Uhing Linear Drives®

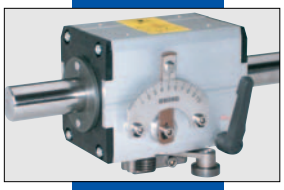
STATEWIDE LINEAR BEARINGS

Rolling Ring Drives RG / ARG RGK / ARGK KI / AKI

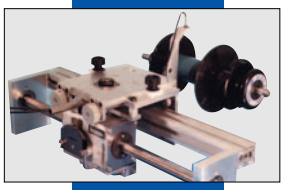
...made by UHING®

07 e 11/2006

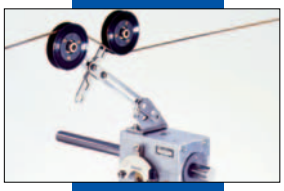
Uhing-Products



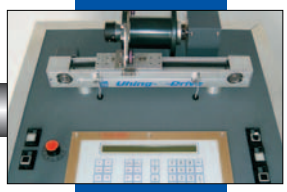
Rolling Ring Drives:
Catalog RG/RGK/KI



Non Contact Flange
Detecting System:
Catalog FA



Guide System:
Catalog GS



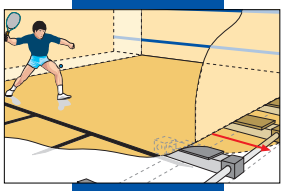
Electronic Winding
System: Manual EWS

Linear Drive Nut:
Catalog RS

Timing Belt Drive:
Catalog AZ

Fast Action Clamping
System easylock®:
Catalog UE

Smooth Shaft Fastener
U-Clip:
Catalog UE



Engineering:
Catalog EG

Joachim Uhing KG GmbH & Co - the originator of the Rolling Ring Principle - successful for over 50 years.

More about us at:
www.uhing.com

Our worldwide network of agencies guarantees a reliable service on the spot.

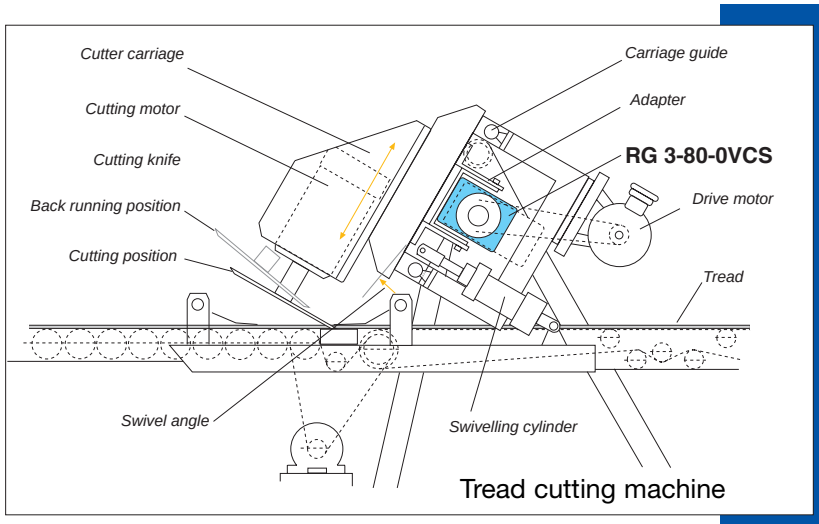
Summary of contents

UHING®

STATEWIDE LINEAR BEARINGS

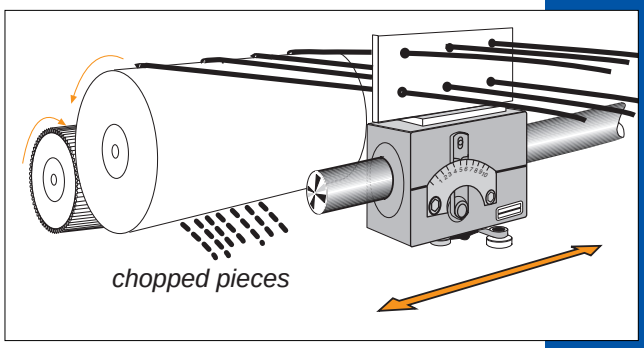
Range of Application for Rolling Ring Drives

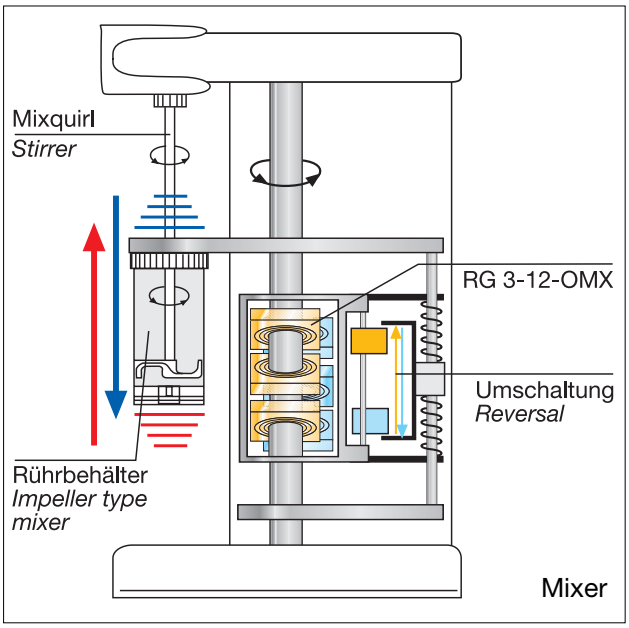
- Winding
- Drives
- Surface treatment
- Measuring and testing
- Materials handling
- Packaging
- Converting
- Tyre manufacture
- Feeds
- Positioning drives
- Power amplifiers (servo functions)
- Traverse drives for speeds up to 4,2 m/sec.
- Drives for synchronous cutting machines
- Sequential feed drives
- Special machines

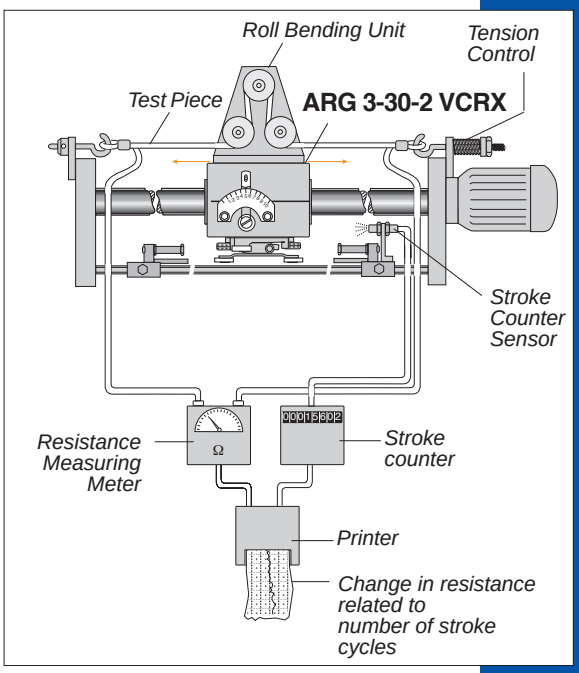


Tread cutting machine

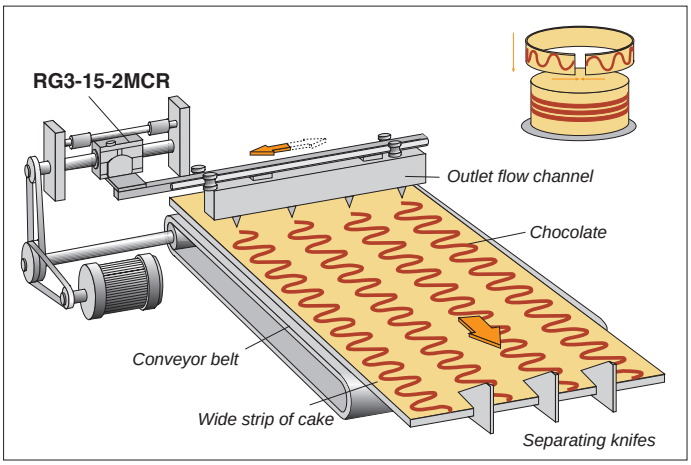
Glass fibre chopping machine





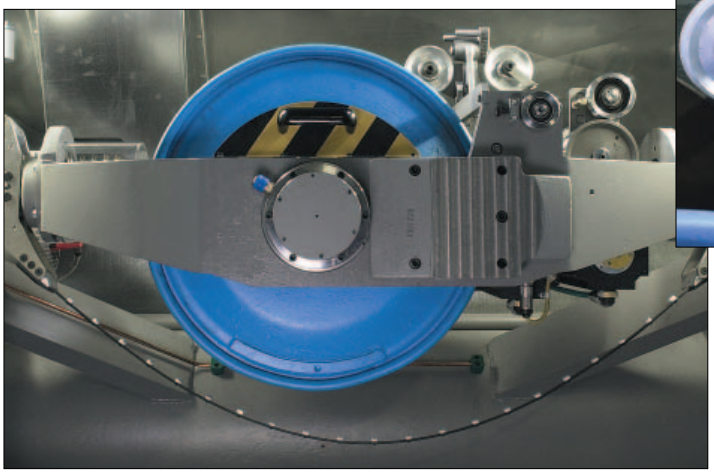


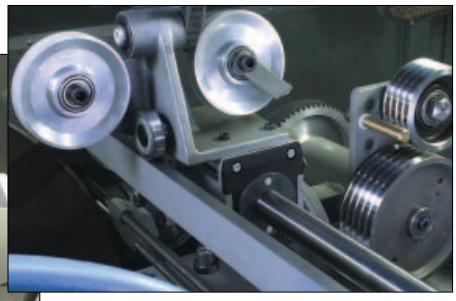
Continuous cable flex-testing equipment



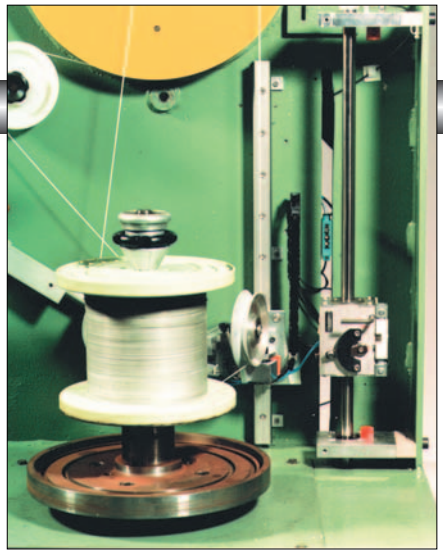
Production of tarts

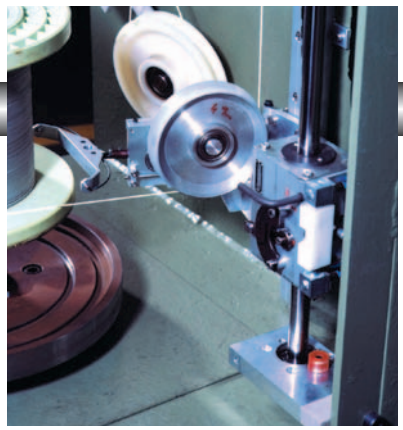
Applicational areas



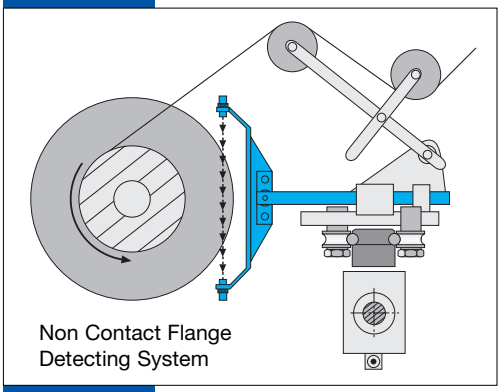


Buncher

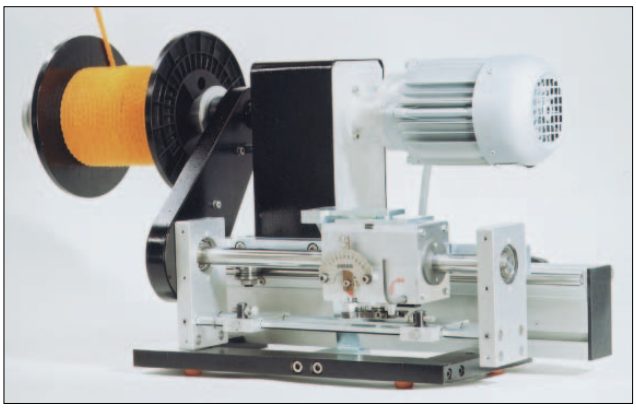




Non-contact flange detecting system with light barrier FA



Winding techniques



Winder „Moving Spool“-type

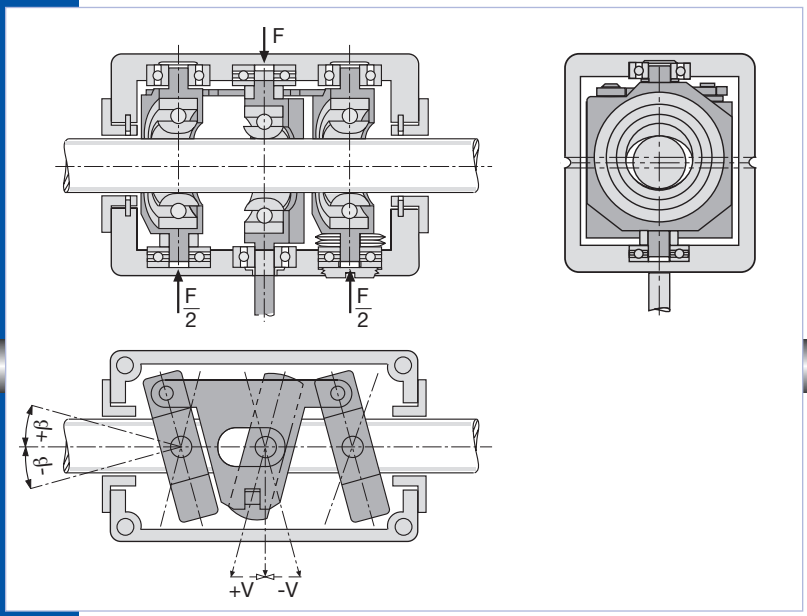
Function

Industrial Area	Coating	Feeding	Manipulating	Measuring/Testing	Opening/Closing	Positioning	Cleaning	Cutting/Parting	Spraying	Sequencing	Linking	Packing	Spreading	Winding	Mixing
Automation						●				●	●				
Automobile	●	●	●												
Baking Machinery								●					●		
Wire + Cable Industry				●										●	
Flat Glass/Mirrors	●								●						
Braiding Machinery														●	
Foil								●						●	
Hollow Glass Ware									●						
Varnishing	●								●						
Food Industry							●	●	●			●	●		
Paper/Cardboard	●			●				●							
Tyres				●				●						●	
Steel				●										●	
Textile									●				●	●	
Packaging	●				●	●				●	●	●		●	
Pharmacy															●

The Uhing Rolling Ring Principle

Rolling Ring Drives are friction drives which convert the constant rotation of a plain round shaft into reciprocating motion. They operate like nuts on a threaded bar, however the pitch both left-hand and right-hand is capable of fine adjustment or can be set at zero.

This effect is achieved by using ball bearing based Rolling Rings which are designed to pivot about the shaft, their specially crowned running surfaces being pressed against the shaft as it rotates.

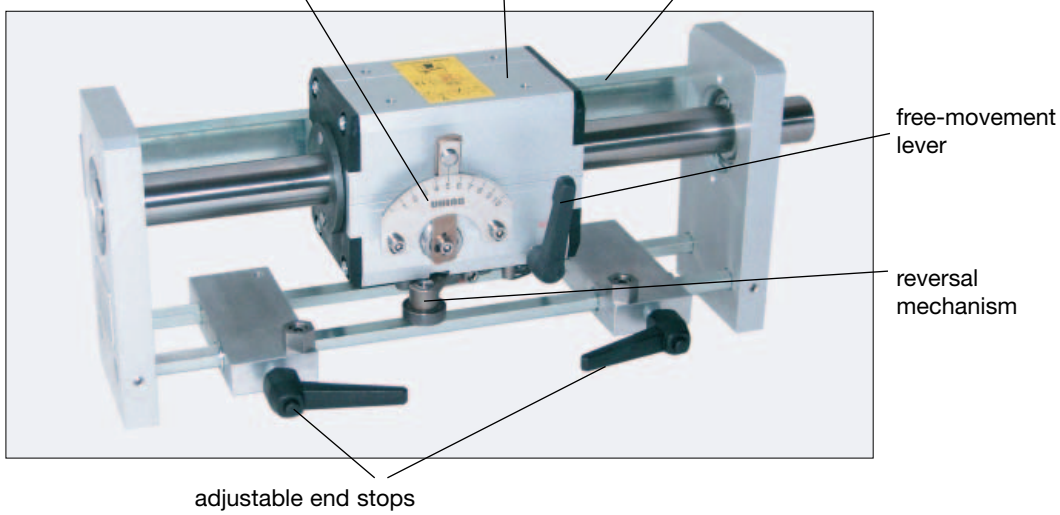


The main advantages of the Uhing Rolling Ring Principle:

- automatic reciprocating motion*
- variable adjustment of traverse speed up to 4,2 m/sec. max., also different for both directions*

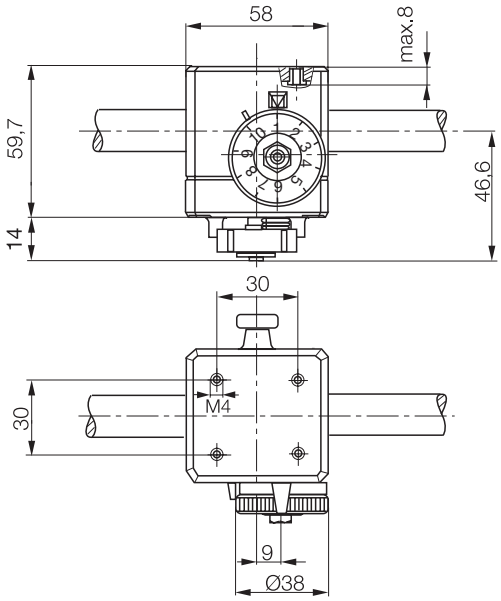
  * at constant speed and direction of shaft rotation
- variable adjustment of traverse length
- high dynamics at the reversal points
- free-movement lever
- low operating costs

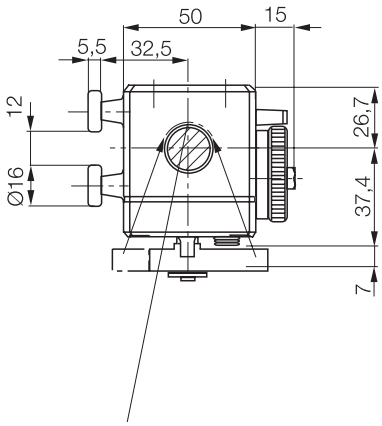
Example ARG 3-30-2 MCRF



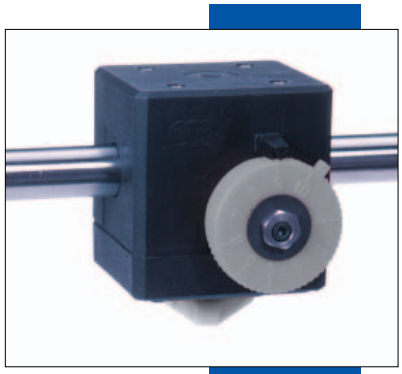
Uhing Rolling Ring Drive
Types KI und AKI

Type KI3-15-6MCR

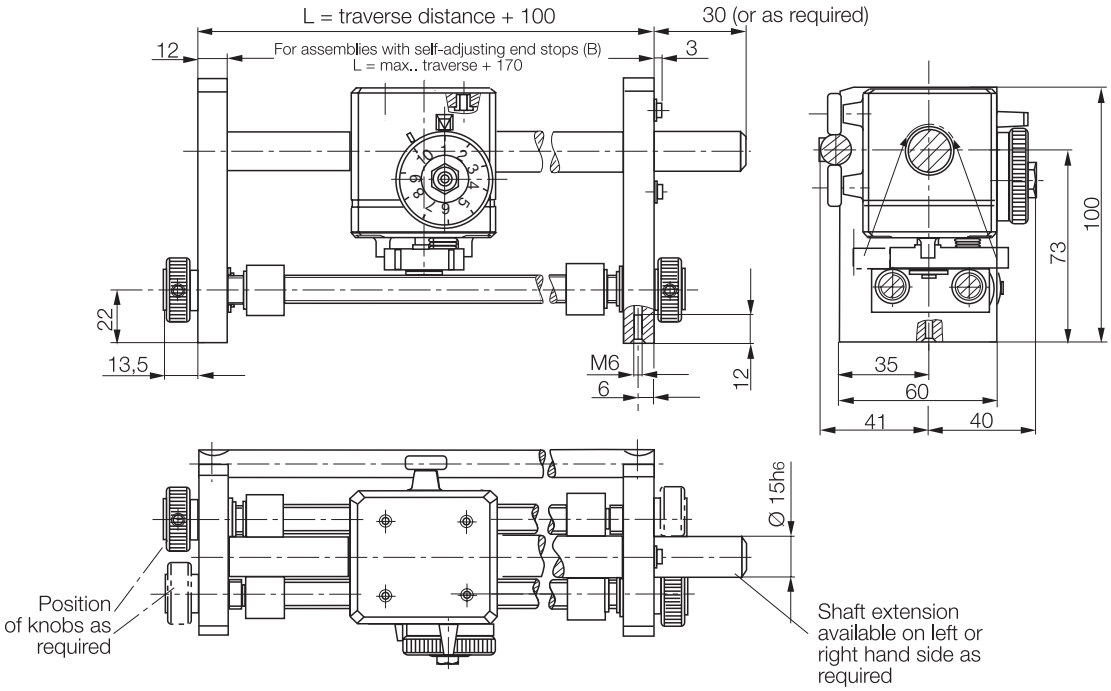




Direction of shaft rotation to be specified on order.



Type AKI3-15-6MCRW



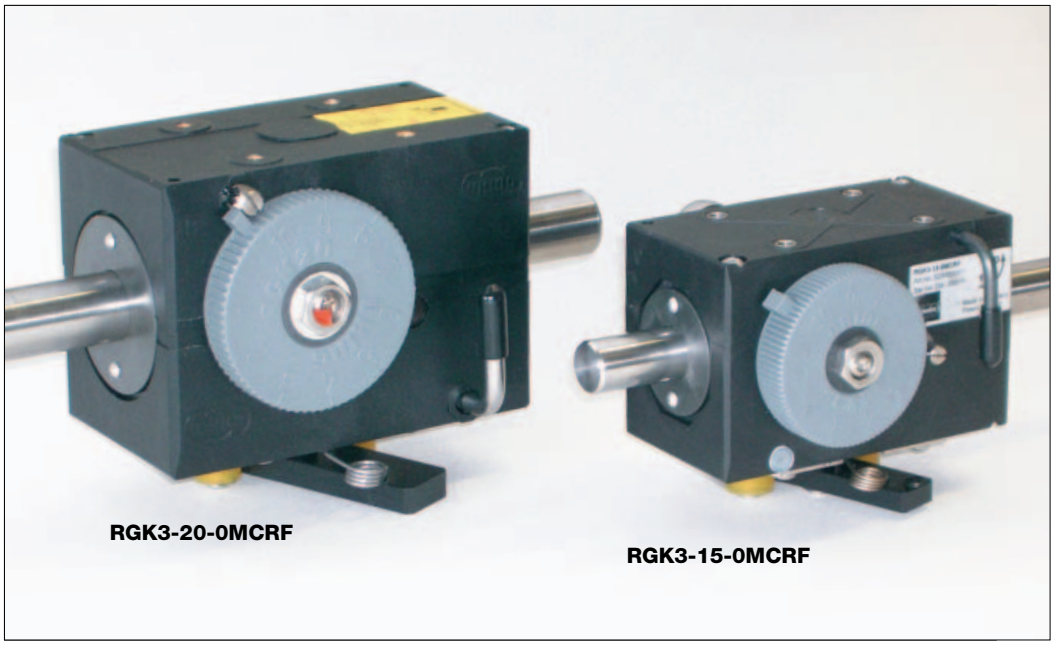
The CAD - drawings are available in the Internet in DXF - format.

Dimensions

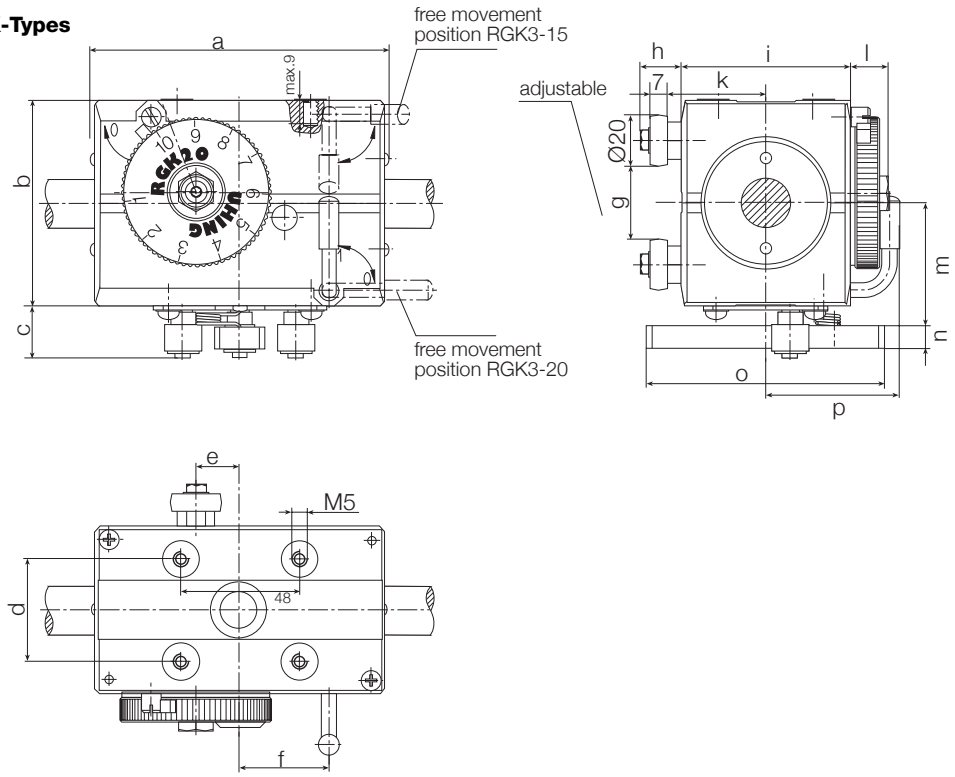
Type	Weight (kg)	Max. side thrust F_{RG} (N)	Drive torque M_0 (Ncm)	Max. pitch h (mm)
KI3-15-6 MCR	0,28	30	6±0,5	6,2

Dimensions and technical details

Uhing-Rolling Ring Drives
Types RGK und ARGK



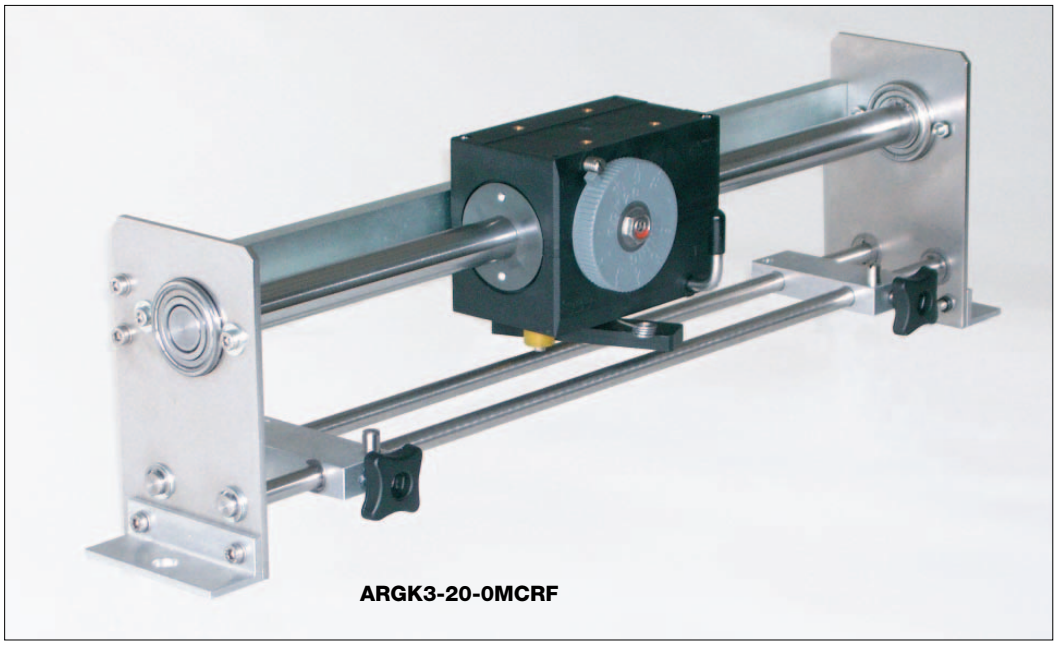
RGK-Types



The CAD - drawings are available
in the Internet in DXF - format.

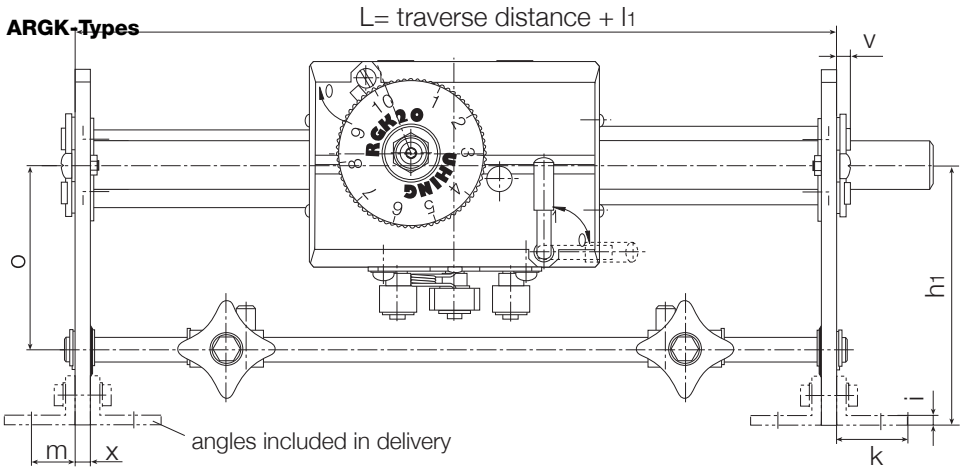
Dimensions

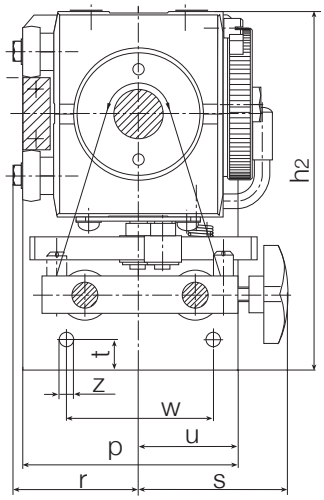
Types	weight (kg)	Side thrust F_{RG} (N)	Drive torque M_0 (Ncm)	Max. pitch h (mm)	Dimensions for RGK-Types a	b	c	d	e	f	g	h	i	k	l	m	n	o	p
RGK3-15-0	0,9	110 - 130	2,3	12,2	100	63	17	34	15	30	20	17,3	53	32,8	15,8	40,5	6	90	42,3
RGK3-20-0	0,9	110 - 130	2,3	12,2	120	84	21	42	18	36	32	17,5	68	40,5	15,5	52,5	8	90	54

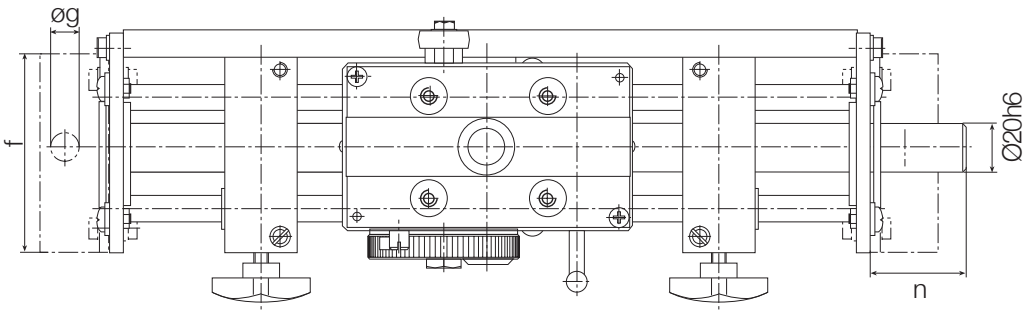


ARGK3-20-0MCRF

ARGK-Types





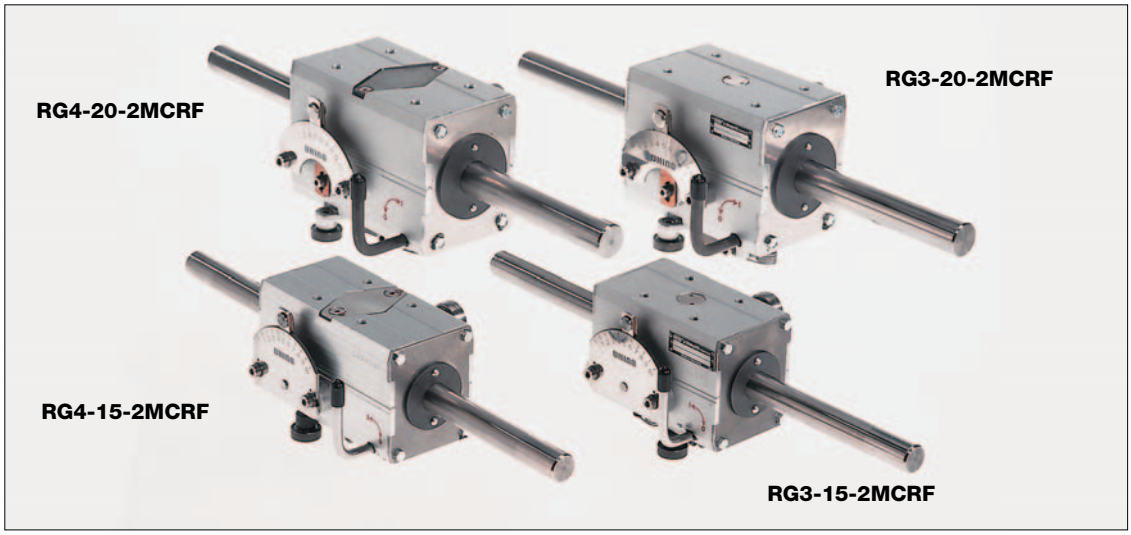


Additional dimensions for **ARGK-**Types (mm)

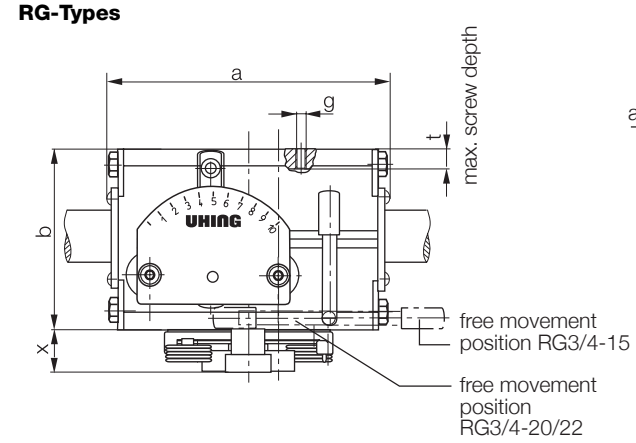
f	Øg	h1	h2	i	k	l1	m	n	o	p	r	s	t	u	v	w	x	z	L max
60	7	80	117	3	20	150	11	30	57	71	44	44	9	30	4	40	3	Ø 4,4	750
80	11	104	146	4	30	175	18	40	73,5	88	51,5	60,5	12	40	5	60	4	Ø 5,4	850

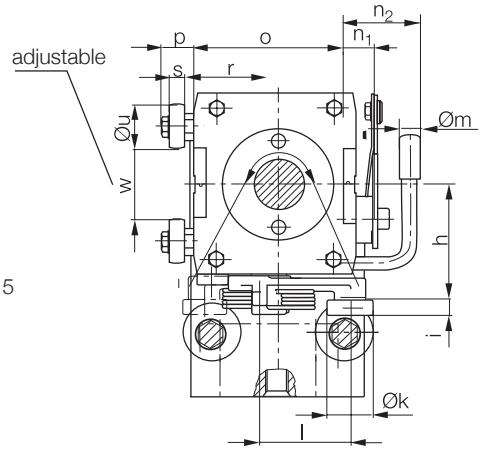
Dimensions and technical details

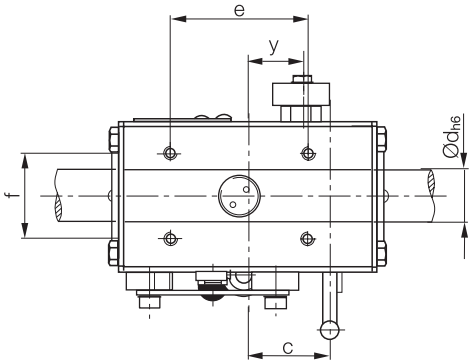
Uhing-Rolling Ring Drives
Types RG und ARG



RG-Types







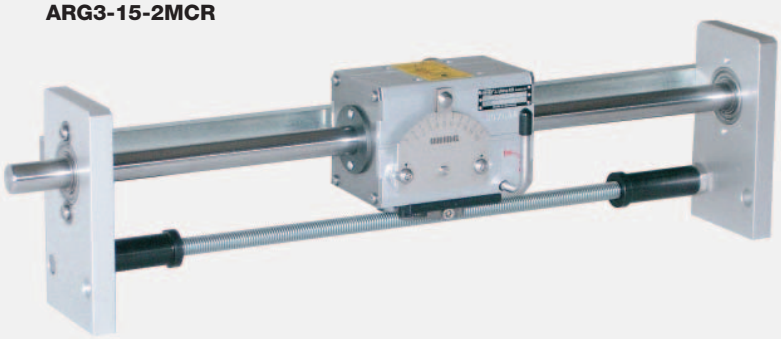
The CAD - drawings are available in the Internet in DXF - format.

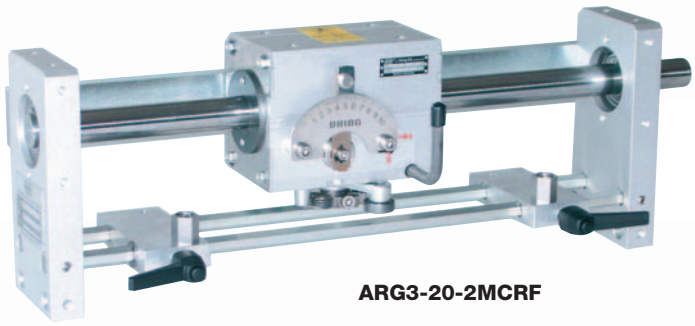
Dimensions

* RG3/4-20/22 with drive „light“ see page 10/11

Type	Weight (kg)	a	b	c	Ød$_{h6}$	e	f	g	h	i	Øk	l	Øm	n$_1$	n$_2$	o	p	r	s	t$_{max}$	Øu	w	x	y
		Dimensions for **RG**-Types (mm)																						
RG3-15-2MCRF	0,71	98	63	28,5	15	36	32	M5	41	5,5	16	25	7,4	12,5	24	53	16	32	7	6	20	$20^{+0.4}_{-2.4}$	15	19
RG4-15-2MCRF	0,86	115	”	38	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”
RG3-20-2MCRF *	1,33	119	84	37	20	70	40	M6	54	6	19	37	10	16	37,5	68	17,5	40,5	7	9,5	20	$32^{\pm0.4}$	21	21
RG4-20-2MCRF *	1,53	129	”	41,5	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	29
RG3-22-2MCRF *	1,33	119	84	37	22	70	40	M6	54	6	19	37	10	16	37,5	68	17,5	40,5	7	9,5	20	$32^{\pm0.4}$	21	21
RG4-22-2MCRF *	1,53	129	”	41,5	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	29

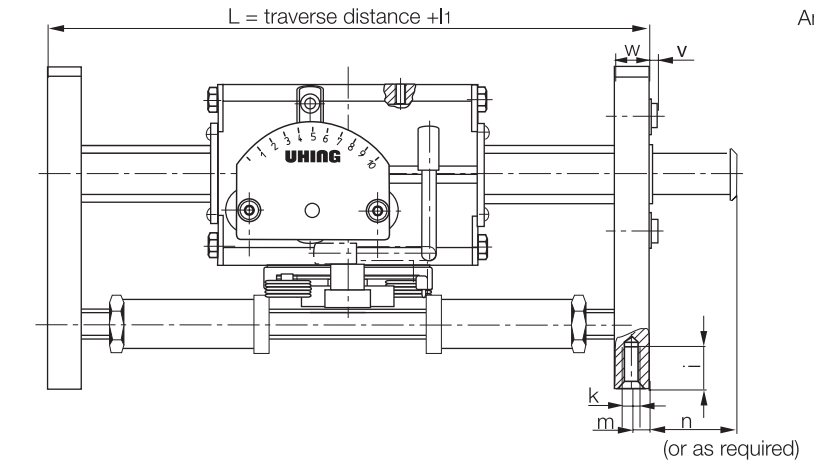
ARG3-15-2MCR

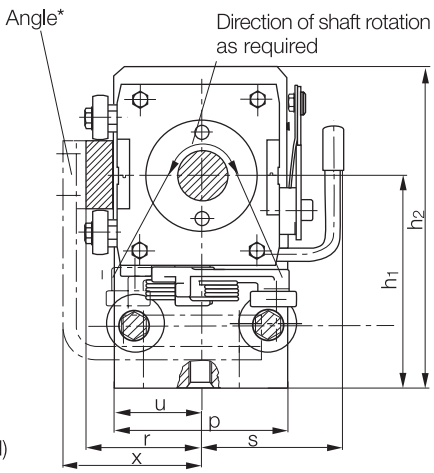


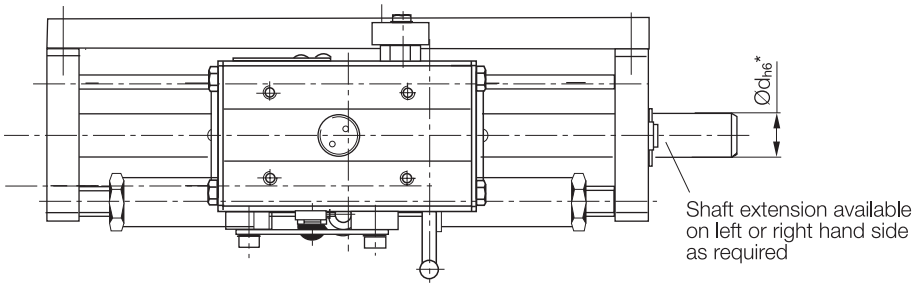


ARG3-20-2MCRF

ARG-Types







***Attention**
Shaft extension for ARG22 = Ø 20h_6

The CAD - drawings are available in the Internet in DXF - format.

l_1* = for specific features different dimensions are possible

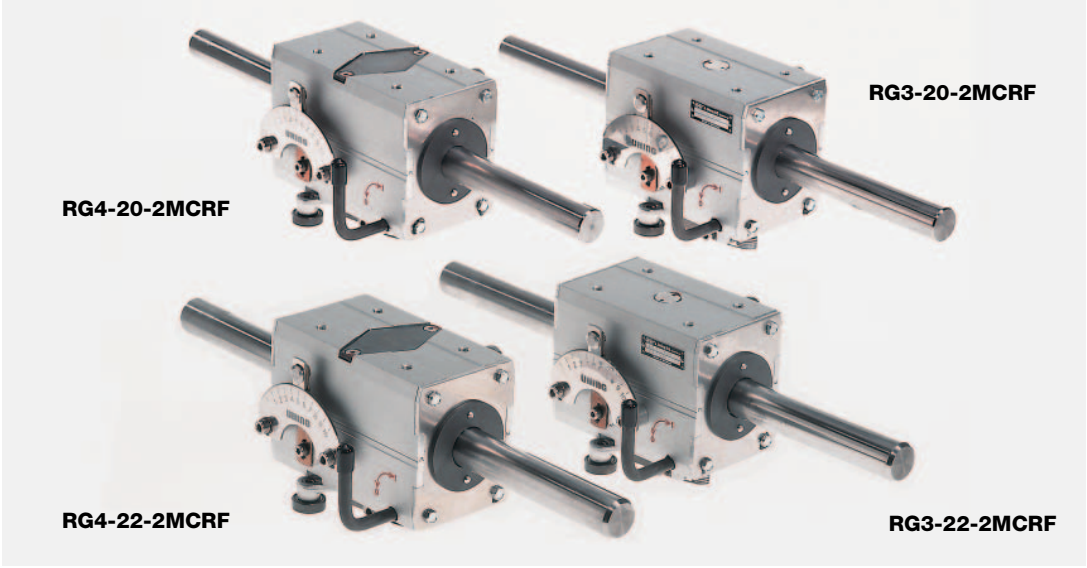
Additional dimensions for **ARG**-Types (mm)

Technical details (see page 20)

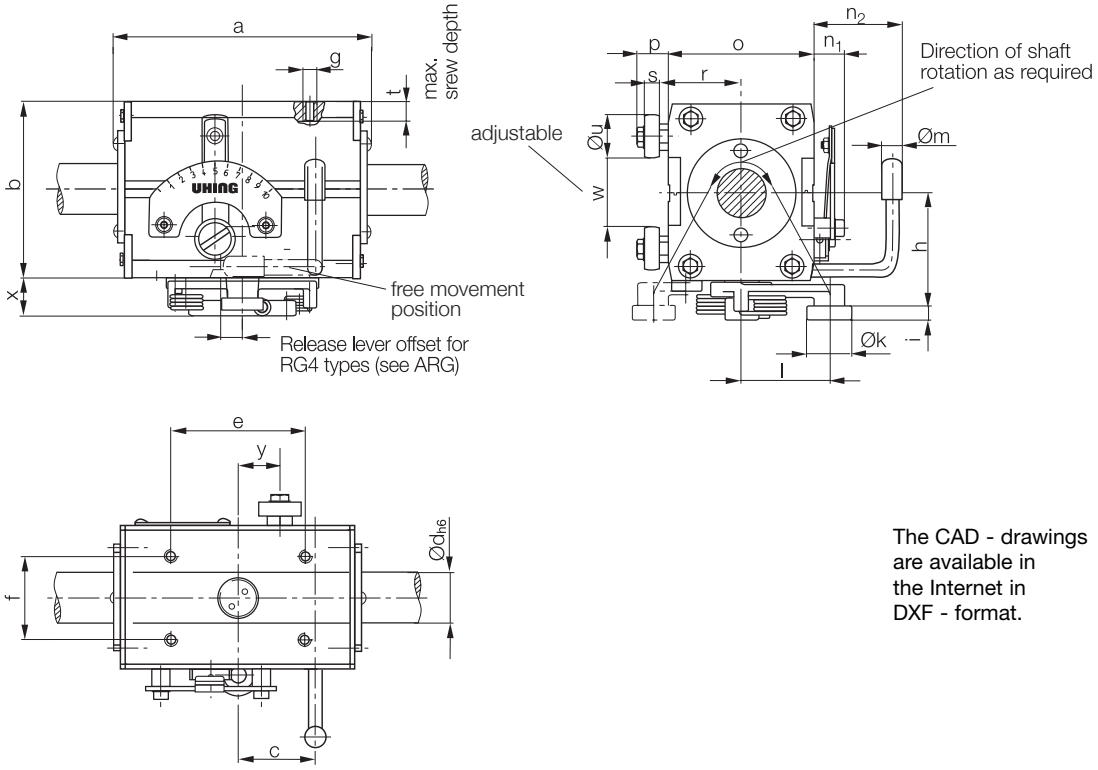
h_1	h_2	i	k	l_1*	m	n	p	r	s	u	v	w	x	y	* Angle for L ≥	F_{RG} (N)	M_0(Ncm)	h (mm)
75	112	20	M6	150	6	30	60	40		30	3	12	47	÷	750	110	2,5	11,4
”	”	”	”	180	”	”	”	”		”	”	”	”	9,5	”	220	4,8	”
104	146	24	M12	200	10	40	70	48	79	36	5,5	20	63	÷	850	160	2,5	15,9
”	”	”	”	210	”	”	”	”	”	”	”	”	”	11,5	”	320	5,1	15,7
104	146	24	M12	200	10	40	70	48	79	36	5,5	20	63	÷	850	160	2,5	17,2
”	”	”	”	210	”	”	”	”	”	”	”	”	”	11,5	”	320	5,1	17,0

Dimensions and technical details

Uhing-Rolling Ring Drives
Types RG und ARG



RG-Types



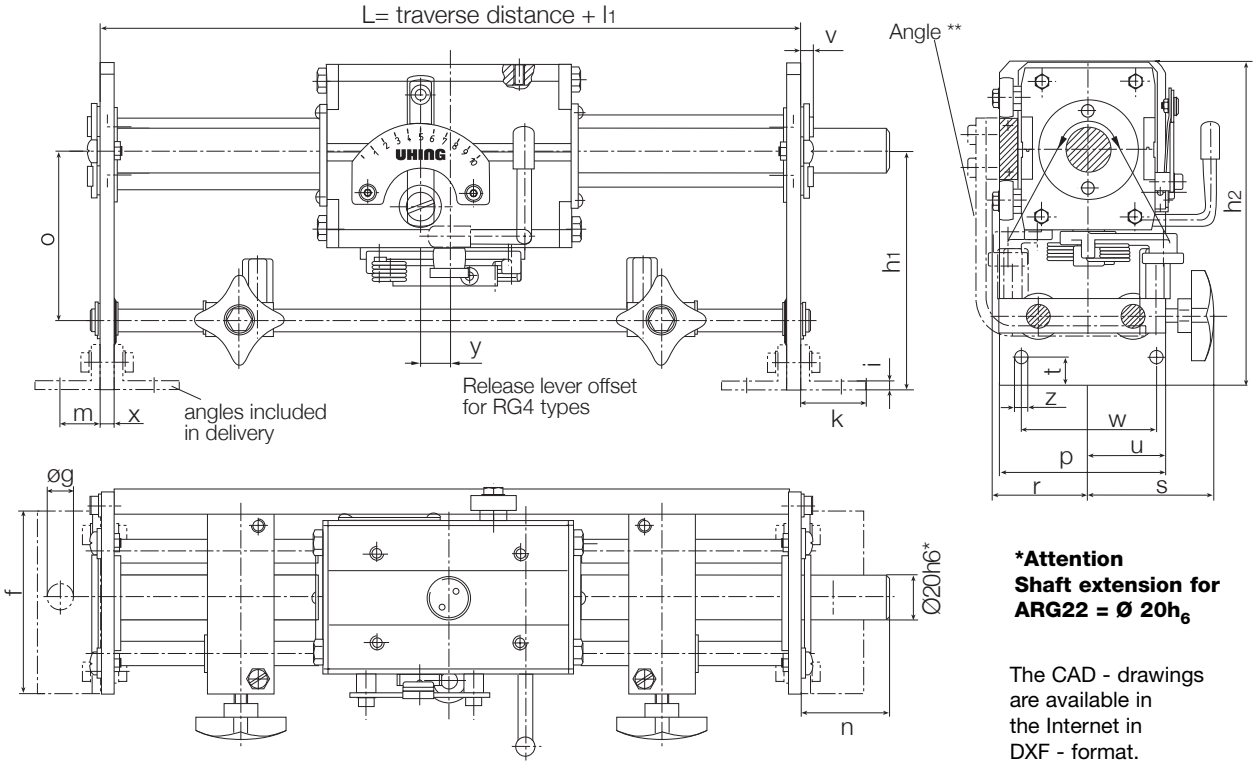
The CAD - drawings are available in the Internet in DXF - format.

Dimensions

Type	Weight (kg)	a	b	c	Ød$_{h6}$	e	f	g	h	i	Øk	l	Øm	n_1	n_2	o	p	r	s	t_{max}	Øu	w	x	y
			Dimensions for **RG**-Types (mm)																					
RG3-20-2MCRF	1,33	119	84	37	20	70	40	M6	54	6	19	37	10	16	37,5	68	17,5	40,5	7	9,5	20	32	$^{\pm 0.4}$21	21
RG4-20-2MCRF	1,53	129	"	41,5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	29
RG3-22-2MCRF	1,33	119	84	37	22	70	40	M6	54	6	19	37	10	16	37,5	68	17,5	40,5	7	9,5	20	32	$^{\pm 0.4}$21	21
RG4-22-2MCRF	1,53	129	"	41,5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	29

ARGL3-20-2MCRF „light“

ARGL-Types



***Attention**
Shaft extension for
ARG22 = Ø 20h$_6$

The CAD - drawings are available in the Internet in DXF - format.

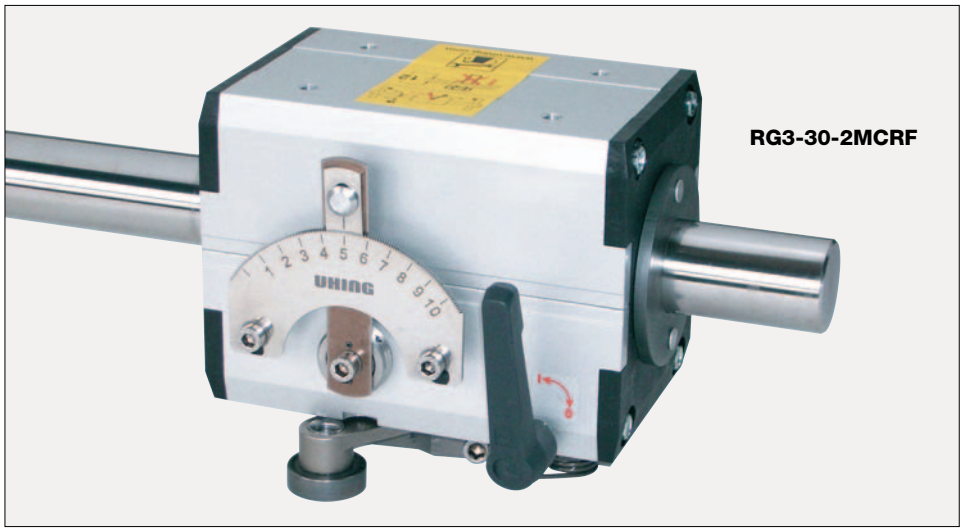
l_1* = for specific features different dimensions are possible

Additional dimensions for **ARGL-**Types **MCRF** (mm)

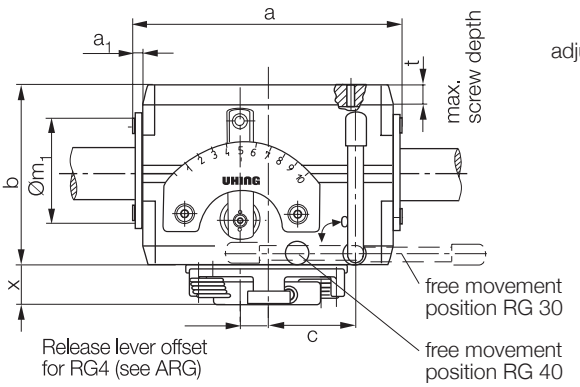
Technical details (see page 20)

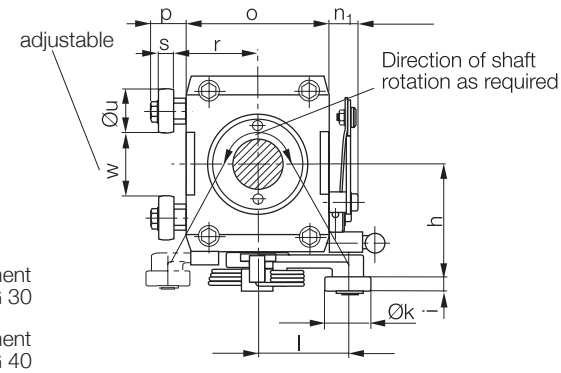
f	Øg	h1	h2	i	k	l1*	m	n	o	p	r	s	t	u	v	w	x	y	z	** Angle for L ≥	F_{RG} (N)	M_0(Ncm)	h (mm)
80	11	104	146	4	30	200	18	40	73,5	88	51,5	60,5	12	40	5	60	4	11,5	ø 5,4	850	160	2,5	15,9
“	“	“	“	“	“	210	“	“	“	“	“	“	“	“	“	“	“	“		”	320	5,1	15,7
80	11	104	146	4	30	200	18	40	73,5	88	51,5	60,5	12	40	5	60	4	11,5	ø 5,4	850	160	2,5	17,2
“	“	“	“	“	“	210	“	“	“	“	“	“	“	“	“	“	“	“		”	320	5,1	17,0

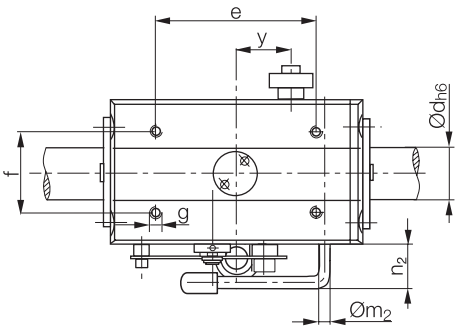
Uhing-Rolling Ring Drives
Types RG und ARG



RG-Types



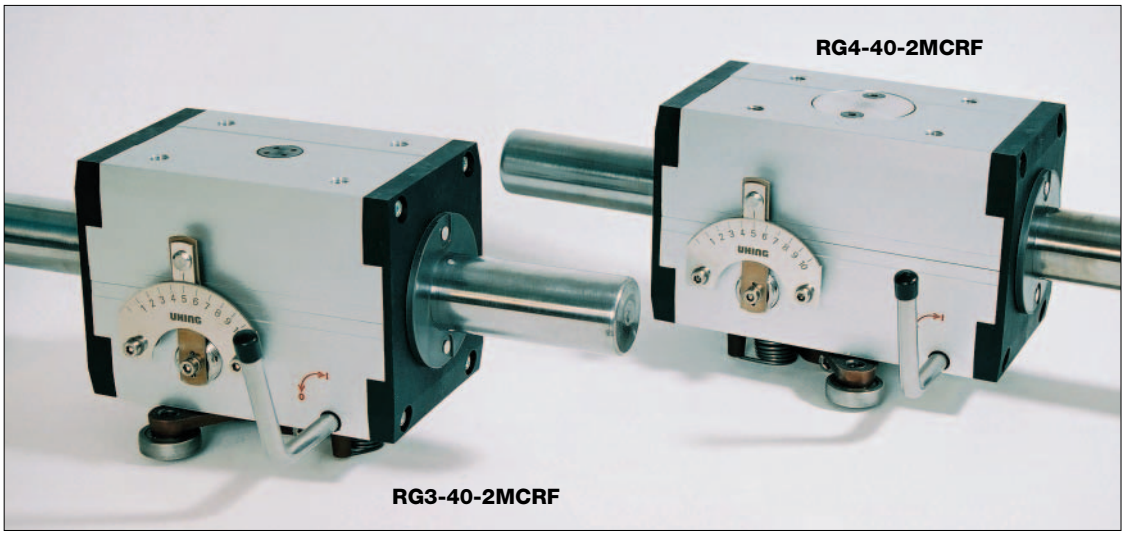




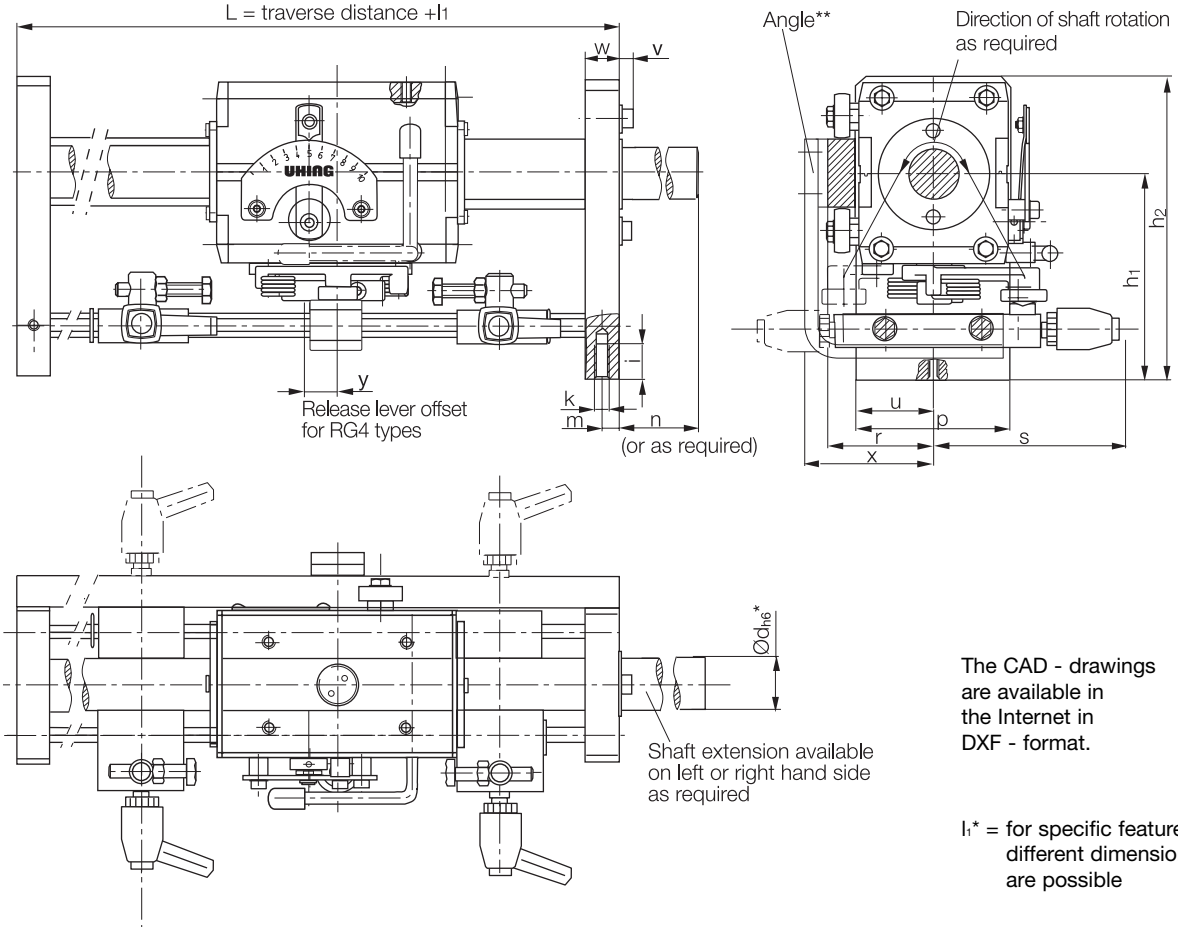
The CAD - drawings are available in the Internet in DXF - format.

Dimensions

Types	Weight (kg)	a	a1	b	c	Ød h6	e	f	g	h	i	Øk	l	Øm1	Øm2	n1	n2	o	p	r	s	tmax	Øu	w	x	y
	Dimensions for **RG**-Types (mm)																									
RG3-30-2MCRF	2,7	150	5	105	43	30	80	50	M6	67,5	8	26	52	64	8	17	41,5	86	18	49	8	12	26	$40^{\pm 0,6}$	23	25
RG4-30-2MCRF	3,2	180	"	"	58	"	"	"	"	"	"	"	"	"	"	"	41,5	"	"	"	8	"	"	"	"	40
RG3-40-2MCRF	4,4	182	4	128	51	40	100	68	M10	76	9	32	70	80	10	17	67,5	110	20	61	9	12	32	$50^{\pm 0,5}$	25,5	25
RG4-40-2MCRF	5,3	210	"	"	67	"	"	"	"	"	"	"	"	"	"	17	"	"	"	"	"	"	"	"	"	41



ARG-Types



The CAD - drawings are available in the Internet in DXF - format.

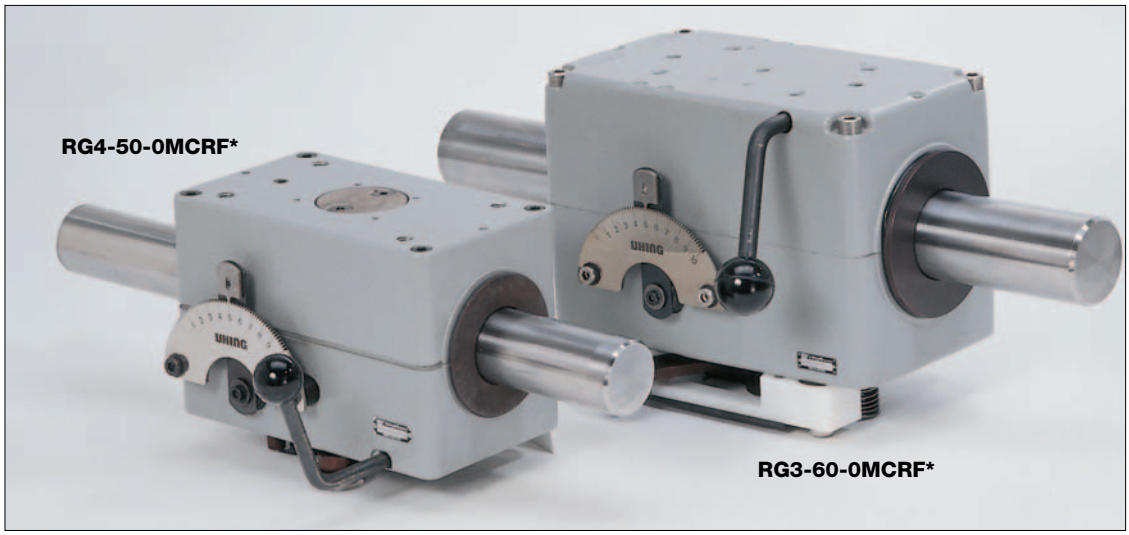
l_1* = for specific features different dimensions are possible

Additional dimensions for **ARG**-Types (mm)

h_1	h_2	i	k	l_1*	m	n	p	r	s	u	v	w	x	y	** Angle for L ≥	Technical details (see page 20) F_{RG} (N)	M_0(Ncm)	h (mm)
120	175	25	M12	240	10	60	89	61	107	45	7	20	75	~	940	260/400	8/10,2	26
”	”	”	”	280	”	”	”	”	107	”	”	”	”	15	”	520	12	26
150	220	32	M16	320	15	80	114	77	126	57	6,5	30	104		1100	420	28	33
”	”	”	”	350	”	”	”	”	126	”	”	”	”	16	”	840	50	33

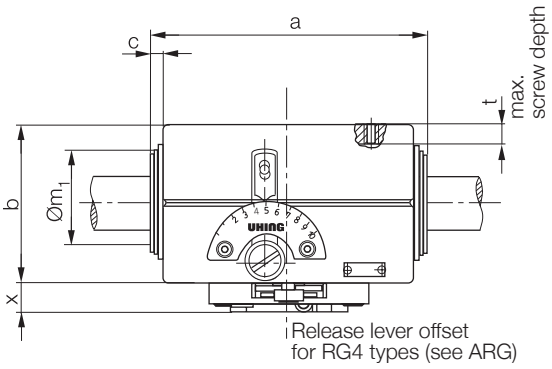
Dimensions and technical details

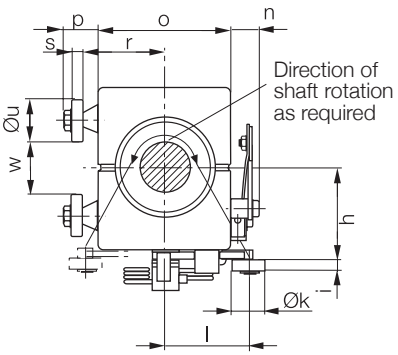
Uhing-Rolling Ring Drives
Types RG und ARG

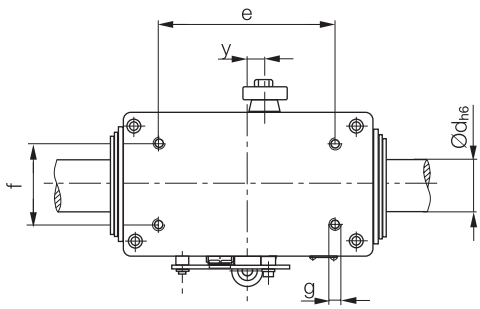


* F = Special Feature

RG-Types



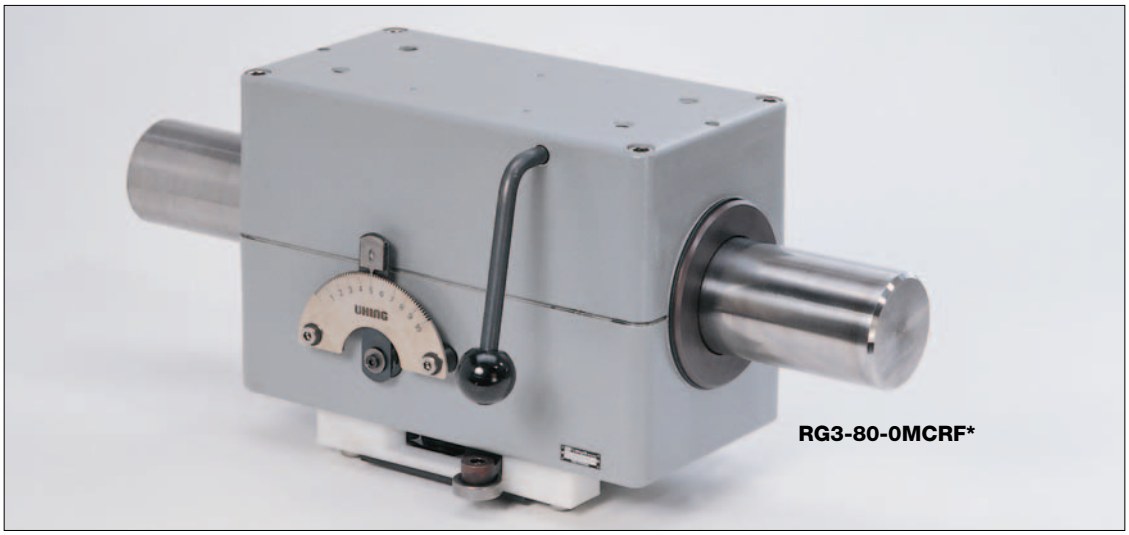




The CAD - drawings are available in the Internet in DXF - format.

Dimensions

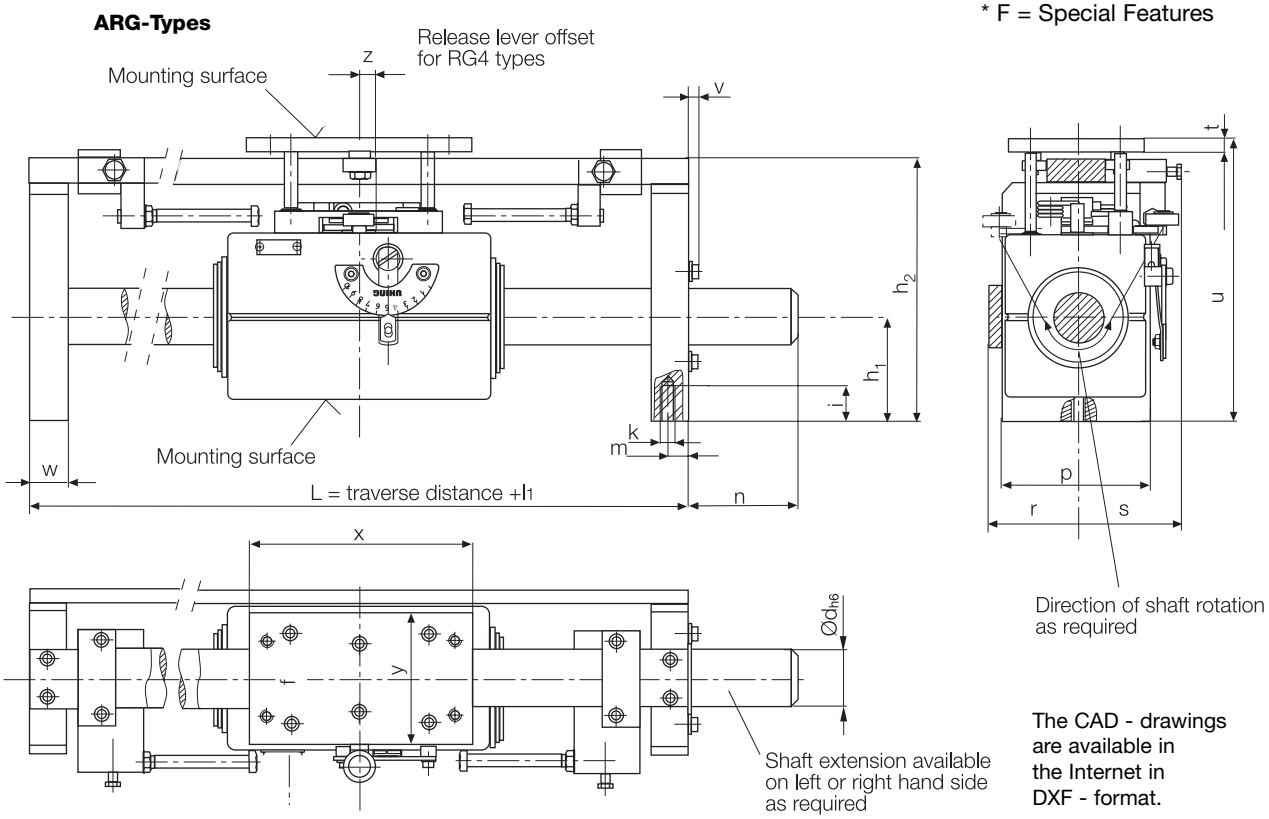
Type	Weight (kg)	a	b	c	Ød$_{h6}$	e	f	g	h	i	Øk	l	Øm	n	o	p	r	s	t$_{max}$	Øu	w	x	y
		Dimensions for **RG**-Types (mm)																					
RG3-50-0MCR	9,8	240	154	6	50	160	90	M12	89,5	9	32	70	96	23	132	35	74	18	15	32	65	25,5	5
RG4-50-0MCR	11,1	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”
RG3-60-0MCR	17,0	297	190	9,5	60	120	80	M12	109	10	35	114	114	26	160	32	83	20	15	35	100	40	51
RG4-60-0MCR	19,6	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”
RG3-80-0MCR	27,0	368	236	8,5	80	240	80	M12	132	10	35	114	130	23	188	41	103	20,6	19	52	92	40	./.
RG4-80-0MCR	32,0	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”



RG3-80-0MCRF*

* F = Special Features

ARG-Types



The CAD - drawings are available in the Internet in DXF - format.

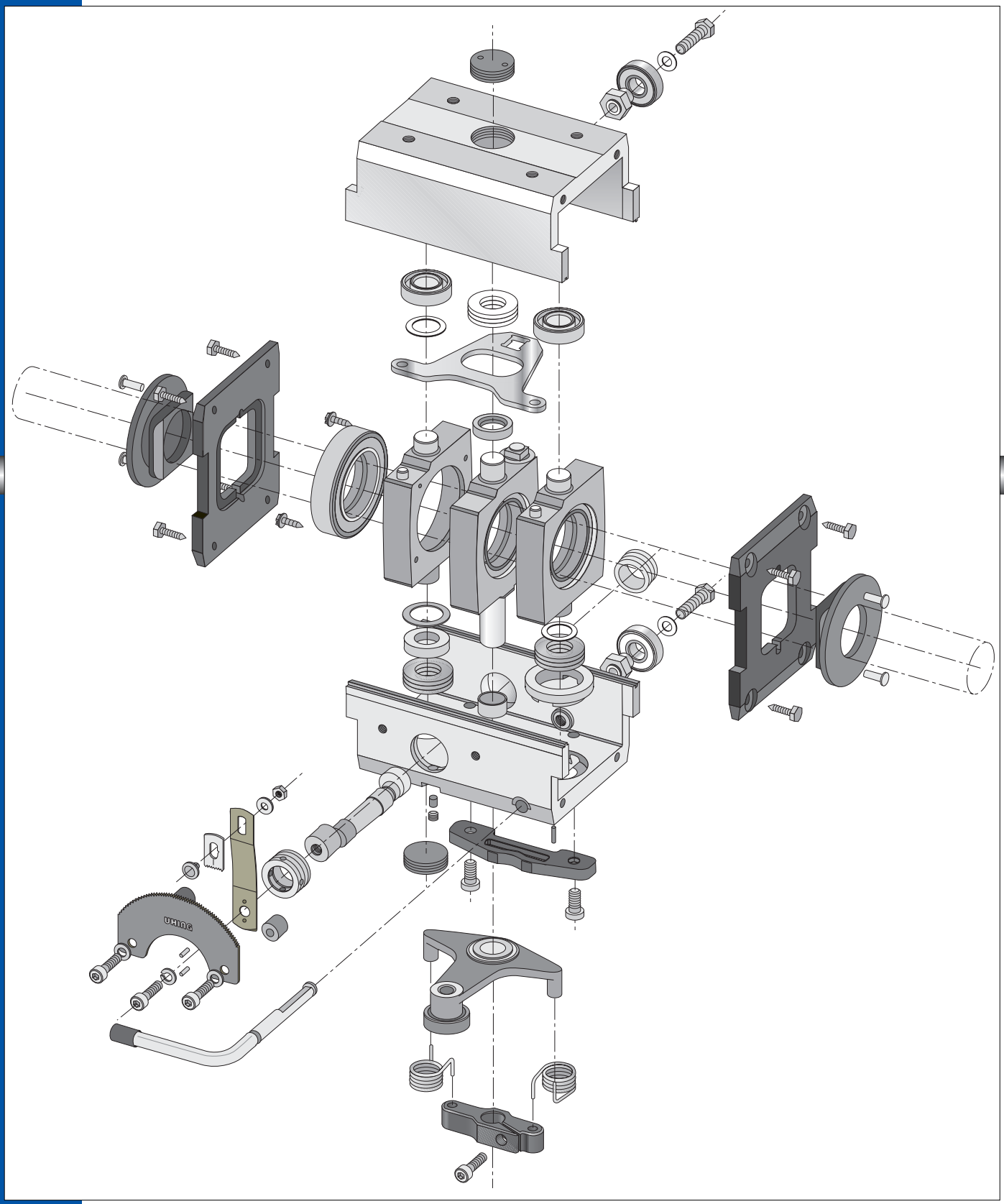
l_1* = for specific features different dimensions are possible

Additional dimensions for **ARG**-Types (mm)

MCR1	h_1	h_2	i	k	l_1*	m	n	p	r	s	t	u	v	w	x	y	z	Heavy duty steady bar for L	Technical details (see page 20) F_{RG} (N)	M_0(Ncm)	h (mm)
12,3	91	235	32	M16	460	16	100	150	95	81	12	256	9	38	190	130	÷	≤ 2000	700	70	41
		250							100[1]			271						> 2000			
13,6	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	18	”	1400	120	41
19,6	140	330	35	M16	580	25	120	170	115	138	15	352	8	48	300	180	÷	≤ 3000	1000	90	49
		340										362						> 3000			
22,2	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	22,5	”	2000	150	49
29,6	140	350	35	M16	620	25	150	200	130	138	15	375	8	48	300	180	÷	≤ 3600	1800	300	76
		380										405						> 3600			
34,6	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	”	30	”	3600	350	76

Exploded view of a typical Rolling Ring Drive Unit

RG3



Product Survey

	Uhing Linear Drives®										
Product Group	**Rolling Ring Drive**										**Kinemax**
Type Reference	**RG** page 10 - 16								**RGK** p. 8		**KI** page 7
	ARG page 11 -17								**ARGK** p.9		**AKI** page 7
Style Number of rolling rings	3 or 4								3		3
Size Shaft diameter	15	20	22	30	40	50	60	80	15	20	15
Design Category	2	2	2	2	2	0	0	0	0	0	6
Direction of rotation **Pitch** L = left R = right	L, R								inde-pendent		L, R
Features	see page 23 - 25								s. page 23-25		
Customer Specific Features	see page 25								wipers		see page 25
Pitch max. (mm)	11,4	15,9	17,2	26	33	41	49	76	8,5	12,2	6,2

Example of Ordering Specification

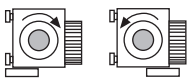
Type Reference	**RG, ARG, ARGL** *(„light"-Antrieb)* **RGK, ARGK, KI, AKI**										
Example	**RG**	**3**	**-**	**30**	**-**	**2**	**M**	**C**	**R**	**F**	**X**
Type Reference	●										
Style		●									
Seperator Symbol			●		●						
Size				●							
Design Category						●					
Features							●	●	●	●	
Customer Specific Features *											●

* **X** e.g. Adapter (twist-free coupling), intermediate support bracket, heavy duty steady bar, drive motor, wipers, special paint finish, additional anti-corrosion protection, double bearing support, special pitch, noise dampening, sequence control, etc.

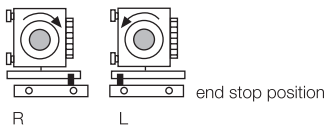
The following is further required:

Direction of shaft rotation
to the right = R
to the left = L

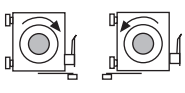
KI / AKI



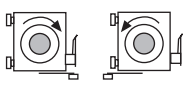
RGK / ARGK



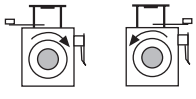
RG15 to **RG80**



ARG15 to **ARG40**

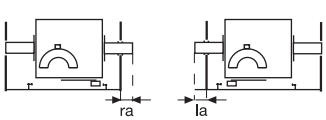


ARG50 to **ARG80**

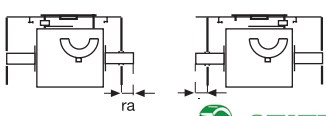


Shaft extension,
diameter and length (mm)
ra = extending beyond the <u>righthand</u> bracket when looking at the pitch selection scale
la = extending beyond the <u>lefthand</u> bracket when looking at the pitch selection scale

for **ARG15** to **ARG40** and **ARGK**



for **ARG50** to **ARG80**



1. Formulae and related units

$a(m/sec^2)$ = acceleration at the reversal point

d(mm) = shaft diameter

F(N) = side thrust required

$F_{RG}(N)$ = side thrust produced by Rolling Ring Drive Unit

$F_R(N)$ = friction ($F_N \cdot \mu$) only relevant when the associated mass is mounted on its own independent carriage

$F_N(N)$ = normal force of total weight of associated mass and carriage

μ = coefficent of friction

$F_Z(N)$ = additional force e.g. component of the cutting force of a separator

f(mm) = shaft sag from Fig.1

$g(m/sec^2)$ = acceleration due to gravity ($9{,}81 m/sec^2$)

h(mm) = pitch of unit (travel per shaft revolution)

$h_{max}(mm)$ = maximum pitch see Fig.3

l(mm) = length of shaft between centres of bearing brackets

m(kg) = total mass to be moved, including the Rolling Ring Drive Unit, connections etc.

Md (Ncm) = drive torque

Mo (Ncm) = idling torque

n(r.p.m.) = shaft speed

n_{crit}(r.p.m.) = critical shaft speed

P(kW) = drive power required

s(mm) = length of reversal slowdown cam

t(sec) = reversal time from Fig.2

v(m/sec) = max. traverse speed required. Should always be calculated at maximum unit pitch (pitch setting 10 from Fig.2)

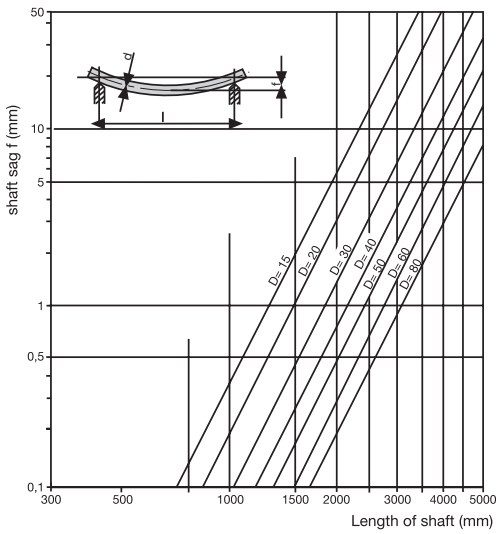
C(N) = dynamic loading of Rolling Rings

$P_R(N)$ = radial loading of Rolling Rings

2. Preselection

A unit should be preselected by estimating the side thrust required and/or giving consideration to the permissible shaft sag f with reference to Fig. 1

Fig. 1



2.1. Rolling Ring Drive Units with Instantaneous Reversal (Feature M)

Only suitable for traverse speeds up to approx. 0.25 m/sec.
(Kinemax up to approx. 0.4 m/s; RG40-2 up to 0.6 m/s)

The reversal time t is dependent on the size of the Rolling Ring Unit and the pitch selected via the scale (pitch angle). The reversal action is of the triggered throwover type.

$$F = 2.5 \frac{m \cdot v}{t} + F_R + F_Z + 1.25 \cdot m \cdot g + (F_k)^*$$

*see section 6 - Winding Applications

Note:
The value of side trust F calculated must be less than that of the Rolling Ring Drive Unit selected.
$F < F_{RG}$

If necessary, select a different size of unit and repeat the process.
For winding applications please also refer to section 6.

2.2 Rolling Ring Drive Units with Reversal Slowdown (Feature V)

Suitable for traverse speeds up to approx. 4,2 m/sec.
A reversal with slowdown reduces the forces imposed on the unit at the reversal point.

$$F = 1.25 \cdot m \cdot a + F_R + F_Z + 1.25 \cdot m \cdot g$$

If a maximum rate of acceleration a is specified, the required length s for the delay cam is calculated as follows:

$$s = \frac{v^2 \cdot 10^3}{a}$$

If the delay cam length s is specified, the acceleration a is calculated as follows:

$$a = \frac{v^2 \cdot 10^3}{s}$$

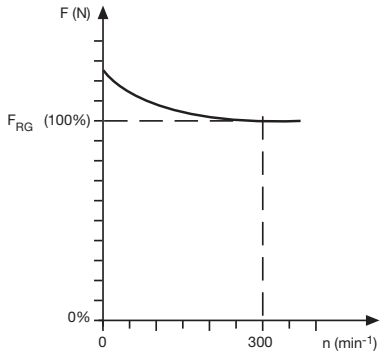
3. Side Thrust

The value of side thrust F calculated must be less than that of the Rolling Ring Drive Unit selected.
$F < F_{RG}$

If the side thrust available from the unit chosen is too little, either a larger unit or a longer length of delay must be selected.

The thrust provided by the units is virtually constant for shaft speeds above 300 rpm. For slower speeds the thrust increases a little over the specified catalogue values as the speed reduces towards zero.

For increase of lifetime there should only be adjusted the side thrust which is needed as a result of calculation according to 2.1 and 2.2



Change in side thrust related to shaft speed

4. Shaft Speed

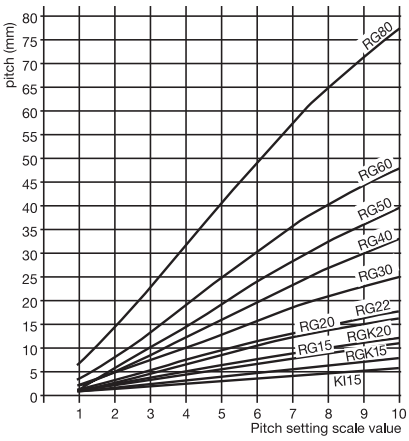
4.1. Calculation

$$n = \frac{v \cdot 6 \cdot 10^4}{h_{max}}$$

The speed so calculated must not be exceeded.
Recommended speed range:
n_{min} = 10 rpm.
n_{max} = 3000 rpm.
For speeds outside this range, please consult supplier.
The pitch h is obtained by taking the 10 setting value for the pitch selection scale and relating it to the graph for the appropriate unit size. (Fig. 3)

Minimum reversal distance:
Feature **M** (see Page 19) ≈ 1 x d
Feature **E**+**N** (see Page 19) = 0

Fig. 3



4.2. Critical Shaft Speed

$$n_{crit} = 1{,}225 \cdot 10^8 \frac{d}{l^2}$$

Note:
Depending upon its quality, the shaft can go out of balance at a speed of up to 25 % lower than that specified above.
If it is necessary to go through a critical range in order to reach the operational speed, this can lead to short term shaft vibration. This has no effect on the operation of the drive.
If the operational speed is in the critical speed range, this can be rectified as follows:
1. with a double bearing support at one end:
Increase factor approx. 1.5.
2. with double bearing supports at both ends:
Increase factor approx. 2.2.
The distance between the bearing support brackets should be at least 2.5 x the diameter of the shaft.

5. Shaft Drive

5.1. Drive Torque

$$Md = \frac{F_{RG} \cdot h_{max}}{20 \cdot \pi} + Mo$$

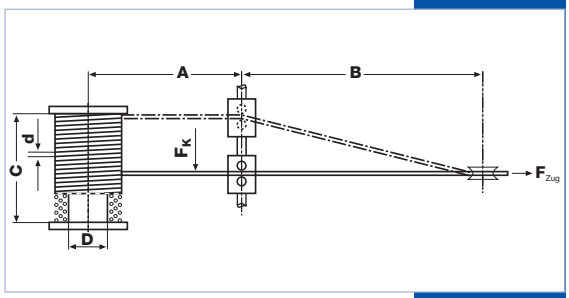
Value for Mo to be taken from the technical data section.

5.2. Drive Power Requirement

$$P = \frac{Md \cdot n}{9550 \cdot 10^2}$$

6. Winding Applications

6.1. Formulae and related units



B(mm) = distance between previous pay-off
C(mm) = traverse width
D(mm) = barrel diameter of bobbin
d_{max}(mm) = maximum diameter of material to be wound or maximum pitch
F_{Zug}(N) = tension in the material to be wound
F_K(N) = component of force working against the direction of travel of the traverse
h_{max}(mm) = max. pitch of unit selected, taken from the technical data section
v_w(m/sec) = winding line speed

6.2. Tension

In winding operations, the force F_K acting on the traverse and related to the tension F_{Zug} in the material to be wound, is a major factor in the selection of a Rolling Ring Traverse

$$F_K = \frac{C \cdot F_{Zug}}{1{,}6 \cdot \sqrt{\frac{C^2}{4} + B^2}}$$

As, almost invariably, traverses with instantaneous reversal are used for winding applications, the value calculated for F_K must be added to the side thrust required figure taken from section 2.1.

6.3. Calculation of Traverse Speed

$$v = \frac{v_w \cdot d_{max}}{D \cdot \pi \cdot 0{,}95}$$

6.4. Optimum Ratio between Spool Shaft and Traverse Shaft Speeds

$$i_{opt} = 0{,}95 \frac{h_{max}}{d_{max}}$$

$i_{opt} > 1$ = traverse shaft slower
$i_{opt} < 1$ = traverse shaft faster
Formulae see 6.1.

6.5. Please note

Pitch settings lower than "1" on the scale should be avoided if the requirement is for a high quality of wind. Compensate by changing the ratio between the spool shaft and traverse shaft speeds. (Reduce traverse shaft speed).

7. Calculation of the Operational life of Uhing Rolling Rings

1. C Determine a value for

Type RG	C_1(N)	C_2(N)
15/KI	6 050	2 800
20/22/RGK	11 200	5 600
30	16 800	9 300
40	21 600	13 200
50	29 600	18 300
60	37 700	24 500
80	58 800	39 000

C_1 = Unit operating continuously on rotating shaft without a standstill
C_2 = Unit operating continuously and including a standstill on a rotating shaft

2. Calculate P_R
KI, RGK and all RG3-types:
$P_R = 5 \cdot F_{RG}$*
all RG 4-types: $P_R = 2.5 \cdot F_{RG}$*
*F = calculated value of the side thrust according to 2.1 and 2.2 only if increasing of operational life time of the Rolling Rings is really necessary. In case of order it is an absolute must to mention.

3. Divide C by P_R

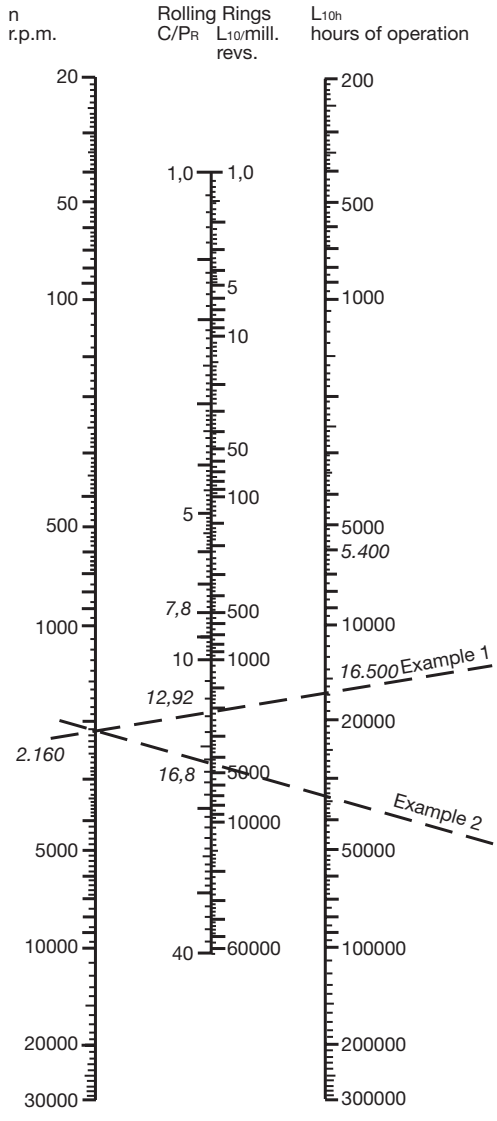
4. Calculate the required shaft speed as shown

$$n = \frac{v \cdot 6 \cdot 10^4}{h_{max}}$$

5. Determine the operational life in hours from the nomogram

	Example 1	Example 2
	ARG 3-30-2 VCRF Speed 0,9 m/sec. Standard Thrust F = 260 N	ARG 3-30-2 VCRF Speed 0,9 m/sec. **Reduced thrust F = 200 N**
1.	C_1 = 16.800	C_1 = 16.800
2.	$P_R = 5 \cdot 260$ N = 1.300 N	$P_R = 5 \cdot 200$ N = 1.000 N
3.	$\frac{C_1}{P_R} = \frac{16.800}{1.300} = 12.92$	$\frac{C_1}{P_R} = \frac{16.800}{1.000} = 16{,}8$
4.	$n = \frac{0{,}9 \cdot 6 \cdot 10^4}{25} = 2.160$ rpm	$n = \frac{0{,}9 \cdot 6 \cdot 10^4}{25} = 2.160$ rpm
5.	L_{10h} = 16.500 Hours of operation	L_{10h} = 35.000 Hours of operation

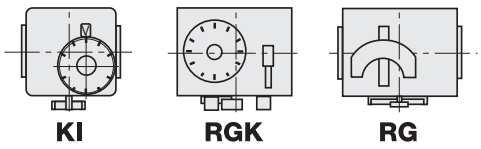
Nomogramm



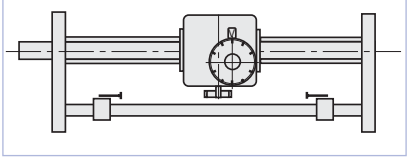
If you wish Joachim Uhing KG GmbH & Co to make a selection for you in respect of your application, please ask for Applications Questionnaire 03e.

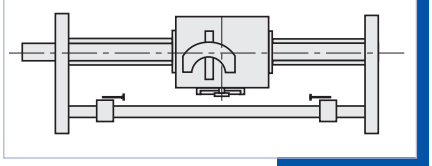
Standard

Rolling Ring Drives
Types KI, RGK und RG
KI 3-15, RGK3-15/20
RG 3/4-15 to RG 3/4-80



Rolling Ring Drives
Types AKI, ARGK und ARG/ARGL („light“)
Rolling Ring Drive Units KI, RGK and RG
with shaft, steady bars, end brackets and end stops



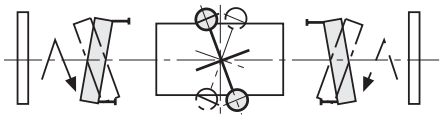


Features

Attention: The dimensions and technical Details on the pages 7 to 17 are only valid for the features MCRF resp. MCR/MCR1. For different features ask for dimensional drawngs.

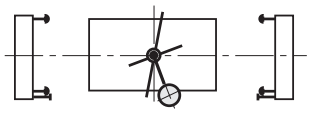
Reversal

D *2
Two-way shaft rotation



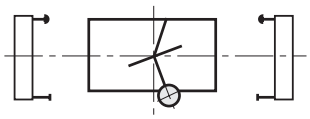
Reversal mechanism suitable for either direction of shaft rotation. Push-rod not supplied.

H *2
Control lever, double-sided



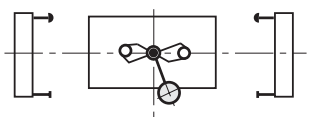
Provides reversal slowdown over short and adjustable slowdown length. Can be used to provide slowdown control both **before and after the reversal.**

K *2
Control lever, single-sided



Reversal slowdown as H above but only providing slowdown **prior to the point of reversal.**
For RG 15-2 / 20-2 / 22-2 / 30-2 this function is only possible by modifying **H**.

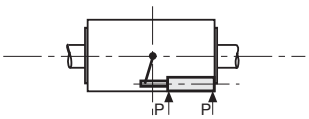
M
Instantaneous reversal



Mechanical spring operated trigger action automatic reversal of the direction of travel.

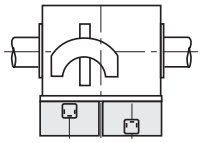
Minimum length of stroke = approx.1x shaft diameter.

N*1
Pneumatic



The direction of travel is reversed by the action of a two-way pneumatic cylinder (operating pressure = 6 bar).

E*1
Electro-magnetic



The direction of travel is reversed by switching two solenoids (24 V D.C.) one for each end of the traverse stroke. No minimum stroke length requirement.

Please Note: The solenoids are designed for 40% energizing. The permissable energizing period should not be exceeded. Due to the good cooling characteristic related to the fitting of the solenoids directly on the drive unit, the energization duration can be multiplied by a factor of 1,7 to give an effective value of 68%.

$$ED\% = \frac{\text{Time Period Switched On}}{\text{Time Period Switched On} + \text{Time Period Switched Off}} \times 100$$

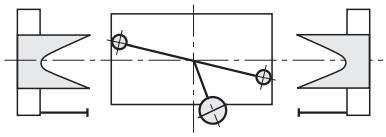
***1**

Reversal characteristics **E** and **N** can be further combined with reversal characteristics **H**, **K** and **V** and with stopping character (**O**). With such combination, an additional restart system (**O1**) or (**O2**) is not required as the restart can be activated by operation of the solenoid (**E**) or pneumatic cylinder(**N**).

***2**

feature is not available for RGK3-15/20

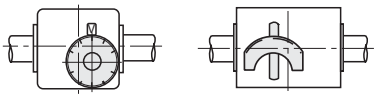
V *2
Reversal slowdown



Reversal slowdown for slowdown lengths in excess of 15 mm via cam and contact lever system.

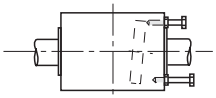
Pitch Setting

C
Scale



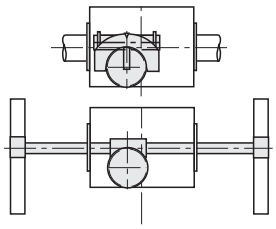
Pitch setting via knob (KI/RGK) or the engagement of a lever in a serrated scale (RG). Simultaneous setting of the same pitch in both directions of travel.

S *2
Set scews



Infinetely variable pitch setting - separate settings for each direction.

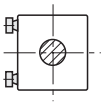
Z *2
Worm drive



Simultaneous infinitely variable setting of the same pitch in each direction of travel. Types RG: Supplied without wormwheel drive shaft. If required an operation knob is available (X.) Types ARG: Supplied with worm drive shaft for remote adjustment from either end (to be specified). Also available with adjustment control (X).

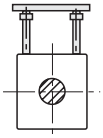
Steady Rollers

R



Rolls on rear of unit which (in conjunction with a rear steady bar) prevent the rotation of the unit on the shaft.
Standard with RG3/4-15 to RG3/4-80, ARG3-15 to ARG3/4-40 and RGK3-15/20 and ARGK3-15/20

R1



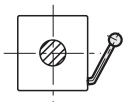
Rolls fitted to seperate top mounting plate assembly, used in conjunction with a top steady bar to prevent the rotation of the unit on the shaft.
ARG 3/4-50 to RG3/4-80.

***2**

feature is not available for RGK3-15/20

Free-Movement Lever

F
Mechanical



After operation of the free-movement lever, the unit can be pushed freely along the shaft.
Standard with RG3/4-15 to RG3/4-30 and RGK

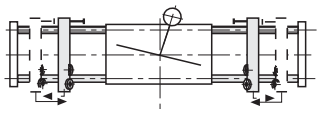
P *2
Pneumatic

Side thrust of the unit is achieved pneumatically, free movement (pushing the unit freely along the shaft) by venting the membran cylinder. System also suitable for remote control.
Operating pressure = 6 bar

Please note: In vertical applications, before operating the free-movement lever please ensure that the load cannot fall in an uncontrolled manner. Injury can result!
Attention: All Rolling Ring Drive Units, especially if fitted with feature F or P are not allowed to be rigid connected to a seperate load carrier. (see page 23, item 5)

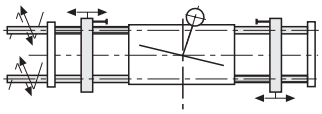
Stroke Width Adjustment

B *2
Self-adjusting end stops



For continuously increasing or decreasing the traverse width during the winding operation. Only recommended with units having a free-movement lever (**F**). Please consult supplier if application is vertical.

W *2
Lead screw operated end stops



Remote lead screw adjustment of the traverse width operated from one of the end bracket positions. Can also be supplied with a hand-wheel control or with a control motor drive (**X**).

Stopping on a Rotating Shaft and Restarting

O *2
Stopping

The Rolling Ring Drive is brought to a standstill position on the rotating shaft by reducing the pitch to **0**. Only available in combination with units having reversal type **H**, **K** and **V**. Restart via **O1** or **O2**.
(For information concerning stand-still times, please consult supplier).

O1 *2
Pneumatic restart

Restart activated by a single action pneumatic cylinder (operating pressure = 6 bar) which operate the reversal mechanism.

O2 *2
Electro-magnetic restart

Restart activated by solenoids (operating voltage 24 V D.C.) which operate the reversal mechanism.

Load Carrier

LZ

Roller style load carrier designed to accomodate loads and twisting forces
(dimensions upon request)

Customer Specific Special Features

X

Adapter (twist-free coupling see page 23)
Intermediate support bracket
Heavy duty steady bar
Drive motor
Wipers

Special paint finish
Anti-corrosion protection
Double bearing support
Special pitch
Noise dampening
Sequence control
etc.

*2 feature is not available for RGK3-15/20
We reserve the right to make technical alterations.

1. Shaft Material

1.1. Basic Requirements

Uhing Linear Drives should only be used in conjunction with steel shafts manufactured from induction surface hardened, ground and finished bar of the following quality, minimum:

- surface hardness: 50 HRC
- tolerance on diameter: h6
- out of roundness: maximum one half of the diameter variation permitted by ISO tolerance h6
- true running tolerance (DIN ISO 1101): ≤ 0.1 mm/m

1.2. Uhing Precision Shaft

Standard: Material Cf 53,
Mat.-Nr. 1.1213 induction surface hardened, 60-64 HRC

Rust resistant:
Material X 40 Cr 13, Mat.-Nr. 1.4034 induction surface hardened, 51-55 HRC

Rust and acid resistant:
Material X 90 CrMoV 18 Mat.-Nr. 1.4112 induction surface hardened, 52-56 HRC

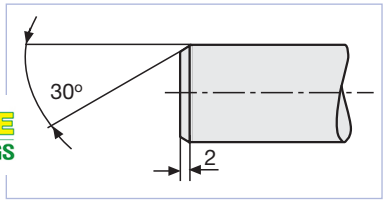
- all ground and superfinished
- surface roughness: mean value (DIN 4768 T.1) R_a: ≤ 0.35 µm
- tolerance on diameter: h6
- out of roundness: maximum one half of the diameter variation per mitted by ISO tolerance h6
- true running tolerance (DIN ISO 1101): ≤ 0.1 mm/m

1.3. Uhing Precision Shafts with Enhanced True Running Tolerance

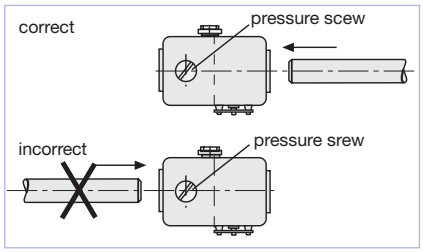
Available in the above styles, but
- true running tolerance (DIN ISO 1101): ≤ 0.03 mm/m

1.4. Leading End Chamfer

The leading end of the shaft should be chamfered to avoid damage to the Rolling Rings when screwing the unit onto the shaft.



The following method should be followed to facilitate the screwing of the shaft into the unit:



For units not having a pressure screw (KI, RGK and types RG 4-15/20/22/30-2) the entry side for the shaft is not specified.

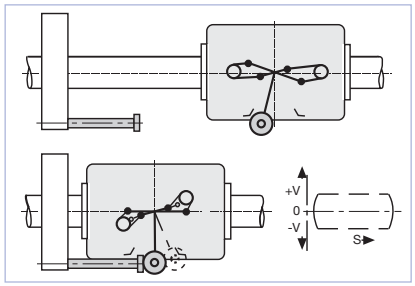
2. Shaft Rotation

The mechanical reversal of the Rolling Ring Drive is related to the direction of shaft rotation. It will operate only when the rotation is as specified in the order (except for feature **D and RGK-types**).
When changing the direction of rotation, the pitch symmetry must be checked and adjusted if necessary (see Operating Instructions 05e).

3. Reversal

3.1. Instantaneous Reversal (Feature M)

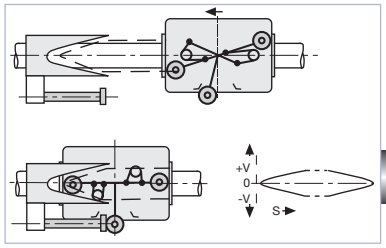
Mode of operation: on making contact with a traverse stroke limiting endstop, the torsion springs in the reversal mechanism charged, trigger and fire the reversal once the throwover position has been reached.



For the reversal mechanism to operate, a minimum distance of travel equivalent approximately to the diameter of the shaft (dependent of the pitch setting) is required.The reversal time is also pitch related (see Fig. 2, page 16). Consequently, as the pitch is increased, there is a slight increase in the traverse stroke length (and a decrease if the pitch is reduced).
Differences in the stroke length also result when the speed of a unit, the pitch of which remains unaltered, is varied by significantly changing the shaft speed.
Drive speed increases = increase in length of stroke,
Drive speed decreases = decrease in length of stroke.

3.2. Reversal Slowdown (Feature V)

Mode of operation: just prior to the reversal point an additional lever, which terminates in a contact bearing, makes contact with a V-shaped slowdown cam which causes it to swivel. This swivel action serves to reduce the unit's pitch as it approaches the reversal point such that the instantaneous reversal which follows is at a greatly reduced traverse speed.



As a result of the reversal slowdown, the forces exerted on the unit through the reversal are reduced, and high traverse speeds, without slip, are possible.
The reversal slowdown is predominantly distance related and changes in pitch do not effect the length of traverse stroke.

4. Pitch Setting

The pitch is the distance travelled per revolution of the shaft. With a Uhing Rolling Ring Drive, this is variable between nearly zero and a maximum specified value. The pitch can be set either when the unit is in motion or stationary.
The following pitch setting possibilities are available:
Kinemax and RGK: self retaining knob for infinite variability.
Feature C: 100/50 pitch selection scale covering the full pitch range.
Feature S: Set screws for the infinitely variable setting of the pitch in each direction.
Feature Z: Worm gear drive for infinitely variable pitch setting. Remote control from one of the end bracket positions possible.
Note: With the exception of **S** type units, the pitch is generally set to be the same for both directions of travel. The difference in pitch in the two directions (symmetry) is factory set not to exceed 1%, for RGK-types not to exceed 2%.

5. Separately Carried Additional Loads

If Rolling Ring Drives are used to move separately carried masses, allowance should be made in the coupling to compensate for any misalignment between the drive shaft and the carriage.

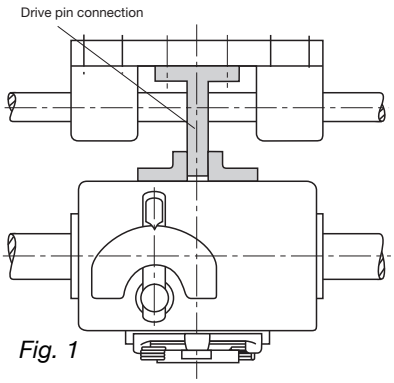


Fig. 1

It should be additionally ensured that the distance between the point of connection and the unit is as short as possible, as twisting moments affect the thrust produced.

Optimum couplings are twist-free as shown in Fig. 2 and 3.

Coupling connection at end of unit

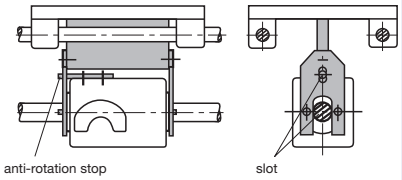


Fig 2

Coupling connection at side of unit

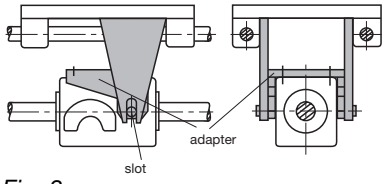
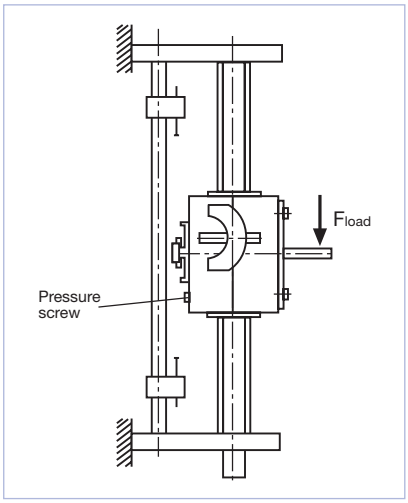


Fig. 3

6. Vertical Applications

Attention should be given to the direction of the applied load and the position of the pressure setting screw so as to avoid a drop in thrust efficiency (except with KI 3-15-6, RGK-types, RG 4-15/20/22/30-2).



In the arrangement illustrated, there is an increase in thrust when unit is moving up the shaft.

In applications using units with a free-movement-lever, care must be taken before its operation to ensure that the load can not drop in an uncontrolled way - injury could result.

7. Stopping on a Rotating Shaft

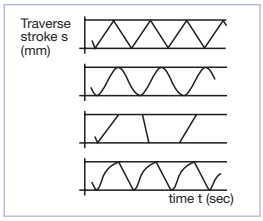
Rolling Ring Drives fitted with slowdown cams (type **V**) or a control lever (**H** or **K**) can, with appropriate control, be brought to a standstill (pitch setting „0“) without the need to stop the shaft. This could be necessary if the drive is being used as a feed mechanism and is required to wait for a start signal at one or both ends of its traverse stroke.

Intermediate stop positions between the end stop positions are also possible. If positional accuracy in excess of ± 0.5 mm is acceptable, slowdown cams are adequate for the purpose. Otherwise, if accuracy better than ± 0.5 mm is sought, a control lever should be used.

To protect the condition of the shaft, we recommend that the drive to the shaft be switched out if the standstill period exceeds 5 sec. at full rated thrust. The standstill time can be extended if the shaft speed is low or the thrust is reduced. Please refer related enquiries to the supplier.

8. Traversing Characteristics

By using a lever, the end of which is in the form of a roll which makes contact with cams which are arranged along the length of the traverse stroke, the pitch - and with it the speed - can be matched to the most varied requirements, the distances travelled being exactly repeatable.



9. Synchronization of Processes

Drives fittet with set screws (type **S**) offer the possibility of exactly relating the speed to that of already existing processes, e.g. synchronization of a travelling cutting head in cutting operations involving continuously fed materials. If the Uhing shaft and the material feed have a common drive, synchronization is maintained even if the material throughout speed varies.

10. Operating Temperature

Suitable for a temperature range of -10° to +80° C (RGK to + 70°C). Special styles available for other temperatures on request.

11. Maintenance

Shaft: MoS2 free ballbearing greases can be used, e.g. SKF Alfalub LGMT, Shell Alvania R2 or G2 Esso Beacon 2.

Procedure: Clean the shaft and spread the grease with a rag thinly as possible.

Unit: Lubricate the reversal mechanism, particularly the springs, with high viscosity machine oil (SAE 90). RGK is maintanance free.

Frequency: Monthly.

shorter intervals are recommended e.g.

- where a unit is required to be stationary on a rotating shaft
- it is working in shifts
- where it operates under extremly dusty conditions
- at temperatures over 80° C

Uhing

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The addresses of our agencies are available in the Internet: www.uhing.com

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