

# ICH Linear Motors

English **Installation Guide**



Edition: C, April 2017

Part Number ICH-Installation-Guide-EN

Original language English

European Version (CE region)



Keep all manuals as a product component during the life span of the product. Pass all manuals to future users and owners of the product.

**Record of Document Revisions**

Revision	Remarks
A, 10/2015	First version
B, 07/2016	Mounting procedure added
C, 04/2017	Tightening torque and flatness added

**Technical changes which improve the performance of the device may be made without prior notice!**

Printed in Czech Republic.

This document is the intellectual property of Kollmorgen. All rights reserved. No part of this work may be reproduced in any form (by photocopying, microfilm or any other method) or stored, processed, copied or distributed by electronic means without the written permission of Kollmorgen.

# Table of Contents

---

- 1 General** ..... **4**
  - 1.1 Introduction ..... 4
  - 1.2 About this manual ..... 4
  - 1.3 Symbols Used ..... 4
- 2 Safety** ..... **6**
  - 2.1 Safety notes ..... 6
  - 2.2 You should pay attention to this ..... 6
  - 2.3 Use as directed ..... 8
  - 2.4 Prohibited use ..... 8
- 3 Mounting procedure** ..... **9**
- 4 Record of document revisions** ..... **15**

# 1 General

## 1.1 Introduction

Kollmorgen Linear Motor (ICH) is a part of a specific motion system. ICH can be combined with several devices. ICH motors fulfil CE requirements, but the user has to ensure that the machine as whole fulfils all CE requirements.

Kollmorgen provides only following components: the linear motors coils (ICH), the magnet ways (MCH) and the Hall sensor (HD). Complete linear system consisting from linear stages, linear guides, linear feedbacks, drag chains, carriages, mechanical buffers etc. is not included in Kollmorgen's product portfolio. For correct assembly of complete linear system, please refer to relevant supplier's documentation.

## 1.2 About this manual





This manual describes the ICH series of linear servomotors (standard version). The motors are operated in drive systems together with Kollmorgen servo drives. Please observe the entire system documentation, consisting of:







- Safety Notes of the ICH.
- Installation Guide of the ICH series of motors
- Instructions manual for the servo drive
- Manual Bus Communication (e.g. CANopen or EtherCAT)
- Online help of the servo's setup software

More background information can be found in our "Product WIKI", available at [www.wiki-kollmorgen.eu](http://www.wiki-kollmorgen.eu).

## 1.3 Symbols Used

### Warning Symbols

Symbol	Indication
 <b>DANGER</b>	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
<b>NOTICE</b>	This is not a safety symbol. Indicates situations which, if not avoided, could result in property damage.
<b>NOTE</b>	This is not a safety symbol. This symbol indicates important notes.
	Warning of a danger (general). The type of danger is specified by the text next to the symbol.

Symbol	Indication
	Warning of danger from electricity and its effects.
	Warning of hot surfaces.
	Warning of suspended loads.
	Warning of magnetic forces.
	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	Mandatory safety sign - Wear gloves.

## 2 Safety

This section helps you to recognize and avoid dangers to people and objects.

### 2.1 Safety notes



#### **DANGER**

The execution of work by persons with cardiac pacemakers is forbidden! The function of the cardiac pacemaker can be impaired by the magnetic fields; death or heaviest injuries could be the result.



#### **DANGER**

The strong magnetic fields, which are present, constitute a hazard for persons with implants that can be influenced by magnetic fields. As a general rule, all persons who may suffer impairment to health through the influence of strong magnetic fields must keep at a safe distance of at least 1 meter from the motor.



#### **WARNING**

Always wear gloves when working on the linear motor. Because of the high magnetic attraction forces, special care must be taken in surroundings of about 20cm from the magnetic plates. Inside this area, heavier (>1kg) or larger (>1dm<sup>2</sup>) objects of steel or iron must not be held in the hand.



#### **WARNING**

The magnetic plate radiate high attractive magnetic forces which have effect on all soft magnetic materials (e.g. iron). These forces cannot be controlled by hand and may cause serious injury. Do not place any soft magnetic objects nearer than 20cm from the magnetic side of the magnet plates.



#### **WARNING**

The magnetic plates must never be stored in an unpacked state. Always use non-magnetic packaging material that is at least 2cm thick. During assembly of magnetic plates unpack only one magnetic plate and fix it to avoid injury due to the large magnetic forces acting between magnetic plates. The storage location must be dry and protected from heat. Place warning signs (Caution: STRONG MAGNETS) at place where the linear motors are stored.

### 2.2 You should pay attention to this

#### **Read the documentation!**

Read carefully the applicable documentation before assembly, setup and using (available on Kollmorgen website or as a printed version on request). Incorrect handling of ICH can cause injury and damage to the persons and equipment.

The operator must ensure the following of the safety instructions. The operator must ensure that all staff responsible for working with ICH have read and understood the product manual.

Always follow the safety instructions described in this manual.

#### **Safety notes placement!**

Safety notes should be placed in a location where they can be easily accessed and available to the responsible persons

#### **Pay attention to the technical data!**

Adhere to the technical data and the specifications on connection conditions (rating plate and documentation). If permissible voltage values or current values are exceeded, ICH can be damaged, e.g. through overheating.



### Perform a risk assessment!

The manufacturer of the machine must create a risk analysis for the machine and take appropriate measures to ensure that unexpected movements cannot cause any injury or damage to any person or property.



### Specialist staff required!

Only thoroughly qualified persons are permitted to perform activities such as transport, installation, commissioning and maintenance. Thoroughly qualified persons are those who are familiar with the transport, assembly, installation, commissioning and operation of linear motors, and who have the appropriate qualifications for their job.

- Transport: only by staff with knowledge of handling electrostatically sensitive components and magnetic materials.
- Mechanical Installation: only by mechanically qualified staff.
- Electrical Installation: only by electrically qualified staff.
- Setup: only by qualified staff with extensive knowledge of electrical engineering and drive technology

Qualified staff must know and respect the following standards and directives:

IEC 60364 or IEC 60664 or national accident prevention regulations



### Hot surface!

The surfaces of the motors can be very hot during operation, according to their protection category. Risk of minor burns! The surface temperature can exceed 100°C. Measure the temperature and wait until the motor has cooled down below 40°C before touching it.



### Earthing! High voltages!

It is mandatory to ensure that all metallic motor parts are safely grounded to the PE (protective earth) terminal in the switchboard. Electrical safety is not possible without low-resistance protective earth connection. Safety of personnel cannot be assured without protective earth connection.

Never unplug any connector during operation. This creates a hazard with the risk of death, severe injury or material damage.

Power connections may still be live, even though the motor is not moving. Never disconnect the electrical connections to the motor while a voltage is present. This can cause flashover with injury and damage to persons and equipment.

After disconnecting the drive from the supply power, wait at least five minutes before touching any components which are normally live (e.g. contacts, screw connections) or opening any connections. The capacitors in the drive can still carry a dangerous voltage up to five minutes after switching off the supply voltages. To ensure safety, measure the voltage in the DC-link circuit and wait until it has fallen below 40V.



### Strong magnets!

During the work on or in the vicinity of linear motors make sure that at least two finely pointed wedges of tough non-magnetic material (e.g. material V2A with a wedge angle of approx. 10°-15°) and a hammer (approx. 3 kg) are at hand. In an emergency case you can use these tools to detach objects that are magnetically bound to the magnetic track (e.g. to free trapped parts of the body).

Keep watches and magnetic data media (credit cards, diskettes, etc.) out of the immediate vicinity (<50cm) of the linear motor.

Place easily visible warning signs (e.g. permanent self-adhesive labels) on the machine:

Caution: The linear motors on this machine are fitted with strong permanent magnets.

"STRONG MAGNETIC FIELDS + HIGH MAGNETIC ATTRACTIVE FORCES!"



### Transport of ICH motors with a weight of more than 20kg

Suspended load. Risk of death if loads falls. Never step under the load, while the linear motor is raised.

Hanging loads (vertical axes) require an additional, external mechanical brake to ensure personnel safety.

## 2.3 Use as directed

- The user is **only** permitted to operate ICH under the ambient conditions which are defined.
- ICH are installed as a component in electrical systems or machines and can only be put into operation as integral component.
- ICH motors have to operate on the servo drives which supports linear servo motors operation.
- The thermal sensor, which is integrated in ICH winding, must be observed and evaluated.
- If machines or sections of machines are transported with linear motors already mounted on the motion axes, then these axes must be blocked to prevent unintended movement.
- If the magnet ways or linear machines or sections of machines are transported via air cargo with the magnet ways already mounted on the motion axes, then these parts need to be packed according to IATA953 requirements.

## 2.4 Prohibited use

- The use of the ICH motors is prohibited directly on mains supply networks.
- The use of the ICH motors is prohibited if any kind of mechanical parts is present in air gap between forcer and magnetic way.
- ICH motors should not be used in applications with contact with food and beverage.
- Standard ICH motors should not be applied in explosion-prone, hazardous environments.
- Standard ICH motors should not be used in environments with caustic and/or electrically conducting acids, bases, oils, vapors, dusts.
- Commissioning the motor is prohibited if the machine in which it was installed
  - does not meet the requirements of the EC Machinery Directive,
  - does not comply with the EMC Directive,
  - does not comply with the Low Voltage Directive.



### 3 Mounting procedure



**DANGER**

Inappropriate handling with all magnetic parts of the ICH linear system could cause a hazardous situation which, if not avoided, will result in death or serious injury.



**WARNING**

Power magnetic fields and mechanical forces developed by the magnet plates (MHC) can create hazards to personnel through chipping, shattering, or pinching, upon impact. Whenever possible, leave the protective cardboard and steel plates on the magnets. Keep hand tools and equipment away from the magnet plate. Use extreme caution when installing the coil assembly over the magnet plate.



**WARNING**

Due to the high magnetic attractive forces of the magnet way (MCH), exercise extreme caution during handling and installation to avoid damage to equipment or personnel injury.



Kollmorgen will assume no responsibility if these mounting recommendations are not followed.



**WARNING**

Always wear gloves when working on the ICH linear motor.

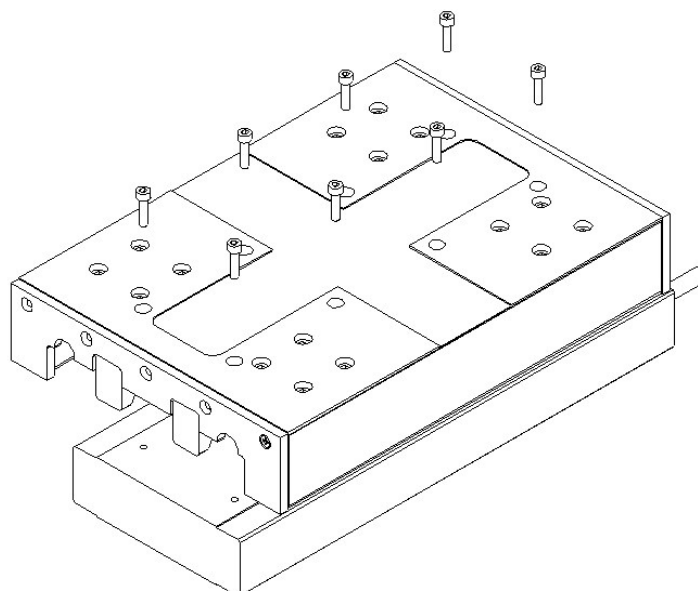
1. Remove waxed paper directly before mounting.



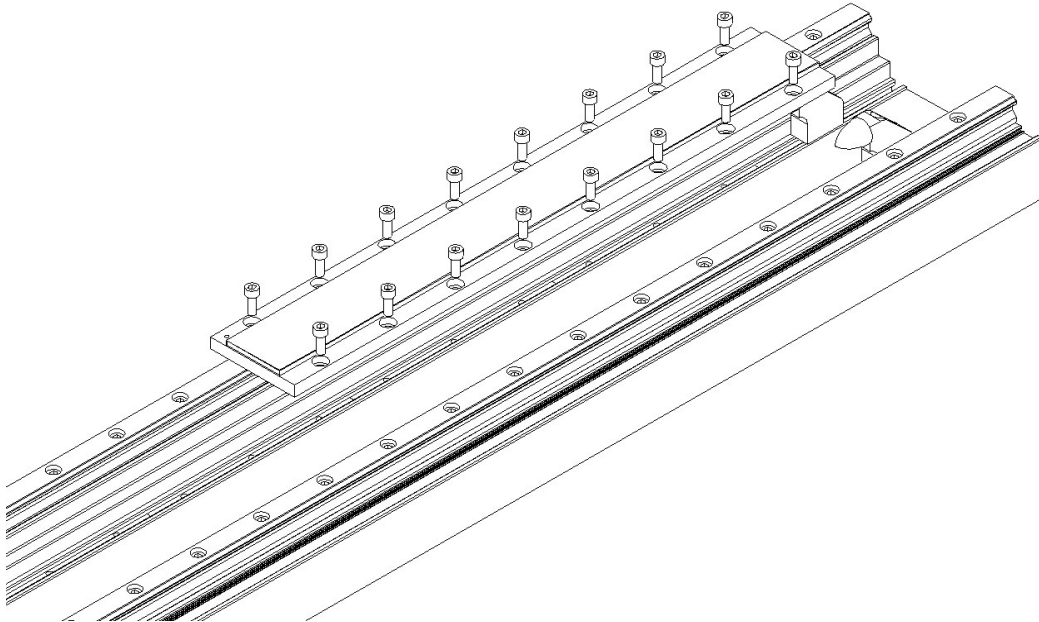
**WARNING**

Avoid degreasing of mounting surface and touching with bare fingers (use gloves).

2. Mount and fix the customer's interface on the forcer (the primary part of the ICH linear motor) with the fixing screws. Tighten the screws with torque 1.7 Nm in 3 stages crosswise from centre to 40%, 70%, 100% of tightening torque 1.7 Nm.



3. Mount and fix the first magnetic plate segment (the secondary part of the ICH linear motor) on the customized base with the fixing screws.



**WARNING**

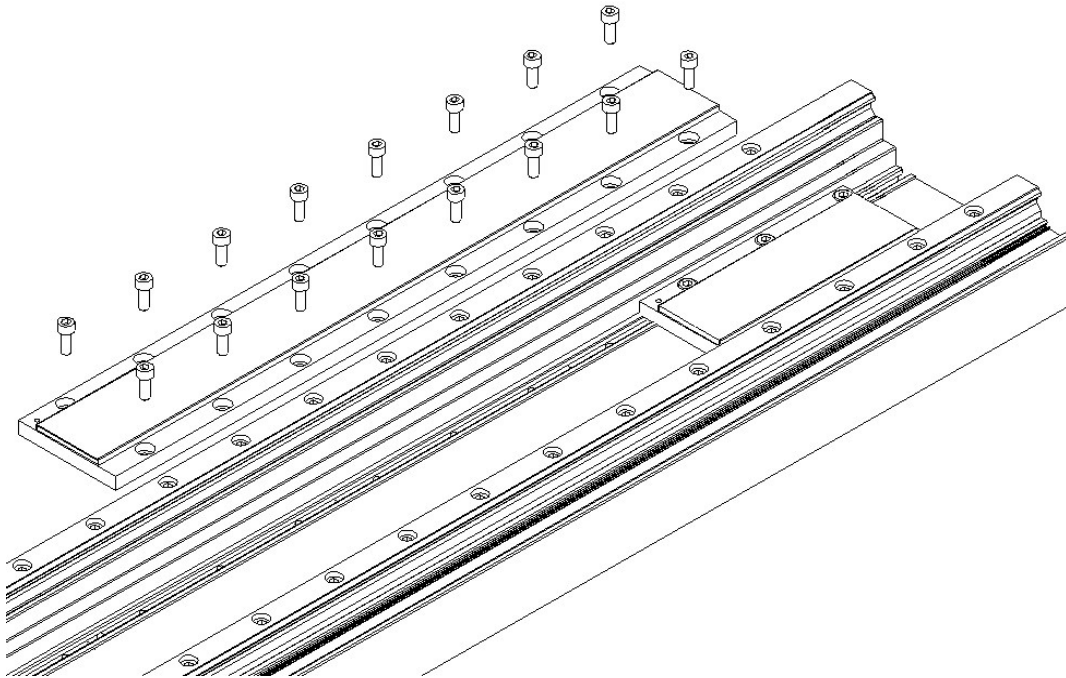
During assembly of magnetic plates (MCH) unpack only one magnetic plate and fix it to avoid injury due to the large magnetic forces acting between magnetic plates.



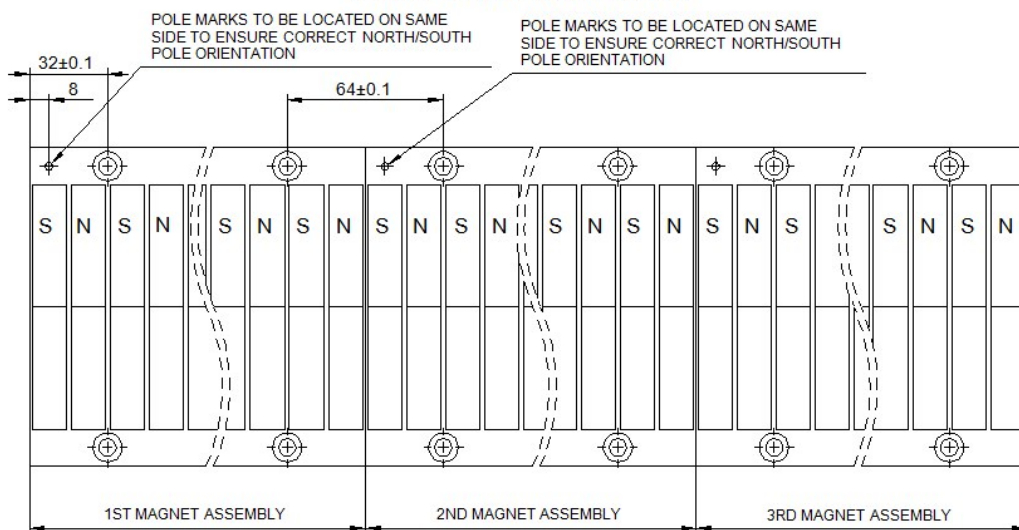
**CAUTION**

Pay attention to the attraction forces between the magnetic way (MCH) and the linear guides.

4. Place the second magnetic plate from the top and parallel to the base. Mount and fix with the screws the second magnetic plate segment on the base. Pole marks to be located on same side to ensure correct north/south pole orientation.



**MAGNETIC WAY INSTALLATION**

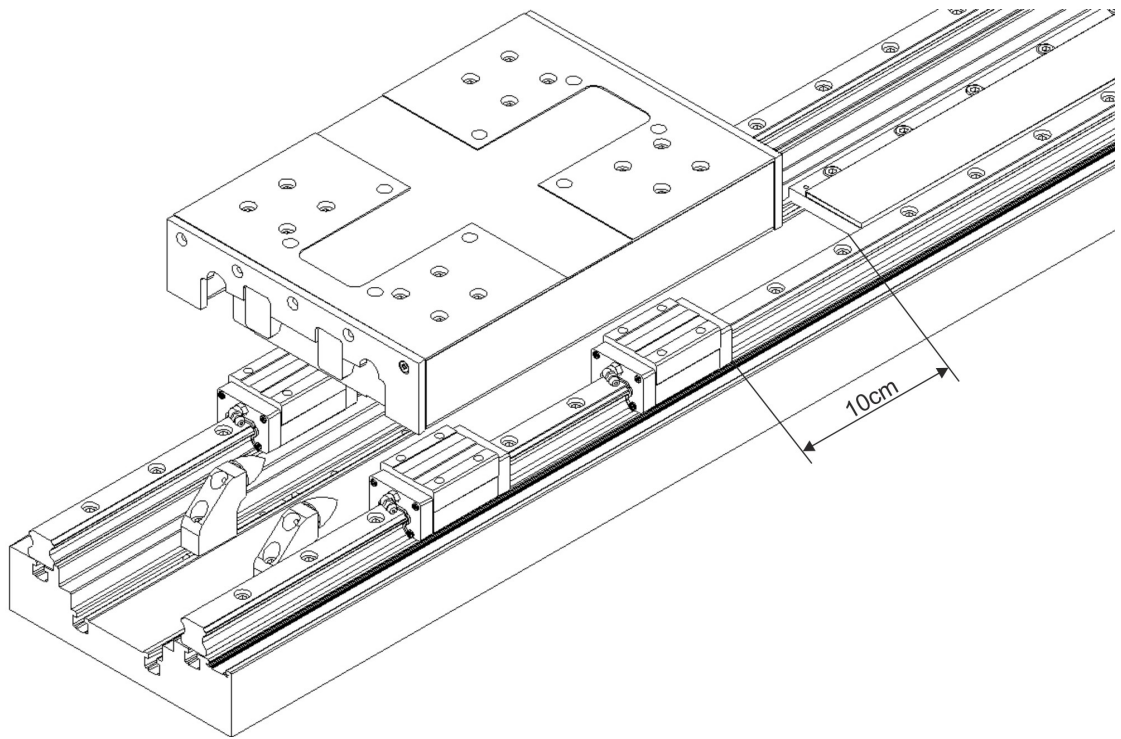


5. Mount and fix the motor assembly (forcer and customer's interface) on the linear guides.

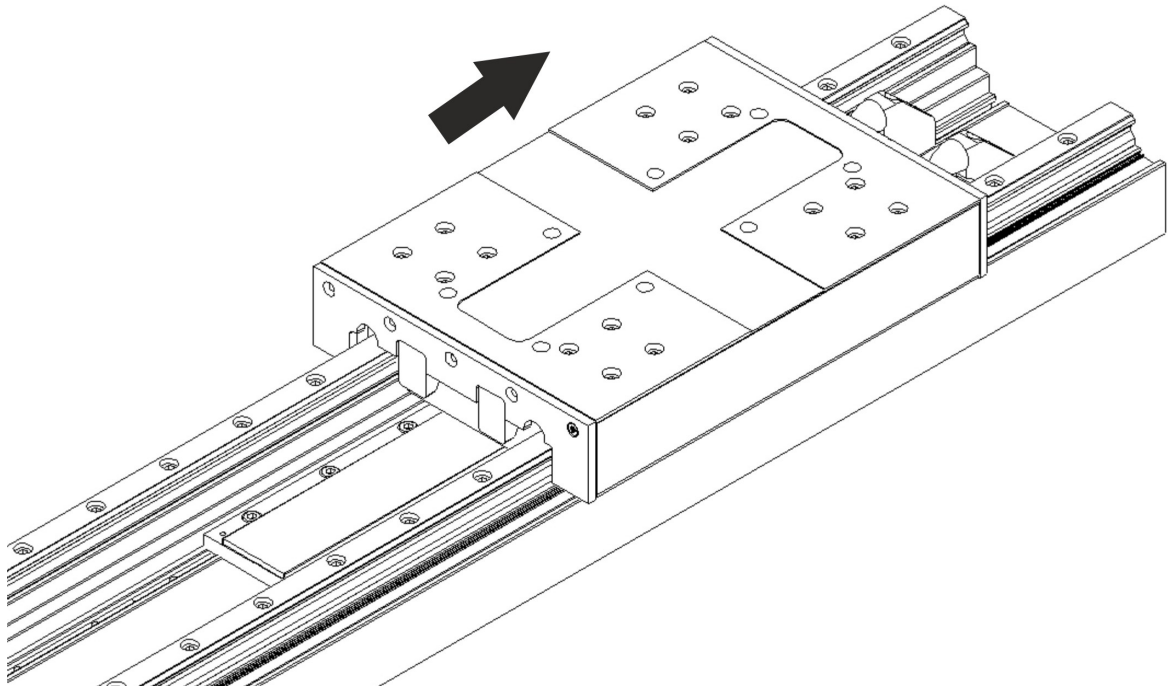


**WARNING**

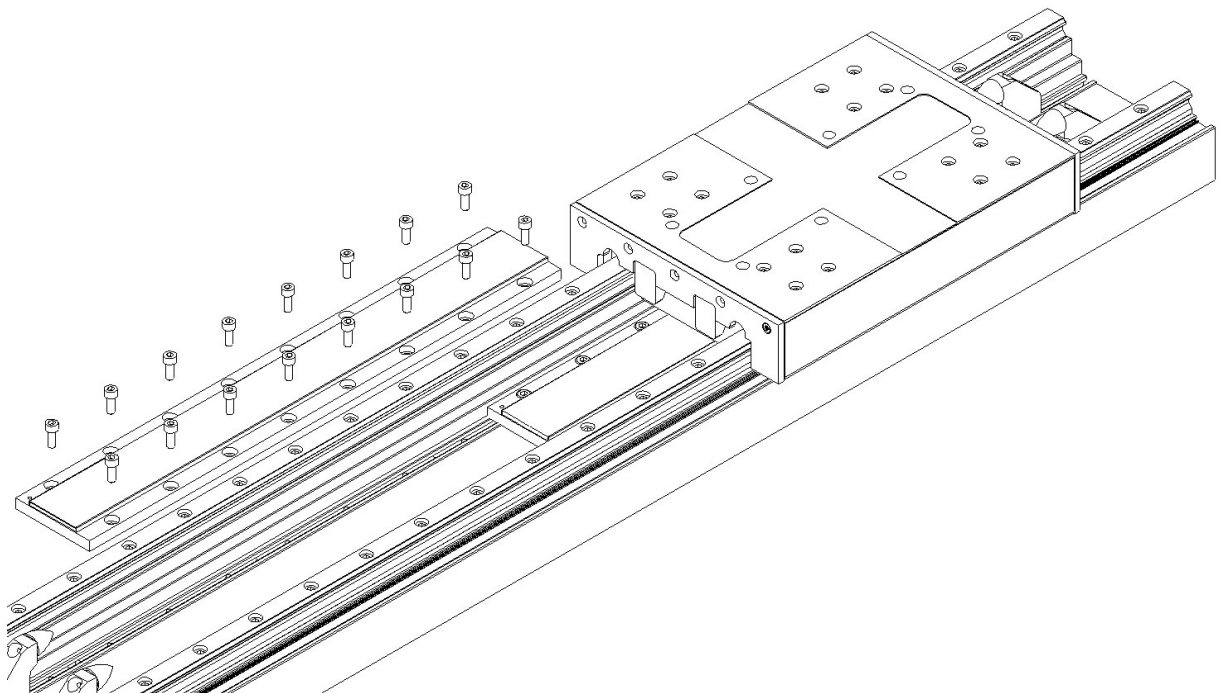
Pay attention to leave a minimum gap of 10 cm between the magnetic way and the motor assembly in order to avoid unexpected movement of the motor assembly.



6. Carefully and slowly slide the linear motor assembly over the mounted magnetic plates and temporarily secure the motor against the mechanical end stop.

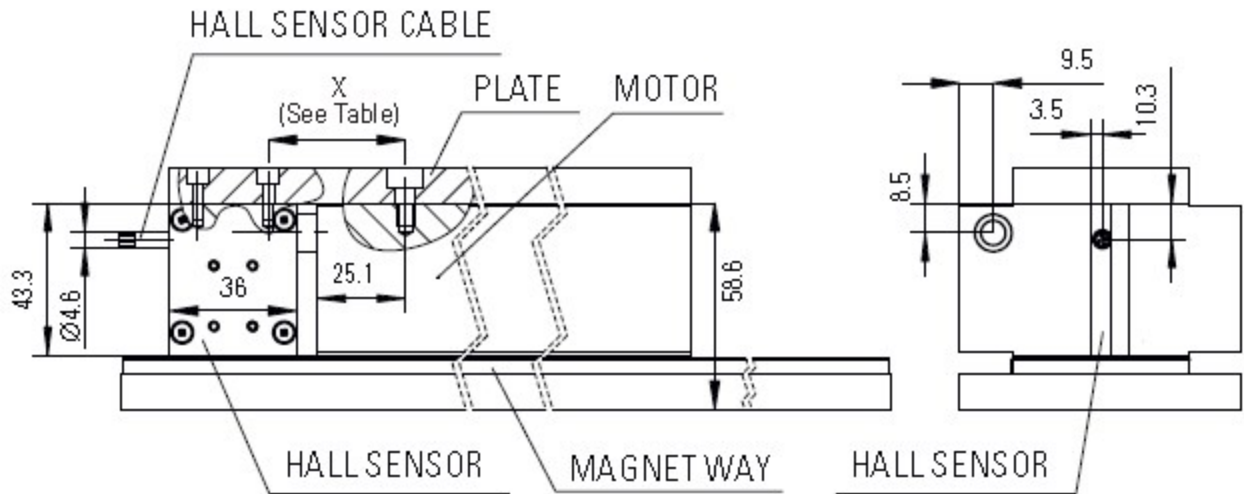


7. Mount and fix the remaining magnetic plate segments with the fixing screws.



8. Test whether the motor moves without contact with the magnetic ways over the whole magnetic way. It is normal to observe variations in the forces depending on the position (detent force).

9. In case the Hall sensor option is used, please check if the Hall sensor type is fit to the coil winding type. Star connected coil windings need to be used with HD-Y-Px Hall sensor box, the Delta connected coil windings need to be used with HD-D-Px Hall sensor box. Please keep the correct mounting distance X according to the drawing and table below.



Hall Sensor Mounting Distance	
ICH Type	X (mm)
ICH11	34.9
ICH22	48.9
ICH33	60.9
ICH44	36.4



**WARNING**

Flatness and height of magnet ways and coil units is defined at fastened to the flat base (steel plate with 30 mm thickness).

## 4 Record of document revisions

Revision	Remarks
A, 10/2015	First version
B, 07/2016	Mounting procedure added
C, 04/2017	Tightening torque and flatness added

## About KOLLMORGEN

Kollmorgen is a leading provider of motion systems and components for machine builders. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions that are unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

For assistance with your application needs, visit [www.kollmorgen.com](http://www.kollmorgen.com) or contact us at:

### North America

#### KOLLMORGEN

203A West Rock Road  
Radford, VA 24141 USA

**Web:** [www.kollmorgen.com](http://www.kollmorgen.com)

**Mail:** [support@kollmorgen.com](mailto:support@kollmorgen.com)

**Tel.:** +1 - 540 - 633 - 3545

**Fax:** +1 - 540 - 639 - 4162

### Europe

#### KOLLMORGEN Europe GmbH

Pempelfurtstraße 1  
40880 Ratingen, Germany

**Web:** [www.kollmorgen.com](http://www.kollmorgen.com)

**Mail:** [technik@kollmorgen.com](mailto:technik@kollmorgen.com)

**Tel.:** +49 - 2102 - 9394 - 0

**Fax:** +49 - 2102 - 9394 - 3155

### China & Southeast Asia

#### KOLLMORGEN

Rm 202, Building 3, Lane 168, Linhong  
Rd  
Changning District, Shanghai, China

**Web:** [www.kollmorgen.cn](http://www.kollmorgen.cn)

**Mail:** [sales.china@kollmorgen.com](mailto:sales.china@kollmorgen.com)

**Tel.:** +86 - 400 - 661 - 2802

**Fax:** +86 - 21 - 6071 - 0665

**KOLLMORGEN**<sup>®</sup>

*Because Motion Matters™*