

# NIKORAIL OWNER'S MANUAL



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## NIKORAIL® Owner's Manual

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# 1 TECHNICAL DESCRIPTION of NIKORAIL® light cranes

## 1.1. General description

NIKORAIL® light cranes provide an ergonomic and economical solution for a variety of applications. The robust design and high standard of manufacturing guarantee long life with the minimum of maintenance. The modular design of the NIKORAIL® light crane is useful for future expansion of the system.

**There are three main categories of NIKORAIL® light cranes, depending on which kind of cross bridge:**

- I. Light cranes with cross bridge without any reinforcement
- II. Light cranes with cross bridge with welded spine
- III. Light cranes with cross bridge with welded square profiles

Light cranes of the first category are very economical but they can only be used for a limited amount of applications. They are used when the bridge span is relatively small and lighter loads need to be moved.

Light cranes of the second category may be used when the span is a little larger than that of the first category and support points are less frequent. Using reinforcement, deflection will be reduced. The exact dimensions of the spine depend on the load that will be moved and the dimensions of the area where the crane will work.

**Light cranes of third category may be used when:**

- ✓ Large loads (up to 4400lbs) need to be moved
- ✓ Bridge span is large
- ✓ There are limited amount of points for support

In this category the reinforcement is using square hollow sections.

*\* Components that can be painted: tracks (plain and reinforced), brackets and joints.*

**Main characteristics of NIKORAIL® light crane are as follows:**

1. Loads up to 4400lbs
2. Modular design allows for extension and relocation
3. Easy installation using a variety of supporting brackets
4. Connectivity with future or existing overhead conveyor system
5. Telescopic cranes
6. Manual or electric travel
7. Floor or ceiling mounted cranes
8. Components available painted\* or electrolytic plated
9. Stainless steel cranes

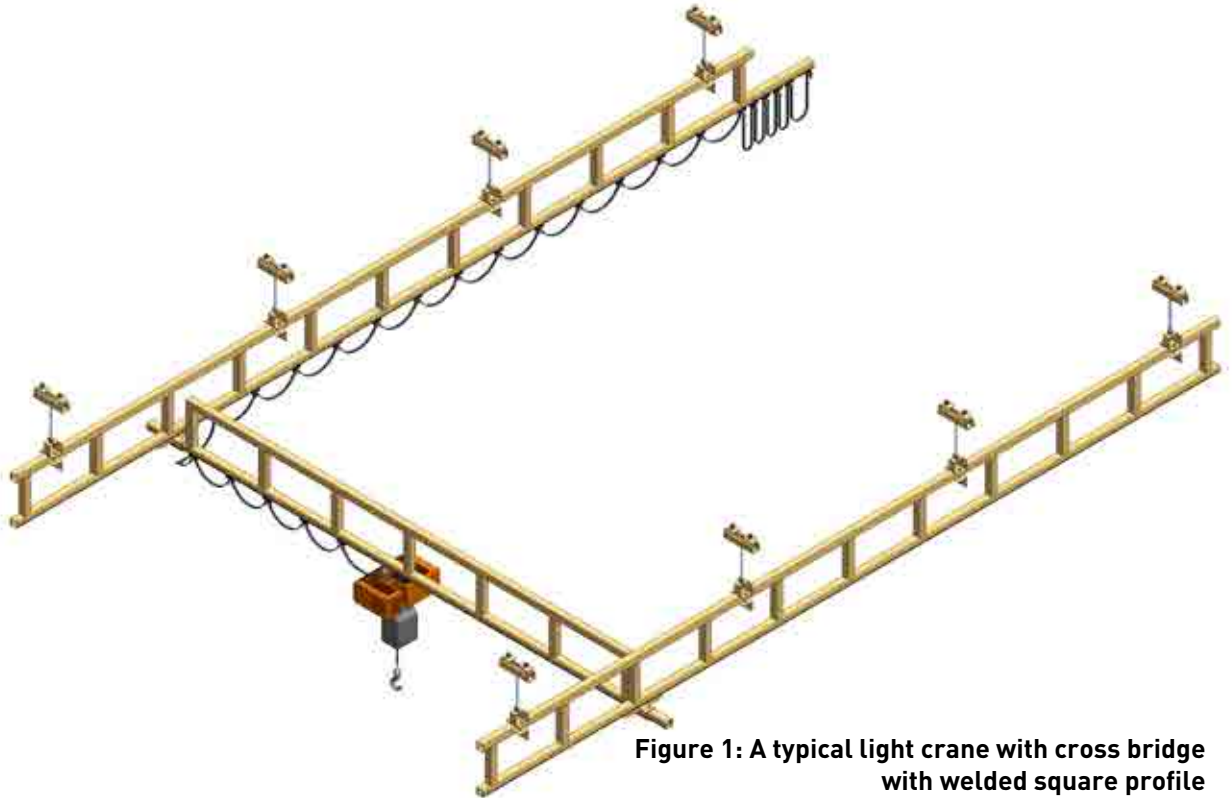


Figure 1: A typical light crane with cross bridge with welded square profile

## 1.2. Description of main components of a NIKORAIL® light crane

Main components of a NIKORAIL® light crane are as follows:

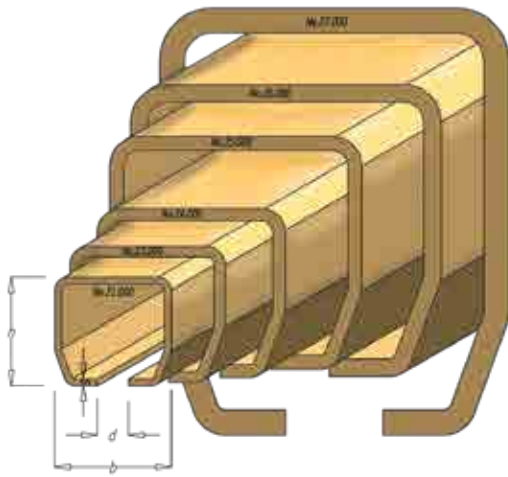
1. Track profile NIKORAIL® type, is the main component for long travel tracks and for cross bridge.
2. Reinforcement track with spine or square profile used as long travel rails and cross travel bridge.
3. Supports and splice joint.
4. End carriages are used to move the cross travel bridge forward and backwards along the long travel rails. They can be power driven if required.
5. Trolleys that are used to transfer loads. They also can be power driven if required.
6. Track end stop
7. Cable trolley
8. Bridge interlocks and/or cantilevers

### 1.2.1. Track profile NIKORAIL®

Track profile that is used in any NIKORAIL® light crane is available in up to approximately 33 foot lengths. Track is usually painted or galvanized by the electrolytic zinc plating method.

Track profiles can be electrolytic plated, painted or stainless steel.

Due to the closed shape of NIKORAIL® track, accumulation of dust or other undesirable particles can be reduced and the system's lifetime increased. Dimensions of the basic NIKORAIL® track profile are as follows



NIKORAIL® PROFILE	h (in)	b (in)	d(in)	s (in)
23.000	1.37	1.57	0.43	0.11
24.000	1.71	1.90	0.59	0.13
25.000	2.36	2.55	0.70	0.14
26.000	2.95	3.15	0.86	0.18
27.000	4.33	3.54	0.98	0.25

**Figure 2: Basic dimensions of different NIKORAIL® profiles**

## 1.2.2. Reinforcement track profile

Reinforced track is used to increase the bridge span and the supporting distances without increasing deflection and to keep the entire construction safe. The choice between three types of cross bridge (without reinforcement or with reinforcement using spine or square profile) depends on the load that will be transferred and the amount of supports that are used.

## 1.2.3. Supports brackets and assemblies. Joints

**Supports must be used correctly because this is of great importance for crane safety. Therefore NIKORAIL® engineers should be consulted to specify the type and number of supports, taking into account:**

- ✓ Special operational conditions (e.g. when power driven trolleys are used, vibrations are increased and support points must be increased accordingly)
- ✓ Dimensions of the area in which the crane will be used.
- ✓ Type of supporting structure
- ✓ Load that will be transferred

There is a wide range of supports that can be used, some of which are shown in paragraph 3.2.1.2. The complete list can be found in NIKORAIL® brochures.

Where track needs to be joined, a B49 splice joint can be used. However, when part of the track is reinforced, other types of joints may be used. (See paragraph 3.2.2.)

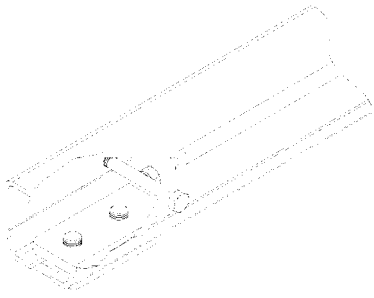
## 1.2.4. End carriages and trolleys

NIKORAIL® has a wide range of end carriages and trolleys. NIKORAIL® engineers take into account the specific features of each crane to make the best and most economical choice. Where required, NIKORAIL® can also manufacture special products in order to increase both crane functionality and customer satisfaction.

Both end carriages and trolleys may be power driven.

For more details see paragraphs 3.2.3 and 3.2.5.

## 1.2.5. Track end stops



As in any NIKORAIL® application, in the case of light cranes, for every track profile end stops are used to retain the transferred load. In particular with light cranes, an end stop type .X01 is used in conjunction with a transverse bolt with safety nut (type .X06). With this combination, engineers reduce the risk of load fall.

**Figure 3: End stop (type .X01) in conjunction with a transverse bolt with safety nut (type .X06)**

## 1.3. Description of main optional components in a NIKORAIL® light crane

In addition to the basic components of a NIKORAIL® light crane, there are some optional extras that can increase the functionality or resolve problems due to their special features. These optional components are:

- ✓ Use of electrical power or air supply. This can be achieved with cable or hose trolleys. (See paragraph 3.2.6.)
- ✓ Where the crane needs to connect to another crane or to a monorail, a bridge interlock set (two separate parts) has to be used. (See paragraph 3.2.7.1.)
- ✓ Where the crane is required to work outside the normal limits of long travel track, a cantilever trolley can be used. (See paragraph 3.2.7.3.)
- ✓ All trolleys can be driven manually or electronically. (See paragraph 3.2.7.3.)

# 2

## DESIGN of NIKORAIL® light cranes

NIKORAIL® engineers use the following criteria in crane design:

- ✓ Safety of construction
- ✓ Maximum space utilisation
- ✓ Extendibility
- ✓ Low cost

With NIKORAIL® engineers' experience and knowledge, the above are guaranteed. NIKORAIL® is certified to EN ISO 9001 and EN ISO 14001 standards for design and manufacturing light crane components. All the manufacturing processes are

environmentally friendly.

NIKORAIL® crane design follows all European guidelines on to this subject (e.g. DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL from 17 May 2006 on machinery, and amending Directive 95/16/EC).

Also, ISO 2768 is used in component manufacture and design to define tolerances. This ensures good joining of the components for easy of assembly.

# 2

In the installation or extension of any crane system, support distance is the most important safety factor. There are a number of rules that must be considered, but experience and detailed study of any single component gives this conclusion. A useful general rule that should never be ignored is that: *“Support of a track with length L must be done in such a way*

*that deflection can not exceed  $L/300$ ”*. NIKORAIL® engineers’ recommendations for support should always be followed. The installer should find all the documentation and designs inside the packaging. Changes to recommended supports should not be implemented without prior permission of the manufacturer.

# 3

## INSTALLATION INSTRUCTIONS of NIKORAIL® light cranes

### 3.1. Preparing for installation

For correct installation and trouble-free operation, careful preparation must be done. This helps to prolong the life of the system. Some basic steps that should be followed are:

- i IMPORTANT!** **Installation must be done by experienced staff.**
- ✓ Before installation, all the correct tools must be prepared and ready for use. Use of any inappropriate tool should be avoided.
  - ✓ Packing list should be available during installation and should be used to check all the received components. The packing list is usually located in a plastic bag stuck to one of the packages.
  - ✓ Before installation, the installer should study all the manufacturer’s designs. He should ensure he understands each step of the installation, and if there is any query, he should contact the manufacturer.
  - ✓ Before installation, the installation area must be clearly marked as “off limits to all unauthorised personnel”.
  - ✓ Before installation, the installation manager must ensure that all personal protective equipment (e.g. helmet, appropriate shoes etc.) is available and is used by all personnel.
  - ✓ Since crane installation involves working at height, scaffolding or suitable access equipment should be used for safe movement of personnel. In each case, the legislation of each country regarding protection at height must be adhered to.
  - ✓ Before installation, the installer should ensure that the steel structure is well aligned. This will aid with the correct installation of the crane.

**IMPORTANT!** Only trained personnel should work on electrical connections.

## 3.2. Main instructions for NIKORAIL® light crane installation

NIKORAIL® light crane installation is a six (6) basic processes. These are:

1. Long travel track installation (with both support and splice joints)
2. Cross bridge and end carriages installation
3. Installation of track end stops
4. Installation of trolleys for suspension of load
5. Installation of cable trolleys (optional)
6. Installation of interlocks, power driven trolleys, cantilevers (optional)

### 3.2.1. Long travel track installation

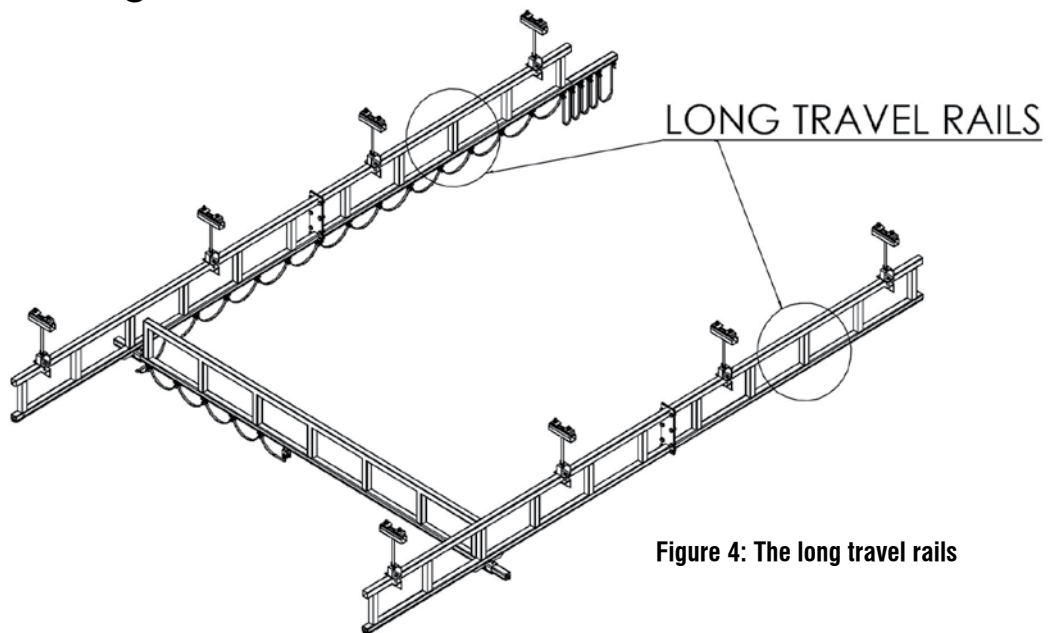


Figure 4: The long travel rails

**This is the first stage of the installation procedure. Long travel tracks are installed using the supports suggested by the manufacturer.**

**This stage includes three separate steps:**

1. Preparation of tracks before use
2. Installation of supports
3. Installation of splice joints

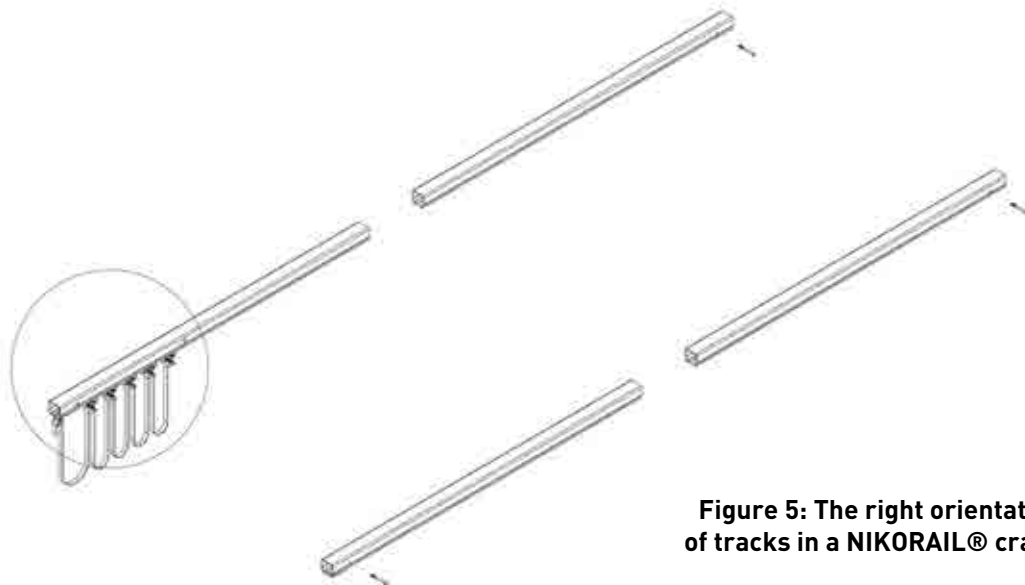
The next three paragraphs explain all the above.

#### 3.2.1.1. Preparation of tracks to install

**Firstly, after separating standard and reinforced track, the track should be sorted into three categories (as step 1 refers):**

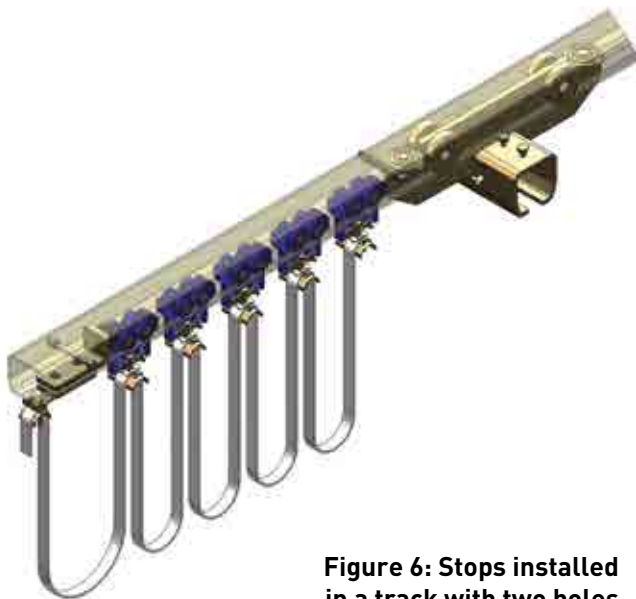
**STEP 1:** Track with two holes in the same side, track with a single hole and track without holes.





**Figure 5: The right orientation of tracks in a NIKORAIL® crane**

- ✓ If there is track with two holes, it will be used at the extremities of the long travel rails inside which both end carriages and cable trolleys will move. The side with two holes will be used for parking cable trolleys. One of the two holes will be used for type .X06 transverse bolt which stops end carriage movement. Cable trolleys can pass under this bolt and bunch up within the parking area. The other hole is used for the extra transverse bolt which accompanies end stop .X01.



**Figure 6: Stops installed in a track with two holes**

- ✓ Tracks with one hole will be used for the other three ends of the crane. The hole will be used for the transverse bolt type .X06. Please note! Tracks should be situated as the above picture shows.
- ✓ Tracks without any hole should be used as intermediate tracks in the crane.
- ✓ If the end track lengths have no holes, it is essential that they are drilled and that the safety feature is installed according to the manufacturer's guidelines.

**STEP 2:** Check carefully that tracks are clear inside and without any metal burrs. If not, clear them using a suitable file.

### **i** IMPORTANT!!

**Next picture shows how two lengths of track should be prepared in order to join together properly.**

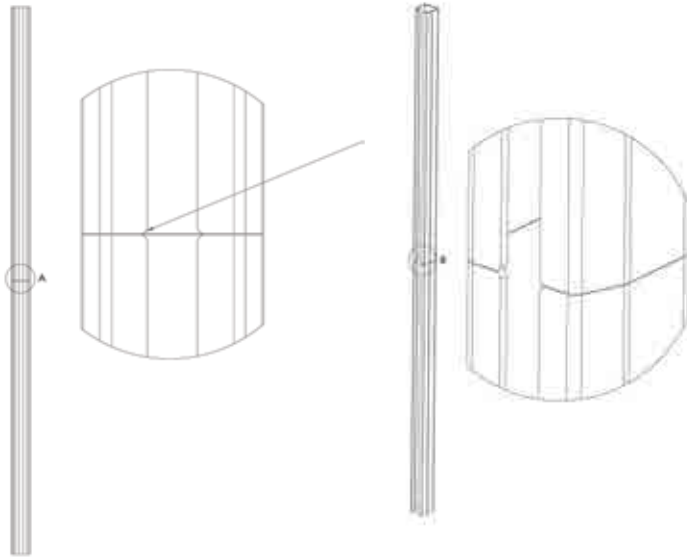


Figure 7: The right preparation of two parts of track in order to get joined

### **i** IMPORTANT!!

In some cases the track may need to be cut before it is installed, which may change the original dimensions. This can be corrected using splice joints and tightening all the side bolts (eight (8)) properly. (See paragraph 4.2.1.3, installation of splice joints).

## 3.2.1.2. Installation of support brackets and support assemblies

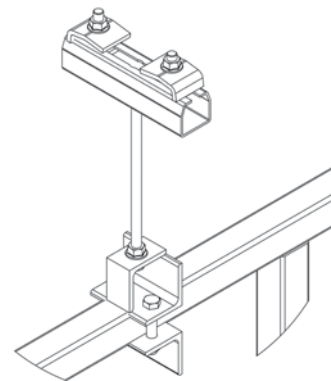
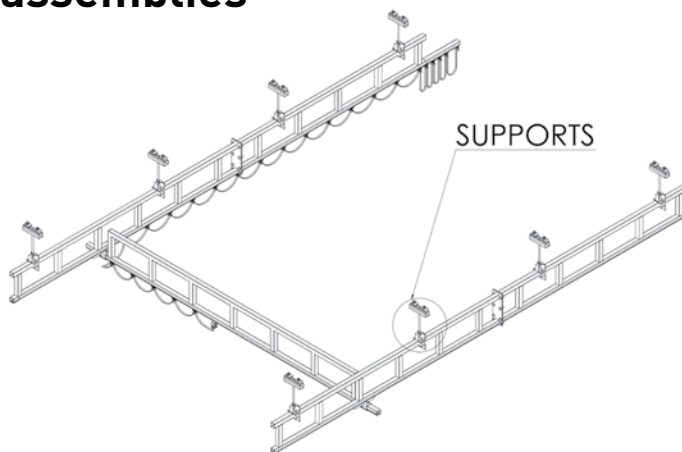


Figure 8: Supporting a NIKORAIL® crane

Support brackets and support assemblies are used to connect tracks to the support structure. The choice of support bracket and the frequency of support points are crucial for the smooth and safe operation of the crane. Therefore:

- i** Follow the manufacturer's designs exactly.
- i** Do not change anything without prior permission from the manufacturer.

Here are some types of support brackets or support assemblies:

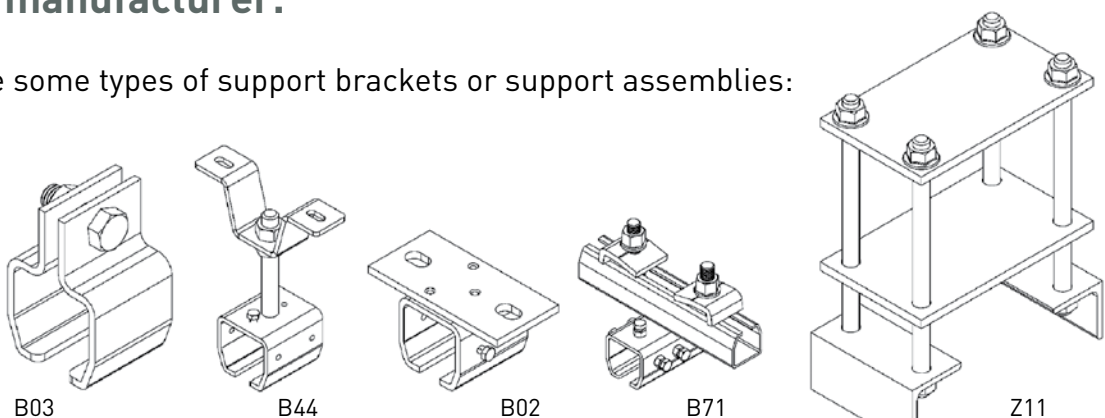


Figure 9: Different support types

**In general, installation of supports must follow these steps:**

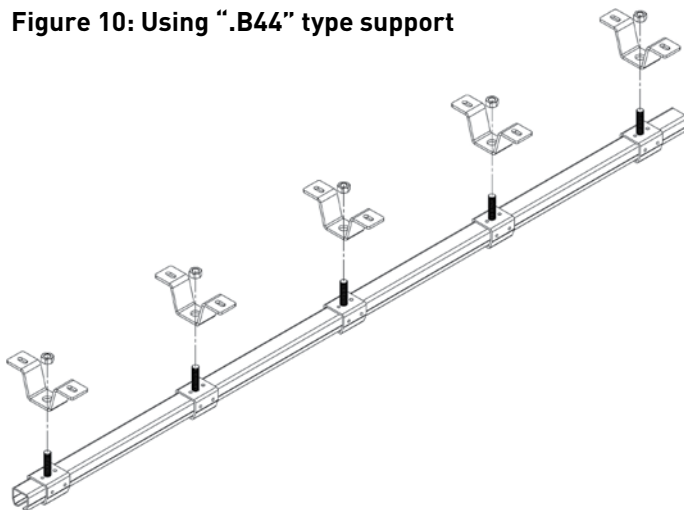
**STEP 1:** Following manufacturer's designs, supports should be matched to the tracks.

**STEP 2:** supports have to be prepared by removing or loosening all the bolts and nuts. They are now ready to pass around the track lengths.

**i IMPORTANT!** If supports are such as type .B04 or .B44, and installation needs be done consecutively and not independently, follow step 3A. Alternatively, with supports such as type .B03 which could be installed independently, follow step 3B . In the case of special supports, extra instructions can be given by the manufacturer.

**STEP 3A:** in this case all the supports pass around the track one after the other and are secured (screwing the bolts) at the correct positions along the track. Then the long travel track with supports must be connected with the support structure. The installation of the tracks must be done using appropriate lifting equipment (due to the weight).

**Figure 10: Using ".B44" type support**



**STEP 3B:** in this case two halves of the support must be bolted together on either ends of the track. With this, the long travel track can be positioned between the two support halves and secured by tightening the cross bolts to the steel structure. Then, all the other supports can be installed consecutively in the proper positions.

**i IMPORTANT!**

During installation of supports, extra care should be taken with two things: a) Parallel alignment of two long travel tracks. Installer must ensure that both long travel tracks are parallel throughout the length of the structure.

b) Parallel horizontal alignment of the light crane structure.

It is very important to achieve both of the above because this will result in smooth running, avoiding unreasonable damage to the crane components ensuring longevity and safe operation.

## 3.2.2. Installation of joints

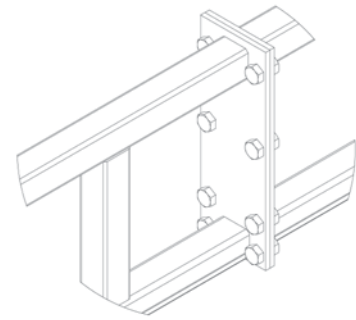
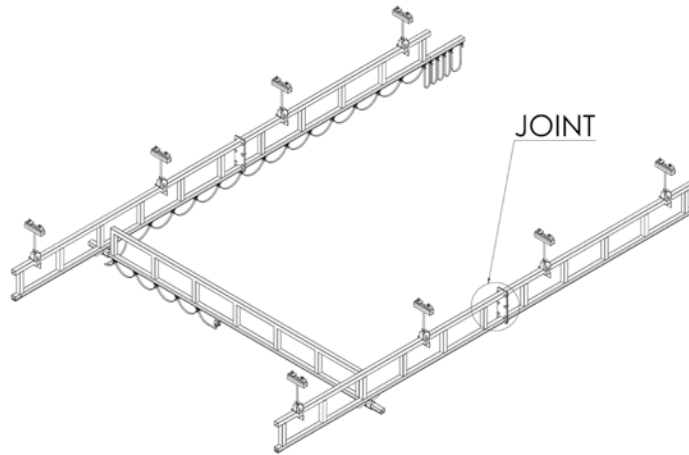


Figure 11: Joints in a NIKORAIL® crane

There are five different kinds of joints:

- a) Splice joint type .B49
- b) Special flange and special chocks
- c) Special flange (different to that of case b)
- d) Support assemblies type “.Z13”
- e) Splice joint type .B49 combined with special flanges.

The following paragraphs give details.

### 3.2.2.1. Junction using typical splice joint type .B49

When two separate track (non-reinforced) parts need to be joined, typically a splice joint type .B49 is used. This must be done with care, as it's possible it may cause problems with the trolley's rolling if installed incorrectly. Installer should follow the next steps:

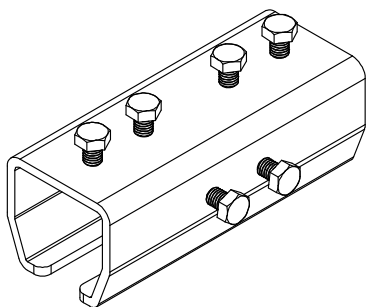


Figure 12: Joint “.B49” type

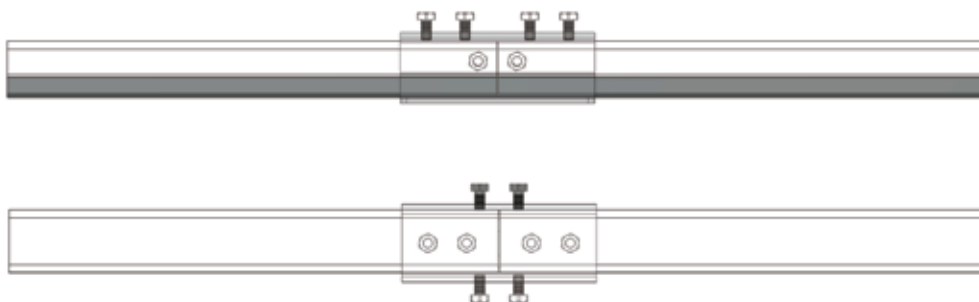
**STEP 1:** the edges of each track enter the joint and meet in the centre.

**STEP 2:** The four bolts at the top of the joint have to be bolted so that the track has tight contact with the joint, creating a flat running surface through the joint.

**STEP 3:** The four side bolts are used to achieve horizontal alignment within the joint.

### Care must be taken with the following:

- ✓ Alignment of the two parts both to horizontal and vertical level is absolutely necessary in order to avoid any problem to trolleys rolling inside the tracks. The gap between the two parts of track must be as small as possible.

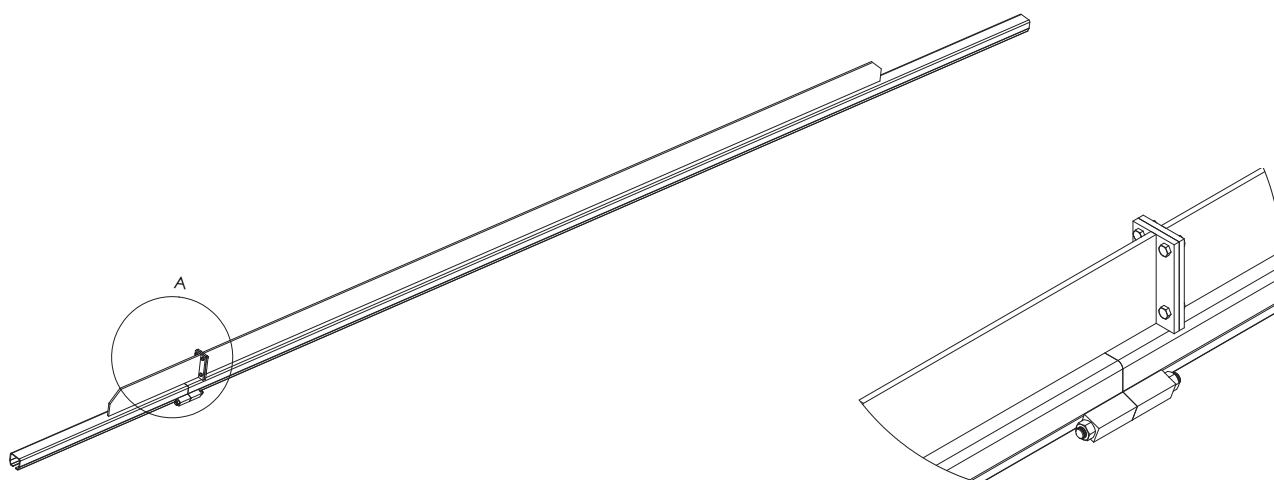


**Figure 13:**  
Horizontal  
and vertical  
alignment

- ✓ Proper tightening of bolts will help the track edges to return to the original dimensions if they've changed (e.g. due to cutting process). This means that installer must tighten the bolts until the two edges return to the initial dimensions and stop there. PLEASE NOTE! Over-tightening may cause deformities.
- ✓ Pay particular attention when supports are used around a splice joint. The joint is for connection only and does not support any load. The use of supporting brackets either attached directly to the top of joint or alternatively the joint can be supported either side by additional support brackets. These supports must not be omitted.

### 3.2.2.2. Junction of two separate parts of reinforced track using special plate and chocks

This solution is used for connecting track reinforced with spine. The following diagram shows this technique:

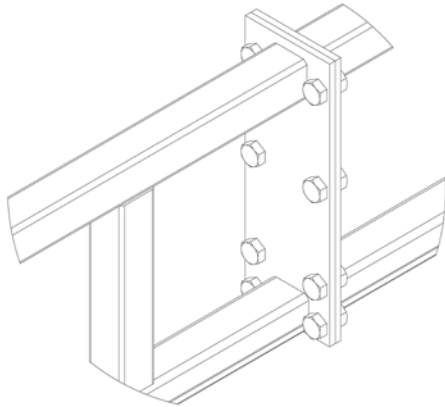


**Figure 14: Junction using special plate and chocks**

Normally, the customer receives the above ready for use. If there is any need for alignment, all the bolts have to be bolted progressively until the best result is achieved. This should be checked during maintenance of the crane.

### 3.2.2.3. Junction of two separate parts of reinforced tracks using only special plate

The third solution of track connection is shown below:



In this case, all the bolts are bolted progressively so that the best alignment is achieved. This must be checked during the maintenance process.

Figure 15: Junction using a special plate

### 3.2.2.4. Junction of two separate parts of reinforced tracks using the support assembly type “.Z13”.

This kind of junction is often the best and sometimes the only way. For example, whenever the steel structure is not from side to side, this junction should be used.

An extra advantage of this way of junction is that support assembly type “.Z13” is used both as support and as joint.

**Alignment is of great importance when using this junction. All the bolts have to be bolted progressively until the best result is achieved.**

See figure below:

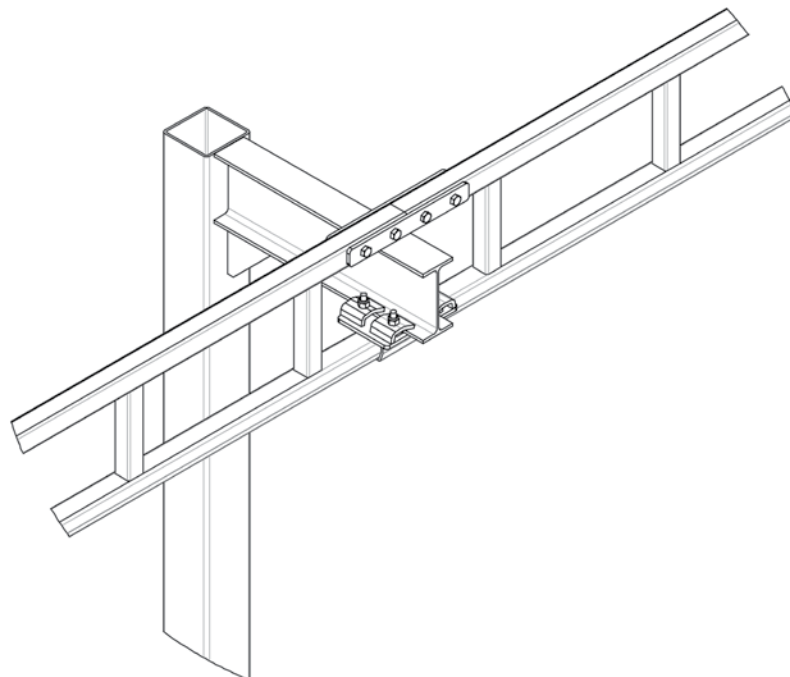
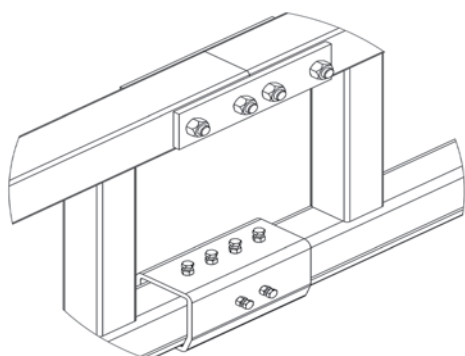


Figure 16: Junction using “.Z13” type support

### 3.2.2.5. Splice joint type .B49 combined with special flanges

This kind of junction is shown below:



It is a very common way of junction due to easy installation. The splice joint must be installed as it is described in paragraph 3.2.2.1. Extra flanges are used to join the two parts of the square profiles and to align each other. This will be achieved tightening progressively the bolts of the flanges.

Figure 17: Joint type .B49 combined with special flanges

### 3.2.3. Installation of end carriages and cross bridge

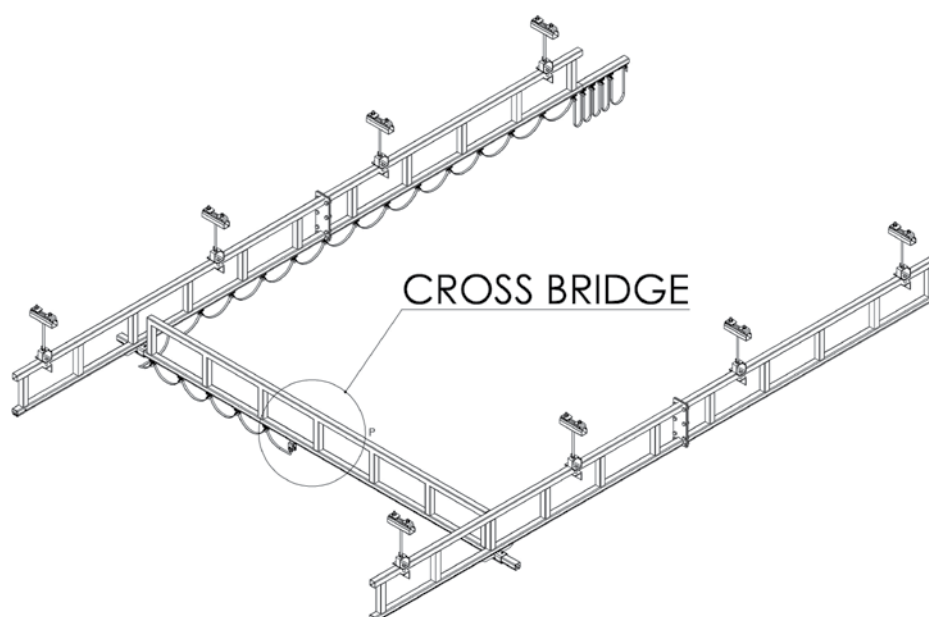
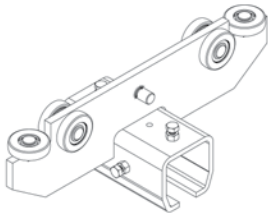


Figure 18: The cross bridge in a NIKORAIL® crane

**i PLEASE NOTE!** One of the two end carriages is assembled without any bolts, to counter any misalignment between the long travel tracks which may present after the initial installation.

When the customer (or representative) receives the packages, he must ensure that the end carriages are two different kinds with different codes. Although they may look similar the difference is that one has bolts and the other has not. For example, the most common end carriage is type .T54 (with bolts). The same end carriage without bolts has code .T74.



**i** **IMPORTANT!** Because the bolts of one end carriage maintain the connection with the cross bridge, they must be checked frequently during operation as well as during maintenance to ensure safety.

Figure 19: End carriage “.T54” type

The installation of end carriages is a very simple procedure and may be combined with cross bridge installation. Two alternatives are described below:

### 3.2.3.1. Installation of end carriages and cross bridge without reinforcement

In this case the cross bridge is a simple track without any reinforcement and there is enough space from the one side of the construction in order to pass the track through the joints of the end carriages. Installer should follow next steps:

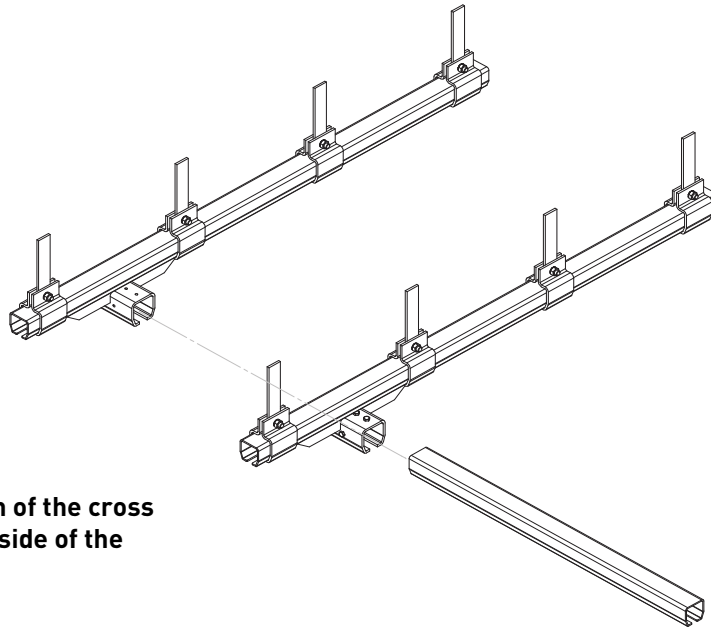


Figure 20: Installation of the cross bridge using the free side of the construction

**STEP 1:** the bolts of the end carriages have to be loosened on the fixed end.

**STEP2:** Lubricate inside the joint of the free floating end carriage (type “.T74”) to aid smooth operation.

**STEP 3:** the end carriages have to pass inside long travel tracks and be secured so they cannot slide out.

**STEP 4:** the track that is used as cross bridge must pass through the splice joints of the end carriages. This process has to be done using the space at the one side of the crane.

**STEP 5:** all the bolts of the one end carriage must be bolted carefully. Safety nuts must be used to ensure a proper connection.



# 3

## 3.2.3.2. Installation of end carriages and cross bridge with reinforcement

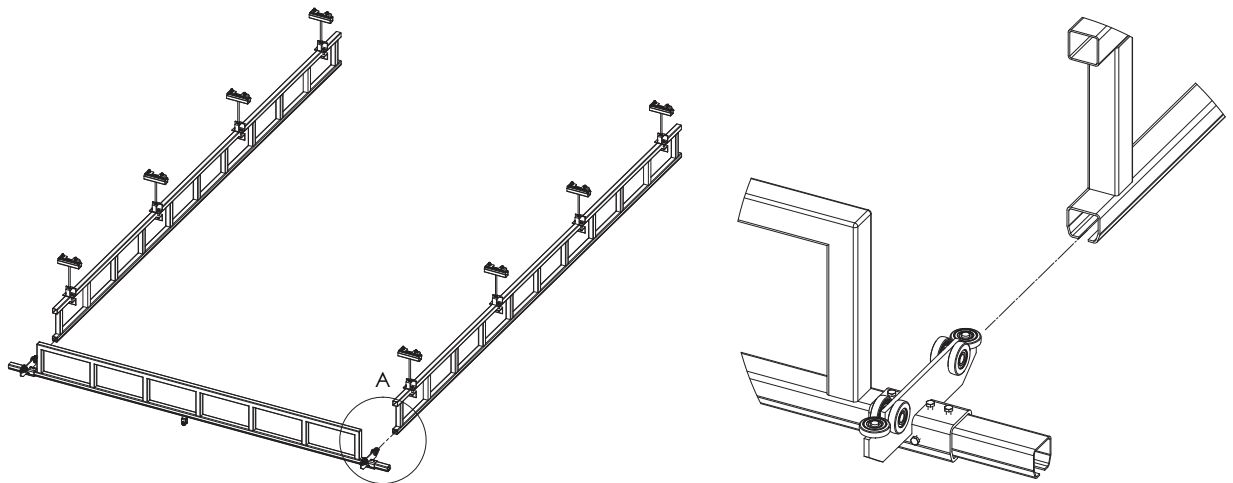


Figure 21: Installation of a cross bridge with reinforcement

**Where the cross bridge is reinforced or there is no space at both sides of the crane installer should follow these steps:**

**STEP 1:** firstly the end carriages have to be connected to the cross bridge.

**STEP 2:** all the bolts of the one end carriage have to be bolted. The floating end carriage without bolts (type “.T74”) must lubricated and be secured so that it doesn't slide off the bridge.

**STEP 3:** the set of end carriages and cross bridge have to be inserted into the long travel tracks. In this case appropriate lifting equipment may be needed.

## 3.2.4. Installation of track end stops

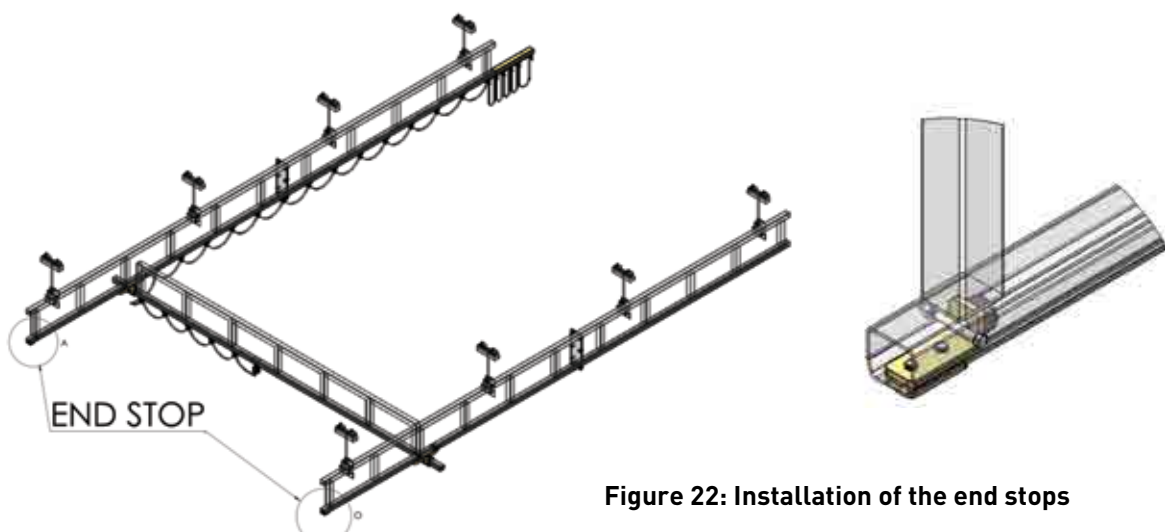


Figure 22: Installation of the end stops

Once both long travel tracks and cross bridge have been installed, track end stops must be placed at all track ends. This is crucial for safety reasons in order to avoid any fall from height, with the exception of one side of long travel track which has to remain open in order that cable trolleys can be fed into the rail. Also, one side of cross bridge has to remain open because the trolley has to be inserted.

**i IMPORTANT!** In light cranes, whenever track end stops are used (typical stopper type .X01) a transverse bolt (followed by a safe nut) type .X06 must also be used. This procedure will improve the safety of the construction.

End track stop installation is very simple and is described in the following steps:

**STEP 1:** firstly, the two bolts that join the two different parts of end stop have to be loosened.

**STEP 2:** the end stop has to be inserted at the edge of the track in the correct direction as in the diagram above. The rubber component has to be placed inside the track.

**STEP 3:** all the bolts must be tightened properly according to manufacturer's instructions. See the table below (this table must be used for all the bolts of the crane):

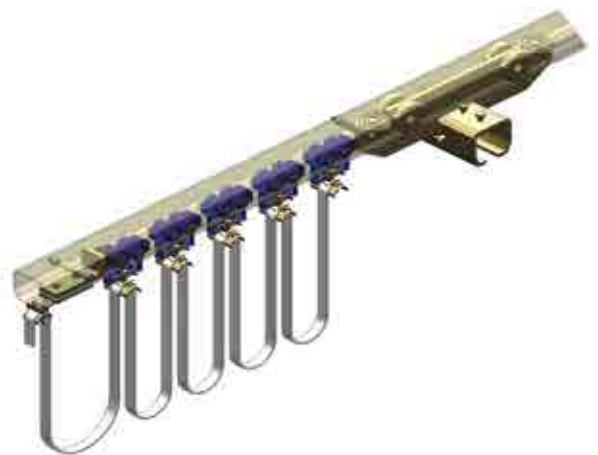
BOLT (class 8.8)	M6	M8	M10	M12	M16	M20	M24	M30
TORQUE (Nm)	10	25	50	87	210	412	711	1422

**Table 1: The proper torque according the size of the bolt**

**STEP 4:** finally, the transverse bolt type .X06 must be installed safely using a safety nut.

**i IMPORTANT!** Where long travel tracks are used for cable trolleys, then an extra transverse bolt (with plastic cover) is recommended. It is installed at a point of the track so that only cable trolleys may pass below it. End carriages cannot pass. In addition, an extra track end stop is installed in the correct position on the opposite track to ensure that cross bridge-end carriages will stop in the right position. All the necessary holes will usually be drilled by the manufacturer. If this is not the case, then it is essential that they are drilled and the safety

feature is installed according to manufacturer's guidelines.



**Figure 23: Double end stop**

### 3.2.5. Installation of trolleys

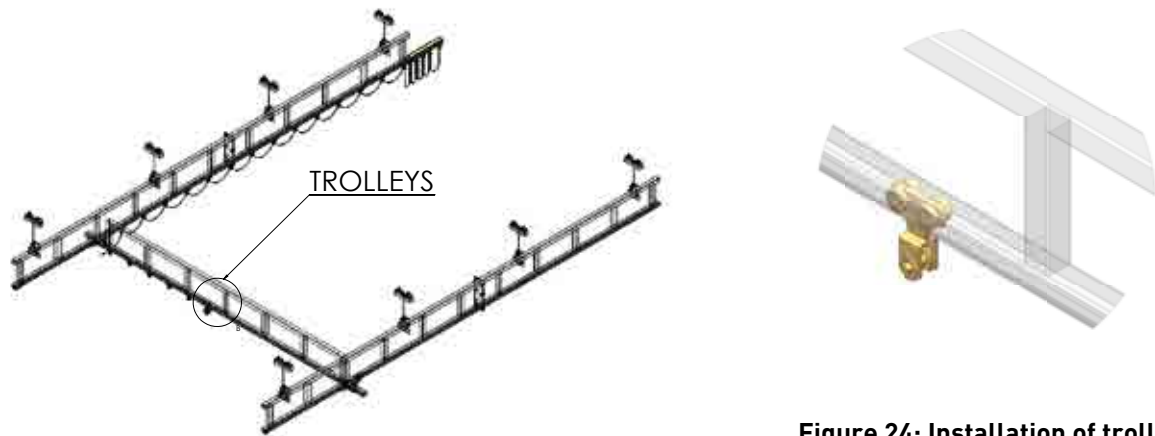


Figure 24: Installation of trolleys

With one side open (as described in previous paragraph), load bearing trolleys can be inserted into the cross bridge. There are many different trolleys. Some of them are as follows:

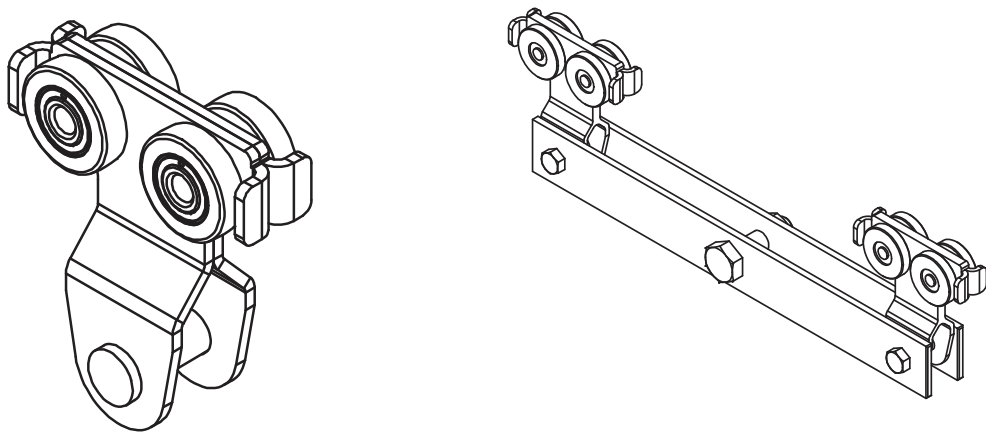


Figure 25: Trolleys ".T48" and ".T49" types

It is very important to check all the bolts and safety devices on the trolley before installation. For example, trolley type .T48 has a split pin that ensures the suspension pin is locked in the correct position. A lifting device can then be connected to the trolley.

Next steps describe all the necessary procedure in order to connect trolley .T48 (which is the most common) with other devices (e.g. winch).

**STEP 1:** unbend cotter or split pin and remove it totally from trolley pin.

**STEP 2:** position trolley pin in in such a way to pass and connect the lifting device.

**STEP 3:** put the trolley pin back into the initial position. Take care to place all the washers in both sides of trolley pin. Washers centre the lifting device and avoid unstable movement.

**STEP 4:** finally, the split pin must be installed again and bent correctly. This is very important and must never be omitted. The position of cotter pin has to be checked frequently and if something is wrong, it must be changed immediately.

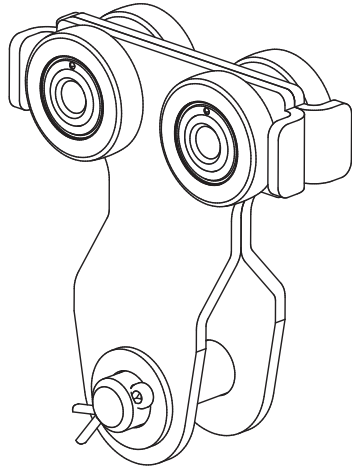


Figure 26: Safety devices in ".T48" type trolley

**i IMPORTANT!**  
 Installer must install track end stops on all the remaining ends of track that have been fitted in accordance with manufacturer`s instructions.

### 3.2.6. Installation of cable trolleys (optional)

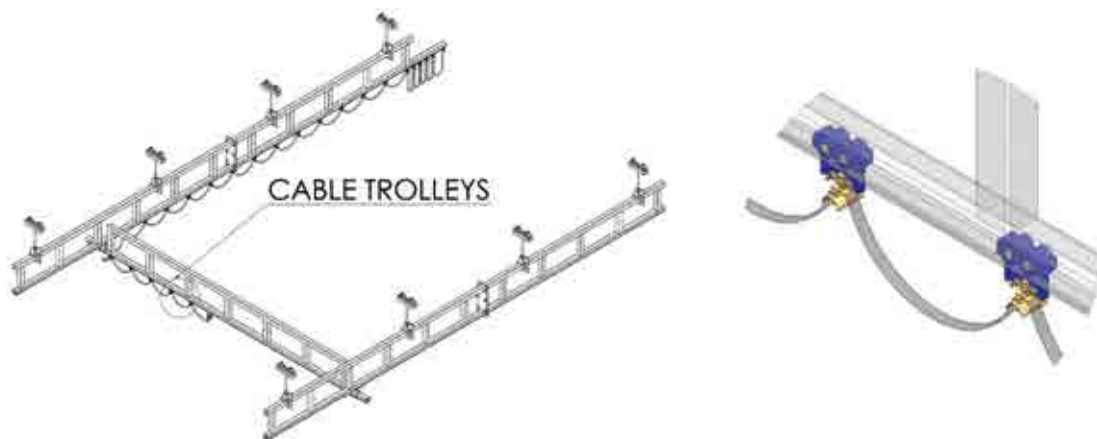


Figure 27: Installation of the cable trolleys using one of the travel rails

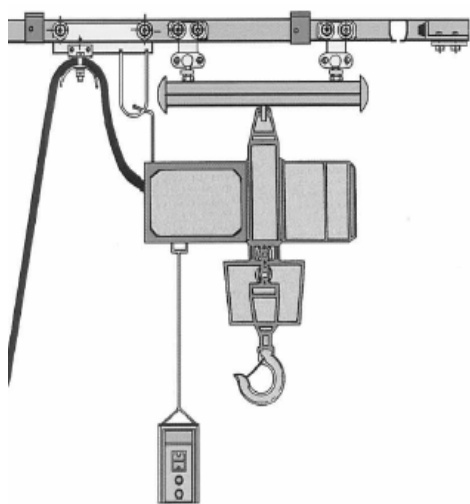
- ✓ In some cases cable trolleys move in an additional line which is called an auxiliary line. This line is running parallel to the main line.
- ✓ This design gives a variety of options for use with:
  - a) Round cables with different sections
  - b) Flat cables with different sections
  - c) Flexible hoses
- ✓ Installation instructions for the main lines should also be followed for the installation of auxiliary lines.
- ✓ Manufacturer has defined the correct number of cable trolleys taking into account the line length and the desired maximum depth of cable. All the details can be found in the manufacturer`s design.

- ✓ Installer should note that:
  - a) The specification of cable depends on the power supply. The installer must take into account that large sections may bend with difficulty and they may have to distribute them among several cables of smaller specification.
  - b) In systems with cable trolleys which move with high speed (more than 2m/sec), the trolleys should be connected using chains in order to protect them against damage.
- ✓ Auxiliary lines are connected to the support structure using typical support brackets and assemblies (e.g. supports type .B02, .B03 etc.).
- ✓ Track end stops have to be installed to auxiliary tracks.

**The installation of cable trolleys should be done as follows:**

### **1<sup>st</sup> case: using auxiliary line**

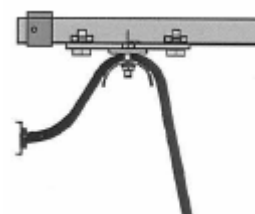
**STEP 1:** With one side of the auxiliary track open, the towing trolley is inserted into the track. It connects to the lifting device via a “U”-shaped clamp.



**Figure 28:** The connection of the towing trolley to the lifting device

**STEP 2:** all cable trolleys are inserted one after the other into the auxiliary track.

**STEP 3:** cable end clamp must be inserted into the track as next figure shows.



**Figure 29:**  
Installation of the cable end clamp

**STEP 4:** all the bolts of clamps have to be loosened. Then the cable has to pass through each clamp.

**STEP 5:** cable passes through each clamp starting with the lifting device and ending with the end clamp.

**STEP 6:** all the clamp bolts have to be re-bolted once the cable or hose has been distributed equally.

**STEP 7:** install all track end stops to secure cable trolleys so they are suitably retained

## 2<sup>nd</sup> case: without auxiliary line

**STEP 1:** With one side of long travel track open, pass all nylon cable trolleys through it.

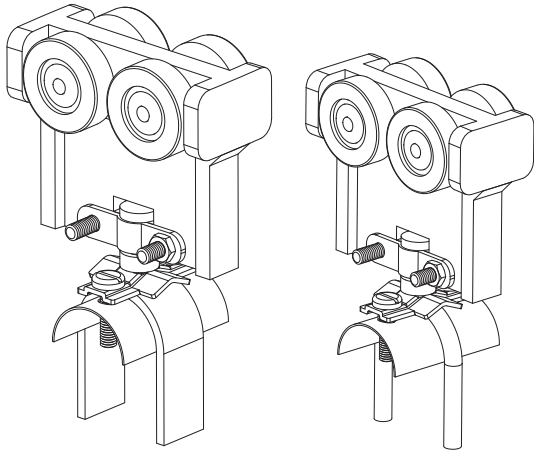


Figure 30:  
Nylon cable trolleys “.L00” and “.L01” types

**STEP 2:** end stop with cable end clamp type .K02 works as the end clamp in previous case 2. If installer receives cable end clamp type .K00, this should be connected to end stop type .X01 to create a .K02.

**STEP 3:** all bolts have to be loose.

**STEP 4:** cable or hose passes through clamps distributing it equally.

**STEP 5:** all clamp bolts have to be re-bolted again.

**i IMPORTANT! Excessive tightening may cause deformities in cable or hoses.**

### 3.2.7. Installation of interlocks, power driven trolleys and cantilever (optional)

In some cases, due to specific characteristics of the area or of the load, some extra devices could be used. Interlocks, power driven trolleys and cantilevers are the most common.

Instructions for installation are given just below.

#### 3.2.7.1. Installation of interlocks

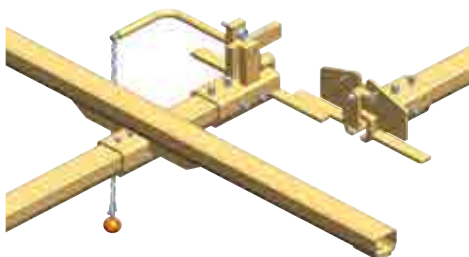


Figure 31: A set of interlocks

If the light crane needs to connect to another line (e.g. monorail) then a set of interlocks has to be used. Operator may couple and un-couple the two lines either manually via a pull cord or remotely via an electric or pneumatic cylinder operated interlock.

**Basic points of interlock's installation are described below:**

**STEP 1:** both parts of bridge interlock have to be placed in the two sides of track to be connected. The two parts have to be at the same height with track edges meeting before next step.

**STEP 2:** the bolts that are located on the top of two parts have to be bolted in order to be locked onto the track. This position will be secured using back nuts of the bolts.

# 3

**STEP 3:** the side bolts have to bolt simultaneously until the edges of the two interlocks match the edges of the tracks.

**i IMPORTANT!** All the adjustments of the two parts of interlocks must be done carefully. At the end of the process no gap between the two parts should be kept to a minimum (approximately 2 in recommended).

**i IMPORTANT!** Two parts of bridge interlocks must not extend from vertical level that is defined by the track edge. This may cause collision during movement of the cross bridge.

**i IMPORTANT!** Where the handle device seems not to work properly (it does not return to initial position easily), then adjustment of spring must be done. This is described in maintenance procedure (paragraph 5.2)

## 3.2.7.2. Installation of power driven trolley

Where power driven trolleys are necessary (this could be for both end carriages and trolleys in the cross bridge), then trolleys type .H110 are used. There are the following combinations available:

1. Power driven trolley inside cross bridge only (M1)
2. Power driven trolley inside long travel tracks only (M2+M3).
3. Power driven trolley inside both long travel tracks and cross bridge (M1+M2+M3)

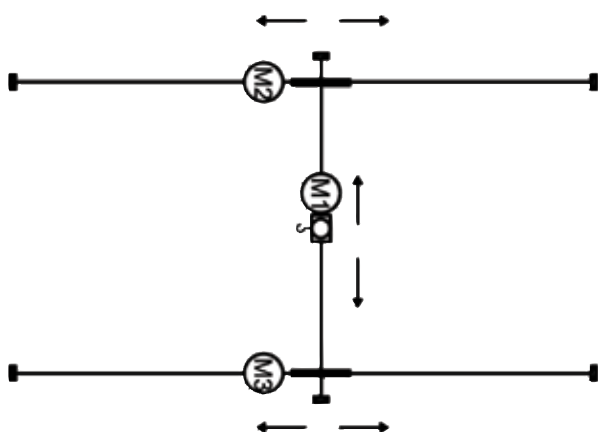


Figure 32: The power driven trolley motion

Power driven trolleys rely upon power supply and the distribution of cables through crane's track. As paragraph 3.2.6. describes distribution of cables could be done using auxiliary lines or even using some of the tracks of the crane.

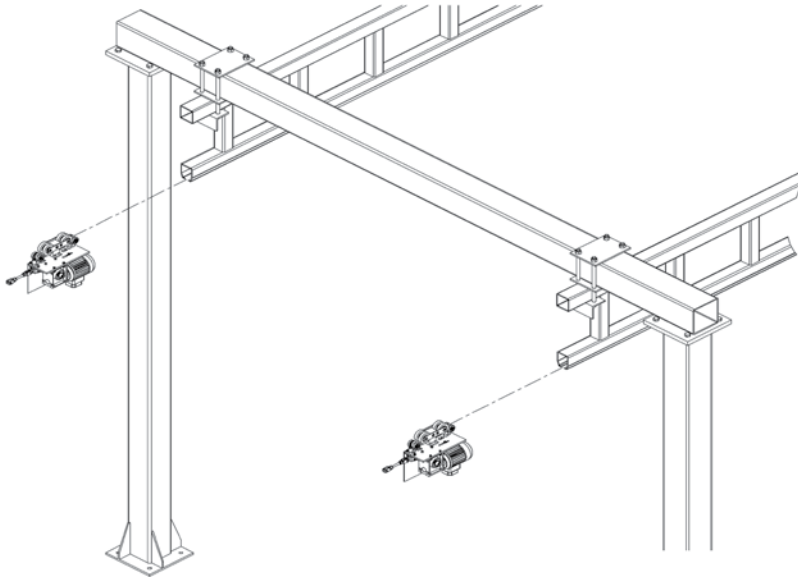
Installation of power driven trolleys is described in the next steps. This deals with the conversion from manual to electric handling of trolleys. The same steps are followed in a new crane just omitting steps 1 and 2.

# 3

**STEP 1:** firstly any load must be removed from system. The end stop of the long travel track must be uninstalled.

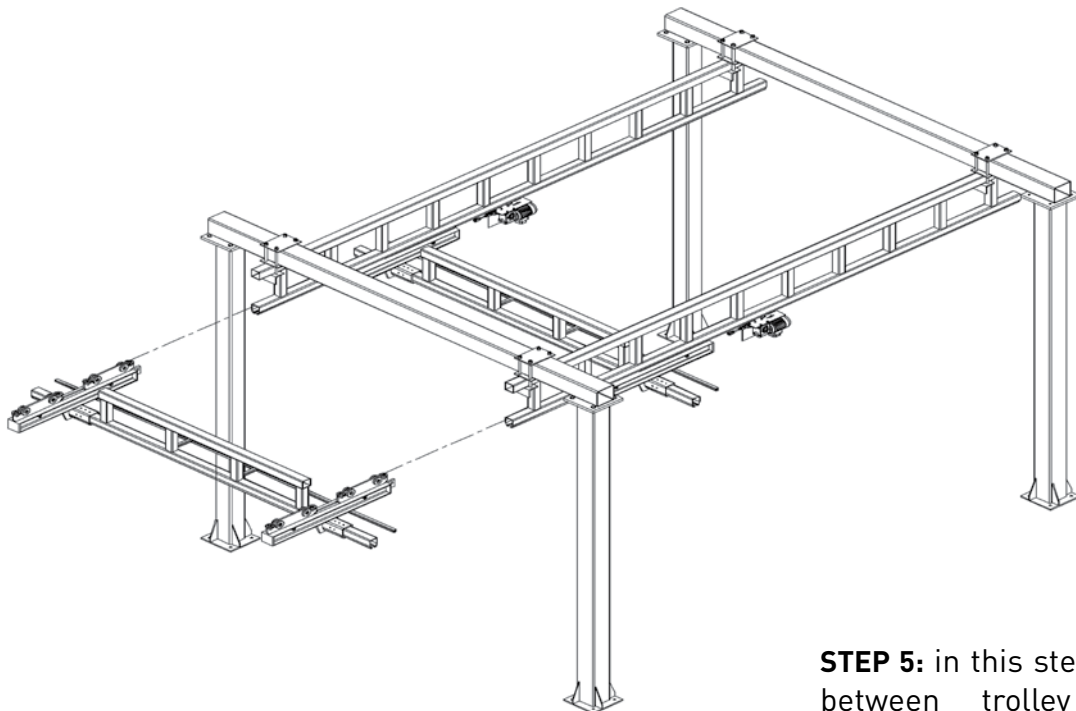
**STEP 2:** any load must removed from system. The cross bridge with end carriages should be installed. This process should be done using an appropriate lifting device because the set is quite heavy.

**STEP 3:** Power driven trolleys type .H110 have to pass inside long travel tracks with the correct orientation. This means that the connection clamps will be close to the end carriages when they are installed.



**STEP 4:** the set of cross bridge and end carriages can now be re-installed. Installer has to take into account the orientation of the set. It has to be in such way that connection with power driven trolleys is possible (see figure below).

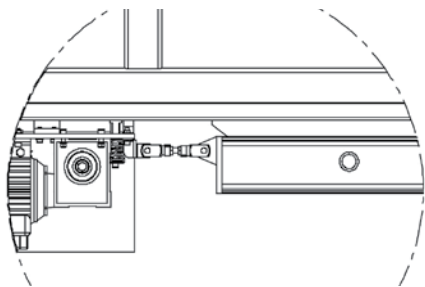
**Figure 33: Installation of the power driven trolley inside to the long travel tracks**



**STEP 5:** in this step connection between trolley and end carriage is done. Then the track end stops must be re-installed.

**Figure 34: Installation of the set cross bridge and end carriages**

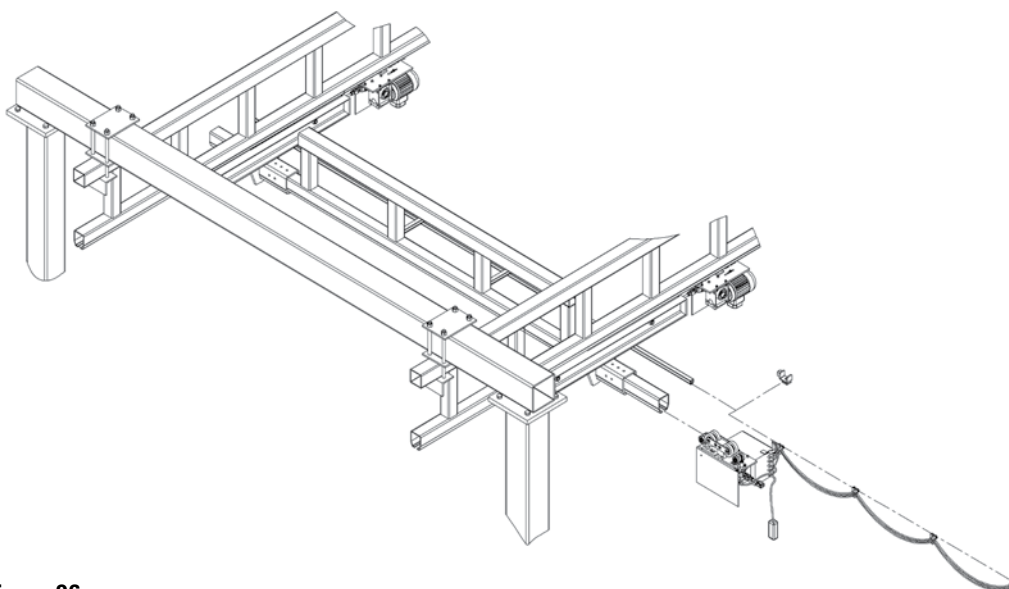




**Figure 35:**  
Connection between trolley and end carriage

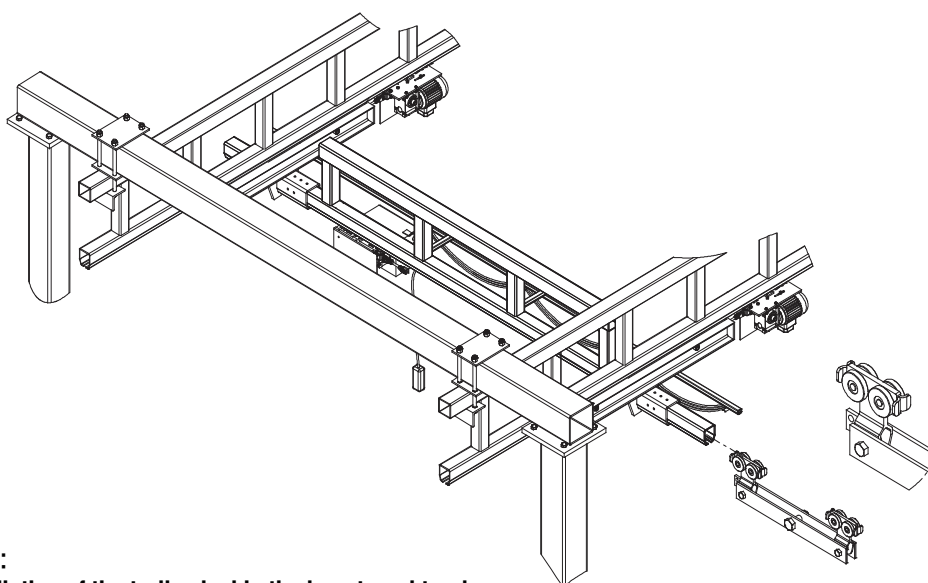
**STEP 6:** in this step, installer must begin the installation of the power driven trolley inside cross bridge. First, one track end stop must be removed. Then the cross bridge trolley can be removed.

**STEP 7:** The power driven trolley has to pass inside cross bridge. Then the cable trolleys have to pass inside it too (see figure below).



**Figure 36:**  
Passing the power driven trolley inside long travel track

**STEP 8:** the trolleys have to be reinstalled inside the cross bridge. Please note: trolleys and power driven trolleys have to be oriented in such way that connection will be possible.



**Figure 37:**  
The installation of the trolley inside the long travel track

**STEP 9:** in this step the power driven trolley will connect to the trolley.

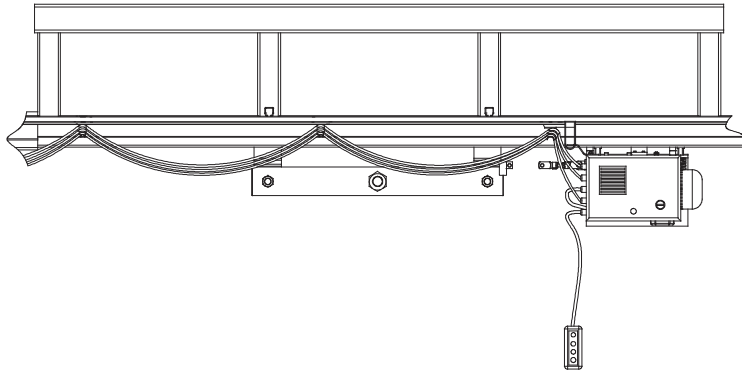


Figure 38: The connection between the power driven trolley and the trolley.

**i NOTE:** steps 6,7,8,9 can be implemented at the installer's discretion even when the cross bridge is not yet installed.

**STEP 10:** The control power box should be installed already on the cross bridge: if not, a qualified person has to install it following the manufacturer's instructions. Then the cables can simply be connected in to the box.

**STEP 11:** The power supply cable has to pass through the clamps of the cable trolleys that move inside the auxiliary line or cross bridge track and long travel track. (See paragraph 3.2.6.)

**STEP 12:** Finally, connect the power supply cable to the control power box and the main power supply. An alternative to festoon cable is the use of an enclosed 4 pole conductor system. (This increases the long and cross travel movements and removes the need for cable loops)

**i NOTE:** Once the above steps are complete, the adjustment of the power driven trolley can be done. Firstly, the installer should adjust the two bolts under the springs in such way that the trolley can move freely, but displays only minimal slippage upon stopping. To achieve this he must follow next steps:

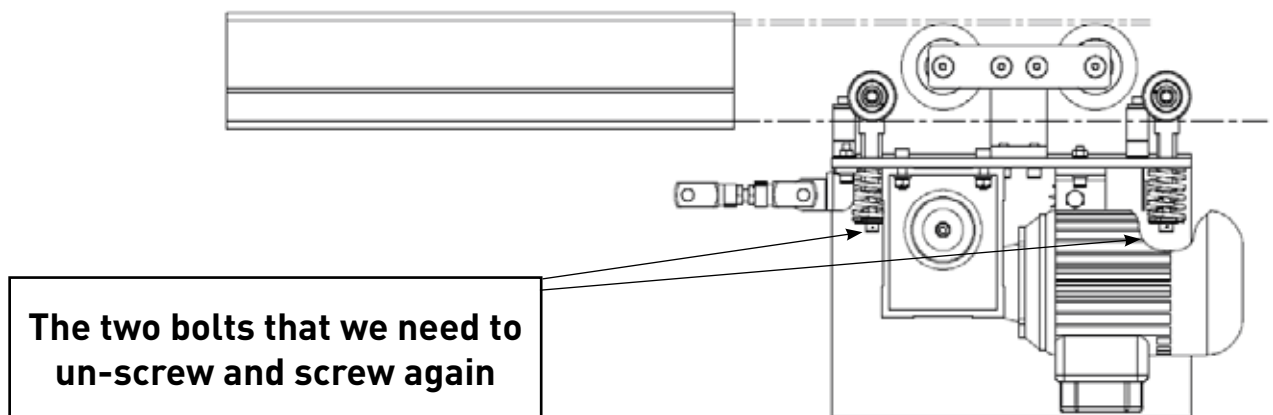


Figure 39: Adjustment screws for power driven trolleys

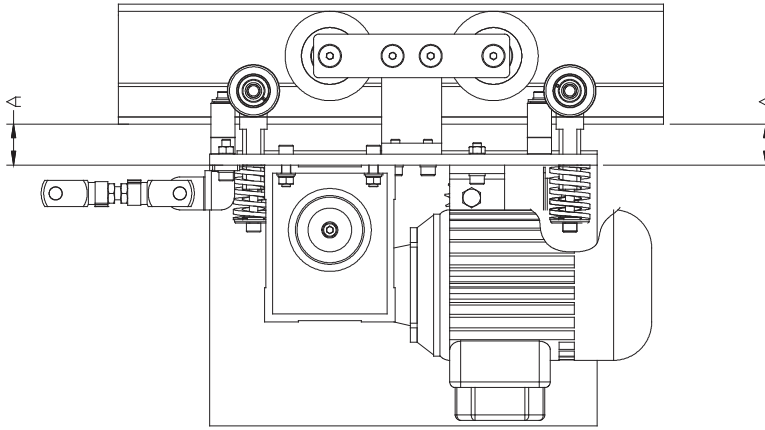


Figure 40: Dimension "A" for power driven trolley

**i IMPORTANT!**  
In all cases dimension "A" must be the same on both sides of trolley.

**STEP 1:** without load, the installer should tighten the bolts bit by bit so that the trolley can move. The movement should start when the two nylon wheels touch the upper internal side of the track.

**STEP 2:** The installer should now test that the trolley's movement is free. Next, he should try stopping the trolley. If there is only minimal slippage, he may proceed to the next step. If not, he should repeat step 1.

**STEP 3:** step 1 and step 2 should then be repeated under maximum load.

### 3.2.7.3. Installation of cantilever

The cantilever is used when needed:

- ✓ To avoid obstacles during movement along the cross bridge.
- ✓ To transfer a load beyond the crane's limits (as defined by the long travel track and cross bridge track).

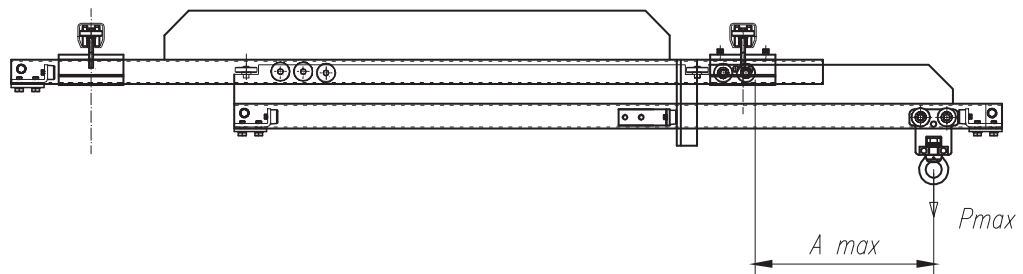


Figure 41: The cantilever

A cantilever may be used in NIKORAIL® track profiles from 23000 up to 27000 series. To ensure the continuous horizontal movement of the cantilever, an "antikick" set of wheels are used. These can be found already installed in the rear of the cantilever. Antikick wheels also help to minimize oscillation of the cantilever.

The installation method depends on the specific dimensions of the area where the crane is to be installed. If there is enough space on the opposite side to where the cantilever will work, then the installer should follow these steps:

**STEP 1:** The installer removes all the end track stops.

**STEP 2:** The cantilever is passed inside the cross bridge. This must be done from the opposite side to where the cantilever will work.

**STEP 3:** One side of the cross bridge should be closed using a track end stop plus a transverse bolt type .X06. The other side remains open to allow the cantilever to pass. The cantilever will work until dimension "A" is at the maximum (see "A max" figure above)., "A max" is defined by a stopper device that has been installed by the manufacturer. (see figure above).

**STEP 4:** one track end stop should be placed at one end of the cantilever. The trolley from the cross bridge can then travel inside the cantilever. Finally, the other track end stop closes the other side of cantilever.

If there is not enough space on the opposite side to where the cantilever will work, then the steps above cannot be followed unless the cross bridge is uninstalled first.

Once the cross bridge has been uninstalled, the installer can follow all the above steps working at floor level. When finished, he can re-install the completed set using an appropriate lifting device.

### 3.3. Final check and function test

When the entire crane installation has been completed, a final check and a run test must be done.

**The check points are as follows:**

- ✓ A visual check should be made that all safety devices are properly installed, including all track end stops, all emergency stop devices and all other safety devices (e.g. cotter pins.)
- ✓ Check that all screws and nuts are properly tightened.
- ✓ Check that all danger/warning signs are visible.
- ✓ This manual and the manufacturer's product list and designs should be kept in a safe place that is easily accessible for interested parties.
- ✓ Check that the working area is free of traffic and obstacles before beginning the test run.

Once the above checks have been made, a competent person should perform a thorough examination of the crane. Using a calibrated test load (equal to the maximum safe working load), the motion of the crane in every direction should be tested. Operation during the test should be both smooth running and without any unusual noise. If something is wrong, it should be corrected immediately by the appropriate person.

**IMPORTANT! ALL SAFETY PROCEDURES MUST BE OBSERVED DURING THE TEST RUN. THE USE OF PERSONAL PROTECTIVE EQUIPMENT IS OBLIGATORY IN ANY PROCEDURE!**

When all the above is completed, the crane is ready to use.

# 4

## FUNCTION

of NIKORAIL® light cranes

### 4.1. General instructions for proper use of a NIKORAIL® light crane

Before operating the crane, the operator should study the instructions for himself and note any information which may not have been passed on by the supervisor.

Initially, if the operation of the crane is via pendant control, the operator should practise pushing each button without power supply so as to become familiar with the feel (if the button is hard or soft, and how much pressure to use) but also to ensure that none of them stick. Should there be a problem, it must be reported to the supervisor and corrected immediately.

Once the operator has ensured that everything works properly and the working area is free, he may operate the crane.

The operator should check all the safety devices of the pendant control and familiarise himself with how it works (e.g. how to move the load slowly or more quickly) and especially with how it works at the beginning and at the end of any movement. To do that, he must make a careful study of the pendant control manufacturer's manual.

Before a weight can be attached, the lifting device should be positioned directly above it. If the weight is not centered properly, it could cause vibration during movement. Then the weight needs to be raised to the desired height. The controller's cable should never be used to achieve movement of the load as this may cause damage to the cable or pendant controller.

The operation at the beginning and end of the run should be at slow speed. If the operator notices anything unusual in the operation of the crane he should stop immediately and have the crane inspected by a competent person.

### 4.2. Instructions for operators

In general, a measure of the correct operation of a crane is the smoothness of movement. Use of the crane should be restricted to trained personnel. A good operator should be aware of and follow the instructions below:

1. The crane should be operated smoothly avoiding sudden movements of the load.
2. Centring the crane is necessary before the suspension of any load so as to prevent oscillations during the operation.
3. If there are any crane cables, they should be positioned vertically. The crane should not be used for lateral thrusts.
4. The operator has to ensure that no-one is in the working area. Any persons present should be aware that a load is being lifted.

5. Any suspended load must not exceed the lifting capacity of the crane.
6. Before starting the operation all security measures relating to the lifting device (e.g. winch) should have been undertaken, according to the manufacturer's instructions.
7. The load should be lifted just enough in order to be easily transported.
8. The load should never be left without some form of control. If there is a power supply, the power switch should not be turned off. If the crane moves manually, the operator must always be in contact with the load to keep always the control of it. Of course, all the procedure must be in line with safety rules (e.g. the operator must never be under the load).
9. Do not keep surplus cables or devices on or near the crane. Only essential equipment should be present.
10. Particular care is required to prevent transferring loads, or even empty packages, above people. If magnets or vacuum devices are used, this must be done with great care and always strictly following the manufacturer's instructions.
11. In an emergency, the operator or other person should stop the crane's operation (for example by pressing the "emergency stop" on the controller).
12. No change should be made in the basic elements of the crane and no intervention made by unauthorised personnel.
13. In an emergency, the crane must be secured so it cannot be operated (e.g. closing the main fuse) and should not be left with a load.
14. In every situation, contact with any part of the crane (trolleys, stoppers etc.) should be done very carefully, always following safety rules.
15. If there is any link to another conveyor system (e.g. monorail), the operator should slowly push the bridge until an alignment between the two lines is achieved. Once the alignment and coupling have been done, then the load should be passed through the link carefully. After the load has passed, and the uncoupling has been finished, the operator should be sure that the safety devices work properly and the open ends of the lines are closed. Also, the operator has to ensure that there is no any cable to impede the functioning.

## 5.1. General instructions for maintenance

**Any monitoring or maintenance procedure should be performed using the following principles:**

1. Maintenance procedures should be carried out without load.
2. If there is power supply, the corresponding fuse must be isolated. The same applies if there is air supply.
3. Safety rules must be always be followed, as defined by the relevant legislation of that country.
4. For safety reasons, during any maintenance procedure, the cross bridge must remain stationary.
5. In any repair procedure, only original NIKORAIL® spare parts should be used to ensure proper operation of the system. Also, any change or addition in the crane structure should be done only with the approval of NIKORAIL®.
6. During maintenance the crane has to be isolated from any other system with which uses the same lines. Alternatively, a person can be positioned at a point where he could give a signal to the operator of the relevant system in order to stop the motion and to prevent any accident.
7. When any maintenance or inspection procedure has been finished, all the elements that have been disconnected must be reassembled by the same person who disconnected them. Also, all safety devices must be replaced carefully and in a proper manner to enable the crane to return to normal operation.
8. Finally, all the material or equipment used for maintenance should be removed after the maintenance procedure has been completed.

## 5.2. Periodic check and maintenance. Table of actions

**The first inspection should be done one month after the crane's installation. At that time, the following should be checked:**

- ✓ Horizontal and vertical alignment of the crane must be checked.
- ✓ All the elements of the crane have to be inspected for any unusual wear.
- ✓ All the bolts and nuts should be properly tightened.
- ✓ All the track end stops should be correctly placed.
- ✓ All the safety devices should be in place and working properly.
- ✓ All splice joints have to be aligned correctly.
- ✓ All the trolleys and the end carriages have to roll smoothly.

**Even for NIKORAIL® cranes not requiring any special maintenance there are periodic checks which should be done. These checks combined with proper installation increase the system's lifetime. A check and maintenance table appears below:**

<b>CRANE ELEMENT</b>	<b>EVERY 3 MONTHS</b>	<b>EVERY 6 MONTHS</b>	<b>ANNUALLY</b>
<b>TRACK</b>	VISUAL INSPECTION <b>(OPERATOR)</b>		CHECK FOR CORROSION OR SIGNS OF DEFORMITY. CLEAN INSIDE THE TRACK <b>(MAINTENANCE PERSONNEL)</b>
<b>SPLICE JOINT</b>	VISUAL INSPECTION FOR HORIZONTAL AND VERTICAL ALIGNMENT <b>(OPERATOR)</b>		CHECK ALL BOLTS ARE TIGHTENED PROPERLY <b>(MAINTENANCE PERSONNEL)</b>
<b>SUPPORT BRACKETS OR SUPPORT ASSEMBLIES</b>	VISUAL INSPECTION FOR ANY MOVEMENT <b>(OPERATOR)</b>		CHECK ALL BOLTS ARE TIGHTENED PROPERLY <b>(MAINTENANCE PERSONNEL)</b>
<b>TROLLEYS –END CARRIAGES</b>	CHECK FOR SMOOTH OPERATION AND MOVEMENT. CHECK ALL THE BOLTS AND NUTS ARE TIGHTENED PROPERLY. CHECK ALL SAFETY DEVICES ARE PROPERLY INSTALLED <b>(OPERATOR)</b>	1) CHECK FOR CORROSION IN ALL MOVING PARTS 2) CHECK ALL THE BOLTS AND NUTS ARE TIGHTENED PROPERLY <b>(MAINTENANCE PERSONNEL)</b>	UNINSTALL ALL THE TROLLEYS AND END CARRIAGES. CHECK FOR UNUSUAL WEAR OR CORROSION. ESPECIALLY CHECK THE SMOOTH OPERATION OF THE BEARINGS AND THAT THE BOLTS AND THE NUTS ARE PROPERLY TIGHTENED. <b>(MAINTENANCE PERSONNEL)</b>
<b>TRACK END STOP</b>	VISUAL INSPECTION FOR ANY MOVEMENT <b>(OPERATOR)</b>		CHECK ALL BOLTS ARE TIGHTENED PROPERLY AND FOR ANY DEFORMITY <b>(MAINTENANCE PERSONNEL)</b>
<b>CONVEYOR SYSTEM FOR CABLES OR HOSES</b>	VISUAL CHECK FOR ANY WEAR AND FOR SMOOTH OPERATION <b>(OPERATOR)</b>	CHECK CABLE'S ELECTRICAL CONNECTIONS. CHECK CONNECTIONS OF CABLES TO TROLLEYS. CHECK CABLE FOR EXCESSIVE HANGING <b>(MAINTENANCE PERSONNEL)</b>	
<b>SAFETY DEVICES</b>	VISUAL INSPECTION <b>(OPERATOR)</b>		
<b>INTERLOCKS</b>	VISUAL INSPECTION FOR ANY MOVEMENT AND PROPER FUNCTIONING OF THE SAFETY BLADES	LUBRICATION OF SAFETY BLADES, TIGHTEN ALL BOLTS AND NUTS AND CHECK THE CONTROLLER RETURNS CORRECTLY*	
<b>OTHER DEVICES</b>	ACCORDING TO MANUFACTURER'S INSTRUCTIONS		

Table 2: Table of actions for maintenance



# 5

## \*INSTRUCTIONS FOR INTERLOCK'S SPRING:

If the controller pushes up the blade and it does not fully return to its position, an adjustment of the relevant spring tension has to be done. Where this is the case, the back nut has to be loosened and then, using the proper tool (an Allen key) the spring has to be tightened properly. **IMPORTANT! DO NOT OVER-TIGHTEN!** Then, the back nut can be tightened again to secure the adjustment.

In addition to the above table, where the operator notices unusual effort in lifting and/or transference of the load or unusual noises appear, then the cause should be found and be corrected. If necessary, the bearings can be lubricated with care and without allowing the lubrication to spill over. If the operating area is subject to much dust or other impurities then the crane (and particularly the interior of the track) needs to be cleaned. Under no circumstances should any cleaning liquids be used.

It is recommended that a regular inspection (annually, or as dictated by the country's legislation) of the crane by a competent person has to be done.

# 6

## BASIC RULES OF SAFETY

At all stages of installation, operation and maintenance of a NIKORAIL® crane, all the safety rules in accordance with the laws and regulations of each country should be followed.

Some principle safety standards referring to installation, maintenance and operation of the crane are as follows. (Please note, this list is not exhaustive).

- ✓ Before any work starts, this manual has to be read and understood.
- ✓ Any personnel involved with the crane's installation, operation or maintenance should know where this manual is kept.
- ✓ Only trained personnel must be involved with installation, maintenance and operation of the crane.
- ✓ The area where crane is installed must be well marked up.
- ✓ The personnel involved with installation, maintenance or operation of the crane must wear appropriate clothing (e.g. helmet, proper shoes etc.).
- ✓ Once the installation has been completed, a supervisor must check the proper installation and that the crane works correctly.
- ✓ **IMPORTANT! THE CRANE MUST ONLY BE USED FOR TRANSFERRING LOADS AND NOT FOR PERSONNEL.**

**In particular, the rules below should be followed during operation:**

### **BEFORE OPERATION:**

- ✓ Operation may start once the operator has verified that there is no instruction to the contrary (e.g. a sign to inform that the crane is off).
- ✓ Before operation starts, all the bolts and nuts must be tightened properly, unnecessary cables or hoses must be removed, and all safety devices should have been placed correctly.
- ✓ The working area should be free of any obstacles.
- ✓ Any lifting device has been checked as the manufacturer recommends.

**DURING OPERATION:**

- ✓ The crane must never transfer loads that exceed the maximum working load.
- ✓ The crane must never lift a load which is not under control.
- ✓ Where there is a power failure, the operator should disable all the devices.
- ✓ Both the crane and its load should always be under the control of the operator.
- ✓ The operator must be able to reach the controls easily.
- ✓ The operator must comply with the instructions given by a competent person and not by any untrained personnel. The operator should only respond to general workers when they are giving an emergency signal.
- ✓ Under no circumstances should loads be operated above people.
- ✓ A crane must not be used to make a sideways pull (except where it has been specifically authorised by a qualified person after making specific adjustments)
- ✓ Compressed gases can only be lifted by a cradle or enclosed platform.
- ✓ Under no circumstances should personnel ride a hoisting device, such as a magnet, hook, ball, or load.
- ✓ Before any transportation of a load, ensure that it is well balanced and secured.
- ✓ Multiple lines must never be twisted around each other.
- ✓ Ensure there is no sudden acceleration or deceleration of the moving load.
- ✓ The crane must not operate if all the track end stops are not installed properly.
- ✓ The track end stops must never be hit with force or repetitively at speed.
- ✓ If any unusual sound or behavior becomes apparent, the operation of the crane must stop immediately. In this case a detailed inspection must be done.

**The minimum qualifications for an employee selected to operate a crane are as follows.**

**They must:**

- ✓ Have understood all the safe operating instructions in this manual.
- ✓ Have good or corrected vision (to the standard required for a driver's license)
- ✓ Be physically able to operate equipment.
- ✓ Be tall enough to operate the controls and to have an unobstructed view over the controls into the working area.
- ✓ Have good coordination between eyes, hands, and feet.
- ✓ Have had no episodes of epilepsy, seizures or other ailments that may render them unconscious
- ✓ Have the ability to understand signs, labels, and instructions.
- ✓ Must be re-examined for these qualifications at least once every 3 years.

**All the above should never replace the legislation of any country.**



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