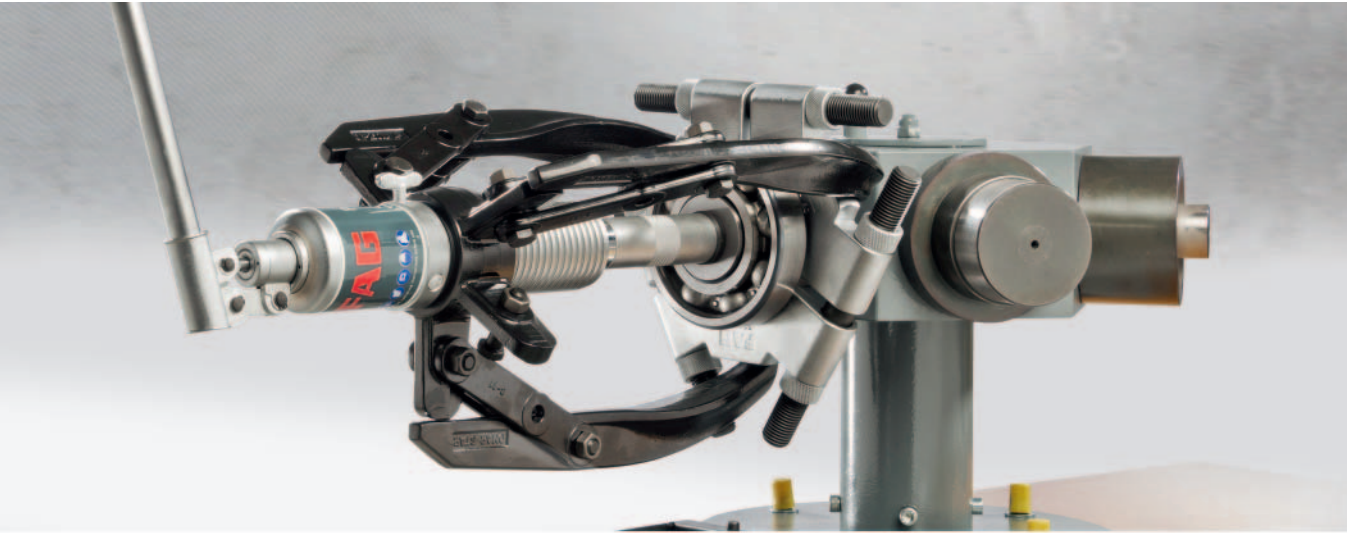


FAG



Tools for the Mechanical Mounting and Dismounting of Rolling Bearings

SCHAEFFLER

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Mechanical mounting and dismounting of rolling bearings

Cylindrical bearing seats

In order to prevent bearing damage, the mounting forces must always be applied to the tightly fitted ring during mounting and dismounting. If the extraction forces are directed through the rolling elements during extraction of rolling bearings, the bearings are generally rendered unusable.

Mounting

Smaller bearings can be driven cold onto the shaft or into the housing for normal tight fits.

For the economical and secure mounting of rolling bearings in the range up to 50 mm bore diameter and up to 110 mm outside diameter, mounting tool sets are suitable. They can also be used to easily mount sleeves, intermediate rings, seals and similar components, *Figure 1*.

Tightly fitted inner rings can be driven onto the shaft or outer rings can be driven into the housing bore by hitting a mounting sleeve with the hammer. Applying the mounting force to the tightly fitted bearing ring prevents the mounting forces from being transmitted through the rolling elements and raceways, which can lead to damage. The precision parts are matched to each other, ensuring that the forces are uniformly transmitted to the side faces of the bearing rings.



Figure 1
Mounting tool set

Dismounting

Extraction tools are used for dismounting. Particular care is also necessary during dismounting in order to prevent damage to the bearing. The extraction tool must always be applied to the ring to be removed.

For the dismounting of small bearings up to approx. 100 mm bore diameter that are located with a tight fit on the shaft or in the housing, mechanical extractors are used. The extraction force is normally applied by means of a threaded spindle, *Figure 2*. In the case of extractors for larger rolling bearings, the work can be aided by means of a hydraulic spindle. In this way, extraction forces of up to 400 kN (40 tonnes) can be generated.



Figure 2
Two-arm extractor

Tapered bearing seats

The inner ring of a bearing with a tapered bore is always mounted with a tight fit. The bearing can be seated directly on a tapered shaft or be located on a cylindrical shaft using an adapter sleeve or withdrawal sleeve. When the inner ring is pushed on, it is expanded and the radial internal clearance of the bearing is reduced.

The reduction in radial internal clearance is thus an indication of the seating of the inner ring. In order to prevent bearing damage, the inner ring must not be pushed on too far.

As an alternative to measurement of the radial internal clearance, the axial drive-up distance can also be measured in order to set the radial internal clearance correctly.

Locknuts can be easily tightened and loosened on shafts, adapter sleeves and withdrawal sleeves using sockets. Hook wrenches can be used to tighten and loosen locknuts and precision locknuts on shafts, adapter sleeves or withdrawal sleeves, *Figure 3*. If no tightening torque is specified, jointed hook wrenches and jointed pin wrenches can be used for locknuts and precision locknuts.



Figure 3
Hook wrench

Mechanical mounting and dismounting of rolling bearings

Double hook wrenches are engraved with a torsional angle scale. The radial internal clearance can thus be set precisely for self-aligning ball bearings and spherical roller bearings without the need for measurement, *Figure 4*.



Figure 4
Double hook wrench

FAG MOUNTING MANAGER

The online calculation program MOUNTING MANAGER is a user-friendly aid for ensuring the correct mounting of bearings with a tapered bore. It shows suitable mounting methods, calculates the data required for mounting in relation to the reduction in radial internal clearance and drive-up distance and generates a list of the accessories and tools required.

Further information

- Guide values for the reduction in radial internal clearance: Mounting Handbook MH 1, Mounting of Rolling Bearings
- Feeler gauges for measuring the radial internal clearance of rolling bearings: Catalogue IS 1, Mounting and Maintenance of Rolling Bearings
- Online calculation program FAG MOUNTING MANAGER: <http://mountingmanager.schaeffler.com>.



Tools for mounting

Mounting tool set

Mounting tool set FITTING-TOOL-ALU-10-50

Features The mounting tool set FITTING-TOOL-ALU-10-50 facilitates particularly economical mounting of many standardised rolling bearings and other parts with a cylindrical bore. It is suitable for rolling bearings with a bore diameter of 10 mm to 50 mm. Each mounting sleeve can be pushed over the shaft end by up to 220 mm.

The mounting rings are made from impact-resistant plastic. This prevents metal/metal contact as well as damage to or premature wear of the bearing seats. The mounting sleeves are made from aluminium. The head of the recoilless hammer produces no sparks.

The low mass of the components makes this mounting tool set very easy to handle. The parts are driven into place by hitting the mounting sleeve with the hammer, *Figure 1*.



Figure 1
FITTING-TOOL-ALU

The combination of mounting ring and mounting sleeve required for a particular bearing is given in the dimension tables. This can also be taken from the worksheet included in the case for the mounting tool set.

It must be noted that, in some cases, the bearing can only be mounted in the housing while the shaft is dismantled. This is the case if the bore diameter of the bearing is larger than the inside diameter of the available mounting rings.

Scope of delivery

Scope of delivery of the mounting tool set FITTING-TOOL-ALU-10-50, *Figure 2*:

- 33 mounting rings
- 3 mounting sleeves
- 1 recoilless hammer
- 1 transport case.

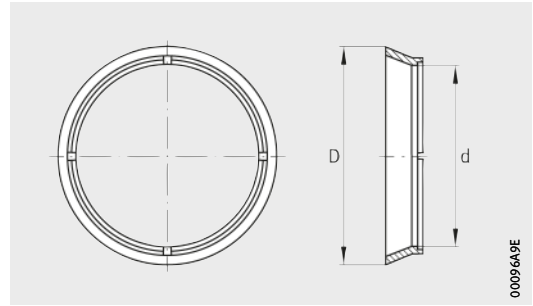
The mounting rings, mounting sleeves and hammer can also be ordered as individual items. The dimensions of the transport case are 437 mm×379 mm×130 mm.



Figure 2
Mounting tool set
FITTING-TOOL-ALU-10-50

Mounting tool set

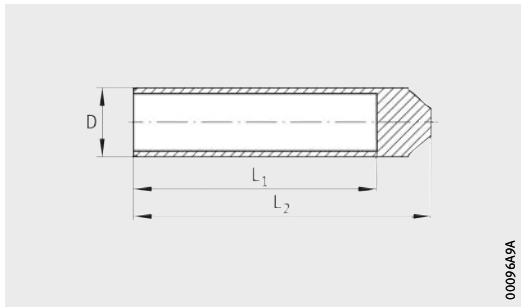
Mounting rings
 Mounting sleeves
 For mounting of bearings
 with and without shaft



FITTING-TOOL-ALU.RING

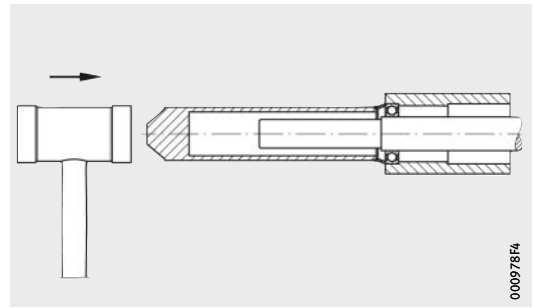
Dimension table · Dimensions in mm

Mounting ring				Mounting sleeve				
Designation	Dimensions		Mass m ≈ kg	Designation	Dimensions			Mass m ≈ kg
	d	D			D	L ₁	L ₂	
FITTING-TOOL-ALU.RING10/26	10	26	0,005	FITTING-TOOL-ALU.SLEEVE-A	25	210	235	0,15
FITTING-TOOL-ALU.RING10/30		30	0,006					
FITTING-TOOL-ALU.RING10/35		35	0,008					
FITTING-TOOL-ALU.RING12/28	12	28	0,005	FITTING-TOOL-ALU.SLEEVE-A	25	210	235	0,15
FITTING-TOOL-ALU.RING12/32		32	0,007					
FITTING-TOOL-ALU.RING12/37		37	0,01					
FITTING-TOOL-ALU.RING15/32	15	32	0,007	FITTING-TOOL-ALU.SLEEVE-A	25	210	235	0,15
FITTING-TOOL-ALU.RING15/35		35	0,008					
FITTING-TOOL-ALU.RING15/42		42	0,011					
FITTING-TOOL-ALU.RING17/35	17	35	0,008	FITTING-TOOL-ALU.SLEEVE-A	25	210	235	0,15
FITTING-TOOL-ALU.RING17/40		40	0,01					
FITTING-TOOL-ALU.RING17/47		47	0,013					
FITTING-TOOL-ALU.RING20/42	20	42	0,013	FITTING-TOOL-ALU.SLEEVE-B	41	210	240	0,34
FITTING-TOOL-ALU.RING20/47		47	0,015					
FITTING-TOOL-ALU.RING20/52		52	0,018					
FITTING-TOOL-ALU.RING25/47	25	47	0,013	FITTING-TOOL-ALU.SLEEVE-B	41	210	240	0,34
FITTING-TOOL-ALU.RING25/52		52	0,016					
FITTING-TOOL-ALU.RING25/62		62	0,029					



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FITTING-TOOL-ALU.SLEEVE



000978F4

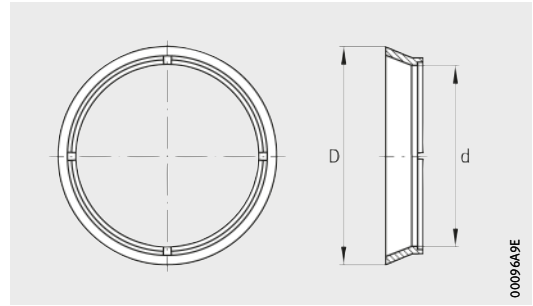
Mounting of bearings possible with and without shaft

Suitable for

Deep groove ball bearings	Self-aligning ball bearings	Angular contact ball bearings		Spherical roller bearings	Cylindrical roller bearings	Tapered roller bearings	
		Single row 72...-B, 73...-B	Double row 32, 33			302, 303, 322	313, 323
60, 62, 63, 64	12, 13, 22, 23			213, 222, 223	NU, NJ, N		
6000	-	-	-	-	-	-	-
6200	1200	-	3200	-	-	-	-
-	2200	-	-	-	-	-	-
6300	1300	-	-	-	-	-	-
6001	-	-	-	-	-	-	-
6201	1201	-	3201	-	-	-	-
-	2201	-	-	-	-	-	-
6301	1301	-	-	-	-	-	-
-	2301	-	-	-	-	-	-
6002	-	-	-	-	-	-	-
6202	1202	7202-B	3202	-	-	-	-
-	2202	-	-	-	-	-	-
6302	1302	-	3302	-	-	30302	-
-	2302	-	-	-	-	-	-
6003	-	-	-	-	-	-	-
6203	1203	7203-B	3203	-	-	30203	-
-	2203	-	-	-	-	-	-
6303	1303	7303-B	3303	-	-	30303	-
-	2303	-	-	-	-	-	-
6004	-	-	-	-	-	-	-
6204	1204	7204-B	3204	-	204	-	-
-	2204	-	-	-	-	-	-
6304	1304	7304-B	3304	21304	304	30304	32304
6403	2304	-	-	-	-	-	-
6005	-	-	-	-	-	-	-
6205	1205	7205-B	3205	22205	205	30205	-
-	2205	-	-	-	-	-	-
6305	1305	7305-B	3305	21305	305	30305	31305
6404	2305	-	-	-	-	-	32305

Mounting tool set

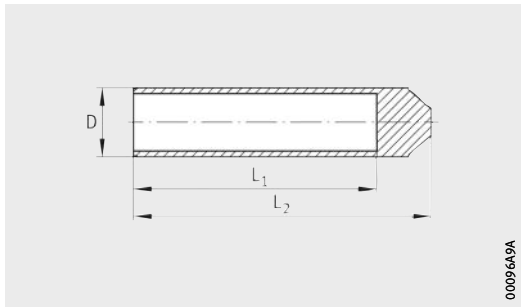
Mounting rings
 Mounting sleeves
 For mounting of bearings
 with and without shaft



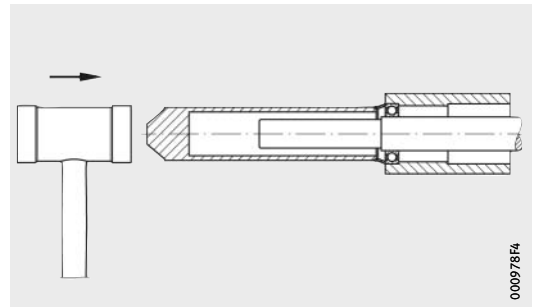
FITTING-TOOL-ALU.RING

Dimension table (continued) - Dimensions in mm

Mounting ring				Mounting sleeve				
Designation	Dimensions		Mass m ≈ kg	Designation	Dimensions			Mass m ≈ kg
	d	D			D	L ₁	L ₂	
FITTING-TOOL-ALU.RING30/55	30	55	0,018	FITTING-TOOL-ALU.SLEEVE-B	41	210	240	0,34
FITTING-TOOL-ALU.RING30/62		62	0,026					
FITTING-TOOL-ALU.RING30/72		72	0,042					
FITTING-TOOL-ALU.RING35/62	35	62	0,027	FITTING-TOOL-ALU.SLEEVE-C	61	210	245	0,34
FITTING-TOOL-ALU.RING35/72		72	0,037					
FITTING-TOOL-ALU.RING35/80		80	0,047					
FITTING-TOOL-ALU.RING40/68	40	68	0,03	FITTING-TOOL-ALU.SLEEVE-C	61	210	245	0,56
FITTING-TOOL-ALU.RING40/80		80	0,045					
FITTING-TOOL-ALU.RING40/90		90	0,067					
FITTING-TOOL-ALU.RING45/75	45	75	0,034	FITTING-TOOL-ALU.SLEEVE-C	61	210	245	0,56
FITTING-TOOL-ALU.RING45/85		85	0,046					
FITTING-TOOL-ALU.RING45/100		100	0,083					
FITTING-TOOL-ALU.RING50/80	50	80	0,036	FITTING-TOOL-ALU.SLEEVE-C	61	210	245	0,56
FITTING-TOOL-ALU.RING50/90		90	0,056					
FITTING-TOOL-ALU.RING50/110		110	0,103					



FITTING-TOOL-ALU.SLEEVE

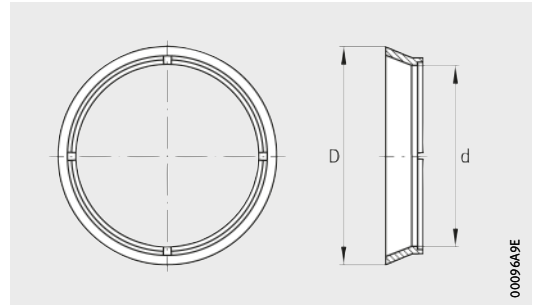


Mounting of bearings possible with and without shaft

Suitable for							
Deep groove ball bearings	Self-aligning ball bearings	Angular contact ball bearings		Spherical roller bearings	Cylindrical roller bearings	Tapered roller bearings	
		Single row 72..-B, 73..-B	Double row 32, 33			302, 303, 322	313, 323
60, 62, 63, 64	12, 13, 22, 23	72..-B, 73..-B	32, 33	213, 222, 223	NU, NJ, N	302, 303, 322	313, 323
6006	-	-	-	-	-	-	-
6206	1206	7206-B	3206	22206	206	30206	-
-	2206	-	-	-	-	32206	-
6306	1306	7306-B	3306	21306	306	30306	31306
6405	2306	-	-	-	405	-	32306
6007	-	-	-	-	-	-	-
6207	1207	7207-B	3207	22207	207	30207	-
-	2207	-	-	-	-	32207	-
6307	1307	7307-B	3307	21307	307	30307	31307
6406	2307	-	-	-	406	-	32307
6008	-	-	-	-	-	-	-
6208	1208	7208-B	3208	22208	208	30208	-
-	2208	-	-	-	-	32208	-
6308	1308	7308-B	3308	21308	308	30308	31308
6407	2308	-	-	22308	407	-	32308
6009	-	-	-	-	-	-	-
6209	1209	7209-B	3209	22209	209	30209	-
-	2209	-	-	-	-	32209	-
6309	1309	7309-B	3309	21309	309	30309	31309
6408	2309	-	-	22309	408	-	32309
6010	-	-	-	-	-	-	-
6210	1210	7210-B	3210	22210	210	30210	-
-	2210	-	-	-	-	32210	-
6310	1310	7310-B	3310	21310	310	30310	31310
6409	2310	-	-	22310	409	-	32310

Mounting tool set

Mounting rings
 Mounting sleeves
 For mounting of bearings
 with dismantled shaft



FITTING-TOOL-ALU.RING

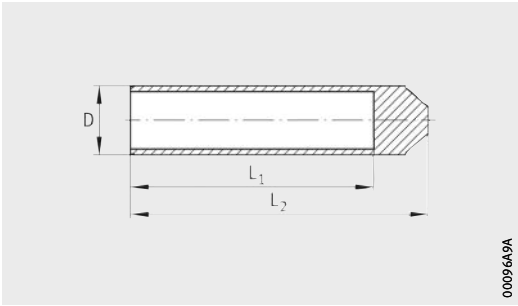
Dimension table · Dimensions in mm

Mounting ring				Mounting sleeve				
Designation	Dimensions		Mass m ≈ kg	Designation	Dimensions			Mass m ≈ kg
	d	D			D	L ₁	L ₂	
FITTING-TOOL-ALU.RING45/100	45	100	0,083	FITTING-TOOL-ALU.SLEEVE-C	61	210	245	0,56
FITTING-TOOL-ALU.RING50/90	50	90	0,056	FITTING-TOOL-ALU.SLEEVE-C	61	210	245	0,56
FITTING-TOOL-ALU.RING50/110	50	110	0,103	FITTING-TOOL-ALU.SLEEVE-C	61	210	245	0,56

Other ordering numbers:

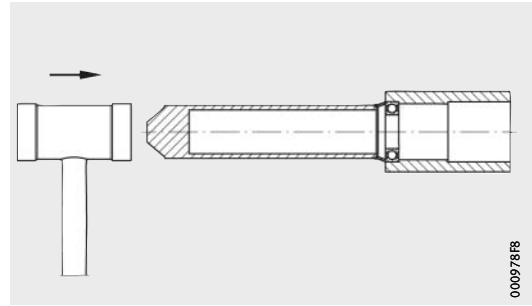
FITTING-TOOL-ALU-10-50: Complete tool set, mass m ≈ 4,18 kg;
 scope of delivery, see page 7.

FITTING-TOOL-ALU.HAMMER: Hammer, recoilless, mass m ≈ 0,95 kg.



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FITTING-TOOL-ALU.SLEEVE



0009788B

Mounting of bearings only possible with dismounted shaft

Suitable for

Deep groove ball bearings	Self-aligning ball bearings	Angular contact ball bearings		Spherical roller bearings	Cylindrical roller bearings
		Single row 72...-B, 73...-B	Double row 32, 33		
60, 62, 63, 64	12, 13, 22, 23	7211-B	3211	213, 222, 223	NU, NJ, N
6013	1211	7211-B	3211	22211	211
6211	2211	-	-	-	-
6011	-	-	-	-	-
6012	-	-	-	-	-
6014	1212	7212-B	3212	22212	212
6015	1213	7213-B	3213	22213	213
6212	2212	7311-B	3311	21311	311
6213	2213	-	-	22311	410
6311	1311	-	-	-	-
6410	2311	-	-	-	-



Tools for mounting and dismounting

Sockets
Hook wrenches
Jointed hook wrenches
Jointed pin wrenches
Double hook wrenches

Tools for mounting and dismounting

Sockets 18

Sockets LOCKNUT-SOCKET facilitate the tightening and loosening of locknuts with the aid of ratchets and torque wrenches. As a result, torque-controlled tightening is possible. A further advantage is that they require little space on the circumference of the nut.

Hook wrenches 20

Hook wrenches LOCKNUT-HOOK are suitable for the tightening and loosening of locknuts KM on shafts, adapter sleeves and withdrawal sleeves.

Jointed hook wrenches 22

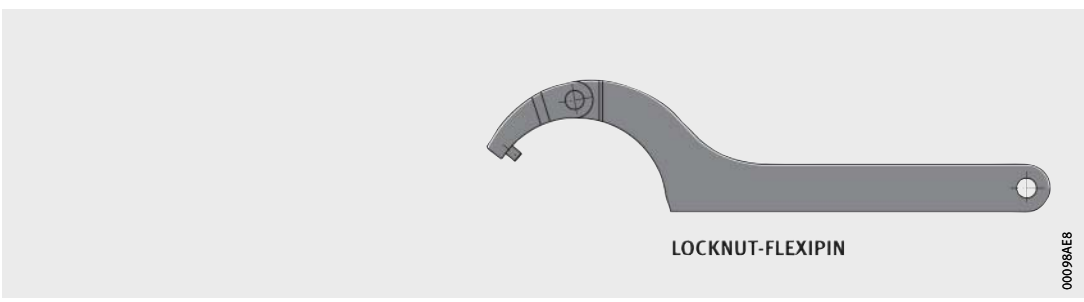
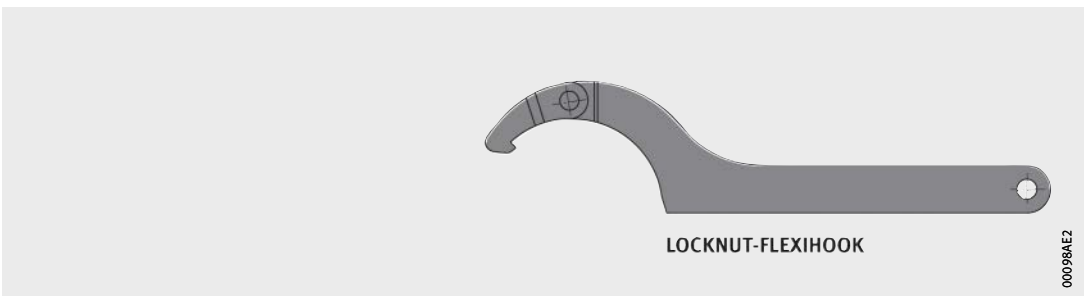
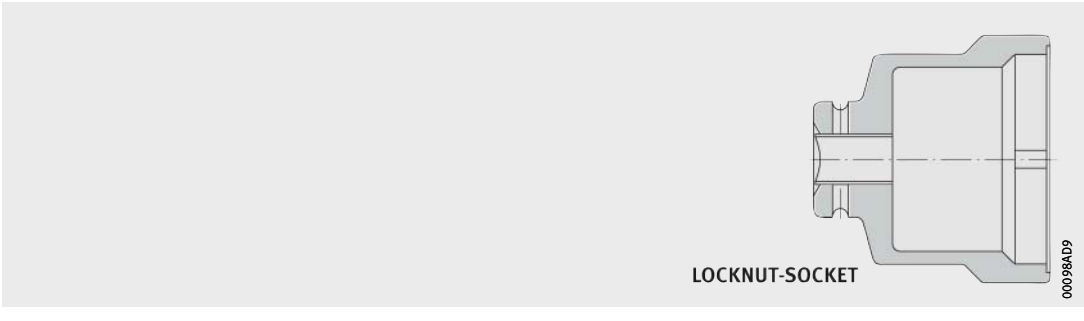
Jointed hook wrenches LOCKNUT-FLEXIHOOK are suitable for the tightening and loosening of locknuts KM as well as precision locknuts ZM and ZMA on shafts, adapter sleeves and withdrawal sleeves. Due to the joint, a jointed hook wrench is suitable for a larger range of locknut sizes than a conventional hook wrench.

Jointed pin wrenches 24

Jointed pin wrenches LOCKNUT-FLEXIPIN are suitable for the tightening and loosening of precision locknuts AM, if no tightening torque is specified. Tightening is achieved by means of radially arranged holes.

Double hook wrenches 26

Double hook wrenches LOCKNUT-DOUBLEHOOK are suitable for the mounting of self-aligning ball bearings and spherical roller bearings with a tapered bore. They can be used to set the radial internal clearance of these bearings while tightening the locknuts without the need for measurement of the radial internal clearance or the axial drive-up distance.



Sockets LOCKNUT-SOCKET

Features The sockets LOCKNUT-SOCKET, *Figure 1*, are suitable for the tightening and loosening of locknuts KM0 to KM20 on shafts as well as on adapter sleeves and withdrawal sleeves.



Figure 1
Sockets LOCKNUT-SOCKET

The sockets require less space on the circumference of the nut than hook wrenches and allow the use of ratchets and torque wrenches, *Figure 2*.

For safer working, the sockets should be secured using a locking pin and rubber washer. The socket therefore has a hole for the locking pin and a groove for the rubber washer. The rubber washer prevents the locking pin from falling out. The locking pin and rubber washer are included in the scope of delivery.



Figure 2
Use of the socket LOCKNUT-SOCKET

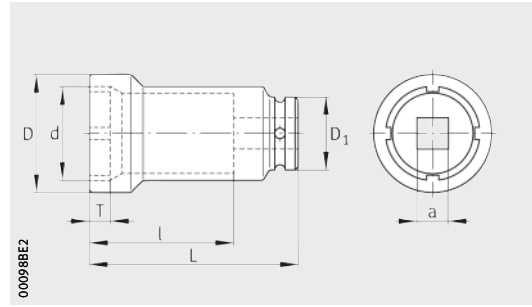
Improved coating of the surface

The sockets LOCKNUT-SOCKET have a new type of coating. This coating replaces the black oxide coating that was previously used on these components. It has a lustrous silver colour.

The advantages of the coating are as follows:

- It is free from heavy metals and therefore environmentally acceptable.
- It gives improved anti-corrosion protection compared to black oxide coating.

Sockets



LOCKNUT-SOCKET

Dimension table - Dimensions in mm

Designation	Dimensions						Square section a <i>inch</i>	Mass m ≈ kg	Suitable for	
	d	D	D ₁	L	l	T			Lock-nuts	Precision locknuts
LOCKNUT-SOCKET-KM0	18,1	22	22	57	44	5	3/8	0,11	KM0	ZM10
LOCKNUT-SOCKET-KM1	22,2	28	22	57	44	5	3/8	0,11	KM1	ZM12
LOCKNUT-SOCKET-KM2	25,2	33	30	82	61	6	1/2	0,27	KM2	ZM15
LOCKNUT-SOCKET-KM3	28,2	36	30	82	61	6	1/2	0,24	KM3	ZM17
LOCKNUT-SOCKET-KM4	32,2	38	30	82	58	9	1/2	0,28	KM4	ZM20
LOCKNUT-SOCKET-KM5	38,2	46	30	82	58	9	1/2	0,38	KM5	ZMA20/38, ZM25
LOCKNUT-SOCKET-KM6	45,2	53	30	82	58	9	1/2	0,42	KM6	ZMA25/45, ZM30
LOCKNUT-SOCKET-KM7	52,2	60	30	82	58	9	1/2	0,47	KM7	ZMA20/52, ZMA30/52, ZM35
LOCKNUT-SOCKET-KM8	58,3	68	30	82	58	9	1/2	0,61	KM8	ZMA25/58, ZMA35/58, ZM40
LOCKNUT-SOCKET-KM9	65,4	73,5	44	90	62	13,5	3/4	0,8	KM9	ZMA30/65, ZM45
LOCKNUT-SOCKET-KM10	70,4	78,5	44	90	62	13,5	3/4	0,9	KM10	ZMA35/70, ZM50
LOCKNUT-SOCKET-KM11	75,4	83,5	44	90	62	13,5	3/4	0,9	KM11	ZMA40/75, ZMA50/75, ZM55
LOCKNUT-SOCKET-KM12	80,4	88,5	44	90	60	13,5	3/4	1,04	KM12	–
LOCKNUT-SOCKET-KM13	85,4	94	44	90	60	13,5	3/4	1,12	KM13	ZMA45/85, ZM65
LOCKNUT-SOCKET-KM14	92,5	103	76	110	74	12	1	2,13	KM14	ZMA50/92, ZM70
LOCKNUT-SOCKET-KM15	98,5	109	76	110	74	13	1	2,24	KM15	ZMA55/98, ZMA60/98, ZM75
LOCKNUT-SOCKET-KM16	105,6	116	76	110	74	15	1	2,35	KM16	ZMA65/105, ZM80
LOCKNUT-SOCKET-KM17	110,6	121	76	110	74	16	1	2,5	KM17	ZMA70/110, ZM85
LOCKNUT-SOCKET-KM18	120,6	131	76	110	74	16	1	2,72	KM18	ZMA80/120, ZM90
LOCKNUT-SOCKET-KM19	125,6	137	76	110	74	17	1	3,01	KM19	ZMA75/125
LOCKNUT-SOCKET-KM20	130,6	143	76	110	74	18	1	3,24	KM20	ZMA90/130, ZM100
LOCKNUT-SOCKET-KM21	115	153	76	110	80	18	1	3,43	KM21	ZMA100/140, ZM105
LOCKNUT-SOCKET-KM22	120	158	76	110	80	18	1	3,54	KM22	ZM110
LOCKNUT-SOCKET-KM24	130	170	76	110	80	18	1	4,15	KM24	ZMA90/115, ZM120

Sockets LOCKNUT-SOCKET are also suitable, in combination with sockets AMS, for precision locknuts AM.
Further information: see TPI 123, Bearings for Screw Drives.

Hook wrenches LOCKNUT-HOOK

Features The hook wrenches LOCKNUT-HOOK in accordance with DIN 1810-A are suitable for the tightening and loosening of locknuts KM on shafts, adapter sleeves and withdrawal sleeves, if no tightening torque is specified.

The hook wrenches are suitable for locknuts KM0 to KM40. Special sizes are available by agreement.

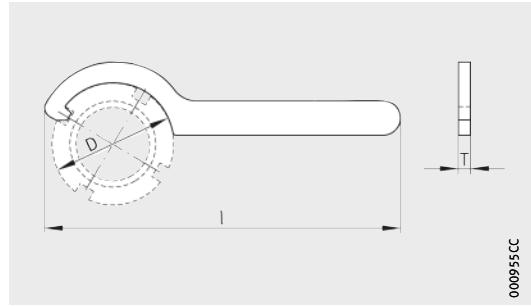
Hook wrenches can be used to mount rolling bearings on tapered shaft seats, on adapter sleeves and on withdrawal sleeves. Withdrawal sleeves can also be dismantled using hook wrenches together with the extraction nuts.

Hook wrenches can be ordered as individual items. The hook wrenches for the locknuts KM0 to KM16 are also available as a set with a roll-up pouch, *Figure 1*.



Figure 1
Hook wrench set
LOCKNUT-HOOK-KM0-16-SET

Hook wrenches



LOCKNUT-HOOK

000955CC

Dimension table - Dimensions in mm

Designation	Set	Dimensions				Mass m ≈ kg	Suitable for locknuts
		D		l	T		
		min.	max.				
LOCKNUT-HOOK-KM0-1	①	16	20	110	3	0,03	KM0, KM1
LOCKNUT-HOOK-KM2-3	①	25	28	136	4	0,05	KM2, KM3
LOCKNUT-HOOK-KM4	①	30	32	136	4	0,05	KM4
LOCKNUT-HOOK-KM5	①	34	36	170	5	0,09	KM5
LOCKNUT-HOOK-KM6	①	45	50	206	6	0,16	KM6
LOCKNUT-HOOK-KM7	①	52	55	206	6	0,16	KM7
LOCKNUT-HOOK-KM8-9	①	58	62	240	7	0,26	KM8, KM9
LOCKNUT-HOOK-KM10-11	①	68	75	240	7	0,26	KM10, KM11
LOCKNUT-HOOK-KM12-14	①	80	90	280	8	0,41	KM12, KM13, KM14
LOCKNUT-HOOK-KM15-16	①	95	100	280	8	0,41	KM15, KM16
LOCKNUT-HOOK-KM17	-	110	115	335	10	0,75	KM17
LOCKNUT-HOOK-KM18-20	-	120	130	335	10	0,72	KM18, KM19, KM20
LOCKNUT-HOOK-KM21-23	-	135	145	385	10	1	KM21, KM22, KM23
LOCKNUT-HOOK-KM24-27	-	155	165	385	10	0,97	KM24, KM25, KM26, KM27
LOCKNUT-HOOK-KM28-30	-	180	195	470	10	1,5	KM28, KM29, KM30
LOCKNUT-HOOK-KM31-34	-	205	220	470	10	1,58	KM31, KM32, KM33, KM34
LOCKNUT-HOOK-KM36-40	-	230	245	568	10	2,25	KM36, KM38, KM40

Special sizes are available by agreement.

① Constituent part of **LOCKNUT-HOOK-KM0-16-SET**, mass m ≈ 2,01 kg.

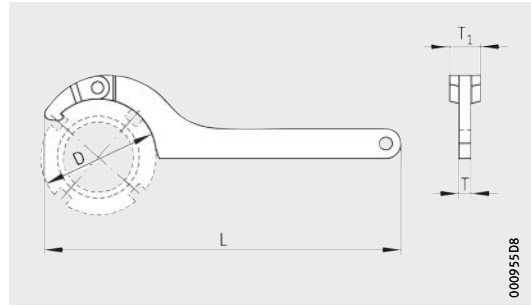
Jointed hook wrenches LOCKNUT-FLEXIHOOK

Features The jointed hook wrenches LOCKNUT-FLEXIHOOK, *Figure 1*, are suitable for the tightening and loosening of locknuts KM as well as precision locknuts ZM and ZMA on shafts, adapter sleeves and withdrawal sleeves, if no tightening torque is specified. The joint allows one hook wrench of series LOCKNUT-FLEXIHOOK to be used for mounting and dismounting locknuts of various sizes.



Figure 1
Jointed hook wrench
LOCKNUT-FLEXIHOOK

Jointed hook wrenches



LOCKNUT-FLEXIHOOK

Dimension table - Dimensions in mm								
Designation	Dimensions					Mass m ≈ kg	Suitable for	
	D		L	T	T ₁		Locknuts	Precision locknuts
	min.	max.						
LOCKNUT-FLEXIHOOK-KM1-4	20	35	165	4	10,5	0,09	KM1, KM2, KM3, KM4	ZM12, ZM15, ZM17, ZM20, ZMA15/33
LOCKNUT-FLEXIHOOK-KM5-8	35	60	210	5	12,5	0,17	KM5, KM6, KM7, KM8	ZM25, ZM30, ZM35, ZM40, ZMA20/38, ZMA20/52, ZMA25/45, ZMA25/58, ZMA30/52, ZMA3/58
LOCKNUT-FLEXIHOOK-KM9-13	60	90	280	6	14,5	0,36	KM9, KM10, KM11, KM12, KM13	ZM45, ZM50, ZM55, ZM60, ZM65, ZMA30/65, ZMA35/70, ZMA40/62, ZMA40/75, ZMA45/68, ZMA45/85, ZMA50/75
LOCKNUT-FLEXIHOOK-KM14-24	90	155	335	7	17,5	0,61	KM14, KM15, KM16, KM17, KM18, KM19, KM20, KM21, KM22, KM23, KM24	ZM70, ZM75, ZM80, ZM85, ZM90, ZM100, ZM105, ZM110, ZM115, ZM120, ZMA50/92, ZMA55/98, ZMA60/98, ZMA65/105, ZMA70/110, ZMA75/125, ZMA80/120, ZMA90/130, ZMA90/155, ZMA100/140
LOCKNUT-FLEXIHOOK-KM24-36	155	230	460	8	17,5	1,2	KM24, KM25, KM26, KM27, KM28, KM29, KM30, KM31, KM32, KM33, KM34, KM36	ZM120, ZM125, ZM130, ZM140, ZM150, ZMA90/155

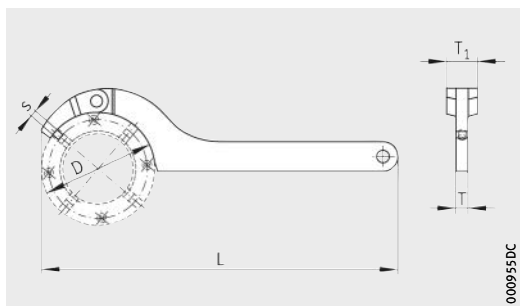
Jointed pin wrenches LOCKNUT-FLEXIPIN

- Features** The jointed pin wrenches LOCKNUT-FLEXIPIN, *Figure 1*, are suitable for the tightening and loosening of precision locknuts AM15 to AM90 on shafts, if no tightening torque is specified.
- The jointed pin wrenches can be used to mount small bearings on tapered shaft seats. Tightening is achieved by means of radially arranged holes.



Figure 1
Jointed pin wrench
LOCKNUT-FLEXIPIN

Jointed pin wrenches



LOCKNUT-FLEXIPIN

Dimension table - Dimensions in mm

Designation	Dimensions						Mass m ≈ kg	Suitable for precision locknuts
	D		L	s	T	T ₁		
	min.	max.						
LOCKNUT-FLEXIPIN-AM15-17	22	35	135	4	3	8	0,04	AM15, AM17
LOCKNUT-FLEXIPIN-AM20	35	60	175	4	4	11	0,09	AM20
LOCKNUT-FLEXIPIN-AM25-35/58	60	90	175	5	4	11	0,09	AM25, AM30, AM35/58
LOCKNUT-FLEXIPIN-AM35-60	95	155	245	6	6	13	0,25	AM35, AM40, AM45, AM50, AM60
LOCKNUT-FLEXIPIN-AM70-90	95	155	300	8	7	15	0,43	AM70, AM90

Double hook wrenches LOCKNUT-DOUBLEHOOK

Features The double hook wrenches LOCKNUT-DOUBLEHOOK, *Figure 1*, are suitable for the mounting of self-aligning ball bearings and spherical roller bearings with a tapered bore. They can be used to set the radial internal clearance of these bearings precisely without the need for measurement of the radial internal clearance or the axial drive-up distance. Each double hook wrench is engraved with a torsional angle scale.



Figure 1
Double hook wrench
LOCKNUT-DOUBLEHOOK

Together with the double hook wrench, a torque wrench and mounting lever are required. For the torque wrench WRENCH20-100NM, which is used for locknuts from KM9, an adapter is also necessary, *Figure 2*. When the torque wrench is ordered, the adapter is included in the scope of delivery.



- ① Double hook wrench
- ② Torsional angle scale
- ③ Torque wrench
- ④ Adapter
- ⑤ Mounting lever

Figure 2
Double hook wrench and
accessories required

When using double hook wrenches, the first stage involves screwing the locknut into place as far as the initial mounting position. In order to determine this position exactly, a suitable torque wrench is necessary. The double hook wrench set includes a suitable wrench of this type.

In a second stage, the locknut is tightened with the aid of the torsional angle scale until the correct drive-up distance and thus the correct radial internal clearance of the bearing is achieved, *Figure 3*.

Information on the tightening torques and torsional angles for all suitable bearings is given in the user manual BA 28 included with the double hook wrench sets.



Figure 3
Use of the double hook wrench
LOCKNUT-DOUBLEHOOK

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Double hook wrenches LOCKNUT-DOUBLEHOOK

Double hook wrench sets

The double hook wrenches can be ordered as individual items or in a set. There are 2 double hook wrench sets available.

LOCKNUT-DOUBLEHOOK-KM3-8-SET

The set LOCKNUT-DOUBLEHOOK-KM3-8-SET, *Figure 4*, comprises:

- 1 torque wrench:
 - LOCKNUT-DOUBLEHOOK.WRENCH10-50NM
- 6 double hook wrenches:
 - LOCKNUT-DOUBLEHOOK-KM3-D16
 - LOCKNUT-DOUBLEHOOK-KM4-D16
 - LOCKNUT-DOUBLEHOOK-KM5-D16
 - LOCKNUT-DOUBLEHOOK-KM6-D16
 - LOCKNUT-DOUBLEHOOK-KM7-D16
 - LOCKNUT-DOUBLEHOOK-KM8-D16
- 1 mounting lever:
 - LOCKNUT-DOUBLEHOOK.LEVER400
- 1 mounting paste:
 - ARCANOL-MOUNTINGPASTE-70G
- 1 transport case
- 1 user manual:
 - MATNR 032821409-0000.



Figure 4

Double hook wrench set
LOCKNUT-DOUBLEHOOK-KM3-8-SET

00097AD1

LOCKNUT-DOUBLEHOOK-KM9-15-SET

The set LOCKNUT-DOUBLEHOOK-KM9-15-SET, *Figure 5*, comprises:

- 1 torque wrench with adapter:
 - LOCKNUT-DOUBLEHOOK.WRENCH20-100NM
 - LOCKNUT-DOUBLEHOOK.WRENCH-ADAPTER22-16
- 7 double hook wrenches:
 - LOCKNUT-DOUBLEHOOK-KM9-D22
 - LOCKNUT-DOUBLEHOOK-KM10-D22
 - LOCKNUT-DOUBLEHOOK-KM11-D22
 - LOCKNUT-DOUBLEHOOK-KM12-D22
 - LOCKNUT-DOUBLEHOOK-KM13-D22
 - LOCKNUT-DOUBLEHOOK-KM14-D22
 - LOCKNUT-DOUBLEHOOK-KM15-D22
- 1 mounting lever:
 - LOCKNUT-DOUBLEHOOK.LEVER400
- 1 mounting paste:
 - ARCANOL-MOUNTINGPASTE-70G
- 1 transport case
- 1 user manual:
 - MATNR 032821409-0000.

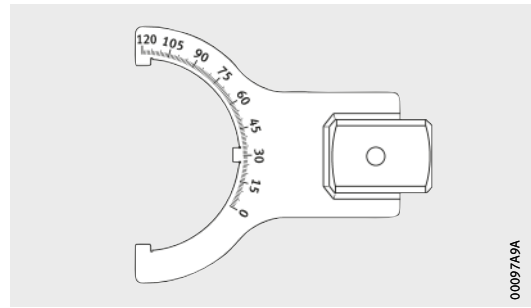


Figure 5
Double hook wrench set
LOCKNUT-DOUBLEHOOK-KM9-15-SET

Further information

- User manual BA 28, LOCKNUT-DOUBLEHOOK.

Double hook wrenches



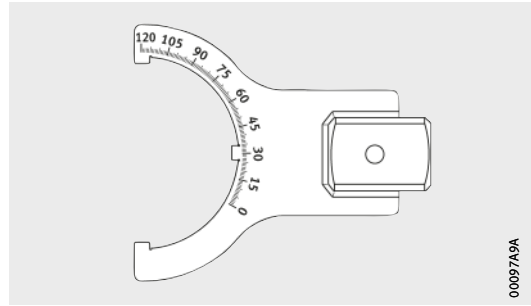
LOCKNUT-DOUBLEHOOK

Dimension table					
Designation	Set	Suitable for			Mass m ≈ kg
		Self-aligning ball bearings with tapered bore	Spherical roller bearings with tapered bore	Locknut	
LOCKNUT-DOUBLEHOOK-KM3-D16	①	1203-K	–	KM3	0,2
		2203-K	–		
		1303-K	–		
		2303-K	–		
LOCKNUT-DOUBLEHOOK-KM4-D16	①	1204-K	21304...K	KM4	0,2
		2204-K	–		
		1304-K	–		
		2304-K	–		
LOCKNUT-DOUBLEHOOK-KM5-D16	①	1205-K	22205...K	KM5	0,2
		2205-K	21305...K		
		1305-K	–		
		2305-K	–		
LOCKNUT-DOUBLEHOOK-KM6-D16	①	1206-K	22206...K	KM6	0,2
		2206-K	21306...K		
		1306-K	22306...K		
		2306-K	–		
LOCKNUT-DOUBLEHOOK-KM7-D16	①	1207-K	22207...K	KM7	0,2
		2207-K	21307...K		
		1307-K	22307...K		
		2307-K	–		
LOCKNUT-DOUBLEHOOK-KM8-D16	①	1208-K	22208...K	KM8	0,3
		2208-K	21308...K		
		1308-K	22308...K		
		2308-K	–		
LOCKNUT-DOUBLEHOOK-KM9-D22	②	1209-K	22209...K	KM9	0,4
		2209-K	21309...K		
		1309-K	22309...K		
		2309-K	–		

① Constituent part of **LOCKNUT-DOUBLEHOOK-KM3-8-SET**, mass m ≈ 4,55 kg.

② Constituent part of **LOCKNUT-DOUBLEHOOK-KM9-15-SET**, mass m ≈ 6,85 kg.

Double hook wrenches



LOCKNUT-DOUBLEHOOK

Dimension table (continued) · Dimensions in mm					
Designation	Set	Suitable for			Mass m ≈ kg
		Self-aligning ball bearings with tapered bore	Spherical roller bearings with tapered bore	Locknut	
LOCKNUT-DOUBLEHOOK-KM10-D22	②	1210-K	22210..-K	KM10	0,4
		2210-K	21310..-K		
		1310-K	22310..-K		
		2310-K	–		
LOCKNUT-DOUBLEHOOK-KM11-D22	②	1211-K	22211..-K	KM11	0,4
		2211-K	21311..-K		
		1311-K	22311..-K		
		2311-K	–		
LOCKNUT-DOUBLEHOOK-KM12-D22	②	1212-K	22212..-K	KM12	0,4
		2212-K	21312..-K		
		1312-K	22312..-K		
		2312-K	–		
LOCKNUT-DOUBLEHOOK-KM13-D22	②	1213-K	22213..-K	KM13	0,4
		2213-K	21313..-K		
		1313-K	22313..-K		
		2313-K	–		
LOCKNUT-DOUBLEHOOK-KM14-D22	②	1214-K	22214..-K	KM14	0,4
		2214-K	21314..-K		
		1314-K	22314..-K		
		2314-K	–		
LOCKNUT-DOUBLEHOOK-KM15-D22	②	1215-K	22215..-K	KM15	0,4
		2215-K	21315..-K		
		1315-K	22315..-K		
		2315-K	–		
LOCKNUT-DOUBLEHOOK.WRENCH10-50NM	①	–	–	KM3 – KM8	1,1
LOCKNUT-DOUBLEHOOK.WRENCH20-100NM	②	–	–	KM9 – KM15	2,3
LOCKNUT-DOUBLEHOOK.LEVER	①, ②	–	–	KM3 – KM15	0,8

① Constituent part of **LOCKNUT-DOUBLEHOOK-KM3-8-SET**, mass m ≈ 4,55 kg.

② Constituent part of **LOCKNUT-DOUBLEHOOK-KM9-15-SET**, mass m ≈ 6,85 kg.



Tools for dismounting

- Two-arm extractors
- Two-arm separator extractors
- Three-arm extractors
- Hydraulic pressure tool
- Hydraulic extractors
- Three-section extraction plates
- Internal extractors
- Special bearing extractors

Tools for dismounting

Two-arm extractors 36

Two-arm extractors PULLER-2ARM are suitable for the extraction of rolling bearings or other tightly fitted components that can be gripped from the inside or outside.

Two-arm separator extractors 38

Two-arm separator extractors PULLER-2ARM-SEPARATOR are intended specifically for the extraction of bearing rings that are in full contact with a surface and do not have extraction slots.

Three-arm extractors 40

Three-arm extractors PULLER-3ARM are suitable for the extraction of rolling bearings or other tightly fitted components that have good axial and radial accessibility for gripping from the outside.

Hydraulic pressure tool 42

The hydraulic pressure tool PULLER-SUPPORT is used in conjunction with a mechanical extractor for the loosening of tightly fitted components.

Hydraulic extractors 45

Hydraulic extractors PULLER-HYD facilitate the extraction even of larger rolling bearings. The extraction forces are applied by means of a hydraulic cylinder.

Three-section extraction plates 52

Three-section extraction plates PULLER-TRISECTION are used in conjunction with a three-arm extractor for rolling bearings or inner rings.

Internal extractors 54

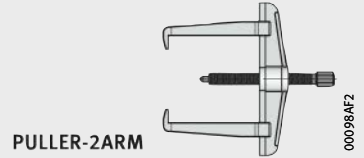
Internal extractors PULLER-BORE are suitable for the dismounting of deep groove and angular contact ball bearings with a tightly fitted outer ring. In this case, the inner ring bore must be freely accessible.

..... 58

Internal extractors PULLER-INTERNAL are suitable for the dismounting of deep groove and angular contact ball bearings with a tightly fitted outer ring without the need for dismounting of the shaft.

Special bearing extractors 61

Special bearing extractors PULLER-SPECIAL are used for the dismounting of radial bearings with a tight fit of the inner ring or outer ring under difficult conditions.



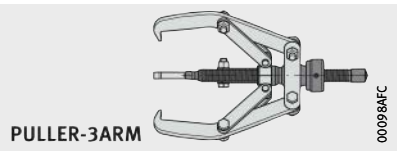
PULLER-2ARM

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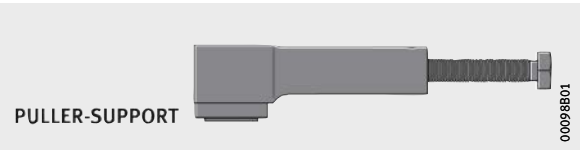
PULLER-2ARM-SEPARATOR

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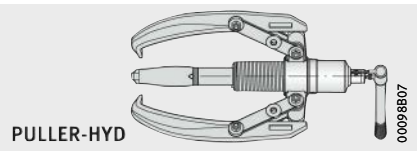
PULLER-3ARM

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PULLER-SUPPORT

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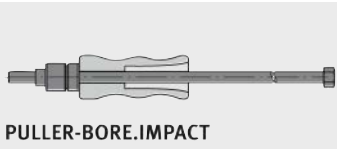
PULLER-HYD

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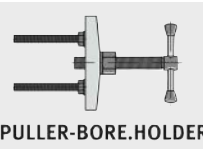


PULLER-TRISECTION

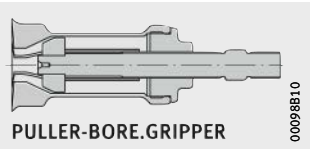
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PULLER-BORE.IMPACT

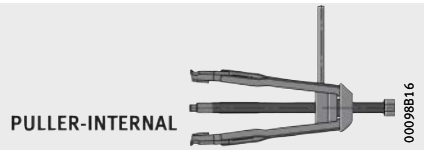


PULLER-BORE.HOLDER



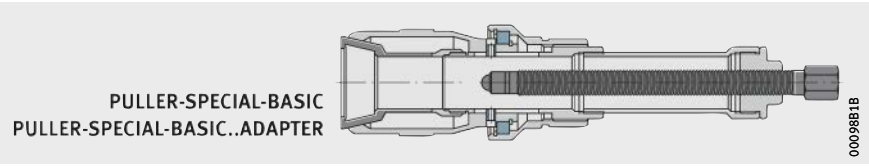
PULLER-BORE.GRIPPER

00098B10



PULLER-INTERNAL

00098B16



PULLER-SPECIAL-BASIC
PULLER-SPECIAL-BASIC..ADAPTER

00098B1B

Two-arm extractors PULLER-2ARM

Features The two-arm extractors PULLER-2ARM, *Figure 1*, are suitable for the extraction of complete rolling bearings of widely varying types, of tightly fitted inner rings and of other components such as gears that can be gripped from the inside or the outside. These extractors require good radial and axial accessibility of the bearing position, possibly with extraction slots.



Figure 1
Two-arm extractor PULLER-2ARM

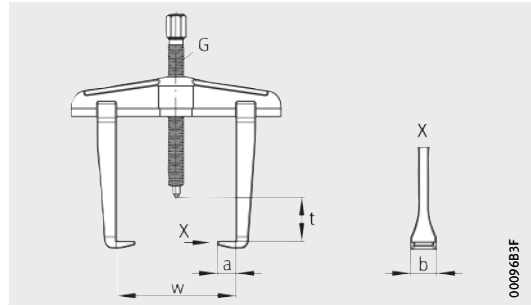
The grip span is adjusted by moving the arms on the crossbar. Symmetrical adjustment is aided by a scale. During extraction, a self-locking device prevents the arms from slipping off. A rotatable insert in the spindle facilitates selection of either a pointed or round centring tip.

- PULLER-2ARM-SET The PULLER-2ARM-SET, *Figure 2*, comprises:
- 1 two-arm extractor PULLER-2ARM130
 - 1 two-arm extractor PULLER-2ARM200
 - 1 two-arm extractor PULLER-2ARM350
 - narrow extraction arms of size 130 and 200
 - 1 tube of spindle grease
 - 1 transport case.



Figure 2
PULLER-2ARM-SET

Two-arm extractors



PULLER-2ARM

Dimension table

Designation	Set	Grip span		Grip depth t max. mm	Dimensions		Spindle thread G	Extraction force kN	Mass m ≈ kg
		w			a	b			
		min. mm	max. mm						
PULLER-2ARM90	–	6	90	100	15	22	M14×1,5	30	0,9
PULLER-2ARM130	①	6	130	100	15	22	M14×1,5	30	1,3
PULLER-2ARM160	–	8	160	150	24	30	G1/2	50	2,7
PULLER-2ARM200	①	8	200	150	24	30	G1/2	50	3,3
PULLER-2ARM250	–	10	250	200	32	36	G3/4	75	6,6
PULLER-2ARM350	①	10	350	200	32	36	G3/4	75	7,5

① Constituent part of **PULLER-2ARM-SET**, mass m ≈ 15,5 kg.

Two-arm separator extractors PULLER-2ARM-SEPARATOR

Features The two-arm separator extractors PULLER-2ARM-SEPARATOR, *Figure 1*, are suitable for the extraction of complete rolling bearings or tightly fitted inner rings. Bearing rings can be in full contact with a surface, i.e. extraction slots are not necessary.



Figure 1
Two-arm separator extractors
PULLER-2ARM-SEPARATOR

The separator extractor of suitable dimensions is selected in accordance with the bearing size and the mounting conditions, *Figure 2*.

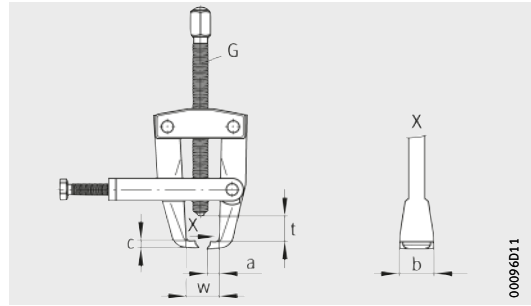
Once the separator extractor has been positioned, the screw on the clamp is rotated in order to slide the arms between the bearing ring and the locating face. This is aided by means of a special profile on the arms. Once the bearing has been wedged in this way, it is then extracted by rotating the spindle.

The wedging of the bearing, in conjunction with centring on the shaft, allows gentle extraction of the bearing.



Figure 2
Use of the two-arm separator
extractor PULLER-2ARM-SEPARATOR

Two-arm separator extractors



PULLER-2ARM-SEPARATOR

Dimension table

Designation	Grip span		Grip depth t max. mm	Dimensions			Spindle thread G	Extraction force kN	Mass m ≈ kg
	w			a	b	c			
	min. mm	max. mm							
PULLER-2ARM-SEPARATOR45	12	45	65	2,5	12 ⁰ ₊₁	5	M10	10	0,55
PULLER-2ARM-SEPARATOR90	20	90	100	2,5	14 ⁰ ₊₁	6	M14×1,5	40	1,36
PULLER-2ARM-SEPARATOR150	20	150	150	2,5	28 ⁰ ₊₁	6	M20×1,5	40	3

Three-arm extractors PULLER-3ARM

Features The three-arm extractors PULLER-3ARM, *Figure 1*, are suitable for the extraction of complete rolling bearings of widely varying types and of tightly fitted inner rings. These extractors require good radial and axial accessibility of the bearing position, possibly with extraction slots.



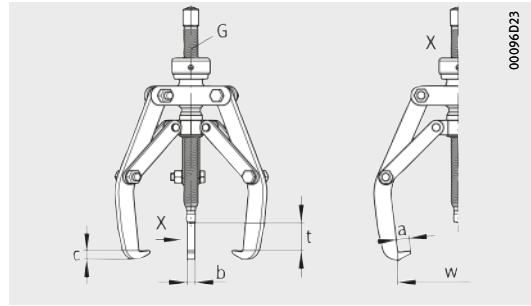
Figure 1
Three-arm extractor
PULLER-3ARM

The grip width is set by rotating the knurled disc located above the upper screw. This disc is connected to an adjustment cylinder that has two opposing threads. Due to this arrangement, the two screws rotate simultaneously, which means that the entire grip width can be covered in just a few revolutions. The arms always move symmetrically to the centre, which aids operation under unfavourable conditions. Since the arms are screw mounted, they can be reversed and operation as an internal extractor is possible. The extractor of suitable dimensions is selected in accordance with the bearing size and the mounting conditions, *Figure 2*. The self-centring function prevents tilting of the bearing during tightening.



Figure 2
Use of the three-arm extractor
PULLER-3ARM

Three-arm extractors



PULLER-3ARM

Dimension table

Designation	Grip span		Grip depth t max. mm	Dimensions			Spindle thread G	Extraction force kN	Mass m ≈ kg
	w			a	b	c			
	min. mm	max. mm							
PULLER-3ARM160	35	160	100	14 ⁰ ₊₁	15 ⁰ ₊₁	9	M14×1,5	45	2
PULLER-3ARM230	42	230	165	19 ⁰ ₊₁	22 ⁰ ₊₁	11	M22×2	100	4
PULLER-3ARM310	48	310	235	19 ⁰ ₊₁	22 ⁰ ₊₁	11	M22×2	100	4,5
PULLER-3ARM430	58	430	240	20 ⁰ ₊₂	30 ⁰ ₊₂	16	M30×2	150	10
PULLER-3ARM660	62	660	340	22 ⁰ ₊₂	34 ⁰ ₊₂	16	M30×2	150	13,8

Hydraulic pressure tool PULLER-SUPPORT

Features The hydraulic pressure tool PULLER-SUPPORT, *Figure 1*, is used for the loosening of tightly fitted parts in conjunction with mechanical extractors.

Depending on the size, it generates an axial force of 80 kN or 150 kN. The spindle thread of the mechanical extraction tool is not unduly stressed as the main extraction force acts on static thread flanks.



Figure 1
Hydraulic pressure tool
PULLER-SUPPORT150

The hydraulic pressure tool is positioned between the spindle of the extractor and the end of the shaft. The spindle of the extractor must be in contact with the pressure tool, *Figure 2*. The hydraulic system is actuated by screwing in the pressure screw, *Figure 3*. The axial force generated in this way loosens the component to be extracted. The component can then be extracted using the mechanical spindle of the extractor.



Figure 2
Hydraulic pressure tool
in combination
with two-arm extractor

Figure 3
Use of the hydraulic pressure
tool PULLER-SUPPORT

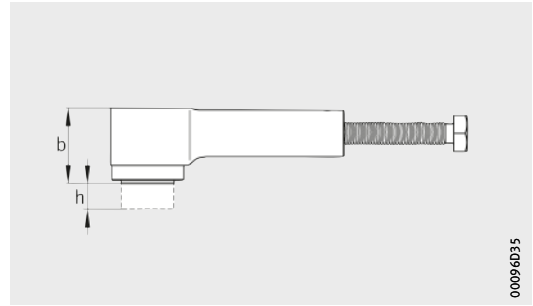


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The pressure tool PULLER-SUPPORT150 has a hydraulic return mechanism. This means that, when the pressure screw is reversed, the hydraulic piston automatically returns to the initial position.

For safety reasons, the minimum size of spindle diameter and the maximum torque must be observed, see dimension table.

Hydraulic pressure tool



PULLER-SUPPORT

00096035

Dimension table

Designation	Axial force kN	Stroke length	Section height	Minimum spindle diameter of extractor mm	Maximum torque Nm	Mass
		h mm	b mm			m ≈ kg
PULLER-SUPPORT80	80	7	35	M22	25	0,6
PULLER-SUPPORT150	150	10	85	M30	50	1,7

Hydraulic extractors PULLER-HYD

Features

The hydraulic extractors PULLER-HYD are available with extraction forces of 40 kN to 400 kN. They facilitate simple dismantling of rolling bearings, gears, bushes and other components. Depending on the size, the hydraulic cylinders of the extractors have an integrated or a separate hydraulic hand pump. Due to the rotatable pump lever of the integrated hand pump, the operator can always adopt the optimum working position.

The stroke length can be adjusted by means of the adapter included in the scope of delivery. If there is insufficient space for 3 arms, the extractor can be simply converted to 2 arms.

The parts of the extractor under mechanical load are made from high quality chromium-molybdenum steel. The smooth-running piston is made from quenched and tempered steel with a chromium coating.



Figure 1
Use of the hydraulic extractor PULLER-HYD in conjunction with the three-section extraction plate PULLER-TRISECTION



The application example, *Figure 1*, shows the positioning of the extractor on the bearing. Before the bearing is extracted, the safety grid or safety cover must be put in place.

Hydraulic extractors PULLER-HYD

Scope of delivery When a hydraulic extractor PULLER-HYD is ordered, the extractor is supplied with the following accessories:

- 1 adapter in the case of extractors with arms of normal length, 2 adapters in the case of extractors with extended arms
- hydraulic cylinder with integrated or separate hydraulic pump, depending on design
- arms of normal length or extended arms, depending on design
- safety grid or safety cover, depending on size
- plastic or metal case, depending on size.

If replacement parts for these components or arms of a different length are required, these can also be ordered as individual items.

PULLER-HYD40 to PULLER-HYD80

The hydraulic extractors with cylinders with an integrated hand pump PULLER-HYD40, 60 and 80 are available for extraction forces of 40 kN, 60 kN and 80 kN, *Figure 2*.

The compact units are housed in a robust plastic case. For the protection of operating personnel, a safety grid is included.

The hydraulic extractors PULLER-HYD40 are supplied with arms of normal length. The hydraulic extractors PULLER-HYD60 and PULLER-HYD80 are also available in a version with extended arms, suffix XL.



Figure 2

Hydraulic extractor with integrated hand pump PULLER-HYD80

0009673C

**PULLER-HYD100 to
PULLER-HYD300**

The hydraulic extractors with cylinders with an integrated hand pump PULLER-HYD100, 120, 200, 250 and 300 are available for extraction forces of 100 kN to 300 kN, *Figure 3*.

The compact units are housed in a rigid metal case. For the protection of operating personnel, a safety cover is included. The hydraulic extractors PULLER-HYD100 to PULLER-HYD300 are also available in a version with extended arms, suffix XL.



Figure 3
Hydraulic extractor with integrated
hand pump PULLER-HYD100

PULLER-HYD400

In the case of the hydraulic extractor PULLER-HYD400 for an extraction force of 400 kN, the oil pressure is applied by means of a separate hand pump. The extractor can be therefore also be used where space is restricted.

The extractor is housed together with the pump in a rigid metal case, *Figure 4*. For the protection of operating personnel, a safety cover is included.

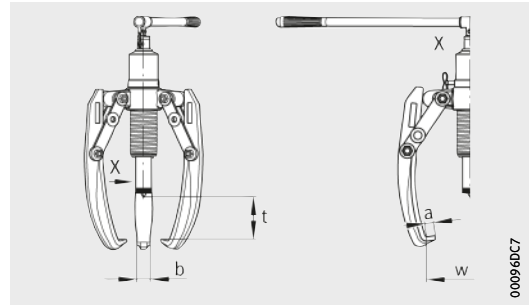
The hydraulic extractor PULLER-HYD400 is also available in a version with extended arms, suffix XL.



Figure 4
Hydraulic extractor with separate
hand pump PULLER-HYD400

Hydraulic extractors

With integrated hand pump
With separate hand pump

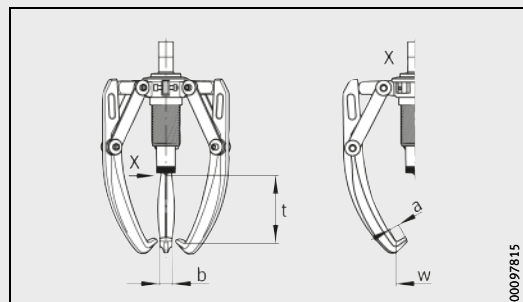


PULLER-HYD
with integrated hand pump

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Dimension table

Designation	Grip span w max. mm	Grip depth t max. mm	Dimensions		Stroke length mm	Extraction force kN	Mass m ≈ kg
			a mm	b mm			
PULLER-HYD40	200	165	14	22	55	40	5,5
PULLER-HYD60	200	165	14	22	80	60	5,9
PULLER-HYD60 -XL	220	195	21	26			7,1
PULLER-HYD80	250	210	21	26	80	80	7,7
PULLER-HYD80-XL	300	240	20	29			9
PULLER-HYD100	100	280	16	22	80	100	7,2
PULLER-HYD100-XL	250	195	15	26			8,8
PULLER-HYD120	120	330	15	26	80	120	10,6
PULLER-HYD120-XL	300	240	20	29			12,6
PULLER-HYD200	200	380	20	29	80	200	14,6
PULLER-HYD200-XL	360	275	25	32			17,1
PULLER-HYD250-XL	250	440	25	32	100	250	22,2
PULLER-HYD250-XL	410	315	30	38			27
PULLER-HYD300	300	610	30	38	100	300	35
PULLER-HYD300-XL	540	375	42	44			55,7
PULLER-HYD400	580	420	40	52	120	400	90,6
PULLER-HYD400-XL	1 000	635	42	44			100

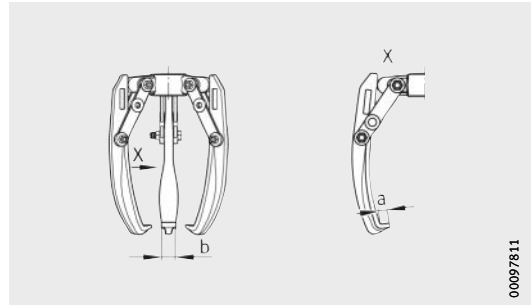


PULLER-HYD
with separate hand pump

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Hydraulic extractors

Arms for extractors



PULLER-HYD..JAW

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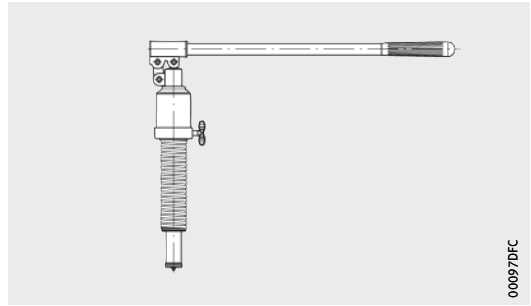
Dimension table - Dimensions in mm

Designation	Dimensions		As replacement part for extractor	As accessory with extended arms for extractor	Mass m ≈ kg
	a	b			
PULLER-HYD40.JAW	14	22	PULLER-HYD40	–	3,1
PULLER-HYD60.JAW	14	22	PULLER-HYD60	–	3,1
PULLER-HYD60.JAW-LONG	21	26	PULLER-HYD60-XL	PULLER-HYD60	4,5
PULLER-HYD80.JAW	21	26	PULLER-HYD80	–	4,8
PULLER-HYD80.JAW-LONG	20	29	PULLER-HYD80-XL	PULLER-HYD80	5,9
PULLER-HYD100.JAW	16	22	PULLER-HYD100	–	4,2
PULLER-HYD100.JAW-LONG	15	26	PULLER-HYD100-XL	PULLER-HYD100	5,7
PULLER-HYD120.JAW	15	26	PULLER-HYD120	–	7,1
PULLER-HYD120.JAW-LONG	20	29	PULLER-HYD120-XL	PULLER-HYD120	8,6
PULLER-HYD200.JAW	20	29	PULLER-HYD200	–	9,1
PULLER-HYD200.JAW-LONG	25	32	PULLER-HYD200-XL	PULLER-HYD200	12,3
PULLER-HYD250.JAW	25	32	PULLER-HYD250	–	14,5
PULLER-HYD250.JAW-LONG	30	38	PULLER-HYD250-XL	PULLER-HYD250	19
PULLER-HYD300.JAW	30	38	PULLER-HYD300	–	24,8
PULLER-HYD300.JAW-LONG	42	44	PULLER-HYD300-XL	PULLER-HYD300	44,2
PULLER-HYD400.JAW	40	52	PULLER-HYD400	–	64,6
PULLER-HYD400.JAW-LONG	42	44	PULLER-HYD400-XL	PULLER-HYD400	71,5

A delivered unit always comprises 3 arms including the star-shaped retaining device.

Hydraulic extractors

Cylinder with integrated hand pump
 Cylinder with separate hand pump



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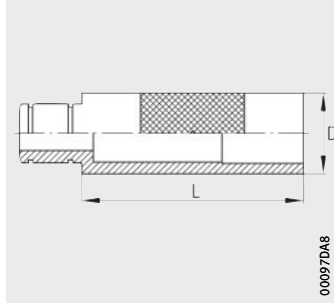
PULLER-HYD..CYLINDER

Dimension table

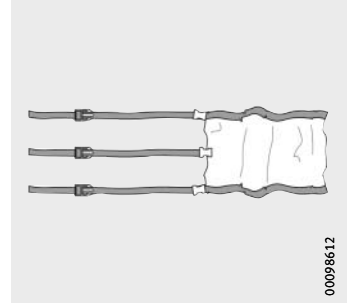
Designation	Stroke length	Extraction force	Hydraulic pressure max.	Oil quantity	Suitable for extractor	Mass m ≈ kg
	mm					
PULLER-HYD40.CYLINDER	55	40	460	0,6	PULLER-HYD40	2,6
PULLER-HYD60.CYLINDER	80	60	690	0,8	PULLER-HYD60 (60XL)	3
PULLER-HYD80.CYLINDER	80	80	620	1,2	PULLER-HYD80 (80XL)	3,6
PULLER-HYD100.CYLINDER	80	100	1 150	0,8	PULLER-HYD100 (100XL)	2,9
PULLER-HYD120.CYLINDER	80	120	940	1,2	PULLER-HYD120 (120XL)	3,4
PULLER-HYD200.CYLINDER	80	200	1 080	2	PULLER-HYD200 (200XL)	4,2
PULLER-HYD250.CYLINDER	100	250	1 030	3,3	PULLER-HYD250 (250XL)	7,2
PULLER-HYD300.CYLINDER	100	300	890	4,3	PULLER-HYD300 (300XL)	9,3
PULLER-HYD400.CYLINDER	120	400	700	1,3	PULLER-HYD400 (400XL)	18
PULLER-HYD400.PUMP	120	400	700	1,3	PULLER-HYD400 (400XL)	7,3

Hydraulic extractors

- Adapters
- Safety grid
- Safety cover



PULLER-HYD.ADAPTER



Safety cover

Dimension table - Dimensions in mm

Designation	Dimensions		Suitable for extractor	Mass m ≈ kg
	D	L		
PULLER-HYD.ADAPTER-D25/L50	25	50	PULLER-HYD40 (60, 100, 100XL)	0,18
PULLER-HYD.ADAPTER-D28/L80	28	80	PULLER-HYD80 (120, 120XL)	0,25
PULLER-HYD.ADAPTER-D35/L100	35	100	PULLER-HYD200 (200XL, 175, 175XL)	0,45
PULLER-HYD.ADAPTER-D45/L110	45	110	PULLER-HYD250 (250XL)	0,95
PULLER-HYD.ADAPTER-D55/L150	55	150	PULLER-HYD300 (300XL)	1,65
PULLER-HYD.ADAPTER-D69/L150	69	150	PULLER-HYD400 (400XL)	2,55
PULLER-HYD.ADAPTER-D69/L250	69	250	PULLER-HYD400 (400XL)	3,7

Dimension table - Dimensions in mm

Designation	Suitable for extractor	Design
PULLER-HYD40.NET	PULLER-HYD40	Safety grid
PULLER-HYD60.NET	PULLER-HYD60	
PULLER-HYD60XL.NET	PULLER-HYD60XL	
PULLER-HYD80.NET	PULLER-HYD80	
PULLER-HYD80XL.NET	PULLER-HYD80XL	
PULLER-HYD100.NET	PULLER-HYD100	Safety cover
PULLER-HYD100XL.NET	PULLER-HYD100XL	
PULLER-HYD120.NET	PULLER-HYD120	
PULLER-HYD120XL.NET	PULLER-HYD120XL	
PULLER-HYD200.NET	PULLER-HYD200	
PULLER-HYD200XL.NET	PULLER-HYD200XL	
PULLER-HYD250.NET	PULLER-HYD250	
PULLER-HYD250XL.NET	PULLER-HYD250XL	
PULLER-HYD300.NET	PULLER-HYD300	
PULLER-HYD300XL.NET	PULLER-HYD300XL	
PULLER-HYD400.NET	PULLER-HYD400	
PULLER-HYD400XL.NET	PULLER-HYD400XL	

Three-section extraction plates PULLER-TRISECTION

Features The three-section extraction plates PULLER-TRISECTION, *Figure 1*, are used for the extraction of complete bearings or tightly fitted inner rings.



Figure 1
Three-section
extraction plate PULLER-TRISECTION

The extraction plates are mainly suitable for mounting situations where a three-arm extractor on its own cannot be used to achieve gentle extraction by means of the inner ring. This can be the case, for example, where there are no extraction slots or the bearing rings are wide, if the arms cannot grip the inner ring.

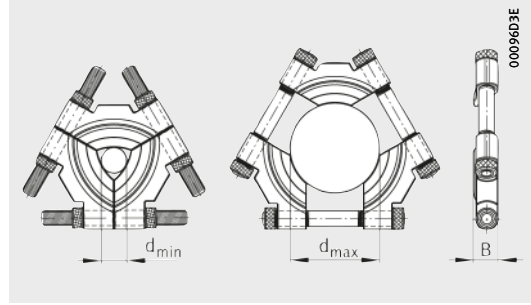
Good radial access to the bearing position is required. Extraction of inner rings and complete rolling bearings without damage is possible with proper handling.

The three extraction plates are pushed, by means of alternately screwing in the nuts, between the shaft shoulder and inner ring. The bearing is extracted by means of an extractor that is inserted into the plates, *Figure 2*.



Figure 2
Use of the three-section
extraction plate PULLER-TRISECTION

Three-section extraction plates



PULLER-TRISECTION

Dimension table - Dimensions in mm

Designation	Dimensions			Recommended for extractor		Mass m ≈ kg
	d		B	PULLER-HYD	PULLER-3ARM	
	min.	max.				
PULLER-TRISECTION-50	12	50	17	–	160	0,43
PULLER-TRISECTION-100	26	100	28	40, 60, 80, 100	230	2,27
PULLER-TRISECTION-160	50	160	37	80, 100, 120, 175, 200	310	6,07
PULLER-TRISECTION-260	90	260	53	175, 200, 250, 300	430	19,4
PULLER-TRISECTION-380	140	380	71	250, 300, 400	660	48,2

Internal extractors PULLER-BORE

Features The internal extractors PULLER-BORE are suitable for the dismantling of deep groove and angular contact ball bearings with a tightly fitted outer ring. In this case, the inner ring bore must be freely accessible. The internal extractors can be used for bearings with bore diameters of 5 mm to 79,5 mm. Since the extraction force is directed through the rolling elements, the possibility of bearing damage cannot be excluded.

The gripping segments of the internal extractor are spread when the threaded spindle is tightened. The lip of the gripping segments is pressed against the back of the bearing inner ring bore.

The bearing is then extracted with the aid of the countersupport and its threaded spindle, *Figure 1*.



Figure 1
Internal extractor PULLER-BORE
with countersupport

As an alternative to the countersupport, an impact extractor comprising a rod and an impact weight can be used. The internal extractor is screwed onto the rod. The bearing is then dismantled by applying impacts to the rear end of the impact extractor by means of the impact weight, *Figure 2*.



Figure 2
Internal extractor PULLER-BORE
with impact extractor

Internal extractor sets

The internal extractors can be ordered as individual items or in a set. There are 2 internal extractor sets available.

PULLER-BORE5-39-SET

The internal extractor set PULLER-BORE5-39-SET, *Figure 3*, comprises:

- 1 countersupport
 - PULLER-BORE.HOLDER-30-95
- 1 impact extractor
 - PULLER-BORE.IMPACT-90
- 6 internal extractors
 - PULLER-BORE.GRIPPER-5-6
 - PULLER-BORE.GRIPPER-7-9
 - PULLER-BORE.GRIPPER-10-13
 - PULLER-BORE.GRIPPER-14-19
 - PULLER-BORE.GRIPPER-20-29
 - PULLER-BORE.GRIPPER-30-39
- 1 tube of spindle grease
- 1 transport case.



Figure 3
Internal extractor set
PULLER-BORE5-39-SET

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Internal extractors PULLER-BORE

PULLER-BORE40-79-SET

The internal extractor set PULLER-BORE40-79-SET, *Figure 4*, comprises:

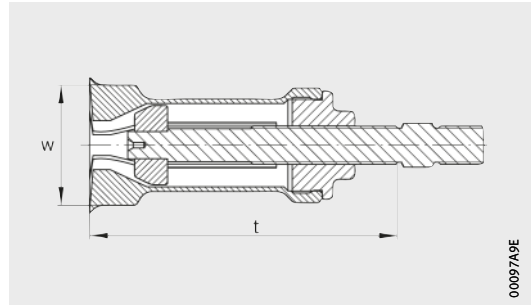
- 1 countersupport
 - PULLER-BORE.HOLDER-55-135
- 1 impact extractor
 - PULLER-BORE.IMPACT-300
- 4 internal extractors
 - PULLER-BORE.GRIPPER-40-49
 - PULLER-BORE.GRIPPER-50-59
 - PULLER-BORE.GRIPPER-60-69
 - PULLER-BORE.GRIPPER-70-79
- 1 tube of spindle grease
- 1 transport case.



Figure 4
Internal extractor set
PULLER-BORE40-79-SET

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Internal extractors



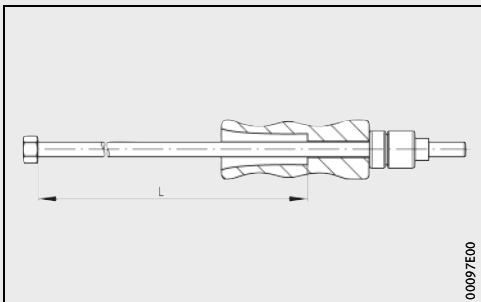
PULLER-BORE.GRIPPER

Dimension table

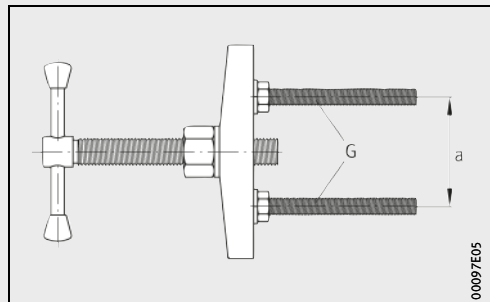
Designation	Set	Grip width for bore diameter w		Grip depth t mm	Impact travel L mm	Support diameter a		Thread of support base G	Mass m ≈ kg
		min. mm	max. mm			min. mm	max. mm		
PULLER-BORE.GRIPPER-5-6	①	5	6,5	35	-	-	-	-	0,09
PULLER-BORE.GRIPPER-7-9	①	7	9,5	35					0,09
PULLER-BORE.GRIPPER-10-13	①	10	13,5	35					0,1
PULLER-BORE.GRIPPER-14-19	①	14	19,5	45					0,13
PULLER-BORE.GRIPPER-20-29	①	20	29,5	50					0,18
PULLER-BORE.GRIPPER-30-39	①	30	39,5	90					0,25
PULLER-BORE.GRIPPER-40-49	②	40	49,5	95					0,55
PULLER-BORE.GRIPPER-50-59	②	50	59,5	95					0,74
PULLER-BORE.GRIPPER-60-69	②	60	69,5	95					0,88
PULLER-BORE.GRIPPER-70-79	②	70	79,5	95					0,76
PULLER-BORE.IMPACT-90	①	-	-	-	90	-	-	-	1,2
PULLER-BORE.IMPACT-300	②	-	-	-	300	-	-	-	1,4
PULLER-BORE.HOLDER-30-95	①	-	-	-	-	30	95	M10×100	0,57
PULLER-BORE.HOLDER-55-135	②	-	-	-	-	55	135	M16×150	1,45

① Constituent part of **PULLER-BORE5-39-SET**, mass m ≈ 3,75 kg.

② Constituent part of **PULLER-BORE40-79-SET**, mass m ≈ 7,3 kg.



PULLER-BORE.IMPACT



PULLER-BORE.HOLDER

Internal extractors

PULLER-INTERNAL10-100-SET

Features The internal extractors PULLER-INTERNAL are used for the dismantling of standard deep groove ball bearings with a tightly fitted outer ring without dismantling of the shaft, *Figure 1*. They are suitable for rolling bearings with a bore diameter of 10 mm to 100 mm.



Figure 1
Use of the internal extractor
PULLER-INTERNAL

Three extraction arms grip under the outer ring shoulder of the deep groove ball bearing. The suitable combination of arms and threaded spindle for the bearing size can be found in the selection table, see table.

**Selection table
for arms and spindle**

Deep groove ball bearings				Arms	Spindle
60	62	63	64		
6000	6200	–	–	A1	M12
6001	–	–	–		
6002	–	–	–		
6003	–	–	–		
6004	6201	–	–	A2	
6005	6202	–	–		
6006	6203	–	–		
6007	6204	6300	–	A3	
6008	–	6301	–		
6009	–	6302	–		
6010	–	–	–		
6011	6206	6303	–	A4	M16
6012	–	6304	–		
6013	–	–	–	A5	
6014	6207	6305	6403		
6015	6208	6306	–		
6016	6209	6307	–		
6017	6210	–	–		
–	6211	–	–		

**Selection table
for arms and spindle
(continued)**

Deep groove ball bearings				Arm	Spindle
60	62	63	64		
6018	6212	6308	6404	A6	M16
6019	6213	6309	6405		
6020	6214	6310	6406		
-	6215	6311	6407		
-	6216	6312	6408		
-	6217	6313	6409		
-	-	-	6410		

The spindles and arms can be ordered as individual items or in a set.

PULLER-INTERNAL10-100-SET

The internal extractor set PULLER-INTERNAL10-100-SET, *Figure 2*, comprises:

- 6 kits each containing 3 arms:
 - PULLER-INTERNAL.ARM-A1-KIT
 - PULLER-INTERNAL.ARM-A2-KIT
 - PULLER-INTERNAL.ARM-A3-KIT
 - PULLER-INTERNAL.ARM-A4-KIT
 - PULLER-INTERNAL.ARM-A5-KIT
 - PULLER-INTERNAL.ARM-A6-KIT
- 2 spindles with nut
 - PULLER-INTERNAL.SPINDLE-M12
 - PULLER-INTERNAL.SPINDLE-M16
- 1 tube of spindle grease
- 1 transport case.

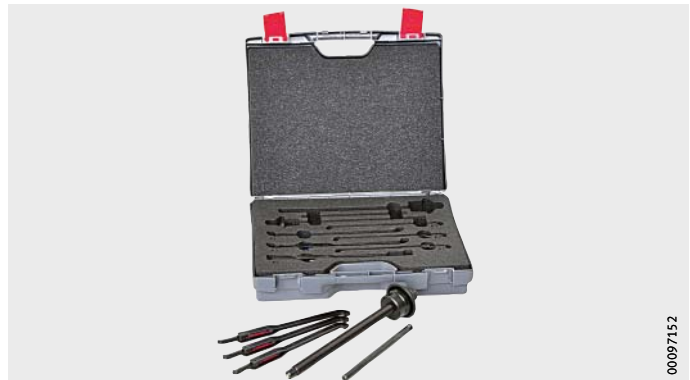
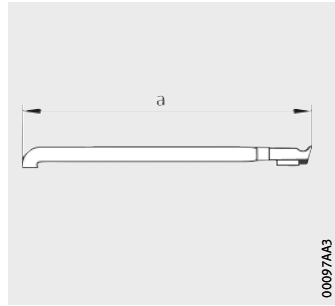


Figure 2
Internal extractor set
PULLER-INTERNAL10-100-SET

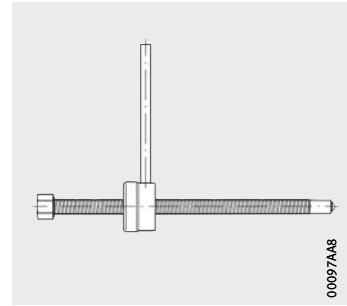
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Internal extractors

Arms
Spindles



PULLER-INTERNAL.ARM



PULLER-INTERNAL.SPINDLE

Dimension table

Designation	Set	Arm length a mm	Size	Arms Quantity	Spindle thread	Mass m ≈ kg
PULLER-INTERNAL.ARM-A1-KIT	①	140	A1	3	–	0,14
PULLER-INTERNAL.ARM-A2-KIT	①	140	A2	3	–	0,15
PULLER-INTERNAL.ARM-A3-KIT	①	140	A3	3	–	0,16
PULLER-INTERNAL.ARM-A4-KIT	①	170	A4	3	–	0,31
PULLER-INTERNAL.ARM-A5-KIT	①	170	A5	3	–	0,34
PULLER-INTERNAL.ARM-A6-KIT	①	170	A6	3	–	0,41
PULLER-INTERNAL.SPINDLE-M12	①	–	–	–	M12	0,32
PULLER-INTERNAL.SPINDLE-M16	①	–	–	–	M16	0,66

① Constituent part of **PULLER-INTERNAL10-100-SET**, mass m ≈ 3,5 kg.

Special bearing extractors PULLER-SPECIAL

Features

The special bearing extractors PULLER-SPECIAL, *Figure 1*, are used for the dismantling of radial bearings with a tight fit of the inner ring or outer ring. They are required if the bearing rings cannot be gripped using conventional extractors. They are also suitable for cases where the inner ring is in contact with a shaft shoulder that does not have extraction slots. This also applies if the bearing in a housing must be removed from the shaft.

The special bearing extractors comprise a base device and a collet. Extraction of the bearing without damage is possible with proper handling. The maximum shaft diameter is 75 mm.



Figure 1
Special bearing extractor
PULLER-SPECIAL

A differentiation is made between 4 extraction principles, see page 64. The extraction principle depends on the bearing design and the mounting position. The collet grips the bearing ring by the maximum possible circumferential surface.

Depending on the extraction principle, the finger-shaped extensions of the collet engage between the rolling elements on the raceway edge of the inner ring, behind the rollers in tapered roller bearings or by wedging behind the chamfer of the bearing ring to be extracted.

Special bearing extractors PULLER-SPECIAL

For use, a collet is screwed into the base device and positioned on the bearing, *Figure 2*. The collet is closed using the left hand thread of the union nut and clamped against one of the bearing rings, *Figure 3*. The extraction force is generated by a threaded spindle, *Figure 4*.

Figure 2
PULLER-SPECIAL:
positioning on the bearing



Figure 3
PULLER-SPECIAL:
tensioning of the collet
on the bearing

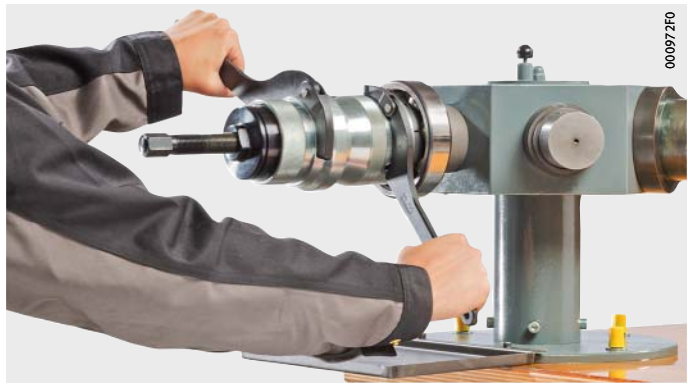


Figure 4
PULLER-SPECIAL:
extraction of the bearing



Selecting the special bearing extractor

When selecting the base device and collet, the size of the bearing and the extraction principle necessary for the application must be taken into consideration.

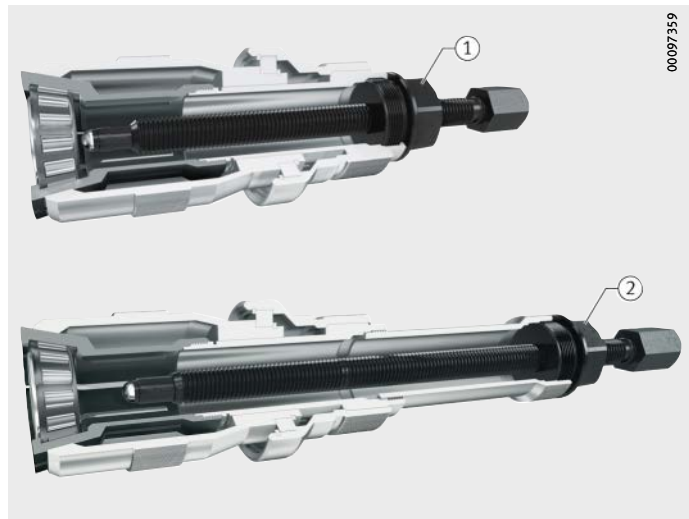
Base device

The base device is selected so that its inside diameter d is larger than the bore diameter of the bearing. For the deep groove ball bearing 6015 (bore diameter = 75 mm), for example, the base device PULLER-SPECIAL-BASIC77 ($d = 77$ mm) must be selected.

For applications in which the bearing must be pushed a particularly long distance onto the shaft, extensions are available for the base devices, *Figure 5*.

- ① Base device
- ② Base device with extension

Figure 5
PULLER-SPECIAL
with tapered roller bearing



Collet

The gripping profile of collets must be matched to the geometry of the bearing to be extracted. The extraction principle and thus the collet depends on the bearing design and the mounting position. Two collets are always required for tapered roller bearings in X and O arrangements.

Since the number of rolling elements is not standardised, different collets may be required for the same bearing sizes from different manufacturers. The bearing manufacturer must always be stated at the time of ordering.

Ordering designation

The ordering designation of a collet comprises:

- PULLER-SPECIAL
- the extraction principle
- the bearing designation.

Example: PULLER-SPECIAL-A-6208.

Special bearing extractors PULLER-SPECIAL

Extraction principles

The extraction principle depends on the bearing design and the mounting situation, *Figure 6* to *Figure 9*. In the case of tapered roller bearings arranged in pairs in an X and O arrangement, the extraction principle B is used for one bearing and the extraction principle C for the other bearing.

Extraction principle A

The extraction principle A is used for deep groove, angular contact and self-aligning ball bearings, four point contact bearings, ball bearings with a split inner ring and roller bearings. For extraction, the inner ring of the bearing is gripped. Extraction is therefore also possible if the bearing is located in the housing in such a way that the bearing cannot be gripped either from the inside or from the outside.

This extraction principle can also be used to grip bearings that are located deep in a housing if the outside diameter of the bearing is greater than the outside diameter of the base device.



Figure 6
Extraction principle A

Extraction principle B

The extraction principle B is used for tapered roller bearings mounted in an X or O arrangement. The gripper reaches over the rollers, irrespective of their number. The internal profile of the collet is matched to the rollers and their angle.

With certain bearing dimensions, deeply located bearings can also be extracted. The outer ring must be removed in advance.



Figure 7
Extraction principle B

Extraction principle C

The extraction principle C is used for tapered roller bearings mounted in an X or O arrangement. The collet engages behind the large rib of the inner ring. The possibility of gripping behind is predetermined by the bearing geometry and is normally small, which requires high precision in the manufacture of the collets.

The outer ring must be removed in advance.



Figure 8

Extraction principle C

Extraction principle D

The extraction principle D is used for a wide variety of bearing types. Examples include the inner rings of cylindrical roller bearings, angular contact ball bearings and magneto bearings, the second inner ring half of four point contact bearings and the outer rings of deep groove ball bearings, spherical roller bearings and needle roller bearings. Other components such as ABS rings or gears can also be extracted using extraction principle D.

In the extraction of rolling bearings, wedging of the rolling bearing is carried out on the chamfer of the bearing ring.



Figure 9

Extraction principle D

Ordering example for special bearing extractor and collet for cylindrical roller bearing NU315:

Ordering example

Tool	Ordering designation
Base device	PULLER-SPECIAL-BASIC77
Collet	PULLER-SPECIAL-D-NU315

Special bearing extractors PULLER-SPECIAL

Special tools

In addition to the special bearing extractors with base device and collet, other designs are available. These are available by agreement.

PULLER-SPECIAL-CUSTOM

Larger extraction collets do not include the base device. In this case, the collet is tensioned by means of a locking collar and the bearing is extracted from the shaft by means of a hydraulic cylinder, *Figure 10*. Extractors of the type are manufactured by agreement as a customer-specific solution.



Figure 10
Special bearing extractor
PULLER-SPECIAL-CUSTOM

PULLER-SPECIAL-E

The extractor PULLER-SPECIAL-E is a tool for the dismantling of spherical roller bearings and toroidal roller bearings, *Figure 11*. The dismantling tool has specially produced fingers that grip behind the end faces of the rollers. The extractor then presses on the shaft by means of a hydraulic cylinder and pulls the bearing out. The tight fit of the bearing inner ring must have been removed in advance, for example by the use of a hydraulic system for the oil pressure method.

The most frequent application for the extractor PULLER-SPECIAL-E is found in paper machinery.

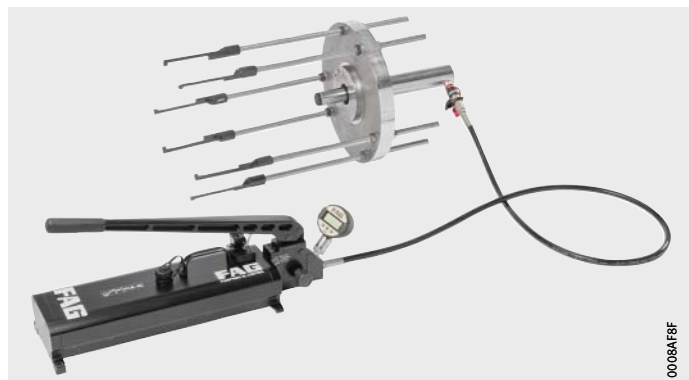
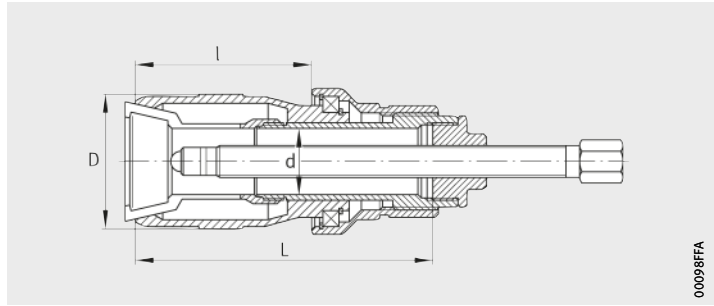


Figure 11
Special bearing extractor
PULLER-SPECIAL-E

Special bearing extractors

Base device
Extension



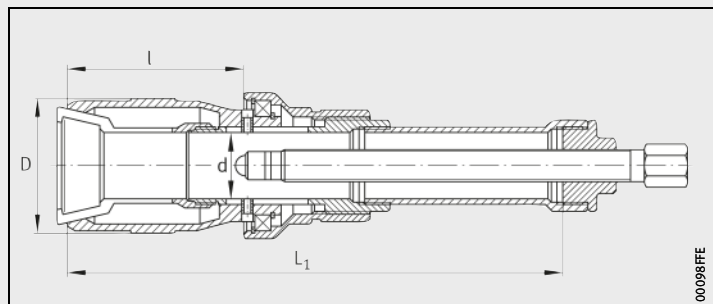
PULLER-SPECIAL
Base device with collet

00098FA

Dimension table - Dimensions in mm

Designation		Dimensions					Spindle thread	Mass
Base device	Extension	d	D	l	L	L ₁	G	m ≈ kg
PULLER-SPECIAL-BASIC10	-	10,5	26	62	95	-	M8×1,25	0,2
PULLER-SPECIAL-BASIC10	PULLER-SPECIAL-BASIC10.ADAPTER				-	165		0,06 ¹⁾
PULLER-SPECIAL-BASIC18	-	18	35	64	100	-	M14×1,5	0,4
PULLER-SPECIAL-BASIC18	PULLER-SPECIAL-BASIC18.ADAPTER				-	180		0,11 ¹⁾
PULLER-SPECIAL-BASIC30	-	30,5	60	78	135	-	M14×1,5	1,3
PULLER-SPECIAL-BASIC30	PULLER-SPECIAL-BASIC30.ADAPTER				-	235		0,21 ¹⁾
PULLER-SPECIAL-BASIC46	-	46	75	80	150	-	M20×2	2,5
PULLER-SPECIAL-BASIC46	PULLER-SPECIAL-BASIC46.ADAPTER				-	250		0,37 ¹⁾
PULLER-SPECIAL-BASIC66	-	66	100	92	170	-	M22×2	3,8
PULLER-SPECIAL-BASIC66	PULLER-SPECIAL-BASIC66.ADAPTER				-	270		0,6 ¹⁾
PULLER-SPECIAL-BASIC77	-	77	126	120	205	-	M30×2	6,7
PULLER-SPECIAL-BASIC77	PULLER-SPECIAL-BASIC77.ADAPTER				-	305		0,9 ¹⁾

¹⁾ Mass of extension PULLER-SPECIAL-BASIC..ADAPTER.



PULLER-SPECIAL
Base device with extension and collet

00098FE

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