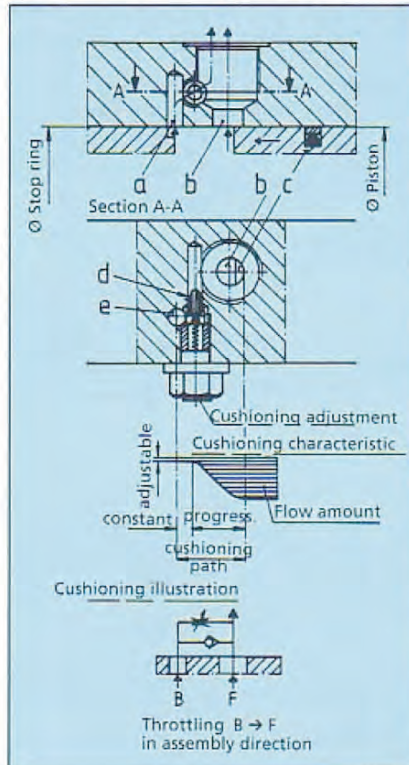


## Cushioning End Positions



### 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

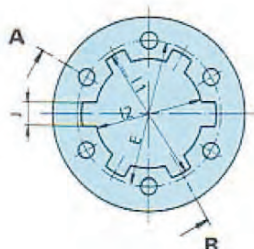
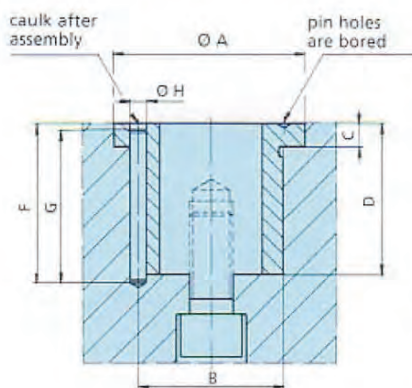
After loosening the self-sealing lock nut, the throttle section can be adjusted by an Allen key.

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. $\alpha$	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
Splines	6x	6x	6x	6x	8x	8x	8x
Splinesway to DIN 5463	11x14	16x20	21x25	26x32	36x42	46x54	62x72
Ø A <sub>0.1</sub>	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 m <sub>6</sub>	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/m 6	2.5	3	4	4	5	6	8
I <sub>1</sub> H11	14	20	25	32	42	54	72
I <sub>2</sub> 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

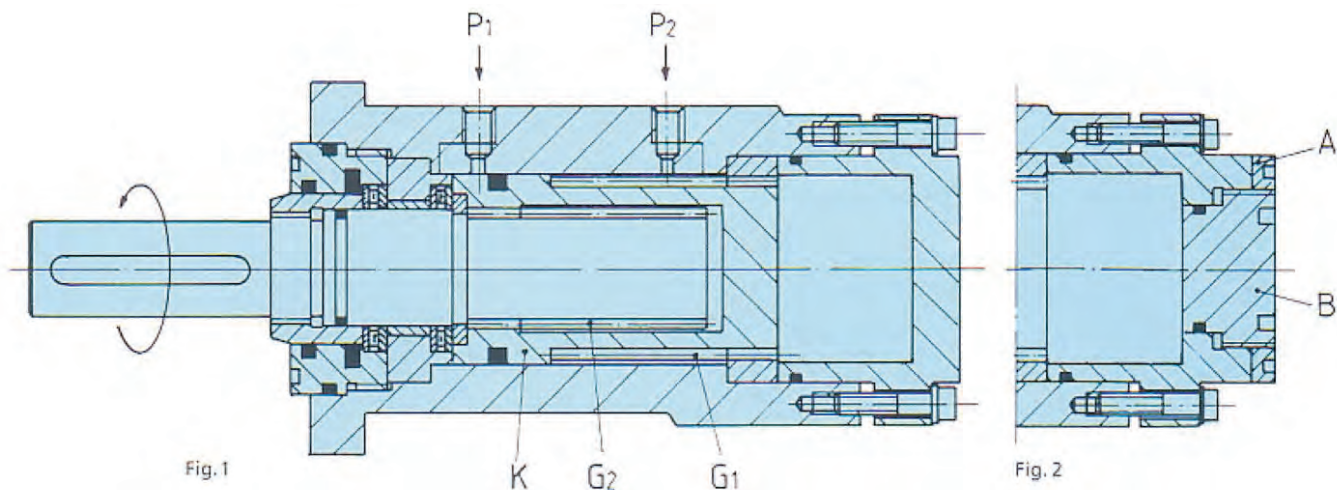
- actuator shaft with spline profile to DIN 5463
- actuator shaft with second drive cogs
- actuator shaft and mounting flange to customer's requirements
- angle adjustment over the whole rotation area
- limit switch equipment
- direct valve connection
- 3 mounting positions
- **all intermediate rotation 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 <sup>3</sup> )	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).

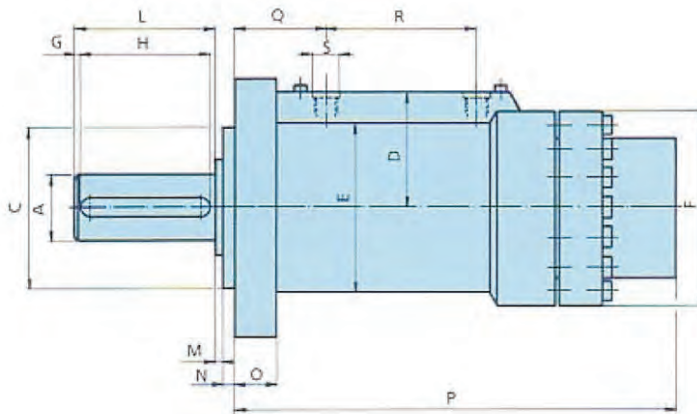
### Technical Data of the DA-H 180 to DA-H 300 Range Technical Data up to DA-H 450 Range upon request

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 <sup>3</sup> )	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

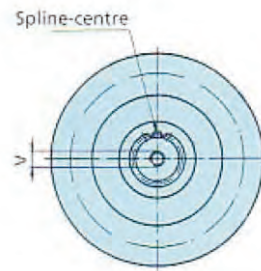
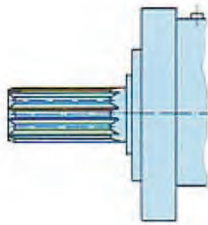
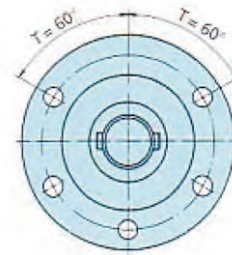
Subject to alterations

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

# Standard Type

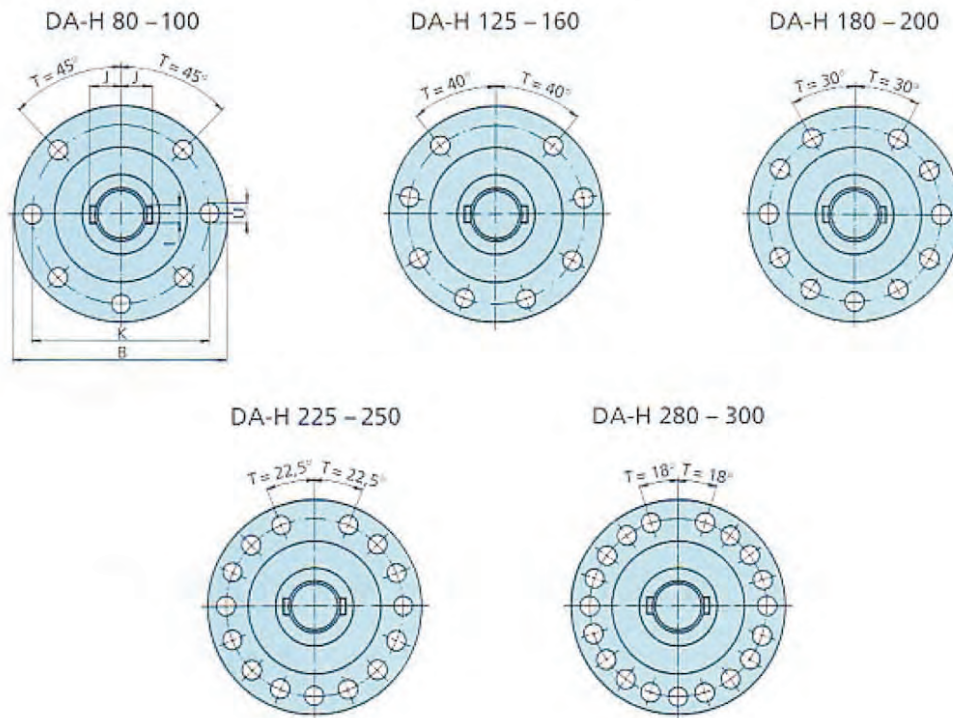


DA-H 40 – 63



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



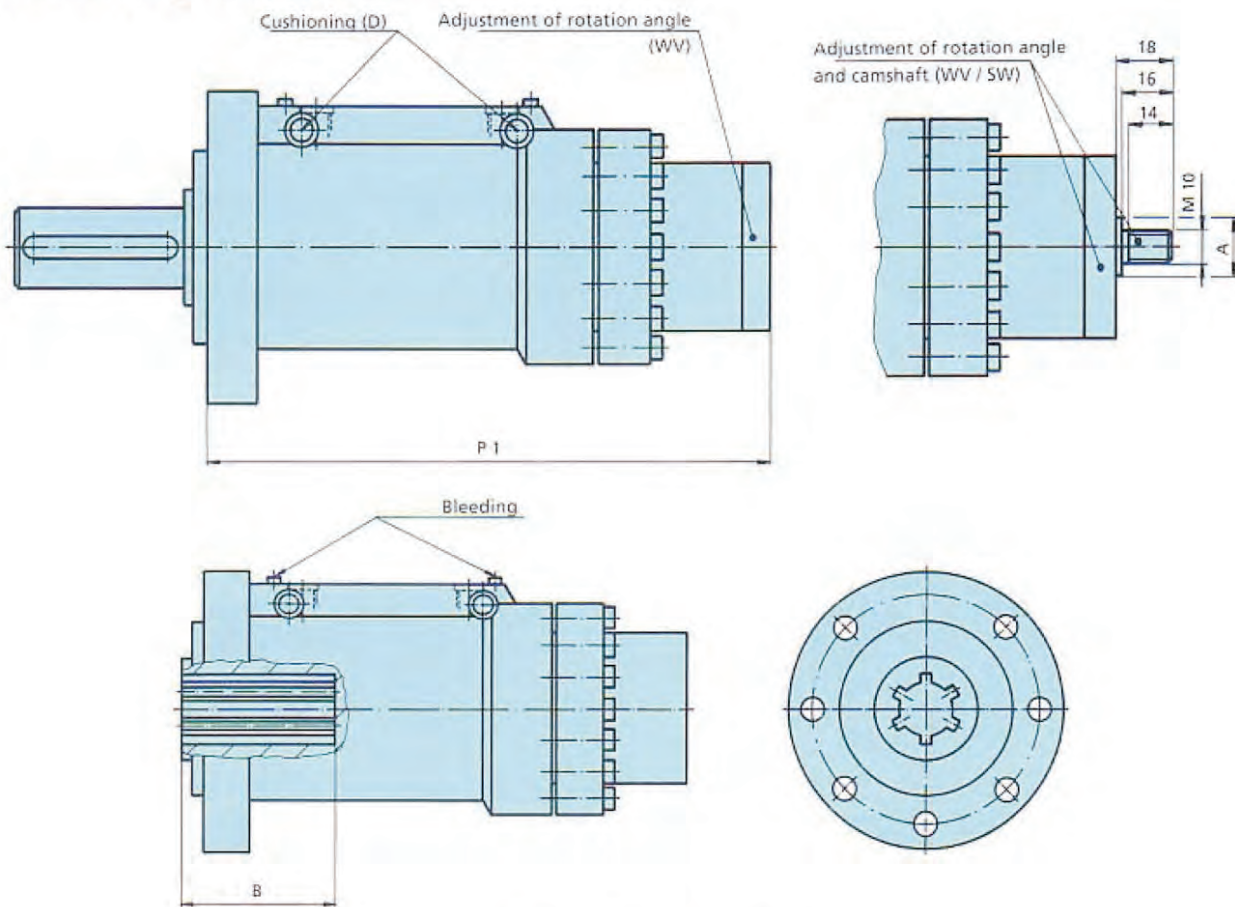
Ordering example on page 15

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 <sub>k6</sub>							
Ø A <sub>m6</sub>	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 <sub>f7</sub>	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



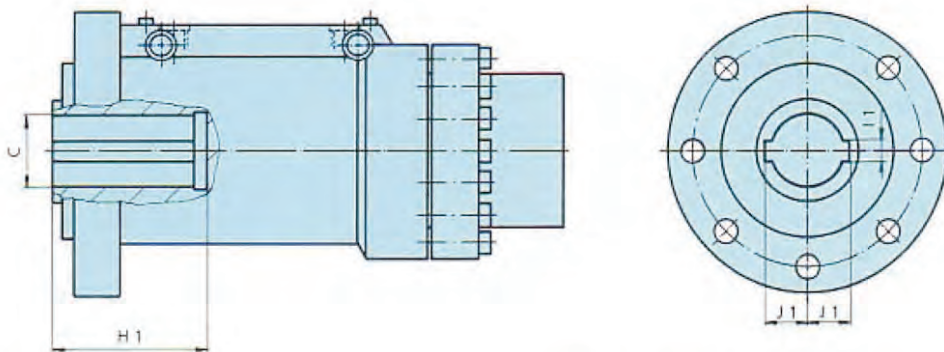
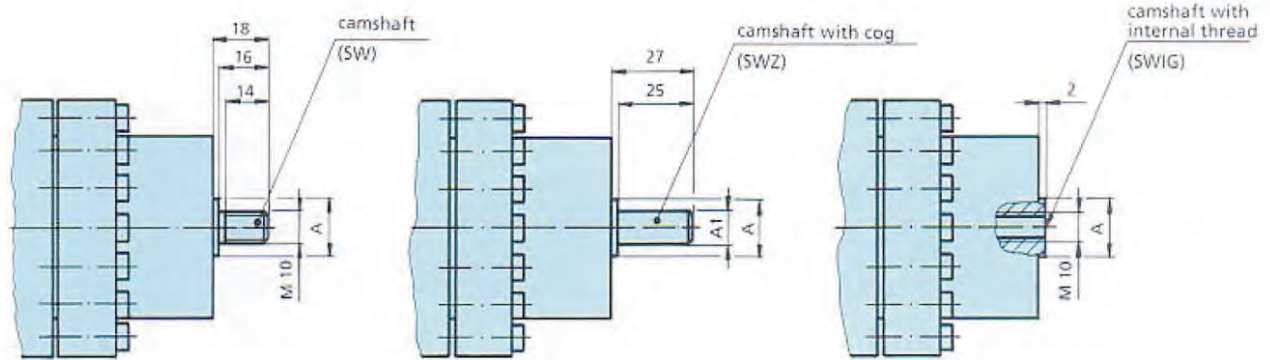
## Hollow Shaft Type (HW)

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 <sup>1)</sup>	18.3	24.3	31.8	34.4	42.4
Ø C <sup>17</sup>	12	16	24	30	42	55	60	75
I 1	4	5	8	8	12	16	18	20

Subject to alterations

<sup>1)</sup> Depth of splineway to DIN 6885 page 3



Ordering example:

### Hollow Shaft Type (HWP)

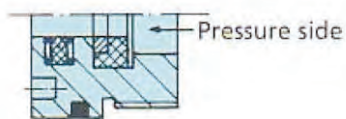
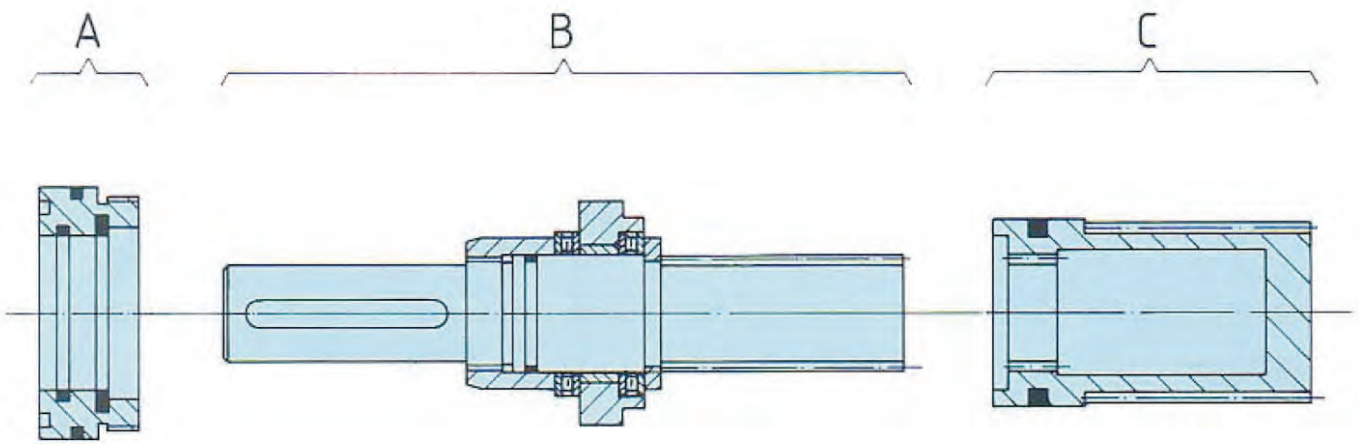
DA-H 80 270 D WV SW HW



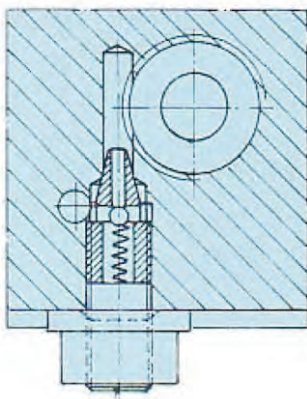
Standard version  
**Measures of construction to DA-H 450 upon request**

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

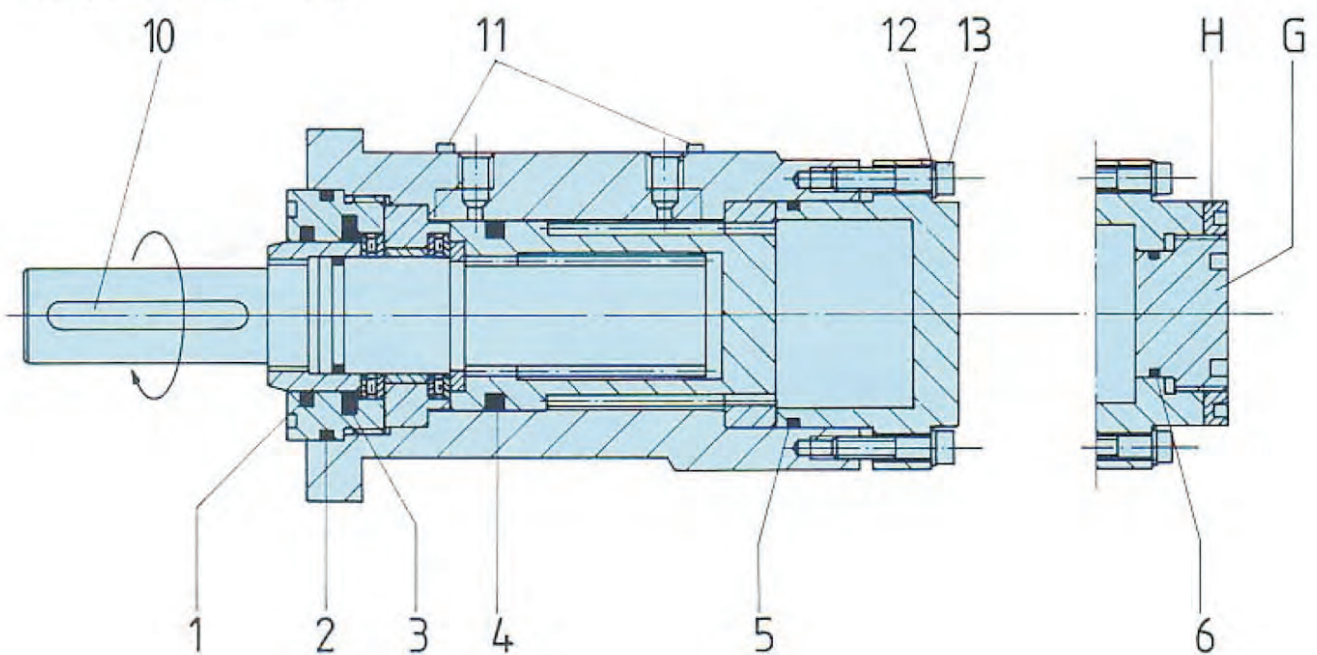
### Adjustment of the feather key position

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.

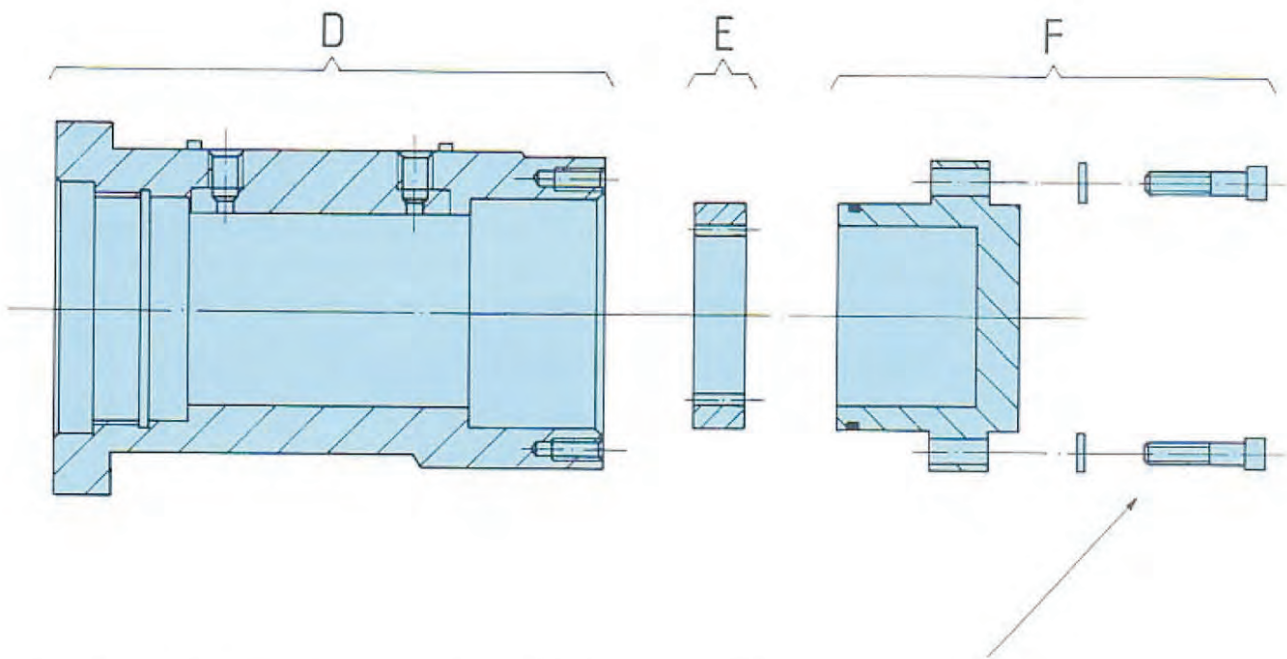
After adjusting the feather key position all the cylinder screws (13) are to be tightened with a torque spanner with the appropriate tightening torque given in the table on page 17.

### 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 <sub>A</sub>	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:

DA-H 100 E 3

- Individual parts
- Component
- Series
- Rotary Actuator /Hydraulic

