

STAR – Ball Transfer Units

STAR – Linear Motion Technology

Ball Rail Systems

Standard Ball Rail Systems
Ball Rail Systems with Aluminum Runner Blocks
Super Ball Rail Systems
Wide Ball Rail Systems
Miniature Ball Rail Systems
Cam Roller Guides
Accessories

Roller Rail Systems

Linear Bushings and Shafts

Linear Bushings
Linear Sets
Shafts
Shaft Support Rails
Shaft Support Blocks

Ball Transfer Units

Screw Drives

Linear Motion Systems


Linear Motion Slides
Linear Modules
Compact Modules
Ball Rail Tables
ALU-STAR Profile System
Controllers, Motors, Electrical Accessories
Linear Actuators

Rexroth Star GmbH
D-97419 Schweinfurt



REG. No.
1617 - 03



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Ball Transfer Units

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STAR – Ball Transfer Units

Product Overview

Star Ball Transfer Units make light work of shifting, rotating and directing unit loads. They have proven extremely valuable as integral parts of conveyor systems, feed devices, and machining and packaging equipment.

Applications

General-Purpose Machines

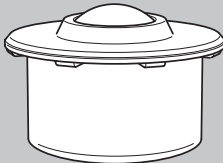
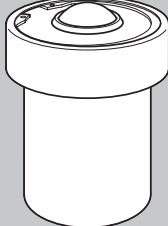

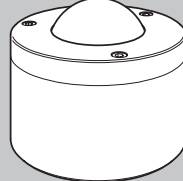
- Feed tables for sheet-metal working machines
- Fixtures for press brakes
- Feed devices for machining centers
- Drilling machine tables and motor-driven supporting tables
- Assembly aids in the manufacture of large engines and motors

Materials-Handling Systems

- Transfer ball tables, turntables and switches for sorting and distribution systems
- Crossover sections of continuous conveyors
- Baggage sorting systems at airports
- Transport of steel tubes and pipes
- Lifting platforms

Other Fields

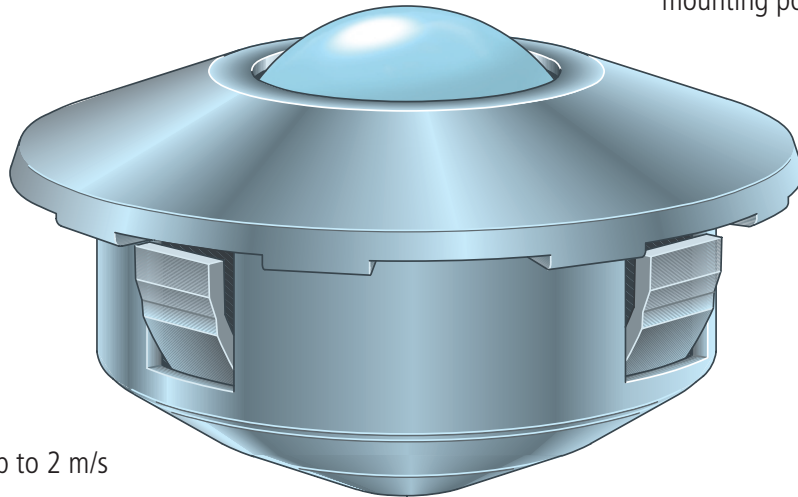
- Construction of special-purpose machines
- Aerospace industry
- Nuclear reactors
- Beverage and stone-processing industries

Ball Transfer Units			
			
<p>with sheet steel housing 0530-...</p> <ul style="list-style-type: none"> • for general applications <p>plastic load ball 0531-...</p> <ul style="list-style-type: none"> • suitable particularly for transporting sensitive materials such as glass, polished aluminum, brass and steel sheets 	<p>spring-loaded 0532-...</p> <ul style="list-style-type: none"> • are supported on springs and mounted under preload in a housing • Ball Transfer Unit recedes into its housing when overloaded 	<p>with solid steel housing - without rim 0533-...</p> <ul style="list-style-type: none"> • solid steel housing • very small Ball Transfer Unit • without felt seal • very smooth movement 	<p>with solid steel housing - without rim 0533-...</p> <ul style="list-style-type: none"> • solid steel housing and cover • for very high loads

▶ Easy mounting and extraction

▶ Types for all standard applications and for many special solutions

▶ Precise rolling and full load-bearing capability in any mounting position


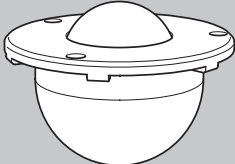

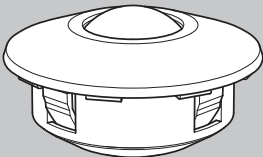


▶ Smooth running

▶ Conveying speed up to 2 m/s in all types

▶ High rationalization effect

▶ Consistently high quality

Ball Transfer Units			
			
<p>with solid steel housing 0533-...</p> <ul style="list-style-type: none"> • solid steel housing • for heavy loads 	<p>without housing 0534-...</p> <ul style="list-style-type: none"> • low space requirement • simple mounting • mounting via holes in the rim 	<p>with sheet steel housing 0535-...</p> <ul style="list-style-type: none"> • reinforced housing and cover • for heavy impact loads 	<p>with spring clip 0536-...</p> <ul style="list-style-type: none"> • easily mountable and extractable from the load side. Fixing is by means of spring clips, which permit generous tolerances in the mounting hole • reinforced cover to withstand heavy impact loads

STAR – Ball Transfer Units

Technical Data

Structural design of the Ball Transfer Units

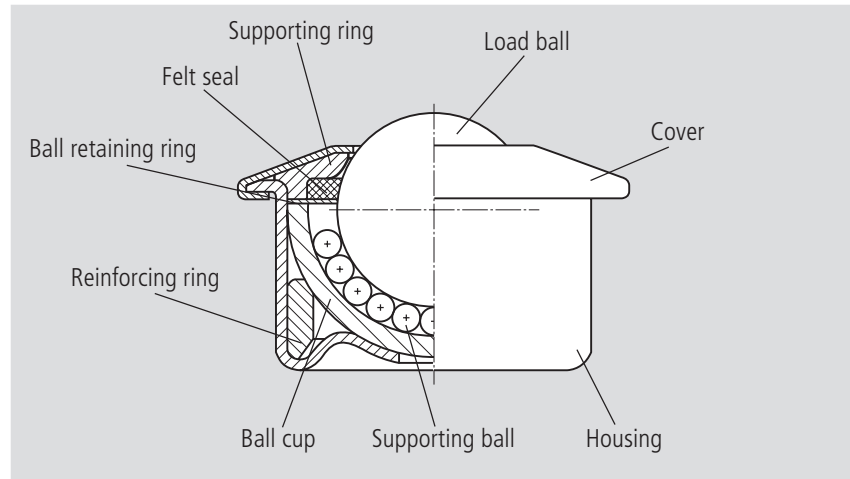
Star Ball Transfer Units have a steel housing incorporating a hardened ball cup.

The latter serves as a raceway for a multitude of small supporting balls.

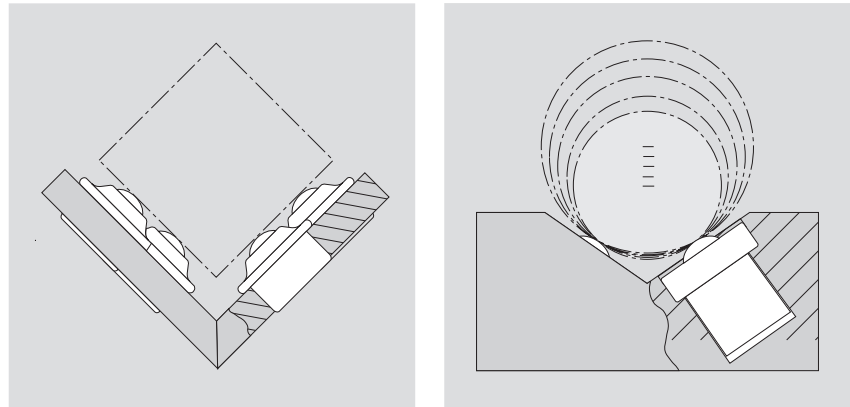
The supporting balls roll against the ball cup when the load ball turns.

Star Ball Transfer Units are designed so that precise rolling and full load-bearing capability are ensured in any mounting position.

Star Ball Transfer Units require little maintenance, and almost every type is protected against dirt by an oil-soaked felt seal.



Mounting possibilities



Application example

STAR Ball Transfer Units used for assembling STAR Ball Rail Systems



Ball Transfer Units in corrosion-preventive design

Corrosion, caused by moisture or chemical attack, can lead to impaired functioning or even failure of the Ball Transfer Units.

Coated (galvanized + chromated) surfaces and/or higher-grade materials offer enhanced anticorrosion protection.

Galvanized covers and housings

offer simple protection against corrosion. The supporting balls and load balls are made from standard antifriction bearing steel and are protected by lubricating oil.

All parts galvanized

but with corrosion-resistant steel balls. This affords significantly greater protection against corrosion.

All parts made from corrosion-resistant steels

(Antifriction bearing steel to DIN 17230 / EN 10 088)

This type is selected if conveyed articles abrade the galvanized/chromated surface and there is exposure to moisture or chemicals. This type is unsuitable for underwater use. Reason: The hardened (carbon-bearing) corrosion-resistant steel of the ball cups and balls.

STAR – Ball Transfer Units

Technical Data

Arrangement of the Ball Transfer Units

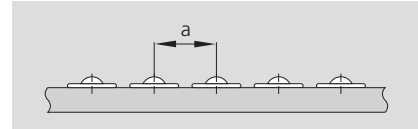
How the Ball Transfer Units should be arranged depends on the undersurface of the conveyed article. For articles with a uniform, smooth undersurface, such as boxes and cases, the distance between the Ball Transfer Units is calculated simply by dividing the smallest edge length by 2.5.

Example:

Undersurface of the conveyed article
= 500 x 1,000 mm

Distance between Ball Transfer Units

$$a = \frac{500 \text{ mm}}{2.5} = 200 \text{ mm}$$



Determining the load for Ball Transfer Units

To determine the load for a Ball Transfer Unit, the mass of the conveyed article is divided by 3.

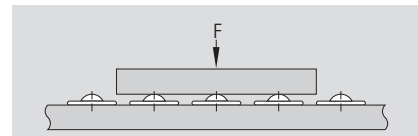
If the load ball height tolerances are well-correlated, it is possible, depending on the nature of the conveyed article, to also perform the calculation based on the number of load-bearing Ball Transfer Units.

Example:

Mass = 3,000 N

Ball Transfer Unit load

$$F = \frac{3,000 \text{ N}}{3} = 1,000 \text{ N}$$



Spring-loaded Ball Transfer Units

The figures in the column headed "Preload" are most important when choosing the size for these types.

The mass of the conveyed article is divided in this case by the number of load-bearing Ball Transfer Units.

Conveying speed

$$V_{\max} = 2 \text{ m/s}$$

Load capacity

The stated load capacities apply to all mounting positions and relate to 10^6 rotations of the load ball.

In case of prolonged periods of use at speeds above 1 m/s, an increase in temperature and reduced nominal life must be expected, especially for sizes 60 to 90, as a function of the load.

Calculation of the nominal life

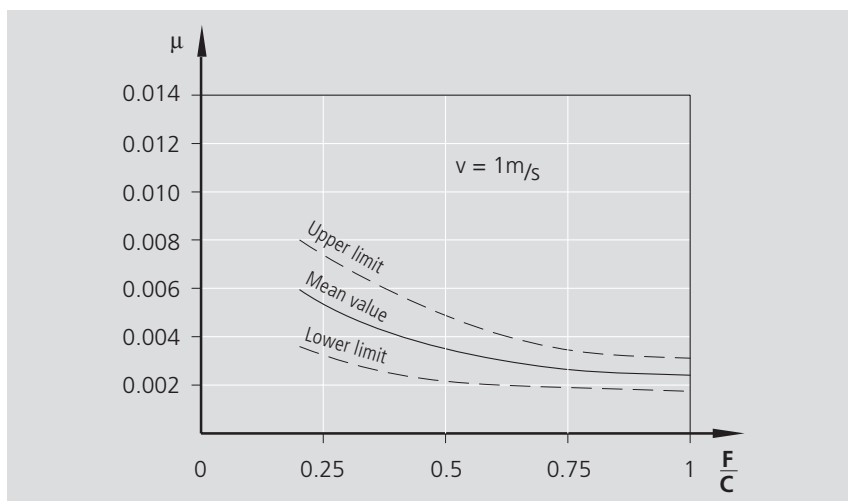
$$L = \left(\frac{C}{F}\right)^3 \cdot 10^6$$

L = Nominal life	(rotations)
C = Load capacity	(N)
F = Load	(N)

Friction coefficients

The diagram shows the friction coefficients of STAR Ball Transfer Units as a function of load and speed.

These guideline values apply to any mounting position for rolling contact on a hardened steel plate.



Operating temperature

Ball Transfer Unit with steel load ball:

up to 100 °C.

At temperatures above 100 °C, only non-galvanized load balls without a felt seal should be used. Make allowance for reduction in load capacity.

Use high-temperature lubricant! Observe the manufacturer's instructions! The existing lube oil may have to be washed out.

Ball Transfer Unit with plastic load ball:

up to 30 °C.

At temperatures above 30 °C, make allowance for reduction in load capacity.

Temperature factor

for steel load ball:

Temperature °C	Temperature factor f_T
125	0.9
150	0.8
175	0.7
200	0.5

for plastic load ball:

Temperature °C	Temperature factor f_T
40	0.9
50	0.8
60	0.7
80	0.5

The load capacity must be multiplied by the temperature factor.

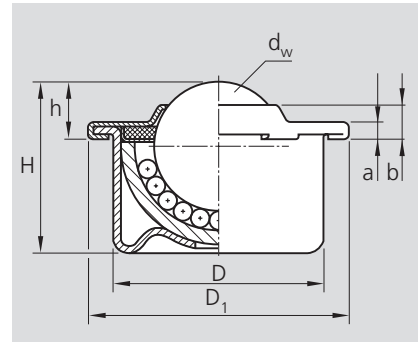
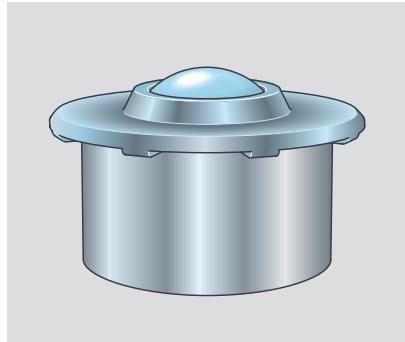
Lubrication

The lubrication must be adapted to the conveyed article and to the ambient conditions. The lubricant (oil) can be introduced via the load ball.

STAR – Ball Transfer Units Tables

Ball Transfer Units with sheet steel housing

0530 – ...



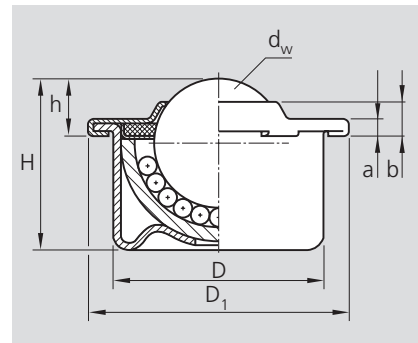
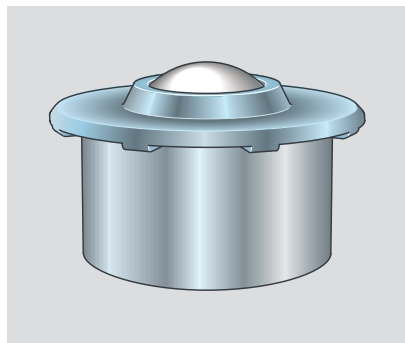
Part numbers	Finish	Dimensions (mm)							Load capacity C (N)	Mass (kg)
		d _w	D	D ₁	h	H	a	b		
0530-115-10 ¹⁾	Cover and housing galvanized	15	24 ± 0.065	31	9.5 ± 0.2	21.5	2.5	6.1	500	0.038
0530-122-10		22	36 ± 0.080	45	9.8 ± 0.2	29.5	2.9	5.7	1300	0.132
0530-130-10		30	45 ± 0.080	55	13.8 ± 0.3	37.5	3.7	7.9	2500	0.265
0530-145-10		45	62 ± 0.095	75	19.0 ± 0.4	53.7	4.2	10.3	6000	0.720
0530-215-10 ¹⁾	All parts galvanized, balls made from corrosion-resistant steel	15	24 ± 0.065	31	9.5 ± 0.2	21.5	2.5	6.1	370	0.038
0530-222-10		22	36 ± 0.080	45	9.8 ± 0.2	29.5	2.9	5.7	970	0.132
0530-230-10		30	45 ± 0.080	55	13.8 ± 0.3	37.5	3.7	7.9	1900	0.265
0530-245-10		45	62 ± 0.095	75	19.0 ± 0.4	53.7	4.2	10.3	4500	0.720
0530-615-00 ^{1) 2)}	All parts made from corrosion-resistant steel	15	24 ± 0.065	31	9.5 ± 0.2	21.5	2.5	6.1	370	0.038
0530-622-00 ²⁾		22	36 ± 0.080	45	9.8 ± 0.2	29.5	2.9	5.7	970	0.132
0530-630-00 ²⁾		30	45 ± 0.080	55	13.8 ± 0.3	37.5	3.7	7.9	1900	0.265

¹⁾ Without felt seal

²⁾ Also available with plastic load ball

Ball Transfer Units with plastic load ball

0531 – ...



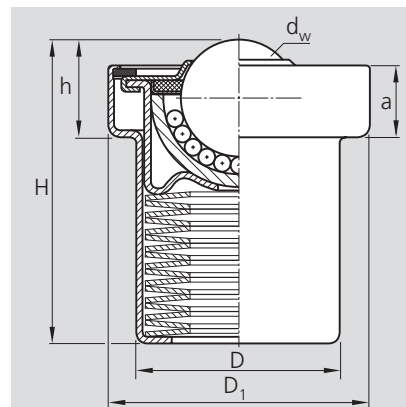
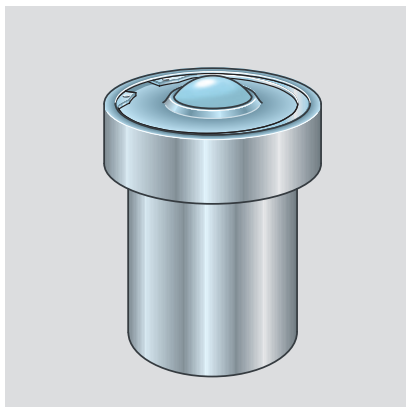
Part numbers	Finish	Dimensions (mm)							Load capacity ³⁾ C (N)	Mass (kg)
		d _w	D	D ₁	h	H	a	b		
0531-115-10 ¹⁾	Cover and housing galvanized	15	24 ± 0.065	31	9.5 ± 0.2	21.5	2.5	6.1	70	0.024
0531-122-10 ²⁾		22	36 ± 0.080	45	9.6 ± 0.2	29.3	2.9	5.7	100	0.093
0531-130-10 ²⁾		30	45 ± 0.080	55	13.6 ± 0.3	37.3	3.7	7.9	150	0.168
0531-215-10 ¹⁾	All parts galvanized, load balls made from corrosion-resistant steel	15	24 ± 0.065	31	9.5 ± 0.2	21.5	2.5	6.1	70	0.024
0531-222-10 ²⁾		22	36 ± 0.080	45	9.6 ± 0.2	29.3	2.9	5.7	100	0.093
0531-230-10 ²⁾		30	45 ± 0.080	55	13.6 ± 0.3	37.3	3.7	7.9	150	0.168

¹⁾ Without felt seal

²⁾ Felt seal not oil-soaked

³⁾ At 20 °C

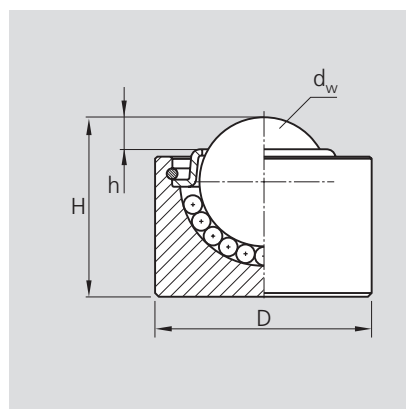
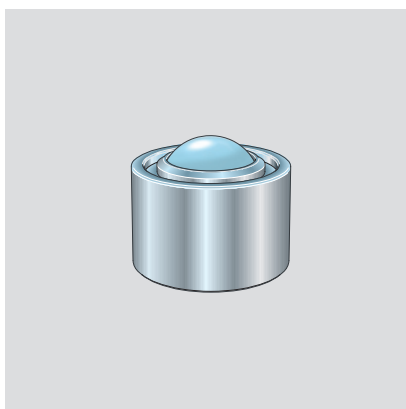
Ball Transfer Units, spring-loaded
0532 – ...



Part numbers	Finish	Dimensions (mm)						Pre-load (N)	Ultimate load ¹⁾ (N)	Tol. for preload and ult. load (%)	Mass (kg)
		d _w	D	D ₁	h	H	a				
0532-122-10	Cover and housing galvanized	22	38.8	50 ± 0.100	18.6	58.1	13.6	730	860	+25/-7.5	0.30
0532-130-10		30	48.2	62 ± 0.125	24.4	70.0	17	1350	1600	+15/-7.5	0.60
0532-145-10		45	66.4	85 ± 0.150	35.6	100.5	24.2	2280	2770	+15/-7.5	1.60
0532-222-10	All parts galvanized. balls made from corrosion-resistant steel	22	38.8	50 ± 0.100	18.6	58.1	13.6	730	860	+25/-7.5	0.30
0532-230-10		30	48.2	62 ± 0.125	24.4	70.0	17	1350	1600	+15/-7.5	0.60
0532-245-10		45	66.4	85 ± 0.150	35.6	100.5	24.2	2280	2770	+15/-7.5	1.60

¹⁾ Under ultimate load the Ball Transfer Unit recedes completely.

Ball Transfer Units with solid steel housing – without rim –
0533 – ...

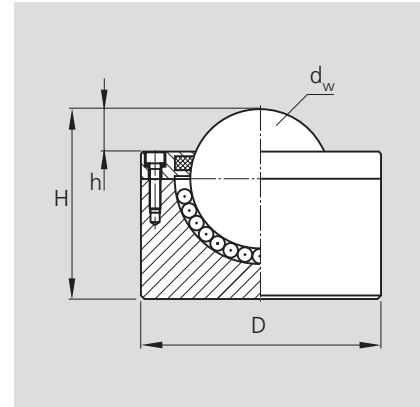
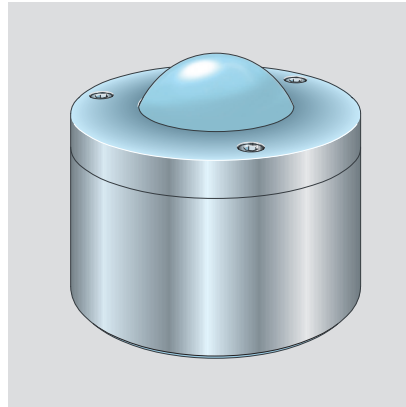


Part numbers	Finish	Dimensions (mm)				Load capacity C (N)	Mass (kg)
		d _w	D	h	H		
0533-712-00 ¹⁾	Bright metal	12	20 ± 0.065	3	16.5 ± 0.2	250	0.027

¹⁾ Without felt seal

STAR – Ball Transfer Units Tables

Ball Transfer Units with solid steel housing – without rim – 0533 – ...

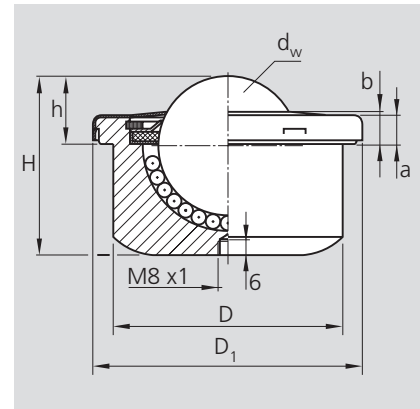
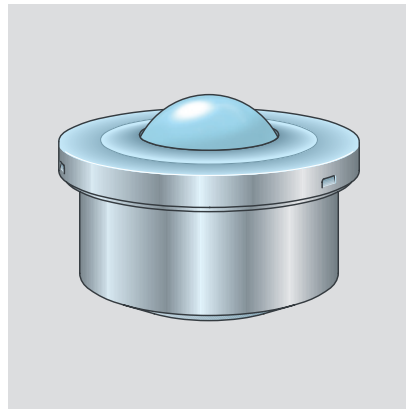


Part numbers	Finish	Dimensions (mm)				Load capacity C (N)	Mass (kg)
		d _w	D	h	H		
0533-076-00 ¹⁾	Bright metal	76	130 ± 0.080	23	103 ± 0.2	20000	8.6
0533-090-00 ²⁾		90	145 ± 0.080	25	115 ± 0.2	25000	11.0

¹⁾ Upon request, available with lube hole

²⁾ Lube hole R1/8" (at center of base) closed by screw plug

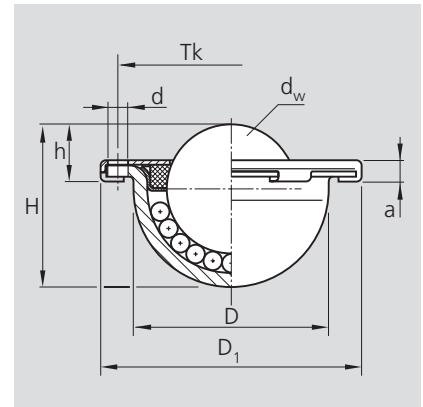
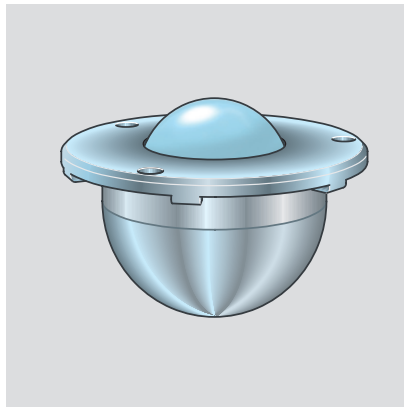
Ball Transfer Units with solid steel housing 0533 – ...



Part numbers	Finish	Dimensions (mm)							Load capacity C (N)	Mass (kg)
		d _w	D	D ₁	h	H	a	b		
0533-060-00	Bright metal	60	100 ± 0.110	117	29.5 ± 0.2	77.5	13	14.5	13000	3.5
0533-160-10	Cover and housing galvanized	60	100 ± 0.110	117	29.5 ± 0.2	77.5	13	14.5	13000	3.5
0533-260-10	All parts galvanized, balls made from corrosion-resistant steel	60	100 ± 0.110	117	29.5 ± 0.2	77.5	13	14.5	9700	3.5

¹⁾ Upon request, available with lube hole

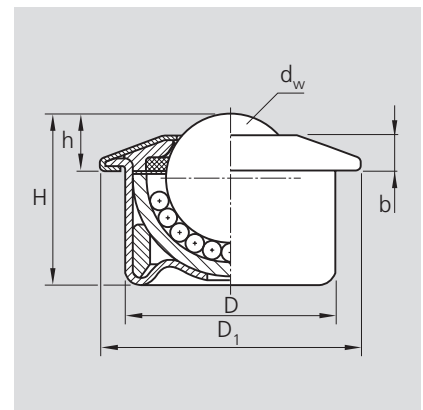
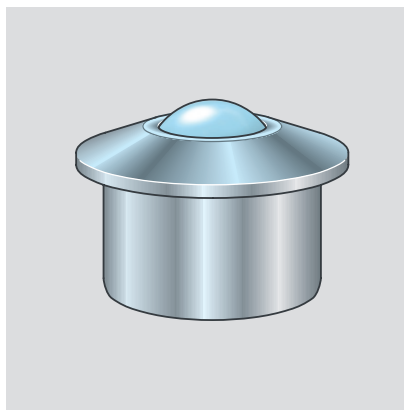
Ball Transfer Units without housing
0534 – ...



Part numbers	Finish	Dimensions (mm)						Mounting holes			Load capacity C (N)	Mass (kg)
		d _w	D	D ₁	h	H	a	d	Tk	Number		
0534-122-10	Cover and ball cup galvanized	22	33 -0.2	45	9.8 ± 0.2	27.7	3.6	3.5	39	3	1200	0.1
0534-222-10	All parts galvanized, balls made from corrosion-resistant steel	22	33 -0.2	45	9.8 ± 0.2	27.7	3.6	3.5	39	3	900	0.1

Ball Transfer Units with reinforced sheet steel housing
0535 – ...

- For applications entailing extreme impact loads on the housing
- The special shape of the cover requires the use of a mounting tool, particularly for tight fits – see Mounting Tools



Part numbers	Finish	Dimensions (mm)						Load capacity C (N)	Mass (kg)
		d _w	D	D ₁	h	H	b		
0535-115-10	Cover and housing galvanized	15	24 ± 0.065	31	9.5 ± 0.2	21.5	5.5	500	0.045
0535-122-10		22	36 ± 0.080	45	9.8 ± 0.2	29.5	6.0	1300	0.150
0535-130-10		30	45 ± 0.080	55	13.8 ± 0.3	37.5	8.0	2500	0.300
0535-145-10		45	62 ± 0.095	75	19.0 ± 0.4	53.7	10.0	6000	0.820
0535-215-10	All parts galvanized, balls made from hardened corrosion-resistant steel	15	24 ± 0.065	31	9.5 ± 0.2	21.5	5.5	370	0.045
0535-222-10		22	36 ± 0.080	45	9.8 ± 0.2	29.5	6.0	970	0.150
0535-230-10		30	45 ± 0.080	55	13.8 ± 0.3	37.5	8.0	1900	0.300
0535-245-10		45	62 ± 0.095	75	19.0 ± 0.4	53.7	10.0	4500	0.820
0535-331-10 ¹⁾ ²⁾		30	45 ± 0.080	55	13.8 ± 0.3	37.5	8.0	1900	0.300

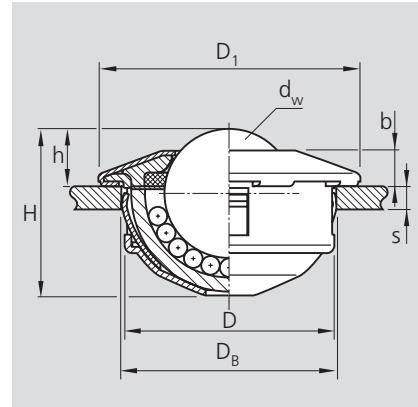
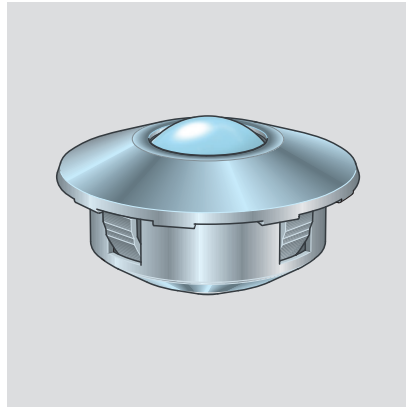
¹⁾ With holes in base

²⁾ Ball cup, balls and ball retaining ring made from corrosion-resistant steel. Other parts galvanized.

STAR – Ball Transfer Units Tables

Ball Transfer Units with spring clip 0536 – ...

- Types with plastic load ball upon request. Load capacities same as for 0531 – ...
- Special cover shape requires use of mounting tool – see Mounting Tools



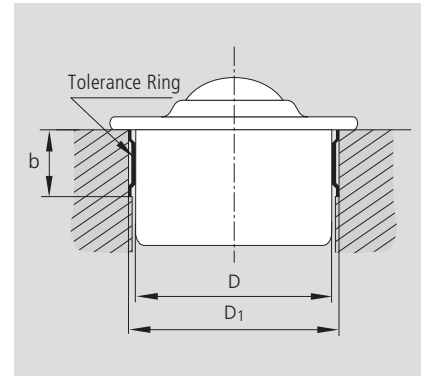
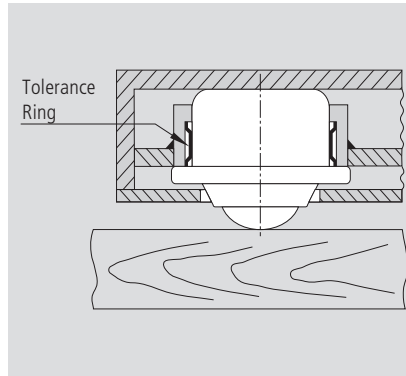
Part numbers	Finish	Dimensions (mm)							Mounting cutout dia. DB	S ¹⁾ min	Load capacity C (N)	Mass (kg)
		dw	D	D ₁	h	H	b	D				
0536-115-10	Cover and housing galvanized	15	24 -0.13	31	9.5 ± 0.2	20.5	5.5	24 + 0.5	1.5	500	0.044	
0536-122-10		22	36 -0.16	45	9.8 ± 0.2	28.6	6.0	36 + 0.8	2.0	1300	0.146	
0536-130-10		30	45 -0.16	55	13.8 ± 0.3	37.5	8.0	45 + 1.0	2.5	2500	0.290	
0536-215-10	All parts galvanized, balls made from corrosion-resistant steel	15	24 -0.13	31	9.5 ± 0.2	20.5	5.5	24 + 0.5	1.5	370	0.044	
0536-222-10		22	36 -0.16	45	9.8 ± 0.2	28.6	6.0	36 + 0.8	2.0	970	0.146	
0536-230-10		30	45 -0.16	55	13.8 ± 0.3	37.5	8.0	45 + 1.0	2.5	1900	0.290	

¹⁾ Minimum nominal thickness of mounting base

Tolerance Ring / Mounting Tools

Tolerance Ring

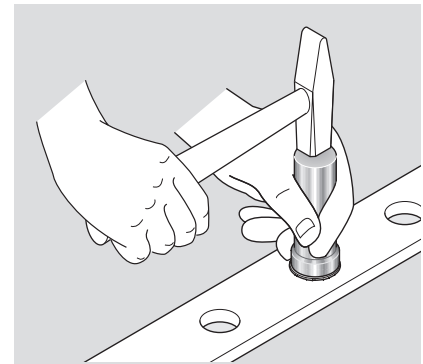
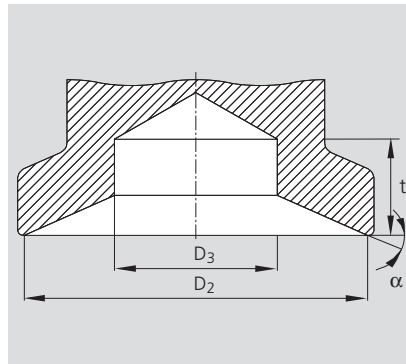
0810 – ...



Ball Transfer Units				Dimensions (mm) D	Tolerance Ring	Mounting dimensions (mm)	
Part numbers						Part numbers	D ₁
0530-.15-..	0531-.15-..	—	0535-.15-..	24	0810-024-03	25.67 + 0.08	7.1+0.2
0530-.22-..	0531-.22-..	—	0535-.22-..	36	0810-036-05	37.67 + 0.08	12.1+0.2
0530-.30-..	0531-.30-..	—	0535-.30-..	45	0810-045-01	46.67 + 0.08	12.1+0.2
0530-.45-..	—	—	0535-.45-..	62	0810-062-03	64.03 + 0.12	15.1+0.2
—	—	0533-.60-..	—	100	0810-100-02	102.42 + 0.14	19.1+0.3

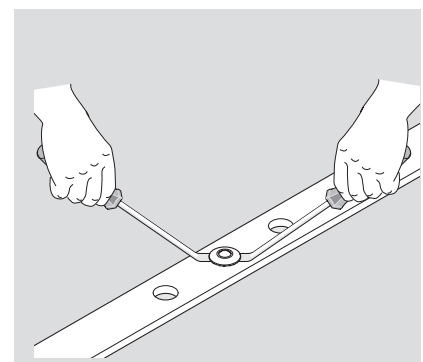
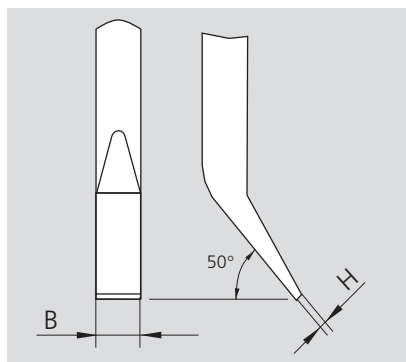
Mounting tool 0536- for Ball Transfer Units 0535- and 0536-

for d _w	Part numbers	Dimensions (mm)			
		D ₂	D ₃	t _{min}	a (°)
15	0536-015-30	29	17	10	30
22	0536-022-30	43	24	10	20
30	0536-030-30	53	30	10	24
45	0536-045-30	73	45	15	26



Extraction tool recommended for Ball Transfer Units 0536-

for d _w	Dimensions (mm)	
	H ¹⁾ max	B ¹⁾ max
15	0.6	6
22	0.6	8
30	0.8	10




¹⁾ Suitable for the recesses in the rim of Ball Transfer Unit 0536-

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Rexroth Star GmbH

D-97419 Schweinfurt
Germany

Telephone +49-9721-937-0

Telefax +49-9721-937-275
(general)

Telefax +49-9721-937-350
(direct)

www.rexroth-star.com

Ball Transfer Units
RE 82 910/09.99