Tunkers Accumulating Conveyor Catalogue
EFS Pallet Accumulating Chain Conveyor
Task:
Transportation of workpieces in production lines between two work stations and accumulation of the workpieces on the transport route independent of indexing time.

Functional principle:

Cell 1
Loading station with fixed stopper

Flexible accumulating distance with loaded workpiece carriers

Unloading

Stopper

Return transport of empty carrier

Cell 2

Cycle-time independent!
Loading of cell 1 and unloading from cell 2 independent of the respective production cycle.
EXPERT-TÜNKERS Accumulating Conveyor
Constructional principle

Pneumatic stopper / isolator for carrier positioning

Carriers with patented friction unit and guide rollers

Drive and baffle units with geared motor, shafts and sprocket wheels safely protected by full cover

Supporting frame with horizontal guide profiles, cross and base supporting elements

Detail: Operating head and chain adjuster
New Concept:
Pallet with dual friction clutch

- The fixed driving pin is replaced by a driving friction sprocket
- The driving sprocket is functionless on the level transport path and is located above the chain. The accumulating function is ensured by the first functional wheel

**Driving sprocket**
active only for baffling; clutch is steplessly adjustable via brake discs

**Friction wheel**
“Accumulating clutch” on level transport route

**Drive chain**

**Pallet**

Bottom view of the pallet
Detail: dual friction
• Along the path of redirection, the driving sprocket engages with the chain and conveys the empty pallet from the top to the bottom and vice versa
• The force of the driving sprocket can be adjusted via the friction discs in such a way that the weight of the pallet is just compensated for, and simultaneously ensures safe conveyance
• The pallet can be stopped by hand in any position during directional change ⇒ Operator protection

On level transport path: Driving sprocket above the chain

When turning: Driving sprocket engages with the chain and conveys the pallet; based on tractive force $F_Z$ set via the clutch

In reversion: The pallet can be manually stopped in any position!
Application example 1

- Single-strand belt
- Component: crankshaft
- Customer: AuE
- Site: VW Salzgitter
Application example 2

- Dual-strand belt
- Accumulating conveyor for cylinder head
- Customer: Claas
- Site: VW Shanghai
Application example 3

Accumulating conveyor 90° design
Application example 4

- Accumulating conveyor for side panel
- Overhead operation
AFS Pallet Accumulating Chain Conveyor
AFS Accumulationg Conveyor Overview

Centre profile for integration of the drive chain

Reversing station

Pallet in modular aluminium design

Robust side profiles for a stable self-supporting construction with integrated pallet guide

Drive station
Construction of pallet

Dual friction sprocket

Plastic roller with concave running surface

Steel tube guide rail flush-mounted into the profile

Modular pallet construction in aluminium screw-fitted design
Pallet transportation with positive fit during directional change

- Through spring-supported pins, the pallet is conveyed by the driving sprocket and changes direction with positive fit.

- Situation of pallet shortly before it engages into the driving sprocket.
Detail: Isolation of pallets

Synchronised rockers with one stopping and one isolating roller each
• If the predefined load torque is exceeded, e.g. due to pallet crash etc., the drive unit is switched off
Realisation of special lengths > 20 m

- Connection of individual segments through synchronous operation
Option: Automated component unloading / Transmittor
1.2 - Weight: workpiece + workpiece carrier

As to conveyance, we have to consider the following graphic illustrations for the distribution of the centre of gravity in relation to the sum of the weights \((P1+P2)\):

Mass centre of gravity of the empty tool \((P1)\)
Centre of the workpiece to be transported \((P2)\)
Application example 1
Horizontal accumulating conveyor
Application example 2
90° accumulating conveyor
Application example 3
90° accumulating conveyor
Application example 4
90° accumulating conveyor “around the bend”
LFS Accumulating Belt Conveyor
LFS Accumulating belt conveyor

Accumulating conveyor transporting the pallets via a belt instead of a chain.
LFS Accumulating belt conveyor
Construction principle of complete system

- Pallets
- Redirecting head
- Drive head with motor
- Aluminium profile system for top and bottom strand
- Frame in steel construction
Advantage 1:
Serial operator protection due to belt principle

- Contrary to standard accumulating conveyors, the pallets are transported via a belt frictional connection not form closure.
- The frictional connection is precisely adjusted to the pallet and workpiece carrier weight during directional change.
- That is why the pallet can be stopped by the operator in any given position.
- Special safety devices such as housings, light grids or pressure mats are rendered obsolete.
Frontal loading due to omitted protective housing

- Loading from the side

as is the case with standard accumulating conveyors which require a lot of space and cause a loss in conveying distance

- Loading from the front

of TÜNKERS belt conveyors in space-saving and battery-like design
Advantage 2: Minimal energy needs

- **Standard accumulating conveyors: Energy dissipators!**
  Each pallet is equipped with an independent friction unit. The motor output must be designed to correspond to the total friction of the pallets accumulated in front of the stopping points.

- **Motor design for**
  - $= 1 + 5 + 4$ pallets
  - $= 10$ friction units
  - Limitation of accumulating distance
    - ca. 10 pallets

- As to the TÜNKERS belt conveyor, the pallets are mechanically decoupled from the belt when accumulating, only one remains in frictional connection per stopping point.

- **Motor design for 3 pallets**
  - (ca. 150 N = watts)
  - No limitation of accumulating distance
Patented pallet decoupling system*

Functional principle:
- The pallet interlocks with the belt via a spring-loaded mechanism
- No positive fit but a frictional connection
- The retention mechanism can be unlocked with the release button

*) Patent: Leiritz Automation Tools

Transport pallet with retention mechanism

Guide profile

Belt

Release button for retention mechanism
Detail: Unlocking function

- When the pallets accumulate, the retention mechanism of the first pallet is unlocked. Only the last of the accumulated pallets is in frictional connection with the conveyor belt.
- The motor output only needs to be designed for the work of the frictional force of one pallet, even if there are several accumulating pallets.
LFS Accumulating belt conveyor
Detail: Fine positioning

Two ISO standard cylinders lift the pallet and secure the end position in x-y-z.
Application example 1
Manifold system with frontal loading
Application example 2
Conveyance of accumulating storage systems for multiple loading
Application example 3
“Double decker“, here: installation phase
Application example 4
Frontal loading with side support
Application example 5
System with crosswise pallets
TÜNKERS Conveying Technology

Accumulating Conveyors

Technical design and selection criteria
Product range of accumulating conveyors

- EXPERT-TÜNKERS One-strand-Accumulating conveyor-Chain EFS-1
- EXPERT-TÜNKERS Dual-strand-Accumulating conveyor-Chain EFS-2
- APM System Dual-strand-Accumulating conveyor-Chain AFS-2
- LAT System One-strand-Accumulating conveyor -Belt LFS-1
Technical data as to accumulating conveyors
Overview

<table>
<thead>
<tr>
<th></th>
<th>Horizontalbetrieb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EFS-1</td>
</tr>
<tr>
<td>Max. carriage load</td>
<td></td>
</tr>
<tr>
<td>(Weight of component+carrier)</td>
<td>35.00 kg</td>
</tr>
<tr>
<td>Max. weight of</td>
<td></td>
</tr>
<tr>
<td>component carrier</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(30.00 kg)</td>
</tr>
<tr>
<td>Max. torque M centre of gravity of component carrier (s) * distance to carriage</td>
<td>50 Nm (25.00 kg – 200 mm)</td>
</tr>
<tr>
<td>Max. component width</td>
<td>1,000 mm</td>
</tr>
<tr>
<td>Max. component length</td>
<td>150 – 700 mm</td>
</tr>
<tr>
<td>Max. number of</td>
<td></td>
</tr>
<tr>
<td>carriages before</td>
<td></td>
</tr>
<tr>
<td>stopper</td>
<td>10</td>
</tr>
<tr>
<td>Max. incline</td>
<td>≤ 1°</td>
</tr>
</tbody>
</table>
## Performance specifications of accumulating conveyors in comparison

<table>
<thead>
<tr>
<th>Feature</th>
<th>EXPERT-TÜNKERS One-strand</th>
<th>EXPERT-TÜNKERS Dual-strand</th>
<th>APM</th>
<th>LAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable for small parts</td>
<td>+</td>
<td>o</td>
<td>o</td>
<td>+</td>
</tr>
<tr>
<td>Suitable for medium-sized parts</td>
<td>o</td>
<td>+</td>
<td>+</td>
<td>x</td>
</tr>
<tr>
<td>Suitable for large parts</td>
<td>x</td>
<td>o</td>
<td>+</td>
<td>x</td>
</tr>
<tr>
<td>Suitable of robot / robot linkage</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>x</td>
</tr>
<tr>
<td>Suitable of robot / operator linkage</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>+</td>
</tr>
<tr>
<td>Stop in the bend</td>
<td>x</td>
<td>x</td>
<td>+</td>
<td>x</td>
</tr>
<tr>
<td>Fully electric version</td>
<td>in prep.</td>
<td>in prep.</td>
<td>+</td>
<td>x</td>
</tr>
<tr>
<td>90° version</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Overhead operation</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>
### Maximum Carriage Load

**Sum of Component Carrier and Component**

<table>
<thead>
<tr>
<th>Component</th>
<th>Carriage Load</th>
<th>Length Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFS-1</td>
<td>35 kg</td>
<td>270 mm</td>
</tr>
<tr>
<td>EFS-2</td>
<td>70 kg</td>
<td>600 – 1500 mm</td>
</tr>
<tr>
<td>AFS-2</td>
<td>130 kg</td>
<td>400 - 700 mm</td>
</tr>
<tr>
<td>LFS-1</td>
<td>60 kg</td>
<td>155 mm</td>
</tr>
</tbody>
</table>

**Precondition:** Overall centre of gravity is at the centre of the carriage.

Weight increase by multiple carriage installation!!!
Maximum load due to component carrier

- Critical size, as the mass of the component carrier needs to be conveyed upward at the turning point and the centre of mass generates a reverse torque to the drive motor.

<table>
<thead>
<tr>
<th></th>
<th>EFS-1</th>
<th>EFS-2</th>
<th>AFS-1</th>
<th>LFS-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. torque</td>
<td>S * l ≤ 50 Nm</td>
<td>S * l ≤ 100 Nm</td>
<td>S * l ≤ 150 Nm</td>
<td>S * l ≤ 5 Nm</td>
</tr>
<tr>
<td>Max. weight</td>
<td>30 kg</td>
<td>60 kg</td>
<td>100 kg</td>
<td>10 kg</td>
</tr>
</tbody>
</table>

Example of carrier

Cg = Centre of gravity
Maximum radial carriage load with 90° belt

| Carrier and component | Carriage | Belt |

EFS-1

Fmax = 30 kg  
Mmax = 40 Nm  
Lmax = 400 mm

EFS-2

Fmax = 40 kg  
Mmax = 80 Nm  
Lmax = 800 mm

AFS-2

Fmax = 60 kg  
Mmax = 90 Nm  
Lmax = 800 mm

LFS-1

Fmax = 60 kg  
Mmax = 15 Nm  
Lmax = 800 mm

→ 80 kg  
Weight increase via additional support rollers at the base
Recommended application of accumulating conveyor in relation to component width and weight (component + carrier)
Recommended application in relation to component width and weight of component carrier

![Recommended application diagram]

- **EFS-2**
- **AFS-2**
- **LFS-1**

Component width (mm) vs. Max. weight (kg) component carrier