



FLOW RAIL[®]

Dynamic LIFO storage system

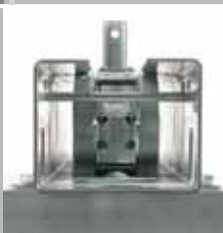
Installation, operation and
maintenance manual



THE PERFECT SOLUTION

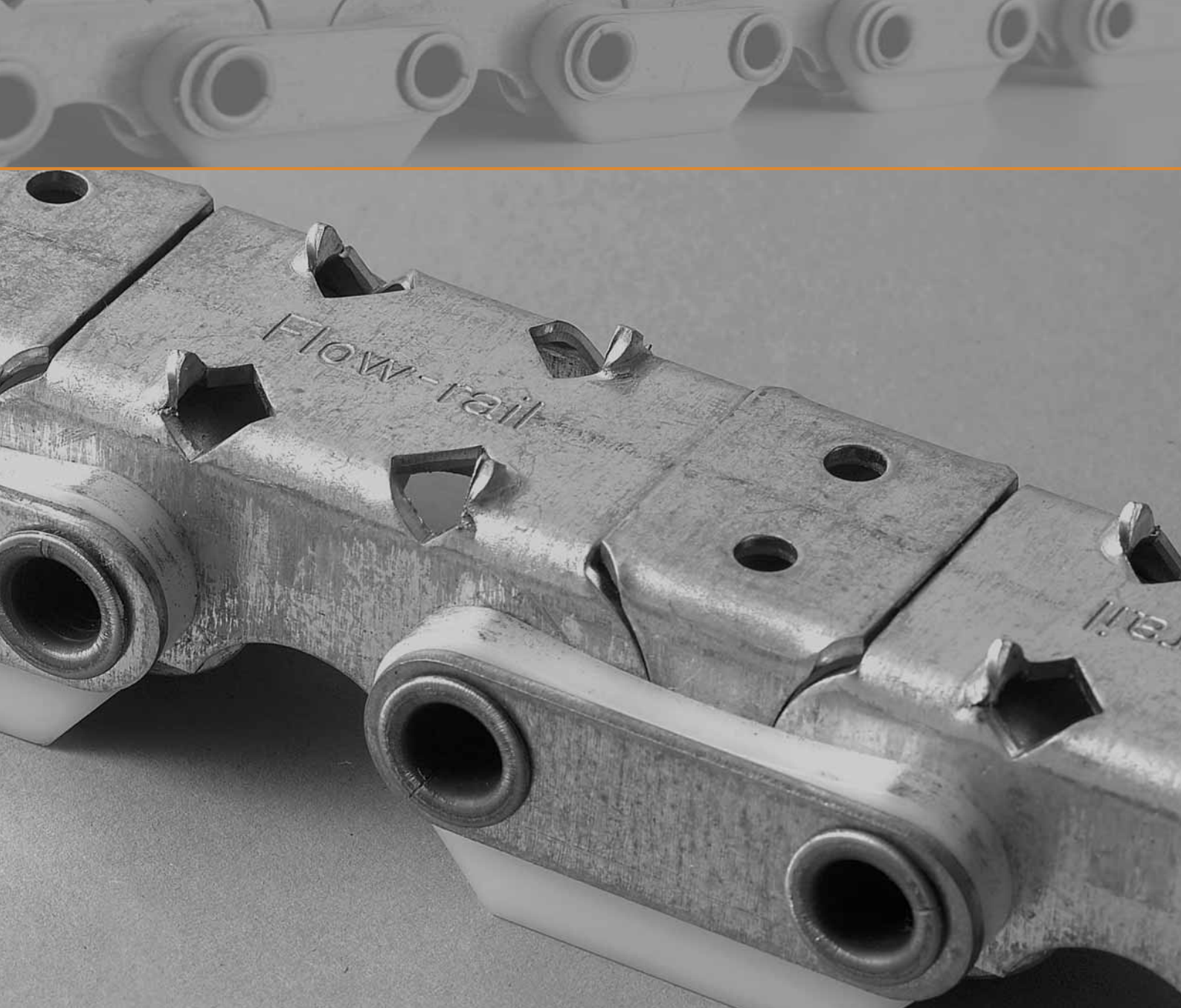


DYNAMIC SPACE




REGAZZI





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1 General information

1.1 Short description of the system

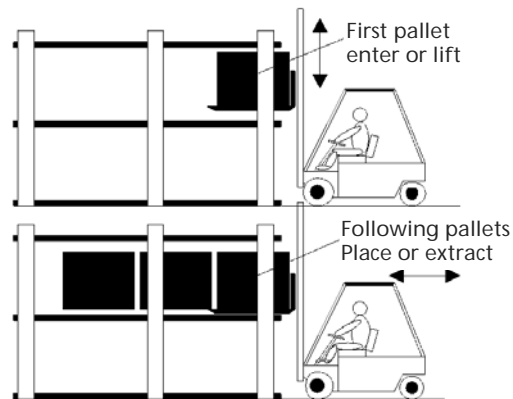
Flow Rail® is a much-awaited compact storage system that can be used with traditional forklifts. The forklift in fact no longer needs to enter inside the shelving as in the case of Drive-In systems. This means significant time savings. The key element in the system is a chain that slides on roller bearings.

The rail and chain assembly measures 90 mm in height. Consequently, the system can be fitted in the space of existing Drive-In installations. The shelves only need to be fitted with the beams.

The *Flow Rail*® system does not require extensive explanation. When the lane is empty the first position can be used as simple shelving with one storage place. The distance at the side from the structure of the shelving can be reduced, as this distance does not change for the pallets as they move through the lane.

A pallet positioned at the start of the lane always keeps the same lateral position during its movement. Subsequently all other pallets are placed and removed just like loaves of bread in an oven.

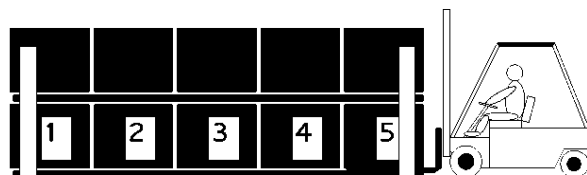
Das System verfügt über keine eigene Antriebsmaschine, sodass ihm die Bewegungsenergie von außen zugeführt wird.



The system does not have its own motor drive and gets the energy for the movements from an outside source.

Indeed, this comes from the forwards-backwards movement of the forklift, due to the coupling with the load, half of which rests on the forks and other half on the chain.

The following limits must be carefully observed. The lanes can hold a maximum of 12 EuroPallets (800 mm / pallet depthwise) meaning a maximum length of the 10.5 m, with a maximum weight per pallet of 1200 kg. The difference in weight between the pallets in the same lane must not exceed 10%.



1.2 Advantages of the *Flow Rail*[®] system

- Any standard forklift can be used.
- The operations are all performed at the entrance to the shelving, never inside.
- Very fast loading and unloading times.
- Each pallet is always ready for picking at the entrance to the lanes.
- The pallets do not move on the chain, it is the chain that moves.
- Each lane can hold up to 12 EuroPallets (1000 kg/EuroPallet).
- Different goods can be stored in each lane.
- The system can be easily adapted to existing Drive-In structures.
- Can be used in cold rooms down to -30°C.
- Minimum maintenance: simply surface cleaning.
- Maximum usage of space in the store.
- Space occupied by the rail: 9 cm in height.

1.3 Contents

This manual contains the description of the *Flow Rail*[®] system and the corresponding instructions for assembly, operation and maintenance, as well as the technical specifications and the preliminary specifications of the installation.

The descriptions are accompanied by diagrams and drawings for clearer understanding.

1.4 Conformity and reference standards

We hereby declare that the product Flow-Rail C.99 as described in the technical file FlowRailComponenti.doc of Sept. 2001 complies with the following directives:

98/37/EC (Machinery Directive)

Standards applied:

EN 294, EN 292

EN 1050 Risk assessment

Directives applied:

ISO 9001 (Quality standard)

1.5 Recipients of the manual

This document is addressed to:
the manager of the factory, the workshop or the site
the personnel responsible for installation
the operator
the maintenance personnel.

The manual must be kept by the safety manager, in a suitable place, so that it is available at all times.

If lost or damaged, a replacement document can be ordered from:

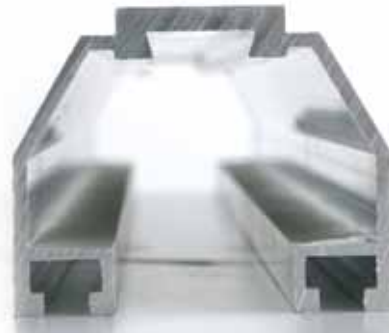
Regazzi SA / Via alle Gerre 1 / 6596 Gordola

Quality of Flow Rail®

2.1 Quality of the materials

The materials have been carefully selected to ensure easy handling, long life and resistance to low temperatures.

- **Aluminium rail:**
its lightness simplifies transport and assembly.
- **PA6 side chain guides:**
guarantee low friction and high strength even at low temperatures.
- **Roller bearings:**
lifetime lubrication.
- **Steel:**
Sendzimir galvanised.



2.2 Quality in production

Regazzi SA manufactures its products in accordance with the ISO 9001 standard.

All the metal parts of the *Flow Rail*[®] system are die pressed in house. Any defects are only possible in the event of breakage of the tool, however breakage of the tool instantly stops the production.

The metal parts are subsequently assembled using automatic machinery. This machinery can only assemble parts that are perfect. Otherwise the machinery stops.

Parts assembled by hand are checked using templates.

2.3. Quality in installation

To ensure workmanlike installation, the assembly team is always assisted the first time by qualified personnel.

Each assembly team receives an assembly manual (FlowRailMontaggio). When installation is complete, the assembly personnel must, as described in the manual, test the sliding of the chains.

3 Installation

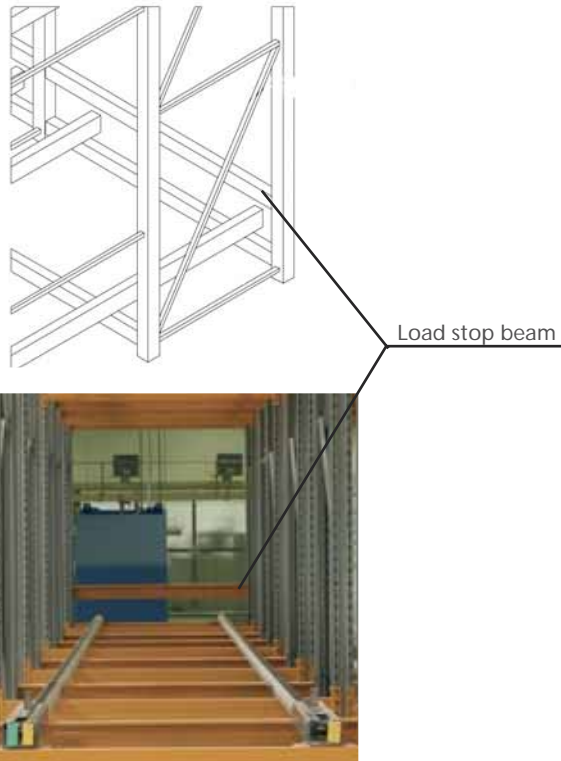
3.1 Characteristics of the shelving

The supplier of shelves must fit the shelving with the following safety elements:

An extra beam must be fitted above the last support beam.

This prevents the pallet in a lane that has been overloaded from falling backwards.

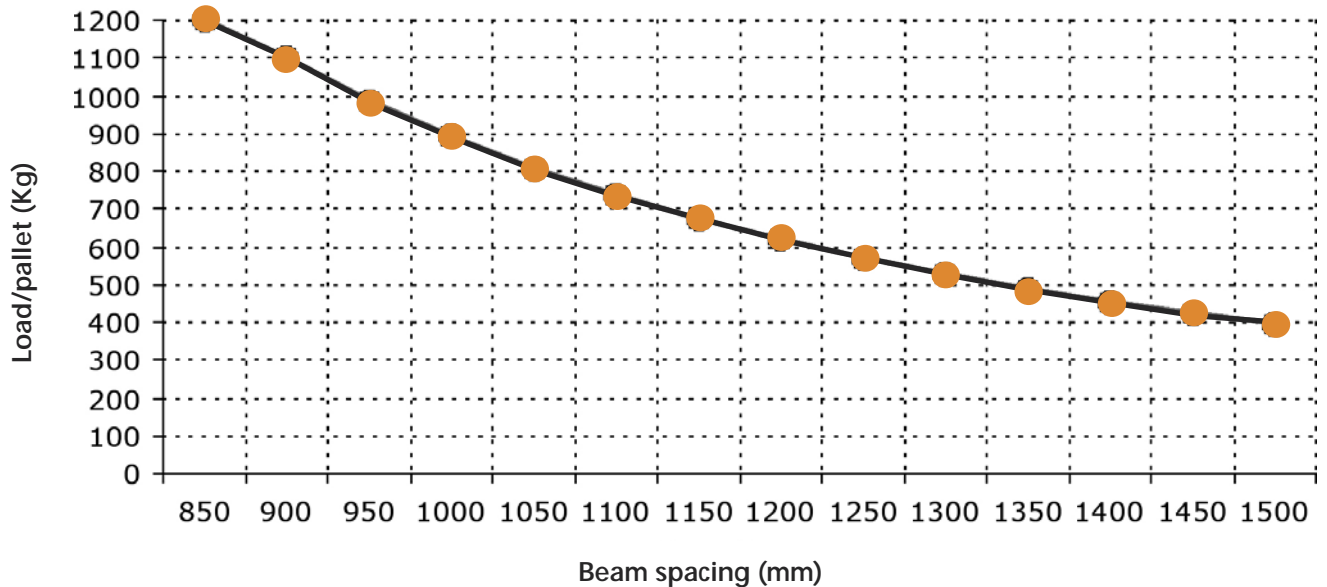
The lanes must be assembled so as to prevent the material from falling sideways or backwards, or alternatively in such a way that any falling material does not represent a danger to personnel. This is done positioning the shelving so that the open sides are up against a wall or are enclosed by mesh barriers.



The beams in the shelving are already drilled by the manufacturer for fastening the *Flow Rail*[®] system. If the holes are drilled by the reseller, authorisation must be requested from the manufacturer. The manufacturer of the shelving must, after installing the shelving, certify that it corresponds to the state-of-the-art and that the minimum static requirements, in particular load and forces acting when placing and removing the pallets with the *Flow Rail*[®] system, are guaranteed.

The maximum load allowed for the pallets is an integral part of the contract. The load/pallet allowed based on of the distance between the beams must be inside the following curve.

Beam spacing (mm)	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
Load/pallet (Kg)	1200	1100	987	891	808	736	674	619	570	527	489	455	424	396

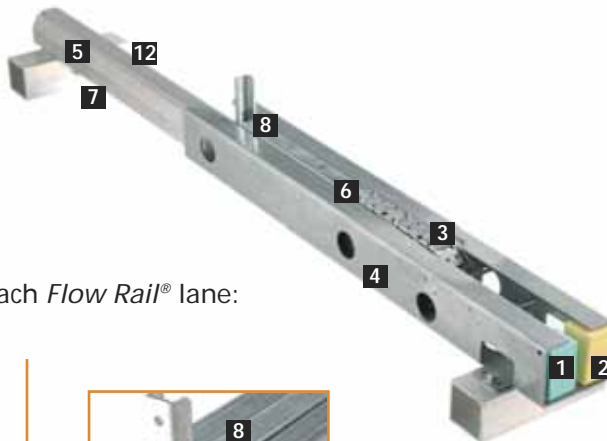


The personnel responsible for assembly must check compliance with the above requirements for the shelving. Only then may the *Flow Rail*[®] system start to be assembled.

3.2 Components and assembly

3.2.1 Flow Rail® components

The following components are typically supplied for each *Flow Rail®* lane:



1. end loading marker
code F40000009
2. end unloading marker
code F40000008



3. drive head
code M75000960



4. 2 front heads, 800 mm
code F40000010
2 front heads, 1000 mm
code F40000011



5. 2 joining heads
code M750009616



6. 2 chains
code F40000015



7. 2 rail joints
code F40000002



8. 2 load stops
code F40000003



9. 2 shelf fastening brackets
code F40000004



10. 2 beam fastening plates
code F40000005



11. Quick Fix plates
code F40000006



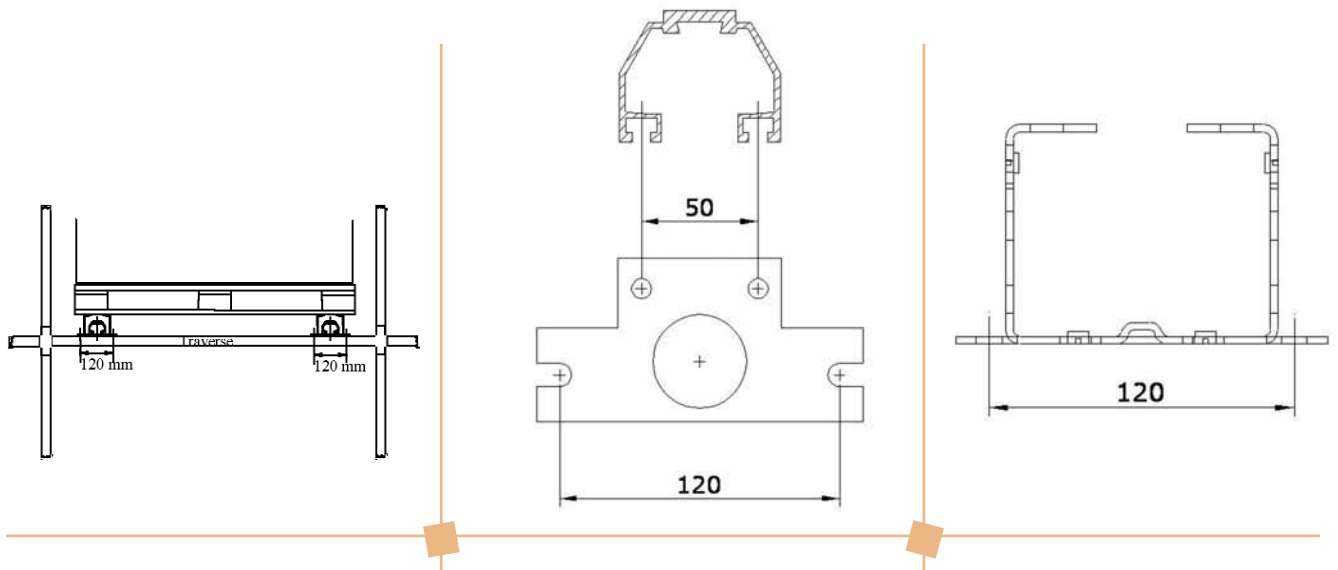
12. 2 rails
code M10200125



13. Pair of forklift extractors
cod. F40000026

3.2.2 Drilling the beams

The beams should be drilled before being assembled on the shelving, with the help of the drilling template. For the correct size of the holes, see the corresponding figure. If using the fastening plate, all the beams must be drilled in the same way (120 mm).



3.2.3 Inserting any joining heads

Any joining heads for aligning the cover strips must be inserted.



3.2.4 Inserting the bolts

The rails have grooves at the bottom for sliding the heads of the M8 bolts.

Make sure the right number of bolts is inserted. There must be 2 bolts in each point where the rail rests on the beams (see Figure 3.2.1).

There must be 4 bolts for each rail joint (see Figure 3.6.1). There must also be 4 bolts at the front head and at the lane full marker (see Figure 3.7.1 and Figure 3.11.2).



3.2.5 Tightening the joints and the fastening plate

Any joints can now be fastened.

The fastening plate can also be tightened to the rail. The fastening plate bolts should not yet be fully tightened.

Adjustments may be required to the position. For the joints, a cover strip can be fitted on top and underneath. This makes the rail look like one single piece.



3.2.6 Fastening the front head

The front head is fixed to the rail. Slide the head in from the front until it rests against the cover strip. Then tighten using 4 bolts, previously positioned in the rail.



3.3 Positioning

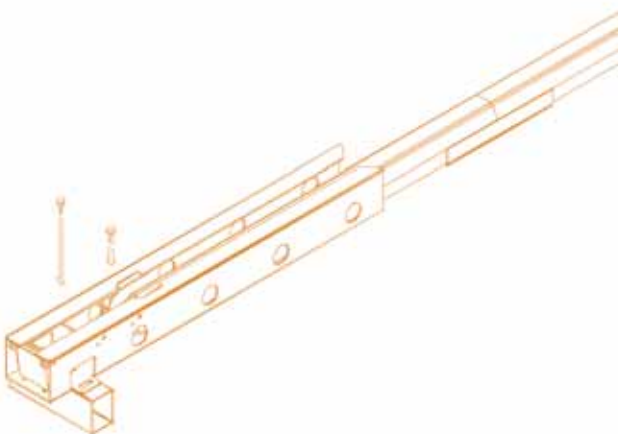
3.3.1 Positioning the rail and tightening

The rail with the bolts is now rested on the beams. Before fastening, make sure the number and the position of the bolts is correct.

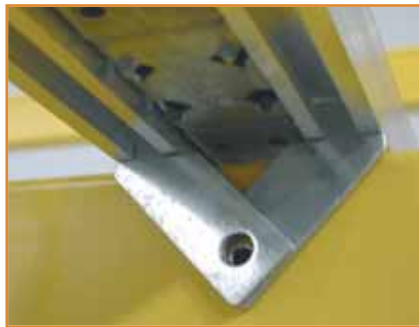
The rail is now positioned, observing the correct distance from the beams at the front and rear. The rail can now be fixed to the beams using the fastening plate.

The plates are secured to the beams and the rail using nuts. For closed beams, self-tapping screws must be used.

Warning: if fitting high shelves, secure the *Flow Rail*® to the shelving using cables. The assembly personnel working on the high shelving must also be harnessed using safety straps.



3.3.2 Montage Quick Fix-Platten



3.3.3 Positioning with shelf fastening brackets

Corner plate, used when the last beam is positioned at the same level.



3.3.4 Fitting the second rail

The second rail is prepared and fitted in the same way as the first. Make sure this is fitted perfectly parallel to the first.

3.3.5 Positioning the chains

The chain must be unwound without twisting. The chain is laid on the rail along its complete length, and then slid inside the cover strip. On high shelves, pay careful attention, as unsecured chains may, due to the weight of a small hanging part, fall down.

This represents a potential danger. The chain must be secured by cables.

The assembly personnel must be harnessed by safety systems to protect against accidentally falling when working on high shelves.

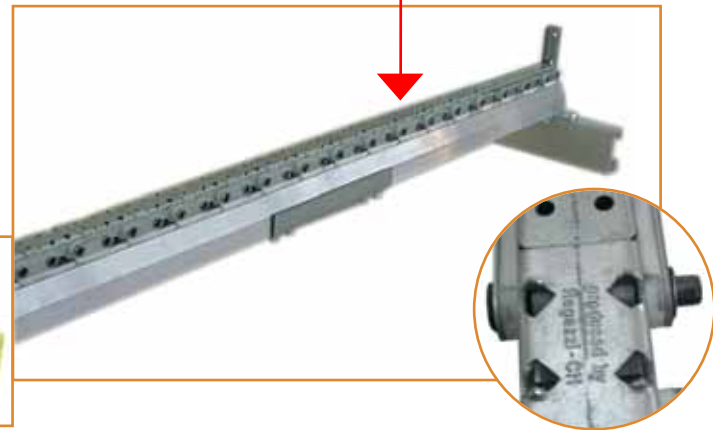


3.4 Inserting the marker pins

The yellow end unloading and chain synchronisation marker, code F40000008, is activated by a pin that must be inserted in the 12th hole to the right of the chain link from the load stop.



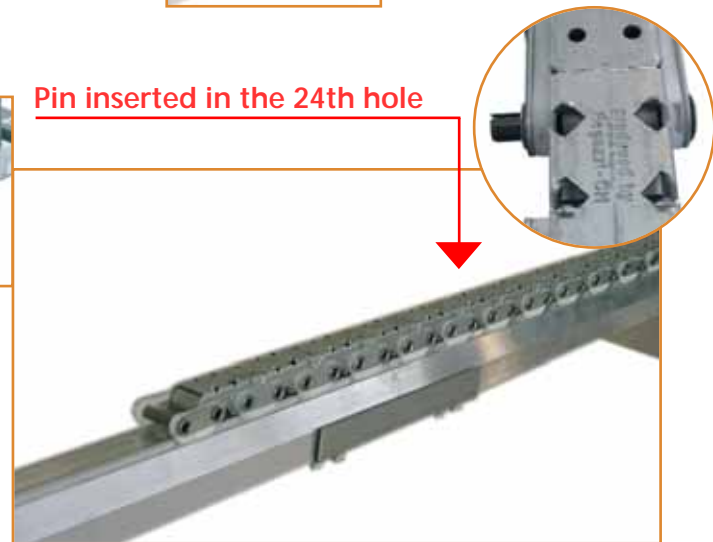
Pin inserted in the 12th hole



The green end loading marker code F40000009 is activated by a pin that must be inserted in the 24th hole to the left of the chain link from the opposite side of the load stop.



Pin inserted in the 24th hole



In this position, the marker will be visible until there is room for just one 1200x800 pallet in the lane.

3.5 Checks

The following must be checked at the end of the assembly operations:

- Have all the bolts and screws been fitted and tightened?
- Are the rails parallel?
- Does the chain move freely inside the rail?
- Are the markers working?



3.6 Crucial points in the assembly phase

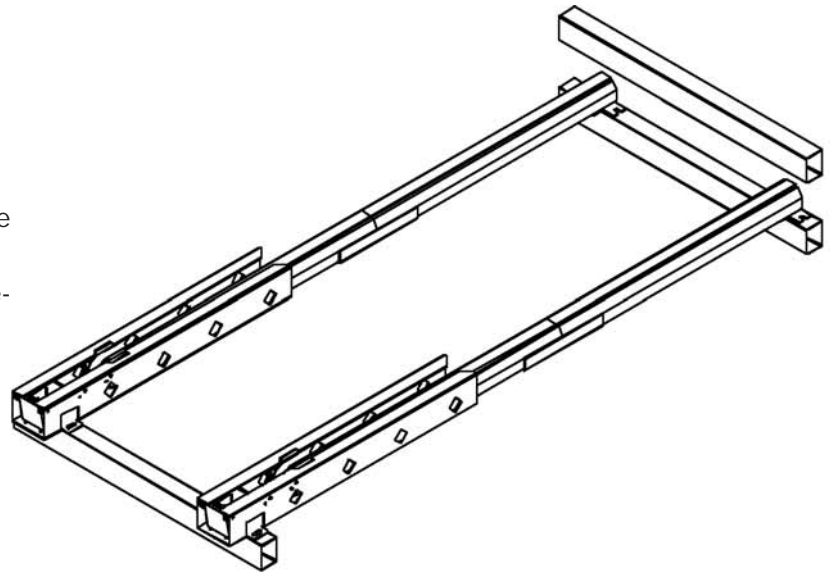
3.6.1 Joints

If the aluminium rails are connected using joints, before tightening the bolts make sure the rails are perfectly in line and that there are no sharp edges at the point of contact.



3.6.2 Ensuring the two rails are parallel

During assembly the two rails must be checked to make sure they are parallel. Check that the two rails are parallel before tightening the bolts.



3.6.3 Checking the front head

When assembling the front head on the rail, make sure this is fully inserted. The guard inside the front head must rest against the aluminium rail.



3.7 Lubricating the guard and the side guides

The guard and the top of the side guides (white plastic cover on the chain) must be lubricated with silicone spray before starting to use the system.



3.8 Sliding the chain

After having been positioned on the rail, the chain must be moved by foot to simulate a lane loading and unloading operation. The aim is to check that the chain slides freely and the lubricant is evenly spread along the chain.



4.1 Type of forklift

The forklift must have sufficient pushing and pulling force, as well as good stability. This must be guaranteed by the manufacturer of the forklift.

The maximum pushing and traction force required after the pallets start moving: is 2% of the load in the lane (line of pallets), and 2% more to slow down/brake due to elastic collision.

Forces applied to the line of pallets in the lane:

Lane load = X pallets [kg]	4'000	6'000	8'000	10'000	12'000
Stat. pushing/traction force [kg]	80	120	160	200	240
Slowing down/braking [kg]	160	240	320	400	480
Reaction of the shelving [kg]	80	120	160	200	240

4.2 Forklift forks

The forklift forks can be fitted for best operation with the *Flow Rail®* system. The forces can be transferred between the forklift and chain in different ways. The figure shows one possible solution. This solution can be fitted on any type of fork, and also be used for operations outside of the *Flow Rail®* system.



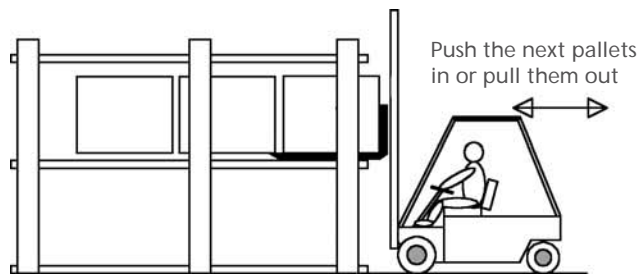
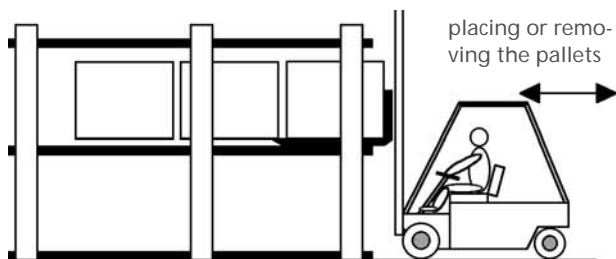
4.3 Filling a lane

When positioning the first pallet, make sure that the chain is in the starting position. If the chain has already been moved forwards, there would not be enough chain left to place the last pallet.

In an empty lane, the chain stops at the front head. Pallet no. 1 is pushed into the lane by resting the front edge on the chain and pushing it into the lane. When the pallet is aligned with the entrance to the lane, it is completely resting on the chain.

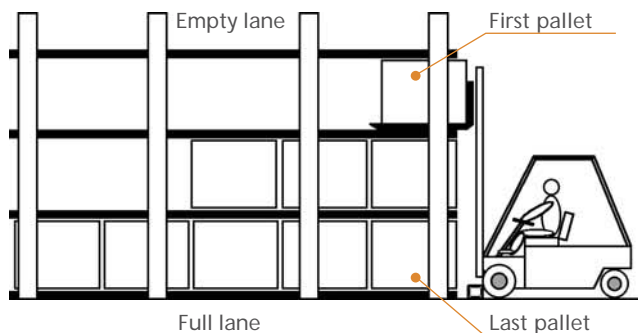
Sideways movements of the forks are not necessary, and only lead to incorrect operations. In no case may the pallet be placed and then its position corrected using sideways movements.

If such movements are applied after the pallet has been positioned on the chain, lateral force is exerted on the chain and this is pushed out of the cover strip. If this happens, carefully lift the pallet and return the chain to the correct position.



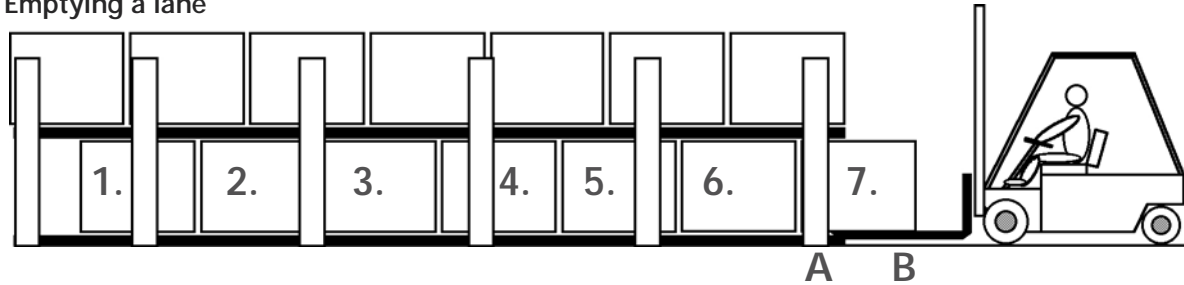
Pallet no. 2 is introduced after pallet no. 1, with or without spacing between the pallets.

The front edge of the pallet being placed must pass over the front head and then come into contact with the teeth of the chain. The edge moves the chain via the teeth. When the rear edge is resting on the front head, the forklift can move away.



Obviously, the number of pallets stored in a lane cannot exceed the length specified in the order. If the correct spacing between pallets is not maintained, there may not be enough space to store all the pallets. The supplier envisages a typical space of 30 to 50 mm between pallets.

4.4 Emptying a lane



1. Pallet rests on the chain	2. Pallet rests on the chain	3. Pallet rests on the chain	4. Pallet rests on the chain	5. Pallet rests on the chain	6. Pallet rests on the chain	7. Pallet rests on the A-Chain B-fork
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All the pallets rest on the chains and move at the same time.

The forklift exerts a horizontal force on the *Flow Rail*[®] chain and consequently on the entire group of pallets via the front pallet. This acts as a connecting element, with the outside edge resting on the forks, and inside edge resting on the chain.

To empty the lane, pull out the last pallet placed (no. 7). The pulling force is interrupted as soon as the next pallet (no. 6) comes into contact with the front head. This is because at a certain distance from the front of the lane the group of pallets is not longer subjected to the pulling force. It continues moving by inertia for a further 20 cm until reaching the front head, where it is stopped. The operator can then move away with the pallet loaded on the forks. After a few operations the operator will learn the best speed.

All the pallets are removed in the same way.

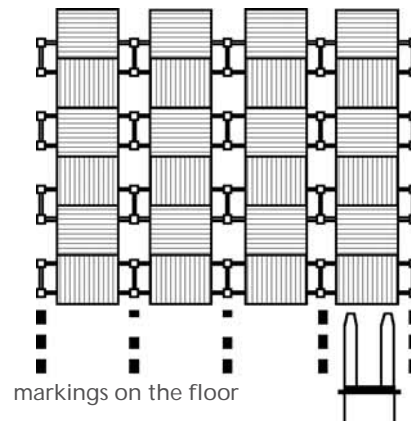
Never pull or push the pallet violently. If in doubt, lift the pallet!

For normal removal, the forklift must reverse at a speed of around 20 cm/s, that is, equivalent to removing one EuroPallet in 4-5 seconds.

Phase	Time (s)	Sequence
1	2-3	Insert the forks under the first pallet.
2	1-2	Slightly lift the forks. There will be friction between the pallet and the fork.
3	4-6	Remove the first pallet and consequently the entire group of pallets from the chain.
4	1	The pallet being removed is detached from the chain. The group of pallets slows down and stops.

4.5 Markings

Applying markings in the lane showing the direction of movement is useful in helping the operator when handling the pallets. The approach must be straight and centred. Further markings on the forklift mast will make it faster to reach the correct positions.



If using similar types of forklifts, protection beams can be fitted that the wheels of the forklift will come to rest against.

The operator can thus approach the lane more quickly without the risk of damaging the shelving.



4.6 Warnings

- Only use forklifts in good working condition and that are strong enough to remove the entire group of pallets.
- Equip the forklift appropriately for the removal of pallets.
- When placing and removing the pallets, do not perform any sideways movements.
- Do not attempt to introduce more pallets in the lane than specified.
- Do not introduce a lighter pallet as the last pallet, as there may not be enough friction to remove the entire group of pallets.
- Do not place or remove the pallets too quickly.
- Perform all operations without exerting excessive force.
- Only stable material must be stored.
- Should the forces exceed the specifications described in point 4.1, there may be fault or alternatively incorrect operation.

4.7 Troubleshooting

Problem	Consequence	How to avoid/resolve the problem
Before placing the first pallet the chains have already been moved forwards.	There is not enough space to hold the specified number of pallets.	Lift and remove the pallet, then reposition the chains in the starting position.
When placing pallet the forks have been moved sideways.	The chain is released from the rail.	Carefully lift and remove the pallet and reposition the chain.
The number of pallets being stored exceeds the maximum number specified.	The pallet hits against the rear stop beam.	Do not continue pushing, but rather move away with the pallet.
When removing the pallet the forklift does not travel in a straight line.	The chain is released from the rail.	Carefully lift and remove the pallet and reposition the chain.
When removing the pallet the forklift travels too fast.	The following pallet slides beyond the front head.	Remove the pallet more slowly.
The forks detach the pallet from the chain during removal.	The pallet slides on the chain without the group of pallets moving.	Do not lift the pallet during removal.
The last pallet introduced is significantly lighter than the others (tolerance 10%).	The pallet slides on the chain without pulling the group of pallets with it.	Lift and remove the pallet and replace it with a heavier one.
The goods stored are unstable.	The goods fall, the pallet gets stuck in the shelving, the pallet slides on the forks.	The goods must be released following the maintenance instructions.
In the event of faults, the pallet is moved with excessive force.	The forks slide out from the pallet.	Immediately stop the removal operation and identify the causes of the fault, referring to the maintenance instructions.

4.8 Faults

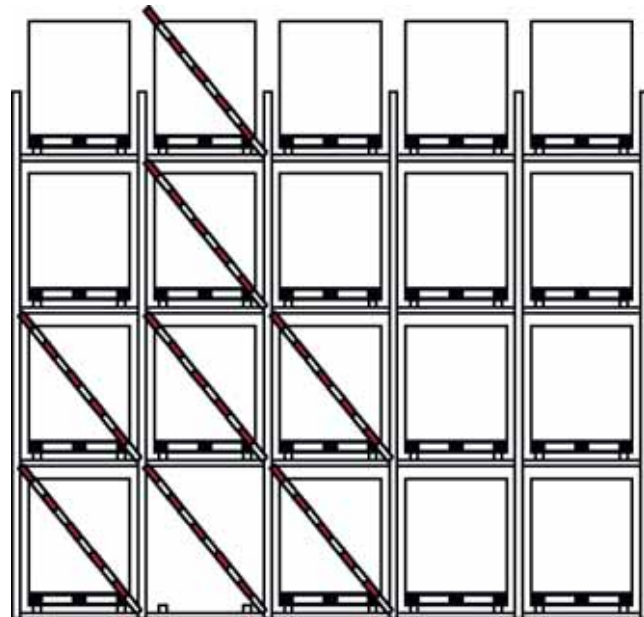
Faults are very rare events in which the operation of the system is stopped due to the goods stored or defects in the system.

Caused by the goods stored: the goods have been stacked incorrectly on the pallet and fall off.

Caused by a defect in the system: the *Flow Rail*[®] system is broken due to manufacturing defects or improper or violent use.

How to fix the fault:

- Stop all operations with the forklift.
- The lanes occupied by personnel, as well as the adjacent lanes, must be closed off. This can be done using markings (red/white tape). When accessing the high shelves, the personnel must be harnessed with safety straps to protect against falling.
- Unload the pallets individually.



5.1 Cleaning

The chain on the rail does not require cleaning in general, only in the event of exceptional dirt (due to the products stored).

Nonetheless, when the chain is too dirty it can simply be lifted and cleaned with compressed air or a vacuum cleaner.

The rail can be washed. The same applies to the front head. Steam cleaning may damage the lubrication of the bearings due to high temperature.

When cleaning the lane this must have been previously emptied.

Warning: when cleaning, the lanes occupied by personnel, as well as the adjacent lanes, must be closed off.

This can be done using markings (red/white tape). When accessing the high shelves, the personnel must be harnessed with safety straps to protect against falling.

5.2 Checking the synchronicity of the chains

Every now and then the synchronicity of the chains must be checked. The chains must be positioned equally, otherwise one chain may reach the end of the lane before the other, with the consequence that one less pallet can be loaded. The chains must be checked and adjusted when the lane is empty. Simply push the chains by foot until they stop to be sure they are positioned equally.



5.3 Lubrication

The rollers have lifetime lubrication.

If the film of lubricant is damaged due to contact with solvents, the chain should not be lubricated by the user.

Unsuitable lubricants may cause the chain to be blocked completely.

For correct repairs always contact the supplier of the *Flow Rail®* system.

5.4 Maintenance intervals

Periodical checks (every 6/12 months) should be carried out to make sure that there are no faults that are not apparent during the normal use of the system.

This will ensure:

damage is prevented to people or things

guaranteeing continuity of operation and avoiding emergency stoppages

A table/chart similar to the one below may be useful for this purpose.





FLOW RAIL®

i Information

Useful addresses: Regazzi SA
Via alle Gerre 1
6596 Gordola
Switzerland

Reseller:

