



COMPONENT/BEARING SERIES

COMPONENT SERIES

The recommended component series for bulk materials are listed in the Bulk Material Table. The alphabetical series codes refer to the minimum construction requirements for a screw conveyor used to convey a specific bulk material. Series A and B construction can be used for most light, non-abrasive and free-flowing bulk materials. Series C and D construction are recommended for dense, abrasive and sluggish bulk materials. Please consult KWS Engineering for further assistance.

Series A

Light Duty Construction – Series A bulk materials such as barley, cocoa beans, fish meal and sawdust are light, non-abrasive and very free-flowing. Light duty construction is very cost-effective and consists of the thinnest gauge materials available for screws, troughs and covers. Helicoid screws and angle flange troughs are recommended for Series A bulk materials.

Series B

Medium Duty Construction – Series B bulk materials such as alfalfa pellets, dry bagasse, activated carbon and crushed ice are slightly higher in bulk density, have some abrasiveness and are slightly less free-flowing when compared to Series A bulk materials. Medium duty construction is cost-effective and consists of slightly heavier gauge materials for screws, troughs and covers. Helicoid screws and angle flange troughs are recommended for Series B bulk materials.

Series C

Heavy Duty Construction – Series C bulk materials such as alumina fines, spent distiller's grain, foundry sand and sodium sulphate are dense, abrasive and sluggish when compared to Series A and B bulk materials. Heavy duty construction is required to prevent excessive maintenance or downtime and consists of heavy duty screws, troughs and covers. Sectional screws and formed flange troughs are recommended for Series C bulk materials.

Series D

Extra Heavy Duty Construction – Series D bulk materials such as adipic acid, blast furnace slag, cement clinker and lignite coal are very dense, extremely abrasive and very sluggish when compared to Series A, B or C bulk materials. Extra heavy duty construction is required to prevent excessive maintenance or downtime and consists of extra heavy duty screws, troughs and covers. Sectional screws with weld-on hardsurfacing and formed flange troughs are recommended for Series D bulk materials.



COMPONENT/BEARING SERIES

Component Series Tables

Screw Dia.	Shaft Dia.	Cover Thickness	Series A			Series B		
			Screw Number		Trough Thickness (Min.)	Screw Number		Trough Thickness (Min.)
			Helicoid	Sectional		Helicoid	Sectional	
4	1"	14 Ga.	4H206	N/A	14 Ga.	4H206*	N/A	14 Ga.
6	1-1/2"	14 Ga.	6H304*	6S309	14 Ga.	6H308*	6S309	14 Ga.
9	1-1/2" 2"	14 Ga.	9H306* 9H406*	9S309 9S409	14 Ga.	9H312* 9H412*	9S312 9S412	10 Ga.
12	2" 2-7/16" 3"	14 Ga.	12H408* 12H508* 12H614*	12S409 12S509 12S612	12 Ga.	12H412* 12H512* 12H614*	12S412 12S512 12S612	3/16"
14	2-7/16" 3"	14 Ga.	14H508* 14H614*	14S509 14S609	12 Ga.	14H508* 14H614*	14S512 14S612	3/16"
16	3"	14 Ga.	16H610*	16S612	12 Ga.	16H614*	16S616	3/16"
18	3" 3-7/16"	12 Ga.	N/A	18S612 18S712	10 Ga.	N/A	18S616 18S716	3/16"
20	3" 3-7/16"	12 Ga.	N/A	20S612 20S712	3/16"	N/A	20S616 20S716	3/16"
24	3-7/16"	12 Ga.	N/A	24S712	3/16"	N/A	24S716	3/16"
30	3-15/16"	10 Ga.	N/A	30S816	3/8"	N/A	30S824	3/8"
36	4-7/16"	3/16"	N/A	36S916	3/8"	N/A	36S924	3/8"
Screw Dia.	Shaft Dia.	Cover Thickness	Series C			Series D		
			Screw Number		Trough Thickness (Min.)	Screw Number		Trough Thickness (Min.)
			Helicoid	Sectional		Helicoid	Sectional	
4	1"	14 Ga.	4H206*	N/A	14 Ga.	4H206*	N/A	10 Ga.
6	1-1/2"	14 Ga.	6H312*	6S312	14 Ga.	6H312*	6S316*	10 Ga.
9	1-1/2" 2"	14 Ga.	9H312* 9H414*	9S316* 9S416	10 Ga.	9H312* 9H414*	9S324* 9S424*	3/16"
12	2" 2-7/16" 3"	14 Ga.	12H412* 12H512* 12H614*	12S416* 12S516 12S616	3/16"	12H412*-H 12H512*-H 12H614*	12S424* 12S524* 12S624*	1/4"
14	2-7/16" 3"	14 Ga.	14H508*-H 14H614	14S524 14S624*	3/16"	14H508*-H 14H614*-H	14S524 14S624*	1/4"
16	3"	14 Ga.	16H614*	16S616	3/16"	16H614*-H	16S624*	1/4"
18	3" 3-7/16"	12 Ga.	N/A	18S624* 18S724	3/16"	N/A	18S624* 18S724	1/4"
20	3" 3-7/16"	12 Ga.	N/A	20S624* 20S724*	3/16"	N/A	20S624* 20S724*	1/4"
24	3-7/16"	12 Ga.	N/A	24S724*	3/16"	N/A	24S724*	1/4"
30	3-15/16"	10 Ga.	N/A	30S832	3/8"	N/A	30S832	3/8"
36	4-7/16"	3/16"	N/A	36S932	3/8"	N/A	36S932	3/8"

*KWS Stock Component (Only Right Hand Screws) -H Hardsurfacing Recommended

COMPONENT/BEARING SERIES

The recommended bearing series for bulk materials are listed in the Bulk Material Table. The numerical series codes refer to the minimum requirements for screw conveyor hanger bearings used for a specific bulk material. Series 1 and 2 bearing materials are used for most non-abrasive bulk materials. Series 3 and 4 bearing materials are recommended for abrasive and extremely abrasive bulk materials. Please consult KWS Engineering for further assistance.

Series 1

Hanger bearings manufactured from engineered plastics such as Nylatron, Plastech and UHMW as well as oil-impregnated wood and ball bearings are recommended for non-abrasive bulk materials.

Series 2

Hanger bearings manufactured from engineered plastics such as Plastech as well as composite materials such as Gatke and ball bearings are recommended for bulk materials that have some abrasiveness when compared to Series A bulk materials.

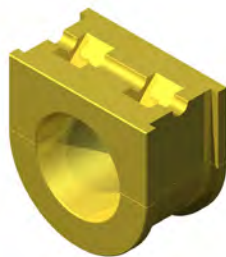
Series 3

Hanger bearings manufactured from bronze and hard iron metals are recommended for bulk materials that are abrasive when compared to Series A and B bulk materials.

Series 4

Hanger bearings manufactured from ceramic, hard iron, stellite, and hardsurfaced metals are recommended for bulk materials that are extremely abrasive when compared to Series A, B or C bulk materials.

Series	Bearing Material
1	Nylatron, Plastech, UHMW, Wood, Ball
2	Plastech, Gatke, Ball
3	Bronze, Hard Iron
4	Hard Iron, Stellite, Hardsurfaced, Ceramic



Style 216 hanger bearing



Style 226 hanger bearing

FACTORS INFLUENCING SCREW CONVEYOR DESIGN

Abrasiveness, Corrosiveness and Flowability

The Bulk Material Table also presents the relative abrasiveness, corrosiveness and flowability of the bulk materials listed. These characteristics, as well as other special aspects of bulk materials, are given further consideration in the Component Selection Section. The nomenclature used in the Bulk Material Table are listed below.

Description	I	II	III	IV
Abrasiveness	Mildly Abrasive	Moderately Abrasive	Extremely Abrasive	—
Corrosiveness	Not Corrosive	Mildly Corrosive	Highly Corrosive	—
Flowability	Very Free Flowing	Free Flowing	Average Flowability	Sluggish
	Angle of Repose			
	To 30°	30° - 45°	30° - 45°	Beyond 45°

NOTE: Some bulk materials, while they are not corrosive under “normal” conditions, may become corrosive when heated or in the presence of moisture.

Special Characteristics Notes

Notable unusual bulk material characteristics are listed by alphabetical codes in the last column of the Bulk Material Table where applicable. An explanation of these numerical codes is shown on the right and in the Bulk Materials Characteristics section.

A	Builds Up and Hardens
B	Generates Static Electricity
C	Decomposes—Deteriorates in Storage
D	Flammability
E	Becomes Plastic or Tends to Soften
F	Very Dusty
G	Aerates and Becomes Fluid
H	Explosiveness
I	Stickiness—Adhesion
J	Contaminable, Affecting Use
K	Degradable, Affecting Use
L	Gives Off Harmful or Toxic Gas or Fumes
M	Hygroscopic
N	Interlocks, Mats, or Agglomerates
O	Oils Present
P	Packs Under Pressure
Q	Very Light and Fluffy—May Be Windswept
R	Elevated Temperature
V	May Be Conveyed In a Vertical Screw Conveyor
•	Consult KWS Engineering Department



FACTORS INFLUENCING SCREW CONVEYOR DESIGN



Quartz

Abrasive Bulk Materials

Abrasive bulk materials may cause excessive wear of screw conveyor components. Screw conveyors must be fabricated from abrasion resistant alloys. Typical materials of construction are AR235, AR400, AR500, TriBrazed or chromium carbide overlay. These materials are harder and tougher than A36 carbon steel for resisting abrasion. The carrying face of the screw may be Hardsurfaced with a weld-on hardsurfacing material. It is also very important to reduce the trough loading and the speed of the screw conveyor when handling abrasive bulk materials.



Copper Sulfate

Highly Corrosive

Highly corrosive bulk materials require the use of corrosion resistant alloys. Screw conveyors must be fabricated from alloys not affected by the corrosive product. Typical materials of construction for highly corrosive products are 304, 310, 316, 410 and 430 stainless steels. Also, high nickel alloys such as Inconel, Monel and Hastalloy may be used.



Drilling Sludge

Mildly Corrosive

Mildly corrosive bulk materials, or bulk materials that have a tendency to become corrosive under certain conditions, may require the use of corrosion resistant alloys. Corrosion is a relative term that is defined by each particular application. Screw conveyors must be fabricated from alloys not affected by the corrosive product. Typical materials of construction for mildly corrosive products are 304 and 316 stainless steels.



Ammonium Sulfate

Builds Up and Hardens (A)

Certain bulk materials build up and harden in the screw conveyor trough. These bulk materials also tend to pack under pressure and absorb moisture. Screw conveyors with close clearance between the screw and trough are required to prevent build up in the trough. Also, high-torque drive units are required to shear through the hardened bulk material and carbide tip teeth can be used as well.

FACTORS INFLUENCING SCREW CONVEYOR DESIGN

Generates Static Electricity (B)

Static electricity can be generated as the rotation of the screw tumbles the bulk material during conveying. Plastic pellets will generate static electricity when conveyed by a screw conveyor. Grounding the screw conveyor trough in several locations will help eliminate static electricity. Low trough loading and reducing operating speeds will also help.



Bentonite

Decomposes – Deteriorates in Storage (C)

Some bulk materials will decompose and deteriorate if stored for long periods of time. Bulk materials stored in hoppers, bins or silos must be discharged and processed before being allowed to decompose or deteriorate. As part of the complete process, screw feeder and conveyor design must take into account the characteristics of specific bulk materials that tend to decompose or deteriorate.



Ground Meat

Flammability (D)

Flammable bulk materials will burn when oxygen and an ignition source are present. Screw conveyors can be designed with non-sparking materials to eliminate a possible ignition source. Pressure tight troughs or housings with mechanical shaft seals will keep oxygen from entering the screw conveyor. The inside of the screw conveyor trough or housing can also be purged with an inert gas such as nitrogen.



Hay

Becomes Plastic or Tends to Soften (E)

Certain bulk materials are sensitive to changes in temperature or pressure. The rotation of the screw may cause friction and heat and cause the bulk material to soften. Many food products must be gently conveyed. Lower trough loading and slower screw speeds are recommended for bulk materials that tend to become plastic or soften.



Silica Gel



FACTORS INFLUENCING SCREW CONVEYOR DESIGN



Hydrated Lime

Very Dusty (F)

Some bulk materials can become very dusty and leak out from screw conveyors. These dusty bulk materials can become a hazard or even be explosive. Screw conveyors must be completely sealed with special shaft seals to contain the dusty bulk material. Design of screw conveyor troughs or housings depends on the severity of the hazard.



Aluminum Oxide

Aerates and Becomes Fluid (G)

Fluidizing bulk materials will aerate and tend to flow like liquids when conveyed. The “as conveyed” bulk density is much lower than the static or packed bulk density. In some cases the fluidized bulk material will flood and “run like water” with the loss of control of capacity or feed rate. Trough loading will increase causing the flooding of downstream equipment. Lower trough loading and slower screw speeds are recommended to reduce the chance of aeration of the bulk material.



Powdered Milk

Explosiveness (H)

Explosive bulk materials will ignite when oxygen and an ignition source are present. Screw conveyors can be designed with non-sparking materials to eliminate a possible ignition source. Pressure tight troughs or housings with mechanical shaft seals will keep oxygen from entering the screw conveyor. The inside of the screw conveyor trough or housing can be purged with an inert gas such as nitrogen. Explosion venting is also an option for relieving pressure due to an explosion.



Rice Grits

Stickiness - Adhesion (I)

Viscous or sticky bulk materials contain a high percentage of moisture or oil and are difficult to convey. Sticky bulk materials tend to stick to the center pipe of a screw conveyor where the flight is welded to the center pipe. Ribbon flighting is an excellent choice for handling sticky bulk materials. Shaftless screw conveyors provide even better performance than shafted conveyors with ribbon flighting.

FACTORS INFLUENCING SCREW CONVEYOR DESIGN

Contaminable, Affecting Use (J)

Contaminable bulk materials lose their value if contaminated by foreign materials. Screw conveyors must be completely sealed with special shaft seals and utilize hanger bearings that will not contaminate the bulk material.



Bread Crumbs

Degradable, Affecting Use (K)

Degradable bulk materials are easily broken down to smaller particles when conveyed and could lose their value. Screw conveyors must be designed for very slow speeds and lower trough loading. Larger screw conveyor sizes are recommended.



Almonds

Gives Off Harmful or Toxic Gas or Fumes (L)

Toxic bulk materials give off vapors or dusts that may be hazardous to personnel. Screw conveyors must be completely sealed with special shaft seals to contain the toxic bulk material. Design of screw conveyor troughs or housings depends on the severity of the hazard. Screw conveyors can be designed to contain internal pressure and even an explosion.



Galena

Hygroscopic (M)

Hygroscopic bulk materials readily absorb moisture and can become contaminated. Screw conveyors with vapor-tight covers are required. It also may be necessary to insulate or provide a jacket for the trough to maintain a consistent product temperature. Purging the troughs with dry gas or air may also be necessary.



Alum

Interlocks, Mats or Agglomerates (N)

Interlocking bulk materials have a tendency to mat together and become resistant to being conveyed. Heavier construction with high torque drives for screw conveyors are required. Intermediate hanger bearings can create an obstruction to flow so may need to be eliminated. Shaftless screw conveyors are a good option for interlocking bulk materials.



Wood Bark

FACTORS INFLUENCING SCREW CONVEYOR DESIGN



Fuller's Earth

Oils Present (O)

Oils contained in the bulk material may cause the bulk material to become sticky and adhere to the flights of the screw as well as the trough. Sticky bulk materials tend to stick to the center pipe of a screw conveyor where the flight is welded to the center pipe. Ribbon flighting is an excellent choice for handling sticky bulk materials. Shaftless screw conveyors provide even better performance than shafted conveyors with ribbon flighting.



Compost

Packs Under Pressure (P)

Compressible materials tend to pack under pressure. Bulk materials will lump or pack together as moisture content increases and pressure is applied. Special screw conveyors with "lump breakers" or "breaker bars" can help break up the lumps and reduce packing. Additional horsepower and torque is required to break up the lumps and convey the bulk material.



Grass

Very Light and Fluffy (Q)

Bulk materials weighing less than 15 lbs. per cubic foot have a tendency to be dusty and aerate when conveyed. A larger diameter screw conveyor with lower trough loading and slower screw speed is recommended to reduce the chance of aeration of the bulk material.



Activated Carbon

Elevated Temperature (R)

Hot bulk materials are encountered in many phases of bulk material processing. Screw conveyors should be designed and manufactured with heavy-duty construction and may require 304, 316 or even high-temperature stainless steel alloys. Hot materials can be cooled with KWS Thermal Processors that utilize jacketed troughs and hollow-flight designs.

May Be Conveyed in a Vertical Screw Conveyor (V)

Many bulk materials can easily be conveyed in a vertical screw conveyor. Bulk materials that are of medium density, free-flowing and non-abrasive are ideal for conveying vertically. Bulk materials that tend to aerate and become fluid, interlock, pack under pressure, are very light and fluffy or are degradable are not recommended for use in a vertical screw conveyor. Please consult KWS Engineering for vertical screw conveyor applications.