



D.C. High Duty Solenoids

Built-in rectifier for A.C. supply
Range up to 30 mm and 1296 Ncm

1

Product group

Type

G TC A

- According to VDE 0580 and ISO 9001 (conform with article 10 of direction 73/23/EEC – according to CENELEC memorandum no. 3 of March 1987).
- Increasing force characteristic (fig. 2)
See product group G TU W for double acting solenoids
- Robust cylindrical construction with body mounting for push and pull operation with optional flange mounting. Seven sizes
- Connections with free leads, plug connector or terminal box
- Terminal box arrangement can be provided with built-in rectifier for A.C. supply up to 250 volts
- Plug connectors available with built-in rectifier for A.C. supply (list – Z KB G) or for over-voltage (OV DC)
- Coil with insulation to class F, for voltages up to 250 volts
- Fork ends are available (list Z GA)
- Protection classification
– DIN VDE 0470 / EN 60529 – IP00, IP20 or IP54
- Size 060 available as shotbolt assembly – energize to lock or unlock
- Flameproof version available VDE 0171 (Ex) s G 4 (PTB)
- General-purpose high duty solenoid for service on:
Machine tools Office machines
Automation Remote control
Packaging and coin equipment
Textile machinery

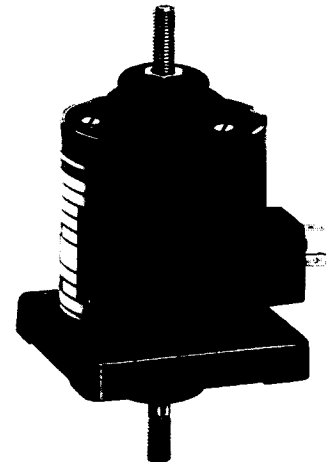


Fig. 1
Types G TC A 090 X 43 A02
(Flange mounting – plug connection)

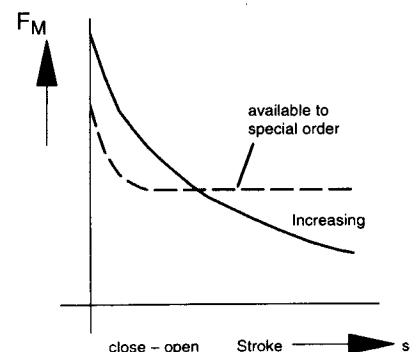


Fig. 2
Force characteristic G TC A



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Performance tables for type G TC A – D.C. supply

Product group **1**

max. voltage (U_N): 250 V

G TC A		040					050					060					070				
Duty rating ED (%)		100	40	25	15	5	100	40	25	15	5	100	40	25	15	5	100	40	25	15	5
Stroke s (mm)		Magnetic force F _M (N)					Magnetic force F _M (N)					Magnetic force F _M (N)					Magnetic force F _M (N)				
	0	38	60	70	82	124	100	144	180	207	278	150	200	228	257	378	196	264	320	355	480
	2	12,6	21	27,5	34	58	28	46	63	77	121	54	89	107	126	200	85	130	164	183	264
	3	11,2	19,6	24,5	30	55	23	39	54	67	107	48	78	95	114	186	73	109	138	159	245
	4	10	18	22,5	28,5	53	21	36	50	63	102	43	71	87	105	178	68	102	132	154	236
	5	9	16,5	21	26,5	51	20	33	47	59	97	40	67	81	99	175	66	100	130	151	233
	6	7,7	15,5	19,5	25,5	48	18	31	44	56	94	38	62	76	93	172	59	94	125	147	229
	8	6	13	17,5	22	44	16	27	39	49	86	32	55	69	85	167	52	86	117	137	220
	10						14	24	36	46	82	29	51	64	79	156	45	75	105	126	214
	12											26	46	58	73	150	38	68	95	116	207
	15																28	54	81	101	193
Work rating A _N (Ncm)		4,8	10,4	14	17,6	35,2	14	24	36	46	82	31,2	55,2	69,6	87,6	180	42	81	121	151	290
Power consumption P ₂₀ (W)		12,9	28	41	53	156	16,5	34	60	100	270	26	54	77	107	377	33	66	118	142	447
Frequency of oper. (S _h max.) (1/h)		19000	15000	10000	8500	2400	15000	12000	8000	5300	2000	12000	9700	6400	4200	1600	10000	7900	5200	3500	1400
Closing time t ₁ (ms)		102	94	90	82	73	128	117	112	101	90	163	148	140	126	112	203	181	171	152	122
Opening time t ₂ (ms)		85	70	63	56	51	101	83	75	66	60	138	112	101	79	82	148	119	107	95	87
Inductance L = τ · R (τ · 10 ⁻³)	Time constant τ Armature open Position closed (ms)			7					15					23					31		
				18					18					33					35		
Armature weight m _A (kg)			0,08					0,12					0,23					0,34			
Solenoid weight m _M (kg)			0,38					0,74					1,26					2			
G TC A		080					090					100									
Duty rating ED (%)		100	40	25	15	5	100	40	25	15	5	100	40	25	15	5					
Stroke s (mm)		Magnetic force F _M (N)					Magnetic force F _M (N)					Magnetic force F _M (N)									
	0	185	268	315	366	505	223	300	344	433	630	353	490	610	800	1060					
	5	72	109	134	164	263	116	166	193	230	360	138	190	240	315	480					
	10	59	96	120	147	236	102	160	182	215	335	129	180	230	295	440					
	15	42	78	104	134	224	87	148	175	212	324	118	175	224	288	432					
	20	29	60	83	113	220	64	130	162	206	330	107	163	215	288	440					
	25						46	102	134	188	330	93	156	212	288	460					
	30											74	138	200	286	470					
	35																				
Work rating A _N (Ncm)		58	120	166	226	440	115	255	335	470	810	222	414	600	858	1296					
Power consumption P ₂₀ (W)		31	71	119	185	588	51	131	202	318	823	69	125	198	403	855					
Frequency of oper. (S _h max.) (1/h)		9000	7100	4700	3200	1200	6800	4700	3200	2200	800	5700	4200	2900	2000	800					
Closing time t ₁ (ms)		230	202	189	166	145	350	302	280	243	208	400	337	306	262	226					
Opening time t ₂ (ms)		166	132	118	105	95	182	142	127	113	101	230	175	156	139	121					
Inductance L = τ · R (τ · 10 ⁻³)	Time constant τ Armature open Position closed (ms)			35					38					52							
				30					38					45							
Armature weight m _A (kg)			0,46					0,8					1,15								
Solenoid weight m _M (kg)			2,85					4,5					6,4								

Note: - 0 mm is completion of energized stroke

PERFORMANCE TABLE

terms are explained in Technical Bulletin G XX & VDE 0580/35.

TABLE BASIS

24 V/5 – 100 % duty Ambient temperature 35° C
Heat insulated base Free air mounted
Horizontal working Pull arrangement
Tolerance ± 10 % (inherent & manufacture).

MAGNETIC FORCE (F_M)

is listed in HOT condition at 90 % of rated voltage (increase approx. 20 % at rated voltage). Adjust for armature weight.

POWER CONSUMPTION (P₂₀)

is listed with a 20° C coil temperature (decrease/HOT).

DUTY RATING (ED %)

% of energized time per operation cycle: $\frac{t_{on}}{t_{on} + t_{off}} \times 100$.

Max. energized time/cycle:

100 % continuous: 40 % – 120 secs., 25 % – 75 secs., 15 % – 45 secs., 5 % – 15 secs.

OPERATING TIMES (t₁/t₂)

are listed per cycle of operation in HOT condition at rated voltage with weight load of 70 % of Force (F_M) at and over rated stroke.

SUPPLY VOLTAGE

Standard D.C.: 24 V, 97 V, 195 V, 205 V, 214 V D.C. (max. 250 V) (for rectified 110 V, 220 V, 230 V, 240 V, 50/60 Hz A.C.).

Built-in rectifier for A.C. supply (... A 14/A 15)

PROTECTION

Special finishes available – Paint (Trop) – Plating/sealed coil (Spec. Trop).

Conversion Factors

1 N = 0.102 kp ≈ 0.1 kg

1 kg = 2.2 lb.

1 mm = 0.039 in.

1 Ncm = 0.086 in. lb.

Dimension table for type G TC A

Free leads

Dimension table see page 4

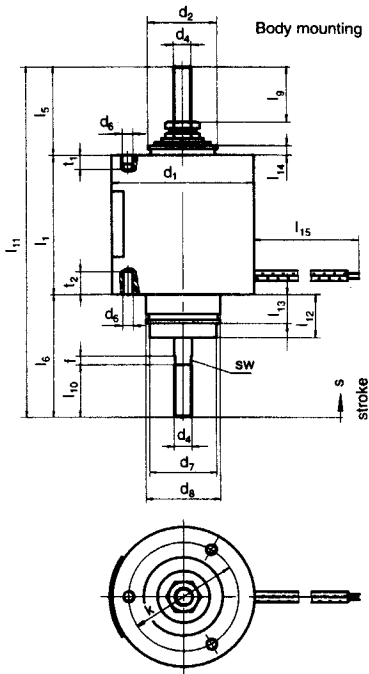


Fig. 3
Type G TC A 040 X 20 A01 to
G TC A 100 X 20 A01

Plug connector

Dimension table see page 4

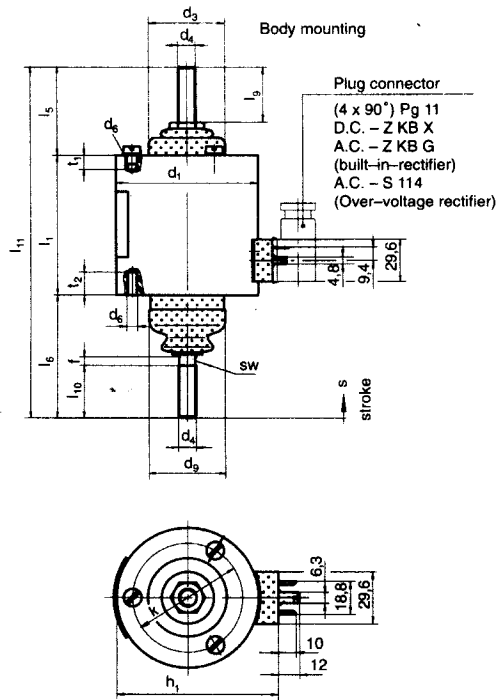


Fig. 5
Type G TC A 040 X 43 A01 to
G TC A 100 X 43 A01

Terminal box

Dimension table see page 4

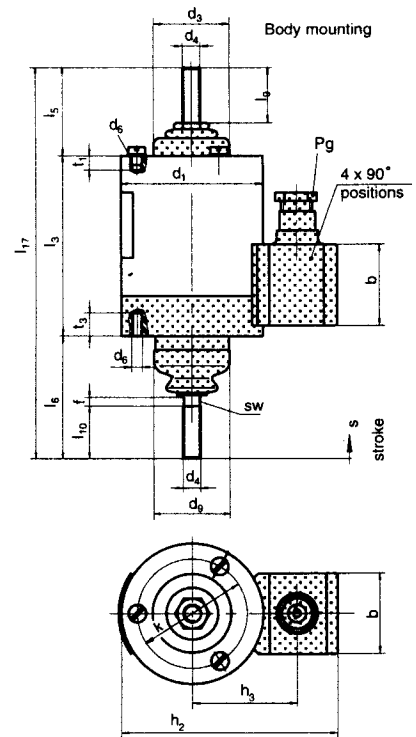


Fig. 7 Type G TC A 040 X 43 A04 to
G TC A 100 X 43 A04
** Type G TC A 040 X 43 A14 to
G TC A 100 X 43 A14

Flange mounting

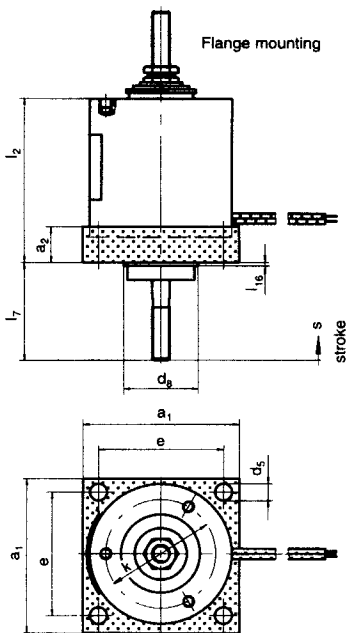


Fig. 4
Type G TC A 040 X 20 A02 to
G TC A 100 X 20 A02
(other dimensions fig. 3)

Flange mounting

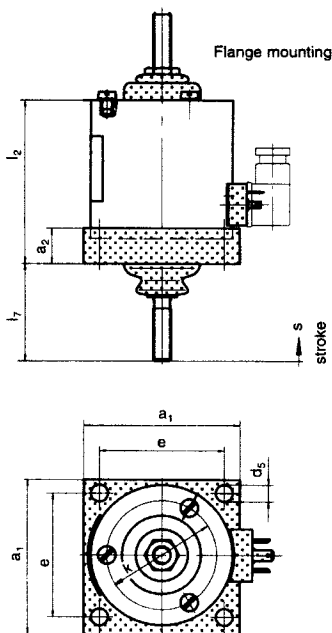


Fig. 6
Type G TC A 040 X 43 A02 to
G TC A 100 X 43 A02
(other dimensions fig. 5)

Flange mounting

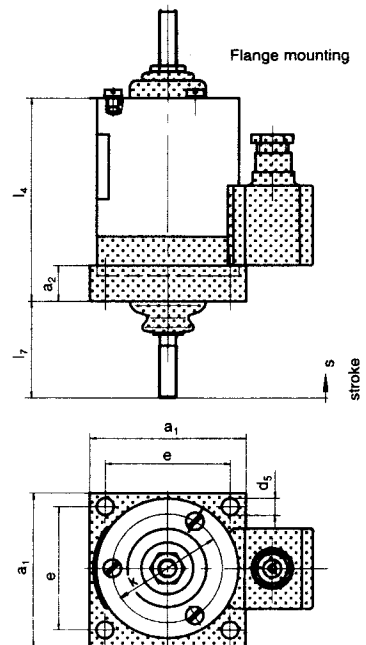


Fig. 8 Type G TC A 040 X 43 A05 to
G TC A 100 X 43 A05
** Type G TC A 040 X 43 A15 to
G TC A 100 X 43 A15
(other dimensions fig. 7)

** includes rectifier for A.C. supply.

Dimension table for type G TC A

Type	G TC A						
Size	040	050	060	070	080	090	100
Dim.	Dims. mm						
a ₁	50	60	70	80	90	100	110
a ₂	7	11,5	12	14	14	16	20
b	40	40	40	56	56	56	56
d ₁	40	50	60	70	80	90	100
d ₂	22	25	32	38	42	52	58
d ₃	24	27	34	40	44	54	60
d ₄	M5	M5	M6	M8	M10	M12	M12
d ₅	4,8	5,8	5,8	7	9,5	9,5	11,5
d ₆	M3	M4	M5	M5	M6	M6	M8
d ₇	20	23	28	32	35	42	48
d ₈	24	28	34	38	45	52	56
d ₉	25	28	35,5	40	44	54	58
e	38	46	54	62	72	80	88
f	3	3	4	5	5	5	5
h ₁	51,5	61,5	71,5	81,5±1,5	91,5±1,5	101,5±1,5	111,5±1,5
h ₂	83	92	94,5	118,5	124	134	144
h ₃	44,5	48,5	46	59,5	60	65	70
k	30	34	45	52	62	68	76
l ₁	45	55	65	74	79	93	110
l ₂	50	64,5	74,5	85	90	105	125
l ₃	55,5	70,5	82,5	93,5	104	123	144
l ₄	60,5	80	92	104,4	115	135	159
l ₅	29	30	33	39	50	60	61
l ₆	37	40	45	54	70	85	91
l ₇	32	30,5	35,5	43	59	73	76
l ₉	15	16	16,5	23,5	32	37,5	37,5
l ₁₀	15	15	18	20	30	40	40
l ₁₁	111	125	143	167	199	238	262
l ₁₂	7	10,5	12,5	15,5	21	26	31
l ₁₃	4,5	10	10	12	13	15	19
l ₁₄	4	4	4	5	5	5	6
l ₁₅	150	150	200	200	200	200	250
l ₁₆	0,5	0,5	0,5	1	2	3	4
l ₁₇	121,5	140,5	160,5	186,5	224	268	296
s	8	10	12	15	20	25	30
sw	4,5	4,5	5	7	9	10	10
t ₁ ¹⁾	4	5	6	6	8	8	11
t ₂ ¹⁾	9	9	8	10	13	15	13
t ₃	6	8	10	10	12	12	13
Pg ²⁾	9	9	9	11	11	11	11
Fork end Z GA K	050	050	060	080	100	120	120

¹⁾ Do not use overlength screws

²⁾ Plug connector gland Pg 11

NOTE:

For flange mounting versions, the flange is supplied fitted on the pulling end (as in figs. 4, 6 & 8). If the customer changes the flange position to the pushing end, the short blanking screws (supplied fitted in the pushing end cover) must be transferred to the vacated holes in the pulling end to maintain the specified environmental protection.

Overlength screws must **not** be used.

Electrical data for type G TC A

A.C. SUPPLY – TYPE G TC A WITH RECTIFIER

The solenoids may be connected to A.C. supplies with:

- plug connector with built-in rectifier (list Z KB G)
- terminal box with built-in rectifier (type G TC A ... A14 and A15)
- over-voltage (timed) plug connector rectifier (list S 114 A01)

A rectifier increases opening time (t_2) by 200 – 300 %. Magnetic force and closing time (t_1) are not affected when correct coil windings are used to allow for rectified voltage drop (19.6 V D.C. for 24 V A.C., 97 V D.C. for 110 V A.C., 196 V D.C. for 230 V A.C. and 214 V D.C. for 240 V A.C.)

The supply circuit should be arranged to avoid voltage peaks and if larger capacitance or inductance is in circuit, the solenoid should be protected by chokes etc. A.C. switching is to be preferred. In the terminal box designs (G TC A ... A14 and A15). D.C. switching is arranged by installing switch in the link between terminals 2 and 3 in fig. 9 or 3 and 4 in fig. 10.

TERMINAL BOX CONNECTIONS

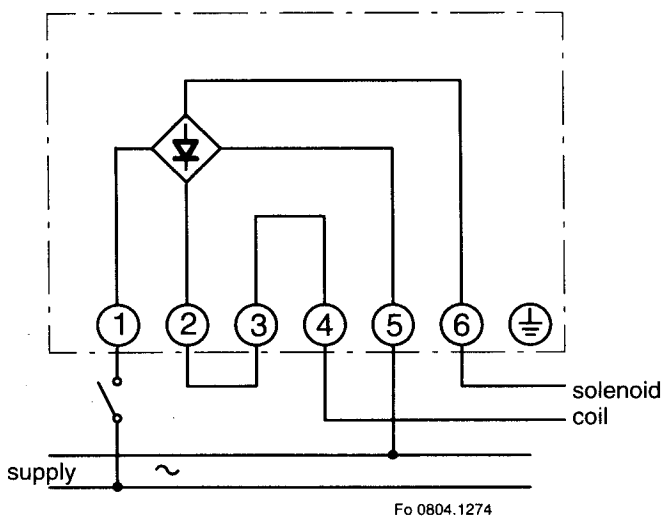


Fig. 9
G TC A ... A 14 and A 15 (sizes 040 to 060)

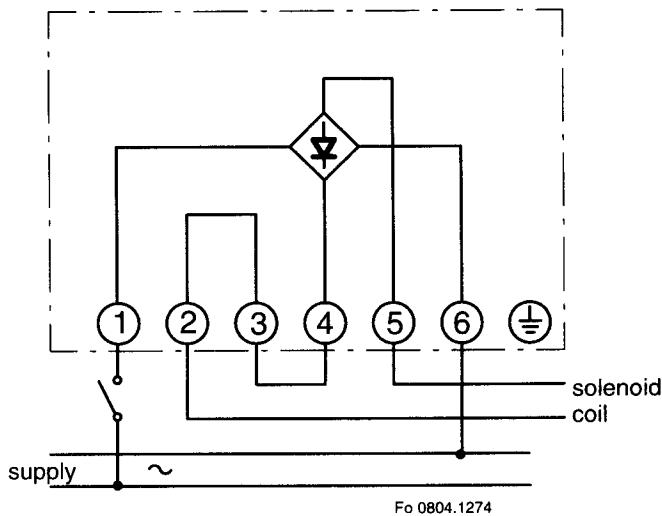


Fig. 10
G TC A ... A 14 and A 15 (sizes 070 to 100)

OVER-VOLTAGE

Force and/or speed of stroke may be increased by application of over-voltage: – A.C. rectifier plugs S 114 (2:1)
D.C. Pulse width modulator OVDC 1 or OV/DC 2

ARRANGEMENT

A standardized solenoid body with plunger for push or pull operation arranged with optional flange mounting and connection arrangements, comprising: –

Free leads – body mounting	... 20 A 01	} D.C. plug Z KB X A.C. pug Z KB G (built-in rectifier) S 114 (built-in rectifier for over-voltage)
Free leads – flange assembled pulling end	... 20 A 02	
Plug connector – body mounting	... 43 A 01	
Plug connector – flange assembled pulling end	... 43 A 02	
Terminal box – body mounting	... 43 A 04	
Terminal box – flange assembled pulling end	... 43 A 05	
A 04 with built-in rectifier for A.C. supply	... 43 A 14	
A 05 with built-in rectifier for A.C. supply	... 43 A 15	

Shotbolt arrangement see product group 57 – 59 (size 060 only)

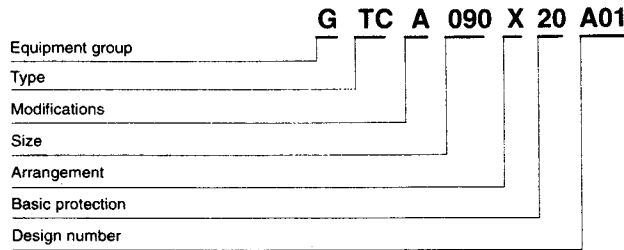
Flameproof version available type G TC E – VDE 0171 (Ex) s G 4. (PTB)

NOTE

Linear force characteristic version G TC W available to special order.

Classification of solenoid type G TC A

Type code



Order Example

1. Equipment group	D.C. classification		- G
Type	- Standard		- TC
Modification	- Increasing force	- A	- A
Size	- Select from tables		- 090
Arrangement	- Standard		- X
Protection	- Free leads	- 20	- 20
	- Plug connector	- 43	
	- Terminal box		

Design

Free leads or plug connector:

Body mounting	- A01		- A01
Flange pulling end	- A02		

Terminal box

Body mounting	- A04	
Flange pulling end	- A05	
as A04	} with rectifier in	- A14
as A05		} terminal box for
	A.C. supply see page 5)	

Voltage (V) – standards – page 2
Duty rating (ED %) – from tables
(5, 15, 25, 40, 100)

- 24 V
- 100 %

Additional requirements:

1. Special protection
tropical or special tropical
2. D.C. plug Z KB X 211
A.C. plug Z KB G 211 (built-in recifier)
3. Fork end Z GA
4. Spare bellows seals
5. Shotbolt lock assembly for size 060

PROTECTION CLASSIFICATION (PROTECTION TO DIN VDE 0470/EN60529)

Electrical connection and protection classification when correctly installed:

- Flying leads type	(...X20...)	IP20
- Plug base type	(...X43 A01/2)	
	- direct connection to plug-base terminals using blade connectors to DIN 46247	IP00
	- connection via plug connector ZKB to DIN 43650	IP54
- Terminal box type	(...X43 A04/5/15/16)	IP54

Additional corrosion resistance is available with tropical or special tropical protection.

SPECIAL

Special solenoids are available to meet the requirements of specific applications, such as short duty rating, high ambient temperature, special voltages etc., for which full operating, application and environmental conditions should be specified in accordance with Technical Bulletins GXX.

INSTALLATION

Installation details are provided in Technical Bulletin G XX.