



STORAGE SYSTEMS FOR LIFE

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1.1 Brief description of the system

Flow Rail® is a compact storage system that the storage sector has been looking forward to for a long time and that can be used with conventional forklift trucks. The forklift no longer has to drive in the rack like with a classic Drive-In. This means a significant time saving. The key element of the system is a chain in which the links slide on roller bearings. Rail and chain together have a height of 90 mm. It is therefore possible to mount this system in an existing Drive-In. Only the beams have to be provided for.

The Flow Rail® system does not require any specific explanation or training. When the channel is empty, the first pallet location is used as in a classic single depth rack. The lateral space relative to the structure of the racks can be limited because the pallets do not change this space during their movement in the channel. A pallet placed in the beginning of the channel maintains its lateral position until the end of the channel. Then all pallets are placed and pulled back like a bread from the oven.

The system is neither powered nor motorized and is powered by an external source. This means that the forklift truck causes a product coupling by half of the load resting on the forks and the other half resting on the chains.

The following limits must be adhered to :

- * a maximum channel depth of 10 places for euro palette (800 mm / pallet depthwise).
- * a maximum depth of 10 500 mm.
- * a maximum pallet weight of 1000 kg / pallet. A minimum pallet weight of 150 kg / pallet.
- * the weight difference between the pallets in the same channel must not exceed 10%.

1.2 Advantages of the Flow Rail® system

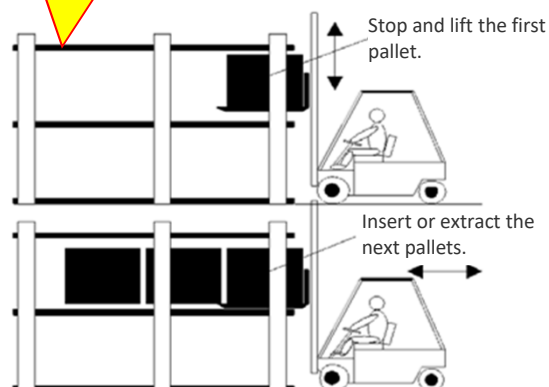
- * Possibility to use any standard type of forklift.
- * All movements are always done on the outside of the rack, never in the rack.
- * The time required to load and unload the system is extremely short.
- * Each pallet is always ready for unloading at the entrance of the channel.
- * The pallets do not move on the chains, it is the chains that move.
- * Each channel can contain up to 10 euro pallets (1000 kg / euro palette). Ability to load a different article in each channel.
- * The system can easily be integrated into an existing Drive-In.
- * The system can also be used in refrigerators and freezers up to temperatures of -30 °C.
- * Minimal maintenance : a superficial cleaning is sufficient.
- * Maximum use of the available space in the storage space. Required height for the rail: 90 mm. The beam height must also be added.

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Rail is positioned perfectly horizontal, so

1. General



1.3 Content

This manual contains a description of the Flow Rail® system, the associated installation instructions, user and maintenance instructions, as well as the technical characteristics and actions to be performed before installation.

All this is accompanied by diagrams and drawings in order to make reading easier.

1.4 Conformity and reference standards

The racks manufactured by CORNIX-REDIRACK as well as the built-in Flow Rail® system are in accordance with the recommendations of the F.E.M. 10.2.02 (static pallet storage systems) and 10.2.07 (pallet storage systems by accumulation). The recommendations of the F.E.M. resume and include the following standards, among others: EN 15512 - EN 15620 - EN 15229 - EN 15635.

1.5 Users of this manual

This document is addressed to the person in charge of the factory, the workshop, the yard; to the installers' personnel, to the operator and to the maintenance personnel.

This manual must be kept by the person responsible for safety, in an appropriate place in order to be accessible at all times.

2.1 Quality of the materials

All materials have been carefully chosen to ensure easy handling, longevity and resistance at low temperatures.

Aluminium rail : light material that makes transport and assembly easier.

Side guides of the chains in PA6: these guarantee low friction and high resistance even at low temperatures.

Roller bearings: lubricated for life-long use.

Steel : sendzimir galvanized.

2.2 Quality during the manufacturing phase

Manufacture is in accordance with the ISO 9001 standard.

All steel parts of the Flow Rail® system are factory-formed. Defective parts are only possible in the event of a break in the tools. However, in such a case, the manufacturing stops automatically.

The steel elements are then assembled full automatically.

This machine can only assemble perfect parts. Otherwise, it blocks.

The manually mounted parts are checked with a jig.

2.3 Quality during the assembling

To guarantee installation according to the rules of the art, each installation team is assisted during the initial installation by a qualified technician.

Each assembly team receives an assembly manual. Once the installation has been completed, the installer must test the proper functioning of the chains in accordance with the installation instructions.

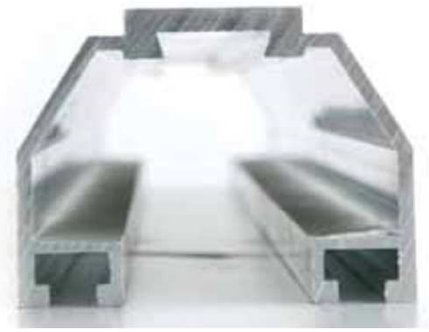
3.1 Characteristics of the racking system

The rack supplier must provide the following safety components :

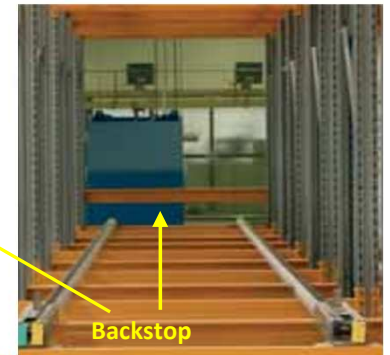
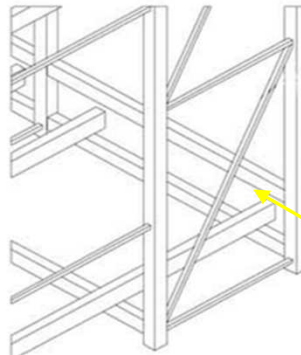
An end stop beam should be placed above the last beam.
This prevents the pallets from falling down in a channel that is overloaded.

The channels must be mounted in such a way that it is impossible for pallets to fall down either at the back or sideways and therefore there is no danger to the personnel.
This is possible by placing the side & back of the racks against a wall or by placing anti-fall grids (optional).

2. The Flow Rail® quality



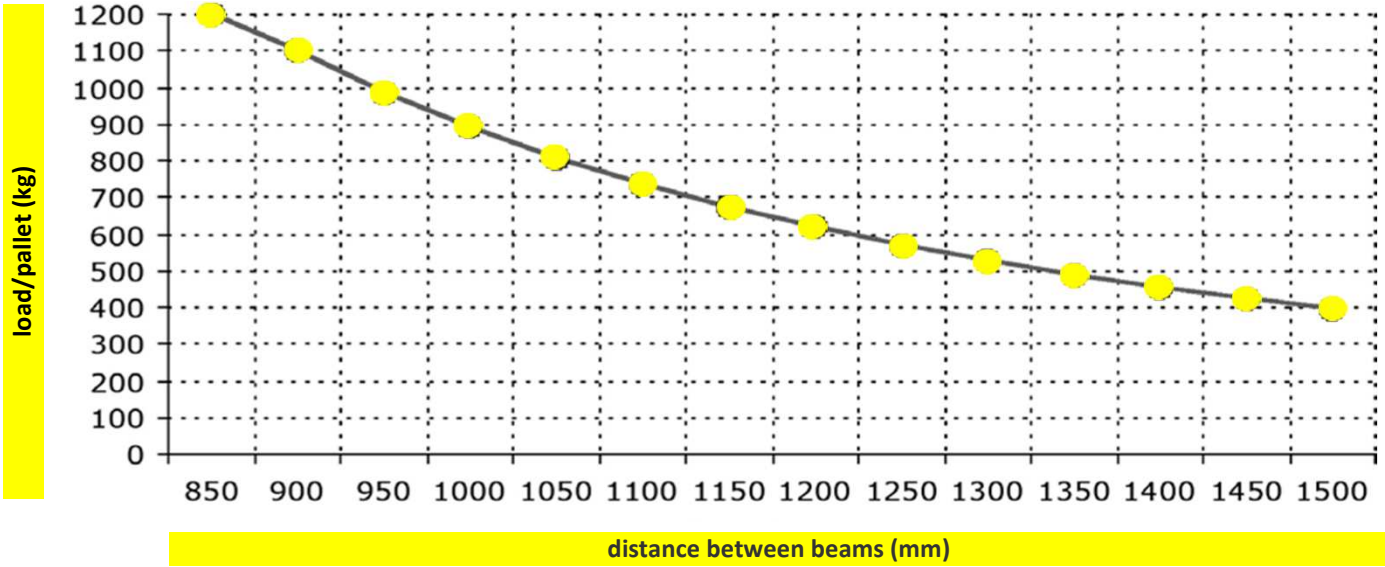
3. Assembly



The 1400 mm single C beams are factory fitted with fixing holes for securing the Flow Rail® system. If the holes are drilled by the reseller, he must obtain permission from the manufacturer. After installing these racks, the manufacturer of the racks must confirm that they are in accordance with the standards and that the minimum static requirements and more specifically the forces exerted during loading and unloading of the Flow-Rail® system have been respected.

The maximum permissible load for the pallets was determined in the order. The permissible load / pallet depends on the distance between the beams and should be situated under the curve in the chart below.

Beam spread (mm)	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
Loads (kg)	1200	1100	987	891	808	736	674	619	570	527	489	455	424	396

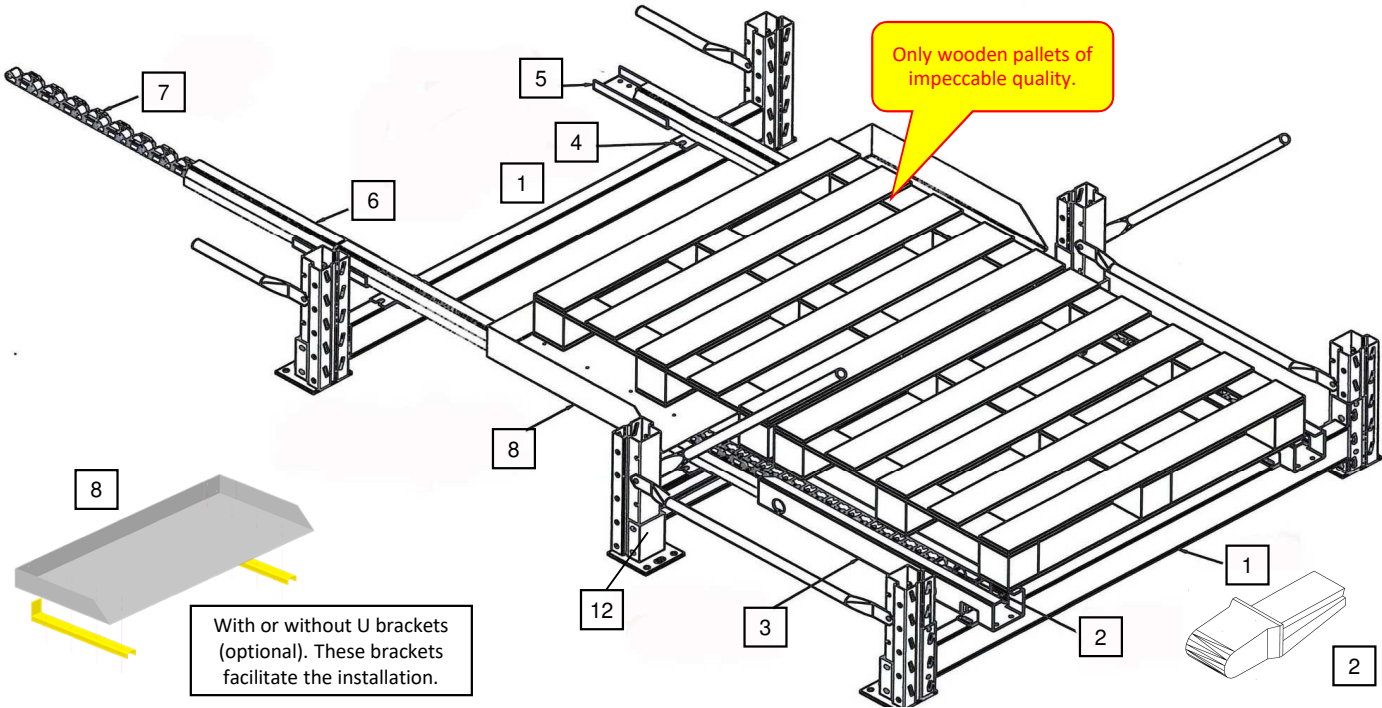


The installation manager must ensure that the above-mentioned requirements with regard to the racks are complied with. Once this check has been carried out, the assembly of the Flow Rail ® system can be started.

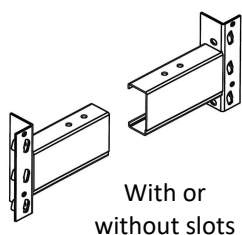
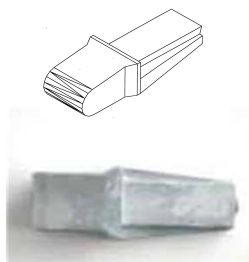
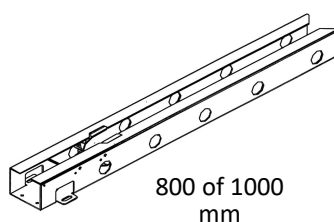
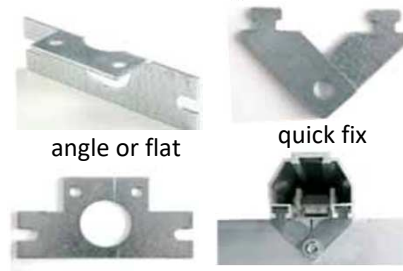
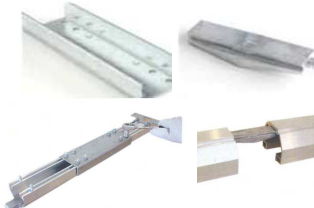
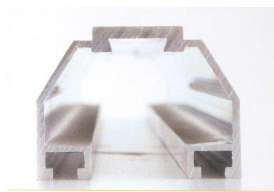
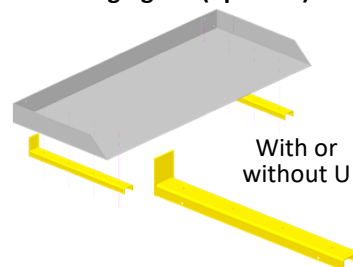
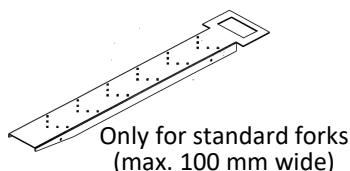
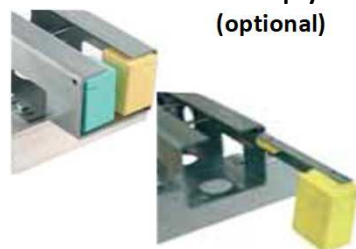
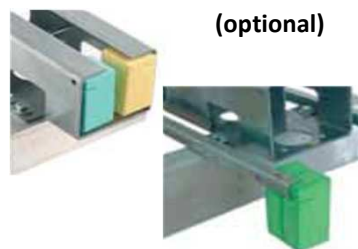
3.2 Components and assembly

3.2.1 Flow Rail ® components

A Flow Rail® standard channel is composed as follows :

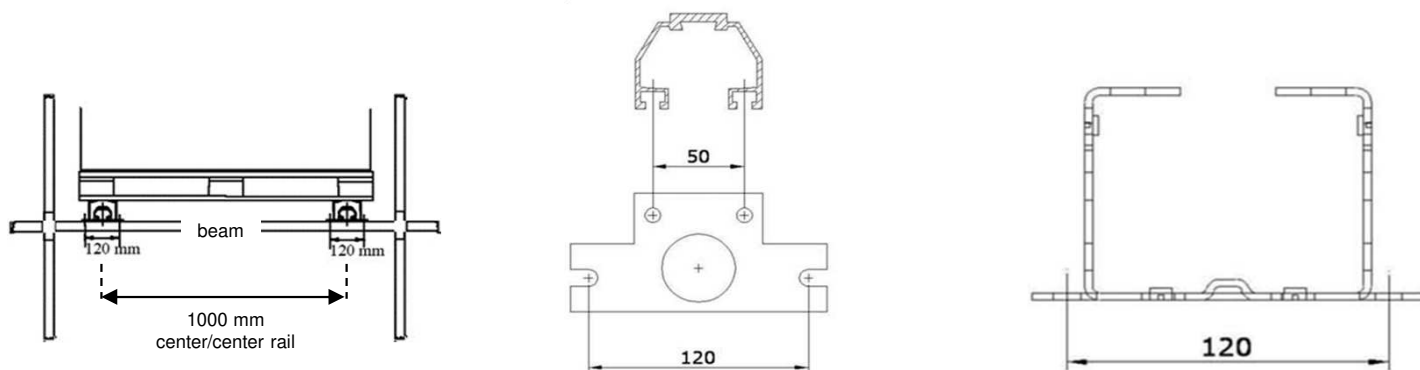


1400 mm bays are easier to assemble but more expensive. Bay width 1400 mm (1 channel), 2700 mm (2 channels), 4100 mm (3 channels).

1 Beam**2 Drive head****3 Front head****4 Fastener rail/beam****5 Rail sleeve****6 Rail****7 Chain****8 Lodging bin (optional)****9 Anti skid (optional) fork cover****10 Indicator channel empty (optional)****11 Indicator channel full (optional)****12 Steel base back****3.2.2 Piercing the beams**

It is recommended to make the fixing holes in the beam before installing the rack. Use a mold for this.

To determine the exact center distances of the holes, please refer to the drawing below. If you use the fasteners (flat or angle piece), all beams must be drilled in the same way (120 mm).

**3.2.3 Inserting eventual rail sleeves**

Insert the sleeves into the rail to ensure its straightness.

**3.2.4 Installation of the bolts**

The rails have slots on the inside at the bottom. You can slide the head of the M8 bolts into these slots.

Make sure that the number of bolts installed is correct. Each point where the rail rests on a beam should have 2 bolts (see figure 3.2.1.).

Each connection must be provided with 4 bolts per rail (see figure 3.6.1. and alongside). On the spot of the front head and of the channel full indicator, 4 bolts must be placed (see figure 3.2.6.).



3.2.5 Fixing of sleeves and fastener plates

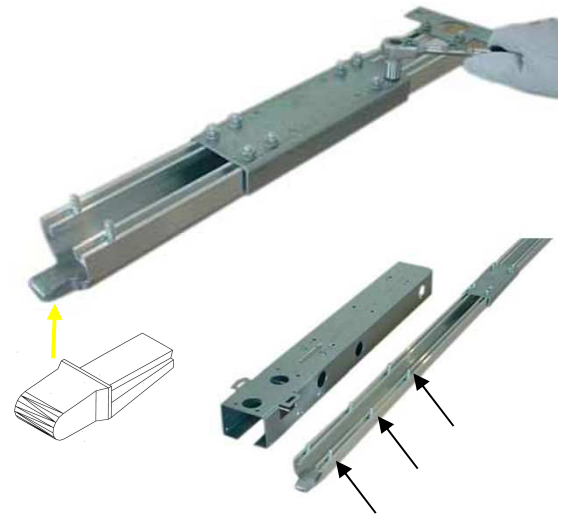
Now you may tighten any sleeves. Also attach the beam fasteners to the rail. Do not tighten the screws for the fasteners yet.

The positioning of the fasteners may need to be changed. It is easier to turn the rail over to fix the bolts of the sleeves. The rail now forms one whole.

3.2.6 Installation of front head and drive head

Place the drive head in the rail. The drive head serves to guide the chain to the bottom of the rail. The front head must be attached to the rail. Slide the front head into the rail to the end.

Now attach the front head to the rail by means of the 6 bolts that were previously placed in the slots of the rail.



3.3 Positioning

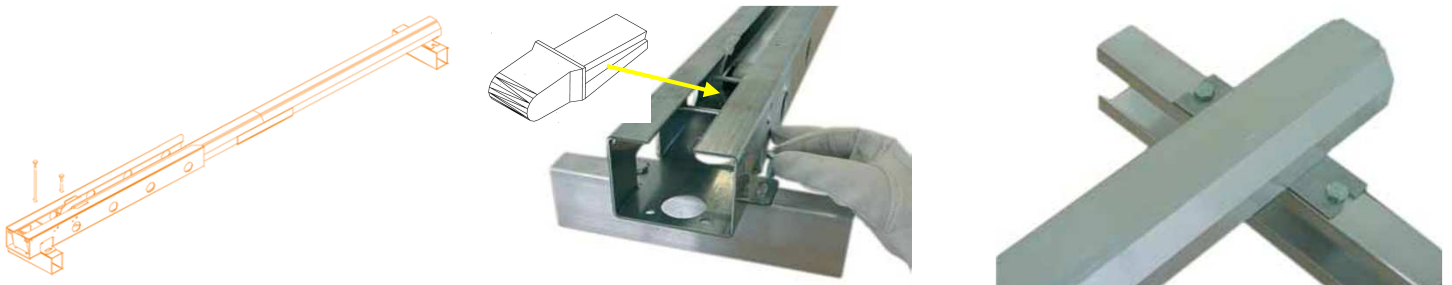
3.3.1 Positioning of the rail and the fasteners

Place the rail with the bolts on the beams. Before fixing, check the position and if the number of bolts installed is correct. Now position the rail.

Respect the rail overhang with respect to the front and rear beams (55 mm on each side). You can now attach the rail to the beams by means of the fasteners (angle or flat).

Now fix the fasteners to the beams and to the rail with the supplied nuts. If the beams have not been drilled, use self-drilling screws.

Attention: in case of installing in racks at a great height, you have to secure the rail Flow Rail® to the rack by means of a cable or similar tool. Also note that high-altitude technicians must wear a safety harness and / or use a scissor lift as appropriate.



3.3.2 Assembly with Quick Fix

The Quick Fix fasteners are used to fix the rail to the intermediate beams by means of a self-drilling screw.



3.3.3 Assembly with angle fastener

The angle fastener is used if the rear beam is welded at the same height as the intermediate beams.

The flat fastener results in an extra thickness of 3 mm. This means that the rear beam must be downwelded 3 mm. The installation of the angle fastener is often not possible because there is not enough space behind the rear beam.

Attention: install the right beam in the right place !



3.3.4 Installation of the 2e rail

Assemble the second rail and install him like the first. Make sure it is installed perfectly parallel to the first rail.

3.3.5 Positioning of the chains

Uncoil the chain without bending it. Place the chain on the rail on its full length and then slide it into the profile. In case of racking at high altitudes, be careful as an unsecured chain can fall down due to the weight of a small moving part.

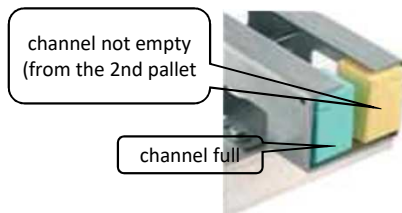
This can cause serious accidents. The chain should be secured with a cable or other means.

In case of high altitude installing, the installers must wear protective equipment against falls.



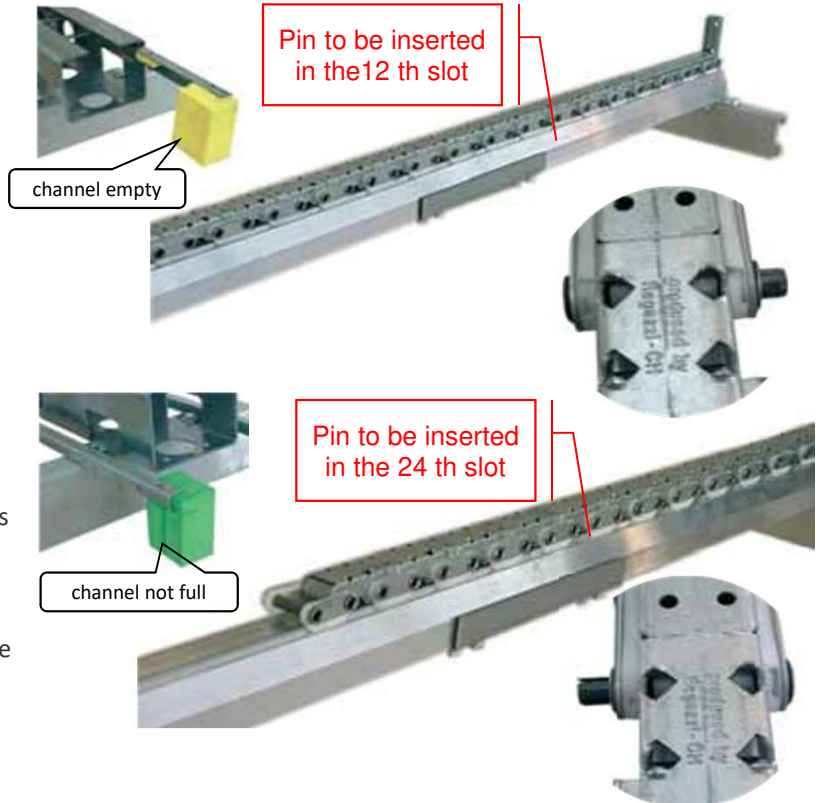
3.4 Installing the pin for the channel full/empty indicator

The channel empty indicator (yellow) is activated by a pin that is placed in the 12th hole of the chain links counting from the back. If an indicator channel is placed empty in both rails of the channel, these can also serve to check the synchronization of the chains.



The channel full indicator (green) is activated by a pin that is placed in the 24th hole of the chain links counting from the head of the channel.

In this position the indicator will be visible until the available space in the channel only allows the loading of one pallet size 1200x800.



3.5 Checks

The following checks must be carried out at the end of the installation :

- Are all bolts installed and properly tightened ?
- Are the rails placed in parallel ?
- Does the chain move smoothly on the rail as well as in the rail ?
- Are the indicators working correctly ?
- Are the lodging bins correctly installed ?



3.6 Critical point during the assembly

3.6.1 Links

If the rails are assembled by means of sleeve, before tightening the bolts, make sure that the rails are perfectly installed in a straight line and that there are no sharp protrusions at the sleeve.

3.6.2 Parallelism of the 2 rails

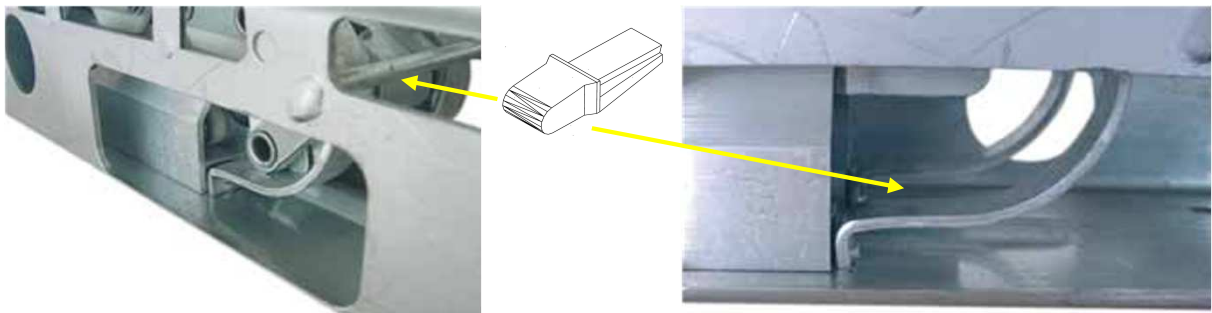
During installation it is imperative to respect the parallelism of the two rails. Check this parallelism before tightening the bolts.

The lodging bin (with or without U support) makes installing easier and will be useful to perfectly center the pallets when loading. If correctly attached, it also guarantees synchronous running of the chains.

Make sure that the screws for attaching the lodging bin are perfectly positioned in the middle of a toothed link.

3.6.3 Slide in front head completely

When attaching the front head to the rail, check that this front head was actually pushed to the end. The inner housing of the front head piece must connect to the aluminum rail.



3.7 Lubrication of housing and lateral guides

Before starting the system, lubricate the housing and the top of the side guides (white plastic parts of the chains) with a silicone spray.



3.8 Sliding of the chain

After placing the chain, move it with the foot to simulate a charge and a discharge from the channel. This is to check the proper functioning of the chain and to spread the silicone spray.



4.1 Fork lift type

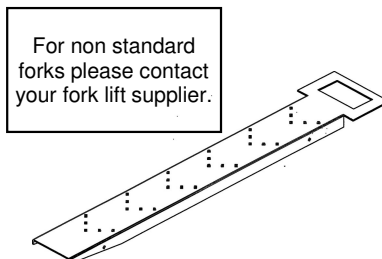
The forklift truck must have sufficient pushing and traction power as well as sufficient stability reserve. This must be guaranteed by the manufacturer of the forklift.

The maximum necessary push and traction forces when the pallets start to move correspond to 2% of the maximum load on the channel (pallets lane) and are increased by another 2% for the deceleration / braking caused by the elastic shock. Caused forces in a lane of pallets in a channel :

Load/channel = X pallets (kg)	4000	6000	8000	10000	12000
Pushing force/traction force (kg)	80	120	160	200	240
Slow down/braking (kg)	160	240	320	400	480
Reaction of the racking system (kg)	80	120	160	200	240

4.2 Forks of the fork lift

The forks of the forklift truck can be equipped with accessories that improve the performance of the Flow Rail® system. The transfer of the forces from the lift truck to the chains can be done in various ways. The drawing opposite shows a possible solution. This accessory can be mounted on standard forks up to 100 mm wide and may remain on the forks for movements other than Flow Rail®. Another solution may be to weld a few nuts on the forks.



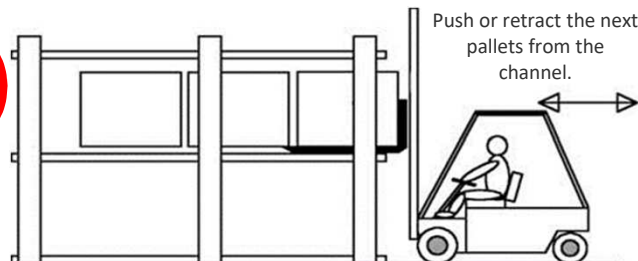
4.3 Filling a channel

When loading the first pallet, make sure that the chains are in the correct starting position. If you have already pushed one or both chains backwards, there will not be enough space to load the last pallet.

In an empty channel, the chain ends in the front head. Pallet No. 1 is placed in the channel in the lodging bin. As soon as the front of the pallet is level with the front of the front head piece, it is completely placed on the chains.

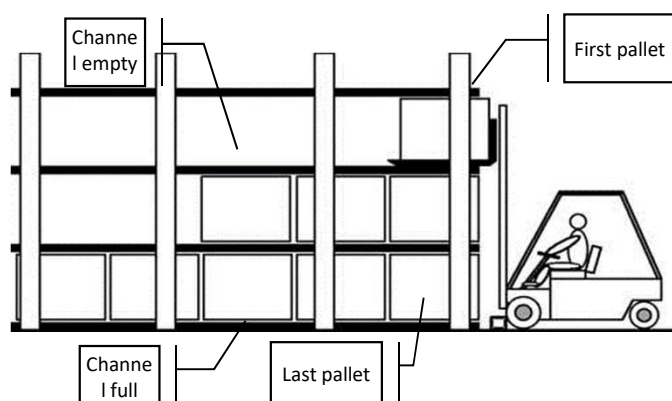
The use of side-shift for the forks is unnecessary, this only gives rise to incorrect actions and defects. In no case is it allowed to place the pallet on the chains and then correct the position with that side-shift.

If the side-shift is activated after placing the pallet on the chains, a lateral force will be applied to these chains and they will be pushed outside the rails. In such a case, carefully lift the pallet and put the chains back in their correct position. It is also best to check whether the chains are still synchronous in such a case.



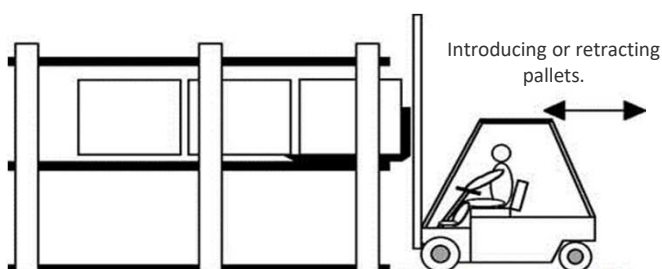
Pallet nr 2 is loaded after pallet nr 1 with or without space between the pallets.

The back of the pallet to be loaded must be placed over the front piece to come into contact with the chains. These engage in the pallet and thus move the chains. If the front of the pallet is also on the head piece, the pallet can be fully set down and the forklift can reverse.

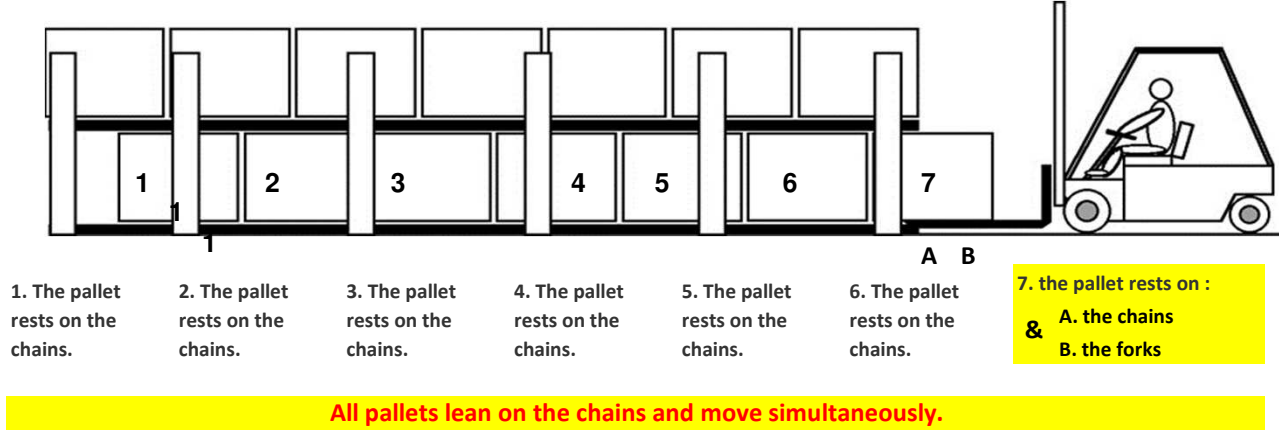


It is of course impossible to place a higher number of pallets in a channel than the number that is provided for it.

In case the space between the pallets is not respected, the available space will not be sufficient for the number of pallets that are provided. A maximum space of 30 to 50 mm is recommended.



4.4 Emptying a channel



By means of the front pallet the forklift truck exerts a horizontal force on the Flow Rail® chains and therefore also on the lane of pallets. This front pallet is the connecting element by the front that rests on the forks on the one hand and the rear that rests on the chains on the other hand.

For emptying the channel, it is sufficient to pull on the last placed pallet (No. 7). The pulling force is interrupted as soon as the next pallet (No. 6) decelerates on the front head. This is because at a certain distance from the front of the channel, the pull force of the pallet row decreases. The row continues to move under the effect of inertia forces on another 20 cm on the front head, where it is then braked. The operator can now drive away with the pallet. To learn the optimal loading / unloading speed will only require a few exercises.

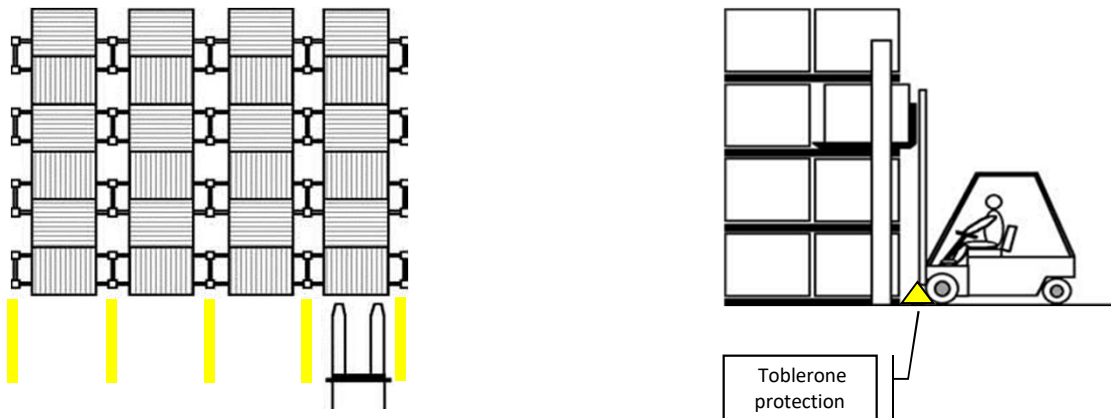
All pallets should be pulled out the same way.

Never push or pull pallets violently. When in doubt lift the pallets !

For normal extraction, the lift truck should reverse at a speed of about 20 cm / s, which means an extraction time of 4-5 seconds per euro pallet.

Phase	Time (sec)	Sequence
1	2 - 3	Slide the forks into the pallet.
2	1 - 2	Lift the forks slightly in order to generate some friction between pallet and forks.
3	4 - 6	Pull out the 1st pallet which causes the moving forward of the full channel of pallets.
4	1	The extracted pallet loses contact with the chains. The line of pallets slows down and stops.

4.5 Markings



The application of markings in the direction of the channel can be useful in guiding the movements of the forklift driver. The approach should be straight and central. Additional markings on the mast of the lift truck can allow the desired height to be reached more smoothly.

If the same forklift truck(s) is used each time, a Toblerone protection can be fixed to the floor. This stop prevents the lift truck from getting too close to the installation.

The forklift driver can thus approach the installation more quickly without risk of damaging the installation.

4.6 Pay attention

- * Only use lift trucks in good condition and robust enough to move a lane of pallets.
- * Provide effective equipment for your forklift that is adapted to pull out pallets.
- * Avoid lateral movements with the lift truck when loading or unloading the channel.
- * Do not try to place a number of pallets in the channel that is higher than what the channel is intended for.
- * Make sure that the last placed pallet is not lighter than the others (maximum tolerance 10%) as the necessary contact for pulling out the lane of pallets will be missing.
- * Please do not place or remove the pallets too quickly.
- * Do all movements without using excessive force.
- * Only stack stable goods.
- * If the forces used are higher than those described under point 4.1., this can lead to malfunctions or incorrect use.

4.7 Possible defects/errors and their solution

Defect/error	Consequence	Remedy
The chains have already shifted before placing the first pallet.	There will not be enough space to place all the provided pallets.	Lift and retract the pallet. Then reposition the chains in their normal starting position.
During the loading of the pallet, the side-shift of the forklift was used.	The chain has been pushed out of the rail.	Carefully lift up and withdraw the pallet. Then reposition the chain.
One wants to place more pallets than designed for.	The palette collides with the back stop.	Stop pushing and remove the pallet.
There was no straight-line reverse while taking out a pallet.	The chain has been pushed out of the rail.	Carefully lift up and withdraw the pallet. Then reposition the chain.
The speed that was reached during the removal of a pallet was too high.	The next pallet has slipped past the front head.	Retract the pallet more slowly. Reposition the pallet that has slid too far.
The forks interrupt the contact between the pallet and the chain during extraction.	The pallet slides over the chain without moving the other pallets.	Do not lift the palette during extraction. Maintain contact with the chains.
The last pallet inserted is noticeably lighter than the others (maximum tolerance 10%).	The pallet slides over the chain without moving the other pallets.	Lift and pull out the pallet and replace it with a heavier one.
The stacked goods are not stable.	The goods fall, the pallet gets stuck in the rack, the pallet slides on the forks of the forklift.	The goods must be removed and stacked according to the maintenance instructions.
In case of defect, the pallet is manipulated with too great a force.	The forks of the lift truck slide from underneath the pallet.	Immediately interrupt the charging / discharging process and find the cause of the defect and observe the maintenance instructions.

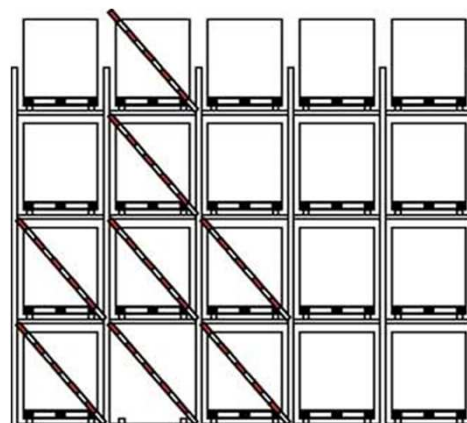
4.8 Breakdowns

Defects are extremely rare: they prevent the system from working properly and can be caused by the stacked goods or by defects in the system.

Cause stacked goods : the goods are badly placed on the pallet and fall or fall over. Cause of defective system : interruption of the Flow Rail® system or an improper and / or too brutal manipulation.

How to fix the defect :

- * Stop movements with the forklift immediately.
- * The channels occupied by the personnel as well as the adjacent channels must be secured in order to make their use impossible. This can be done by defining the zone concerned (red / white barrier tape). Personnel working at great height in the racks must wear anti-fall protection. For example a safety harness.
- * Unload the pallets one by one.



Maintenance

5.1 The maintenance

Normally, the chain running on the rail should not be cleaned. This with the exception of abnormal pollution caused by e.g. overloaded pallets. If the accumulation of dirt is important, it is sufficient to lift the chain and remove the dirt with compressed air or a vacuum cleaner. The rail can be washed. Ditto for the front head of the rail. Please do not use steam systems for cleaning as these high temperatures will damage the lubrication of the roller bearings.

Empty the channel before cleaning it.

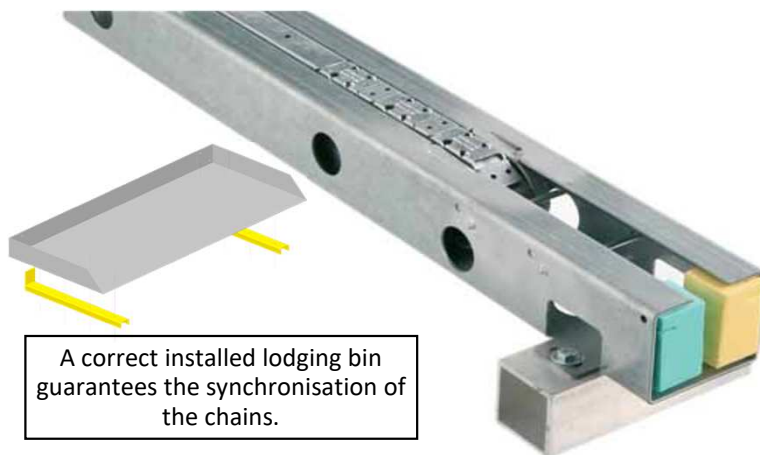
Attention: during cleaning, the channels occupied by the personnel as well as the adjacent channels must be secured in order to prevent their use.

This can be done by defining the zone concerned (red / white barrier tape). Personnel working at great height in the racks must wear anti-fall protection. For example a safety harness.

5.2 Checking the synchronization of the chains

Check the synchronization of the chains regularly. The chains must be positioned absolutely identically. If not, one chain will come to the end of the channel earlier than the other. This will cause the loss of one pallet place. The chains must be positioned with a completely empty channel.

To ensure that the chains are positioned in the same way, you only have to push them with your foot to the end stop.



5.3 Lubrication

The roller bearings are lubricated for life.

If the lubrication film has been damaged by the use of solvents, we strongly advise against lubricating the chain yourself.

The use of unsuitable lubricants can lead to total chain blockage.

Contact your *Flow Rail®* supplier in order to plan an adequate intervention.

5.4 Frequency of inspections

It is recommended to conduct regular inspections (every 6/12 months) to detect anomalies that are difficult to detect during the daily use of the system.

In that way you will :

- * avoid damage to persons, to the goods and to the installation.
- * guarantee continuity of manipulation and avoid possible emergency stops.

We suggest to use the chart below as described :

Periodic inspections of the <i>Flow Rail®</i> system	each 6 months	each 12 months
Check the proper functioning of the chains.	x	x
If necessary, clean with compressed air or with a vacuum cleaner.	x	x
Check the synchronisation of the chains.	x	x
Check if the lodging bin is well fixed.	x	x
Check if all safety pins are still in place.		x
Check if all bolts are still well tightened.		x
In case of doubt or serious defect contact your supplier.		

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