The Heart of Industry

IWAKI

IWAKI CHEMICAL GEAR PUMPS

G

Solutions for chemical handling applications

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, "jamming" and "seizing" tend to occur. SiC ceramic gears do not have this problem 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 fine slurries hard and soft will not impair the longevity of these pumps. Do not specify GM type for slurry applications.

Magnetic drive type added to standard line

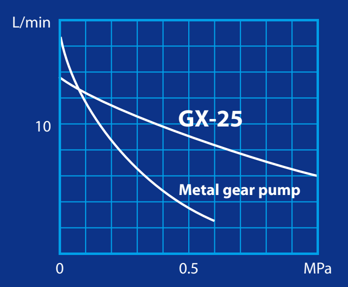
Superior anticorrosive materials such as silicon carbide, silicon nitride, alumina ceramic, PTFE, carbon and stainless steel are used in liquid ends so that all sorts of chemical liquids can be handled. GM is ideal for handling chemical liquids which need strict control on liquid leakage and air contact.

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 graph shows that the G series, which employs 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 general use type gear pumps, liquid is transferred quietly and smoothly no agitating or foaming.

High self-priming ability

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

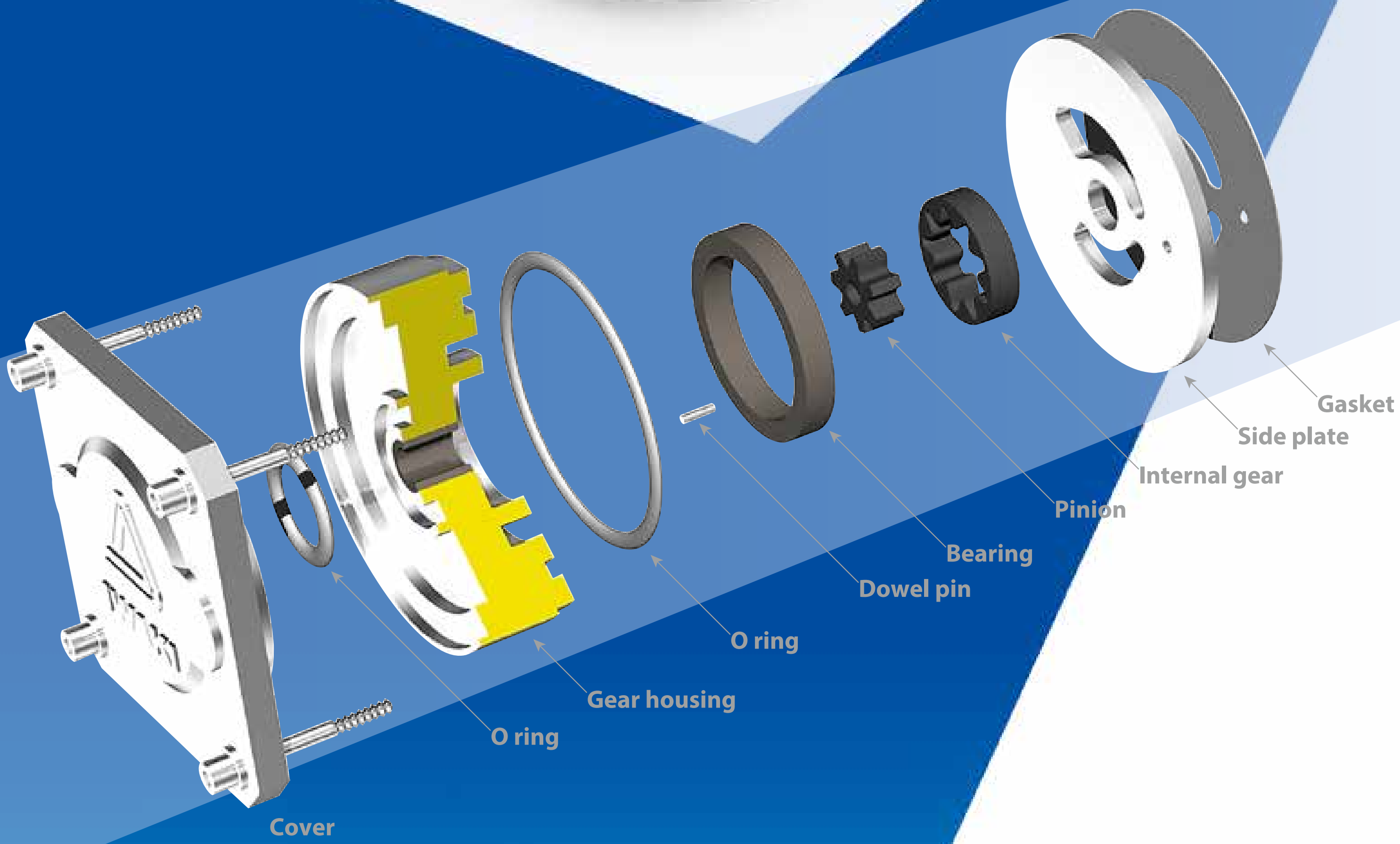
Constant flow injection

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.

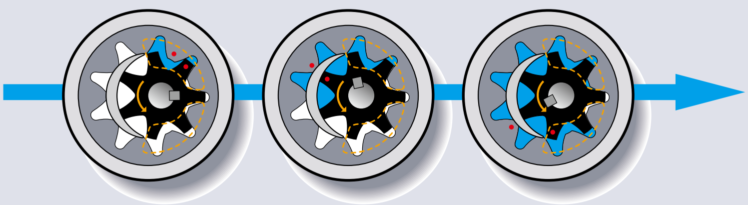
GM type

GX type

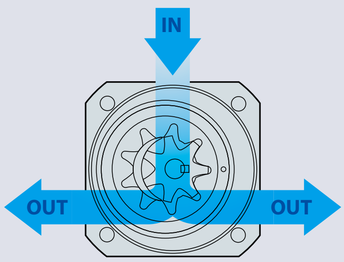
Construction



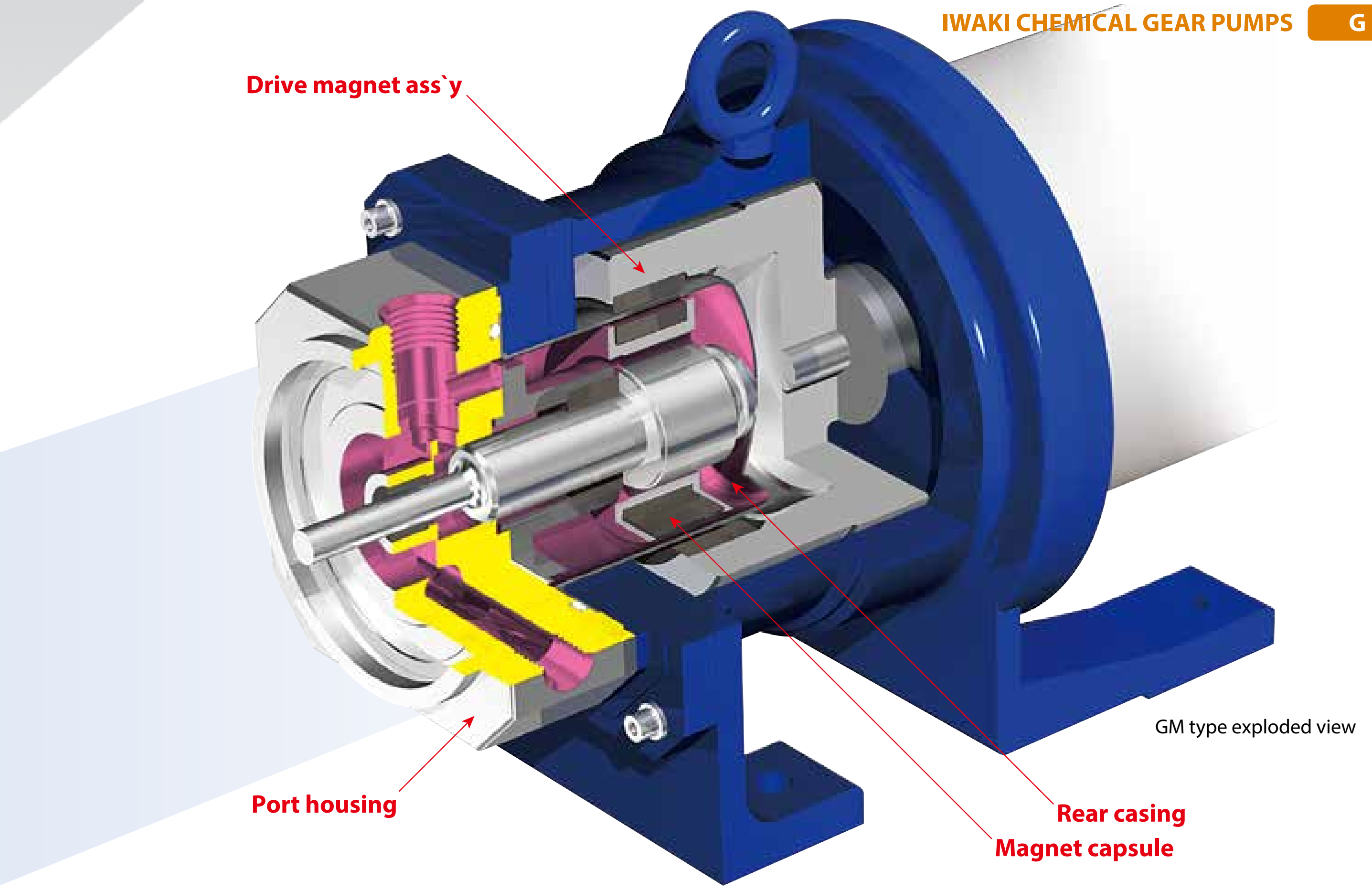
Operating principle



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.



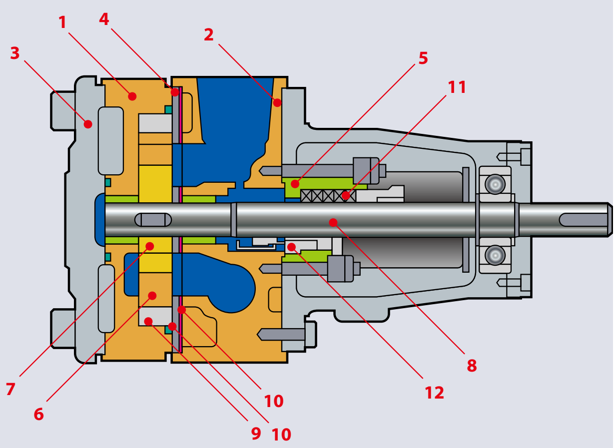
Left or right discharge port selection



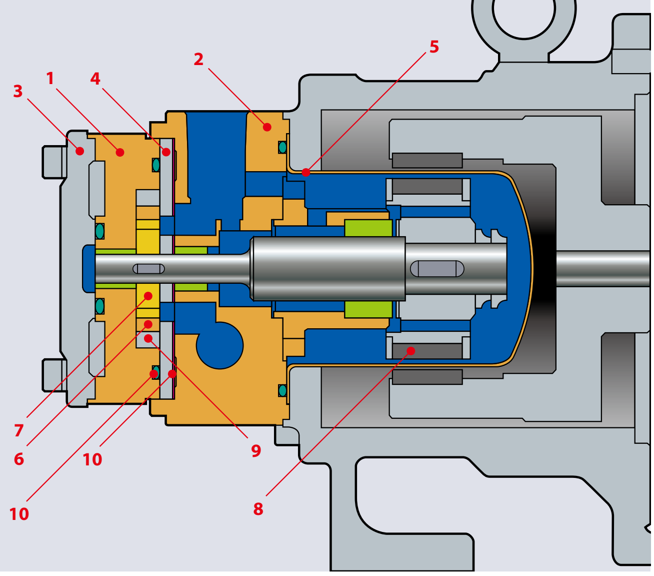
GM type exploded view

Construction / Wet end materials

GX type



GM 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

	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 codes

G X - 15 S K K G - 04 M C - T

- **Pump type**
  X: Gland packing or mechanical seal
  M: Magnetic drive
- **Pump size**
  12: 1.0mL/rev **15**: 3.3mL/rev
  25: 12.8mL/rev **32**: 25.0mL/rev
- **Housing material**
  S: Stainless steel
  X [Note2]: Other materials
- **Gear material** [Note1]
  K: SiC/SiC **N**: Si_3N_4/SiC
- **Bearing material**
  C: Carbon **K**: SiC
- **Shaft seal**
  G: Gland packing seal **W**: Gland packing seal (Water injection type)
  M: Mechanical seal (Carbon / Al_2O_3) **C**: Mechanical seal (SiC / SiC)
  O: Magnetic drive (GM-32) **R**: Rare earth magnetic drive (GM-12 to 25)
- **Motor output**
  02: 0.2kW **04**: 0.4kW (0.37kW)
  07: 0.75kW **15**: 1.5kW
  22: 2.2kW **37**: 3.7kW (4kW)
- **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
- **Motor specifications**
  Blank: TEFC, indoor type
  A: Increased safety, outdoor type [Note3]
  B: Explosion-proof, outdoor type
  C: TEFC, outdoor type
- **Special specifications** [Note2]
  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}	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 - 10,000	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 1/4	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 - 80	0.5 - 100		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 clear water at 25˚C.

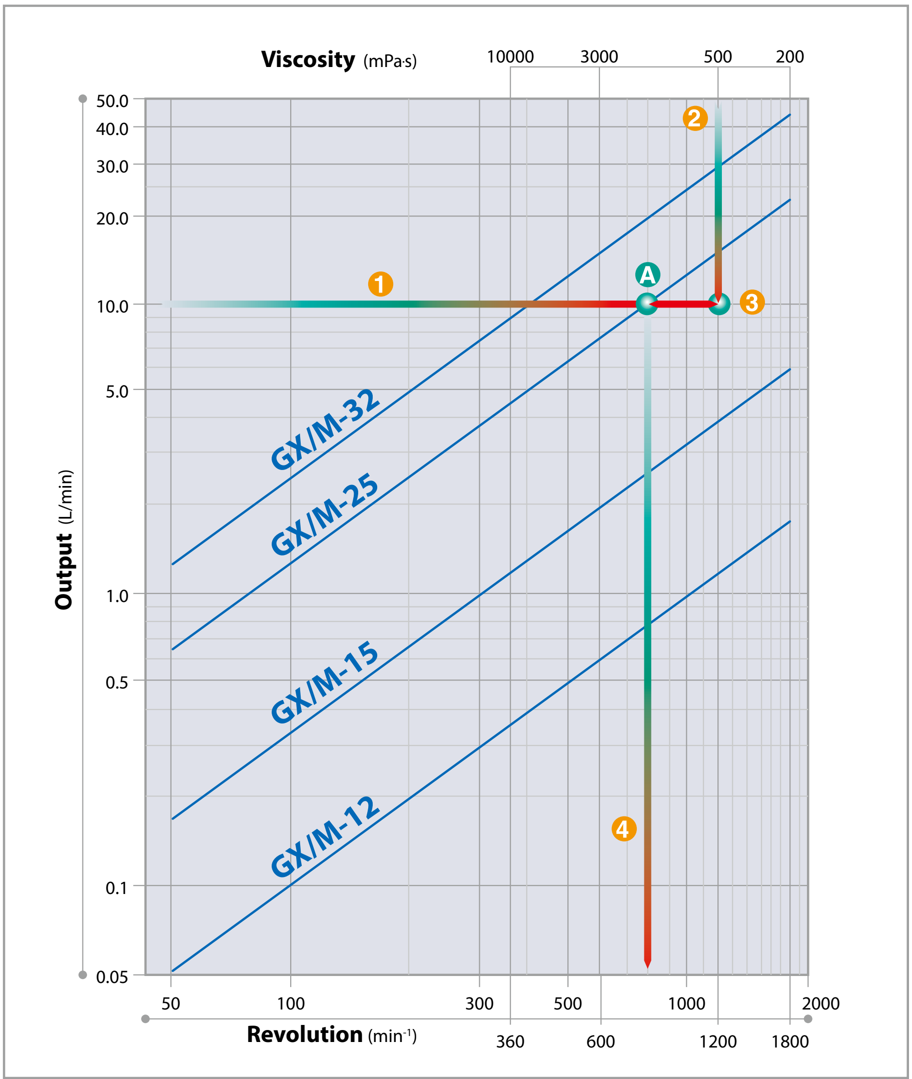
Standard pumps selection table

Model	Viscosity range mPa·s	Pump specifications 50/60Hz Max. pressure MPa	Pump specifications 50/60Hz 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	4P, 0.4kW	Note1
		0.5	5.9		Note2
	200≦viscosity≦1000	0.5	1.2	6P, 0.4kW	Note2

Model	Viscosity range mPa·s	Pump specifications 50/60Hz Max. pressure MPa	Pump specifications 50/60Hz 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 SKCO	0.5≦viscosity<30	0.7 / 0.7	35.2 / 42.5	4P, 2.2kW	
	30≦viscosity≦100			4P, 3.7kW	

Caution: To protect pump install strainer and safety valve. Strainer mesh depends on liquid. For water or equivalent 100 to 150 mesh is recommended. Ask us for details.
The recommended gear materials are K(SiC/SiC) for a viscosity below 200mPa·s and N(Si_3N_4/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 output at a discharge pressure of 0MPa. The output changes in proportion to min^{-1}, but min^{-1} should be reduced when pumping 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 A specifies pump.

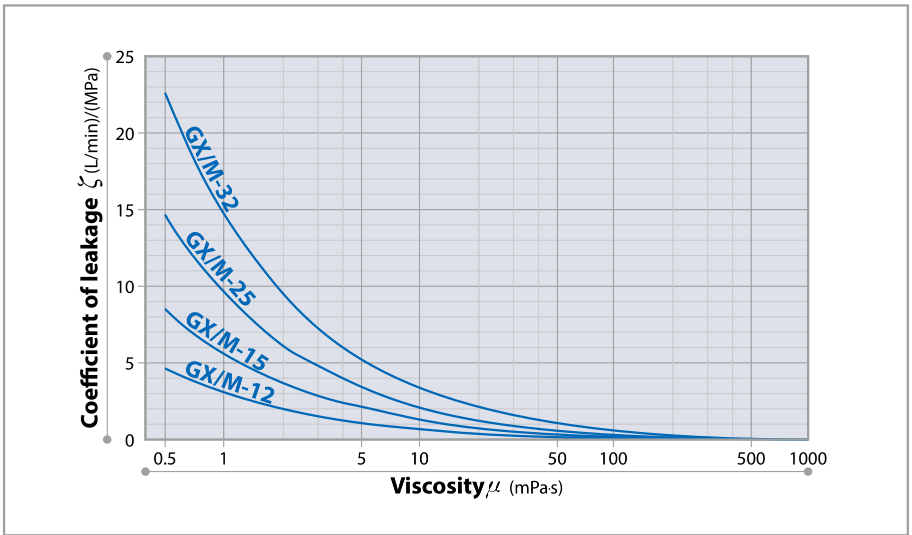
STEP – 4

Draw a downward line from A to specify motor rpm 4.

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)

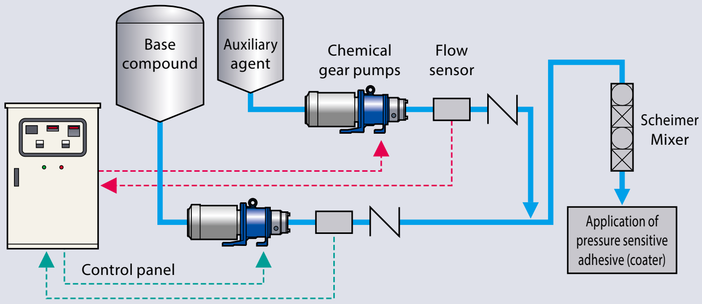
$Qc = q \times N/1000 - \zeta \times \Delta P$ —(2)

- 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.

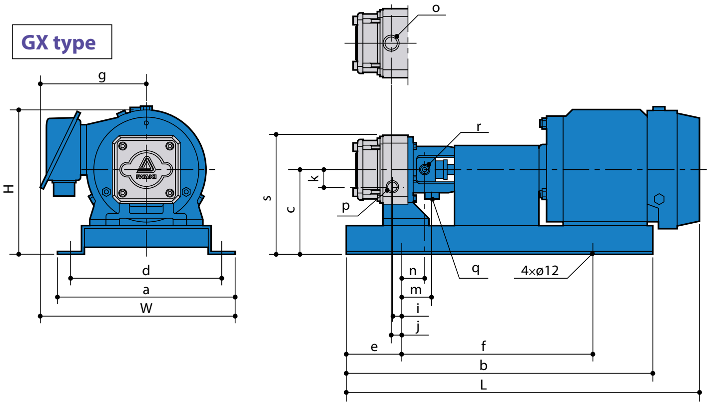
Applications

- 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.)

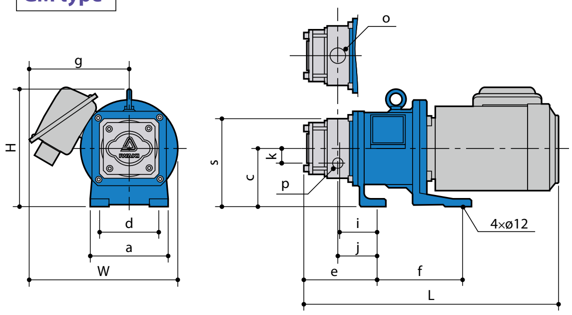


Dimensions in mm

GX type



GM type



mm

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 GX-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	252	440	111.5	222	80	280	151	186.5	13	14	24	469	41	27.5	277					160.5	19
	02SC	252	440	111.5	222	80	280	151	186.5	13	14	24	469	41	27.5	277					160.5	19
	04SC	252	440	120	222	80	280	152	205	13	14	24	501	41	27.5	278					169	26
	04G □	252	440	111.5	222	80	280	160	219.5	13	14	24	528	41	27.5	286					160.5	24
GM-12S	02M/FC	128	–	95	98	121	141	150	193	65	66	24	400	–	–	230			–	–	144.5	24
	02EC	128	–	95	98	121	141	165	193	65	66	24	421	–	–	245			–	–	144.5	30
GM-15S	02M/FC	128	–	95	98	121	141	150	193	65	66	24	400	–	–	230			–	–	144.5	24
	04M/FC	128	–	95	98	121	141	165	193	65	66	24	421	–	–	245			–	–	144.5	27
	04EC	128	–	95	98	121	141	165	235	65	66	24	436	–	–	265			–	–	144.5	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	266	570	140.5	236	100	360	166	241.5	8	9.5	30	607	49.5	36	299					202.5	42
	15SC	266	570	150	236	100	360	172	289	8	9.5	30	648	49.5	36	305					212	49
	07G □	266	570	140.5	236	100	360	165	265.5	8	9.5	30	606	49.5	36	298					202.5	35
GM-25S	07M/FC	120	165	245	165	235	83.5	85	-	90	466	-	120	-	265	160			–	–	182.5	43
	15M/FC	120	165	245	178	235	83.5	85	-	90	533	-	120	-	278	160			–	–	182.5	50
	15EC	160	169	224	185	275	245	89	-	116	600	-	146	-	310	205			–	–	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	340	740	170	300	115	510	227	331	0	0	37	724	80	60	397					247	79
	22SC	340	740	170	300	115	510	227	331	0	0	37	724	80	60	397					247	79
	15G □	340	740	170	300	115	510	175	337	0	0	37	725	80	60	345					247	74
GM-32S	22MC	205	-	146	160	190	224	210	288.5	91	91	37	650	–	–	335			–	–	223	80

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

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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.