IWAKI

Chemical gear pumps

G

The Heart of Industry

Fine ceramic used in internal gear

The Iwaki G series chemical pump is the first internal gear pump designed for chemical process applications, in which gears of fine ceramic (SiC and Silicon nitride) are used. Our pump technology, developed over more than 50 years, has made it possible for Iwaki to equip standard pumps with fine ceramic gears. Without detracting from any of the advantages of conventional internal gear pumps abrasion resistance, chemical resistance, low-viscosity characteristics and sealing characteristics have been remarkably improved. In addition to the gland packing/mechanical seal type (Model GX), magnetic drive sealless type (Model GM) are available as standard products for an expanded range of uses. The G series is an advanced gear pump, capable of dealing with a wide range of industrial processes which continue to increase in sophistication.

Ceramic vs stainless steel gear comparison

Type of gear		Corrosion resistance	Thermal resistance	Seizing resistance	Exfoliation resistance	Abrasion resistance	Coefficient of friction	Impact resistance
Ceramic gear		○	○	○	○	○	○	×
Metal gear	Heat-treated	×	○	△	△	△	○	○
	Hard coated	△	○	○	×	○	△	△

○ Good △ Please contact us for details × No good

Both high viscosity and low viscosity liquids can be handled

When a low-viscosity liquid is handled by a conventional gear pump, "galling" and "seizing" tend to occur. SiC ceramic gears do not have these problems even when the pump functions at a high speed. Silicon nitride ceramic gears show stable performance in handling high viscous liquids, due to their strength and toughness.

Ability to handle fine slurries

Now that gears and other sliding components including bearings are made of ceramic, the handling of hard and soft fine slurries will not impair the longevity of these pumps. Do not use the GM type for slurry applications.

Magnetic drive type added to standard line

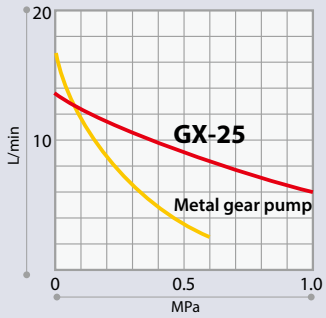
Superior anticorrosive materials such as silicon carbide, silicon nitride, alumina ceramic, PTFE, carbon and stainless steel are used in liquid ends so that all sorts of chemical liquids can be handled. The GM type is ideal for handling chemical liquids which need strict control on liquid leakage and air contact.

Improved performance characteristics

Performance has been noticeably improved. Ceramic gears make it possible to reduce spaces between parts, therefore outperforming conventional metal gear models.

Performance comparison curves

In the graph below, changes in output at varying discharge pressures are compared between the G series pump and a metal gear pump. The G series, equipped with ceramics gears, is far less subject to declining output under high pressure due to its close seal clearance in the gear housing.



Quiet liquid transfer with less pulsation

Without the pulsation that is common to reciprocating pump and gear pumps for general uses, liquid is transferred quietly and smoothly , not agitating or generating foam/bubbles.

High self-priming ability

Because the suction port is at the top of the pump, the pump chamber remains full when pump stops working. The self-priming capacity is enhanced at re-start.

Constant flow injection

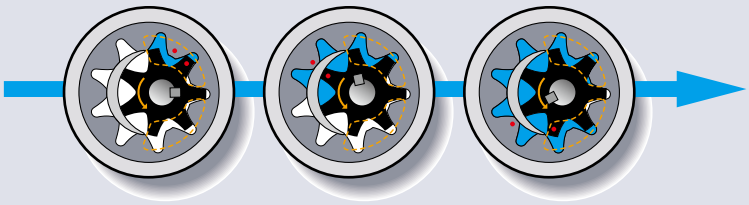
Regardless of the temperature change, viscous liquid can be handled at accurate flow rate, which cannot do with other pumps. As the output is linearly related to rpm, the flow rate is easily controlled by changing speed.

GM type

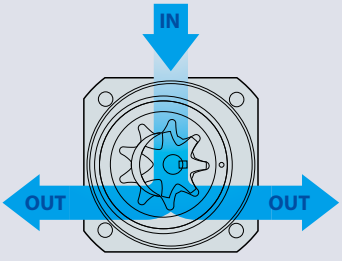
GX type

Construction

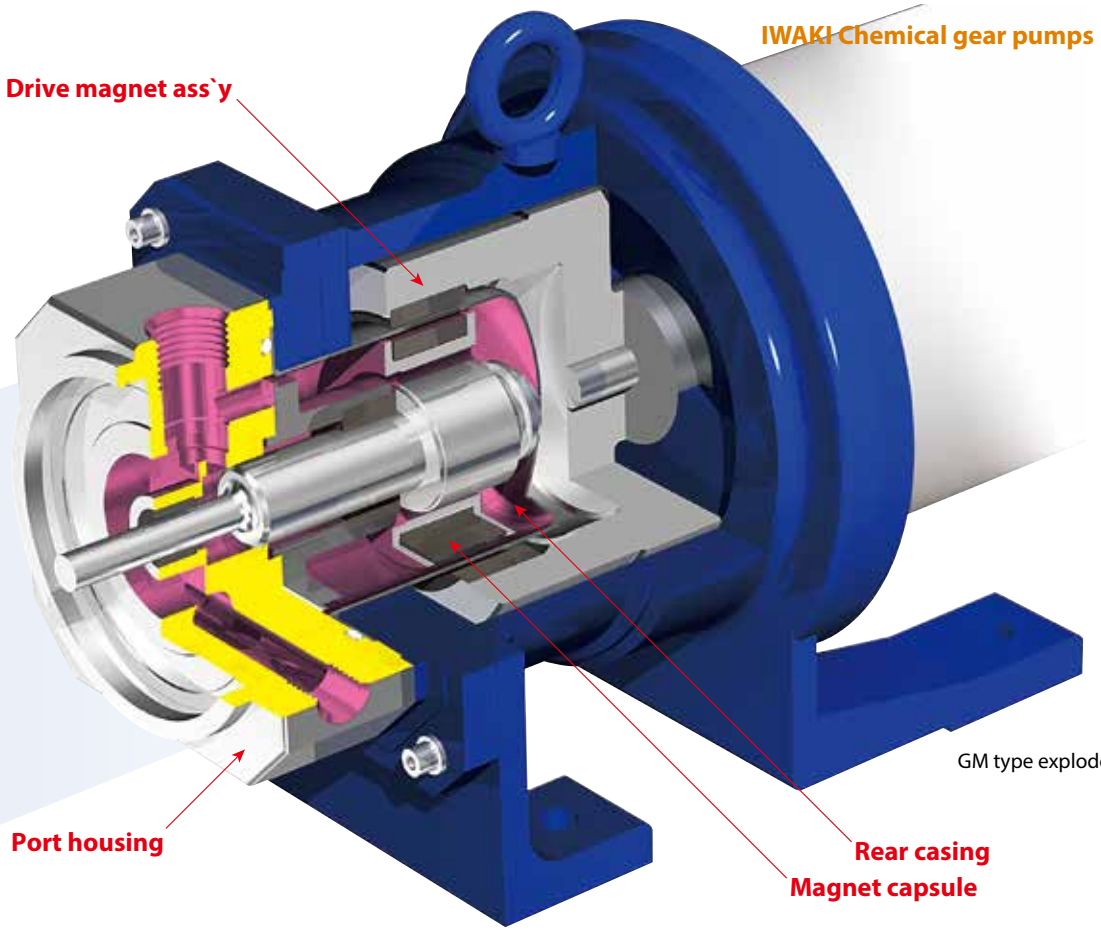
Operating principle



A pinion (drive gear) coupled with a shaft supported by two bearings meshes with an internal gear (driven gear) whose periphery is supported by a strong bearing. Liquid is transfered by a change in the capacity of this meshed portion. In the suction process, the gears are disengaged and a space defined by the two gears and the casing expands. The liquid is drawn into the space by the negative pressure generated. In the discharge process, their teeth begin to mesh and space defined by the two gears and the casing is reduced to force out the liquid.



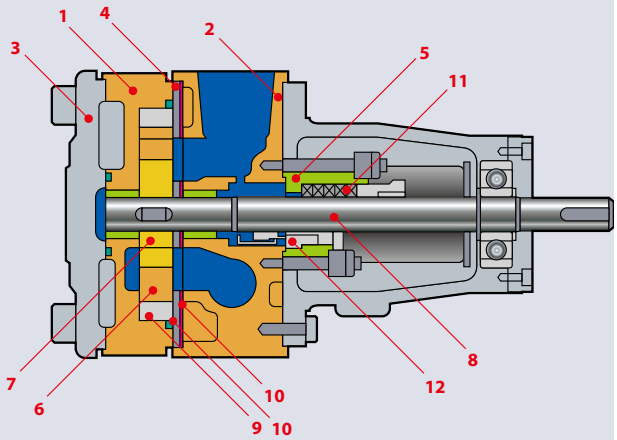
Left or right discharge port selection



GM type exploded view

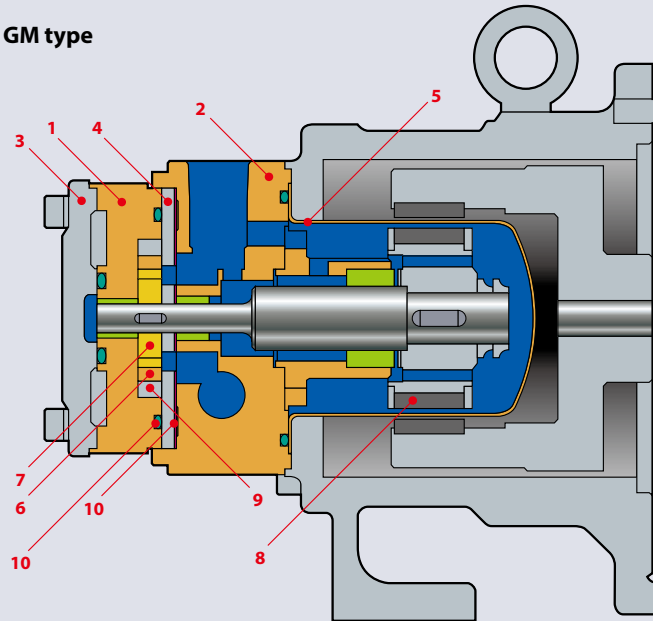
Construction / Wet end materials

GX type



	Parts	Wet end materials
1	Gear housing	SUS316
2	Port housing	SUS316
3	Cover	SCS14
4	Side plate	SUS316
5	Seal case	SCS14 or SUS316
6	Internal gear	SiC
7	Pinion	SiC or Si_3N_4
8	Shaft	SUS630Equi. or SUS316/Cr_2O_3
9	Bearing	Carbon or SiC
10	Gasket / O-ring	PTFE
11	Gland packing	PTFE
12	Mechanical seal	SUS316/Al_2O_3/Carbon/PTFE
		SUS316/SiC/SiC/PTFE

GM type



	Parts	Wet end materials
1	Gear housing	SUS316
2	Port housing	SUS316
3	Cover	SCS14
4	Side plate	SUS316
5	Rear casing	SUS316
6	Internal gear	SiC
7	Pinion	SiC or Si_3N_4
8	Magnet capsule	SUS329J1/SUS316
9	Bearing	Carbon or SiC
10	Gasket / O-ring	PTFE

Identification

G	X	-	15	S	K	K	G	-	04	M	C	-	T
	①		②	③	④	⑤	⑥		⑦	⑧	⑨		⑩

① Pump type
X : Gland packing or mechanical seal
M : Magnetic drive

② Pump size
12 : 1.0mL/rev
15 : 3.3mL/rev
25 : 12.8mL/rev
32 : 25.0mL/rev

③ Housing material
S : Stainless steel
X[Note2] : Other materials

④ Gear materials[Note1]
K : SiC/SiC
N : Si_3N_4/SiC

⑤ Bearing material
C : Carbon
K : SiC

⑥ Shaft seal
G : Gland packing seal
W : Gland packing seal (Water injection type)
M : Mechanical seal (Al_2O_3)
C : Mechanical seal (SiC/SiC)
R : Rare earth magnetic drive

⑦ Motor output
02 : 0.2kW
04 : 0.4kW
07 : 0.75kW
15 : 1.5kW
22 : 2.2kW
37 : 3.7kW

⑧ Motor type[Note4]
M : 4P motor
S : 6P motor
F : 4P Inverter motor
E : 6P Inverter motor
G3 : Geared motor (Reduction ratio 1/3) GM-D
G5 : Geared motor (Reduction ratio 1/5) GM-D
H3 : Inverter geared motor (Reduction ratio 1/3) GM-DZ
H5 : Inverter geared motor (Reduction ratio 1/5) GM-DZ
X[Note2] : Other motors

⑨ Motor specifications
Blank : TEFC, indoor type
A : Increased safety, outdoor type[Note3]
B : Explosion-proof, outdoor type
C : TEFC, outdoor type

⑩ Special specifications
J : Equipped with heat jacket
T : Equipped with torque limiter (GX)
JT : Equipped with heat jacket and torque limiter (GX)
S : Other special specifications

Note1: The indication is the material of the pinion / internal gear. The pinion material CFRPEEK is also possible.
Note2: Special specifications
Note3: Inverter motor can not be selected.
Note4: For IE3 motors of 0.75 kW or more, select F, E, H3, H5 when using the inverter.

Specifications

Model	Discharge per revolution mL/rev	Max. speed min^{-1}(rpm)	Max. discharge pressure MPa*1	Temp. range °C	Viscosity range mPa•s*2	Vacuum kPa*3	Connections IN	Connections OUT
GX-12	1.0	1800	1.0	0 - 150	0.5 - 10000	5.3	RC1/2	RC3/8
GX-15	3.3						RC1/2	RC3/8
GX-25	12.8						RC1	RC3/4
GX-32	25.0						RC1/4	RC1
GM-12	1.0	1800	0.5	0 - 80 (0 - 50)	0.5 - 1000	5.3	RC1/2	RC3/8
GM-15	3.3						RC1/2	RC3/8
GM-25	12.8		0.7				RC1	RC3/4
GM-32	25.0				0.5 - 700		RC1 1/4	RC1

*1. These are maximum values, which vary depending on motor speed and liquid viscosity.
*2. Motor speed and motor output suited to the viscosity of your liquid should be selected.
*3. These are values with clean water at 25˚C.

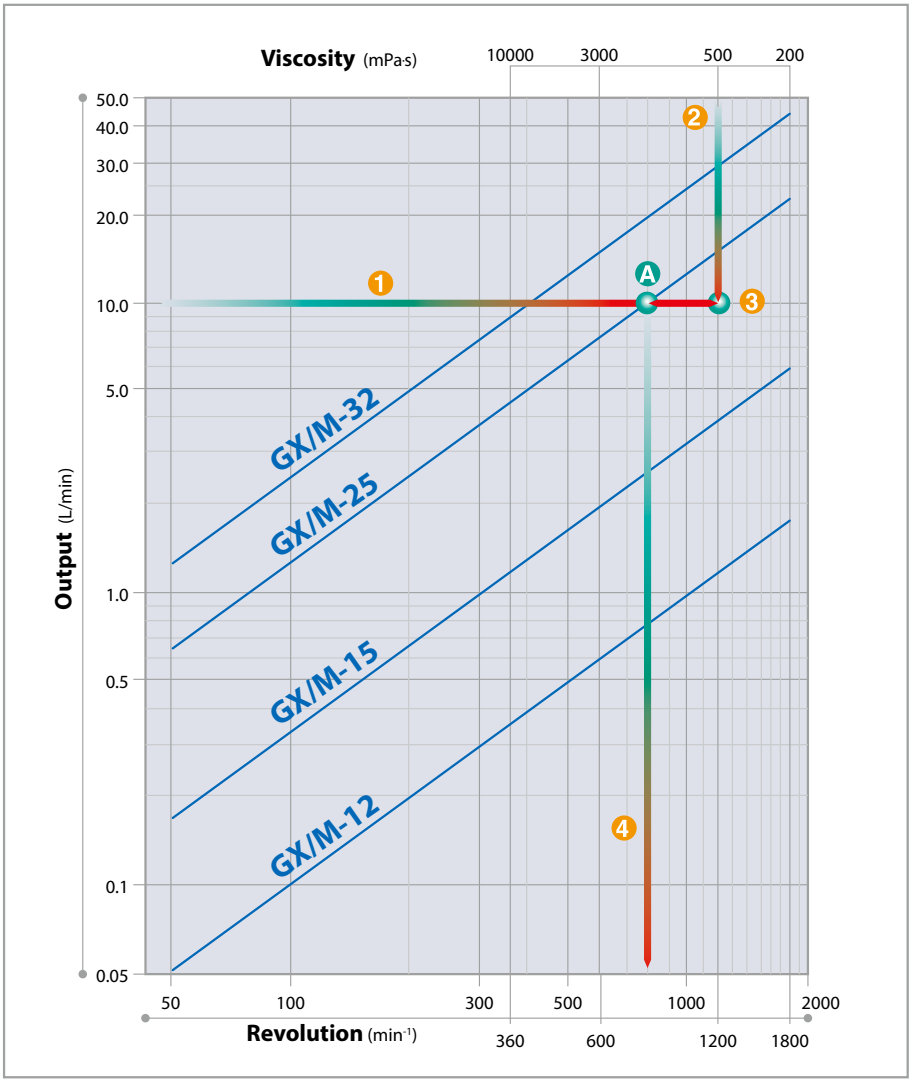
Standard pumps selection table

Model	Viscosity range mPa•s	Pump specifications 50/60Hz Max. pressure MPa	Max. flow rate L/min	Motor	
GX-12	0.5≦viscosity<1	0.3/0.36	1.4/1.7	4P, 0.2kW	
	1≦viscosity<9	0.47/0.57			
	9≦viscosity<200	1.0/1.0			
	200≦viscosity<1000		0.9/1.1	6P, 0.2kW	
	1000≦viscosity<3000	0.7/0.7	0.5/0.6	4P, 0.4kW, 1/3	
	3000≦viscosity≦10000		0.3/0.36	4P, 0.4kW, 1/5	
GM-12 S□□R	0.5≦viscosity<1	0.3/0.36	1.4/1.7	4P, 0.2kW	Note1
		0.38	1.8		Note2
	1≦viscosity<9	0.40/0.48	1.4/1.7		Note1
		0.5	1.8		Note2
	9≦viscosity<200	0.5/0.5	1.4/1.7		Note1
		0.5	1.8		Note2
	200≦viscosity≦1000	0.5	1.8	6P, 0.2kW	Note2
GX-15	0.5≦viscosity<1	0.54/0.65	4.7/5.6	4P, 0.2kW	
	1≦viscosity<9	0.7/0.7			
	9≦viscosity<200	1.0/1.0		4P, 0.4kW	
	200≦viscosity<1000		3.0/3.7	6P, 0.4kW	
	1000≦viscosity<3000	0.7/0.7	1.7/2.0	4P, 0.4kW, 1/3	
	3000≦viscosity≦10000		1.0/1.2	4P, 0.4kW, 1/5	
GM-15 S□□R	0.5≦viscosity<9	0.5/0.5	4.7/5.6	4P, 0.2kW	Note1
		0.5	5.9		Note2
	9≦viscosity<200	0.5/0.5	4.7/5.6		Note1
		0.5	5.9		Note2
	200≦viscosity≦1000	0.5	3.9	6P, 0.4kW	Note2

Model	Viscosity range mPa•s	Pump specifications 50/60Hz Max. pressure MPa	Max. flow rate L/min	Motor	
GX-25	0.5≦viscosity<9	0.7/0.7	18.0/21.8	4P, 0.75kW	
	9≦viscosity<200	1.0/1.0		4P, 1.5kW	
	200≦viscosity<1000		11.8/14.2	6P, 1.5kW	
	1000≦viscosity<3000	0.7/0.7	6.4/7.7	4P, 0.75kW, 1/3	
	3000≦viscosity≦10000		3.8/4.6	4P, 0.75kW, 1/5	
GM-25 S□□R	0.5≦viscosity<9	0.7/0.7	18.0/21.8	4P, 0.75kW	Note3
		0.7	23		Note2
	9≦viscosity<200	0.7/0.7	18.0/21.8	4P, 1.5kW	Note3
		0.7	23		Note2
	200≦viscosity≦1000	0.7	15.3	6P, 1.5kW, Note2	
GX-32	0.5≦viscosity<9	0.7/0.7	35.2/42.5	4P, 2.2kW	
	9≦viscosity<100	1.0/1.0			
	100≦viscosity<200			4P, 3.7kW	
	200≦viscosity<500		23.0/27.7	6P, 2.2kW	
	500≦viscosity<1000		12.5/15.0	4P, 1.5kW, 1/3	
	1000≦viscosity<3000	0.7/0.7			
	3000≦viscosity≦10000		7.5/9.0	4P, 1.5kW, 1/5	
GM-32 S□□R	0.5≦viscosity<30	0.7/0.7	35.2/42.5	4P, 2.2kW	Note3
			45.0		Note2
	30≦viscosity<200		35.2/42.5	4P, 3.7kW	Note3
			45.0		Note2
	200≦viscosity≦700	0.7	30.0	6P, 2.2kW	Note2

Caution: Install strainers and relief valves to protect a pump. The size of a strainer mesh depends on liquid. For clean water, 100 to 150 mesh is recommended. Ask us for details.
The recommended gear material code is K(SiC/SiC) for a viscosity below 200mPa•s and N(Si3N4/SiC) for above 200mPa•s.
Note1: General purpose motor
Note2: Inverter motor
Note3: Commercial power supply direct drive operation
- For handling liquids containing slurry, sticky liquids, liquids that harden easily, etc. , select a model with a torque limiter. Please ask us for information on pumps with torque limiters.
- Max. Pressure varies depending on pump size, viscosity of transferred fluid, and motor used. Please contact us separately for combinations other than the standard model selection table.
- The maximum liquid temperature when transferring liquid of 200 mPa·s or more with GM is 50 °C.

Performance chart



The chart on the left shows the output at a discharge pressure of 0MPa. The output changes in proportion to min^{-1}, but min^{-1} should be reduced when pumping higher viscous liquid. Knowing required output and viscosity, the proper pump/motor min^{-1} can be selected as in the following example.

STEP – 1
Mark the value of your required output (10L/min) on the scale on the left, and draw a horizontal line to the right.

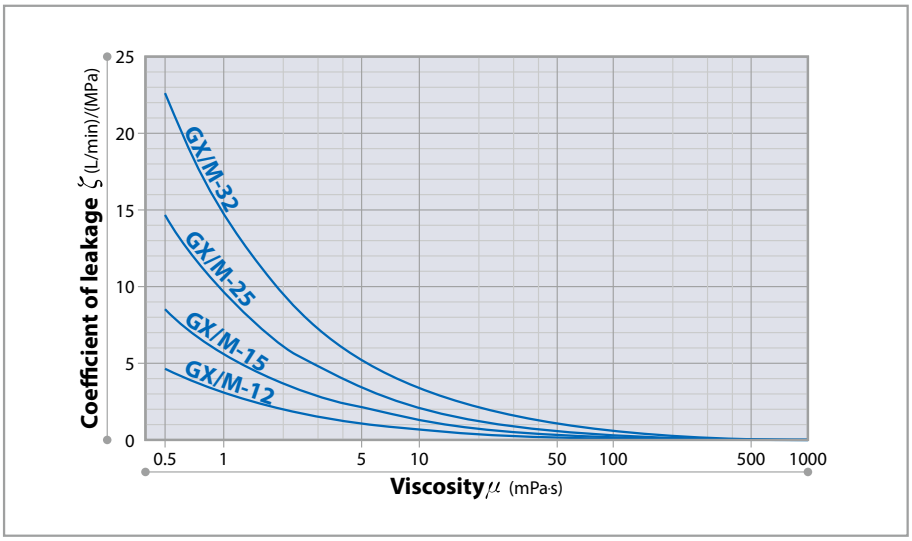
STEP – 2
Mark the value of your viscosity (500mPa·s) on the scale at the top and draw a line downward. In the event your viscosity falls in the middle of two scale lines, select the line on the left (the higher value).

STEP – 3
Extend the intersected point ③ to the left horizontally until intersecting the first pump line (GX/M-25). This point Ⓐ specifies pump.

STEP – 4
Draw a downward line from Ⓐ to specify motor rpm④.

For slurries
For soft slurries, reduce rpm by 75%.
For hard slurries, reduce rpm by 50%.
In principle, only slurries of less than 10μm in diameter can be handled.
GM type pumps cannot handle slurries.

Viscosity-leakage coefficient graph



When discharge pressure rises
The lower the viscosity, as discharge pressure rises, the lower the output will be. You can estimate the actual output, in case of a change in viscosity or discharge pressure, from the following formula. (See note below).

$\zeta = K \times \mu^{-0.65}$ —(1)

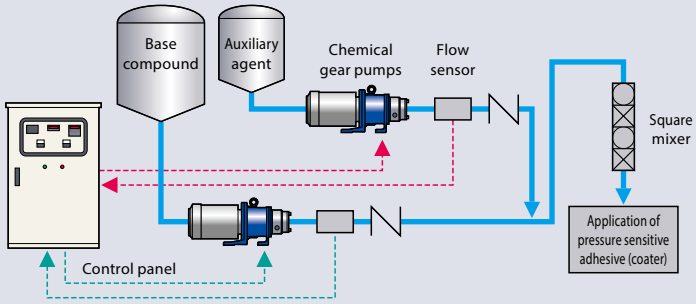
$Qc = q \times N/1000 - \zeta \times \Delta P$ —(2)

Qc : Estimated output (L/min)
q : Output per revolution (mL/rev)
N : min^{-1}
ΔP : Effective differential pressure (MPa)
ζ : Coefficient of leakage (L/min)/(MPa)
μ : Viscosity (mPa·s)
K : Constant GX/M-12 : K=3
GX/M-15 : K=5.5
GX/M-25 : K=9.5
GX/M-32 : K=15

For the value of the coefficient of leakage in formula (1), see the viscosity-leakage coefficient graph.

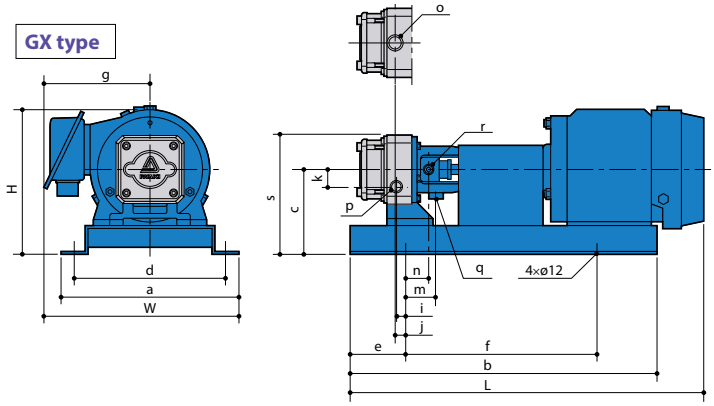
Applications

- Non pulsatile quantitative injection of glue liquor in copper foil manufacturing process
- Quantitative transfer of magnetic slurry liquid
- Quantitative transfer of paint and dye slurry liquid
- Quantitative injection of coagulant
- Quantitative injection of paper strength enhancer
- Non pulsatile quantitative transfer of fine slurry of electronic materials
- Ammonia water / urea water spray in flue gas denitration equipment such as cleaning factory
- Transfer of perfume such as detergent
- Transfer of cleaning solvent for metal parts, electronic parts etc.
- Solvent-based adhesive transfer
- Chemical liquid transfer for various processes (caustic soda, 98% sulfuric acid, nitric acid etc.)

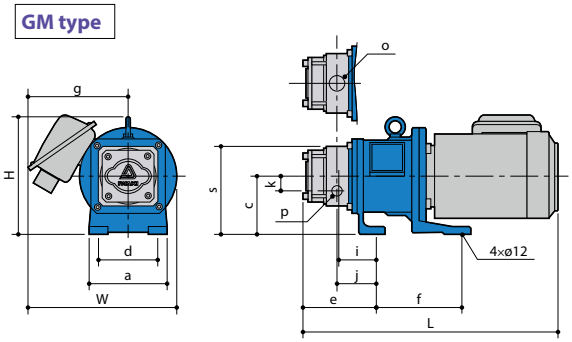


Dimensions in mm

GX type



GM type



Model	Motor	a	b	c	d	e	f	g	H	i	j	k	L	m	n	W	o	p	q	r	s	Mass kg Less motor
GX-12S -15S	02MC	252	440	111.5	222	80	280	142	182.5	13	14	24	442	41	27.5	268	Rc1/2	Rc3/8	Rc1/8	Rc1/8	160.5	17
	04MC							151	186.5				469			277						19
	02SC																					
	04SC			120				152	205				501			278					169	26
	04G□			111.5				160	219.5				528			286					160.5	24
GM-12S	02M/FC	128	—	95	98	121	141	150	193	65	66	24	400	—	—	230	Rc1/2	Rc3/8	—	—	144.5	24
	02EC							165					421			245						30
GM-15S	02M/FC	128	—	95	98	121	141	150	193	65	66	24	400	—	—	230	Rc1/2	Rc3/8	—	—	144.5	24
	04M/FC							165					421			245						27
	04EC								235				436			265						32
GX-25S	07MC	266	570	140.5	236	100	360	152	225.5	8	9.5	30	553	49.5	36	285	Rc1	Rc3/4	Rc1/4	Rc1/8	202.5	34
	15MC							166	241.5				607			299						42
	15SC			150				172	289				648			305					212	49
	07G□			140.5				165	265.5				606			298					202.5	35
GM-25S	07M/FC	160	—	120	120	165	245	165	235	83.5	85	30	466	—	—	265	Rc1	Rc3/4	—	—	182.5	43
	15M/FC							178					533			278						50
	15EC	205		146	160	169	224	185	275	87.5	89		600			310					208.5	70
GX-32S	22MC	340	740	170	300	115	510	210	309	0	0	37	707	80	60	380	Rc1-1/4	Rc1	Rc3/8	Rc1/4	247	69
	37MC							277	331				724			397						79
	22SC																					
	15G□							175	337				725			345						74
GM-32S	22M/FC	205	—	146	160	190	224	185	275	91	91	37	620	—	—	310	Rc1-1/4	Rc1	—	—	223	80
	37M/FC							196					651			321						91
	22EC												688									96

Note: The dimensions may differ with the type of motor installed.

IWAKI CO., LTD. 6-6 Kanda-Sudacho 2-chome Chiyoda-ku Tokyo 101-8558 Japan TEL : (81)3 3254 2935 FAX : 3 3252 8892

IWAKI has global net work. Please find your distributor location at **www.iwakipumps.jp**

European office	**: IWAKI Europe GmbH**	TEL: (49)2154 9254 0	FAX: 2154 9254 48
Germany	**: IWAKI Europe GmbH**	TEL: (49)2154 9254 50	FAX: 2154 9254 55
Holland	**: IWAKI Europe GmbH** (Netherlands Branch)	TEL: (31)74 2420011	FAX: (49)2154 925448
Italy	**: IWAKI Europe GmbH** (Italy Branch)	TEL: (39)0444 371115	FAX: 0444 335350
Spain	**: IWAKI Europe GmbH** (Spain Branch)	TEL: (34)93 37 70 198	FAX: 93 47 40 991
Belgium	**: IWAKI Belgium N.V.**	TEL: (32)13 67 02 00	FAX: 13 67 20 30
Denmark	**: IWAKI Nordic A/S**	TEL: (45)48 24 2345	
Finland	**: IWAKI Suomi Oy**	TEL: (358)9 2745810	
France	**: IWAKI France S.A.**	TEL: (33)1 69 63 33 70	FAX: 1 64 49 92 73
Norway	**: IWAKI Norge AS**	TEL: (47)23 38 49 00	
Sweden	**: IWAKI Sverige AB**	TEL: (46)8 511 72900	

( )Country codes

U.S.A.	**: IWAKI America Inc.**	TEL: (1)508 429 1440	FAX: 508 429 1386
Argentina	**: IWAKI America Inc.** (Argentina Branch)	TEL: (54)11 4745 4116	
Brasil	: IWAKI Do Brasil Comercio De Bombas Hidraulicas LTDA.	TEL: (55)19 3244 5900	FAX: 19 3244 5900
Singapore	**: IWAKI Singapore Pte Ltd.**	TEL: (65)6316 2028	FAX: 6316 3221
Indonesia	**: IWAKI Singapore** (Indonesia Office)	TEL: (62)21 6906606	FAX: 21 6906612
Malaysia	**: IWAKIm Sdn. Bhd.**	TEL: (60)3 7803 8807	FAX: 3 7803 4800
Australia	**: IWAKI Pumps Australia Pty Ltd.**	TEL: (61)2 9899 2411	FAX: 2 9899 2421
Hong Kong	**: IWAKI Pumps Co., Ltd.**	TEL: (852)2607 1168	FAX: 2607 1000
China	**: GFTZ IWAKI Engineering & Trading Co., Ltd.**	TEL: (86)20 84350603	FAX: 20 84359181
	: IWAKI Pumps (Shanghai) Co., Ltd.	TEL: (86)21 6272 7502	FAX: 21 6272 6929
Korea	**: IWAKI Korea Co.,Ltd.**	TEL: (82)2 2630 4800	FAX: 2 2630 4801
Taiwan	**: IWAKI Pumps Taiwan Co., Ltd.**	TEL: (886)2 8227 6900	FAX: 2 8227 6818
Thailand	**: IWAKI (Thailand) Co.,Ltd.**	TEL: (66)2 322 2471	FAX: 2 322 2477

Caution for safety use:
Before use of pump, read instruction manual carefully to use the product correctly.

Actual pumps may differ from the photos. Specifications and dimensions are subject to change without prior notice. For further details please contact us.

Legal attention related to export.

Our products and/or parts of products fall in the category of goods contained in control list of international regime for export control. Please be reminded that export license could be required when products are exported due to export control regulations of countries.