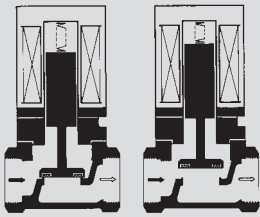
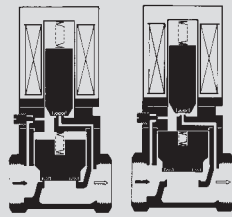


## Solenoid valve operating methods



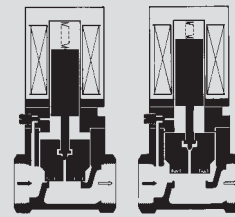
### Direct-acting

For small nominal diameters  
No minimum differential pressure required.



### servo-assisted

A minimum differential pressure of approx. 0.5 bar is required. Cannot open without differential pressure between input and output.



### Automatically servo-assisted

(coupled) For differential pressures from 0 to maximum pressure. For universal application.

Fema piston-type solenoid valves are suitable for demanding applications, particularly in the field of heat, energy and gas technology. All valves of the product groups mentioned below are automatically servo-assisted and may therefore be used from 0 bar to maximum pressure. No minimum differential pressure is required. A DC coil is normally used. A rectifier is supplied for connection to a 230 VAC supply.

### Product Summary

Series Application	Nom. diameter DN (mm)	M= screwed F= flange	Working pressure* (bar)	Seals			Temperatures		N = Normal type Ex = Ex-type	Operating-mode	DIN testing agency
				Piston	Nozzle	Static seal	Medium °C	Environment °C			
<b>TG</b> for neutral media	15/20 25/32 40/50	M + F M + F F	0–40 0–32 0–20	NBR	NBR	NBR	-15 to +90 60°C for Ex	-15 to +60	N + Ex	nc + no	
<b>TGK</b> for high temperatures	15/20 25/32 40/50	M + F M + F F	0–40 0–32 0–20	PTFE	Stainl. steel cone	EPDM	max. 180	-15 to +60	N	nc + no	
<b>K</b> for fuel gases up to 4 bar	15/20 15/20 25/32 40/50	M F F F	0–4 0–4 0–4 0–4	NBR	NBR	NBR	-15 to +60	-15 to +60	N + Ex	nc	DVGW DIN-EN 161
<b>K</b> f. fuel gases over 4 bar	15/20 25/32 40/50	F F F	0–25 0–25 0–20	NBR	NBR	NBR	-15 to +60	-15 to +60	N + Ex	nc	DVGW DIN 3394 part 1
<b>K</b> for liquid gases in liquid phase	15/20 25	F F	0–25 0–25	NBR	NBR	NBR	-15 to +60	-15 to +60	N + Ex	nc	TÜV DIN 32725 (draft Nov '92)
<b>K</b> for fuel oil	15/20 15/32 40/50	F F F	0–25 0–25 0–20	NBR	NBR	NBR	-15 to +60	15 to +60	N	nc	TÜV DIN-EN 264
<b>LG</b> for hot water and steam up to 120°C	15/20 25/32 40/50	M + F M + F F	0–25 0–20 0–16	PTFE	Stainl. steel cone	EPDM	max. 120	+4 to +60	N	nc	TÜV DIN 32730
<b>LGK</b> for hot water and steam up to 180°C	15/20 25/32 40/50	M + F M + F F	0–20 0–16 0–12	PTFE	Stainl. steel cone	EPDM	max. 180	+4 to +60	N	nc	TÜV DIN 32730

nc = normally closed, opened under voltage.

no = normally open, closed under voltage (identified in the Product Summary by the letter "U").

\* = The respective data sheet contains exact details of the limits of use.



#### Sealing materials:

NBR = Perbunan  
EPDM = Ethylene-propylene rubber  
PTFE = Teflon



T25G31M

## TG series

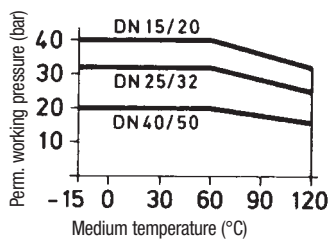
For medium temperatures up to 90°C

The piston-type solenoid valves of the TG series are suitable for universal application under a wide range of pressures. The coupled (automatically servo-assisted) method of

operation requires no minimum differential pressure; the valves open and close without difficulty even without pressure or with low differential pressures.

### Limits of use

(applies only to the "normally closed" operating mode)



### NB:

To avoid heat build-up, the solenoid system must not be insulated or painted.

### Technical data

#### Type

2/2-way

#### Operating mode

Normally closed (standard version) or normally open (on request)

#### Type of construction

Piston-type solenoid valve, coupled

no minimum differential pressure required

#### Materials

Casing: Bronze Rg 5 to DIN 1705

Internal parts: Brass (CuZn) and corrosion-resistant steel

#### Sealing materials

Piston: Perbunan (NBR).

Nozzle: Perbunan (NBR).

Static seal: Perbunan (NBR).

#### Mounting position

Solenoid system preferably upright. Horizontal mounting position only permitted for DN 15–DN 32. In general, the solenoid system should not hang downwards.

fr = suitable for outdoor use

#### Outdoor installations

#### Ambient temperature

-15°C to +60°C

#### Temperature of medium

-15°C to +90°C

#### Flanges

To DIN 2501 Part 1

PN 40 for DN 15–32

PN 25 for DN 40/50

PN 40 to DIN 2635

#### Recommended weld-on flanges

The valve should be operated 5-10 times per month to prevent the piston from sticking. No further maintenance is required.

#### Maintenance

### Product Summary

DN (mm)	k <sub>vs</sub> value (m <sup>3</sup> /h)	Working pressure (bar)	Internal thread	Screwed connection Type	Flange connection Type
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#### TG series (up to 90°C)

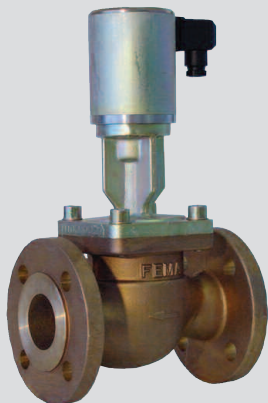
15	4.0	See graph opposite (Limits of use)	G 1/2"	T15G31M	T15G31F
20	4.8		G 3/4"	T20G31M	T20G31F
25	10		G 1"	T25G31M	T25G31F
32	13		G 1 1/4"	T32G31M	T32G31F
40	34				T40G31F
50	40				T50G31F

#### Ex-versions · Operating mode: normally closed

15	4.0	0 - 30	G 1/2"	T15G35M-Ex	T15G35F-Ex
20	4.8	0 - 30	G 3/4"	T20G35M-Ex	T20G35F-Ex
25	10	0 - 25	G 1"	T25G35M-Ex	T25G35F-Ex
32	13	0 - 25	G 1 1/4"	T32G35M-Ex	T32G35F-Ex
40	34	0 - 16		T40G35F-Ex	
50	40	0 - 16		T50G35F-Ex	

All valves are also available in normally open versions. Identified by the letter "U". For example: T25G31FU





T40G31FK

## TGK series

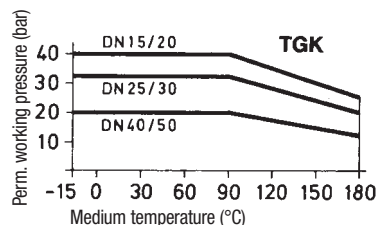
For medium temperatures up to 180°C

The piston-type solenoid valves of the TGK series are suitable for hot water, steam, fuel oil and other non-aggressive media up to a temperature of 180°C.

The cooling piece between the valve section and the solenoid actuator ensures good heat discharge and protects the solenoid against overheating.

### Limits of use

(applies only to the "normally closed" operating mode)



### Technical data

#### Type

#### Operating mode

#### Type of construction

#### Materials

#### Sealing materials

#### Mounting position

#### Outdoor installations

#### Ambient temperature

#### Temperature of medium

#### Flanges

#### Recommended weld-on flanges

#### Maintenance

#### Type

2/2-way  
Normally closed (standard version) or normally open (on request)

Piston-type solenoid valve, coupled

no minimum differential pressure required

Casing: Bronze Rg 5 to DIN 1705

Internal parts: Brass (CuZn) and corrosion-resistant steel

Piston: Teflon (PTFE).

Nozzle: Cone seal made of stainless steel.

Static seal: EPDM.

Solenoid system preferably upright. Horizontal mounting position only permitted for DN 15–DN 32. The solenoid system should not hang downwards.

fr = suitable for outdoor use

-15°C to +60°C

-15°C to +180°C

To DIN 2501 Part 1

PN 40 for DN 15–32

PN 25 for DN 40/50

PN 40 to DIN 2635

The valve should be operated 5-10 times per month to prevent the piston from sticking. No further maintenance is required.

### Product Summary

DN (mm)	k <sub>vs</sub> value (m <sup>3</sup> /h)	Working pressure (bar)	Internal thread	Screwed connection Type	Flange connection Type	
15	4.0	See graph opposite (Limits of use)	G 1/2"	T15G31MK	T15G31FK	
20	4.8		G 3/4"	T20G31MK	T20G31FK	
25	10		G 1"	T25G31MK	T25G31FK	
32	13		G 1 1/4"	T32G31MK	T32G31FK	
40	34					T40G31FK
50	40					T50G31FK

All valves are also available in normally open versions.

Identified by the letter "U". For example: T25G31FU

#### NB:

To avoid heat build-up, the solenoid system must not be insulated or painted.



Degree of protection:  
IP 65

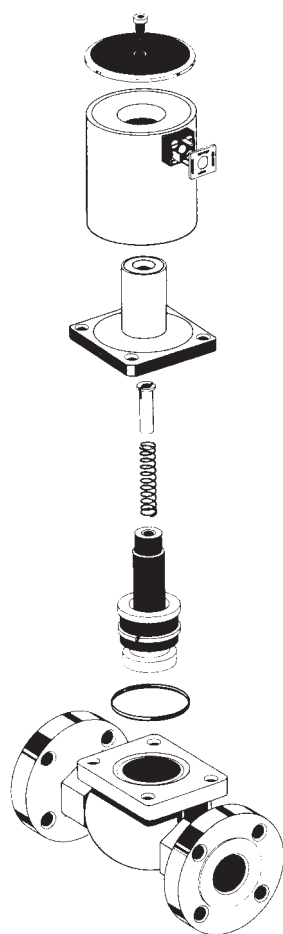
## T/K series

### Solenoid actuators G 31 for standard version

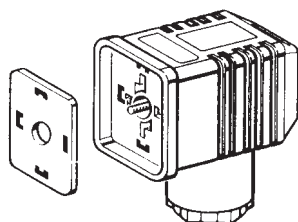
Only solenoids of the G 31 series are used to operate piston-type solenoid valves in non-explosion-proof installations. All G 31 solenoid actuators are generally equipped with a DC coil and plug connector with contact arrangement according to DIN 43 650. The solenoid coils are fully encapsulated in silicone

rubber (to protect against moisture). All solenoid actuators are mutually interchangeable.

The name of the solenoid actuator forms part of the type designation of the complete solenoid valve. For example: T 40 G 31 F



Valve with standard solenoid G 31



Replacement rectifier and connection plug for standard solenoid valves

#### Technical data

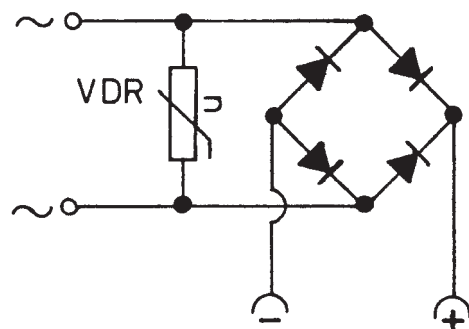
<b>Degree of protection</b>	IP 65 to DIN 40 050 fr = suitable for outdoor use.
<b>Power consumption</b>	50 VA with warm solenoid.
<b>Nominal voltages</b>	Alternating current (AC): 230 V, 45–60 Hz Rectifier is built into the connection plug Direct current (DC): 24 V Supplied without rectifier

**Important:** In all orders or enquiries, the supply voltage and current type (AC or DC) must be specified.

#### Electrical connection for switching device G 31

The AC power supply is connected to the terminals on the PCB inside the plug. The earth conductor is directly connected to the plug cube (underneath the PCB).

#### Rectifier PCB circuit diagram



#### Exchanging solenoid actuators

Complete G 31 solenoid actuators can easily be replaced, even under pressure (undo the screw on the solenoid cover plate, remove the cover and lift out the solenoid). It is not possible to change the coil on its own.

#### GS type

Device socket with built-in rectifier for G 31 solenoid.	
Primary	230 V, 50 Hz
Secondary	approx. 220 V

#### ST 5

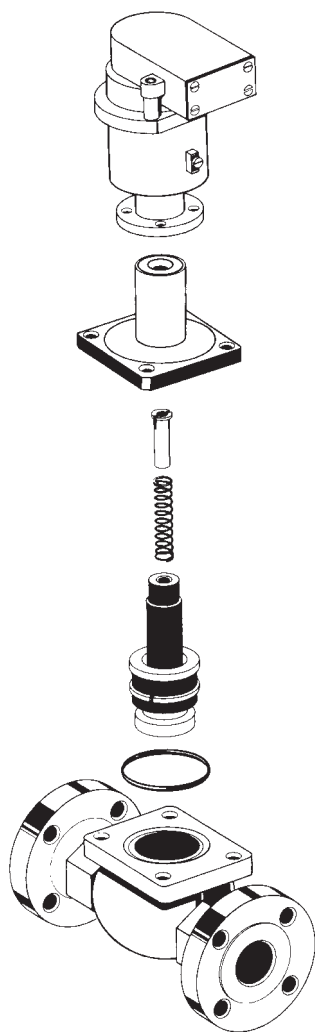
Connection plug with seal and fastening screw (without rectifier)

## T-Ex/K-Ex series

### Ex solenoid actuators

Solenoid valves of type G 35-Ex, of pressure-proof encapsulated design for use in explosion-endangered areas, are generally equipped with

a DC coil which is mounted in a pressure-proof encapsulated cast steel housing and sealed with silicone rubber.



Valve with Ex-solenoid G 35-Ex

#### NB:

Solenoid actuators of older G3-Ex solenoid valves cannot be replaced under pressure.

#### Technical data

##### Nominal voltages

Alternating current (AC):

230 V, 45–60 Hz

Rectifier is built into the solenoid casing

Direct current (DC): 24 V, supplied without rectifier

##### Ex-protection

Pressure-proof encapsulation (Ex) II2 G/D EEx de IIC T4 IP 65 T 125°C). Suitable for  $\geq$  Zone 1, 21.

##### Can be used in outdoor

installations. Because of the deflagration gap specified for the solenoid, the solenoid actuator must be installed vertically. A protective hood is needed to give the solenoid additional protection against weather conditions.

##### Mounting position

Ex-solenoid valves must only be installed with the solenoid system standing vertically. Other mounting positions are not permitted.

##### Power consumption

approx. 50 VA with warm solenoid.

##### Duty cycle

100% ED. Other technical data are the same as for G 31 solenoid actuators.

##### Connection cables

Heat-resistant cables must be used to connect the Ex-solenoid actuator. The solenoid temperature must not exceed 125°C.

#### Replacing solenoid actuators on Ex-solenoid valves G 35-Ex

Solenoid actuators with the type designation G 35-Ex can also be replaced under pressure.

The procedure is as follows:

##### Removing the old solenoid

1. Turn off the power and remove the connection cable.
2. Loosen the three M6 Allen screws on the solenoid cover (aluminum hood), **but do not remove them** (2–3 turns of the screw are sufficient).
3. Remove the Allen screws on the bottom mounting flange of the solenoid and carefully lift up the whole solenoid.

##### Fitting a new solenoid

4. Before fitting the new solenoid, loosen the three Allen screws on the solenoid cover (aluminum hood), but do not undo them completely (2–3 turns of the screw are sufficient).
5. Put the solenoid in place carefully, moving it gently to and fro to allow the solenoid cover plate lying inside (not visible) to center itself on the guide tube. The mounting flange must lie squarely on the lower flange.
6. Align the solenoid head: The terminal connection box must face against the flow direction.
7. Tighten the 4 fastening screws on the lower flange.
8. Tighten the three M6 Allen screws on the solenoid cover.
9. Remove the terminal connection cover and carry out electrical connections in accordance with VDE guidelines.
10. Fit the terminal connection cover.
11. Commission the valve in accordance with the accompanying instruction manual.

## T/K series

### Mounting instructions

Satisfactory operation demands expert installation with due observance of the technical

regulations applicable to the planning and construction of the installation as a whole.

#### Mounting position

A vertical mounting position (solenoid system standing upright) is preferable if at all possible. In general, the solenoid system should not hang downwards. In the case of Ex-solenoids, only a vertical mounting position is permissible. For information about the mounting position of valves, refer to the individual data sheets.

#### Installation location

Solenoid valves contain moving parts which are subject to natural wear. Therefore, care must be taken to ensure that valves can be dismantled for repair.

#### Risk of freezing

If solenoid valves are operated at ambient or medium temperatures of 0°C or lower, or if it is possible that such temperatures may occur, the customer must take steps to ensure that valves cannot freeze up — due to condensation for example.

#### Painting the solenoid

Solenoid coils must not be painted or lacquered, as this will hinder the dissipation of heat.

#### Stress-free mounting

Stresses from the pipe system acting on the valve can cause the piston to stick, hindering or even preventing it from opening and closing. The solenoid casing must on no account be used as a lever during mounting (key faces are cast on the valve body for this purpose).

#### Maintenance

The valve should be operated 5-10 times per month to prevent the piston from sticking. No further maintenance is required.

#### Back-pressure

If the back-pressure (at the output of the valve) is 0.2 bar higher than the pressure on the input side, the piston or diaphragm is automatically lifted from the seat. In this case the medium may flow back through the solenoid valve.

#### Commissioning

Upon first commissioning, medium should be admitted to the valve very gently so as to allow any air trapped in the valve to escape. Sudden admission at working pressure on first commissioning may cause uncontrolled opening of the valve.

#### Dirt trap

The operation of solenoid valves is often impaired by impurities in the medium flowing through the valve. Welding beads, rust flakes, scale and other impurities may prevent a tight seal on the valve seat. Therefore it is advisable to install a dirt trap before every solenoid valve. This will greatly improve the reliability of the installation.

#### Factory certificates and acceptance testing certificates

Factory certificates in accordance with EN 10 204 and DIN 50 049, section 2.3 or 3.1 B, can be supplied for all piston-type valves if required, and enclosed with the delivery documents. The factory certificate contains information about the quality of the materials used and confirms that the solenoid valve was subjected to rigorous pressure tests, leak tests and function tests prior to delivery. The costs of the certificates are shown in the relevant price list.

#### Spare parts

For spare parts such as solenoids and connection plugs, refer to the relevant price list.

### Faults and troubleshooting

If the valve does not function correctly, carry out the following checks:

1. Is the flow direction correct? Observe the arrow on the valve.
2. Is the power supply properly connected?
3. Is the operating voltage present?
4. Does the operating voltage correspond to the details on the rating plate?
5. Is the rectifier in working order?
6. Is the solenoid coil in working order?

The condition of solenoid coils and rectifiers can easily be checked by carrying out resistance, current and voltage measurements.

If the coils and rectifiers are satisfactory, solenoid actuators of the G 31 and G 35 series should give the following readings:

Mains voltage	Coil resistance Ohms	Coil current consumption approx.
230 V~ / =	990–1050	224 mA
24 V =	11.35–12.02	2.1 A

All values are measured on the DC side, i.e. after the rectifier, and are for a solenoid temperature of 20°C.

The values are approximate. If the measured values deviate significantly from those shown in the table, either the solenoid coil is faulty (broken or shorted coil) or the rectifier is damaged.

If a valve actuator with a DC coil is accidentally charged with alternating current at the same level, it will not be damaged but the valve will not operate. Voltage measurements on the secondary side of the rectifier without load (coil) are not meaningful, therefore you should never measure the DC voltage with the system unplugged.

### Replacing rectifiers on Ex-solenoid valves

Rectifiers on Ex-solenoid valves must only be replaced by an authorised electrician. The greatest care must be taken, with due observance of safety regulations.

The following procedure must be observed:

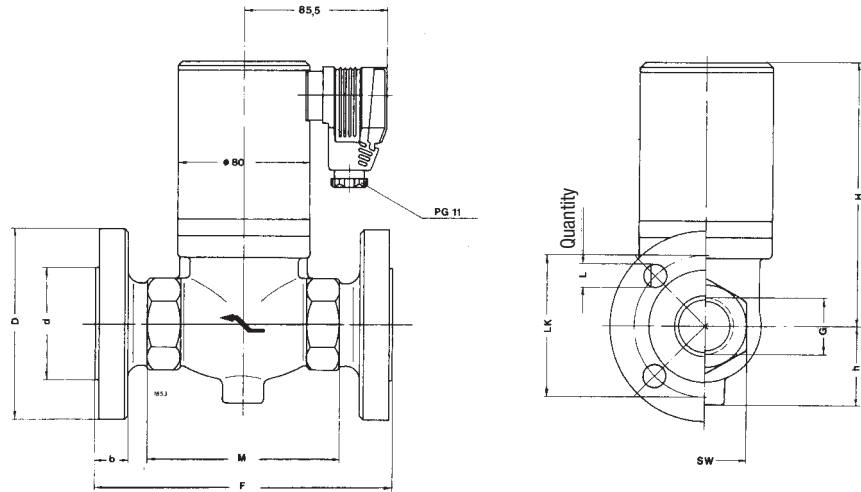
1. Turn off the power and remove the terminal box cover.
2. Disconnect and remove the connection cable.
3. Undo the M6 Allen screws and remove the terminal connection housing.  
NB: Remove the terminal housing carefully to avoid tearing the coil connection wires.
4. Remove the clip (to do this you have to undo the two M3 screws).
5. Pull off the connection wire to the coil. NB: Use thin-nosed pliers and grip it by the plug; do not pull it by the connection cable (otherwise the coil wire may be torn off).
6. Detach the connecting wire on the primary side of the rectifier at the cable guides (use open-ended spanner SW 7).
7. Remove the rectifier (black plastic housing) including the white flat connector guide.
8. Install the new rectifier in the reverse order. Make sure the connection plug of the coil wire is fully inserted in the flat connector guide. The ends of the connector must not project beyond the flat connector guide.

When fitting the terminal connection housing on the solenoid housing, make sure the connection cables do not get caught.

## T/K series

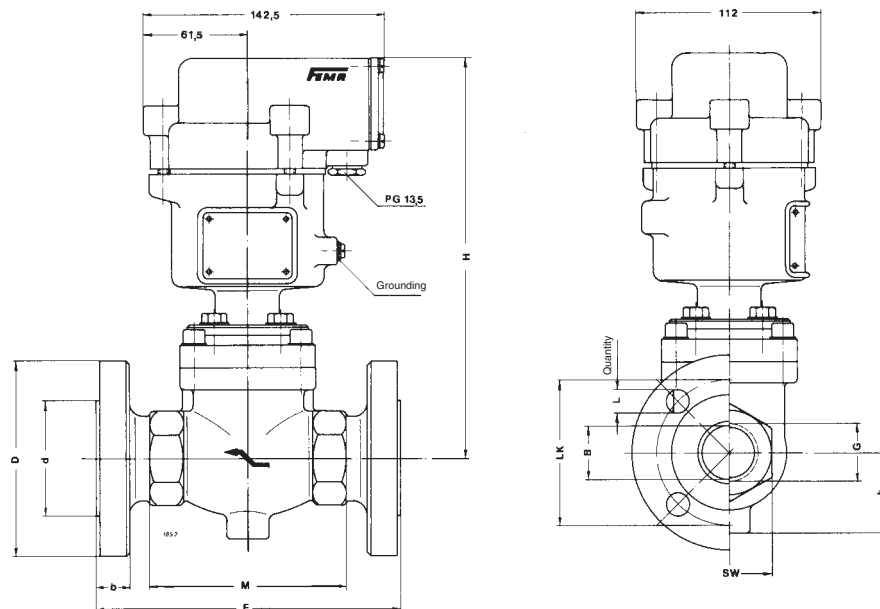
### Dimensioned drawings/weights

Series  
TG, K, LG



DN	Screwed version			Weight kg	Flange version								Weight		
	G	M	SW		F	B	D	d	LK	b	L	i	kg	H	h
15	G 1/2	82	32	4.5	150	20	95	45	65	18	14	4	6.1	137.8	35
20	G 3/4	82	32	4.5	150	20	105	58	75	18	14	4	6.6	137.8	35
25	G 1	112	50	5.8	180	31	115	68	85	20	14	4	9.0	158.3	47.5
32	G 1 1/4	112	50	5.8	180	31	140	78	100	20	18	4	10.5	158.3	47.5
40					200	45	150	88	110	20	18	4	15.0	181.8	53
50					230	45	165	102	125	22	18	4	17.5	181.8	53

Series  
TG-Ex, K-Ex, LG-Ex

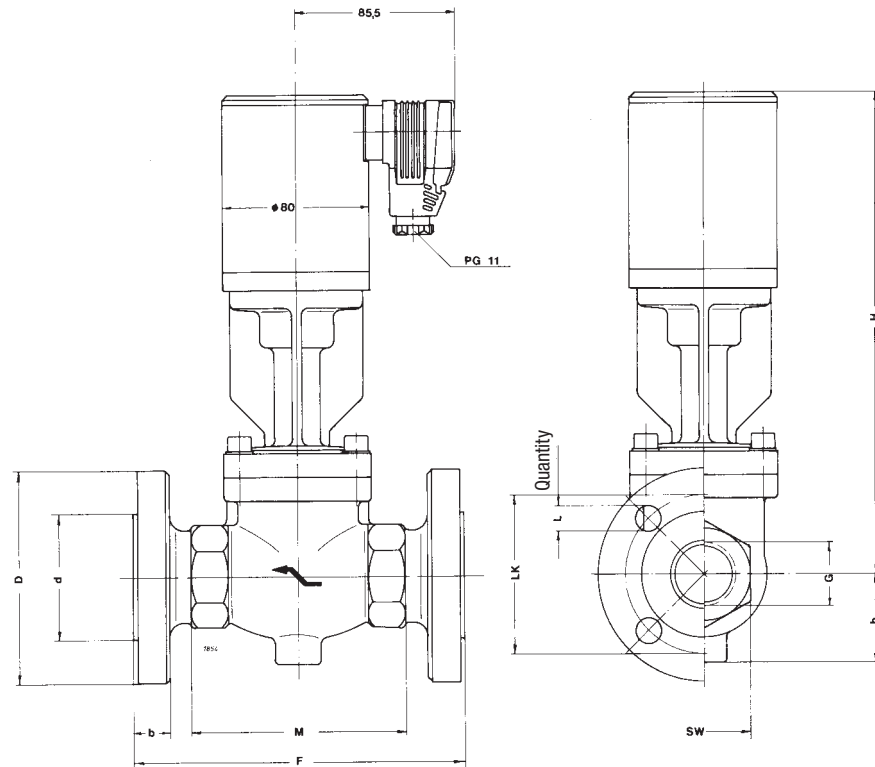


DN	Screwed version			Weight kg	Flange version								Weight		
	G	M	SW		F	B	D	d	LK	b	L	i	kg	H	h
15	G 1/2	82	32	5.8	150	20	95	45	65	18	14	4	7.6	197.9	35
20	G 3/4	82	32	5.8	150	20	105	58	75	18	14	4	8.0	197.9	35
25	G 1	112	50	8.0	180	31	115	68	85	20	14	4	11.0	235.4	47.5
32	G 1 1/4	112	50	8.0	180	31	140	78	100	20	18	4	12.5	235.4	47.5
40					200	45	150	88	110	20	18	4	16.5	253.9	53
50					230	45	165	102	125	22	18	4	20.0	253.9	53



**T/K series**

## Dimensioned drawings/weights

Series  
TGK, LGK

DN	Screwed version			Weight kg	Flange version								Weight		
	G	M	SW		F	B	D	d	LK	b	L	i	kg	H	h
15	G 1/2	82	32	5.6	150	20	95	45	65	18	14	4	7.5	238.3	35
20	G 3/4	82	32	5.6	150	20	105	58	75	18	14	4	7.8	238.3	35
25	G 1	112	50	7.2	180	31	115	68	85	20	14	4	10.5	256.8	47.5
32	G 1 1/4	112	50	7.2	180	31	140	78	100	20	18	4	12.0	256.8	47.5
40					200	45	150	88	110	20	18	4	16.0	277.3	53
50					230	45	165	102	125	22	18	4	19.0	277.3	53