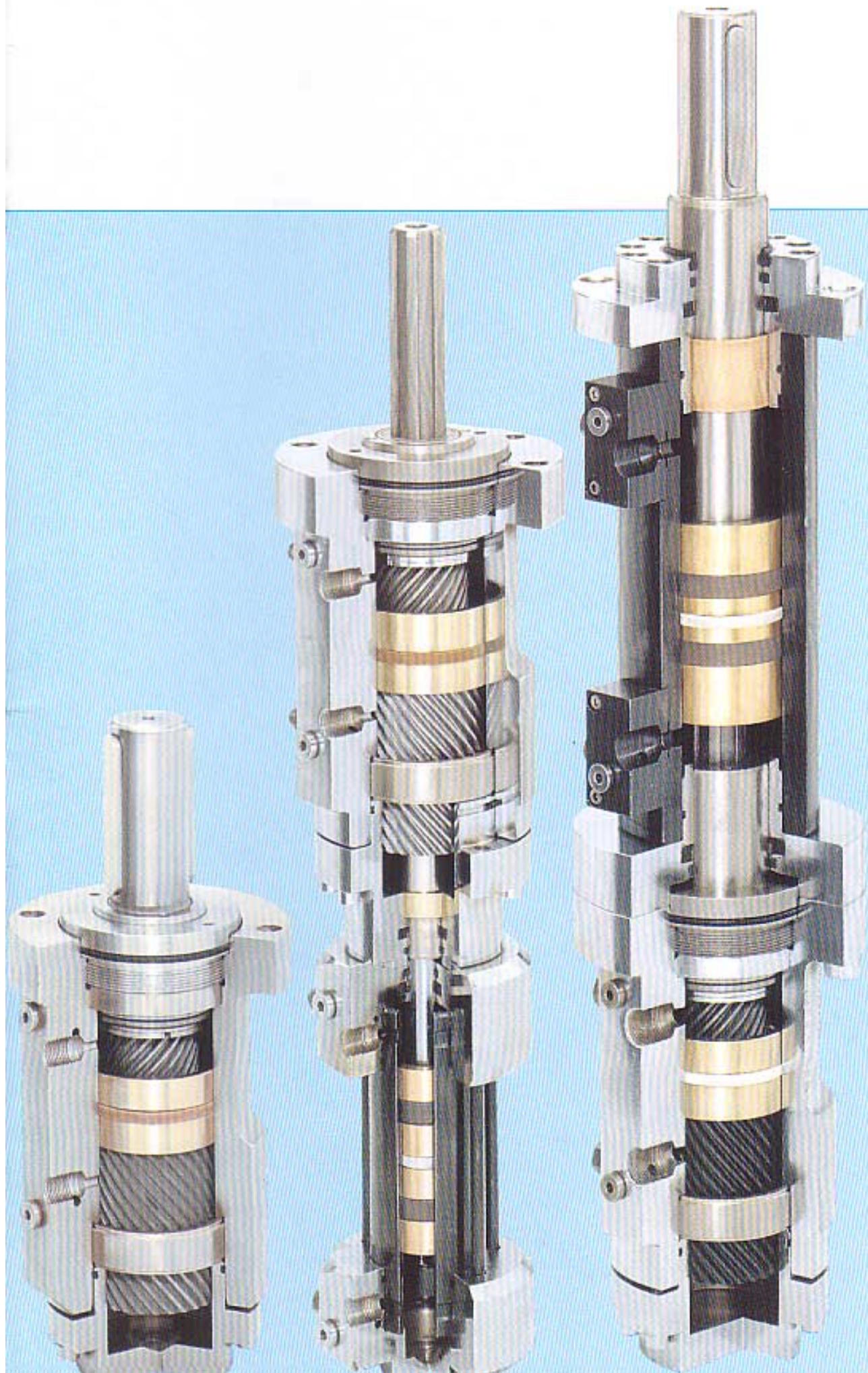




Rotary Actuators and Rotary-Lift Combinations



extended range
up to 250,000 Nm

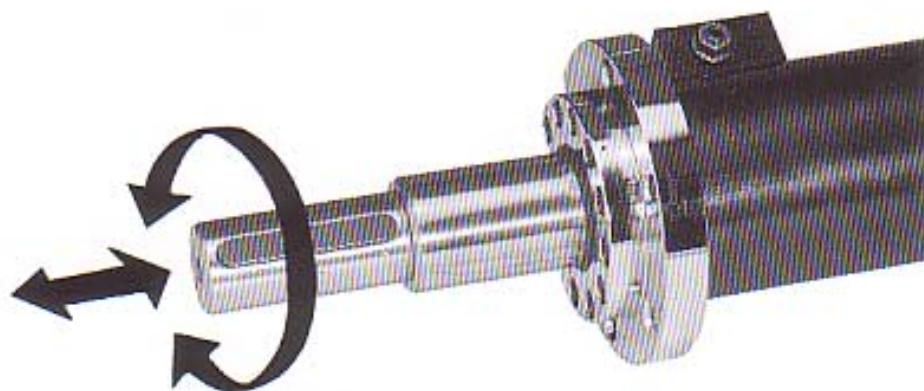
Zertifiziert nach
DIN EN ISO 9001

Possible Rotation and Lifting Movements

Rotary Actuator



Rotary-Lift Combinations



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Introduction

The systematic development of the supplement range of products presented in this catalogue is based on years of trouble-free use of HKS rotary actuators. Compact rotary-lift combinations of various types for extended possibilities of applications are again offered according to the latest state of the art.

Terms such as swivel motor and turning cylinder are replaced in this catalogue by the term rotary actuator to correspond with the German Industrial Standard (DIN).

For your application engineering you may consider the following typical features of all HKS products:

- small dimensions
- all sliding surfaces are hardened, machined-ground and polished
- identical torque in both directions
- interchangeable types of mounting
- no internal leakage so that intermediate positions can be exactly maintained
- variable positioning of the drive shaft (see page 16)
- interchangeability of all components
- tandem rod sealing (no leaks)
- suitable for (almost) all pressure media
- end position cushioning for all movements is possible
- sealing material from reputable manufacturers
- high-quality and high-tensile materials are used
- quality control with reliable final inspection
- all intermediate angles of rotation are available with or without cushioning
- rotary and linear pistons can be run to their end positions under full load
- piston end positions can be indicated by proximity switches
- various auxiliary attachments available
- **special requests to your satisfaction**

This service package is completed with a logical serial production and appropriate storage, which means:

- short delivery periods
- favourable price/performance ratio

Each series offers you the following additional features

Rotary actuator DA-H

- working pressure up to 210 bar (higher working pressures possible by agreement)
- torque up to 250,000 Nm
- safe, robust and compact housing in nodulized cast iron
- cushioning in both end positions can be integrated in the housing
- angle of rotation over 360° possible in special version
- very small tolerance in the angle of rotation (max. 20 minutes, if required 10 minutes)

Rotary-Lift combination – linear cylinder in front of the rotary actuator

Rotary-Lift combination DHK-H-ZV

- working pressure up to 160 bar
- torque up to 16,000 Nm standard
- lifting height up to 1,200 mm according to size
- high lifting capacity (independent of torque)
- drive shaft to customer's requirements
- camshaft for rotary movement possible
- angle of rotation tolerance with spline shaft up to 1.2°
- smaller angle of rotation tolerance with involute spline shaft (if required 30 minutes)
- rotation movement under load at any lifting height possible

Rotary-Lift combination – linear cylinder behind the rotary actuator

Rotary-Lift combination DHK-H-ZH

- working pressure up to 210 bar
- torque up to 14,700 Nm standard
- short size
- camshaft for rotary and lifting movements
- angle of rotation tolerance with spline shaft up to 1.2°
- smaller angle of rotation tolerance with involute spline shaft (if required 30 minutes)
- rotation movement under load at any lifting height possible

Rotary actuators and rotary-lift combinations can also be supplied for use with compressed air.

Hints for applications engineering

Hydraulic rotary actuators and rotary-lift combinations are subject to very different demands with regard to movements, torque, exact positioning, maintaining position, sizes and types of mounting. For all these matters you can refer to the HKS specialists for intensive consultation, or to our representatives and agents at home and abroad.

As each of the applications and working conditions of the users are very different we can only mention here the main characteristics for correctly determining the size (transmitted torque in Nm) of the rotary actuator.

If you are unsure of the correct size, please send the questionnaire on the right to us so that we can make a suggestion to you.



If the mass has to be brought from standstill to a rotary movement at an angle of φ_{ges} in a time t_{ges} , external losses (frictional forces) have to be overcome, masses have to be accelerated and then slowed down. The sum of the resulting movements is the driving torque for the rotary actuator.

It has to be observed hereby that the following demands are fulfilled in every possible rotary position:

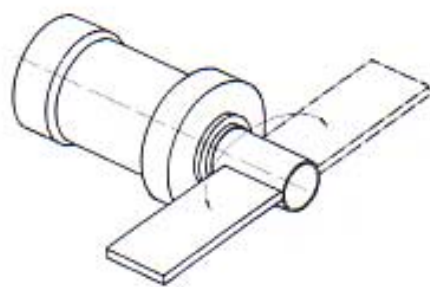
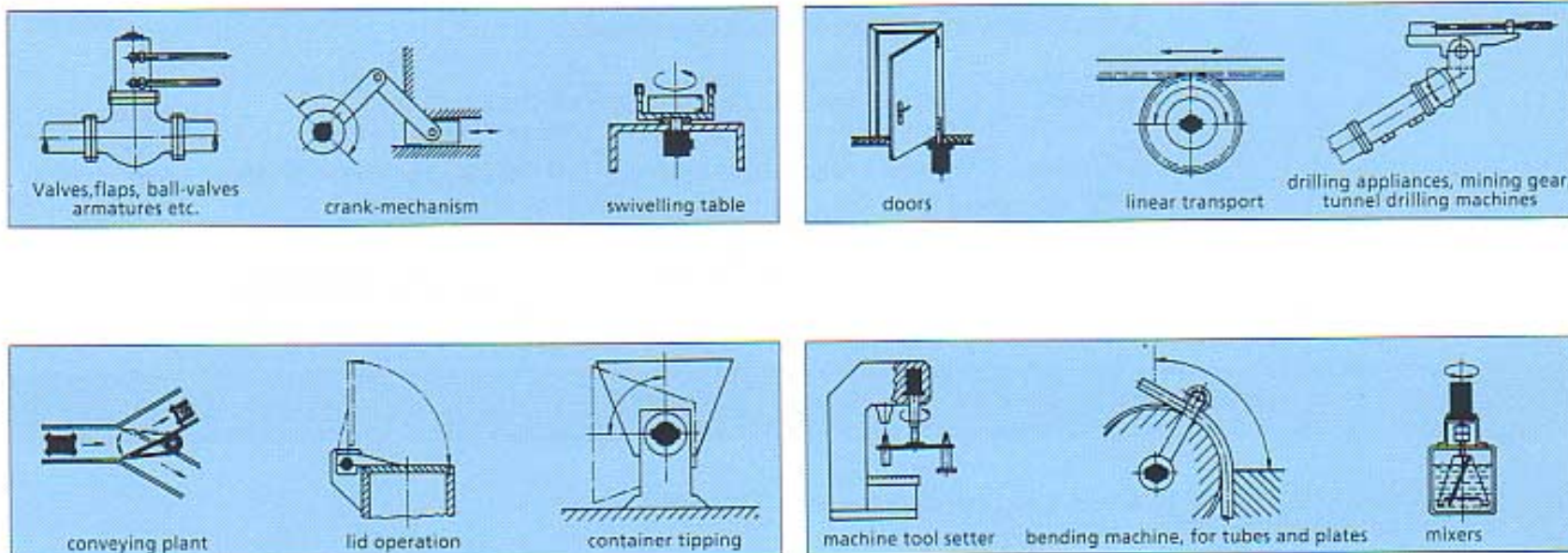
- M_t = Total moment
- M_L = Loading moment
- M_B = Accelerating moment

$$M_t \geq M_L + M_B$$

The appropriate calculations for the loading moment M_L and the accelerating moment M_B must be made according to the position (horizontal, vertical) of the transfer of forces for the rotary movement.

The demand for faster cycle times can be met by enlarging the connecting sections.

A few ideas on applications:



In determining the size of the rotary actuator in the horizontally mounted position, the appropriate vertical turning movements is to be observed:



Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Telefax
Data sheet for determining sizes and hazard analysis

To
 Messrs: **HKS Dreh-Antriebe GmbH**
 Street: **Leipziger Straße 55**
 Town/Code: **63607 Wächtersbach**
 Telephone: +49 (0) 60 53/61 63-0
 Telefax: +49 (0) 60 53/61 63-39

From
 Messrs: _____
 Mr./Mrs.: _____
 Street: _____
 Town/Code: _____
 Telephone: _____
 Telefax: _____

Project ID	Commision	Responsible		Date

Technical Data

1. Mass Moment of Inertia
 - 1.1 Leverage
 - 1.2 Weight
 - 1.3 Radial force
 - 1.4 Separate bearing?
 - 1.5 Specification of torque
 2. Effective rotation angle
 - 2.1 Total rotation angle
 3. Horizontal installation
 Figure (see below page 6)
 - 3.1 Vertical installation
 4. Rotation time
 - 4.1 Cycle
 - 4.2 Working hours/day
 5. Hydraulic plant
 - 5.1 Effective working pressure
 - 5.2 Max. perm. system pressure
 - 5.3 Flow rate
 - 5.4 Plant temperature
 - 5.5 Surrounding temperature
 - 5.6 Medium used
 6. Special conditions of use
 7. Conditions at working place
 8. Necessary properties of the actuator
 9. Additional equipment required
 - Cushioning
 - Camshaft
 - Angle of rotation
 - Hollow shaft
 - Spline shaft
 - with spline bore hub
 - other items
 10. Position switch
- Recommended actuator _____

Rotary Actuator

l _____ kgm²
 r _____ m
 G _____ kg
 R _____ kg
 yes no
 _____ Nm
 _____ in deg.
 _____ in deg.
 1 2 3 4 5

 t _____ sec.
 Z _____ sec./min./h
 _____ h
 p1 _____ bar
 p2 _____ bar
 Q _____ l/min.
 C1 _____ °Celsius
 C2 _____ °Celsius

Linear Actuator

Lifting power _____ N
 Tensile force _____ N
 R _____ kg

 Lift _____ mm

 Lifting time _____ sec.

 p1 _____ bar

mechanical induced

Operating Instructions

Installation and Initial Operation

The drive shaft is to be aligned properly to the counterpart to avoid exceeding the permissible axial and radial forces. Before initial operation the hydraulic system is to be carefully cleaned and bled.

Pressure Fluid

Mineral oils of Group HLP DIN 51524 part 2 and VDMA page 24318 are recommended. Non-inflammable fluids of Group HFC and HFD can also be used. Please supply us with specific information.

Bleeding

With horizontal installation and connections on top the bleeding is effected by the bleeding screws. For other installations please refer to the factory.

Filtering

Filtering of the pressure fluid is recommended between pump and actuator (pressure line). The filter unit should be about 10 microns.

Oil Change

Oil changes are necessary and depend on the size of the system. Oil changes are necessary at shorter intervals with dirty oil.

Temperature Range

-10° C to +75° C
For higher or lower temperatures please refer to the factory.

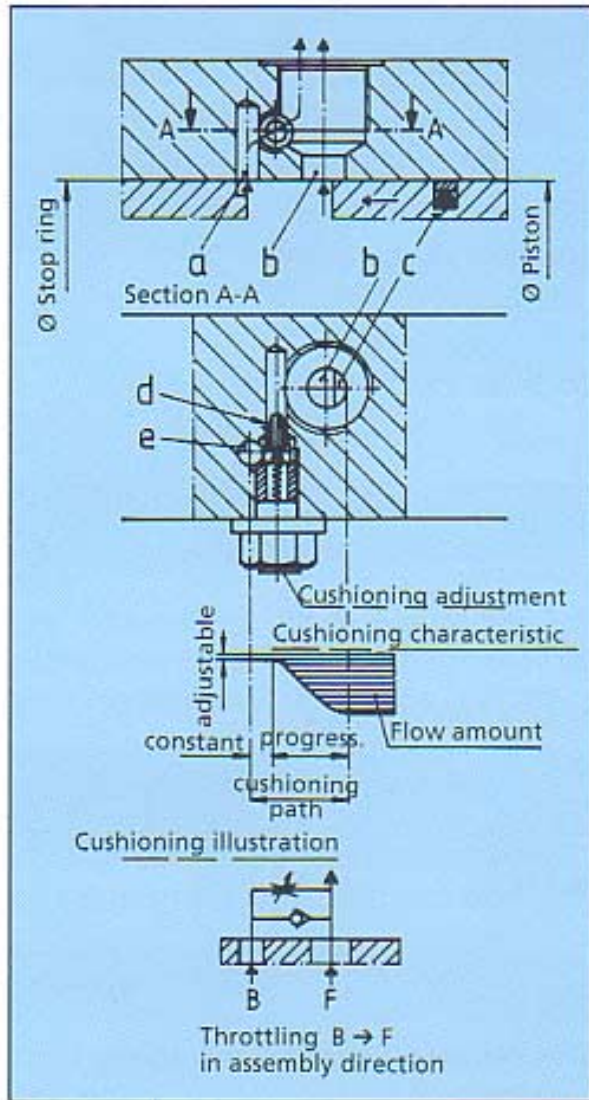
Hints for Continuous operation

The values indicated are effective values which are not to be exceeded. In cases of shiftwork, fast cycles and high continuous stress we recommend an additional safety factor of 70% of the maximum permissible torque to be taken into account.

Important Hint for Hollow Shaft Design

The diameter of splined bushes are maximum values. To avoid torsion damage when transferring the torque to the spline it is necessary to use high-tempered material. A torsion stability calculation of the shaft is implicitly recommended.

Cushioning End Positions



Functional Description of Cushioning End Positions

The pressure medium displaced by piston (c) initially flows freely through the connecting hole (b) until piston (c) completely closes the hole (b), thereby throttling the piston speed. After completely covering piston (c) the medium can only escape through hole (a). The quantity flowing from a to b can be regulated by the throttle screw (d). When the pressure enters from the opposite direction the medium flows from b to a. The non-return valve opens and there is an unimpeded flow at a into the cylinder space. The hole (b) is opened again after the backstroke of piston (c).

It is possible to especially agree the cushioning path and the cushioning characteristics according to the use required.

Cushioning Adjustment

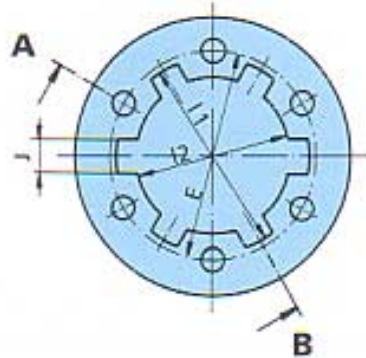
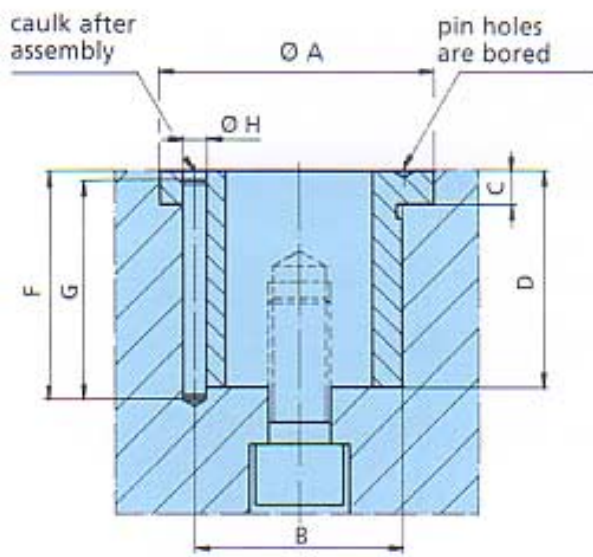
After loosening the self-sealing lock nut, the throttle section can be adjusted by an Allen key.

Turn the tapered throttle valve screw right in and then loosen it one turn. The fine adjustment of the cushioning can now be made.

Optimated cushioning to customers requirement

Size DA-H	40	50	63	80	100	125	140	160	180	200	225	225S	250	280	300
Cushioning angle of approx. α	32°	28°	29°	23°	22°	22°	17°	15°	17°	12°	12°	10°	19°	17°	16°

Average A-B



Splined Profile Bush

Size	40	50	63	80	100	125	160
Splineway to DIN 5463	6x	6x	6x	6x	8x	8x	8x
Ø A _{0,1}	21	26	33	40	52	70	90
B	M18x	M23x	M30x	M37x	M48x	M64x	M82x
	1	1	1	1.5	1.5	1.5	1.5
Alternative Ø _{m6}	18	23	30	37	48	64	82
C	4	6	6	6	6	8	10
D	25	27	32	37	50	60	80
E	17	22	28	35	46	61	79
F	27	32	37	42	57	72	88
G	25	30	35	40	55	70	85
Ø H _{H7/m6}	2.5	3	4	4	5	6	8
I ₁ H11	14	20	25	32	42	54	72
I ₂ H7	11	16	21	26	36	46	62
J F10	3	4	5	6	7	9	12

C45 Material (treated with QPQ process)

Subject to alterations

KW-B DHK-H-ZH 100

Size
Unit
Splined Bush DIN 5463

Splined Profile Bushes to DIN 5480 on request

Rotary Actuators

Applications

The applications for our rotary actuators cover the whole of the industrial sector such as construction machinery, machine tools, bending machines, foundry, mining, agricultural and packing machines, transfer lines, manipulators, armatures, shipbuilding, vehicle and ventilation techniques etc.

HKS rotary actuators are remarkable for the following reasons:

- 20 sizes up to 250,000 Nm with pistons 40–450 mm diam.
- 4 rotary angles: 90°, 180°, 270° and 360° for each size
- actuator shaft with 2 feather keys or DIN 5480 involute spline
- tandem seals on the drive shaft

Auxiliary Equipment

- cushioning at both ends
- rotary angle adjustment to $\pm 4^\circ$
- camshaft
- hollow shaft with DIN 5463, DIN 5480 or DIN 6885 profile

Special Versions

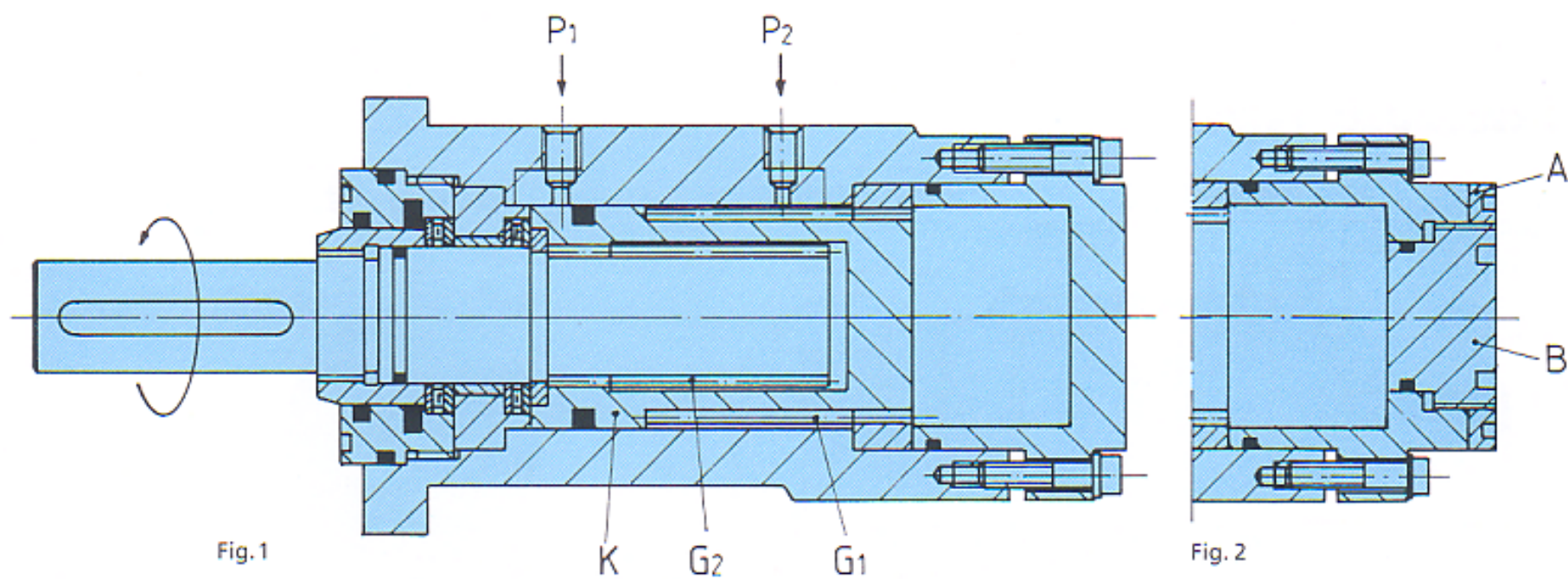
- actuator shaft with spline profile to DIN 5463
- actuator shaft with second drive cogs
- actuator shaft and mounting flange to customer's requirements
- angle adjustment over the whole rotation area
- limit switch equipment
- direct valve connection
- 3 mounting positions
- **all intermediate rotation angles can be supplied**
- rotation area over and above 360°
- sea-water resistance
- additional bearing for higher radial forces
- change of rotation direction
- further special types available
- working pressures up to 250 bar and more can be supplied upon request

Technical Data of the DA-H 40 to DA-H 160 Range

Type	DA-H 40	DA-H 50	DA-H 63	DA-H 80	DA-H 100	DA-H 125	DA-H 140	DA-H 160	
max. nominal torque at 210 bar (Nm)	200	340	650	1300	2500	5107	7100	11300	
nominal torque (Nm/bar)	0.96	1.62	3.10	6.20	11.90	24.32	33.80	53.80	
* max. working pressure (bar)	210	210	210	210	210	210	210	210	
max. radial load (N)	1567	2976	4364	7875	11250	17552	17800	36300	
max. axial load (N)	8000	10000	14000	19050	24900	34100	34800	46200	
Absorption volume (dm ³)	Angle 90°	0.020	0.033	0.066	0.131	0.255	0.518	0.759	1.145
	Angle 180°	0.040	0.066	0.131	0.262	0.509	1.036	1.518	2.290
	Angle 270°	0.060	0.099	0.196	0.391	0.763	1.554	2.277	3.435
	Angle 360°	0.080	0.132	0.262	0.521	1.018	2.071	3.036	4.580
Weight (kg)	Angle 90°	4	5	8.5	16.7	24.1	47	74	114
	Angle 180°	4.5	5.8	9.8	19.1	29.2	55	87	136
	Angle 270°	5	6.9	11	21.5	34	63.5	101	154
	Angle 360°	5.5	7.4	12.2	24	38.5	72.5	115	170

Subject to alterations

* working pressures up to 250 bar and more can be supplied upon request



Functional Description

The oil pressure which is supplied through connections *P1* or *P2* causes a rotary movement on the actuator shaft. The linear movement of the piston *K* is converted into a rotary movement by means of multiple helical gears in the housing, piston and shaft.

Rotation Direction

With pressure at *P1* the actuator shaft rotates from the basic position to the left (anti-clockwise), see Fig 1. Changes in the direction can be especially made to order.

Normal Position of the Feather Key

Fig.1 shows the adjusted position of the piston *K* as made at the factory. Changes in this position are possible (see page 16, "adjustment of the feather key position").

Adjustment of the Angle of Rotation

(see Fig. 2)

The standard type has an angle of rotation of up to 4 in the positive range. An exact angle of rotation can be achieved by an additional device WV as follows:

Loosen lock-nut *A*. Turn adjusting screw *B* to the required angle of rotation. Tighten lock-nut *A* (using a face spanner).

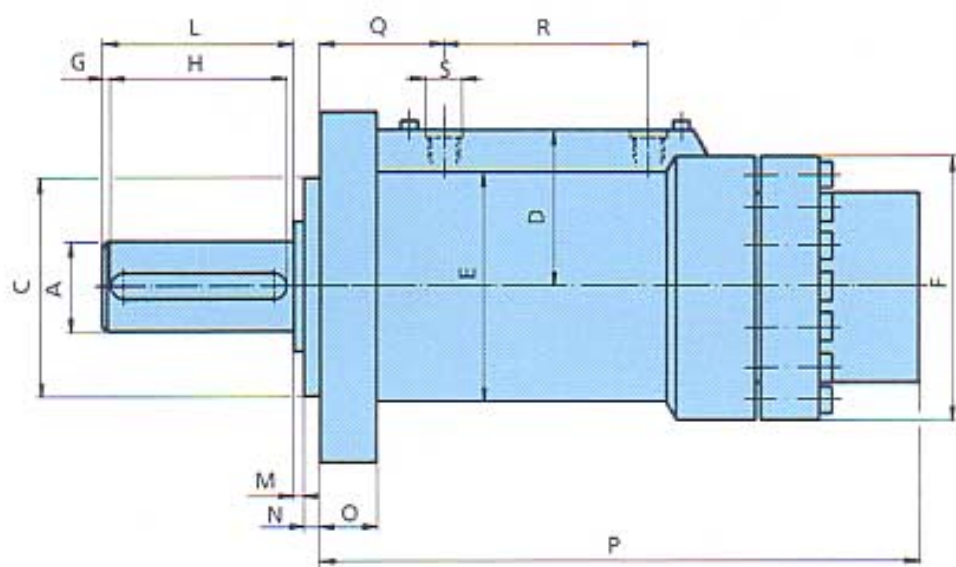
Technical Data of the DA-H 180 to DA-H 300 Range Technical Data up to DA-H 450 Range upon request

Type	DA-H 180	DA-H 200	DA-H 225	DA-H 225 S	DA-H 250	DA-H 280	DA-H 300	
max. nominal torque at 210 bar (Nm)	16200	22300	32000	38920	44000	60800	76000	
nominal torque (Nm/bar)	77.14	106.20	152.38	185.33	209.52	289.52	361.90	
* max. working pressure (bar)	210	210	210	210	210	210	210	
max. radial load (N)	37600	67210	69000	69000	78000	84600	89400	
max. axial load (N)	47400	62000	63100	63100	66500	71000	76000	
Absorption volume (dm ³)	Angle 90°	1.678	2.261	3.388	4.127	4.6072	6.348	7.9304
	Angle 180°	3.356	4.522	6.676	8.245	9.2145	12.695	15.862
	Angle 270°	5.034	6.783	10.014	12.368	13.821	19.043	23.79
	Angle 360°	6.712	9.044	13.352	16.491	18.429	25.391	31.724
Weight (kg)	Angle 90°	150	194	404	487	630	874	1126
	Angle 180°	187	238	488	543	726	1011	1308
	Angle 270°	213	264	565	637	815	1164	1489
	Angle 360°	245	306	630	684	912	1292	1677

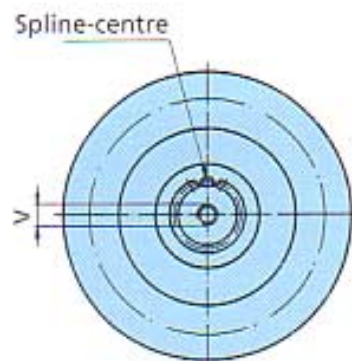
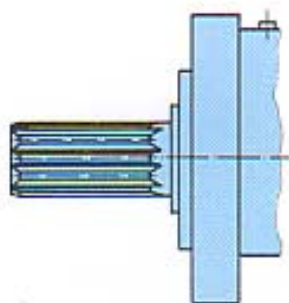
Subject to alterations

* working pressures up to 250 bar and more can be supplied upon request

Standard Type

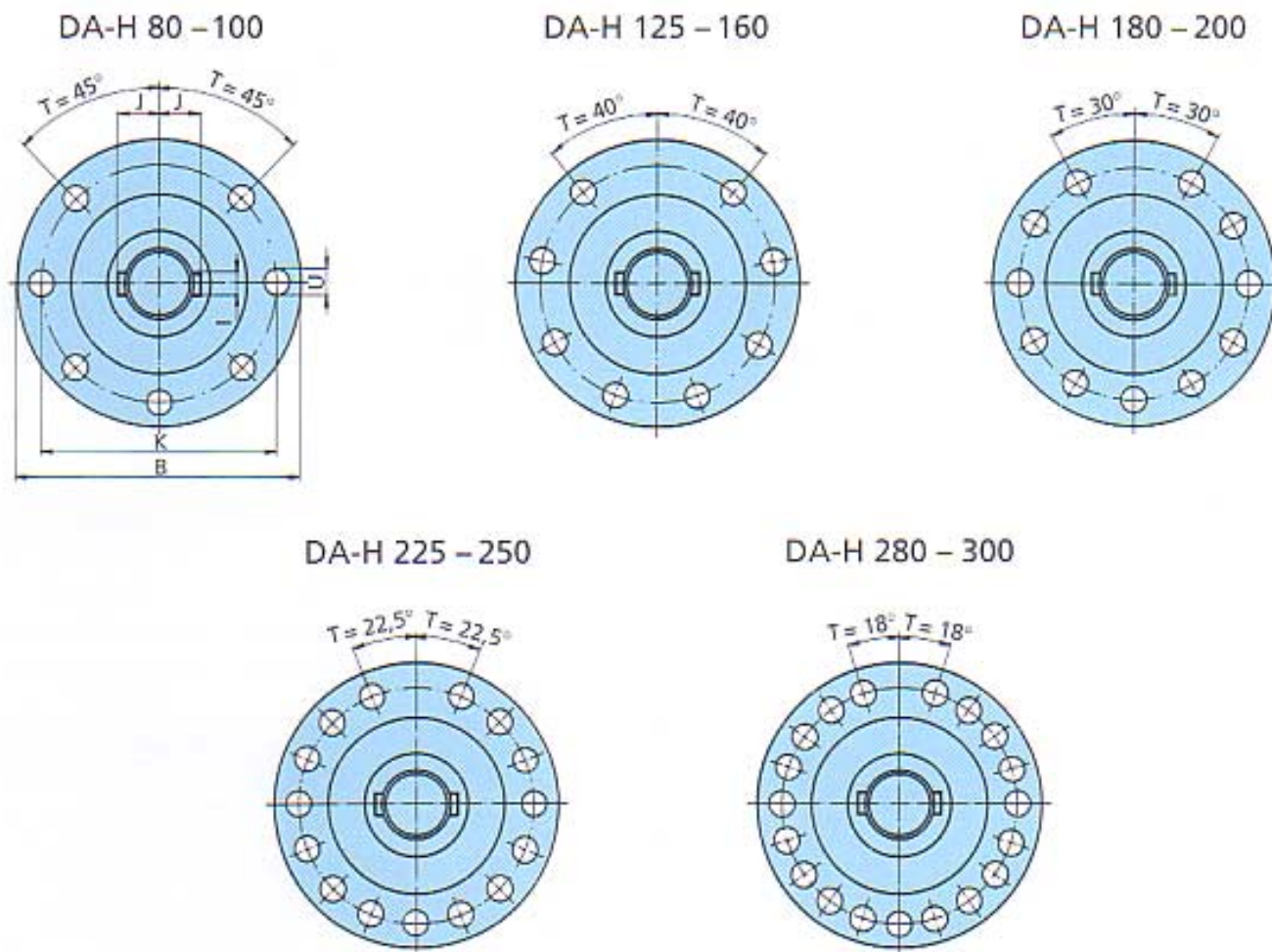


DA-H 40 - 63



Type	DA-H 40	DA-H 50	DA-H 63	DA-H 80	DA-H 100	DA-H 125	DA-H 140	DA-H 160
Ø A _{k6}	22	28	35	42				
Ø A _{m6}					55	70	80	100
DIN 5480	W 22 x 1,25 x 16 x 8 f	W 28 x 2 x 12 x 8 f	W 35 x 2 x 16 x 8 f	W 40 x 2 x 18 x 8 f	W 55 x 2 x 26 x 8 f	W 70 x 2 x 34 x 8 f	W 80 x 3 x 25 x 8 f	W 100 x 3 x 32 x 8 f
Ø B	98	110	128	150	178	222	250	278
Ø C _{f7}	55	68	80	100	115	150	160	190
D	43	49	57	66	80	94	105	127
Ø E	66	72	87	108	130	167	187	206
Ø F	75	82	95	118	147	183	210	240
G	2.5	2	5	5	5	7	5	5
H DIN 6885	45	56	70	100	100	125	140	200
I DIN 6885	8	8	10	12	16	20	22	28
J DIN 6885	14	17	20.5	24	31.5	39.5	45	56
K	84	90	108	130	155	195	220	245
L	50	60	80	110	110	140	150	210
M	3	3	3.5	3	4	4	7	5
N	4	4	5	6	6	8	10	12
O	16	18	25	30	31	37	40	43
P Angle 90°	124	133	152	187	245	281	304	365
P Angle 180°	149	164	200	240	311	392	401	474
P Angle 270°	182	200	245	290	366	480	499	593
P Angle 360°	210	232	284	345	432	550	597	707
Q	39	39	48	57	65	74	78	94
R Angle 90°	28	31	37	47	56.5	76	82	110
R Angle 180°	41	48	57	74	89	118.5	130	168
R Angle 270°	55	65	79	101	121.5	162.5	180	224
R Angle 360°	68.5	80.5	99	125	154	207	229	285
S	G 1/8"	G 1/8"	G 1/4"	G 3/8"	G 1/2"	G 1/2"	G 1/2"	G 3/4"
T	60°	60°	60°	45°	45°	40°	40°	40°
Number U	5	5	5	7	7	8	8	8
U	9	9	11	11	14	18	18	22
V	centre hole to DIN 332 T2, type D (with thread)							

Subject to alterations



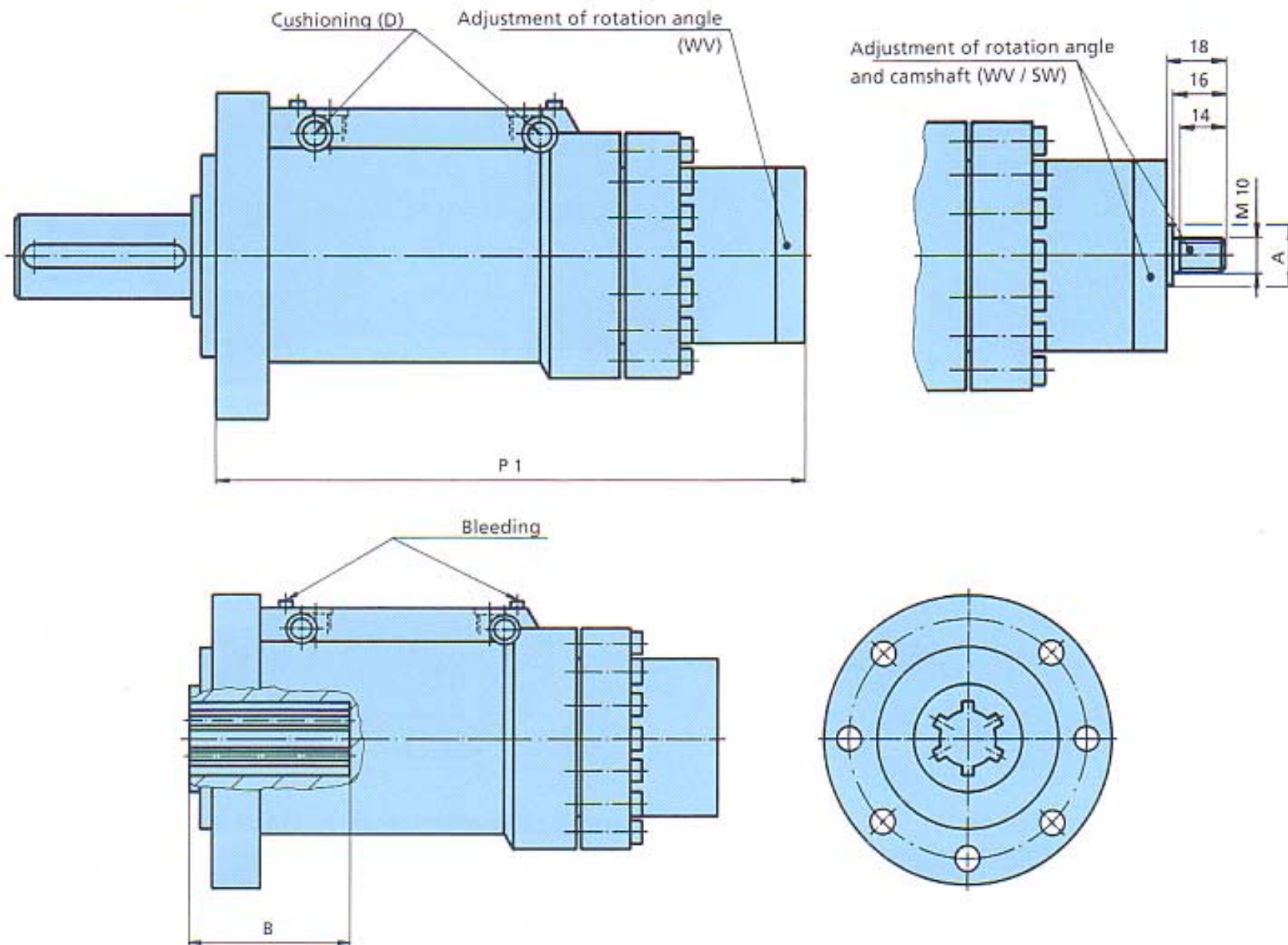
Ordering example on page 15

Measures of construction to DA-H 450 upon request

Typ	DA-H 180	DA-H 200	DA-H 225	DA-H 225 S	DA-H 250	DA-H 280	DA-H 300
Ø A _{k6}							
Ø A _{m6}	105	120	140	140	150	170	180
DIN 5480	W 105 x 3 x 34 x 8 f	W 120 x 5 x 22 x 8 f	W 140 x 5 x 26 x 8 f	W 140 x 5 x 26 x 8 f	W 150 x 5 x 28 x 8 f	W 170 x 5 x 32 x 8 f	W 180 x 5 x 34 x 8 f
Ø B	298	325	385	385	450	490	555
Ø C _{f7}	210	235	260	260	300	340	380
D	138	150	224	224	240	266	285
Ø E	226	252	300	300	346	394	440
Ø F	270	295	350	350	385	435	470
G	5	5	5	5	10	10	10
H DIN 6885	200	200	250	250	280	280	280
I DIN 6885	28	32	36	36	36	40	45
J DIN 6885	58,5	67	78	78	83	94	100
K	265	290	345	345	400	450	500
L	210	210	260	260	300	300	300
M	5	5	6	6	6	6	6
N	12	12	15	15	20	20	20
O	45	54	64	64	90	100	110
P Angle 90°	435	440	570	690	710	790	840
P Angle 180°	565	587	732	805	875	1000	1060
P Angle 270°	702	730	900	995	1060	1205	1285
P Angle 360°	880	878	1069	1220	1261	1408	1510
Q	125	125	155	155	224	261	271
R Angle 90°	119	128	159	175	155	183	194
R Angle 180°	186	202	240	276	248	287	302
R Angle 270°	253	273	321	381	343	392	414
R Angle 360°	321	346	403	484	437	493	528
S	G 1"	G 1"	G 1"	G 1"	G 1"	G 1"	G 1"
T	30°	30°	22.5°	22.5°	22.5°	18°	18°
Number U	11	11	15	15	15	19	19
U	22	22	22	22	26	26	32
V	centre hole to DIN 332 T2, type D (with thread)						

Subject to alterations

Auxiliary Equipment



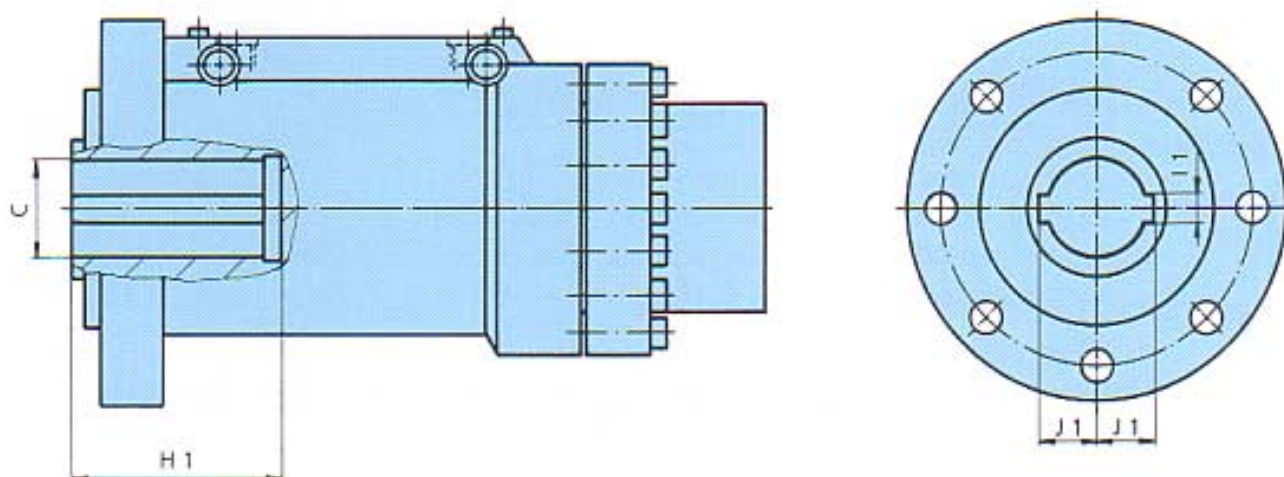
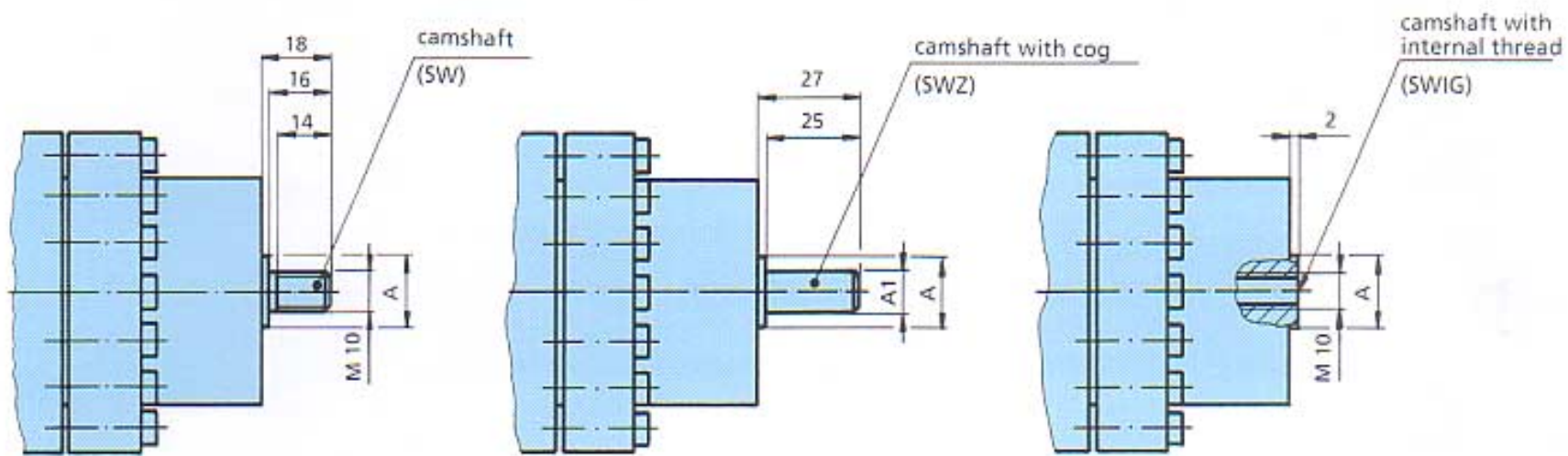
Hollow Shaft Type (HW)

Please observe the important hint on the hollow shaft type on page 8

Type	DA-H 40	DA-H 50	DA-H 63	DA-H 80	DA-H 100	DA-H 125	DA-H 140	DA-H 160
Additional equipment WV – angle adjustment								
P 1 Angle 90°	142	149	172	212	245	296	334	392
P 1 Angle 180°	167	182	220	263	311	392	431	505
P 1 Angle 270°	200	218	265	315	381	485	529	622
P 1 Angle 360°	228	250	305	370	442	550	627	740
Auxiliary device SW – camshaft								
Ø A f7	16	18	18	25	25	25	25	40
Ø A1 h6	10	10	10	16	16	16	16	25
Special version HW – hollow shaft DIN 5463 (DIN 5480 upon request)								
B	26	30	35	40	50	62	62	82
Spline profile DIN 5463	6x11x14	6x16x20	6x21x25	6x26x32	8x36x42	8x46x54	8x52x60	8x62x72
Special version HWP – hollow shaft – keyway (DIN 6885)								
H 1	45	55	65	90	105	120	120	150
J 1	7.8	10.1	14.1 ¹⁾	18.3	24.3	31.8	34.4	42.4
Ø C ¹⁷	12	16	24	30	42	55	60	75
l 1	4	5	8	8	12	16	18	20

Subject to alterations

¹⁾ Depth of splineway to DIN 6885 page 3



Ordering example:

Hollow Shaft Type (HWP)

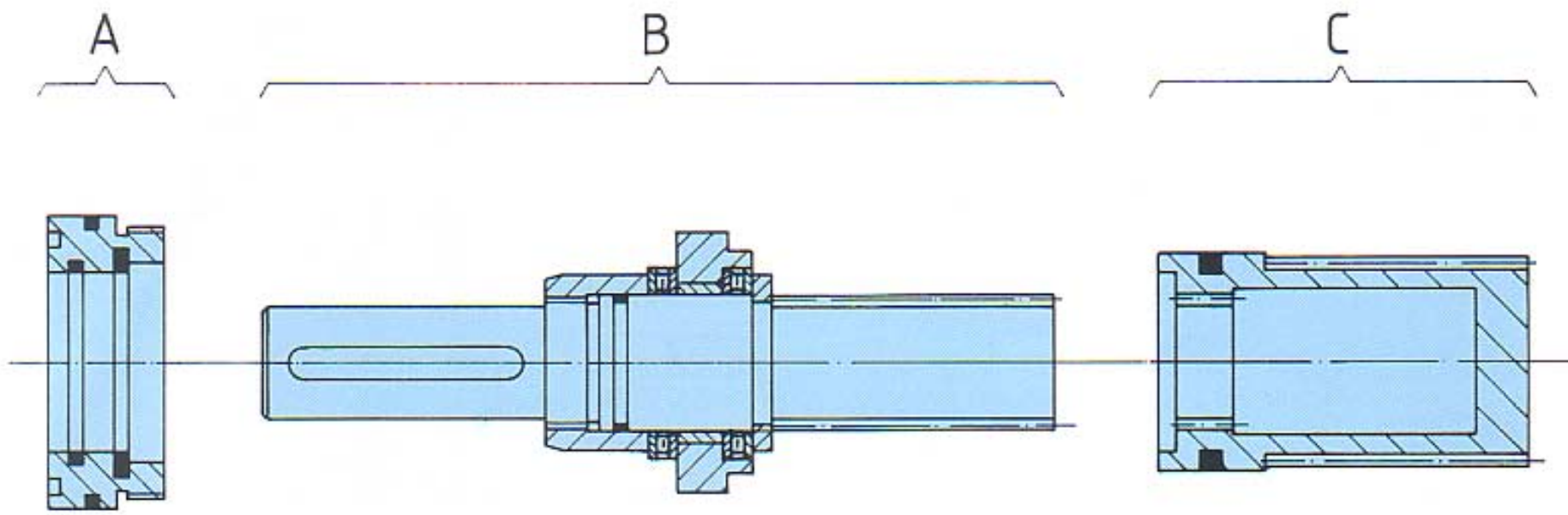
DA-H 80 270 D WV SW HW



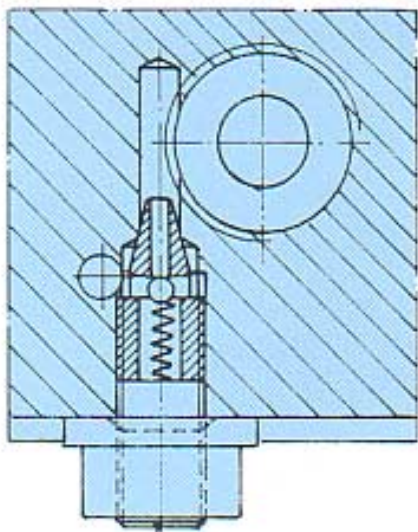
Standard version
Measures of construction
to DA-H 450 upon request

Type	DA-H 180	DA-H 200	DA-H 225	DA-H 225 S	DA-H 250	DA-H 280	DA-H 300
Additional equipment WV – angle adjustment							
P1 Angle 90°	475	480	645	765	725	865	930
P1 Angle 180°	595	626	807	880	910	1075	1150
P1 Angle 270°	742	770	975	1070	1095	1280	1375
P1 Angle 360°	900	920	1140	1295	1286	1483	1600
Auxiliary device SW – camshaft							
Ø A f7	32	40	40	40	40	40	40
Ø A1h6	25	25	25	25	25	25	25
Special version HW – hollow shaft DIN 5463 (DIN 5480 upon request)							
B	100	100	120	120	120	130	140
Spline profile DIN 5463	10x72x82	10x82x92	10x92x102	10x92x102	10x102x112	10x112x125	DIN 5472 130x145x24
Special version HWP – hollow shaft – keyway (DIN 6885)							
H 1	150	175	175	175	175	200	200
J 1	42.4	52.9	56.4	56.4	61.4	67.4	78.4
Ø C H7	75	95	100	100	110	120	140
I 1	20	25	28	28	28	32	36

Subject to alterations



Installation of bar packing



14 Adjustment of cushioning

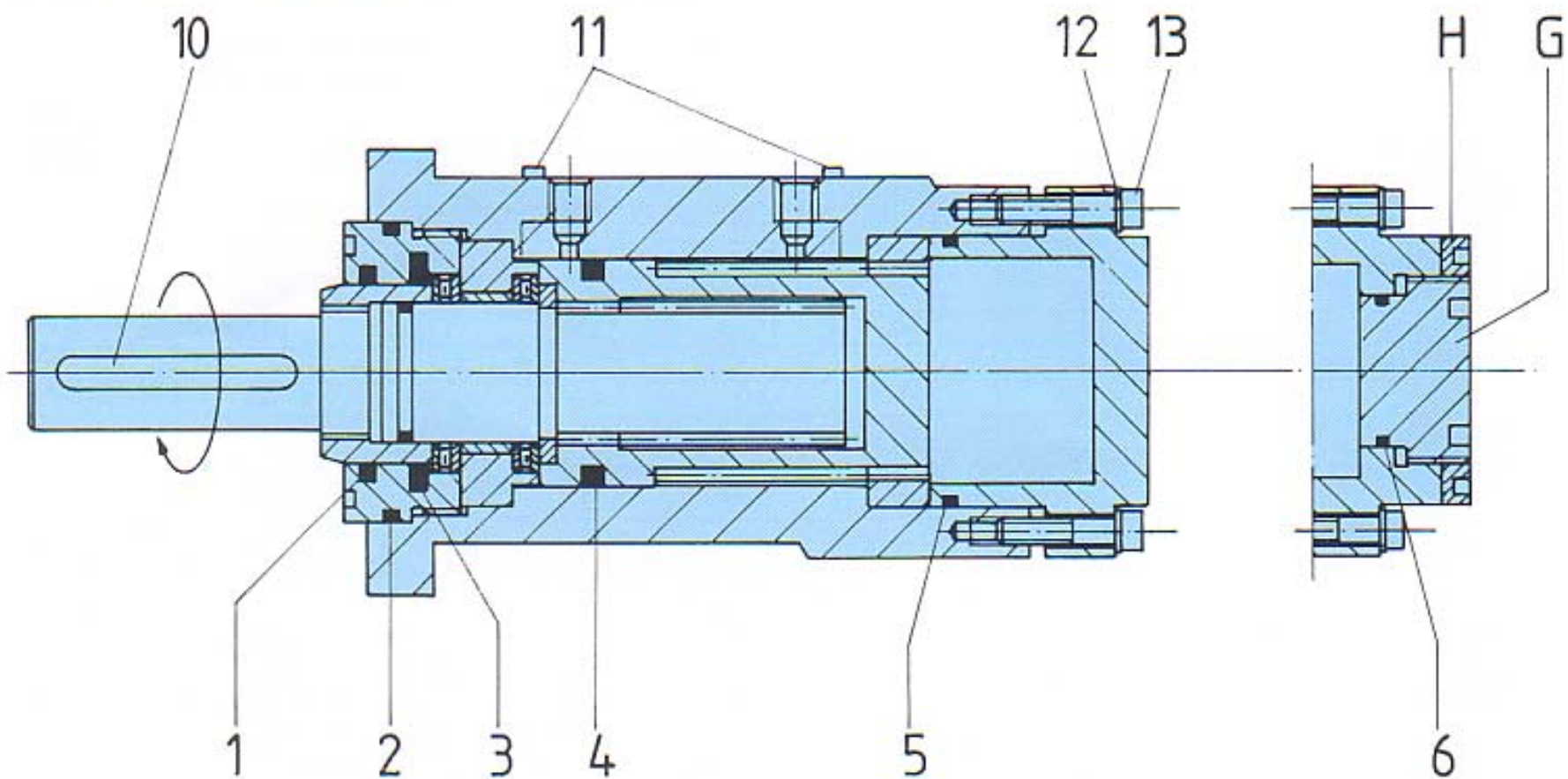
Adjustment of the feather key position

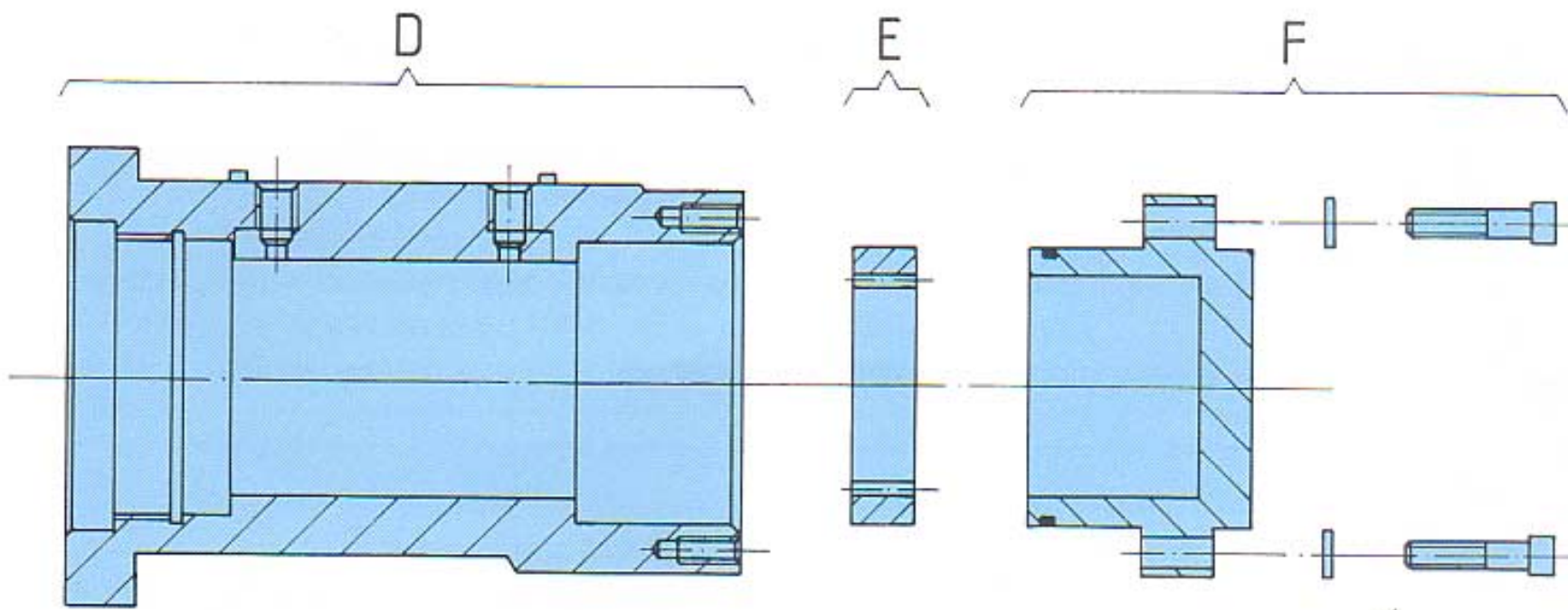
Turn the shaft *B* to the right until the piston *C* lies against the actuator shaft *B*. Then loosen the cylinder screws (13) by about 5 mm. Pull out the base *F* up to the cylinder screws. The required feather key position is obtained by turning the shaft *B* in the direction of the arrow to the right.

After adjusting the feather key position all the cylinder screws (13) are to be tightened with a torque spanner with the appropriate tightening torque given in the table on page 17.

Note

The seals may only be removed with suitable tools (seal remover). The surfaces of the seals are not to be damaged by this.





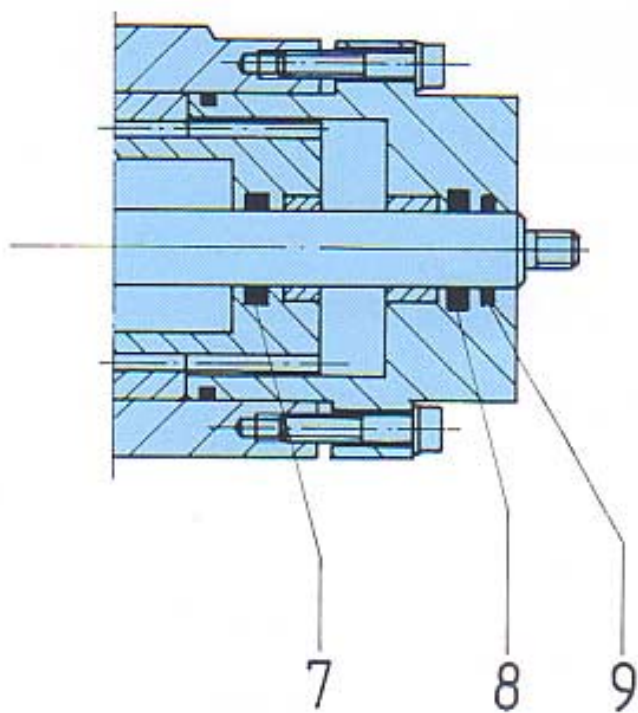
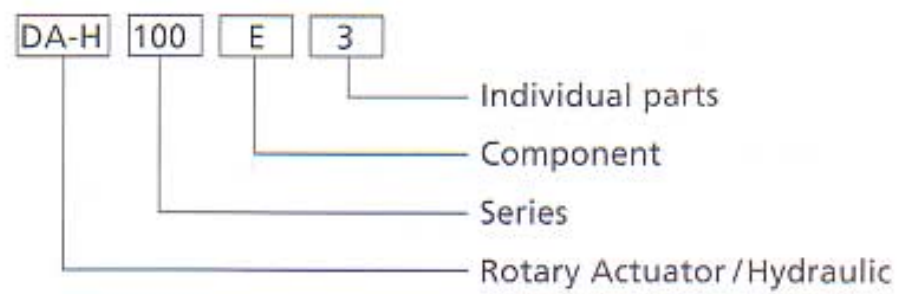
Tightening Torques in Nm for cylinder screws DIN 912 – 12.9

Series DA-H	40	50	63	80	100	125	140	160	180	200	225	225 S	250	280	300
M _A	17	17	17	43	84	148	148	330	650	650	650	650	1100	1100	1100

Spare Part List

Component	Individual part	
A – Sealing ring	1 – Quad-Ring	8 – Rod seal (base)
B – Actuator shaft	2 – O-Ring with back-up ring	9 – Quad-Ring (base)
C – Piston	3 – Rod seal	10 – Feather key DIN 6885 (2 no.)
D – Housing	4 – Piston seals	11 – Bleeding screws
E – Annular gear	5 – O-Ring (base) with back-up ring	12 – Locking washer
F – Base	6 – O-Ring (adjusting screw) with back-up ring	13 – Cylinder screws DIN 912-12.9
G – Adjusting screw	7 – Rod seal (piston)	14 – Cushioning screws
H – Locking nut		

Ordering example:



Rotary-Lift Combinations

In the course of technological development, more and more work cycles have to be automated. For rotary and lifting movements, which have to be executed simultaneously or separately, the rotary-lift combinations from HKS offer you the ideal solution.

Here we have combined the well-established HKS rotary actuator with a doubly effective linear unit into a compact component.

The optimum unit can be chosen from two types for each special use.

Applications

HKS rotary-lift combinations can be used in the whole of the industrial sector such as machine tools, glass-manufacturing industry, bending machines, transfer lines, handling techniques, shipbuilding, vehicle and ventilation techniques etc.

The series with the Linear Cylinder in front of the Rotary Actuator offers

- 8 sizes up to 16,000 Nm
- working pressure up to 160 bar
- lifting capacity up to 360,000 N
- lifting height up to 1.200 mm
- 4 angles of rotation according to size: 90°, 180°, 270°, 360° deg.
- actuator shaft with 2 feather keys, DIN 6885, or DIN 5480

The Series with the Linear Cylinder at the Rear of the Rotary Actuator offers

- 8 sizes up to 14,700 Nm
- working pressure up to 210 bar
- lifting capacity up to 150,000 N
- lifting height is dependent upon rotation angle
- actuator shaft with DIN 5463 spline profile

Auxiliary Equipment

- cushioning at end positions for rotary and lifting movements
- angle of rotation adjustment up to $\pm 4^\circ$
- camshaft

Special Versions

- mounting flange to customer requirements
- baseplate fixing
- provision for limit switch mounting
- direct valve connection
- all intermediate rotation angles from 0 to 360° are available
- fresh and sea-water resistant
- length measuring instrument integralable into the actuator shaft

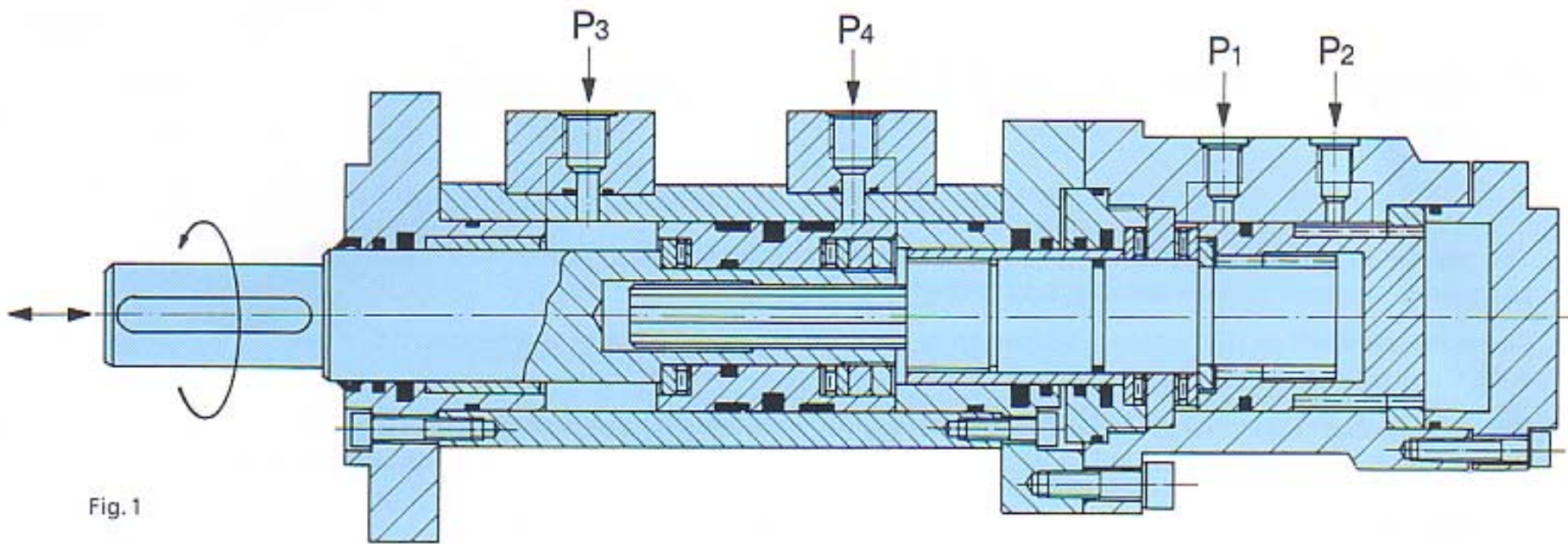


Fig. 1

Functional Description

The oil pressure introduced through the connections *P1* and *P2* causes a rotary movement on the actuator shaft. The linear movement of the piston *K* is converted into a rotary movement by means of multiple counter-rotating helical gears in the housing, piston and shaft. If fluid under pressure flows through the connections *P3* or *P4* into the lifting cylinder, the piston rod will move either in or out. Lifting and rotary movements can take place simultaneously or separately. Exact positioning of movements can be achieved with auxiliary equipment.

Direction of Rotation

Through the entry of pressure fluid at *P1* the actuator shaft turns from the basic position to the left (anti-clockwise). (A change in the direction of rotation is possible as a special version.)

Normal Position of the Feather Key

Fig. 1 shows the factory-adjusted position of the piston *K*. Changes in position are possible (see page 16 "adjustment of the feather key position").

Cushioning

The rotary and lifting movement can be regulated at the end positions by a throttle non-return valve (see fig. 2).

Description

After loosening the self-sealing lock-nut the throttle section can be adjusted by using an Allen key. Turn the screw of the tapered needle valve right in and then loosen it one turn. The fine adjustment of the cushioning can now be made. For a closer description see page 9.

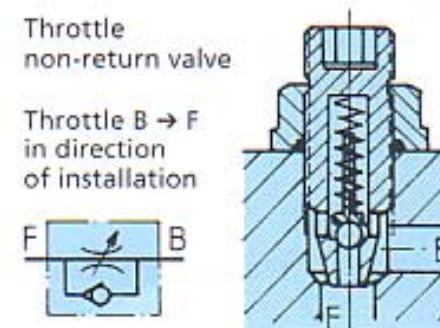
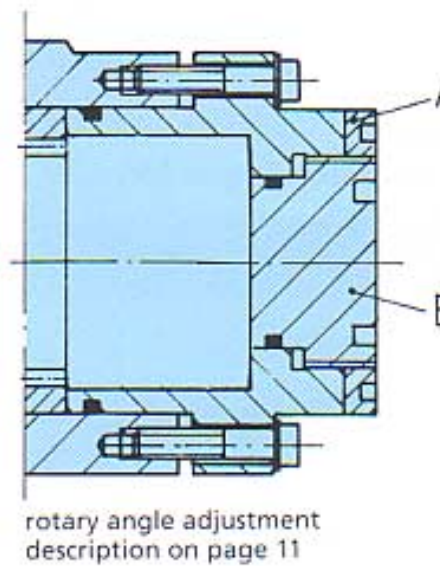
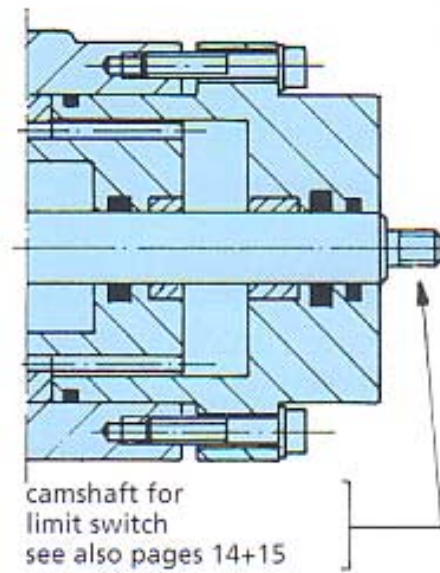


Fig. 2

Rotary-Lift Combination · Series with cylinder at the front

The series where the linear unit is situated in front of the rotary actuator (DHK-H-ZV) has the lifting cylinder and the rotary actuator connected together with flanges.

The actuator shaft of the rotary actuator grips positively into the bore of the piston rod of the lifting cylinder with the involute spline shaft.

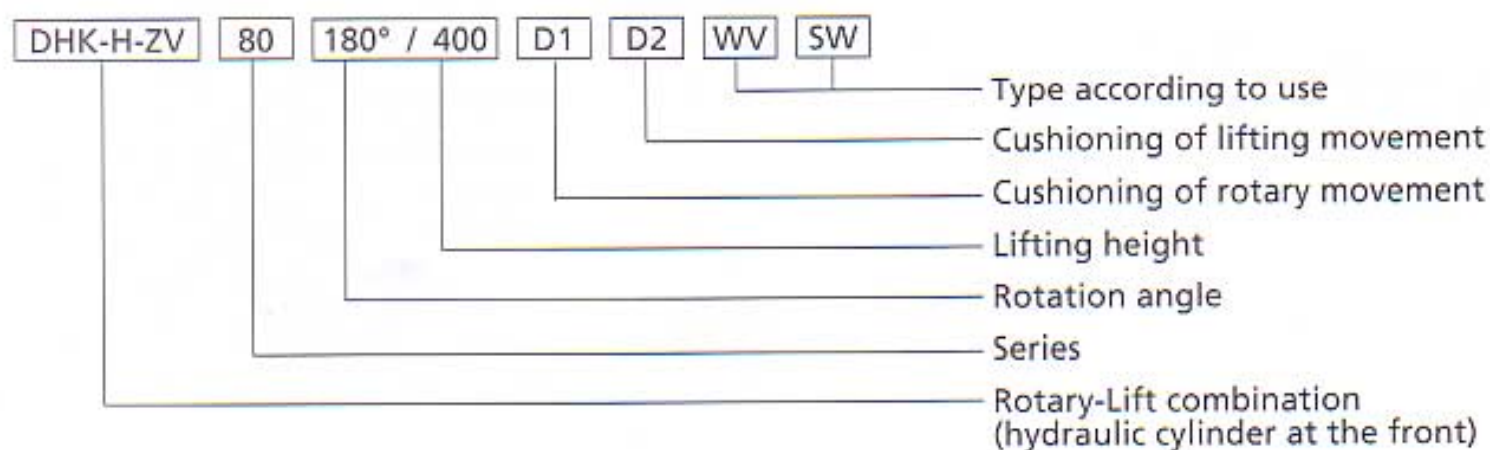
The splined shaft and bore are manufactured to appropriate lengths and depths according to the lifting height. The actuator shaft is situated at the end of the piston rod with two feather keys opposite each other.

Technical Data for the DHK-H-ZV 40 to 200 Series

Type DHK-H-ZV	40	50	63	80	100	125	160	200
max. nominal torque (Nm)	65	200	440	850	1950	3950	8400	16000
nominal torque (Nm/bar)	0.65	1.25	2.75	5.31	12.18	24.68	52.5	100
max. working pressure (bar)	100	160	160	160	160	160	160	160
max. lifting capacity (N)	12000	30000	47000	75000	110000	160000	270000	360000
max. tensile force (N)	9700	21500	35000	33000	60000	87000	130000	180000
absorbed volume (dm ³) for rotary movement	90°	0.020	0.033	0.066	0.131	0.255	0.518	1.145
	180°	0.040	0.066	0.131	0.262	0.509	1.036	2.290
	270°	0.060	0.099	0.196	0.391	0.763	1.554	3.435
	360°	0.080	0.132	0.262	0.521	1.018	2.071	4.580
absorbed volume (dm ³) for lifting movement								
per 100 mm piston rod	0.196	0.237	0.384	0.502	0.785	1.226	2.009	upon enquiry
per 100 mm rod side	0.10	0.141	0.225	0.2198	0.400	0.590	0.879	
weight in kg								
(a) with rotation angle	90°	4	5	8.5	16.7	24.1	47	114
	180°	4.5	5.8	9.8	19.1	29.2	55	136
	270°	5	6.9	11	21.5	34	63.5	154
	360°	5.5	7.4	12.2	24	38.5	72.5	170
b	6.5	9	15	26	38	68	110	
c	1.65	2.75	3.8	5.7	7.5	11	19	
weight in kg calculated according to formula	a + b + $\left(\frac{c + \text{lift in mm}}{100} \right)$							

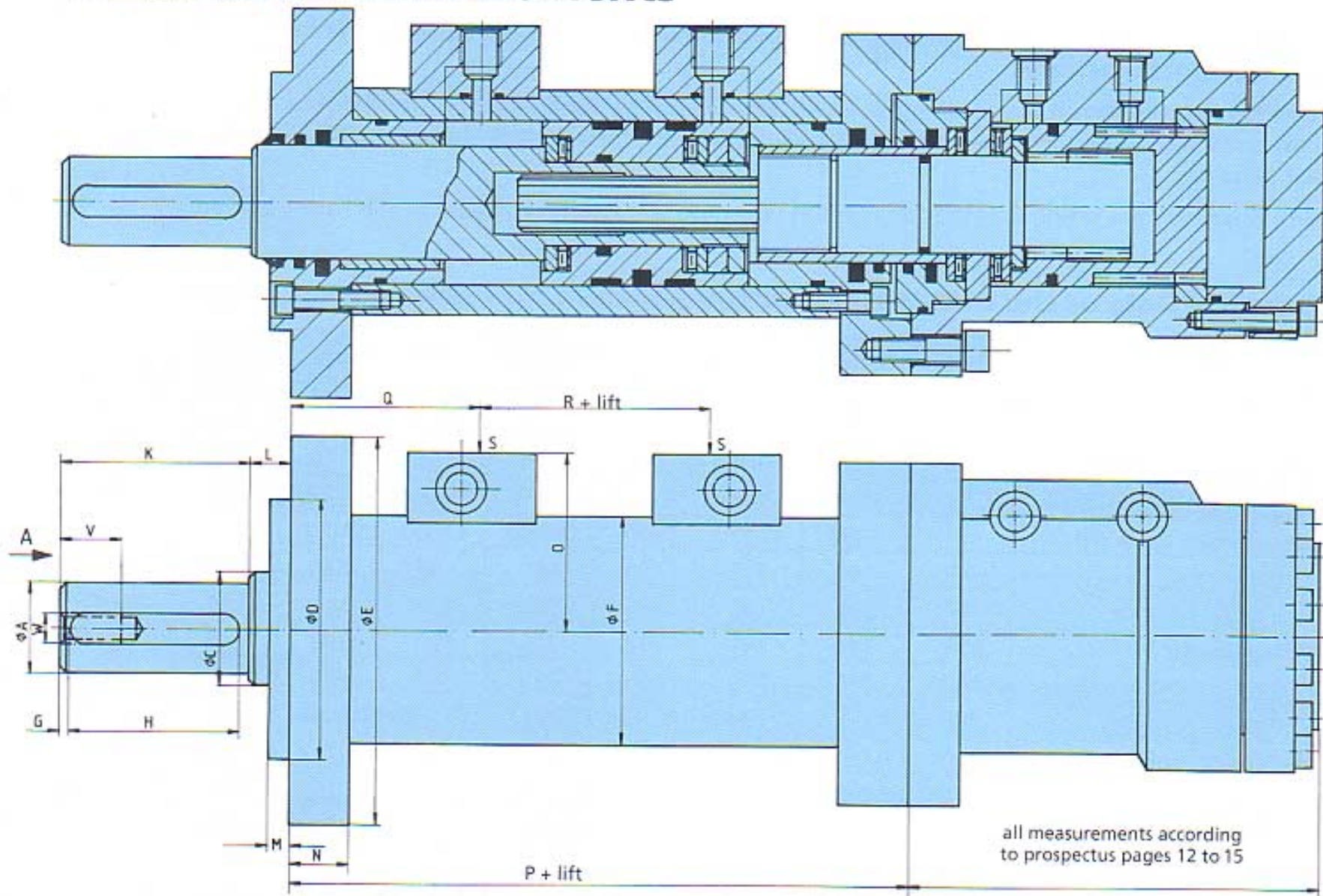
Subject to alterations

Ordering example:

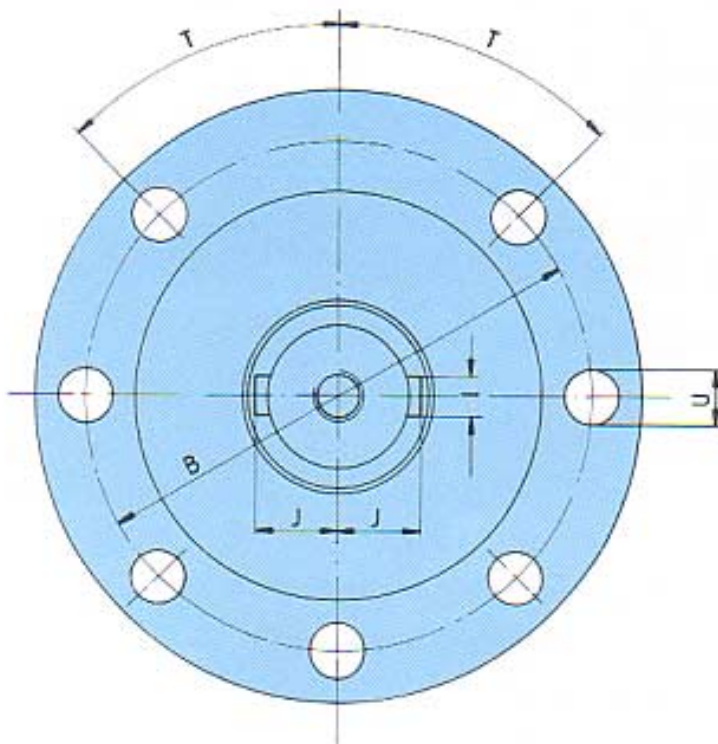


Rotary-Lift Combination · Series with cylinder at the front

Installation measurements



View A



Type DHK-H-ZV	40	50	63	80	100	125	160
Ø A k6	22	28	35	42			
Ø A m6					55	70	100
B	84	100	115	145	160	210	260
Ø C f7	35	35	45	60	70	90	120
Ø D f7	70	80	92	125	140	175	220
Ø E	98	120	135	168	188	242	292
Ø F	70	80	95	110	130	160	210
G	2,5	2	5	5	5	7	5
H DIN 6885	45	56	70	100	100	125	200
I DIN 6885	8	8	10	12	16	20	28
J DIN 6885	14	17	20,5	24	31,5	39,5	56
K	50	60	80	110	110	140	210
L closed	24	27	30	33	40	49	52
M	17	18	20	24	30	35	40
N	18	18	21	28	30	35	40
O	54	60	68	81	91	112	133
P	192	194	210	249	268	310	394
Q	61	66	68	89	92	99	121
R	55	55	63	63	77	93	120
S	G 1/4"	G 1/4"	G 1/4"	G 1/2"	G 1/2"	G 3/4"	G 3/4"
T	60°	60°	60°	45°	45°	40°	40°
U / No.	9/5	9/5	11/5	11/7	14/7	18/8	22/8
V	20	20	30	35	40	50	55
W	M 8	M 8	M 10	M 12	M 16	M 20	M 24

Subject to alterations

Rotary-Lift Combination · Series with cylinder at the rear

The series with the linear unit at the rear of the actuator (DHK-H-ZH) has the lifting cylinder directly mounted on the base of the actuator.

The extended piston rod of the lifting unit grips positively into the hollow shaft of the actuator with its spline shaft and simultaneously serves as actuator shaft. If required splined profile bushes to DIN 5463 can be supplied (see page 9).

With this series the lifting length is dependent upon the size (rotation angle) of the rotary actuator.

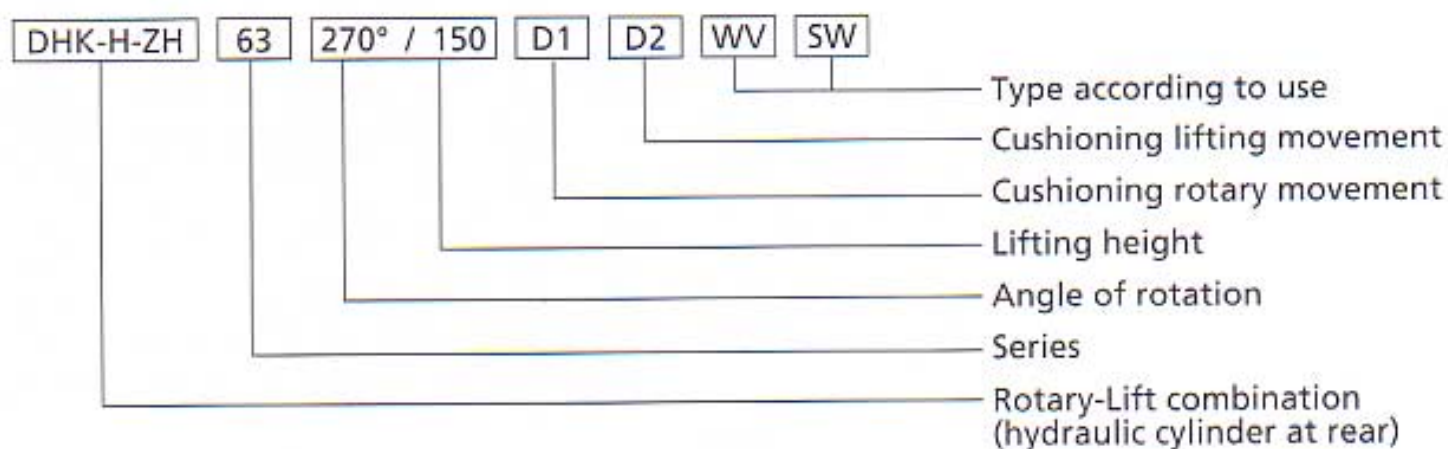
Technical Data of the DHK-H-ZH 40 to 200 Series

Type DHK-H-ZH	40	50	63	80	100	125	160	200
max. nom. torque at 210 bar (Nm)	65	200	440	850	1950	3950	8100	14700
nominal torque (Nm/bar)	0.65	0.95	2.09	4.04	9.28	18.80	38.57	70
max. working pressure (bar)	100	210	210	210	210	210	210	210
max. lifting capacity (N)	5850	16000	25000	39000	56000	68000	102000	150000
max. tensile force (N)	4380	12000	18000	29000	42000	54000	80000	110000
max. lifting height	90°	100	110	120	165	185	220	295
	180°	125	143	162	215	250	310	410
	270°	155	195	212	265	320	390	528
	360°	185	215	255	325	380	480	647
absorption volume (dm ³) for lifting movement	90°	0.0155	0.0247	0.0485	0.097	0.190	0.386	0.7826
	180°	0.0310	0.0494	0.097	0.195	0.381	0.772	1.565
	270°	0.0465	0.0742	0.1455	0.292	0.572	1.158	2.347
	360°	0.0620	0.0989	0.194	0.380	0.763	1.544	3.130
absorption volume (dm ³) for lifting movement								
per 100 mm piston rod	0.061	0.080	0.1256	0.196	0.311	0.502	0,785	
per 100 mm rod side	0.050	0.062	0.0942	0.147	0.231	0.376	0.588	
weight in kg								
(a) with rotation angle	90°	4	5	8.5	16.7	24.1	47	114
	180°	4.5	5.8	9.8	19.1	29.2	55	136
	270°	5	6.9	11	21.5	34	63.5	154
	360°	5.5	7.4	12.2	24	38.5	72.5	170
b		3.6	4.6	6.2	10	14	21	43
c		0.65	0.75	1	2	3.2	4.25	7.2
weight in kg calculated according to formula	$a + b + \left(\frac{c + \text{lift in mm}}{100} \right)$							

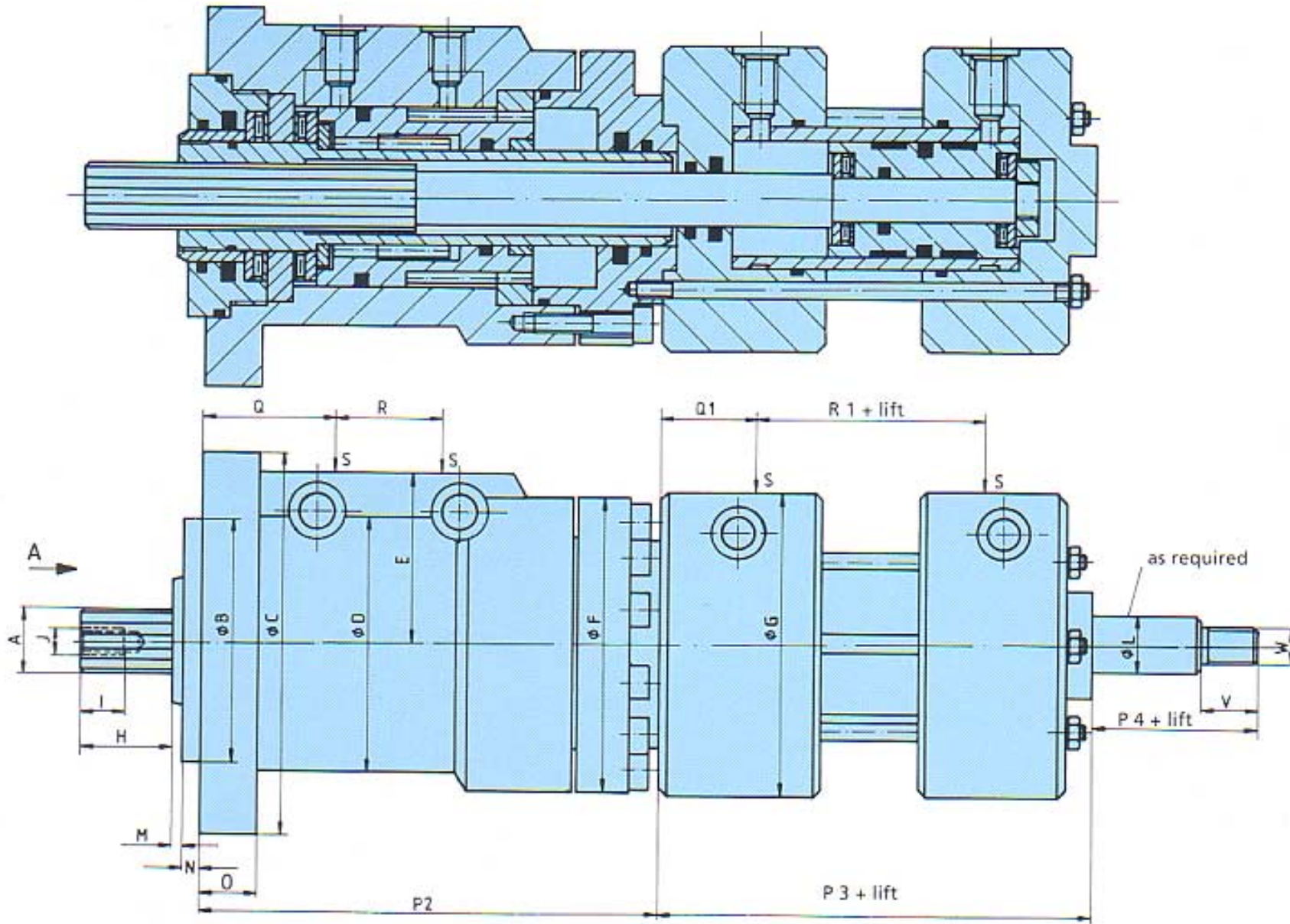
upon enquiry

Subject to alterations

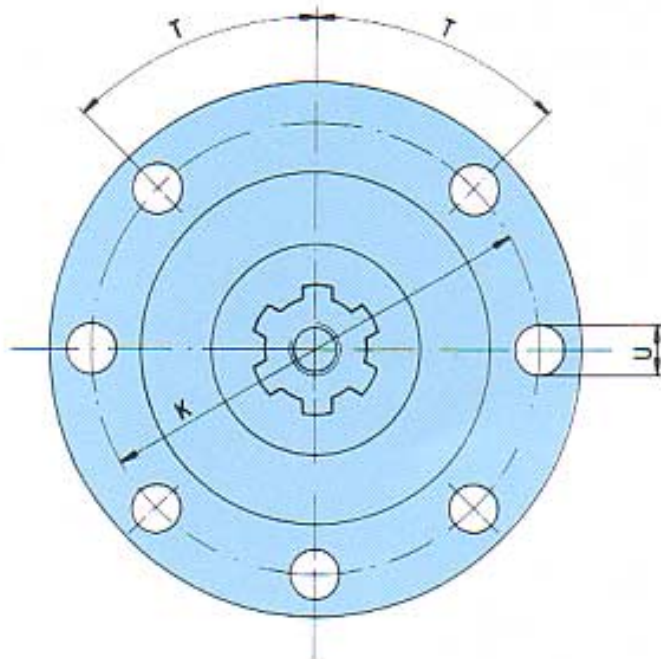
Ordering example:



Rotary-Lift Combination · Series with cylinder at the rear · Installation measurements



View A



Type DHK-H-ZH	40	50	63	80	100	125	160
A = Spline shaft DIN 5463	6x11 x14	6x16 x20	6x21 x25	6x26 x32	8x36 x42	8x46 x54	8x62 x72
Ø B f7	55	68	80	100	115	150	190
Ø C	98	110	128	150	178	222	278
Ø D	66	72	87	108	130	167	206
E	43	49	57	66	80	93	127
Ø F	75	82	95	118	147	178	240
Ø G	78	85	98	120	138	150	198
H	25	30	35	42	58	75	90
I	12	15	22	25	35	40	45
J	M 6	M 8	M 10	M 12	M 16	M 20	M 24
K	84	90	108	130	155	195	245
Ø L f7	14	16	20	25	32	40	50
M	3	3	3.5	3	4	4	5
N	4	5	5	6	6	8	12
O	16	18	25	30	31	38	43
P2	Angle 90°	138	143	184	210	258	311
	Angle 180°	164	178	231	260	324	397
	Angle 270°	196	214	275	313	393	481
	Angle 360°	225	247	316	368	459	569
P3	90	104	115	127	138	163	197
P4	20	20	20	35	35	40	48
Q	39	39	48	57	65	74	94
Q1	27	28	33	36	38	45	47
R	Angle 90°	28	31	37	47	56.5	76
	Angle 180°	41	48	57	74	89	118.5
	Angle 270°	55	65	79	101	121.5	162.5
	Angle 360°	68.5	80.5	99	125	154	207
R1	32	43	48	48	55	59	68
S	G 1/8"	G 1/8"	G 1/4"	G 3/8"	G 1/2"	G 1/2"	G 3/4"
T	60°	60°	60°	45°	45°	40°	40°
U / No.	9/5	9/5	11/5	11/7	14/7	18/8	22/8
V	15	15	15	25	25	30	36
W	M 8	M 8	M 10	M 12	M 16	M 20	M 27

Subject to alterations for technical improvements

HKS Unternehmensgruppe

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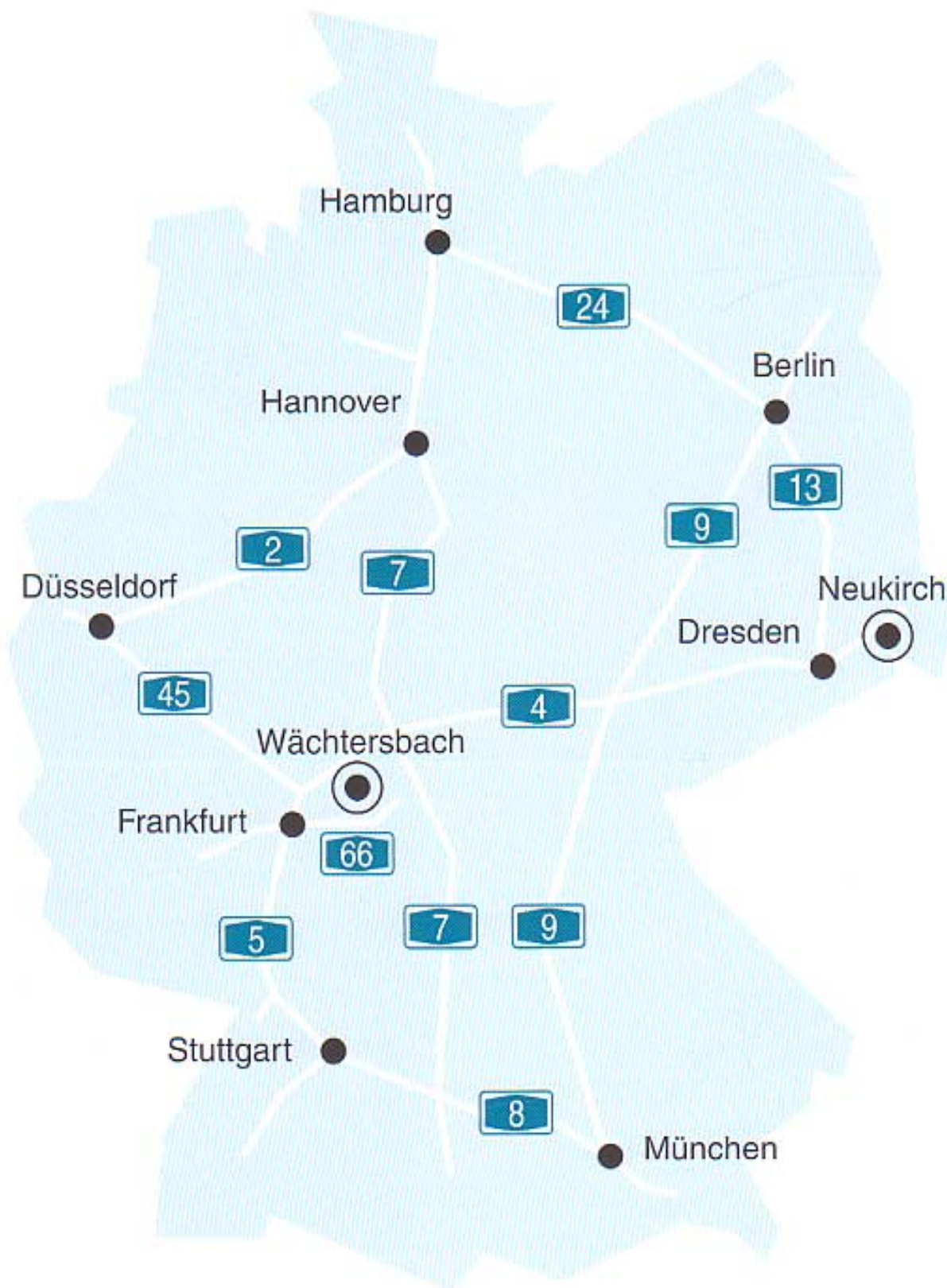
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