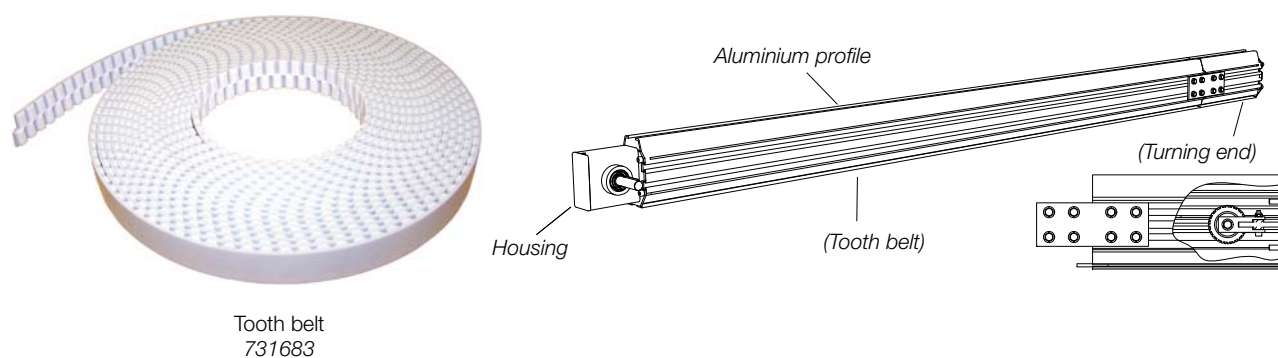
2.6 Configurations



2.7 Spare parts

Base unit	737700-737712	737713-737725	737726-737738	737739-737751	Quantity
Housing	731651	734632	731664	734633	1/base unit
Turning end	737653	737653	733711	733711	1/base unit
Tooth belt $L=2 \times PL + 0.42$	731683	731683	731683	731683	1/base unit
Engine	*	*	*	*	1

* Acc. to Mechbelt specification



3 Usage instruction

Mechbelt is a belt-driven linear unit for driving linear movements in x, y and z directions up to 13.7 metres in horizontal as well as vertical directions. The product is delivered in a customer-adapted version with a project-specific combination of motor and gear. With units mounted in pairs, loads up to 500 kg can be transported. The drive is executed by a tooth belt, and has an option of parallel drive of two units by the same motor. On the output shaft it is possible to attach a pulse counter for load positioning.

Since Mechbelt is a project-specific product delivered without control units or programming, a usage instruction is not included in the product documentation.

MechBelt is mainly used in automated equipment, for example packing stations automatic staplers, pallet loading robots, robot cells, goods elevators and feeding units.

In order to avoid misuse and to ensure the reliable operation of the products, we recommend that the instruction manual is always available to the user/operator.



4 Service and maintenance

A general review and functional control tests are performed on a regular basis during commissioning.

All service and maintenance shall be recorded. The user should make sure that material for the purpose is easily available.

NOTE: Make sure that damaged components are replaced immediately in order to avoid possible personal and material damage.

Do not connect the equipment until the workplace is cleaned. This is important for the comfort and well-being of personnel and facilitates service and maintenance. Dirt gives a clear indication of the equipment not being properly maintained, which may possibly affect the remaining guarantees on the equipment.

4.1 Maintenance safety instructions

The prescribed procedures and service intervals, including those concerning the replacement of parts/accessories, are described in the instruction manual and must be followed. Professionals are the only persons who are allowed to carry out such procedures.

Staff members with appropriate competence and authority are the only persons who are allowed to carry out mechanical and electrical repair and maintenance work. Unauthorised persons should be prohibited to work with machines and devices inside the equipment.

The equipment should be disconnected and secured against unintentional or unauthorised use, including reconnection, during all repair and maintenance work.

It should be confirmed that the equipment is free from voltage before any work on electric equipment is commenced.

Make sure that:

- The main power supply is disconnected
- Moving parts are stationary and locked
- Moving parts cannot move accidentally during maintenance work
- It is not possible to accidentally reconnect the power supply during maintenance and repair work

Use safe and environmentally friendly maintenance products and spare parts!

4.2 Directions for work during operation

The user or the "authorised person" must, in each individual case, ensure that the work in question can be carried out without any risk of personal injury because of specific local conditions.

To prevent accidents, only approved and suitable tools and aids may be used during maintenance, adjustment and repair work.

Do not touch rotating parts. Maintain an adequate safe distance between yourself and the machinery to prevent clothes, limbs and hair from becoming caught.

Avoid the occurrence of naked flame, extreme heat (e.g. welding) and sparks in the presence of volatile cleaning materials and nearby inflammable or heat-sensitive materials (e.g. wood, plastics, oils, fats and electric equipment). This can result in fire hazard, harmful gases and damaged insulation.

4.3 Directions for work with electric equipment*

Use only original fuses with the appropriate rating. The equipment should be stopped immediately on discovery of faults related to the electric power supply. Defect fuses must not be repaired or bypassed and should only be replaced with fuses of the same kind.

Work on electric equipment and electric components or parts must be carried out by an electrician or authorised staff in accordance with current electric safety regulations.

The parts of the equipment on which inspection, maintenance, and repair work is to be carried out should be disconnected from the power supply.

The electrical equipment should be inspected regularly. Deficiencies, such as loose connections, should be rectified without delay.

When it is necessary to work with live parts, a second member of staff, whose responsibility it is to activate the emergency stop and deactivate the main switch in case of an emergency, should be called in. Isolate the work area with a red/white chain or tape and warning signs. Use only voltage-insulated tools.

Electric connectors must be free of voltage (exemptions include socket-outlets, unless safety precautions state that these are dangerous to be in contact with) before they are disconnected or connected.

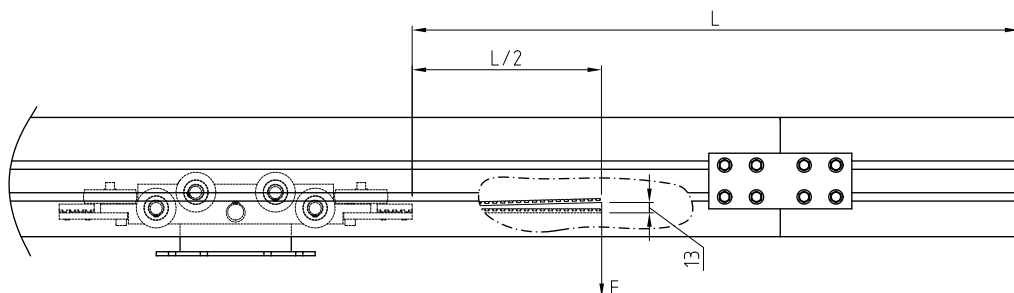
* When applicable (overheating 2A declaration).

4.4 Tooth belt tension

It is necessary to regularly check for wear on the tooth belt according to the service protocol. Environmental and work conditions determine the frequency of the maintenance intervals.

Measuring belt tension

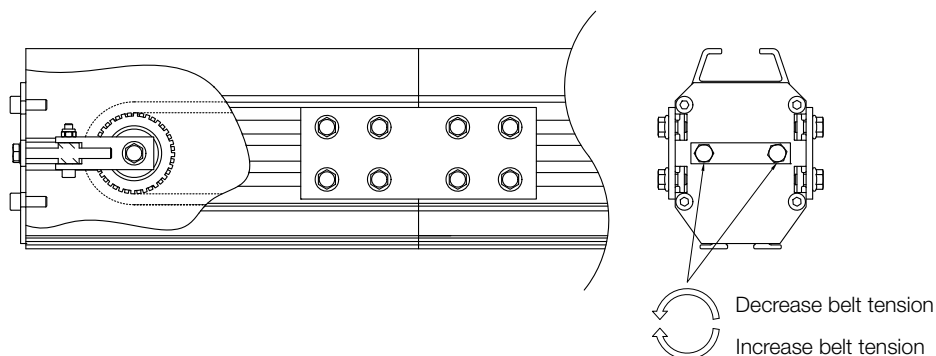
To measure the belt tension, a pressure dynamometer is used. When the tooth belt is pressed inwards 13 mm, the measured force F (N) should be in accordance with the corresponding value for the specific distance L (m) according to the picture and table below.



L (m)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
F (N)	90	45	30	23	18	15	13	11	10	9	8	8	7	7	6	6

Belt tension adjustment

Adjustment of belt tension is done with the belt tensioning unit at the turning end of the base unit, see picture.



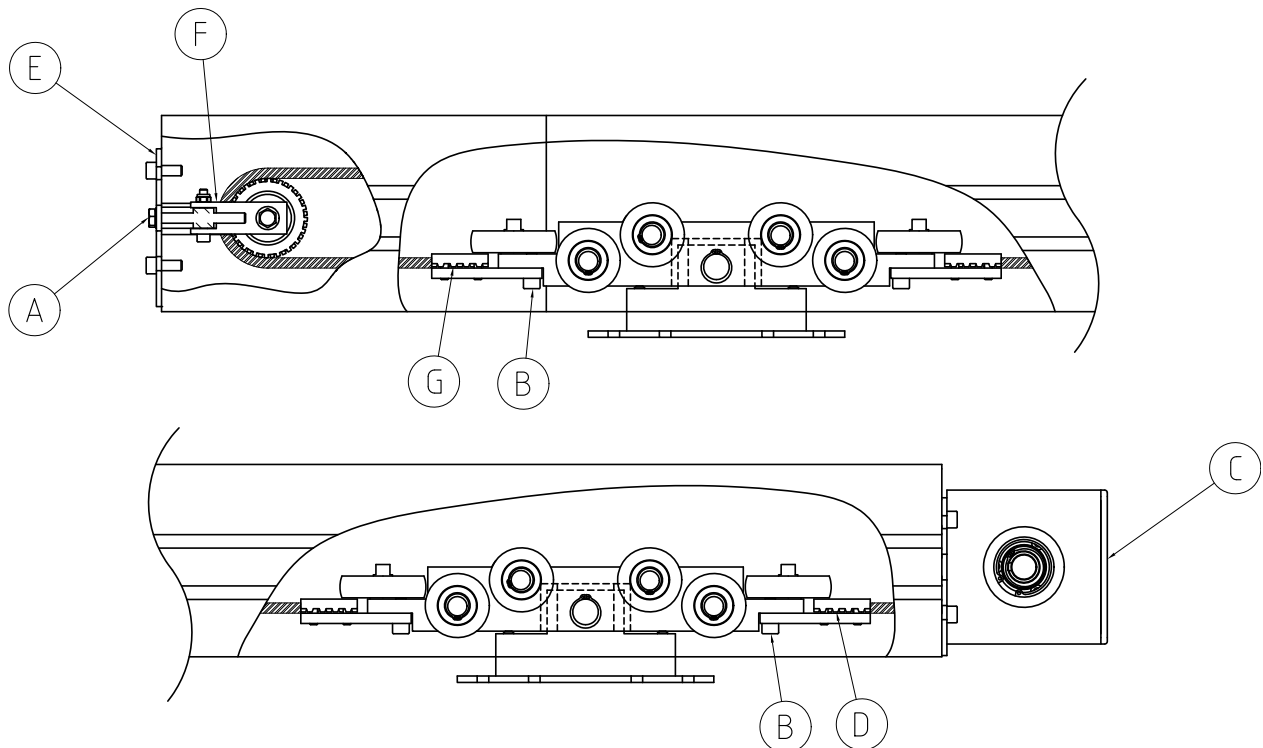
4.5 Exchange of tooth belt

If the tooth belt has burst or is worn out it must be replaced. As a general rule, the tooth belt is worn out and should be replaced when it is no longer possible to adjust belt tension to its correct value.

Safety precautions

The following precautions must be respected when a tooth belt is detached and removed from a transmission during an exchange:

- Always shut off the drive unit and unload the unit from all external loads and stresses.
- Always use safety glasses.
- Always use suitable protective clothing, gloves and safety shoes.
- Make sure the tools are in good condition.
- Always loosen tightening devices.
- Support the tooth belt to avoid a sudden drop of the tooth belt or other components.
- Never try to disassemble or remount a tooth belt transmission without completely understanding the design and function of the unit.
- Never reuse a worn tooth belt or belt wheel.



Removal of existing tooth belt

1. Unload the belt by loosening the M8 screws at A. Do not remove them completely.
2. Remove the two M8 screws at B to free the belt from the trolley.
3. Remove the end cover C from the housing end of the track.
4. Pull out the belt with its end attachment D and demount the attachment.
5. Loosen completely the four M8 screws at E in order to remove the belt tensioning unit.
6. Move the trolley to the belt tensioning unit side of the track and dismount the attachment G.
7. Loosen the belt from the belt tensioning unit.

Installation of a new tooth belt

1. Enter the new belt with the teeth pointing downwards into the track through the upper hole in the belt tensioning unit end of the track.
2. Fasten the end attachment D at the end of the belt.
3. Guide the belt with its attachment around the belt wheel in the housing end of the track.
4. Screw the attachment onto the trolley at B.
5. Guide the belt around the belt wheel in the belt tensioning unit F.
6. Fasten the attachment G onto the belt.
7. Fasten the attachment G onto the trolley at B.
8. Remount the belt tensioning unit at E.
9. Adjust the belt tension with the M8 screws at A. Recommended tensioning moment is 2.7 Nm.
10. Make sure that the belt is well-fitted onto the teeth of the belt wheel.
11. Mount the end cover C at the housing end of the track.

4.6 Service record

The protocol is an acknowledgement that the equipment has been serviced according to Movomech's instructions and must be filed by the customer.

Place:

Date:

Equipment number:

Service technician:

Before continuing operation, the service technician must carry through checks below.

If the service technician determine that the equipment does not work as intended, or is impaired by errors, the equipment must be taken out of operation.

Errors can be such as:

- Damaged components,
- damaged tooth belt,
- unusual noise, etc.

Checks	Done	
Check that forward/backward motions or lifting/lowering motions are stopped when not manoeuvring the equipment, according to project-specific documentation.	<input type="checkbox"/>	
Check fastening elements for missing bolts, nuts and washers. Tightening according to moment table.	<input type="checkbox"/>	
Check tightening torque on bolts in clamping elements in the shaft coupling. Should be 17 Nm.	<input type="checkbox"/>	Double Mechbelt only.
Check that the belt wheels turn without remarks (noise, vibrations).	<input type="checkbox"/>	
Check the tooth belt visually and mechanically for damages, deformation, cracking or signs of wear.	<input type="checkbox"/>	See section 4.4
Check the oil level in the gear box if leakage occurred. Refill if needed. Approved lubricants for refilling: see data from engine manufacturer.	<input type="checkbox"/>	See section 4.8

Service inspection every 4* months with 1 work shift
 Service inspection every 3* months with >1 work shift
 * Unless revised in the project specific documentation.

The equipment has been serviced according to the instructions:

.....
 Place, date and signature of the service technician

4.7 Trouble shooting

The linear unit functions are only available with faultless power supply. If functions fail the first things to check are cable runs, cable towing arms and the power supply connections according to the engine manufacturers manual and/or project manual.

Possible reasons for functional disorder can also be incorrect data transfer from eventual operating handle. Therefore check the operating handle and the auxiliary cable for damages according to the project manual.

	Type of problem	Probable cause	Action
A1	No hoisting or forward/backward motion	No running mode chosen	Choose running mode.
A2		No power supply	Check power connection and fuse. Check cables for damages. Check mains connection on top of the linear unit.
B1	No hoisting motion upwards, or forward/backwards with load	Overload or undervoltage	Reduce load to allowable max load. Correct power supply.
C1	Incorrect operating range	Belt not in wheel tooth due to slackning belt	Increase belt tension according to section 4.4.

4.8 Oil level

Oil level 0.5 l	Oil level 1.0 l	Oil level 1.4 l
737771, 737772, 737773, 737774, 737775, 737776, 737777, 737778, 737779, 737780, 737902, 737906, 737910, 737914, 737918, 737922, 737926, 737930, 737934, 737938, 737942, 737946, 737950, 737954, 737958, 737962, 737966, 737970, 737974, 737978, 737982, 737986, 737990, 737994	737903, 737904, 737907, 737908, 737911, 737912, 737915, 737916, 737919, 737920, 737923, 737924, 737927, 737928, 737931, 737932, 737935, 737936, 737939, 737940, 737943, 737944, 737947, 737948, 737951, 737952, 737955, 737956, 737959, 737960, 737963, 737964, 737967, 737968, 737971, 737972, 737975, 737976, 737979, 737980, 737983, 737984, 737987, 737988, 737991, 737992, 737995, 737996	737901, 737905, 737909, 737913, 737917, 737921, 737925, 737929, 737933, 737937, 737941, 737945

4.9 Additional technical description

For additional technical description, please view the project-specific documentation.

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