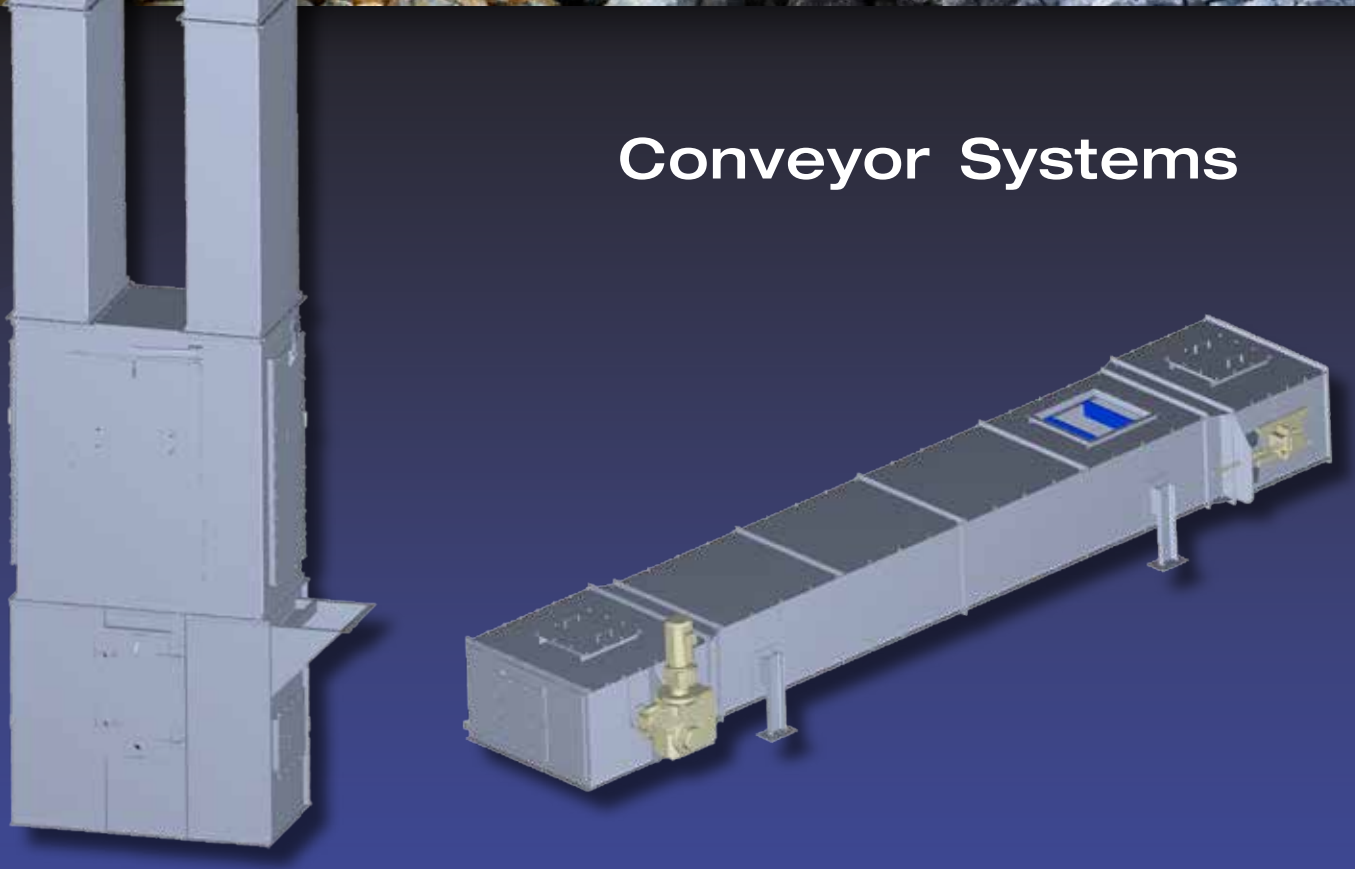
THIELE®

Conveyor Systems



CHANGE® for Success

THIELE quality philosophy


DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

THIELE

THIELE GmbH & Co. KG
Werkstr. 3, 58640 Iserlohn / Kalthof, Germany
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:

ISO 9001:2008

This certificate is valid for the following scope:

Design, Development, Production, Sales and Service of Link Chains and Conveyor Chains as well as Components and Accessories for
- Mining
- Lifting Technology
- Bulk Material Handling

Essen, 27. October 2015

DAkkS Deutsche Akkreditierungsstelle D-ZM-18453-01-00

For the issuing office:
DNV GL - Business Assurance
Schmiedingshof 14, 45329 Essen, Germany

Thomas Bock
Technical Manager


DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

THIELE

Thiele GmbH & Co. KG
Werkstrasse 3, 58640 Iserlohn / Kalthof - Germany

has been found to conform to management system standard(s):
ISO 14001:2004

This certificate is valid for the following Scope:
Design, Development, Production, Service of welded, cold and hot formed safety-components, parts for conveying technology, link chains made from alloyed special steel, austenitic, ferritic and duplex material.

Essen, 10.07.2014

DAkkS Deutsche Akkreditierungsstelle D-ZM-18453-01-00

For the issuing office:
DNV GL Business Assurance Zertifizierung und Umweltgutachter GmbH

Nikolaus Kley
Management Representative

Our quality philosophy

- customer satisfaction
- our products are designed to the highest quality, environmental and safety standards
- continuous and sustainable process improvements
- QA system to ISO 9001 standard
- environmental management system to ISO 14001
- energy management system to ISO 50001
- our CIP (continuous improvement process) stands guarantee for the durability and high quality of our products

AEO

Certified trading partner

MADE IN GERMANY

THIELE – the company

The company
The THIELE Company, which was founded more than 80 years ago, has its roots in the production of chains and chain conveyors.

Chains and conveyor systems are developed in-house by our own design department using our own drawings or following instructions from clients. The engineers responsible for executing this work can draw on years of experience and specialist know-how in designing and building conveyor systems for every sector of industry. A highly skilled workforce and modern, high-performance production facilities stand guarantee for products of the finest quality.

Consulting and product development
THIELE specialises in chain systems for lifting and conveying. THIELE engineers provide an on-site consulting service and work alongside the client to analyse the technical requirements and plan and measure up the conveyor installation.
Customised solutions are then worked out in detail in THIELE's own design department.

Chain production
Our production facilities include equipment for all kinds of welding processes, laser-, plasma- and gas-cutting, solid forming, heat treatment and mechanical processing using the latest CNC lathes and milling machines.

Service
As well as supplying spare parts and consumables our range of services includes plant inspections and on-site analysis, hands-on support for equipment assembly work, system modifications and commissioning. We also work with plant operators to organise coordinated training in product and application techniques.

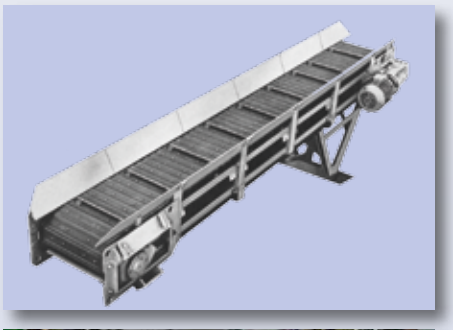
Quality
High-integrity production methods are used to ensure that all products leaving the THIELE factory are of the finest quality, as confirmed by continuous monitoring in our laboratory and testing house. THIELE was one of the world's first chain manufacturing companies to meet the DIN EN ISO 9001 quality management standard.

Engineering design

The THIELE in-house design department is set up to ensure that general requirements and client-specific requests and interfaces are factored into the final product.

The latest design software is used to present and execute complex 3D-based assignments.

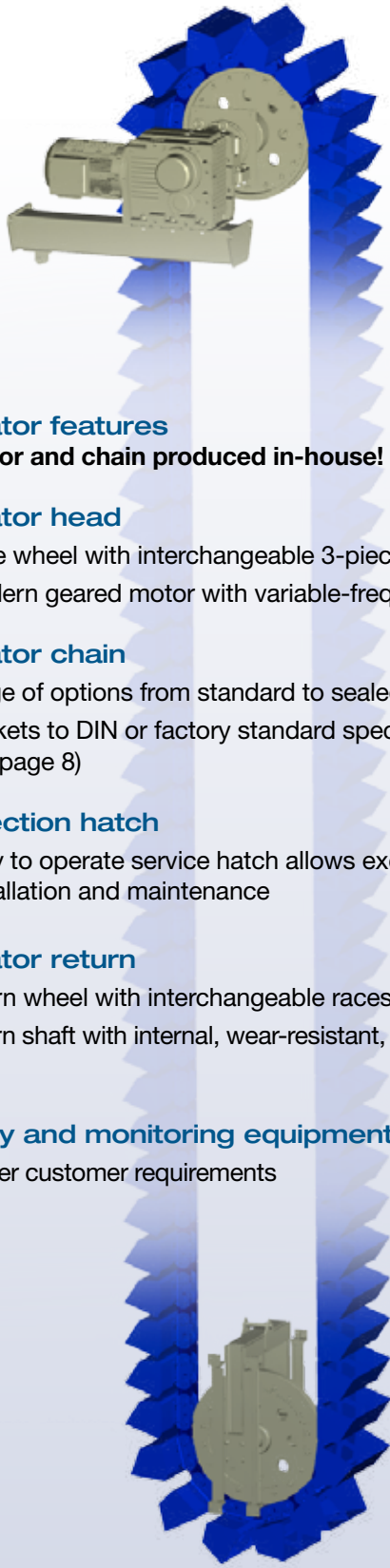
Manufacture

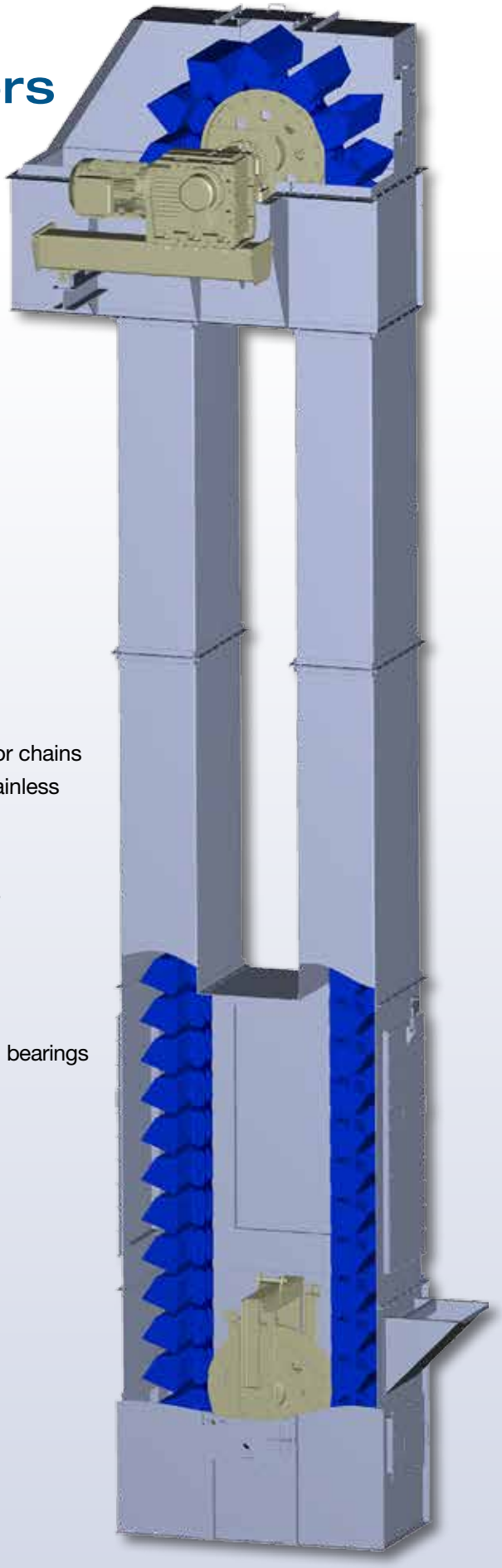


THIELE conveyors have been patented since 1956 and the technology that was developed back then provides the basis for the conveyor systems we use today.

Experience built up over several generations is now being used to produce the latest THIELE conveyor systems.

THIELE bucket elevators





Elevator features

Elevator and chain produced in-house!

Elevator head

- drive wheel with interchangeable 3-piece segments
- modern geared motor with variable-frequency control

Elevator chain

- range of options from standard to sealed, non-coupled elevator chains
- buckets to DIN or factory standard specification, in steel or stainless (see page 8)

Inspection hatch

- easy to operate service hatch allows excellent accessibility for installation and maintenance

Elevator return

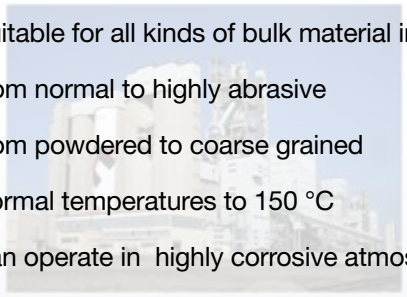
- return wheel with interchangeable races
- return shaft with internal, wear-resistant, maintenance-free plain bearings

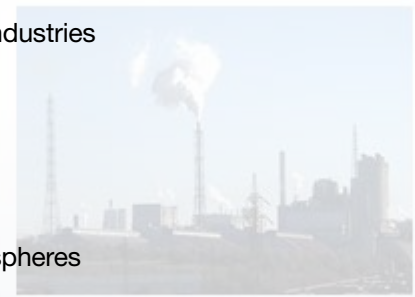
Safety and monitoring equipment

- as per customer requirements

Applications

- suitable for all kinds of bulk material industries
- from normal to highly abrasive
- from powdered to coarse grained
- normal temperatures to 150 °C
- can operate in highly corrosive atmospheres


Cement


Fertiliser

Chemical

THIELE TBE bucket elevators with single-line chain

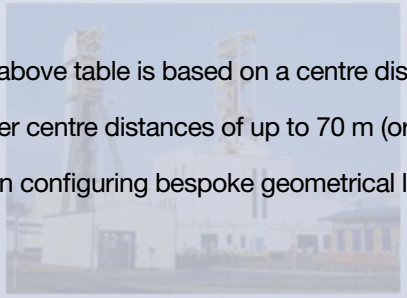
Bucket system	Bucket size (as per DIN 15234)	Bucket capacity [l]		Delivery [m³/h]		THIELE chain breaking strength [kN]		d [mm]	THIELE HLB p = [mm]	
TBE 315	315x200x4	5,8	fill factor 75 %	80	chain speed 1,4 m/s	45	chain plates laser cut	24	140	
TBE 400	400x224x4	9,4		110		65		26	152,4	
TBE 500	500x250x5	14,9		160		80		32		177,8
TBE 630	630x280x5	23,5		250		80		36		
TBE 800	800x280x6	29,8		310		120		42		
TBE 1000	1000x280x6	37,3		400		150		45		
TBE 1250	1250x280x6	46,6		500		180		50		
TBE 1400	1400x280x6	52,2		550		200		55		

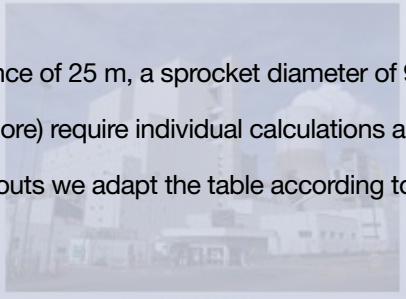
A-A = 25 m; Standard-diameter sprocket = 900 mm
HLB = high-performance elevator chain

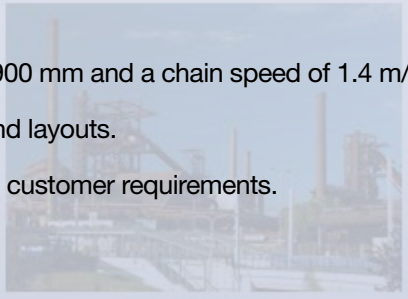
The above table is based on a centre distance of 25 m, a sprocket diameter of 900 mm and a chain speed of 1.4 m/s.

Larger centre distances of up to 70 m (or more) require individual calculations and layouts.

When configuring bespoke geometrical layouts we adapt the table according to customer requirements.

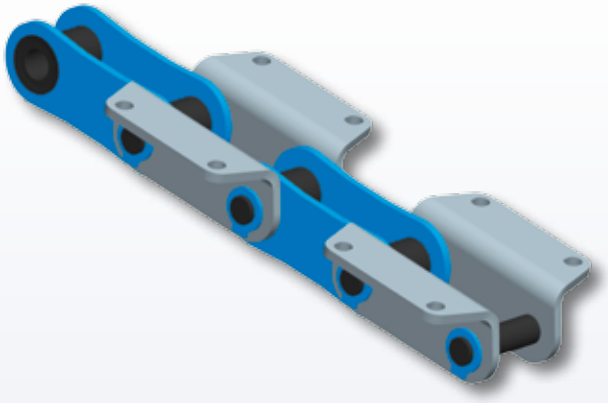

Mining


Electricity

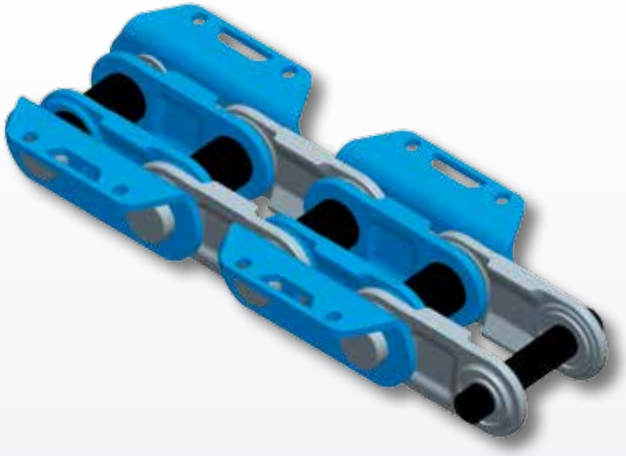

Steel

Bucket elevator chains

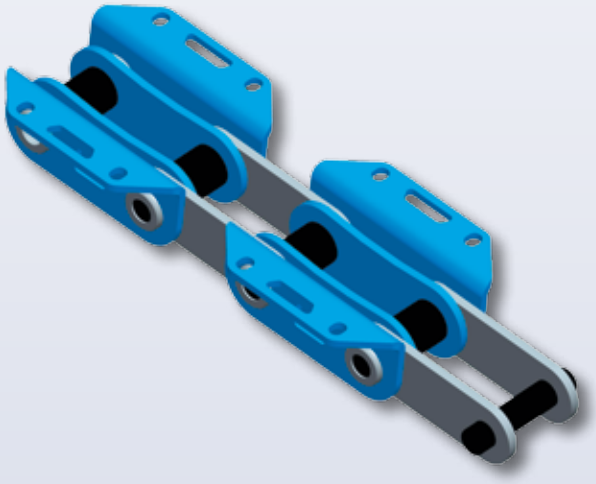
THIELE HLB



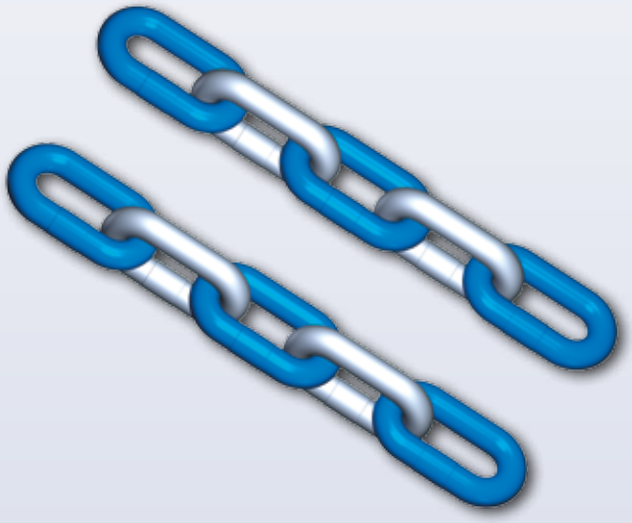
THIELE HLB-WG



THIELE HLB-W



THIELE round-link chains



The overview shows the wide range of modern, technically developed products designed to suit every type of application. Additions to the product range for all common chain dimensions can be found on page 10.

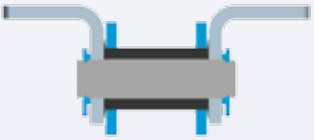
Selection factors

Overview of THIELE bucket elevator chains							
Bucket attachment		HLB	HLB-W (reversible)	HLB-WG (reversible/forged)	F_{Br} [kN]	p [mm]	d [mm]
rigid		45			450	140,0	25
	uncoupled	65	65		650	152,4	30
		80 (B)	80 (B)		800	152,4	35
		80 (A)	80 (A)		800	177,8	35
			120	120	1200	177,8	40
			150	150	1500	177,8	45
			180	180	1800	177,8	50
				200	2000	177,8	55

(A) = 177,8 mm pitch
(B) = 152,4 mm pitch

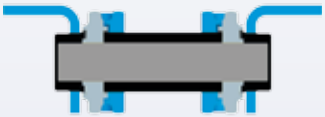
F_{Br} = breaking strength p = pitch d = pin diameter

Subdivision of design types



rigid

A bucket plate is used as a rigid part of the design to create an outer link that is a press fit into the pin fixing.



uncoupled

An additional bucket plate is used as a push-on fitting.

THIELE recommendation

1. Chain speed

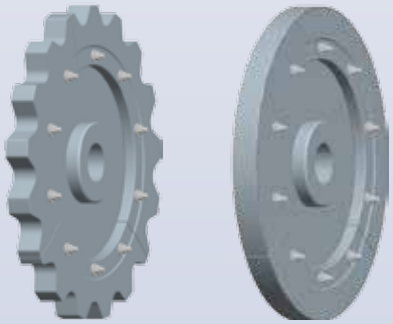
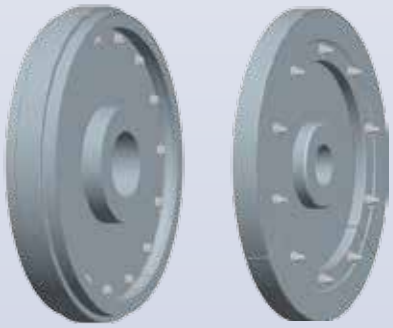
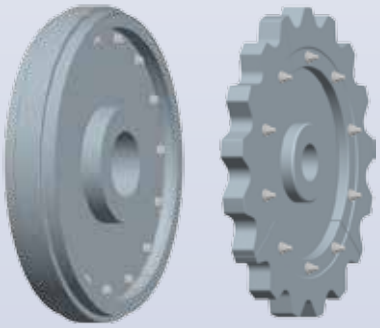
Gravity discharge: ≤ 1,1 m/s rigid
Centrifugal discharge: > 1,1 m/s uncoupled

2. Bucket width

The chain on the chain wheel should be supported across at least 1/6 of the bucket width.

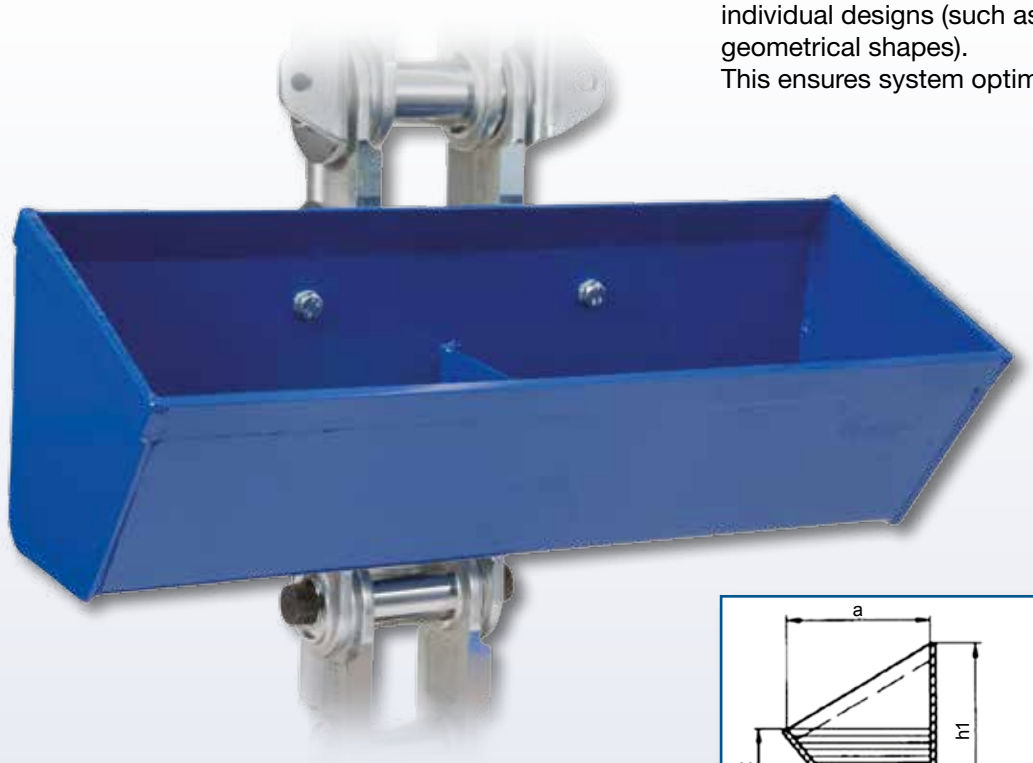
3. Chain wheels

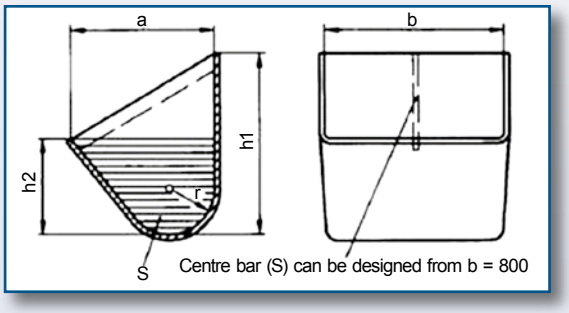
Design recommendation

≤ 15 m: centre distance	> 15 m: centre distance	
Toothed drive wheel Smooth return wheel	Smooth drive wheel Smooth return wheel	Smooth drive wheel Toothed return wheel
		

Buckets

Our conveyor buckets are designed to suit the needs of our customers. As well as supplying a wide range of standard DIN buckets we are always willing to accept proposals for individual designs (such as different geometrical shapes).
This ensures system optimisation.

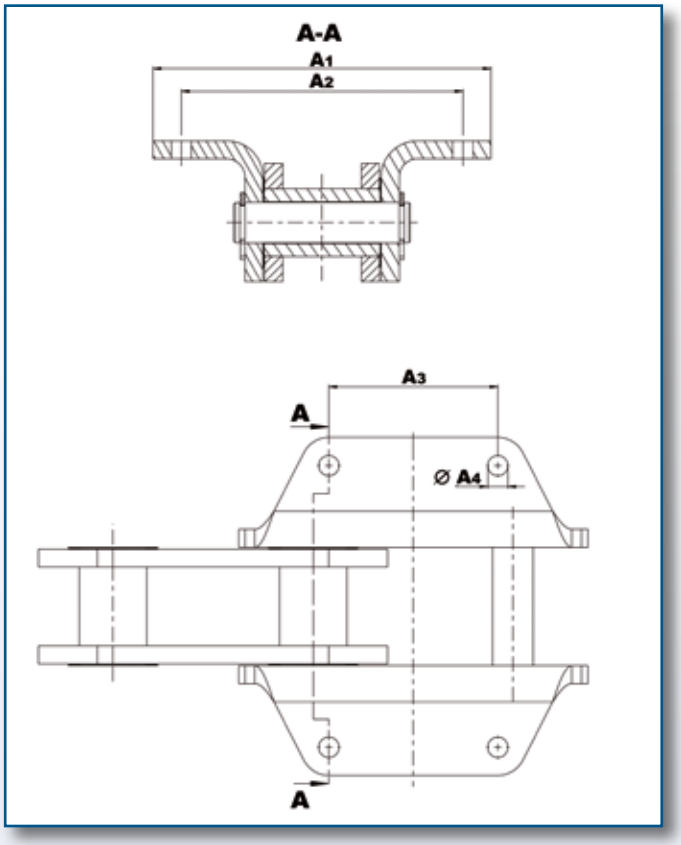




Deep bucket with flat rear face to DIN 15234								
b [mm]	a [mm]	h_1 [mm]	h_2 [mm]	r [mm]	weight [kg] at wall thickness			volume [dm^3]
					4 mm	5 mm	6 mm	
160	160	200	106	50	3,18			1,90
200	160	200	106	50	3,76			2,40
250	200	250	132	63	5,82	7,27		4,60
315	200	250	132	63	6,82	8,59		5,80
400	224	280	150	71	9,40	11,80		9,40
500	250	315	170	80	12,80	16,10	19,40	14,90
630	280	355	190	90	17,60	22,10	26,60	23,50
800	315	400	212	100		30,60	36,90	37,30
1000	355	450	236	112		42,00	50,30	58,30
1250	400	500	265	125			68,50	92,00

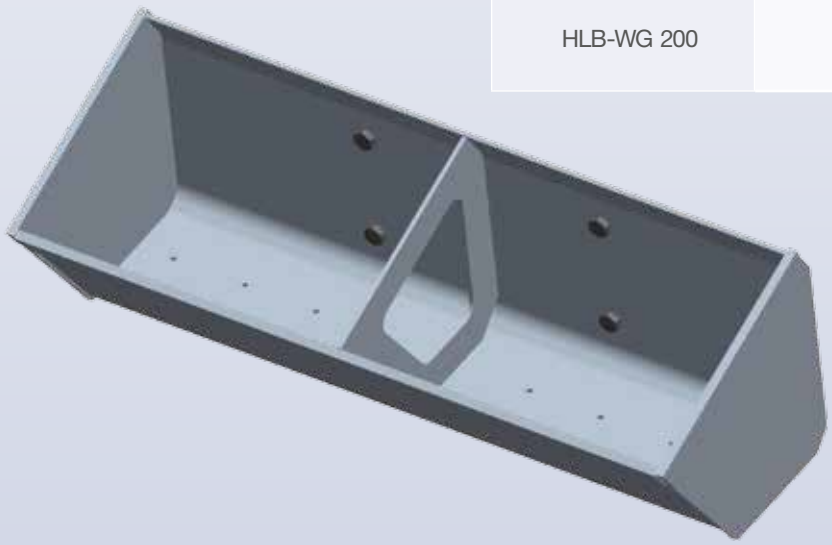
b = bucket width
a = outreach
h_1 = height of rear face
h_2 = height of scoop edge

Bucket - Attachments

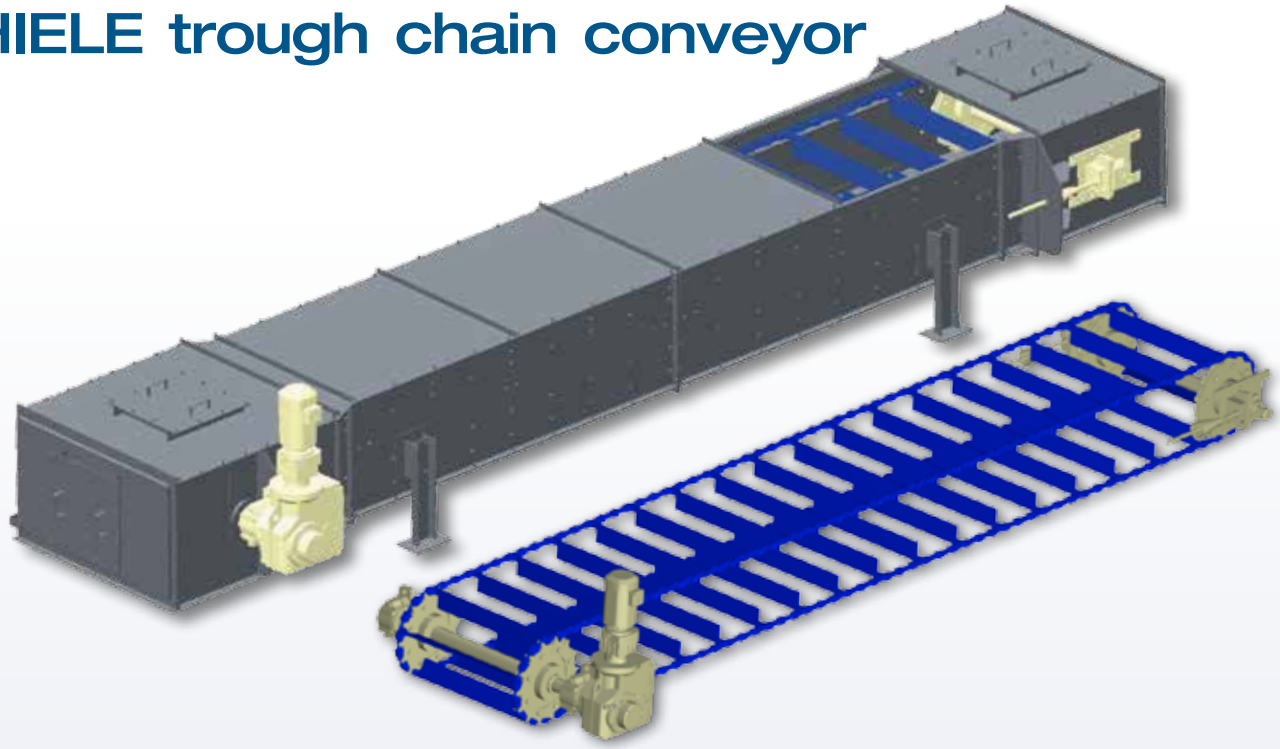


THIELE chain size	A1	A2	A3	A4
HLB 45 HLB-W 45	Depending on bucket contact surface	140	100	14
		158	58,7	12,7
HLB 65 HLB-W 65		184,6	63,5	17,5
		190	100	17,5
		200	130	18
HLB 80 HLB-W 80		250	150	18
		283	200	17
		330	139,7	17,5
HLB 120 HLB-W 120 HLB-WG 120		184,4	63,5	16
		250	150	18
		330	200	17
HLB 150 HLB-W 150 HLB-WG 150		177,8	88,9	16
		300	150	18
		330	200	17
		330,2	166,6	16
HLB 180 HLB-W 180 HLB-WG 180		228,6	92,3	16
		300	150	18
		330,2	139,7	16
		350	200	17
		370	200	18
HLB-WG 200		360	200	17
		380	200	21

We can design the bucket interface to match your system! Our flexible manufacturing process allows for production of all bucket connection sizes from A1 to A4 to suit our customers‘ needs.
The table on the right shows typical values for some of the most common hole patterns.



THIELE trough chain conveyor



Steelwork and chain produced in-house!

Drive

- modern geared motors with variable-frequency control
- easy replacement of tooth segments without opening up the chain

Chain

- available with single-strand or double-strand chain assemblies
- forged links according to requirements, corrosion-resistant version also available
- wide range of flight bars in wear-resistant steel or composite materials and in a variety of geometry

Troughs

- troughs with interchangeable guide rails and wearing rails or easily replaced bottom plates
- different lining options, e.g. high-manganese steel, cast basalt or hard facing
- galvanised troughs and guide rails in wear-resistant plastic are also available for highly corrosive atmospheres (e.g. for handling alternative fuels)

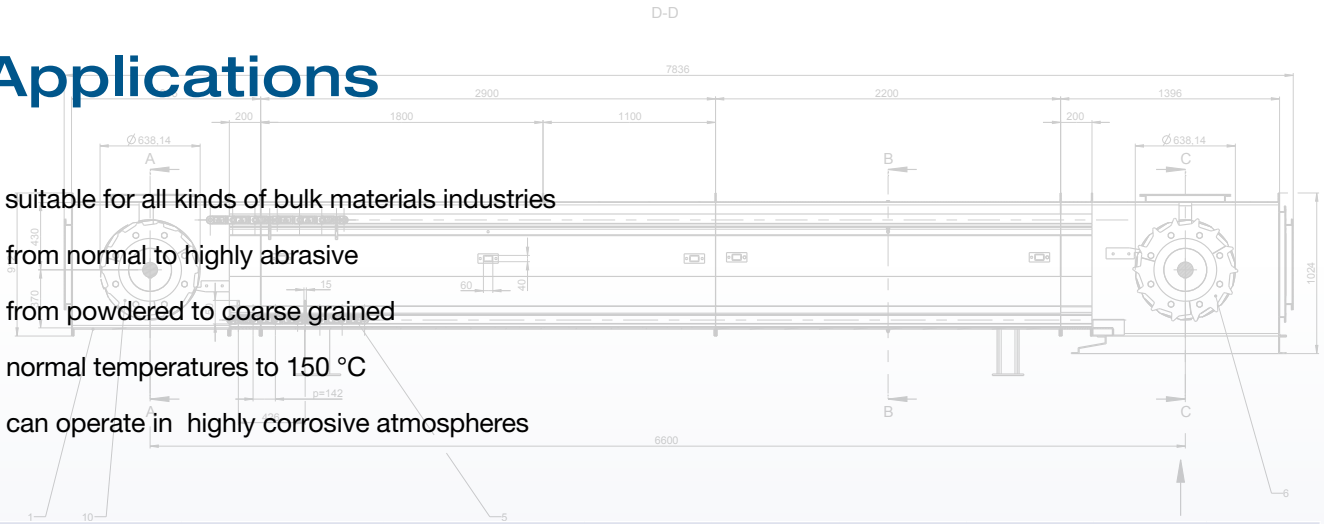
Return station

- easy replacement of tooth segments without opening up the chain
- dirt wipers
- trapezoid spindle and buffer spring ensure uniform chain tension

Safety and monitoring equipment

as per customer requirements

Applications



- suitable for all kinds of bulk materials industries
- from normal to highly abrasive
- from powdered to coarse grained
- normal temperatures to 150 °C
- can operate in highly corrosive atmospheres

THIELE TDC trough chain conveyors with forged link chain

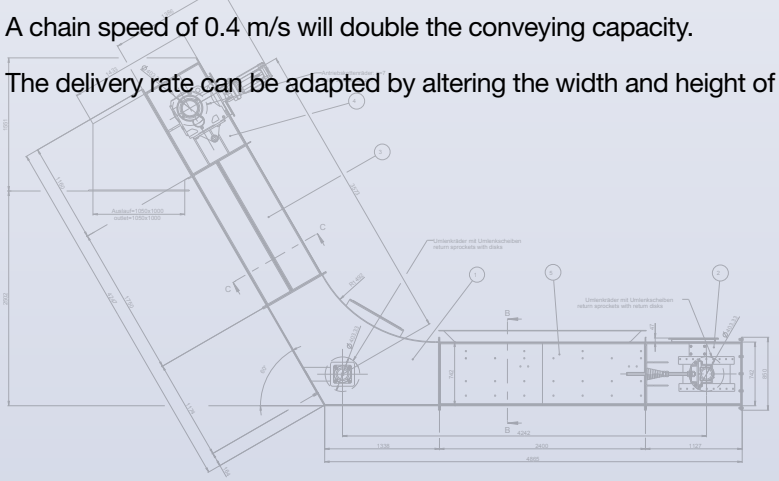
Trough chain conveyor	Trough width [mm]	Trough height [mm]	Filling profile [m²]		Delivery [m³/h]		THIELE GALA p = [mm]	
TDC 250	250	400	0,04	fill factor 70 %	32	chain speed 0,2 m/s	142	
TDC 500	500	650	0,18		126			
TDC 750	750	650	0,26		189			200 250 / 260
TDC 1000	1000	650	0,35		252			
TDC 1250	1250	900	0,61		441			
TDC 1500	1500	900	0,74		529			

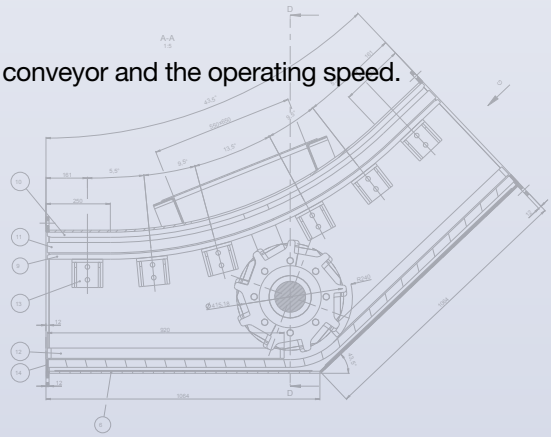
Standard no. of teeth on sprocket = 11
GALA = forged link chain

The above table is for reference purposes only.

A chain speed of 0.4 m/s will double the conveying capacity.

The delivery rate can be adapted by altering the width and height of the conveyor and the operating speed.



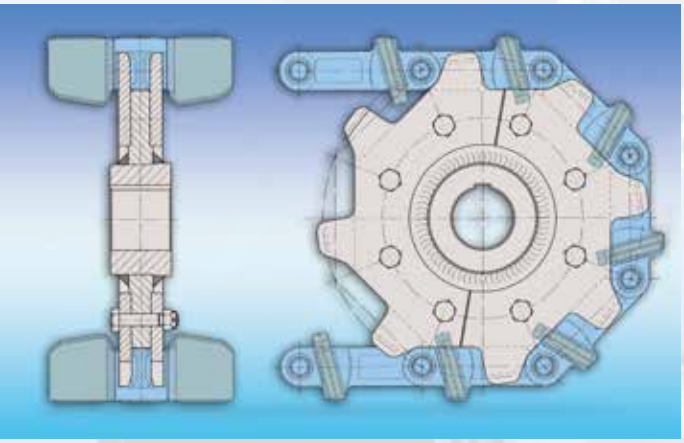


Chain wheels and guide rollers

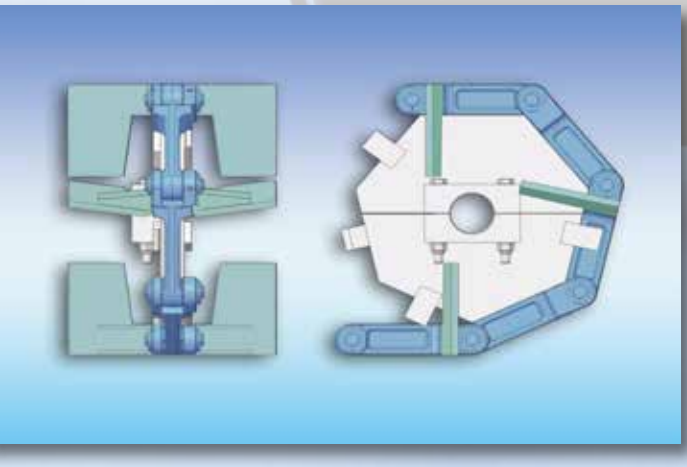
Low-maintenance split-segment chain wheel

To obtain optimum life expectancy from a THIELE chain assembly we strongly recommend fitting new chain wheels as part of the chain replacement process. In many cases this merely involves replacing the worn tooth rings or races.

Interchangeable cogwheel segments are available for all standard wheel sizes. THIELE can also supply complete chain wheels, guide rollers and spindles, if required.



Drive wheel

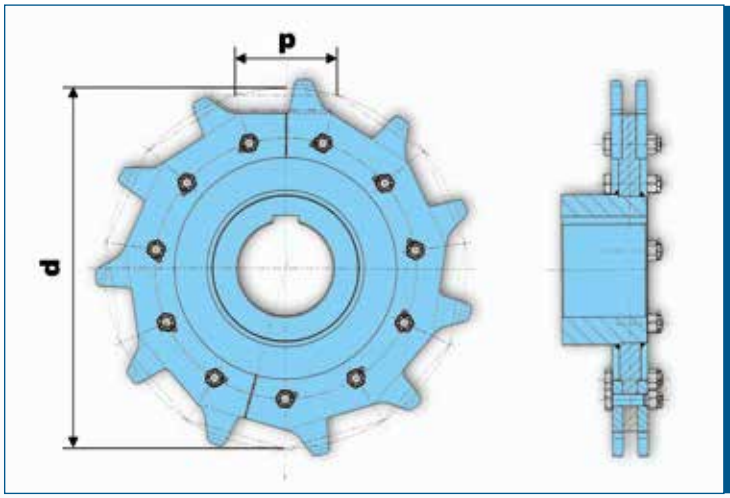


Guide wheel

Specially hardened running surfaces and tooth faces deliver maximum service life

Chain wheels are supplied in a range of pitch sizes to match any link:
d = pitch circle
p = pitch
z = number of teeth

$$d = \frac{p}{\sin \frac{360°}{2 \times z}} \text{ [mm]}$$



z	p = 102	p = 142	p = 160	p = 175	p = 200	p = 220	p = 230	p = 250	p = 260
6	204,00	284,00	320,00	350,00	400,00	440,00	460,00	500,00	520,00
7	235,09	327,28	368,76	403,33	460,95	507,05	530,10	576,19	599,24
8	266,54	371,06	418,10	457,30	522,63	574,89	601,02	653,28	679,41
9	298,23	415,18	467,81	511,70	584,76	643,24	672,48	730,95	760,19
10	330,08	459,52	517,77	566,31	647,21	711,93	744,30	809,02	841,38
11	362,05	504,02	567,91	621,16	709,90	780,88	816,38	887,37	922,86
12	394,10	548,65	618,19	676,15	772,74	850,01	888,65	965,93	1004,56
13	426,22	539,36	668,57	731,25	835,72	919,29	961,07	1044,65	1086,43
14	458,39	638,14	719,03	786,44	898,79	988,67	1033,61	1123,49	1168,43
15	490,59	682,98	769,56	841,70	961,95	1058,14	1106,24	1202,43	1250,53
16	522,83	727,87	820,13	897,02	1025,17	1127,68	1178,94	1281,46	1332,72
17	555,10	772,79	870,75	952,38	1088,44	1197,28	1251,70	1360,55	1414,97
18	587,39	817,75	921,40	1007,78	1151,75	1266,93	1324,52	1439,69	1497,28
19	619,70	862,73	972,09	1063,22	1215,11	1336,62	1397,37	1518,88	1579,64
20	652,03	907,73	1022,79	1118,68	1278,49	1406,34	1470,26	1598,11	1662,04

Material grades for forged links

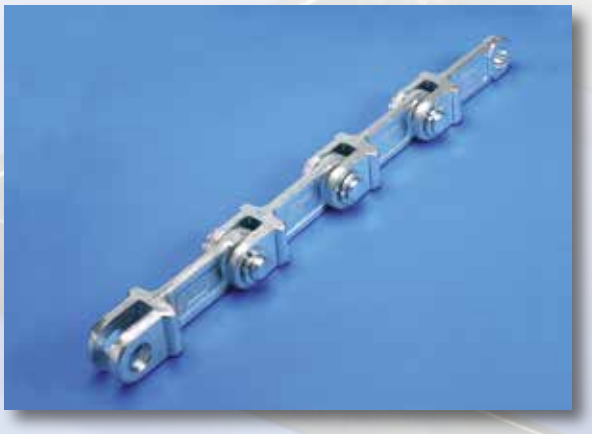
Component	Material Number	Material Designation	Heat treatment	Maximum surface hardness (HRC)
THIELE standard materials for forged links				
Forged link	1.0412	27MnSi5	tempered	
Forged link	1.6758	23MnNiMoCr5-4	tempered	
Forged link	1.7147	20MnCr5	case-hardened	60 ±3 / 0,6+0,3**
THIELE special materials for forged links				
Forged link rust/acid resistant	1.4571	X6CrNiMoTi17-12-2		
Forged link heat resistant	1.4841	X15CrNiSi25-20		
Forged link	1.6758	23MnNiMoCr5-4	case-hardened	60 ±3
Forged link	1.6758	23MnNiMoCr5-4	induction-hardened	50 ±2

Material grades for fittings

Component	Material Number	Material Designation	Heat treatment	Maximum surface hardness (HRC)
THIELE special material grades for link pins				
Link pin	1.7225	42CrMo4	induction-hardened	56 ±2
Link pin	1.4034	X46Cr13	induction-hardened	55 ±2
THIELE standard material grades for bushings				
Bushing	1.5026	55Si7	tempered	50
Bushing	1.4034	X46Cr13	tempered	50
THIELE standard material grades for chain-wheel segments				
Chain-wheel segment	1.0503	C45	induction-hardened	55 ±2 / 3+2
Chain-wheel segment	1.7225	42CrMo4	induction-hardened	55 ±2 / 3+2
THIELE standard material for guide wheels				
Guide wheel	1.0503	C45	induction-hardened	55 ±2 / 3+2
THIELE standard material grades for flight bars: S235JR, S355J2, S700MC				
THIELE special material grades for flight bars: 400 HB, X5CrNi18-10, X15CrNiSi25-20				

Standard strength (N/mm²)	Standard temperature range	Standard combination pin material Number	Designation
THIELE standard materials for forged links			
700 900	max. 200 °C max. 100 °C	1.7131	16MnCr5 *
1150	max. 250 °C	1.6758	23MnNiMoCr5-4 *
1000	max. 100 °C	1.7131	16MnCr5 case-hardened
THIELE special materials for forged links			
600	max. 100 °C	1.4034	X46Cr13
10 130 650	max. 900 °C max. 600 °C RT	1.4841	X15CrNiSi25-20
1150	max. 100 °C	1.6758	23MnNiMoCr5-4 case-hardened
1000	max. 100 °C	1.6758	23MnNiMoCr5-4

* Forged link with bushing: 16MnCr5 case-hardened, 23MnNiMoCr54 case-hardened
** Deeper hardening depth possible with corresponding reduced breaking strength

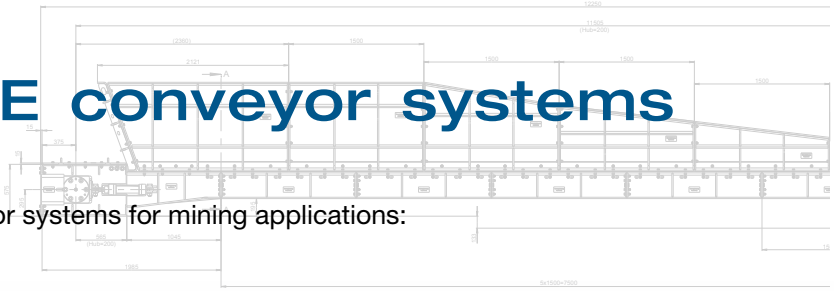


All forged links are produced in our own drop forging plant.

The double strand forged links are produced with solid-forged flight holders.

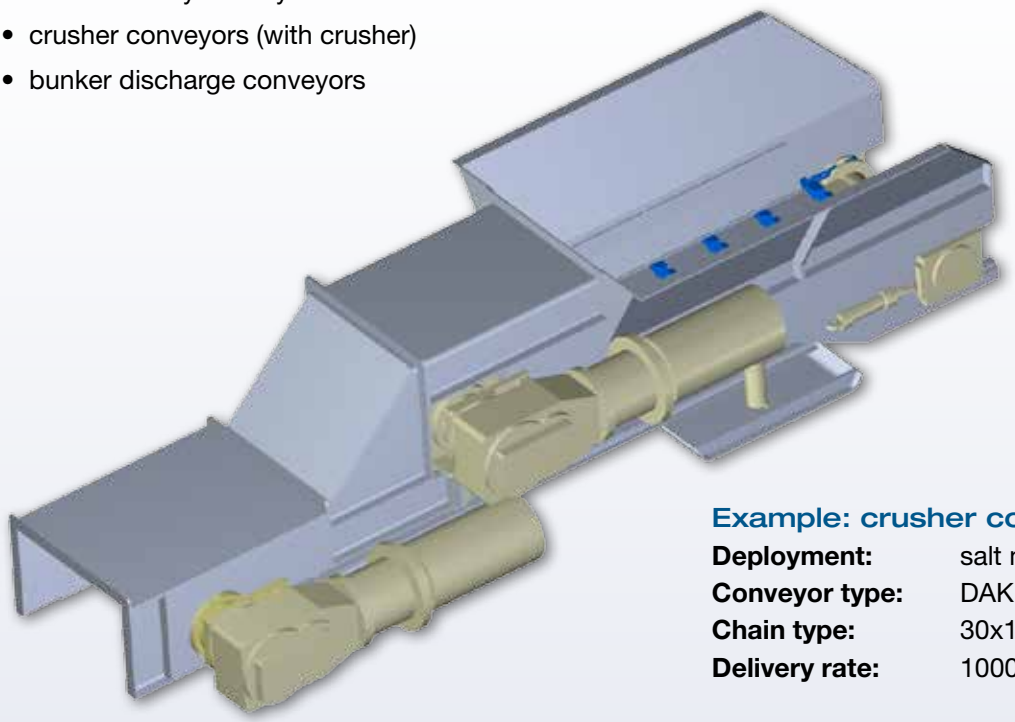
For more detailed information on the range of options available please refer to the THIELE Forged Link Catalogue.

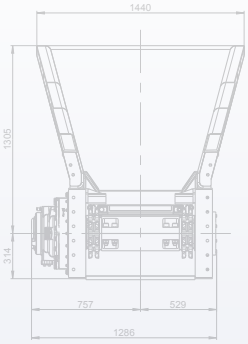
THIELE conveyor systems



THIELE conveyor systems for mining applications:

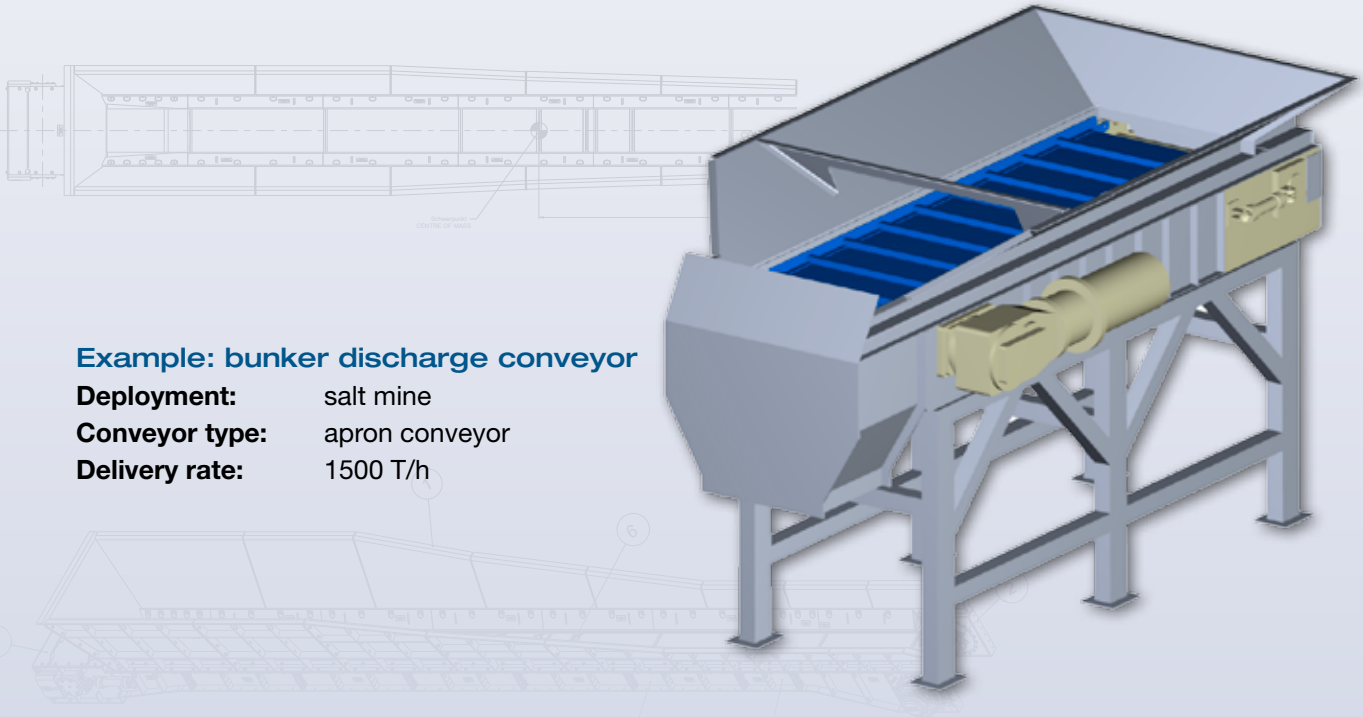
- stage loaders
- mine roadway conveyors
- crusher conveyors (with crusher)
- bunker discharge conveyors





Example: crusher conveyor

Deployment: salt mine
Conveyor type: DAKB chain scraper conveyor
Chain type: 30x108 round link
Delivery rate: 1000 T/h



Example: bunker discharge conveyor

Deployment: salt mine
Conveyor type: apron conveyor
Delivery rate: 1500 T/h

THIELE‘s innovative solutions have been developed to meet individual customer requirements. Decades of experience in designing and manufacturing conveyor chains for all types of layout, paired with state-of-the-art development tools, stand guarantee for our high-performance conveying systems.

THIELE conveyor systems - specialised solutions

THIELE has been carrying out conveyor retrofits for many years.

Examples:

- Conversion of a bucket elevator from round-link chains to central chain system
- Reclaimer upgrade with block plates replaced by plates running on anti-friction rollers
- Trough chain conveyor upgraded from link-plate chains to forged link chains
- Older installations can often be performance enhanced, with the added bonus of reduced maintenance and increased service life
- In such cases the conveyor parameters will be recalculated and the system reconfigured
- Depending on the level of optimisation specified the retrofit may comprise drives with new shafts and bearings and an upgrade to chains and chain guides

Example: apron conveyor retrofit ...

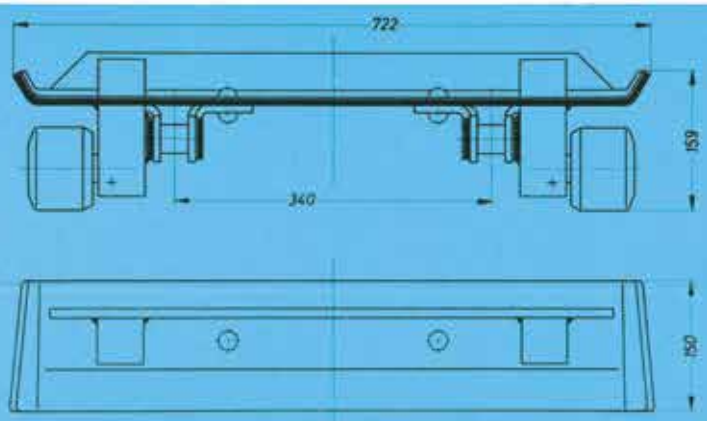
… including replacement of transmission system with the latest high-performance, efficient drive technology.
The conveyor is fitted with a strengthened pan system with rollers mounted on maintenance-free, anti-friction bearings.

Example: upgrade of a conveyor handling alternative fuels ...

… from link-plate chain to THIELE forged link chain including the fitting of new guides and a replacement shaft with new chain sprockets.

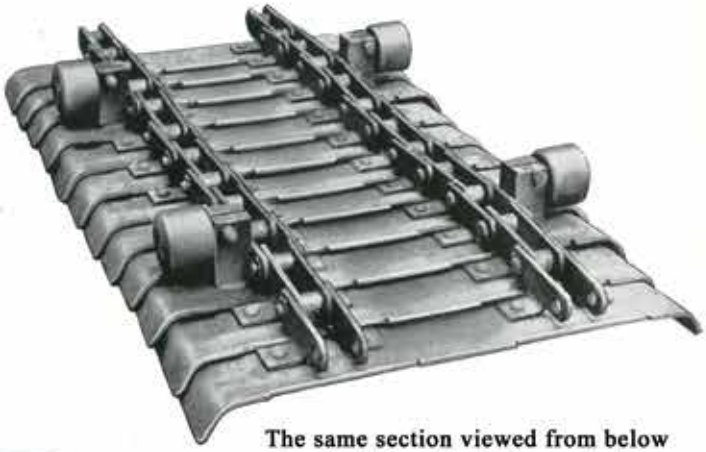
THIELE - steel slat conveyors for bulk materials and general cargo

FRB 650 steel slat conveyor Patent no. 1123693 G.M. no. 1855714

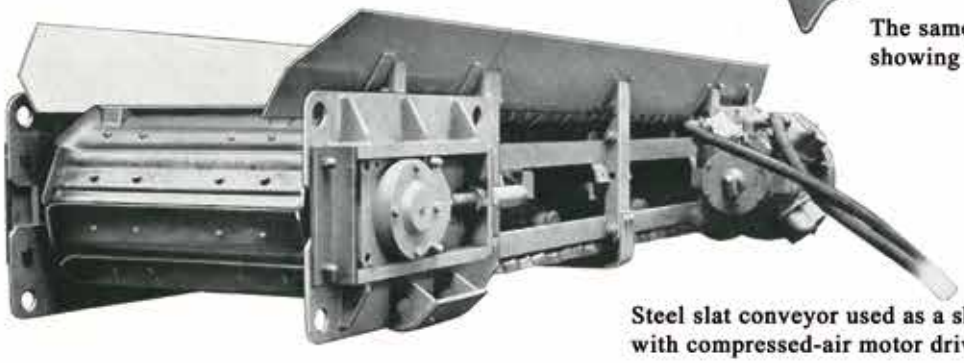


The well-engineered FRB 650 steel slat conveyor is designed to deliver maximum performance and efficiency.
The machine of choice for the reliable, troublefree transport of bulk and general cargoes.
The conveyor components deliver a wear resistance that far exceeds expectations.

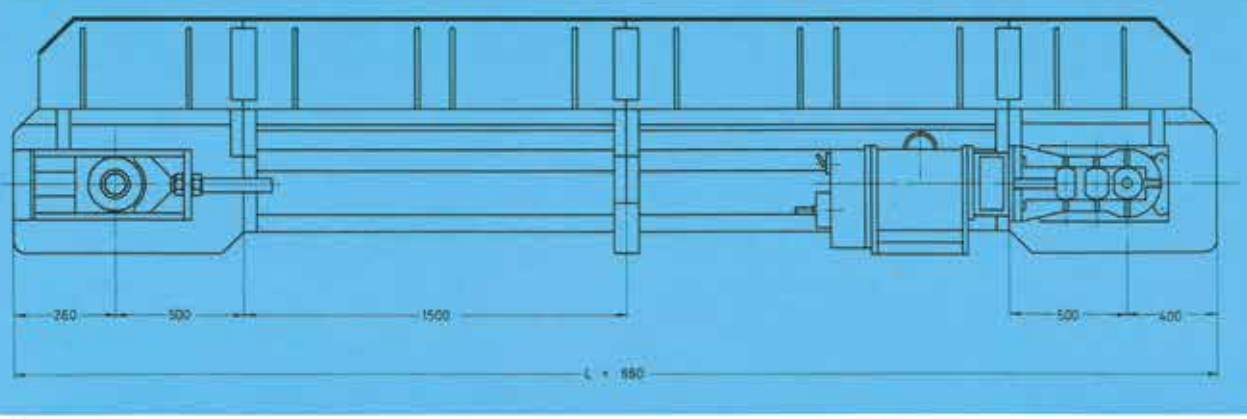
The conveying surface is composed of steel plates (top view)



The same section viewed from below showing link-plate chains and rollers



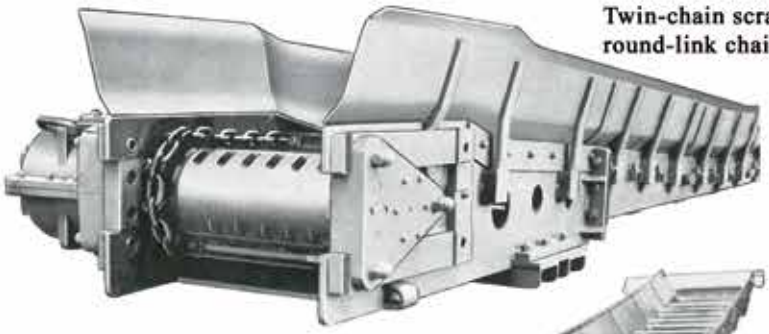
Steel slat conveyor used as a short loading belt with compressed-air motor drive



Reprint – extract from the THIELE Conveyor Catalogue published 1960

THIELE - transport systems for bulk materials and general cargo

Trough and scraper conveyors



Twin-chain scraper conveyor with two high-performance round-link chains, type DKF 600, standard design

Twin-chain scraper conveyor type DKF 600 N, low-height model

THIELE trough and scraper conveyors are fitted with THIELE's well established high-performance round-link chains and come with scraper chains meeting DIN 8177 and DIN 15 263 specifications or fabricated in-house to works standards.

The range comprises closed, open and dustproof versions, all manufactured on the modular principle. The conveyors can be fitted on request with steel troughs and high-grade wear strips and can also be supplied with highly wear-resistant refractory linings.

Trough conveyor return end in closed-frame design with twin scraper chains to DIN 8177 specification

Triple-strand scraper chain assembly with high-performance round-link chains and profiled scraper bars

Reprint – extract from the THIELE Conveyor Catalogue published 1960

THIELE®

CONVEYOR SYSTEMS

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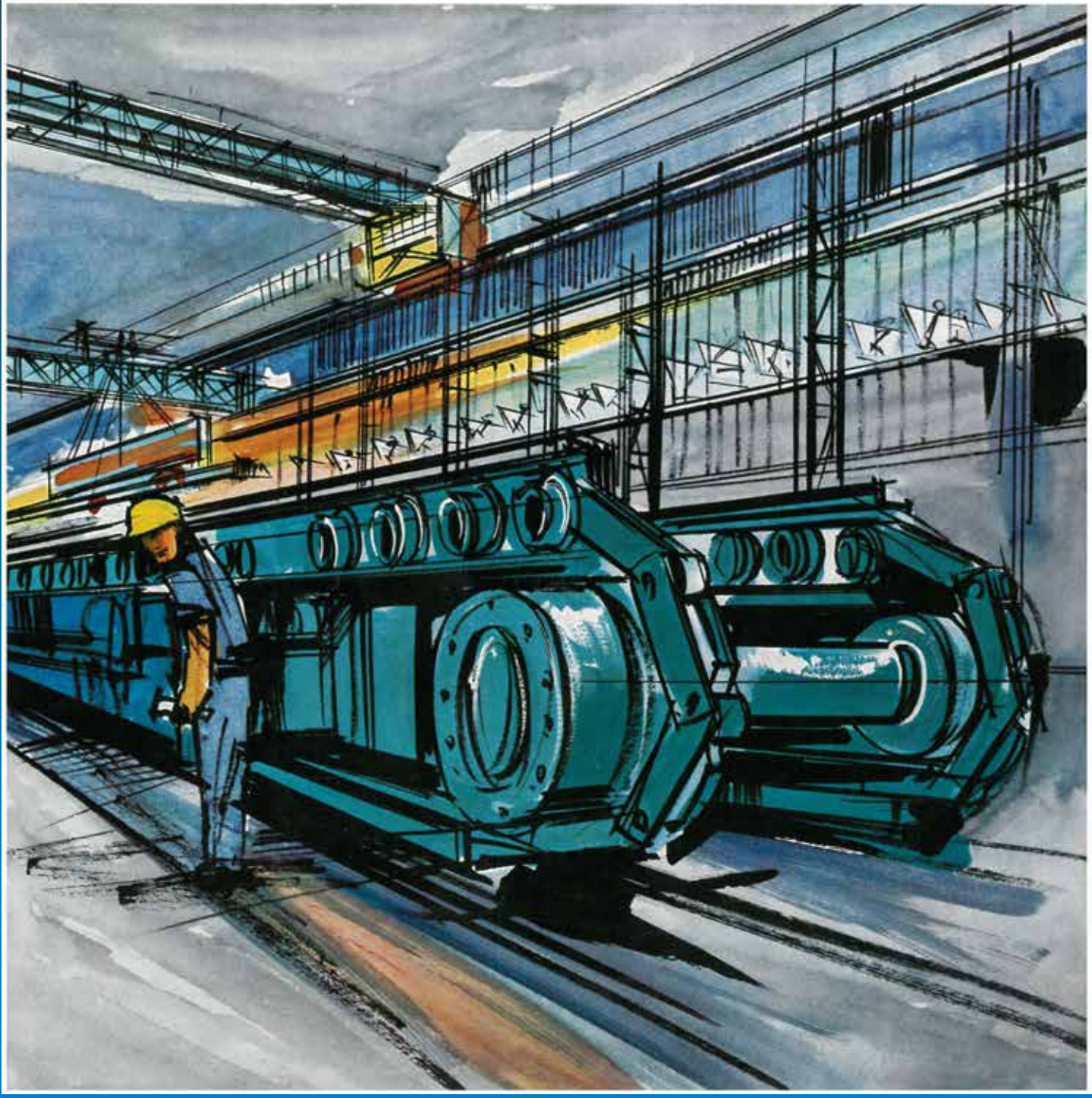

THIELE GmbH & Co. KG
Werkstr. 3
58640 Iserlohn - Kalthof
Germany

Phone +49 23 71 947 - 0
Fax +49 23 71 947 - 295
Internet www.thiele.de
e-mail bulkmaterial@thiele.de

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