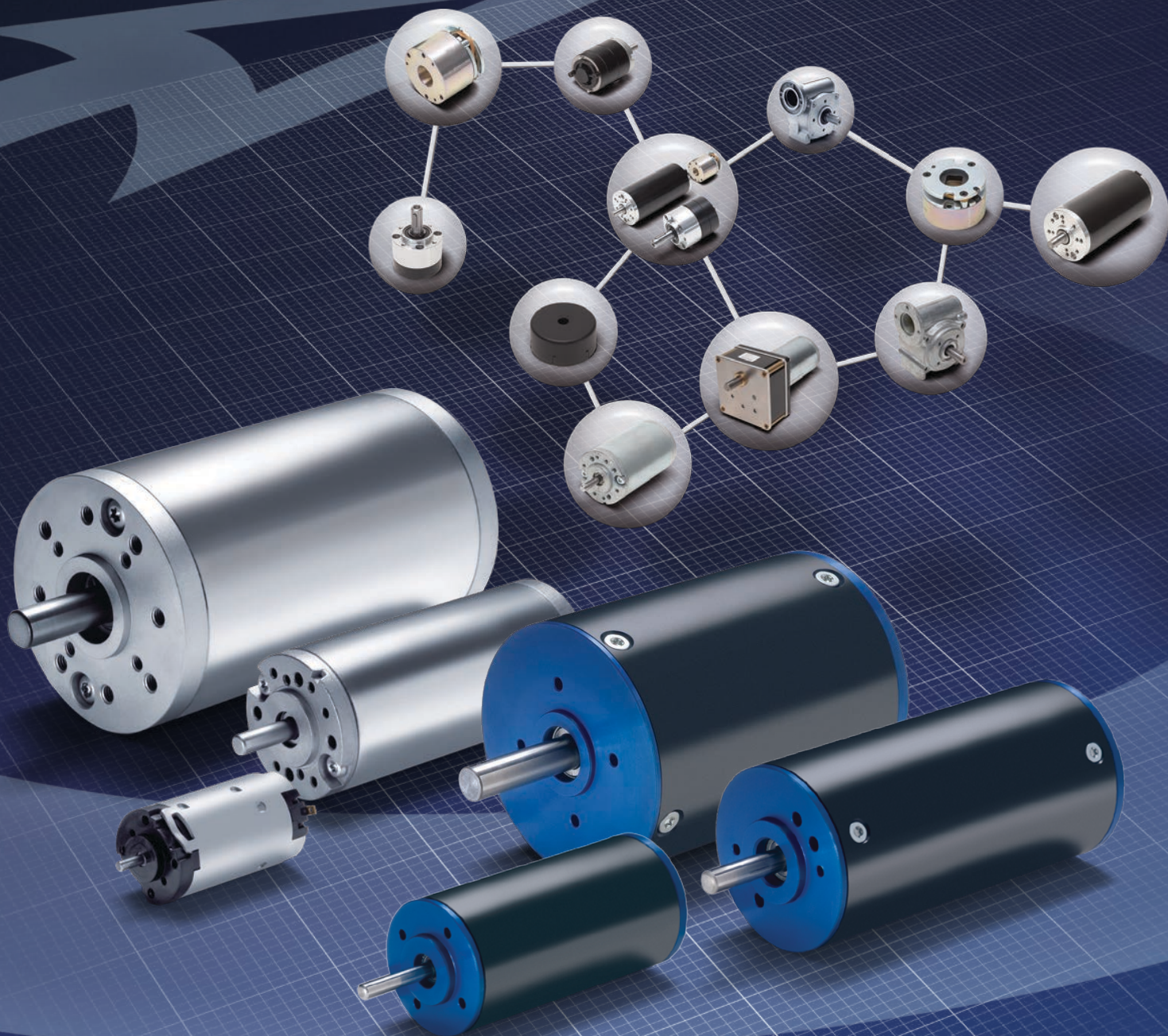




excellent drives



DC drives

Overview brochure

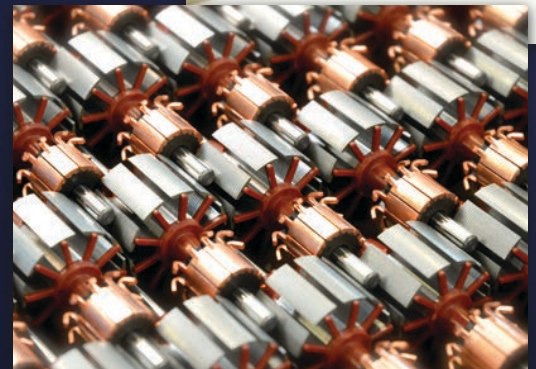


excellent drives – made in Germany

Kählig Antriebstechnik GmbH specialises in brushed and brushless DC motors from 2.5 watts upwards and has established itself meanwhile as one of the world's leading manufacturers in this sector.

We offer cost-effective and innovative drive concepts based on more than 40 years experience and the steadily expanding knowhow of our application engineers.

Thanks to our modular facilities we can economically produce small (50 – 500), medium (up to 20,000) and large (up to 200,000) lots. We employ lean manufacturing techniques in production cells through to fully automated production lines.



A large range of accessories

Our focus is on developing and producing compact, versatile and high-performance drives for customised applications.

Thanks to the extensive expertise of our development department we can provide you with exactly the solution you need for your specific application.

Standard motors with optional extras

For applications that do not entail much development work we can supply our standard modular system motors from stock with very short delivery times. They can also be quickly assembled as complete drive systems with gearing, encoder, brake or controller.

Your system supplier for complete solutions

Apart from our ex-stock DC motors and our knowhow in customised drives you also benefit from the complete solutions we offer as a systems provider. We look forward to receiving your inquiry.





The KAG standard programme – proven solutions.

The basis of our range of services does already cover a broad spectrum of possible areas of application. Both the motors and the attachment part such as gearboxes and encoders are manufactured according to the high technical requirements of the economy and industry and are immediately available.

Of course, adaptable basic modules for series production are also included. Moreover, solo motors for small series ex warehouse are immediately available.

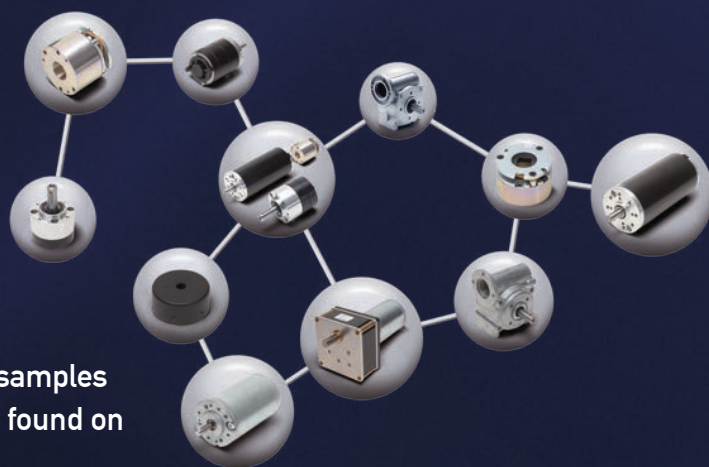


The KAG Drive Configurator – Versatility and efficiency.

The result of combinations of our standard products is an enormous versatility of solutions for the quality requirements of modern production.

You will receive quick solutions for small series and samples at KAG within one week. A selection aid can also be found on the internet with our product configurator at

www.kag-hannover.de



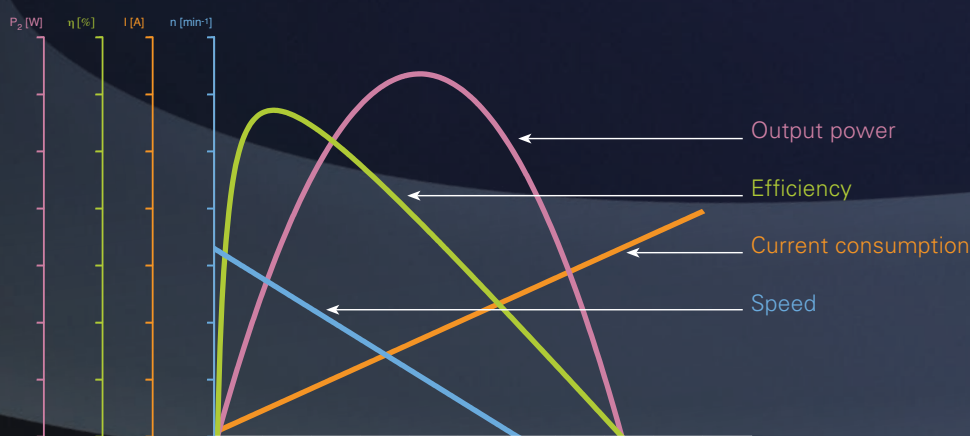


KAG Custom Solutions – the perfect drive.

You have specific requirement regarding your drive? We build your motor using all parameters such as winding number and winding thickness, size of housing, continuous output and peak output. Thereby, we support you in calculating and developing complete sub-assemblies. No matter what drives you – we are responsible for the solution.

Legend of characteristic curve

For your individual demands, we will be happy to determine the specific characteristic curve for your. Please contact us if you cannot find your area of application.



Structure of the product description

Accessories (gears, tachometer ...)

Bearing (l=Ball bearing, S=Sliding bearing)

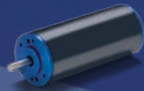
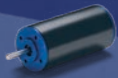
Armature length/rotor length

Motor diameter

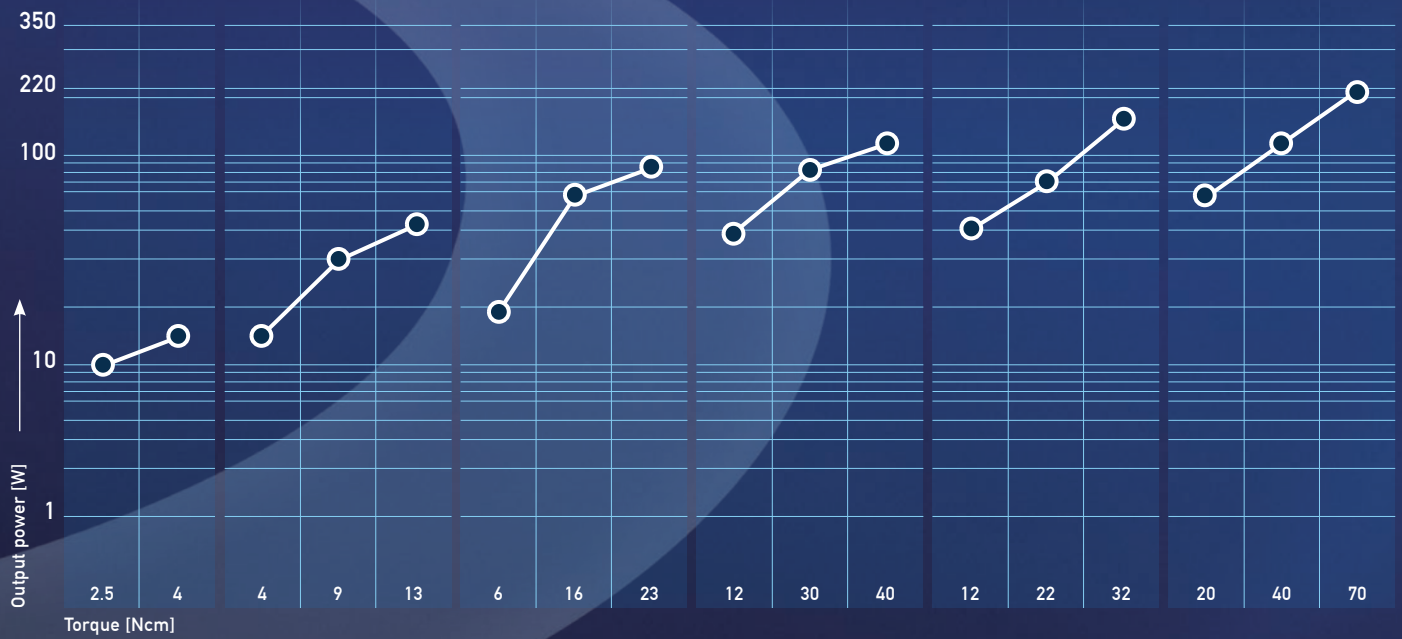
Motor

M	63	x	25	/	x	+	z1	+	...zn
ECM	48	x	40	/	x	+	z1	+	...zn

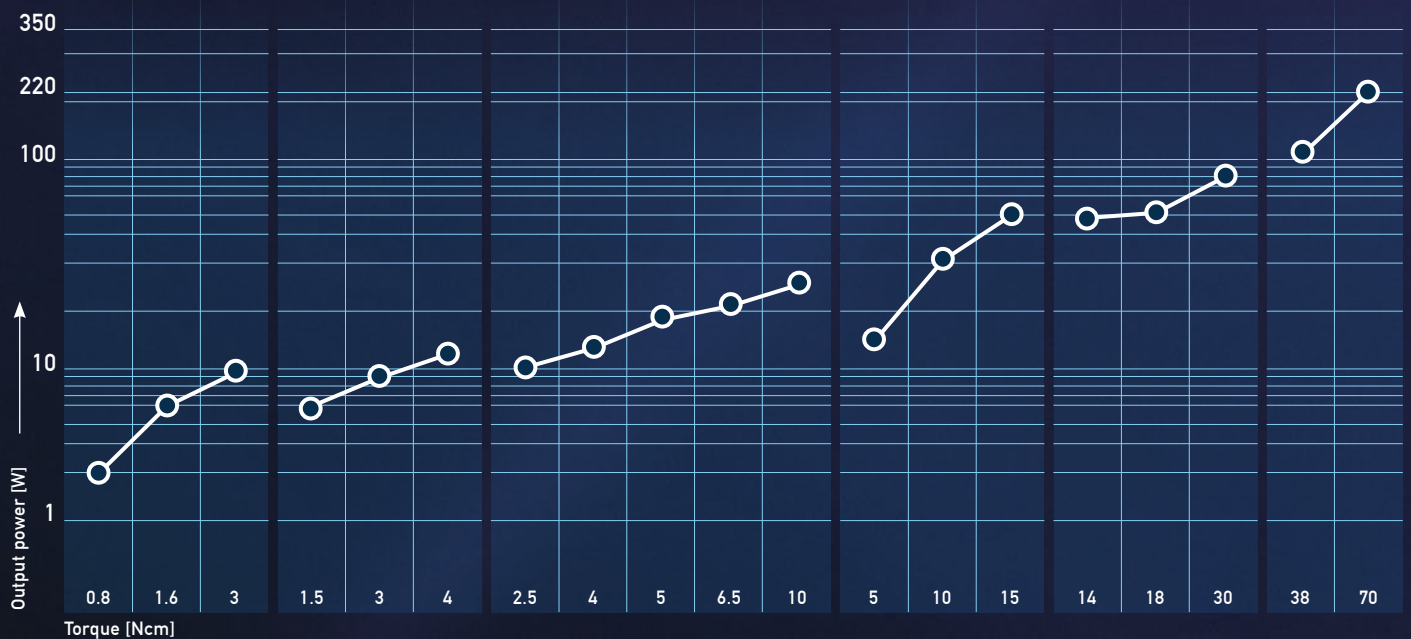
Performance overview DC- and EC-motors



ECM35		ECM42			ECM48			ECM63			ECMa63			ECM75		
x 20	x 30	x 15	x 30	x 45	x 20	x 40	x 60	x 20	x 40	x 60	x 20	x 40	x 60	x 20	x 40	x 60



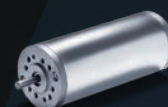
M28			M36			M42					M48			M63			M80	
x 10	x 20	x 40	x 13	x 20	x 30	x 10	x 15	x 20	x 30	x 40	x 25	x 50	x 60	x 25	x 40	x 60	x 40	x 80



Drive Configurator – Overview of the possible combinations



M42



M48

Ident no.
Voltage
Torque in Ncm
Speed in rpm

x15/l	x30/l
222833	222834
24	24
4,0	6,5
3250	3100

x28/l	x60/l
222835	222836
24	24
10	15
3450	3300

Gearboxes	 Planetary gearbox	P32I LN	i = 4 (3,7):1	12 Ncm / 878 upm	19 Ncm / 838 upm		
			i = 7 (6,75):1	22 Ncm / 481 upm	35 Ncm / 459 upm		
			i = 14 (13,73):1	41 Ncm / 237 upm	67 Ncm / 226 upm		
			i = 25:1	75 Ncm / 130 upm	122 Ncm / 124 upm		
			i = 46 (45,56):1	137 Ncm / 71 upm	222 Ncm / 67 upm		
			i = 93 (92,7):1	260 Ncm / 35 upm	422 Ncm / 33 upm		
			i = 4 (3,65):1	12 Ncm / 890 upm	19 Ncm / 849 upm	29 Ncm / 945 upm	44 Ncm / 904 upm
			i = 9 (8,63):1	28 Ncm / 377 upm	45 Ncm / 359 upm	69 Ncm / 400 upm	104 Ncm / 382 upm
		P42I LN	i = 14 (13,53):1	41 Ncm / 240 upm	66 Ncm / 229 upm	101 Ncm / 255 upm	152 Ncm / 244 upm
			i = 25 (24,65):1	74 Ncm / 132 upm	120 Ncm / 126 upm	185 Ncm / 140 upm	277 Ncm / 134 upm
			i = 45 (44,69):1	134 Ncm / 73 upm	218 Ncm / 69 upm	335 Ncm / 77 upm	503 Ncm / 74 upm
			i = 50 (50,16):1	140 Ncm / 65 upm	228 Ncm / 62 upm	351 Ncm / 69 upm	527 Ncm / 66 upm
			i = 81 (81,11):1	227 Ncm / 40 upm	369 Ncm / 38 upm	568 Ncm / 43 upm	852 Ncm / 41 upm
			i = 166 (166,4):1	466 Ncm / 20 upm	757 Ncm / 19 upm	1165 Ncm/ 21 upm	###
			i = 302 (301,68):1	845 Ncm / 11 upm	1373 Ncm/ 10 upm	###	###
			P52I LN	i = 4 (3,65):1			29 Ncm / 945 upm
		i = 9 (8,63):1				69 Ncm / 400 upm	104 Ncm / 382 upm
		i = 14 (13,53):1				101 Ncm / 255 upm	152 Ncm / 244 upm
		i = 25 (24,65):1				185 Ncm / 140 upm	277 Ncm / 134 upm
		i = 45 (44,69):1				335 Ncm / 77 upm	503 Ncm / 74 upm
		i = 50 (50,16):1				351 Ncm / 69 upm	527 Ncm / 66 upm
		i = 81 (81,11):1				568 Ncm / 43 upm	852 Ncm / 41 upm
		i = 166 (166,4):1				1165 Ncm/ 21 upm	1747 Ncm/ 20 upm
		P62I LN	i = 302 (301,68):1			2112 Ncm/ 11 upm	###
	i = 4 (3,65):1						
	i = 9 (8,63):1						
	i = 14 (13,53):1						
	i = 25 (24,65):1						
	i = 45 (44,69):1						
	i = 50 (50,16):1						
	i = 81 (81,11):1						
	Worm gearbox	SN31	i = 10:1				
			i = 15:1				
		SN40	i = 10:1				
			i = 15:1				
	Spur gearbox	S5	i = 10:1	29 Ncm / 325 upm	47 Ncm / 310 upm	73 Ncm / 345 upm	110 Ncm / 330 upm
i = 30:1			76 Ncm / 108 upm	129 Ncm / 103 upm	198 Ncm / 115 upm	297 Ncm / 110 upm	
i = 50:1			132 Ncm / 65 upm	215 Ncm / 62 upm	330 Ncm / 69 upm	495 Ncm / 66 upm	
i = 100:1			236 Ncm / 33 upm	384 Ncm / 31 upm	###	###	
Encoders	magnetic	IGM4/2	4 Imp	x	x	x	x
		IGM12/2	12 Imp	x	x	x	x
	optical	IGO100/2	100 Imp	x	x	x	x
		IGO500/2	500 Imp	x	x	x	x
Brakes	Spring applied-brake	B37	0,24 Nm	x	x		
		B47	0,5 Nm			x	x
		B56	1,0 Nm				

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Overview DC-standard motors



M28

M36

	x 20/S	x 20/S	x 40/S	x 40/S	x13/l	x13/l	x20/l	x20/l
Ident. no.	220518	220519	220520	220521	220218	220219	220220	220221
Voltage	12	24	12	24	12	24	12	24
Torque	1,6	1,6	3	3	1,5	1,5	3	3
Speed	3150	3000	3100	3100	3000	3100	2900	2900
Weight [kg]	0,07 – 0,17				0,2 – 0,3			
Length [mm]	50 – 70				51 – 70			
shaft diameter [mm]	3m3				4k5			
shaft length [mm]	12				20			
PKS30	28 - 250 Ncm		53 - 250 Ncm					
P32l	5 - 345 Ncm		10 - 450 Ncm		5 - 323 Ncm		10 - 450 Ncm	
P42l								
P52l								
P62l								
P72l								
P82l								
SN17								
SN22,6								
SN31								
SN40								
S1	8,8 - 100 Ncm		16,4 - 100 Ncm					
S5								
S90								
S92								
IGO RU	x				x			
IGO								
IGO SN								
IGM					x			
IGMi								
B37					x			
B47								
B56								

9

Overview DC-standard motors



M48

	x25/l	x25/l	x50/l	x50/l	x60/l	x60/l	x25/l
Ident. no.	210890	210891	210892	210893	220191	211333	210950
Voltage	12	24	12	24	12	24	12
Torque	5	5	10	10	15	15	14
Speed	2800	2800	3050	3150	3000	3300	3300
Weight [kg]	0,65 – 0,98						
Length [mm]	91 – 126						
shaft diameter [mm]	5k5 / 6k5						
shaft length [mm]	20						
PKS30							
P32l	16 - 450 Ncm		32 - 450 Ncm		48 - 450 Ncm		
P42l	16 - 1078 Ncm		32 - 1500 Ncm		48 - 1500 Ncm		
P52l	16 - 1078 Ncm		32 - 2156 Ncm		48 - 2500 Ncm		45 - 2500 Ncm
P62l							45 - 3018 Ncm
P72l							
P82l							
SN17							
SN22.6	12 - 68 Ncm		24 - 136 Ncm		36 - 204 Ncm		
SN31	42 - 87 Ncm		84 - 175 Ncm		126 - 262 Ncm		88 - 245 Ncm
SN40							78 - 245 Ncm
S1							
S5	37 - 500 Ncm		73 - 500 Ncm		110 - 500 Ncm		
S90							
S92							180 - 940 Ncm
IGO RU							
IGO	x						
IGO SN	x						
IGM	x						
IGMi							
B37							
B47	x						
B56							



M63

x25/l	x40/l	x40/l	x60/l	x60/l
210961	210951	210962	220311	210963
24	12	24	12	24
14	18	18	22	30
3250	2550	3050	3150	3000
1,16 – 1,75				
95 – 130				
8g6				
25				

45 - 2500 Ncm	58 - 2500 Ncm	70 - 2500 Ncm
45 - 3018 Ncm	58 - 3881 Ncm	70 - 5000 Ncm

88 - 245 Ncm	113 - 315 Ncm	139 - 400 Ncm
78 - 245 Ncm	101 - 315 Ncm	123 - 525 Ncm

180 - 940 Ncm	230 - 1210 Ncm	280 - 1500 Ncm

x	
x	
x	
x	
x	



M80

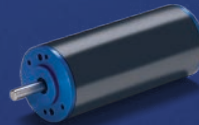
x40/l	x40/l	x80/l	x80/l
222784	222334a	222779	222335a
12	24	12	24
38	38	70	70
2850	2900	1500	3200
2,6 – 3,7			
135 – 175			
12g5			
30			

122 - 5000 Ncm	224 - 5000 Ncm
120 - 8190 Ncm	220 - 8400 Ncm
120 - 8190 Ncm	220 - 12000 Ncm

210 - 670 Ncm	390 - 1230 Ncm

x	
x	
x	
x	
x	

Overview EC-standard motors



ECM35

ECM42

ECM48

x 20/l

x 30/l

x 15/l

x 30/l

x 45/l

x 20/l

x 40/l

x 60/l

Ident. no.		230543	230544	230528	230527	230488	230546	230547	230548
Voltage		12	24	24	24	24	24	24	24
Torque		2,5	4	4	9	13	6	16	23
Speed		3800	3600	3500	3200	3100	3050	3550	3550
Weight [kg]		0,25 – 0,30		0,30 – 0,50			0,45 – 0,85		
Length [mm]		62 – 72		70 – 100			80 – 120		
shaft diameter [mm]		4g5		6g5			6g5		
shaft length [mm]		20		20			20		
Planetary gearboxes	PKS30								
	P32I	8 - 450 Ncm	13 - 450 Ncm	13 - 450 Ncm	29 - 450 Ncm	42 - 450 Ncm			
	P42I	8 - 616 Ncm	13 - 862 Ncm	13 - 862 Ncm	29 - 1500 Ncm	42 - 1500 Ncm	19 - 1294 Ncm	51 - 1500 Ncm	74 - 1500 Ncm
	P52I			13 - 862 Ncm	29 - 1940 Ncm	42 - 2500 Ncm	19 - 1294 Ncm	51 - 2500 Ncm	74 - 2500 Ncm
	P62I								
	P72I								
	P82I								
Worm gearboxes	SN17			21 - 75 Ncm	47 - 169 Ncm	68 - 244 Ncm			
	SN22.6			9 - 54 Ncm	21 - 122 Ncm	31 - 177 Ncm	14 - 82 Ncm	38 - 218 Ncm	55 - 313 Ncm
	SN31						50 - 105 Ncm	134 - 280 Ncm	193 - 400 Ncm
	SN40								
Spur gearboxes	S1								
	S5			29 - 500 Ncm	66 - 500 Ncm	95 - 500 Ncm	44 - 500 Ncm	117 - 500 Ncm	168 - 500 Ncm
	S90			61 - 586 Ncm	138 - 900 Ncm	200 - 900 Ncm	92 - 879 Ncm	246 - 900 Ncm	354 - 900 Ncm
	S92								
Optical encoder	IGO RU	x							
	IGO			x			x		
	IGO SN			x			x		
Magetical encoder	IGM	x		x			x		
	IGM 8-1024			x			x		
Spring applied brakes	B37	x		x					
	B47			x			x		
	B56								
	B60								
Integrated commutation electronics	i42			x			x		
	i63								



ECM63



ECMa63



ECM75

x 20/l	x 40/l	x 60/l	x 20/l	x 40/l	x 60/l	x 20/l	x 40/l	x 60/l
230532	230531	230493	230001	230002	230000	230549	230550	230551
24	24	24	24	24	24	24	24	24
12	30	40	12	22	32	20	40	70
2900	2600	2850	2750	3100	3300	2750	3550	3000
0,80 – 1,55			0,80 – 1,55			1,25 – 2,30		
90 – 130			90 – 130			101,5 – 141,5		
8g5			8g5			10g5		
25			25			30		
38 - 2500 Ncm	96 - 2500 Ncm	128 - 2500 Ncm	38-2500 Ncm	70-2500 Ncm	102-2500 Ncm	64 - 2500 Ncm	128 - 2500 Ncm	224 - 2500 Ncm
38 - 2587 Ncm	96 - 5000 Ncm	128 - 5000 Ncm	38-2587 Ncm	70-4743 Ncm	102-5000 Ncm	64 - 4312 Ncm	128 - 5000 Ncm	224 - 5000 Ncm
						64 - 4312 Ncm	128 - 8400 Ncm	224 - 8400 Ncm
						64 - 4312 Ncm	128 - 8624 Ncm	224 - 12000 Ncm
101 - 210 Ncm	252 - 400 Ncm	336 - 400 Ncm	101-210 Ncm	185-385 Ncm	269-400 Ncm			
101 - 210 Ncm	252 - 525 Ncm	336 - 700 Ncm	101-210 Ncm	185-385 Ncm	269-560 Ncm	168 - 350 Ncm	336 - 700 Ncm	588 - 1225 Ncm
146 - 806 Ncm	365 - 1500 Ncm	486 - 1500 Ncm	146-806 Ncm	267-1478 Ncm	389-1500 Ncm			
	x			x			x	
	x			x			x	
	x			x			x	
	x			x			x	
	x			x			x	
	x			x			x	
	x			x				
	x			x			x	

Gearboxes

Planetary gearboxes



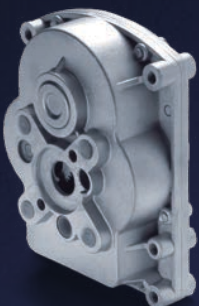
	With motor						Torque [Ncm]	ratio range [x:1]
	M28	M36	M42	M48	M63	M80		
PKS30	•						200	25-308
P32I	•	•	•				450	4-308
PK42I			•	•			400	4-308
P42I			•	•			1500	4-308
PK52I			•	•	•		1000	4-308
P52I			•	•	•		2500	4-308
P62I					•	•	5000	4-308
P81I						•	12000	4-308

Worm gearboxes



	With motor				Torque [Ncm]	ratio range [x:1]
	M42	M48	M63	M80		
SN17	•				169	7 – 75
SN22,6	•	•			204	3 – 40
SN31		•	•		400	7 – 38
SN40			•	•	1225	10 – 50

Spur gearboxes



	With motor				Torque [Ncm]	ratio range [x:1]
	M28	M42	M48	M63		
S1	•				265	7,5-150
S5		•	•		500	10-1250
S90		•			900	19-222
S92				•	1500	15-92

Brakes

Spring-applied brakes

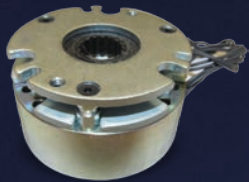
DC-Motors

	Torque	M28	M36	M42	M48	M63	M80
B37	0,24 Nm			•			
B47	0,5 Nm			•	•	-	-
B56	1,0 Nm				•	•	•
B60*	1,0 Nm				-	•	•



EC-Motors

	Torque	ECM35	ECM42	ECM48	ECM63	ECMa63	ECM75
B37	0,24 Nm	•	•				
B47	0,5 Nm		•	•	-	-	
B56	1,0 Nm			-	•	•	•
B60*	1,0 Nm			-	•	•	•



* KEB B60: Especially for pool cover (caoutchouc covering to protect against moisture)

Power-on brakes

DC-Motors

	Torque	M28	M36	M42	M48	M63	M80
ASB32	0,75 Nm			•			
ASB40	1,5 Nm					•	•
ASB31	0,6 Nm				-	•	-



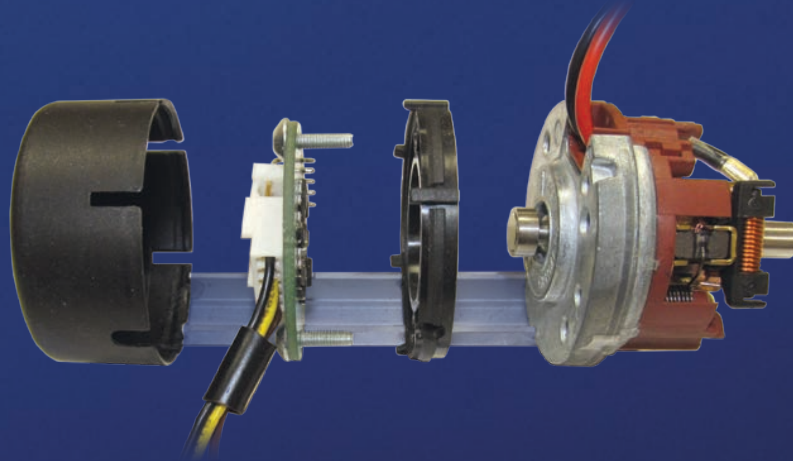
EC-Motors

	Torque	ECM35	ECM42	ECM48	ECM63	ECMa63	ECM75
ASB32	0,75 Nm	•	•				
ASB40	1,5 Nm				•	•	•
ASB31	0,6 Nm			-	•	•	-



• = Application - = possible but no current project

Magnetic encoders



- IGM: 1 / 2 / 4 / 12
- IGM8 - 1024
- IGMi: 2 / 4 / 12 (i=inside motor housing)

Impulses [x]	1	2	4	8	12
IGM X/1	•	•	•	•	•
IGM x/2	•	•	•	-	•
IGMi X/2*	•	•	•	-	•
IGM8-1024	Impulses are selectable in typical bit steps from 8 - 1024				

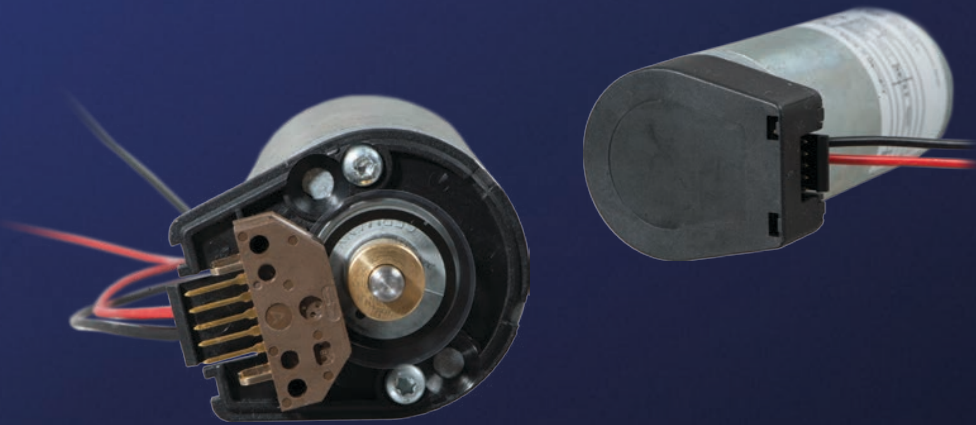
* combinable easy and reliable with brake

DC-Motors	M28	M36	M42	M48	M63	M80
IGM X/1	-	-	•	•	•	•
IGM x/2	-	-	•	•	•	•
IGMi X/2					•	•
IGM8-1024		-	•	•	•	•

EC-Motors	ECM35	ECM42	ECM48	ECM63	ECMa63	ECM75
IGM X/1	•	•	•	•	•	•
IGM x/2	•	•	•	•	•	•
IGMi X/2						
IGM8-1024	-	•	•	•	•	•

• = Application - = possible but no current project

Optical encoders



- PWB
- HP 2 channel / 3 channel Index Impulse / Line Driver
- Sharp (Low Cost – 100 Impulse/2)
- limited temperature range

Impulses [x]	50	100	200	300	500	1.000
IGO X/2 RU		•	•	•		
IGOX/2	-	•	•	-	•	•
IGOX/3	-	-	-	-	•	•
IGO100/2 SN		•				

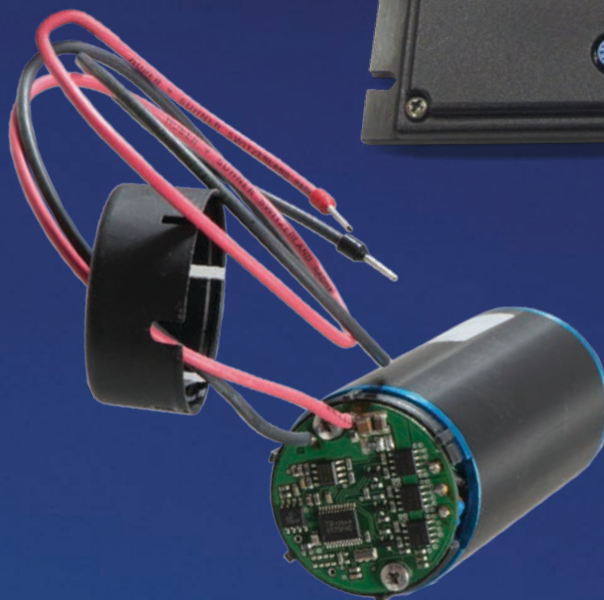
DC-Motors	M28	M36	M42	M48	M63	M80
IGO X/2 RU	•	•				
IGOX/2		-	•	•	•	•
IGOX/3		-	•	•	•	•
IGO100/2 SN			•	•	•	•

EC-Motors	ECM35	ECM42	ECM48	ECM63	ECMa63	ECM75
IGO X/2 RU	•					
IGOX/2	•	•	•	•	•	•
IGOX/3	•	•	•	•	•	•
IGO100/2 SN	-	•	•	•	•	•

• = Application - = possible but no current project

Electronics

Controller	KE30	i63	i42	i42dc
Motors	EC/DC	EC/DC	EC/DC	DC
Voltage max.	30V	30V	30V	30V
Voltage min.	14V	8V	12V	8V
Current max.	5A	10A	5A	5A
CAN-Bus	X	✓	✓	✓
IO-Signal	2	7	8	5
Outputs max.	-	3	5	2
Inputs max.	2	4	5	5
Encoder [pos/r]	-	256	360	256
Operation mode	2Q	4Q	4Q	4Q



KAG Custom Solutions

Achieving customer-specific needs!

We develop, realize and deliver individual adaptation possibilities for our customers that are tailored to their application.

The advantage is that the motor is adapted to the application and environment – and not the application to the motor.

Please contact us for further information.



Requirements of layout



- Mechanical performance / power
- Volume / size
- Stall torque, no load speed, run-up period
- Efficiency, losses
- Stability of torque and detent torque
- Noise level, thermal load
- Environmental conditions
- Target costs

Request of technical data		project number	KAG excellent drives
Customer		editor sales Abiry	
Inquiry No.		editor sales KAG	
customer order no.			

	customer requirement	KAG solution	example / unit
Application / Project			e.g printers, pumps
annual Demand			pcs. with staggerings (e.g 3-100-500 pcs.)
target price	0,00 €		€ / pcs.
start of production by the customer / SOP			e.g week 14/2014
sample quantities			date
Delivery time			

Motor			
drive			e.g. M63x60/I+PM52
max. length			mm
max. diameter			mm

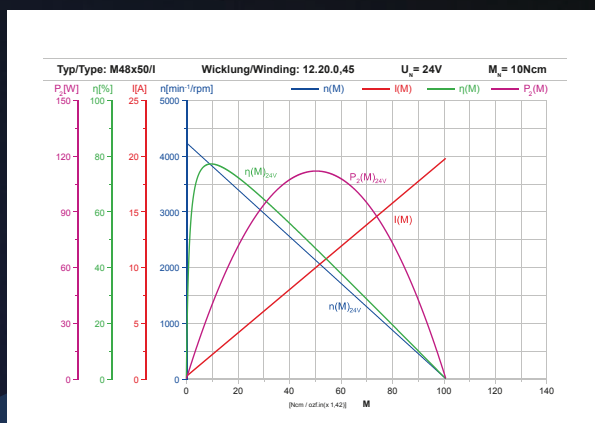
Electrical data				
only motor	voltage		V	
	type of voltage		DC/PWM	
	no- load speed at motor output- shaft (no)		rpm	
	no- load current motor (Io)		A	
	torque at motor shaft (Mn)		Ncm	
	nominal speed at motor shaft (nn)		rpm	
	max. permissible current (In)		A	
	(nominal) power at motor shaft (P2)	0,0	0,0	Watt
	rotating direction of drive			clockwise/ counter clockwise
	motor + gearbox	no- load speed at gear shaft (noG)		rpm
no-load current motor+gear (Io)			A	
torque at gear shaft (Mng)			Ncm	
(nominal) speed at gear shaft (nnG)			rpm	
max. allowable (nominal) current (In)			A	
(nominal) power at gear shaft (P2G)			0,0	Watt
rotating direction of the gearbox shaft				clockwise/ counter clockwise

Demand rotor- / motor design	
	e.g. 12.8.2x0,75



Windings:

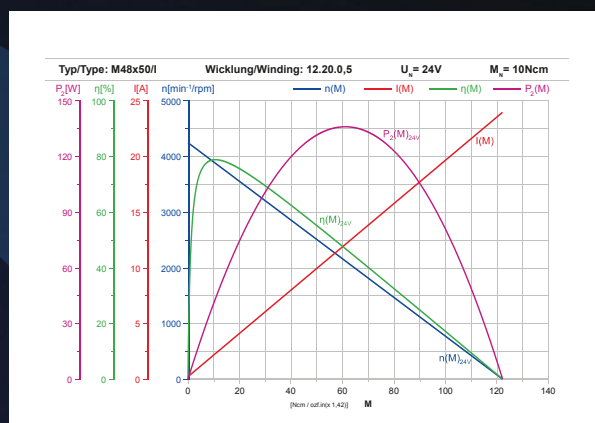
Adaptation of the speed-torque-characteristic curve to your requirements



Smaller winding wire diameter

- Increase in speed
- Decrease in torque

Change of the diameter from 0.45 mm to 0.50 mm



Larger winding wire diameter

- Increase in torque
- Decrease in speed



Brushes:

Selection of the carbon quality for optimum service life and noise adaptation

- "515" is used with 24V and other applications
- "515 skewed" reduced additionally the noise development in the first operating hours
- "608" is used with 12V applications and step mode
- "608 skewed" reduced additionally the noise development



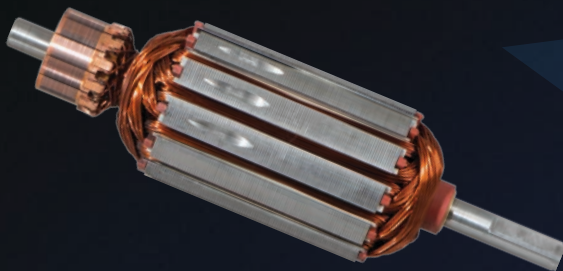


Armature:

Low detent torque as well as improved controllability by skewed armature

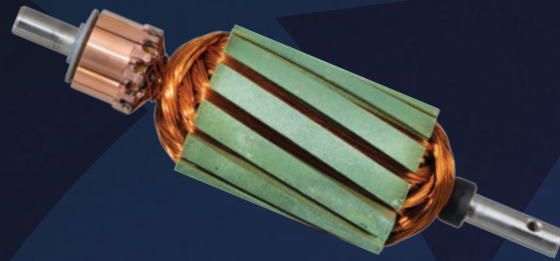
Straight armature

- lower costs
- easier assembly
- Standard model



Skewed armature

- lower cogging torque (for gearbox: righting moment/backlash)
- operation at low revolution per minute/stability of rpm
- reduction of the starting voltage
- is used in doors which have to be opened in case of emergency by hand



Endshield and shaft variations:



Optimum adaptation of the mechanical interface to your system





Cables, protection classes and RFI suppression:



Cable assembly, EMC filters and protection class according to your specifications



Accessories:
Fit to drive!

- Planetary gearboxes
- Spur gearboxes
- Worm gearboxes
- Optical encoders
- Magnetic encoders
- Spring-applied brakes
- Power-on brakes
- Electronics





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