

Inverted Tooth Chains for Conveyors and Interlinked Systems

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The variable structure of inverted tooth chains offers a wide variety of possibilities to solve many different conveying tasks.

Depending on the type and shape of the workpiece they can be placed directly onto the chains or on special fixtures which are held on pallets. For bulky workpieces two or more parallel narrow chains are sufficient. In this way a stable position of equilibrium is obtained in spite of the small width of the chain.

Inverted tooth conveyor chains have an even surface which guarantees optimum stability particularly for workpieces with a small bearing area.

For workpieces which are worked on both sides the upper side of the chain can be additionally grinded, especially in congestion zones; if necessary the grinding can be performed also on both sides of the chain.

For higher workpiece weights chains with shortened, flat bottom links are recommended. These chains have a larger bearing area and a better sliding ability.

In addition to direct charging of the chain, pallets with special workpiece holders can be used. For fastening the pallets to the conveyor chain dog plates are available.

For the transportation of bars or shafts which have a tendency to roll, e.g. camshafts or gearshafts, chains with a cambered link back

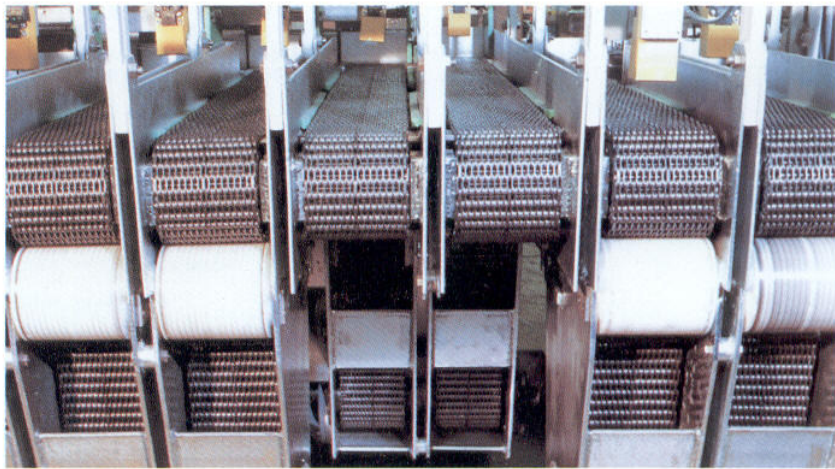
are advantageous. The recess created between the chain links is sufficient for fixing such workpieces within a uniform distance from each other.

Use the advantages of inverted tooth chains:

Space saving and versatility
in form and width due to the laced construction of the chain.

Non-slip and silent running
due to involute gearing.

Functional reliability and long life
due to low wear rate.



Calculation

The size of the chain is determined by the tractive force required to overcome the friction. The friction forces should be doubled in congestion areas.

In order to prevent overstressing through oversized motors it is recommended to make the final choice of the chain according to the available torque.

$$F_1 = 9.81 G \cdot \mu \cdot r$$

$$F_2 = \frac{2 M}{d_k} \cdot 10^3$$

where:

- F = peripheral force [N]
- G = transportation weight
- μ = friction coefficient
sliding friction dry up to 0.15
static friction/plastics up to 0.4
- r = number of the friction surface pairs normally: r = 1
loaded chains in congestion zones: r = 2
- M = torque [N_m]
- d_k = diameter of the tip circle [mm]

For longer distances additions are necessary in order to prevent the

"stick-slip"-effect which can cause a jerky slide at the conveyor end.

The selection of a conveyor chain is made by calculating the chain width using the formula

$$b = \frac{F \cdot y}{8 \cdot p}$$

where:

- b = width of the chain
- p = pitch of the chain
- y = addition factor for the length up to 5 m distance
between axles: y = 1.0
above 5 m distance
between axles: y = 1.4
above 20 m distance
between axles: y = 2.0

Above 1 m distance between axles the loose side of the chain running backwards must be supported.

Besides slide bars supporting rollers are also permitted.

The calculated width should be rounded up to a nominal width value b_n contained in the table overleaf.

Important: The determined width of the chain is valid for chains with a compact plate structure only. Should a conveyor chain with a

loosened structure be selected e.g. with spacers or sleeves, please contact us.

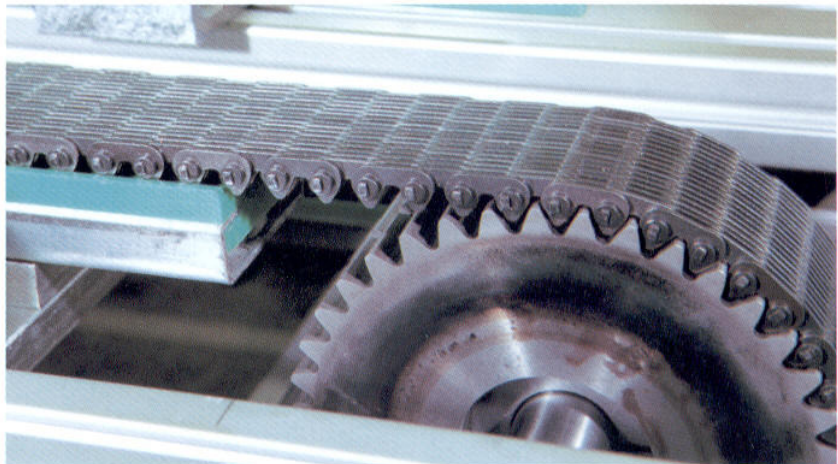
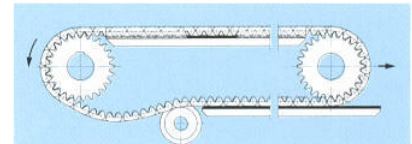
Chain locks:

- Rivet locks should be preferred
- If a cotter lock is to be used, the cotter pin head projection on one side must be considered.

The chain sections run on metal or plastic slide rails.

- Surface hardened steel bars or spring-steel cross-bands should be used.
- Plastics: Commercially available PE and PA grades.

The slide bars should begin near to the wheel, they should have rounded edges and a height corresponding to the tip circle of the wheels. By lifting the bar surface by about 2 % of the wheel diameter the pressure in the wheel teeth is reduced and the smoothness of the run is improved.



Inverted tooth 1/2" pitch conveyor chains with a single pin system

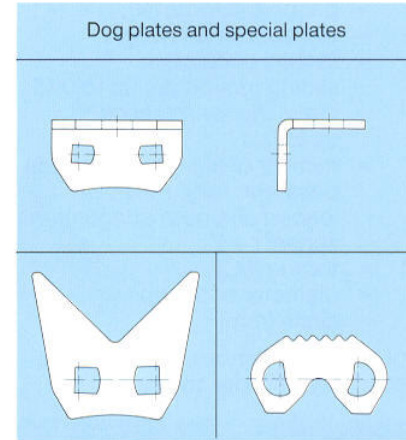
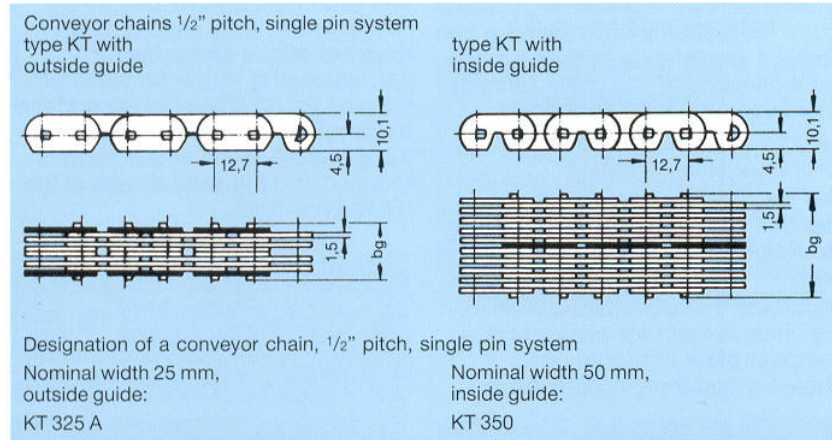
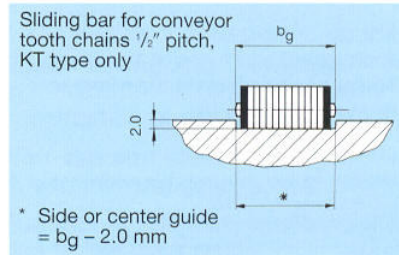
This is a simplified, very rugged design. The link consists of a semi-circular pin with increased cross section. The pins of the links are directly riveted to the outer plates. The flat bottom links increase the bearing area and improve the ability to sliding. The reduced overall height of the design improves the compactness of this conveyor chain and makes it suitable also for heavy duty applications.

These conveyor chains are rigid on their back side. However, the same type is also available for unlimited articulation.

Available versions:

- Grinded on the upper side or on both sides
- Built-in dog plates
- Chains without rigid back side feature
- Additional chain widths available upon request

This type of conveyor chains can be combined with dog plates. The following examples are applicable to 1/2" inverted tooth single pin chains only.



Standard versions 1/2" pitch, single pin system

Code-No.	Nominal width b_n	Number of rows	Overall width b_g^*	Weight [kg/m]	Width of the rim [mm]
KT 312 A	12	8	15	0.67	9
KT 315 A	15	10	18.5	0.82	12
KT 320 A	20	13	23	1.06	16
KT 325 A	25	17	29	1.37	22
KT 330 A	30	19	32.5	1.5	25
KT 330	30	19	32.5	1.5	35
KT 335	35	23	39	1.8	40
KT 340	40	27	45	2.1	45
KT 350	50	31	51	2.4	55
KT 355	55	35	58	2.8	60
KT 360	60	39	64	3.1	65
KT 365	65	43	70	3.4	70

* $b_g + 2.5$ mm for cotter lock projection on one side – dimensions in mm.

Inverted tooth 1/2" pitch conveyor chains with a two pin system

This design contains the same double-pivot system as used in drive chains. The two curved pins in each joint roll against each other resulting in smooth running and low wear rate.

Available versions:

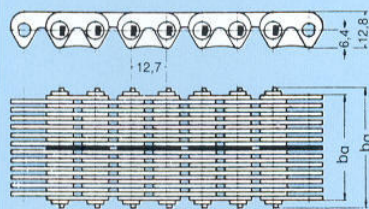
- Loose design with spacers (KTS) or bushings (KTB)
- Grinded on the upper side or on both sides
- Built-in dog plates

- Extended pitch = $2 \times 1/2" = 25.4 \text{ mm}$
- Stainless version, however, with circular pins
- Additional chain widths available upon request

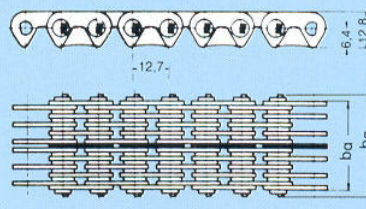
Driving chains with a pitch of $5/16"$ up to $2"$ either in the original- or in the modified version can also be used for transportation and for special purposes. The low wear pivot system guarantees a long and trouble-free life.

Dog plates for inverted tooth chains with a two-piece cradle link and a pitch from $5/16"$ to $2"$.

Inverted tooth conveyor chains, 1/2" pitch
Type KTSS with compact plate structure



Type KTS with loosened plate structure



Designation of an inverted tooth conveyor chain, 1/2" pitch, with a two pin system

Nominal width 200 mm,
with compact plate structure:
KTSS 3200

Nominal width 150 mm,
with loosened plate structure:
KTS 3150

Dog plates and special plates	Available pitch
	$5/16"$ $3/8"$ $1/2"$
	$3/8"$
	$5/8"$
	$5/8"$ $1"$
	$1"$ $1 1/2"$
	$1"$ $1 1/2"$

Standard versions 1/2" pitch, two pin system

Code-No. KTSS... KTS..., KTB...	KTSS, KTS KTB	KTSS + KTS		KTSS	KTS	KTB			KTSS, KTS KTB
	Nominal width b_n	Number of rows	Overall width b_g^*	Weight [kg/m]	Weight [kg/m]	Number of rows	Overall width b_g^*	Weight [kg/m]	Rim width
... 325	25	17	32.5	1.5	1.2	—	—	—	30
... 335	35	23	42	2.0	1.6	—	—	—	40
... 350	50	33	57.5	2.8	2.2	—	—	—	55
... 375	75	48	81	4.5	3.5	48	81	2.2	80
... 3100	100	64	106	6.0	4.7	58	97	2.6	105
... 3125	125	80	131	7.5	5.6	78	128	3.0	130
... 3150	150	96	156	9.0	6.7	96	156	3.8	155
... 3175	175	112	181	10.5	7.7	110	178	4.1	180
... 3200	200	128	206	12.0	8.8	128	206	4.7	205
... 3250	250	160	256	15.0	11.3	158	253	5.8	255
... 3300	300	192	308	18.0	13.4	188	300	6.9	305

* $b_g + 2.5 \text{ mm}$ for cotter lock projection on one side – dimensions in mm.

Inverted tooth 5/8" and 1" pitch conveyor chains

5/8" pitch with vee-section

These chains keep the workpieces in the correct track during transportation; round parts and profiled bars cannot roll out of position; they arrive at the end of the conveyor section precisely centered. This fixed centering is a precondition for automatic feeding for centerless grinding or for picking up parts by grippers of handling devices.

Heightened plastics plates sizes 1 to 8 are used as support for the workpieces. The plates form a prismatically shaped hollow profile with an aperture angle of 120°.

Plastics plates are made of Polycarbonate = PC. PC has a relatively high strength, at a permanent temperature of 135 °C; it is therefore well suited for applications with mechanical stress. PC is not resistant against alkaline solutions and various detergents. If resistivity against chemical agents is required, special plates made of PVDF should be used, which are available upon request.

The whole workpiece diameter range up to 100 mm is covered by only 4 different standard chain widths. By means of various combinations of plates the adaption to shape and size of the workpiece can be obtained.

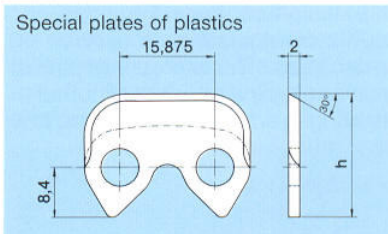
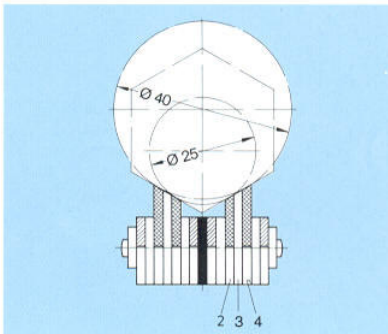


Plate	Dimens. h	Plate	Dimens. h
1	20.5	5	25.2
2	21.7	6	26.3
3	22.8	7	27.5
4	24.0	8	28.6



Standard versions of prismatic chains with 5/8" pitch

Code-No.	For workpiece diameter	Dimensions of inverted tooth chains				Rim width
		Nominal width b_n	Overall width b_g^*	Overall height	Weight [kg/m]	
KTP 425	– 25	25	33	22.8	1.4	30
KTP 430	25 – 40	30	37	24.0	1.8	35
KTP 445	40 – 65	45	50	25.2	2.4	50
KTP 465	65 – 100	65	71	28.6	3.6	70

* $b_g + 3.0$ mm for cotter lock projection on one side – dimensions in mm.

1" pitch

For especially heavy duty applications conveyor chains with 1" pitch are available.

Deviating from the 1" pitch drive chain, this chain has both the back and the teeth of the plates flattened.

This plate shape offers therefore the best preconditions for the transportation of high load workpieces.

Available versions:

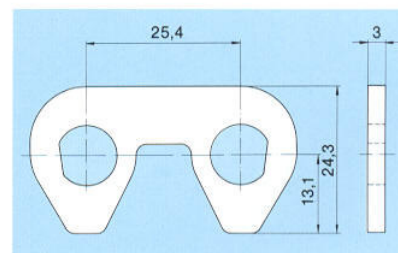
- Grinded on the upper side or on both sides
- Additional chain widths available upon request

This version can also be used as a friction drive to obtain precise synchronisation of rollers for the transportation of glass panes.

Standard versions 1" pitch

Code-No.	Nominal width b_n	Number of rows	Overall width b_g^*	Weight [kg/m]	Rim width
KT 630	30	9	36	3.0	35
KT 640	40	13	48	4.3	45
KT 650	50	17	60	5.6	55
KT 675	75	25	85	8.3	80

* $b_g + 4.0$ mm for cotter lock projection on one side – dimensions in mm.



Inverted tooth chain wheels

We supply inverted tooth chain wheels made of steel C45 with hardened teeth profiles. Other materials are possible, however, up to 30 teeth steel wheels should be preferred. The wheels are fabricated in accordance with the specifications of the customer ready for installation.

For 1/2"-wheels different base tangent lengths are valid for the two types of chain link versions.

When ordering wheels it must be indicated whether chains with a single or a two pin system are to be used.

The wheel width depends upon the width of the chain.

In special cases smaller wheel widths are also possible.

If very wide chains are used several narrow wheel discs can be mounted laterally side by side.

Diameter of the pitch circle:

$$d_o = \frac{p}{\sin \delta} \quad [\text{mm}]$$

$$\delta = \frac{180^\circ}{z}$$

Wheels with a correct toothing are a precondition for a safe function and a long life of the inverted tooth chains.

Diameter of the tip circle d_k

Number of teeth z	1/2"	5/8"	1"
15	59.7	74.6	119.4
16	63.8	79.8	127.6
17	67.9	84.9	135.8
18	72.0	90.0	144.0
19	76.1	95.1	152.2
20	80.1	100.2	160.3
21	84.2	105.3	168.5
22	88.3	110.4	176.6
23	92.3	115.4	184.7
24	96.4	120.5	192.9
25	100.5	125.6	201.0
26	104.5	130.7	209.1
27	108.6	135.8	217.3
28	112.7	140.8	225.4
29	116.7	145.9	233.5
30	120.8	151.0	241.6
31	124.8	156.1	249.7
33	133.0	166.2	266.0
35	141.1	176.3	282.2

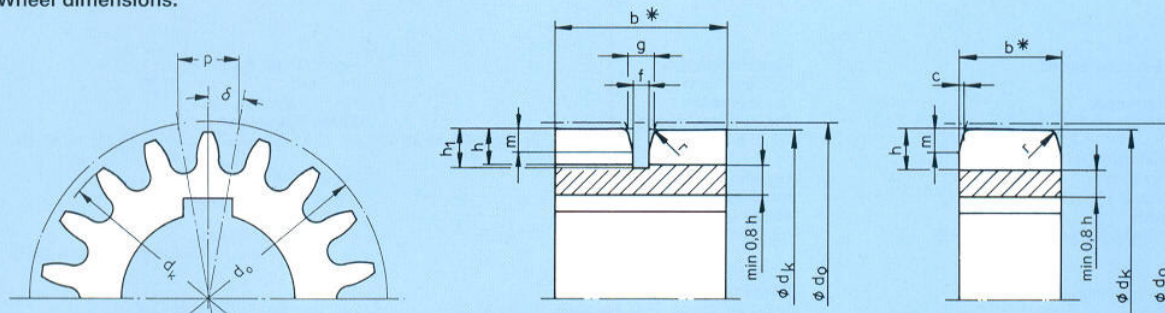
Number of teeth z	1/2"	5/8"	1"
37	149.2	186.5	298.4
39	157.3	196.6	314.6
41	165.4	206.7	330.8
43	173.5	216.9	347.0
45	181.6	227.0	363.2
47	189.7	237.1	379.4
49	197.8	247.2	395.6
51	205.9	257.3	411.8
55	222.1	277.6	441.1
60	242.3	302.9	484.6
70	282.7	353.4	565.5
80	323.2	404.0	646.4
90	363.6	454.6	727.3
100	404.1	505.1	808.2
110	444.5	555.6	889.0
120	484.9	606.2	969.9
130	525.4	656.7	1050.8
140	565.8	707.3	1131.7
150	606.2	757.8	1212.5

Guiding groove and profile

Pitch p	1/2"	5/8"	1"
g	4	5	8
f	3	4	6
h	7.5	9.7	15.4
h ₁	8	10	16
m	5	6	10
r	2	3	3
c	0.5	0.5	1.0

Intermediate values should be interpolated – dimensions in mm.

Wheel dimensions:



b* Rim widths see table, pages 4, 5 and 6