Version of 01.01.2012

User Manual

Quattroflow-150 Series
4-Piston Diaphragm Pump

These two photographs show the Quattroflow-150 S pump. The left one is equipped a stainless steel motor cover and the integrated control panel. The right one is the system integrable version of the Quattroflow-150S, without a stainless steel motor cover and with a seperate control panel.

Safety
These operating instructions contain advices to be observed during installation, operation and maintenance. Therefore, prior to mounting and commissioning, these operating instructions must be read by the user and must always be available at the place of installation.

Performance Data
The exact performance data applying to the pump are to be taken from the order data sheet.

These Operating and Maintenance instructions contain information from the pump manufacturer. They may need to be supplemented by instructions of the operator company for its personnel.

ALMATEC Maschinenbau GmbH is constantly working on improvements of the pump. Modifications of the design or materials might be done without prior notice.

1. General:

1.1 Appropriate specification

This User Manual is valid fort the **Quattroflow-150 S pump**

No liability will be undertaken for any damages caused by non-compliance with the operating instructions and service conditions! Original spare parts serve safety purposes. The use of other parts may cancel the liability for the consequences resulting therefrom.

Manufacturer: ALMATEC Maschinenbau GmbH

Carl-Friedrich-Gauss-Str. 5
D-47475 Kamp-Lintfort
Germany

Phone: +49 2842 961-0
Fax: +49 2842 961-40
e-mail: quattroflow@almatec.de
Internet: www.quattroflow.com

1.2 Labelling of the pump

The type label of each Quattroflow pump can be seen on the bottom of the base plate.
Besides the serial No of the pump head is punshed in, at the front cover.

Quattroflow-150 S with 50W brushless DC motor in a stainless steel housing

Power switch

Control panel

Power kable

The type lable on the bottom of the base plate
CE-sign, protection class: IP55

Safty lable: 6 bar ! Do not remove !

Serial No. is punched in, at the front of the pump!

2. Safety

These operating instructions contain basic hints to be observed during installation, operation and maintenance. Therefore, prior to mounting and commissioning, these operating instructions must by all means be read by the fitter as well as the pertinent expert personnel/customer and must always be available at the place of installation of the pump. Not only are the general safety hints listed under this item “Safety” to be observed, but also the special safety hints such as for specific use at the user’s site.

2.1 Marking of hints in the operating instructions

The safety hints contained in these operating instructions which, in case of non-compliance, may cause danger to personnel, are particularly marked with the danger symbol.

Safety sign according DIN 4844 - W 9

In case of warning against electric voltage with:

Safety sign according DIN 4844 – W8

Safety hints which, in case of non-compliance, may cause danger to the pump itself or to parts of the systems are particularly marked with

the word: ***ATTENTION!***

Marking labels at the pump e.g.

- Pmax 6bar
- Direction of flow

must not be removed and care have to be taken that these labels are readable.

2.2 Safety hints for maintenance, inspection, mounting and operation

The customer shall see to it that all maintenance, inspection and mounting operations are performed by authorized and qualified expert personnel who have sufficiently informed themselves by thoroughly studying the operating instructions. Basically, operations at the machine must be performed during standstill only. Pumps handling noxious fluids must be decontaminated.

2.3 Responsible working

Please follow strictly the safety guidelines that are issued for your particular enviroment. Eg. the handling of chemicals, like caustic or acid, the handling of biological materials, the handling of tubing, piping, instrumentation, fittings etc.

2.4 Dangers in case of non-compliance with safety hints

In case of non-compliance with the safety hints may cause danger to personnel, equipment and enviroment.

It can cause:

- Failure of the proper function of the pump/system.
- Danger to personnel by electrical, mechanical, chemical, biological impacts.
- Danger to equipment and enviroment

2.5 Safety hints for the user / operator

- In case of hot parts (e.g. while CIP or SIP) protective measures have to be taken.
- Protecting covers of moving parts (e.g. coupling, cover of motor) must not be removed.
- Leakages of dangerous materials to be handled must be discharged so as not to result in danger to persons or he enviroment. Legal stipulations are to be obeserved.
- Dangers by electrical energy are to be excluded (for details with regard to hereto, please refer to the regulations of the VDE and the local energy supply associations.

2.6 Safety hints for maintenance, inspection and mounting operations

The customer shall see to it that all maintenance, inspection and mounting operations are performed by authorized and qualified expert personnel who have informed themselves by thoroughly studying the operating instructions.

Basically operations at the machine must be performed during standstill only.
Disconnect mains supply before opening the electrical cabinets (control box).

Pumps or aggregates handling noxious fluids (e.g. caustic, bio hazardous) must be decontaminated.
Prior to restarting all items and the pump are to be observed.

2.7 Arbitrary reconstruction and spare part construction

Reconstruction of or changes to the machine are only admissible after consultation with the manufacturer.
Original spare parts and accessories authorized by the manufacturer serve safety purposes.
The use of other parts may cancel the liability for the consequences resulting herefrom.

2.8 Inadmissible modes of operation

The operating safety of the machine supplied is only ensured with due application according to the operating instructions. The limit values given in the data sheet must by no means exceeded.

2.9 Attention*! Warning hints!*

These warning hints are to prevent the user from an inadmissible mode of operation. These warning hints are to be strictly followed to avoid any damage of the pump and/or any danger to personnel.

Diapragm pumps are positive displacement pumps and can theoretically generate an infinitely high pressure. With the discharge line closed, e.g. by clogging or by incidental closing of a valve, the pressure generated by the pump may reach a multiple of the admissible pressure of the plant. This may lead to bursting of the diaphragm or lines which must be absolutely avoided especially when handling dangerous products.

- ⚠ Diameter of the suction line need to be sufficient to avoid cavitation.
- ⚠ The use of a safety device (e.g. pressure switch) can be necessary.
- ⚠ Please make sure that prior to the start of the pump the discharge line is checked. Make sure that there is no flow restriction in the discharge line to avoid any over pressure (e.g. closed valve).
- ⚠ Check all seals (e.g. TC clamps) before the pump is started.

The maximum discharge pressure depends on the temperature of the fluid.

pmax at room temperature = 6 barg
pmax at 90° C = 3 barg

Please allow the pump to cool down after heat treatment (e.g. CIP / SIP).

Flush the pump prior to use with appropriate fluid (e.g. buffer)

- ⚠ Foundation design: The foundation must be designed so that it can take the weight of the pump aggregate on the entire surface.
- ⚠ Please make sure that the pump is operated with the proper mains voltage and frequeny to avoid damages and electrical danger.

Due to the versatile possibilities to use the Quattroflow-150 s pump it is highly recommended to check case by case if the Quattroflow-150 S pump will be the right tool for the specific application. The user/operator is responsible to perform a proper method of testing if the pump should be applied for his specific application.

The chemical and thermal compatibility of the elastomeric parts of the pump with the fluid that will be pumped are to be checked by the operator before the first process run.

E.g. Oily, fatty fluids or solvents might cause a swelling and/or destruction of the elastomeric components.
If in doubt, please contact the manufacturer!

- ⚠ Operating the pump in humid or aggressive air can cause damages to the motor and control box.
- ⚠ The control box should not be exposed to spray/splash water or to heat sources.

If the Quattroflow-150 S pump is to be used under rough conditions, the manufacturer can supply special equipment, like motors and controls.

2.10 *Attention! Safety Hints!*

The following safety hints notify you of the potential of bodily harm or life danger of the user/operators!

- ⚠ Please read and follow the safety hints and warnings to avoid any risk of bodily harm, life danger and/or the damage of equipment.
- ⚠ Please keep this User Manual available. Make sure that the operators of the pump have read and understood the User Manual. A training session might be appropriate.
- ⚠ We recommend to install specific warning labels at the system.

Disconnect mains before doing any maintenance!
The housing of the control box is to be opened only by skilled personnel.
Check the electrical cables before connecting to mains supply.

- ⚠ The Quattroflow-150 S is a positive displacement pump and can theoretically generate an infintely high pressure even at low speed (rpm). Prior to each start of the pump check and make sure that the discharge line is not closed or restricted. The design of the discharge line must not build up a pressure of > 6 barg.
- ⚠ If suction and/or discharge line are flexible tubing, then make sure that these tubings do have the proper pressure rating for the full range of temperatures that are applied.

pmax. = 6 bar, Do not exceed! Warning Label: p max: bar! Do not remove!
If the maximum pressure is exceeded it can happen that the diaphragm of the pump will burst. In this case the fluid will come out of the pump and can cause a danger for the personnel and/or enviroment (e.g. caustic cleaner).

The Quattroflow-150 S pump can pump air which means that most of the fluid inside the pump chamber will be pump out. However there will be a residual amount of fluid (appr. 1 – 3 ml) inside the pump chamber that should be flushed out of the pump before the pump will be opened.

- ⚠ Please follow the general safety guidelines when handling chemical fluids (wear gloves and/or glasses) before the pump chamber will be opened.

- ⚠ Never operate the pump without coupling and motor housing.

- ⚠ The foundation must be designed so that it can take the weight of the pump on the entire surface.

The Quattroflow-150 S must not be operated in ATEX zones.
Special versions for ATEX applicationen are available.
Please contact the manufacturer in case that the Quattroflow-150 S pump need to be modified for ATEX applications.

ALMATEC Maschinenbau GmbH

Attention! Inadmissible modes of operation, arbitrary reconstruction, spare parts production and/or any changes of the design (without admission of the manufacuturer) may cancel the liability for the concequences resulting therefrom.

3. Description of the Quattroflow-150 S pump

3.1 Application and range of utilization of the Quattroflow-150 S pump

The Quattroflow-150 S is a 4-piston Diaphragm pump, which is mainly used to pump water-like fluids that are typically handled in research-, pilot plant- or production facilities of the pharmaceutical, biotech, food or cosmetic research centers or plants.

Typical examples of these fluids:

- Solutions containing proteins (albumin, IgG, Clotting factors, monoclonale antibodies, enzymes, vaccines.)
- Solutions of polymers or suspensions (silicons, latex, chromatography media)
- Cell suspensions (bacteria, yeast, algae, fungi, mammalian cells)
- Colloidale solutions
- Suspensions of virusses or phages
- Dairy products
- Gelatine
- Supplements and ingredients for cosmetic and food.

3.2 Typical process steps in which the Quattroflow-150 S pump is used

Filtration technology

- To recirculate feed/retentate (e.g. membrane cassettes, hollow fibre, spiral wound, ceramic elements.
- Feed pump for filter cartridges or plate and frame depth filters

Chromatography:

- Packing of chromatography columns
- Feed pump to mix gradients
- **Feed pump for centrifuges or separators**
- **Feed pump for filling machines**

3.3 Discription of the working princaple Quattroflow-150 S

The Quattroflow-150 S pump is a 4-piston diaphragm pump. The 4 diaphragms of the pump oscillate back and forth. This alternate movement is created by a connector plate that is arranged on a ball bearing. The ball bearing sits on an eccentric shaft. The connector plate does not turn!
The stroke of the pistons is determined by the angle of the eccenter. There is only eccentric shafts with 5° available.

Range of flow rate: 5° eccentric shaft: appr. 1 -150 L/hr at max. 3000rpm

Please note:

The direction of flow can be adjusted by turning the pump chamber in 90° steps.

The Quattroflow-150 S is **self-priming and can run dry**. Inside the pump chamber there are no rotating parts that might cause heating up of the product or shed particles.

The pump-motor unit is mounted on a stainless steel base plate. In case that the pump will not be mounted on the base plate but in a frame or any other base measures have to be taken that there will be a proper alignment of the motor and the pump.

3.4 The Control panel

In the Quattroflow-150 S pump is working a 50 W brushless Panasonic motor. You can modify the speed of the motor by the control panel on the top of the pump.

Main switch. Push to start – the panel lights up

Push to speed up (arrow bottom-up) or to speed down (arrow top down)

Push "Green button" RUN, to start the pump

“MOD button“ Switch between rpm, effiency %, motor power V

Display show: "rpm, %, V"
(max. speed 3.000 rpm)

Push the "Red button" STOP to stop the pump

Attention: The optimal motor parameter are set before the delivery.

Only authorized and qualified personnel should change the parameter of the control panel!

Attention!

You must study the operating instruktions of the PANASONIC –Motor before you make any changes of the parameter!

Quattroflow-150 S Pump
Motor: Panasonic, 50 W, 230V with integrated frequence inverter
Speed contol: Panasonic Digital Control panel

3.5 Start-Up

Prior to leaving our factory all pumps are subjected to a leakage and performance test. Only properly operating pumps leave the factory achieving the performances assured by us. It is possible that there will be a few mls of water inside the pump.

Prior to each use we recommend to flush the pump with a proper fluid (e.g. water or buffer)

Prior to the very first use it might make sense to clean and sanitize the pump chamber. A commmercial caustic cleaner and/or 1n bis 0.5n NaOH can be applied. The choosen cleaning agent can be recirculated and also stored inside the pump chamber.

For flushing out of any cleaning agent do not recirculate! Check with appropriate analytical methods the success of the flushing procedure.

Recommendation: Test run prior first use!

Before using your pump in your process (e.g. as recirculation pump in a TFF system) perform a test run to get used to the specific properties of the pump.

Please note:

ALMATEC Maschinenbau GmbH is also building custom-made pumps and set-ups. These modified pumps can be different from this one that is described in here. However the basic information is applicable to all of the Quattroflow-150 (S) Series pumps.

Please do not hesitate to contact us for further information:

ALMATEC Maschinenbau GmbH

Carl-Friedrich-Gauss-Str. 5
D-47475 Kamp-Lintfort
Germany

Phone: +49 2842 961-0
Fax: +49 2842 961-40
e-mail: quattroflow@almatec.de
Internet: www.quattroflow.com

4. Maintenance/Servicing of the Quattroflow-150 S pump

Due to the robust construction the Quattroflow-150 S pump requires only little and easy- to-do maintenance.
The ball bearings do not need any extra lubrication.

The diaphragm and the valves are wear parts. These should be checked and if needed be changed once the performance of the pump decreases.
In case that the diaphragm broke it need to be replaced. Then it is also recommended to check the ball bearings if these are still working smoothly or if these are hard to turn and are noisy during operation.

Attention! Safety hints!

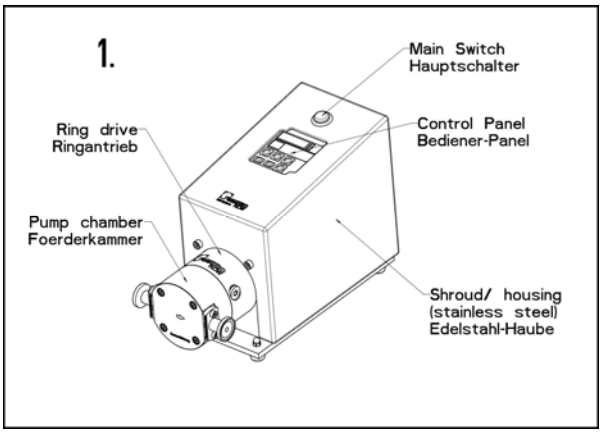
After purging the pump with air there might be a small residual amout of fluid inside the pump chamber.
Flush the pump chamber thoroughly and check the rinse fluid.

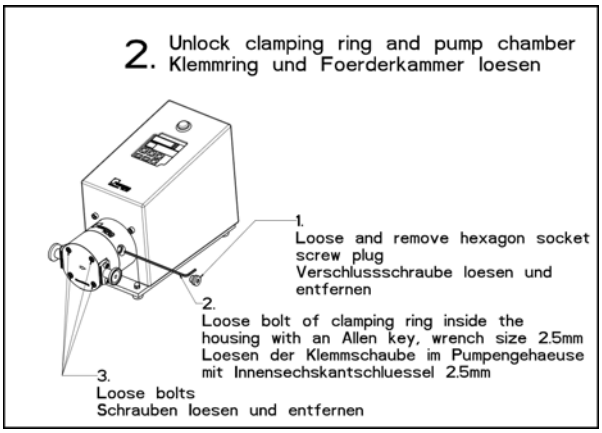
Please follow the general guidelines and safety advices when handling with chemicals.

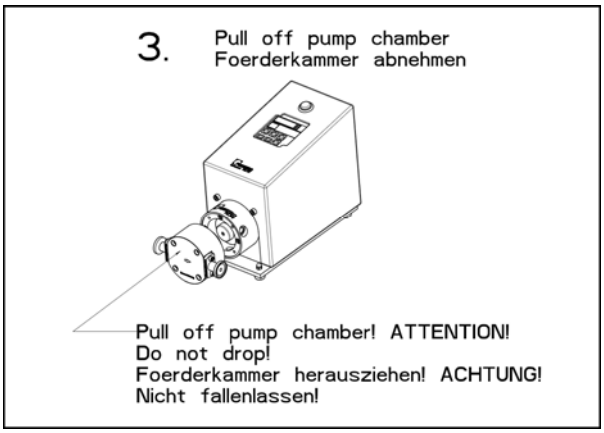
Disconnect mains supply before opening the pump housing!

The dismounting and mounting of the pump should be done on a rigid table or work bench. Please note: the pump is heavy.

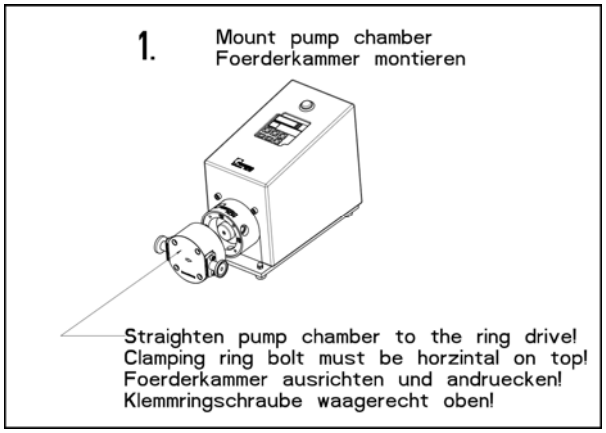
4.1 Dismounting of the pump chamber:

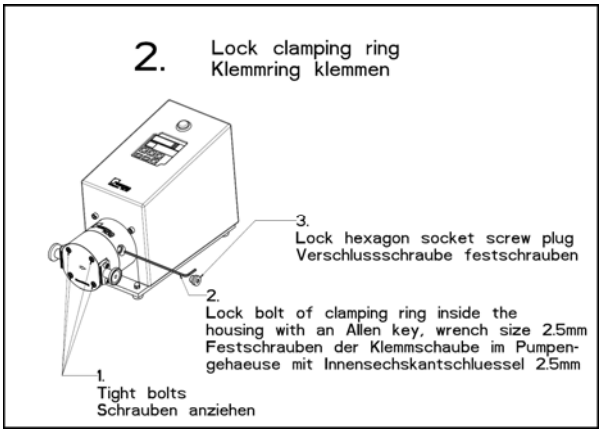






4.2 Mounting the pump chamber to the ringdrive:



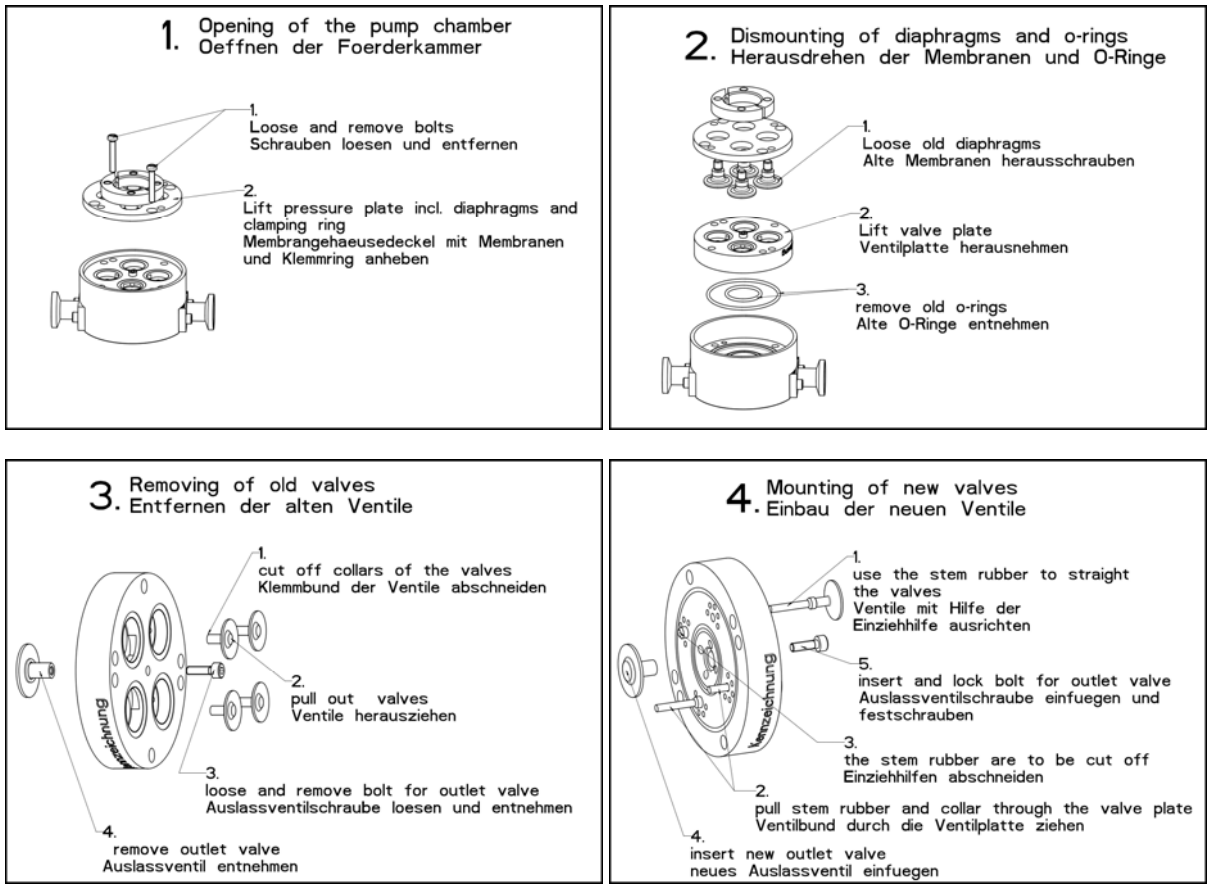


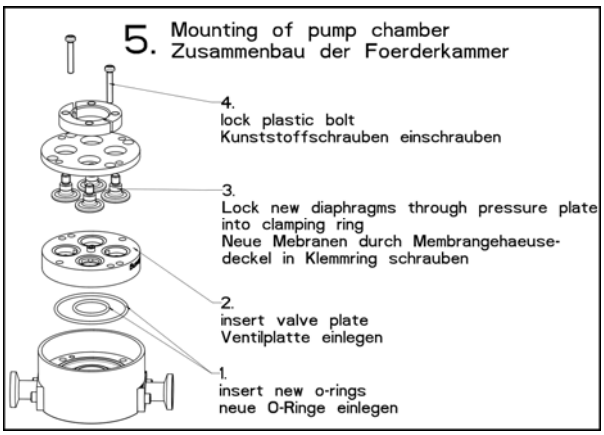
4.2 Mounting of the pump chamber:

The changing of the diaphragms and valves can be done by the user. Please follow the pictures for dismounting and mounting of the pump chamber by using service kit no. PSKITQ15.

Attention:
In case of bursting diaphragms by overpressure we advice also to change the shaft-bearing-cap unit.

For dismounting the pump chamber please follow 4.1.



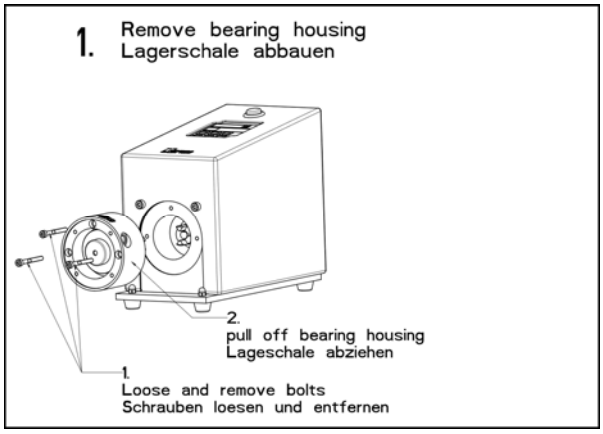


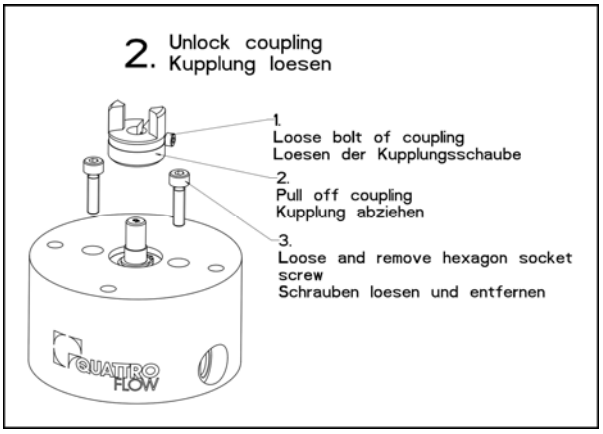
For mounting the pump chamber please follow 4.2

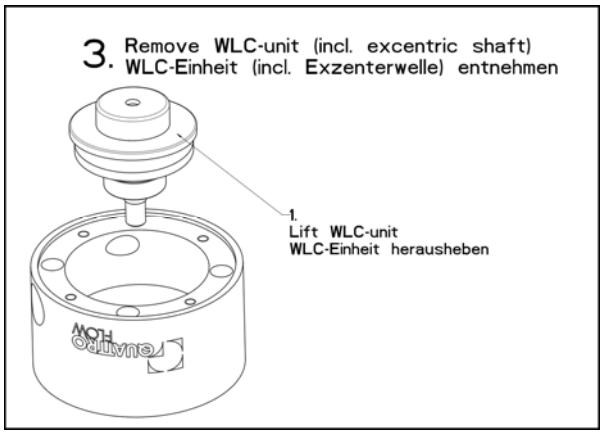
4.4 Changing of the shaft–bearing–cap unit

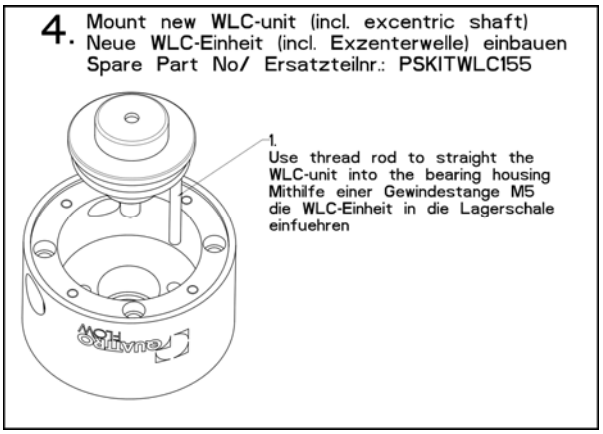
The changing of the shaft-bearing-cap unit can be done by the user. Please follow the schematic drawings “Dismounting of the pump chamber” and “Mounting of the pump chamber” by using following **Spare part kit: PSKITWLC155 (5° excentric shaft)**

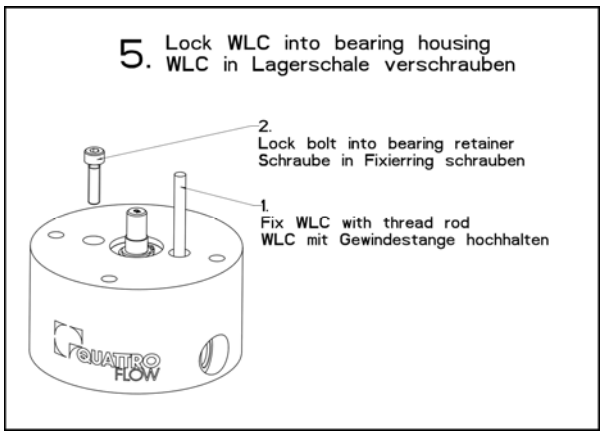
For dismounting the pump chamber please follow 4.1.

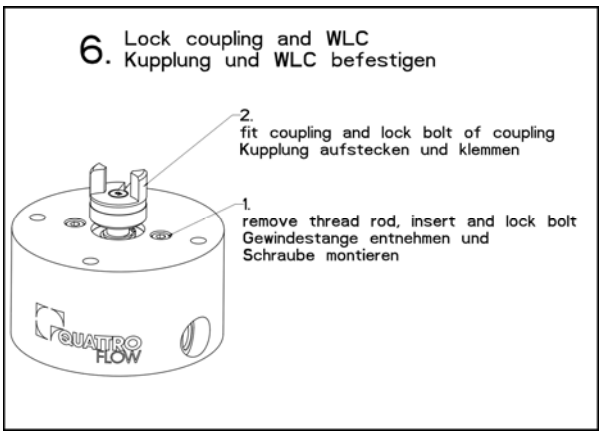


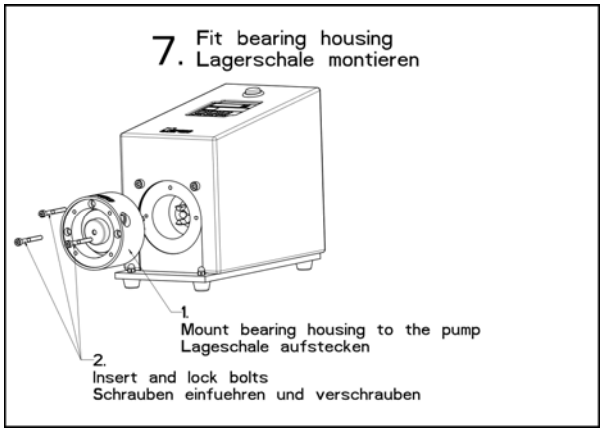












For mounting the pump chamber please follow 4.2

5. Operating troubles, causes and remedial action

No.	Operating troubles									Causes and remedial action
	Pump does not start	Pump does not prime	Delivery is not obtained or reduced	Pressure head is not obtained	Irregular pump delivery	Pump operates noisily	Pump is leaky	Motor gets too warm	Display show Error code	The 4-piston diaphragm pump operates trouble-free at any time provided they are applied according to the operating conditions mentioned in this manual. If indought please contact Quattroflow Fluid Systems
	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	
1		X					X			The screws of the pump-chamber maybe not thightened enough. Fixe it!
2		X								Check the direction of flow showed by the arrow on the pump, in case of wrong way, turn the pump head
3		X	X			X				Check suction pipeline and TC- seals for tightness
4		X	X	X	X					Check suction head-increase suction line cross section.
5		X	X	X						Check viscosity of liquid pumped.
6	X								X	Check pump speed. Control speed of drive motor. Check voltage and frequency and the fuse (6,3A T in the controlbox)
7			X	X	X					Avoid air inclusions in the liquid to be pumped
8			X		X					Check pressure head-open valve in discharge line completely, remove obstruction in discharge line
9							X			Pressure line completely or partly clogged Diaphragm maybe broken Change diaphragm!
10			X							The diameter of the pipes in suction or pressure line are to small
11						X				Check the coupling halves. They must be fixed with at least 2-3mm space.
12						X				Check longitudinal play of coupling rod pins. The spider might be worn.
13		X	X		X					Check whether foreign bodies in pump. Disassemble pump, remove foreign bodies, replace defective parts
14	X							X	X	Pump stopped by the Thermistor switch. Please alow the motor to cool down – please reduce the power consumption.
15	X					X				Bearings are worn or defektive Disassemble pump, replace the shaft – bearing – cap unit (PSKITWLC123 or /PSKITWLC125)
16		X								The valves are dry (e.g. not in use for a long time), deformed or worn. Change valve or wet the pump.
17							X			The diaphragm is burst (the discharge pressure was too high) – replace it PSKITQ12
18		X	X	X			X			O – rings between valve plate and pump housing are defective PSKITQ12
19						X				Align coupling accurately
20			X			X				The clamping ring screw got loose – fixe it! See 4.4 Mounting of the pump chamber (picture 12)

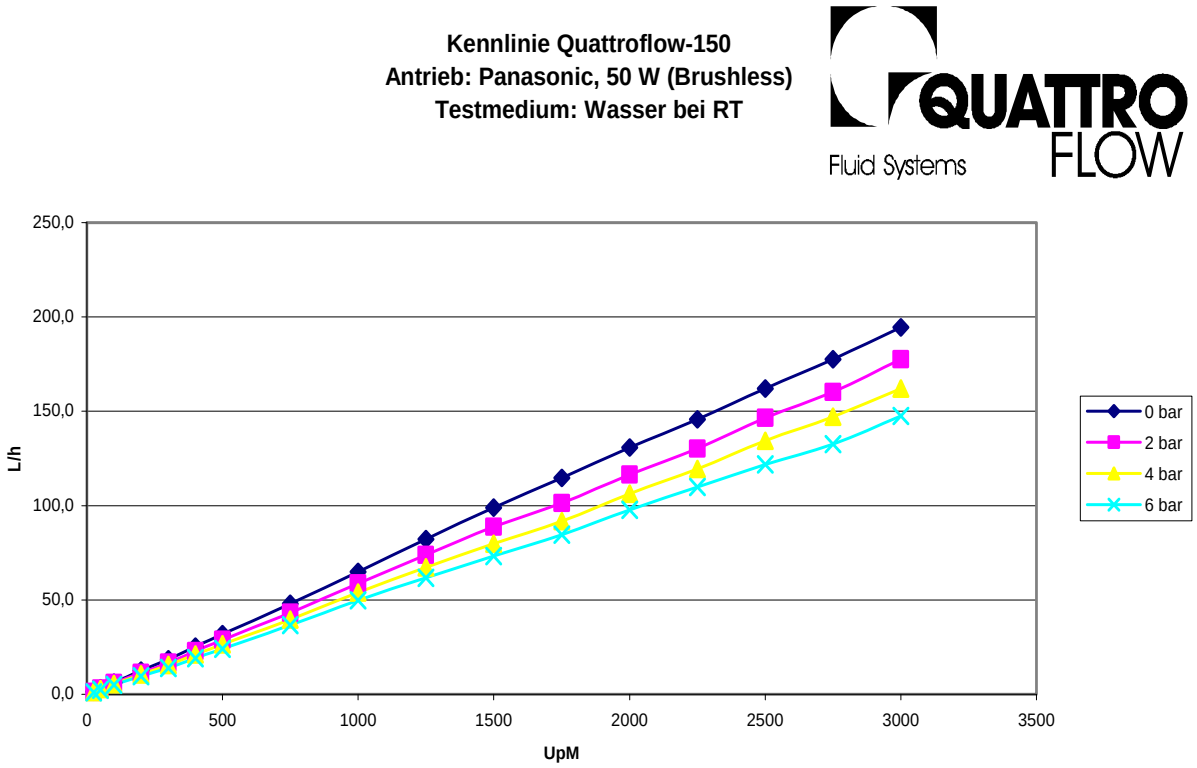
6. Performance chart of the Quattroflow-150 S pump

Performance Diagram Quattroflow-150 S Pump

Testmedia: **Water at ambient temperature**
Eccentric shaft: **5°**
Discharge pressure: **0 to 6 barg**

6.1 Diagram 1: Shows appr. Flow rates as function of pump rpm.

Motor is directly coupled to pump: Pump rpm = motor rpm



Caution: This flowrates are tested with new diaphragms and valves in the pump! It´s possible that the pump won´t reached this flow rates with used diaphragms and valves. In this case it´s necessary to change them. (Look at: 4.1 Changing Diaphragms and valves)

7. Technical data of the Quattroflow-150 S pump

	4-piston-diaphragm pump:	
	Eccentric shaft:	5°
	Flow rate max 5°:	appr. 150 L/h at 0 bar
		appr. 120 L/h at 6 bar
	Flow rate min 5°:	appr. 1 L/h at 0 bar
		appr. 1 L/h at 6 bar
	Pressure (temperature of fluid < 40 °C) max:	6 bar
	Pressure (temperature of fluid > 40 °C) max:	3 bar
	Volume of pump chamber without connectors:	appr. 15ml
	Surfaces area with contact of fluid:	appr. 73,5cm²
	Residual volume, depense on position of ports:	1- 3ml
	Temperature of fluid:	CIP 90°C, SIP 125 °C, Autoklav 125°C
	Speed range:	30 - 3000 rpm
	Diaphragm:	EPDM/PP compound (Santoprene)
	Valves:	EPDM
	O-rings:	EPDM
	Available certificates for elastomer parts:	FDA 177.2600, USP Class VI
	Valve plate:	Stainless steel 1.4435 optional 1.4539 e-polished, Ra < 0,4µm, Ferrite < 1%
	Pump housing:	Stainless steel 1.4435 optional 1.4539 e-polished, Ra < 0,4µm, Ferrite < 1%
	Connector inlet (standard) other dimetions are available:	TC-clamp 1/4", Stainless steel 1.4435 optional 1.4539, e-polished Ra<0,4µm
	Flange diameter inlet:	25 mm
	Internal diameter inlet:	5 mm
	Connector outlet (standard): other dimetions are available:	TC-clamp 1/4", Stainless steel 1.4435 optional 1.4539, e-polished Ra<0,4µm
	Flange diameter outlet:	25 mm
	Internal diameter outlet:	5 mm
	Available certificates for stainless steel parts:	DIN EN 10204 3.1 B, Ra / Ferrite
	Position of connectors:	In line
	Flow directions:	4 (in 90° steps)
	Motor (standard):	Panasonic brushless 50W, IP65
	Additional cooling fan:	Not necessary
	Coupling:	KTR
	Base plate:	Stainless steel 1.4301, e-polished
	Motor housing:	Stainless steel 1.4301, e-polished
	Dimensions (L / W / H):	520 x 155 x 210 mm
	Controlbox:	Panasonic
	Frequency inverter:	integriert
	Panel:	Bedienmodul ESVZXK1
	Power supply:	230 V / 50 Hz or 115V / 60Hz
	Power cabel:	appr. 2 m
	Dimensions (L / W / H):	280 x 155 x 185 mm
	Weight of the controlbox:	appr. 8 kg
	German coustom tarif number:	84138190

Panasonic

Circuit Integrated Brushless Motor
B1-G Series
Instruction Manual

- Thank you very much for buying Panasonic Brushless Motor.
- Read this instruction manual carefully for proper use. **In particular, be sure to read "Safety precautions" before use for safety.** Keep this manual with care after reading, and read as necessary.

Be sure to give this manual to an end user.

■ CONTENTS

Safety precautions

important

See the following precautions in order to avoid damages on machinery and injuries among the operators and other people during the operation.

■ The following symbols are used to indicate the level of danger possibly occurred when you fail to observe the safety precautions.

⚠ **DANGER**	Indicates a potentially hazardous situation, which if not avoided will result in death or serious injury.
⚠ **CAUTION**	Indicates a potentially hazardous situation, which if not avoided, will result in minor injury or physical damage.

■ The following symbols indicate what you must do.
(Shown below is an example of symbols.)

⊘	Indicates that the operation is prohibited to do
!	Indicates that the operation must be done.

⚠ DANGER

Do not touch the rotating part of the motor while operating.

⊘ The failure could result in injuries.

Do not use in corrosive atmosphere, flammable gas atmosphere, or near combustible substance.

⊘ Incompliance could result in failure.

Do not expose the cables to sharp objects, excessive pressing or pinching forces, and heavy loads.

⊘ The failure could result in electric shocks, damages, or malfunction.

Install an external emergency stop device to shut down the main power source in any emergency.

! The failure could result in electric shocks, injuries, fire, damages or malfunction.

Install the product properly to avoid personal accidents or fire in case of an earthquake.

! The failure could result in electric shocks, injuries, fire, damages or malfunction.

An over-current protection, earth leakage breaker, over temperature protector and emergency stop device must be installed.

! The failure could result in electric shocks, injuries, or fire.

Make sure to secure the safety after the earthquake.

The failure could result in electric shocks, injuries, or fire.

Wiring must always be performed properly and reliably by a professional electric worker.

The failure could result in electric shock, injury, fire, malfunction, and damage.

Be sure to ground the grounding wire of motor.

The failure could result in electric shock.

CAUTION

Do not drive the motor shaft from the outside.

The failure could result in fire, electric shocks, or damages.

Do not block the dissipation hole of brushless inverter.

The failure could result in fire, electric shocks, or malfunction.

Do not modify, dismantle or repair the product.

The failure could result in electric shocks, injuries, or fire.

Do not hold the cables or motor shaft when transporting the motor.

The failure could result in injuries.

Never start and stop the motor by magnet contactor, etc. which is provide on the main line.

The failure could result in damages.

Do not place any obstacle that blocks ventilation around the motor.

The failure could result in burns or fire.

Do not touch the motor, since they become hot.

The failure could result in burns.

Do not approach to the equipment after recovery from the instantaneous stop because they may restart suddenly.

The failure could result in injuries.

Install a safety device against idling or locking of gear head, and leakage of grease.

The failure could result in injuries, damages, and contaminations.

Attach to inflammable matter such as metal.

The failure could result in electric shocks, injuries, or fire.

If trip occurs, remove the causes of the trip and secure the safety before restarting.

The failure could result in injuries.

Execute the trial-operations with the motor fixed and a load unconnected. Connect a load to the motor after the successful trial-operations.

The failure could result in injuries.

This product should be treated as an industrial waste when it is disposed.

Maintenance and check must be performed by an expert.

The failure could result in injuries and electric shock.

Use the specified voltage on the product.

The failure could result in electric shocks, injuries, or fire.

Introduction/Name of each part/Cautions

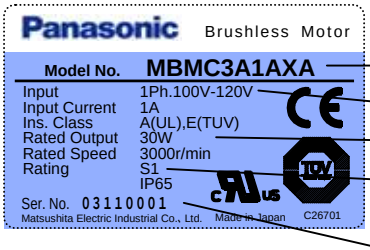
After unpacking

- Make sure that the model is what you have ordered.
- Check whether the product has been damaged or not during transportation.

If any deficiency should be found, contact the dealer store where you bought this product.

Checking the model of brushless motor

Nameplate



Model name
Rated input voltage
Rated output
S1: Continuous rating,
S2: Short time rating
Serial Number

Check the Model Name

MBMC 3A 1 A X A

Series name

Output
3A: 30 W
5A: 50 W
9A: 90 W
1E: 130 W (Rating 30 min)

Input power supply
1: Single phase AC100 – 120 V
2: Single phase AC200 – 240 V

Structure **A**: Standard

Shaft specification
X: For gear head MX8G
Z: For gear head MZ9G
S: Round shaft

Function **A**: Standard

Set specification (Blank): Console A attached
P: Console A attached

Check the Serial Number

*** 03 11 0001***

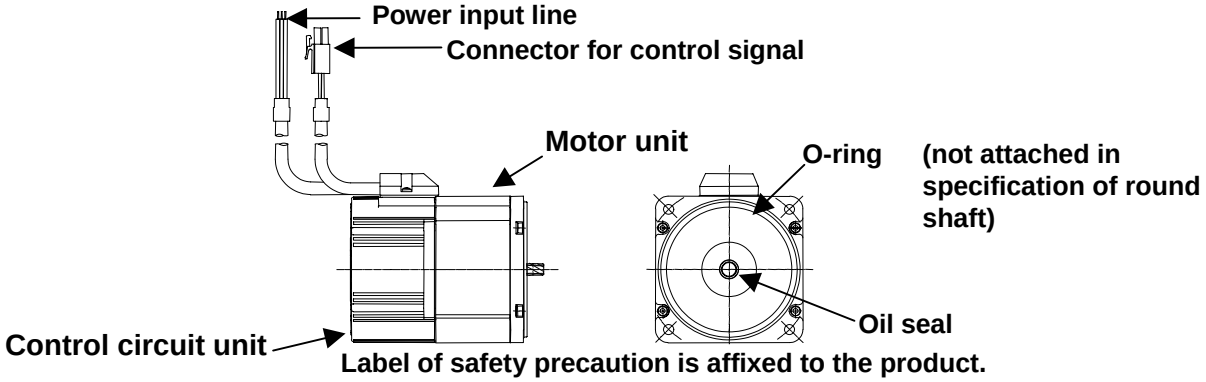
Manufacturing year
(Lower 2 digits of Christian Era)

Manufacturing month

Serial Number

*** Indicates production in November 2003, serial number 0001.**

Name of each part



Precaution for proper use

1. This motor incorporates control circuit. Control circuit is sensitive to temperature and impact, therefore read this instruction manual carefully for proper installation.
2. This motor is controlled by switching the power element at a high speed.
   Therefore, when the motor runs, leaking current may increase, which activates the leakage breaker.
   In such a case, use a leakage breaker which is provided with measure against high frequency for inverter.
3. In starting and stopping the motor, use the operation instruction input "I1" or RUN/STOP switch of console A and digital key pad. When the motor is turned on and off by turning on and off power supply, the life of inner circuit may be shortened.

Installation

Installation

Install the brushless motor properly for preventing failure and accident.

Transport

- **Use caution enough in transporting the unit to prevent injury by drop or fall, and avoid damage to the equipment.**

Storage

- **Keep the unit indoors in a clean and dry place free from vibration with little change of temperature.**
- **In keeping a gear head alone, direct the output shaft down.**

  (Otherwise, grease leaking is possible.)

Location

- **Location gives great influence upon the life of brushless motor, therefore choose a place in conformance with the conditions below:**

(1) Indoors where the motor is not subjected to rain water and direct sun beam.
(2) Do not use the motor in corrosive atmosphere such as hydrogen sulfide, sulfurous acid, chlorine, ammonia, sulfur, gas chloride, gas sulfide, acid, alkali, and salt, in the atmosphere of combustible gas, or in the vicinity of flammables.
(3) Place not exposed to grinding liquid, oil mist, iron powder, and cutting particle.
(4) Well-ventilated place with little moisture, oil, or inundation, and place far from heat source such as a furnace.
(5) Place easy to check and clean
(6) Place free from vibration
(7) Do not use the unit in an enclosed environment. Enclosing may raise the temperature of motor, and shorten their life.

Caution in Installing Gear Head

- Idling by damaged tooth, locking by bite, grease leakage, and the like are possible on the life end of gear head. Install a safety device in order to ensure safety even if such trouble should be found.

  • Install a device for preventing drop by damaged teeth on a lifter or the like.
  • As for application such as opening and closing of door, install a release device against locking by gear biting.
  • As for food or textile equipment, install an oil pan for measure against grease leakage.
  • Do not install an encoder, sensor, contact, etc in the proximity of gear head. If you should install such devices, take measures against their grease leakage.
  • Be sure to perform daily check in order to prevent unexpected accident.

Environmental condition

Item		Condition
Ambient temperature	Brushless motor	-10°C - 40°C (free from freezing) *1
	Console A, Digital key pad (optional)	-10°C - 50°C (free from freezing)
Ambient humidity		85% RH or below (free from condensation)
Storage temperature		-20°C - 60°C (free from freezing) *2
Protection structure	Brushless motor	IP65 (excluding output shaft rotating area, and tip of lead) ・ This motor conforms to test condition specified in EN standard (EN60529 and EN60034-5). This motor is not applicable to the use which requires long-term waterproof performance, such as the case where the motor is always washed with water.
	Console A, Digital key pad (optional)	Equivalent to IP20
Vibration		Not greater than 4.9 m/s^2 (10 – 60 Hz)
Altitude		Not greater than 1000m

*1 Ambient temperature is measured at a distance of 5cm from the motor.

*2 Temperature which is acceptable for a short time, such as during transportation.

Installation/System configuration and wiring

Others

● **Oil and water protections**

(1) Direct down the lead of cable as far as possible.

(2) Avoid use in such an environment where motor is always exposed to oil and water.

(3) Avoid use with cable immersed in oil and water.

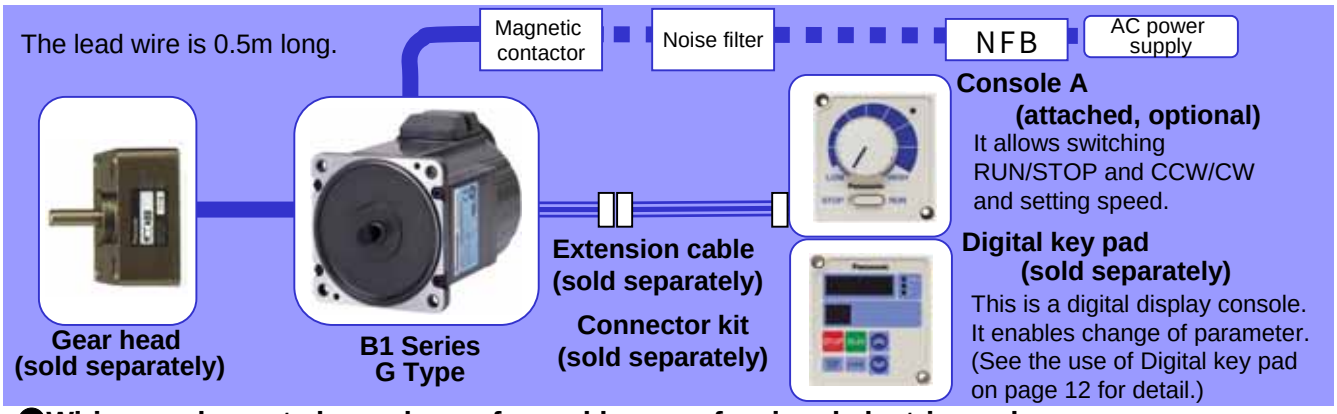
● **Cable: stress relieving**

(1) Make sure that stress is not applied to the lead or connection of cable due to bending or dead weight.

(2) In installation where the motor moves, fix the cable of motor, incorporate the extension cable connected beyond in the cable carrier to reduce stress by bending as small as possible.

(3) Allow the bending radius of cable as large as possible.

System configuration/general wiring diagram



●**Wiring work must always be performed by a professional electric worker.**

●**Do not turn on power before finishing wiring for avoiding electric shock.**

Selection of wiring equipment

● **Recommended noise filter** **Option part number: DVOP3611-5** **(Okaya Electric Industries Co., Ltd)**
Manufacturer's part number: SUP-EQ5-ER-6

● **Selection of non-fuse breaker (NFB), magnetic contactor (made by Matsushita Electric Works, Ltd), and electric wire (wiring within equipment)**
(See "Adaptation to overseas standard" for compatibility with overseas standard.)

Voltage	Capacity (w)	NFB (rated current)	Magnetic contactor (contact structure)	Electric wire (mm^2)	
				Main circuit/ Grounding wire	Control circuit
Single phase 100V	30 - 90	BBC25N(5A)	BMFT61041N(3P+1a)	0.5(AWG20)	0.13(AWG26)
Single phase 200V	30 - 130	BBC25N(5A)	BMFT61042N(3P+1a)	0.5(AWG20)	0.13(AWG26)

■ **Be sure to ground the grounding terminal.**
In wiring to power supply (outside of equipment) from NFB, use an electric wire of 1.6 mm diameter (2.0 mm^2) or more both for main circuit and grounding. Apply grounding class D (100 ohms or below) for grounding.

●**Selection of relay**

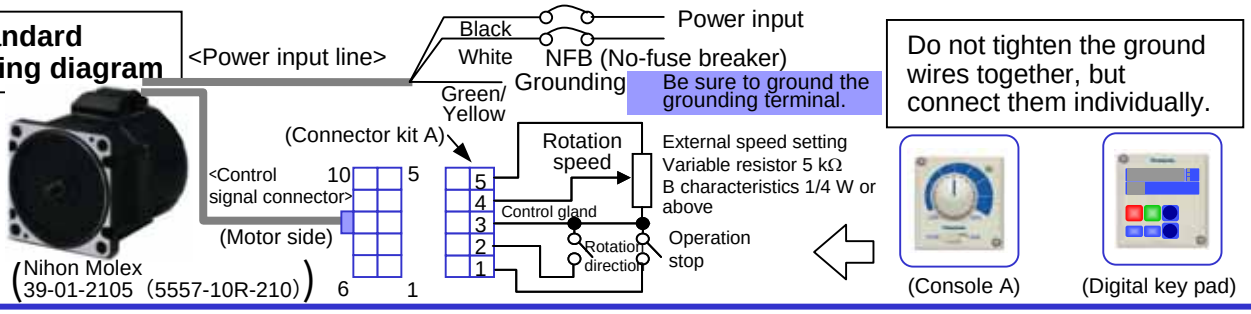
As for use for control circuit such as control input terminal, use a relay for small signal (minimum guarantee current 1 mA or less) for preventing poor contact. <Reference example> Matsushita Electric Works, Ltd: DS type, NK type, HC type, OMRON: G2A type

● **Control Circuit Switch**

When using a switch instead of relay, use one for minute current in order to prevent poor contact.
<Example> Nihon Kaiheiki: M-2012J-G

Wiring

Standard wiring diagram



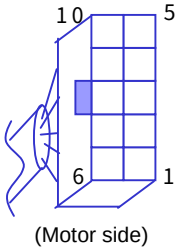
Wiring/Test run

Function of terminal

<Power input line>

Wire color	Name	Description of function
White/Black (L1, L2)	Power input line	Connect the terminal to commercial power supply conforming to voltage specification.
Green/Yellow (E)	Grounding wire	Wire for grounding the motor

<Control signal connector> Nihon Molex 39-01-2105 (5557-10R-210)



(Motor side)

Terminal number	Terminal symbol	Terminal name	Description of function	Wire color
1	I1 *1	Operation instruction input	Motor runs when "I1" and "GND" are shorted, and stops when they are opened.	Brown
2	I2 *1	Rotation speed changeover input	CW operation when "I2" and "GND" are shorted, and CCW operation when they are opened. *2	Red
3	GND	Control ground	Common ground terminal for control signal. *3	Orange
4	FIN	Analog speed command input	Speed can be set by applying voltage DC0 – 5V. Input impedance 100 kΩ.	Yellow
5	+5V	External speed setting power supply	Power output dedicated when connecting an external variable resistor (5 kΩ, B characteristics) to FIN input (Cannot be used for any other purpose.)	Green
6	O1 *1	Trip output	Trip signal output. *1 "L" in trip (Contact ON) Open collector Vce max: DC30V, Ic max: 50mA	Blue
7	SCK	Digital key pad I/F	Interface for digital key pad	Purple (Pink)
8	SIN			Gray
9	SOT			White
10	(N/A)	—	(Do not connect anything.)	Black

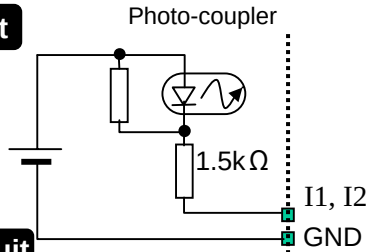
*1 Function of input/output can be changed by the Digital key pad. Default is shown.

*2 Rotation direction is that on motor shaft. When gear head is incorporated, the rotation direction of motor and that of gear output shaft are reversed for some gear reduction ratio. See the allowable shaft torque table on page 8.
(CW: Rotation clockwise when seen from the motor shaft, CCW: Rotation counterclockwise when see from the motor shaft)

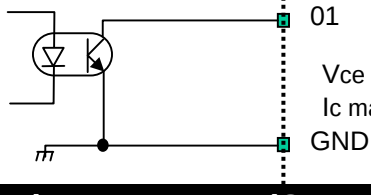
*3 When resistor and control GND are disconnected in use of external variable resistor, 5V is input to FIN irrespective of setting of variable resistor, and upper speed limit is directed; therefore use caution enough for connecting GND.

■ See the optional connector kit A (DVOP3600) for compatible connector.
In extending the control signal wire, keep it below 5m long, and use wire rod above AWG26 (0.12mm²).

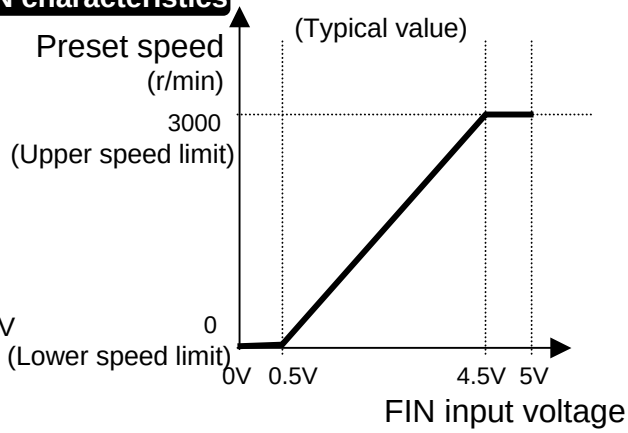
Input circuit



Output circuit

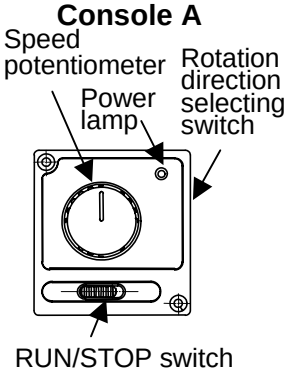


FIN characteristics



Inspection prior to test run (Console A)

- **Connect the Console A**



(Check before operation)

(1) Any mistake found in wiring? (2) Input power supply conforms to rating?

(Test run)

When RUN/STOP switch is changed to RUN, the motor rotates, and when the switch is returned to STOP, the motor stops.
Rotation direction can be changed by rotation direction selecting switch on the side of console.
When the rotation direction is changed in RUN, the motor is inverted suddenly, and the motor may trip due to some inertia of load.
Rotation speed can be adjusted by the speed potentiometer.
Turn off power when the motor is to be stopped for a long time.

■ When power is turned off with RUN/STOP switch on RUN side, and power is turned on again, the motor may start again, which is dangerous. In turning on power, always make sure that the switch is on STOP side.

■ When a gear head is incorporated, rotation direction of gear head output shaft may be inverted for some gear reduction ratio. See the table of allowable shaft torque on page 8.

Checking the load and use condition

Check use condition for eternal use of this product. Some use conditions may possibly lead to heating or damage to the shaft. Fully check use conditions, and use the motor in a permissible range.

Standard life

Standard life is 5,000 hours for the motor equipped with gear head (MB8G and MB9G). Standard life is the same 10,000 hours for motor alone (round shaft). (Standard life of sealing performance of oil seal is 5,000 hours.)

Standard life refers to design life for operation 8 hours per day (service factor: Sf = 1.0) at a normal temperature and humidity, under uniform load (permissible shaft torque of gear head and rated torque of motor).

Service factor (Sf)

$$\text{Expected of life} = \frac{\text{Standard life}}{\text{Service factor (Sf)}}$$

Service factor (Sf) depends on the magnitude of shock of load or operating time. Service factor is shown below for different load conditions:

Type of load	Example of load	Service factor		
		5 hours/day	8 hours/day	24 hours/day
Uniform load	One direction continuous operation	0.8	1.0	1.5
Light shock	Start, stop, or cam shock	1.2	1.5	2.0
Middle shock	Instantaneous rotation/reverse rotation and instantaneous stop	1.5	2.0	2.5
Heavy shock	Middle shock at a high frequency	2.5	3.0	3.5

Permissible shaft torque

Required shaft torque TA of gear head can be obtained from service factor and actual load torque T1.

$$T_A = T_1 \times Sf$$

Select a gear head and motor to ensure that required torque (continuous) is within permissible shaft torque in the table below. Here, the torque T1 must not exceed permissible shaft torque TA irrespective of Sf.

Unit: N m

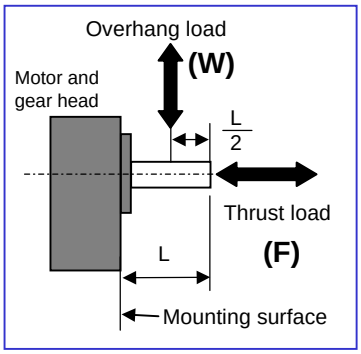
Model name / Reduction ratio	3	3.6	5	6	7.5	9	10	12.5	15	18	20	25	30	36	50	60	75	90	100	120	150	180	200
MBMC3A☐AXA MX8G☐B	0.23	0.28	0.38	0.46	0.58	0.69	0.77	0.96	1.15	1.39	1.55	1.93	2.16	2.60	3.55	4.36	5.43	6.45	6.99	7.84	7.84	7.84	—
MBMC5A☐AXA MX8G☐B	0.39	0.46	0.64	0.77	0.96	1.16	1.29	1.61	1.92	2.33	2.59	3.23	3.61	4.33	5.93	7.29	7.84	7.84	7.84	7.84	7.84	7.84	—
MBMC9A☐AZA MZ9G☐B	0.67	0.81	1.12	1.34	1.69	2.02	2.28	2.54	3.06	3.72	4.11	5.27	6.22	6.96	9.81	11.7	14.7	17.3	19.0	19.6	19.6	19.6	19.6
MBMC1E☐AZA MZ9G☐B	1.01	1.21	1.69	2.02	2.54	3.04	3.42	3.82	4.59	5.58	6.17	7.91	9.34	10.5	14.7	17.5	19.6	19.6	19.6	19.6	19.6	19.6	19.6

* Rotation direction is the same as that of motor in shaded portion, and reverse for others.

Permissible shaft load

Use the permissible shaft load within the load shown below:

	Model name	Permissible overhang (w)	Permissible thrust (F)
Motor alone	**MBMC3A☐ASA**	**100N**	**10N**
	MBMC5A☐ASA	**100N**	**10N**
	MBMC9A☐ASA	**150N**	**20N**
	MBMC1E2ASA	**150N**	**20N**
Gear head	**MX8G type**	**294N**	**49N**
	MZ9G type	**588N**	**147N**



Permissible load inertia moment

Set the acceleration/deceleration time 0.3 seconds or longer.

Apply permissible load inertia moment within the value shown below:
(Acceptable value on round shaft applies when stopping operation in free-run stop. In speed reduction stop, the value is 1/4 of indication below only on round shaft due to regeneration. Set a longer speed reduction time if the inertia is not to be lessened.)

Unit: $\times 10\ kg^{-4} \cdot m^2$

Model name / Reduction ratio	3	3.6	5	6	7.5	9	10	12.5	15	18	20	25	30	36	50	60	75	90	100	120	150	180	200	Round shaft
MBMC3A☐AXA MBMC5A☐AXA MX8G☐B	1.25	1.79	3.42	4.90	7.72	11.2	13.8	21.6	30.6	45.2	55.8	86.9	127	183	342	342	342	342	342	342	342	342	—	2.5
MBMC9A☐AZA MBMC1E☐AZA MZ9G☐B	5.93	8.47	16.4	23.6	37.3	53.4	67.6	98.3	142	211	257	423	589	847	1684	1684	1684	1684	1684	1684	1684	1684	1684	5.6

Assembling of Gear Head

● Preparation before assembling

(1) Compatible gear head described on this instruction manual is MX8G□B (for 30, 50W) and MZ9G□B (for 90, 130W). Never combine anything other than compatible gear head in use. Failure to observe this direction may result in malfunction. (□ represents speed reduction ratio.)

(2) Make sure that the O-ring is attached to the bottom of motor flange.
If the gear head is assembled with O-ring floating, it may result in grease leakage.

(3) When grease adheres to the end surface of gear head, wipe off sufficiently.
If the gear head is assembled with grease adhered, it may cause grease to exude.

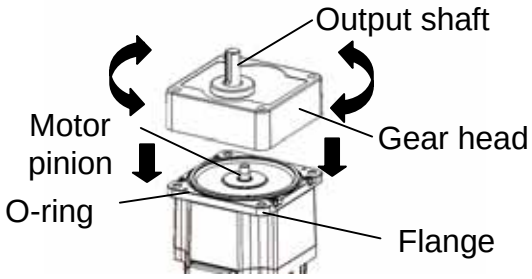
● Assembling

(1) Direct the motor pinion upward, and make sure that the relation between direction of motor lead wire and output shaft matches with the equipment.

(2) Turn the motor pinion finely clockwise and counterclockwise for assembling, ensuring that the tip of motor pinion does not hit the tooth of gear head.

(3) In installing the motor and gear head to the mating equipment, use "mounting screws" attached to the gear head, tighten them sufficiently to eliminate clearance between the motor flange surface and gear head end surface while paying attention to bite of O-ring.
Recommended tightening torque is shown below:

Mounting Angle dimension	Type of gear head	Screw size	Tightening torque	Mounting pitch diameter
□80	MX8G	M5	2.45N・m	94mm
□90	MZ9G	M6	2.94N・m	104mm



Note) Excessive force to assemble the motor and gear, or damage to the tip of motor pinion or tooth of gear head may generate abnormal noise or reduce the life.

Maintenance and inspection

Routine maintenance and inspection are essential for proper and satisfactory operation of the motor.

Notes to Maintenance/Inspection Personnel

- **Power-on/off operations should be done by the operators themselves for ensuring safety in checking.**
- **Do not touch the motor while power on.**
- **In performing the measuring insulation resistance, remove all connections. Measuring insulation resistance with connection can cause motor failure.**

Maintenance/ Inspection item

Maintenance/ Check item	Inspection procedure	Condition
Input voltage	Voltmeter	Must be within ±10% of rating.
Input current	Ammeter	Must be within rated input current described on nameplate.
Insulation resistance	Insulation resistance tester	Measure the insulation resistance of motor with 500V Megger. It must be above 1Mohm. Measuring position: Between power input line (L1, L2) and grounding wire
Noise	Hearing	Noise level must not be different from the usual level. In addition, abnormal noise such as rumbling noise must not be heard.
Vibration	By hand	Free from abnormal vibration.
Grease leakage	By sight	Check that periphery of motor or gear head is not wet by grease or oil. Protect them with a cover etc. in application which is deteriorated by grease leakage.
Installation bolt	Torque wrench	Check for loosening of bolt, and tighten additionally as necessary.
Use environment	By sight	Check the ambient temperature and humidity, and make sure that dirt, dust, or foreign substance is not found. Make sure that the opening of brushless inverter is free from lint.

Be sure to contact our service division or sales agent for disassembling and repairing of the motor.

Protective functions/How to clear trip

Protective functions

■ **When the protection function is activated, motor stops and trip signal output turns on.**
Description of trip can be displayed only when the Digital key pad (option) is connected.
Protection function works even when the Digital key pad is not connected, but it is not displayed.

Protective item	Description	Measure	Display on Digital key pad
Undervoltage warning (default)	When the internal DC voltage is below specified value, operation is stopped; when voltage is recovered, operation is started again. (This is not trip, and no trip output is made.) ■**Trip can be set by parameter 50.** 100V product: Approx DC100V, 200V product: Approx DC200V	Investigate the condition of wiring and circumstances of power supply.	**L**
Undervoltage error	The motor trips when internal DC voltage is below specified value **only if trip is set by parameter 50**. 100V product: Approx DC100V, 200V product: Approx DC200V		**E-LV**
Overload warning (Electronic thermal)	When load factor exceeds specified value, the electronic thermal relay operates and monitor display flashes. It is a warning for electronic thermal trip. 30-90W: 100% 130W : 80%	Reduce the load. Check the load factor in monitor mode.	5-digit LED flashes.
Overload error (Electronic thermal relay)	The motor trips when motor torque is output continuously above specified value. 30-90W: 115% 130W : 105%	Investigate the cause of overload, and reduce the load, change the operating pattern by making acceleration and deceleration time longer, or apply design to increase the capacity of motor.	**THr**
Overcurrent error	The motor trips when the motor current exceeds specified current.	Excessive acceleration/deceleration setting or gain setting is possible. Set the longer acceleration/deceleration time and the smaller gain. If this trip should occur as soon as the unit is started, failure is possible.	**E-OC**
Overvoltage error	The motor trips when internal DC voltage (voltage of smoothing function of power supply) rises and exceeds specified value. Product of 100V: Approx DC200V, Product of 200V: Approx DC400V	If the motor should trip in running, too short deceleration time is one of the causes. Adjust deceleration time. No measure can be taken in continuous regenerative operation such as lowering.	**E-OV**
User parameter error	Parameter data saved in EEPROM is abnormal.	Check all parameters again and set them again. If this protection works frequently, failure is possible	**E-UPr**
System parameter error	Internal parameter data saved in EEPROM is abnormal.	Failure is possible.	**E-SPr**
System error	The motor trips when trouble of control microcomputer is detected.	①Malfunction due to external noise is possible. Investigate for noise source in the vicinity and eliminate such source. ②Internal circuit may be in failure.	**Err**
Sensor error	The motor trips when trouble of CS sensor signal is detected.		**E-CS**
Overspeed error	The motor trips when rotation speed (actual speed) exceeds specified value. Approx 4500r /min	Ensure that the actual speed does not exceed rated rotation speed, such as overshooting by unmatching between load and gain.	**E-OS**
Overheat error	The motor trips when the temperature in control section rises above specified value. Approx 105℃	Check the ambient temperature and cooling condition of motor. Check the load factor. If the ambient temperature is low enough, and the protection occurs soon after power-on, failure is possible.	**E-OH**
Setting change warning	The motor trips when any important parameter such as "**30** Run command selection" is changed	This is not abnormal. Trip reset in order to make change effective.	**CAU**

How to clear trip

If the motor should trip, eliminate the cause and use <u>any of the procedures</u> [1] – [3] below for clear.

[1] Turn off power, and when power LED has gone out, turn on power again.

[2] Press the switch [∧] and [∨] of the Digital key pad simultaneously for one second or more with present trip state displayed.

[3] Input the trip reset signal.

(When F-r or r-F is chosen in "**33** I1/I2 function selection", enter "I1" and "I2" at the same time; when F-rST or r-rST is chosen, enter "I2" for trip reset.

Trip reset signal, when continued to be input, is designed to become ineffective in order to prevent inadvertent restarting. Enter trip reset signal only when necessary.)

Note: As for overcurrent error E-OC, sensor error E-CS, System error Err , and user parameter error E-Upr , reset them by turning off power as shown in [1] above. No other procedure is effective.

(Caution) In clear trip, be sure to find and remove the trip factor before clear.

Troubleshooting

If any trouble should be found, follow the steps below for check and countermeasure.

- **If the cause cannot be found, it is recommended to use the Digital key pad and check the detail of trip. If failure is likely, or when any part is damaged, or when you are in any other trouble, contact the sales agent of purchase or our company.**

Phenomenon	Detail of checking	Measure, etc
Motor does not rotate.	Check for abnormality of wiring.	Apply proper wiring.
	Check whether protective function is activated.	Check the detail of trip by the Digital key pad. Turn off power once, and turn on again.
	(Only when the motor is connected to the key pad) Check whether 7-segment LED of on the key pad is lighted up.	If the LED is off when power is input to the motor, failure is possible. Contact us for repair.
	Check whether voltage on input power is normal.	Check the supply voltage.
	Check whether operation start signal is input.	Check the condition of operation instruction.
	Check whether Analogue speed instruction is set at 0V.	Raise the analogue speed instruction little by little.
Motor does not rotate or stops during operation.	Check whether protective function is activated.	Overload is possible. Reduce the load or increase the output capacity.
Motor stops during deceleration.	Check whether the inertia of load is too large.	Regenerative voltage protection may have worked. Decrease the inertia. Turn off power once, and turn on again, and reset the trip state. Make deceleration time longer by the Digital key pad. Alternatively, apply free-run stop.
Motor does not stop quickly when stop command is input.	The motor with large inertia does not stop quickly because default stop mode is Free-run stop.	Stop motor by 0V analogue speed command. Change stop mode to deceleration stop by Digital key pad .
Large vibration or noise.	Output shaft of motor (gear head) and shaft of load are not aligned.	Check the joint between the output shaft and load shaft of the motor (gear head).
	Motor and gear head are not assembled correctly.	Check the assembling condition between motor and gear head, and their combination, and assemble them properly.
	Damage to gear head or bearing.	Contact us for repair.
Motor rotates reversely.	Check whether Setting of rotation direction changeover input is wrong.	Check the position of rotation direction choosing switch for the console A. As for others, check the status of "I2".
	Rotation direction of the motor and gear output shaft may be reversed for some gear reduction ratio of gear head.	Check the gear ratio and rotation direction. See the list of permissible shaft torque on page 8.
Rotation speed is unstable during operation (actual speed).	Check whether the load fluctuates greatly.	Reduce the fluctuation of load. Increase the output capacity.
Parameter dose not change.	Check whether operation start signal is input.	Some parameters cannot be changed when operation instruction is on. (See the check column of parameter list on page 18.) Turn off operation instruction before changing.

How to use Digital key pad

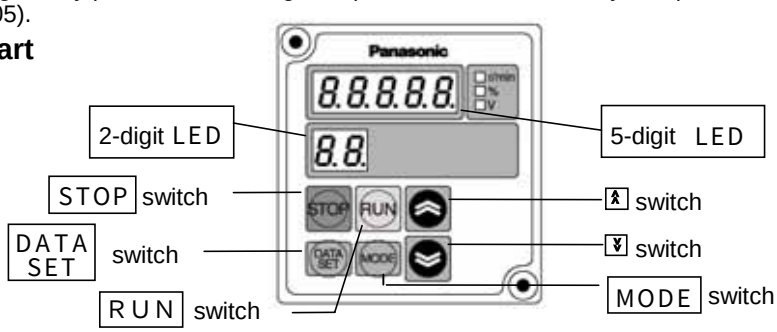
Name of each part and Installation

●What can be done by Digital key pad

- Monitoring of rotation speed (actual speed) and load factor, etc
  (Rotation speed can be displayed being multiplied by the factor set by parameter **47** and **48**.)
- Display detail of trip, and trip history. Trip reset by pressing ∧ and ∨.
- Parameter setting, initialization, and copying function at the same time.
- Start and stop of motor by RUN/STOP switch (Setting of parameter "**30** Run command selection" is required.)

■ When using the digital key pad and control signal input at the same time, buy an optional control signal branch cable (DVOP37505).

●Name of each part



5-digit LED	Displays rotation speed (actual speed), commanded speed, trip history, setting of parameter, and the like.
2-digit LED	Displays the number of parameter (in editing parameter). Displays the rotation direction in operation. Displays **00** when the motor is stopped. (CCW as viewed from the output shaft of motor … **F** and CW … **r**) **Rotation direction of gear head output shaft may be reversed for some gear reduction ratio when gear head is incorporated. See the table of acceptable shaft torque on page 8.**
MODE switch	Switch for changing monitor mode. Whenever this switch is pressed, the mode changes in this sequence: Rotation speed (actual speed) → Internal DC voltage (voltage of smoothing capacitor of power supply) → Load factor → Torque → Commanded speed → Rotation speed (actual speed) → …. * * When you press this switch in the parameter setting mode, setting is stored.
DATA SET switch	This is a switch for changing between parameter number mode and parameter setting mode, and for storing parameter setting.
∧ ∨ switch	This switch enables selection of parameter, and setting and changing of contents. When the motor is tripped, pressing ∧ and ∨ at the same time enables clear of trip.
RUN switch	This switch is for instruction of operation. (Only when "**30** Operation instruction selection" is PnL) ■See "**33** Choosing I1/I2 function" (2) on page 23 for rotation direction.
STOP switch	This switch is for instruction of stopping. (Only when "**30** Choosing operation instruction" is PnL)

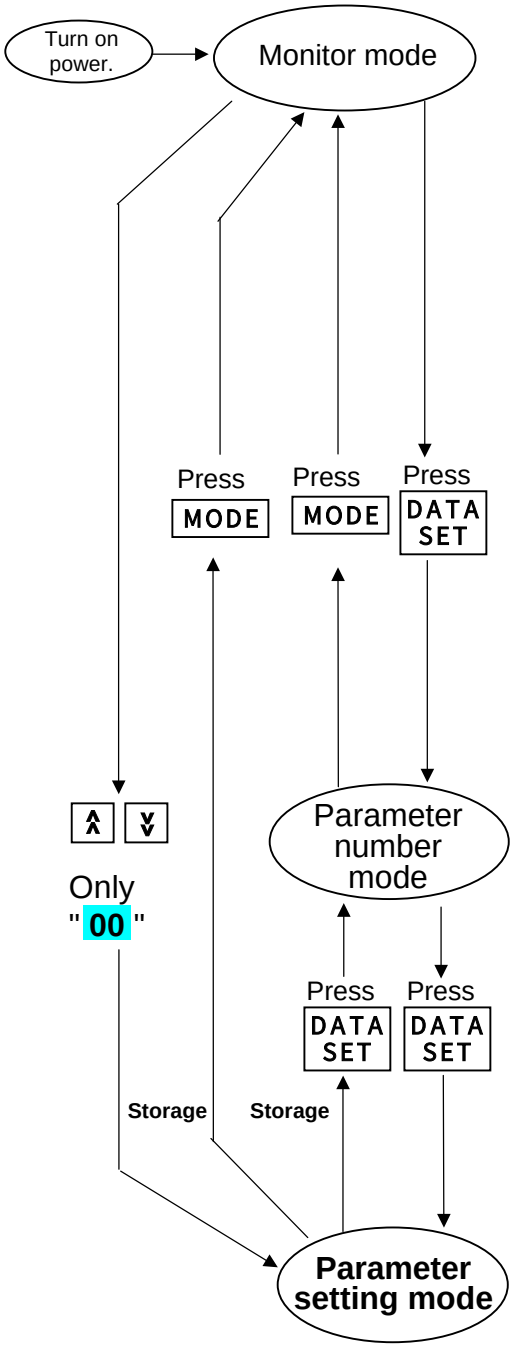
●Description

Monitor mode	Displays rotation speed (actual speed), command speed, internal DC voltage, load factor, and torque on 5-digit LED. **When power is turned on, this mode is set.** This mode is set when power is turned on. Control changes to this mode when MODE switch is pressed in parameter number mode, parameter setting mode.
Parameter number mode	Displays a parameter number (**00** – **F0**) **in flashing**. Control changes to this mode when DATA SET switch is pressed in parameter number mode. Parameter number can be changed and selected by ∧ and ∨ switch.
Parameter setting mode	Displays the detail of parameter (setting) in flashing. Control changes to this mode when DATA SET switch is pressed in monitor mode. Change setting by ∧ and ∨ switch. When DATA SET switch is pressed after change of setting, it is saved in EEPROM.

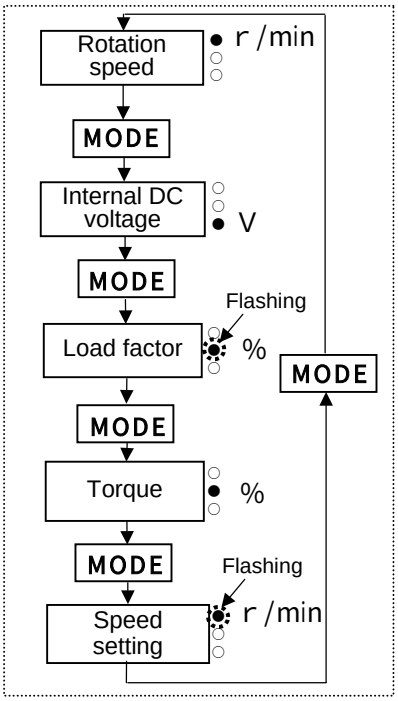
*** Displays rotation speed r/min in normal monitor mode. Displays torque and load factor assuming the rated motor torque at 100%.**

*** Display is just a guide. Do not use the Digital key pad for a measuring instrument.**

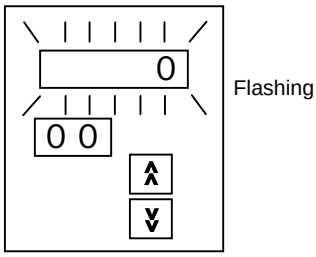
Operating Instruction



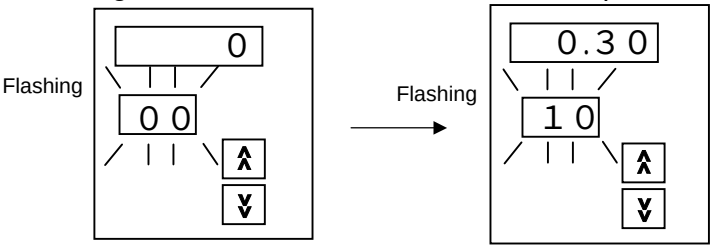
●Press MODE switch for changing display.



Internal speed (0-th speed) can be directly set by ∧ and ∨ in monitor mode.

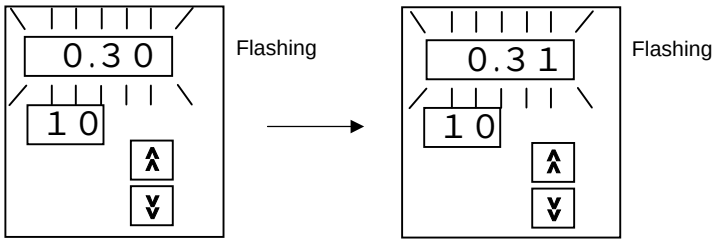


●2-digit LED blinks and allows selection of parameter number.



Change (select) a parameter number by ∧ or ∨.

●5-digit LED blinks and allows change of parameter value.



Change (select) a parameter value by ∧ or ∨.

When DATA SET switch or MODE switch is pressed in parameter setting mode, data is stored.

● When ∧ or ∨ is pressed in monitor mode, detail of "00 Internal speed (0-th speed)" is displayed in blinking, and speed setting can be changed by ∧ and ∨. When 31 Speed command selection is PnL, the motor speed also changes following the speed setting if the motor is running.

Data is stored only when DATA SET switch is pressed. Note that data returns to settings when power is turned off.

Test run (Digital key pad)

Inspection prior to test run

(Inspection prior to test run)
(1) Make sure that all wiring is correct. (2) Make sure that input power supply conforms to rating.
(Test run)
Test run procedure by the Digital key pad is as follows:
An example is introduced here where the motor runs CW at 1800r/min with the Digital key pad.
(1) Be sure to first perform the work below for safety.
Separate the motor from machine or equipment, and make sure that the motor alone can be operated.
(2) Then turn on power and follow the step below for test run.

Description of operation	Digital key pad	
	Switch	LED display
[1] Turn on power		0 00
[2] Change of initial setting (Change the choice of operation instruction from I1/I2 TEr to the Digital key pad PnL)	Press DATA SET	0 → TEr
	Press ∧ several times to choose parameter number **30**.	00 Flashing → 30 Flashing
	Press DATA SET	TEr Flashing → PnL Flashing
	Press ∨ to change parameter value.	30 → 30
	Store by DATA SET.	
	Setting change warning is issued because setting of operation instruction has been changed.	CAU
[3] Trip reset	Press ∧ and ∨ at the same time.	CAU → 0 00
[4] Change of initial setting 2 (Change the choice of speed instruction from analogue speed instruction input to "**00** Speed setting (the 0-th speed)" to enable use of Digital key pad.)	Press DATA SET	0 → VoL−A
	Press ∧ several times to choose parameter number **31**.	00 Flashing → 31 Flashing
	Press DATA SET	VoL−A Flashing → PnL Flashing
	Press ∨ to change parameter value.	31 → 31
	Store by DATA SET.	
	Setting change warning is issued because setting of operation instruction has been changed.	CAU
[5] Trip reset	Press ∧ and ∨ at the same time.	CAU → 0 00

Description of operation	Digital key pad		
	Switch	LED display	
[6] Choosing rotation direction* (This operation is not required for rotation forward [CCW].)	Press DATA SET	0	
	Press ∧ several times to choose parameter number **33**.	00 Flashing → rS. Fr 33 Flashing	
	Press DATA SET	rS. Fr Flashing → r−F Flashing	
	Press ∨ to change parameter value.	33 → 33	
	Store by DATA SET.		
	Setting change warning is issued because setting of operation instruction has been changed.	CAU	
[7] Trip reset	Press ∧ and ∨ at the same time.	CAU → 0 00	
[8] Speed setting	Press ∧	0 Flashing 00	・Internal speed (0-th speed) is displayed (setting at 0r/min).
	Press ∧ to set a speed.	1800 Flashing 00	・Set the Internal speed (0-th speed) at 1800 r/min.
[9] Reset to monitor mode.	Press MODE	0 00	・Data is still stored if power is cut off here.
[10] Operation instruction	Press RUN	1800 r	・Display of rotation speed changes little by little toward 1800 r/min ・Display of rotation direction * (r indicates that the motor is rotating CW.)
[11] Stop instruction	Press STOP	0 00	・Display of rotation speed changes little by little toward 0 r/min.
[12] Power OFF			

<Checkpoint in Test run>

(1) Check whether the motor rotates smoothly. Check for abnormal noise and vibration.

(2) Check whether the motor is accelerated and decelerated smoothly.

(3) Rotation direction and rotation speed of the motor are matched?

* Rotation direction of gear head output shaft may sometimes be reversed due to reduction gear ratio when gear head is installed.
(See the list of permissible shaft torque on the page 8)

* Rotation direction can also be changed by use of "I2". See " **33** I1/I2 function selection " (2) on page 23.

■ Setting is still stored when power is turned off. When operating the motor with Digital key pad only in trial run, either reset the setting or initialize parameters after completion of trial run. (Parameter 54)
Here, note that all parameters return to default when parameters are initialized.

How to copy parameter

1. Reading a parameter value from motor to the Digital key pad

■**Once parameters are read into the console, their details are stored in the Digital key pad.**

Description of operation	Digital key pad	
	Switch	LED display
[1] Turn on power.		0 00
[2] Call **57** Parameter Copy.	Press DATA SET Hold down ∧ to choose parameter number **57**.	Parameter value 00 Flashing → n 0 57 Flashing
[3] P.LOAd Choose reading a parameter into the Digital key pad.	Press DATA SET Press ∧ twice to choose P.LOAd.	n 0 57 Flashing → P. LOAd 57 Flashing
[4] Read a parameter into the Digital key pad.	Press DATA SET for 1 second while holding down STOP .	P. LOAd 57 Flashing → Slow flashing (once per second)
[5] Wait about 30 seconds.		P. End
[6] Reading of parameter into the Digital key pad completed	Press STOP	0 00

2. Copy a parameter value saved in the Digital key pad onto the motor.

Description of operation	Digital key pad	
	Switch	LED display
Turn on power. Call out **57** Parameter. (Same operation as 1. [1] and [2])		
[1] P.PrOG Choose writing a parameter to the motor.	Press DATA SET twice. Press ∧ three times to choose P.PrOG.	n 0 57 Flashing → P. PrOG 57 Flashing
[2] Write a parameter to the motor.	Press DATA SET for 1 second while holding down STOP.	P. PrOG 57 Flashing → Slow flashing (once per second)
[3] Wait about 10 seconds.		P. End

Description of operation	Digital key pad	
	Switch	LED display
[4] Completion of writing a parameter from the Digital key pad to the motor		CAU □
[5] Reset to monitor mode.	Press ∧ and ∨ at the same time for clear trip.	0 00
Error while copying a parameter P.Err1 : Data is abnormal while copying. →Press STOP switch for clearing, and then copy data again. If data is still abnormal, initialize the Digital key pad and retry. P.Err2 : Copy error → This error occurs in an attempt to copy data between products of different function. Press STOP switch for clear. Parameters can be copied between the same models (B1-G Series standard unit), but parameters should be copied between the same output in principle because gain setting is different.		

3. Initializing of data of Digital key pad

■ **When any trouble occurs during copying, it can be often solved by initializing the Digital key pad. (Stored data is cleared by initializing.)**

Description of operation	Digital key pad	
	Switch	LED display
Turn on power and call **57** Parameter. (Same operation as 1. [1] and [2])		
[1] P.InIT Choose initialization of data of Digital key pad.	Press DATA SET Press ∧ once and choose P.InIT .	n 0 → P. InIT 57 Flashing → 57 Flashing
[2] Initialization of Digital key pad	Press DATA SET for 1 second while holding down STOP .	P. InIT Flashing → Continuous lighting 57 LED display changes from flashing to continuous lighting during initializing operation.
[3] Wait about 30 seconds.		P. End
[4] Initializing of data of Digital key pad completed	Press STOP	0 00

■ Do not turn off power or disconnect the cable of Digital key pad during operation such as "Reading a parameter from the motor to the Digital key pad", "Copying a parameter value stored in the Digital key pad to the motor", and "Initializing the data of Digital key pad".

Parameters

Overview of parameter

Motor of this series is provided with various parameters for adjusting and controlling its characteristics and function. Purpose and function of respective parameter are described. Understand them well enough and adjust the unit at your optimum operation condition.

List of parameter composition and setting

Parameter No.	Name of parameter	Parameter setting			
		Setting range	Minimum unit	Default	Check *1
00	Internal speed (0-th speed)	0 – "3b Upper speed limit"	1 r/min	0	
10	1st acceleration time	0.01 - 3600 sec. (- 3 sec : Incremented by 0.01 sec. / 3 - 30 sec : Incremented by 0.1 sec. / 30 - 3600 sec : Incremented by 1 sec.)		0.30	
12	1st deceleration time	0.01 - 3600 sec. (- 3 sec : Incremented by 0.01 sec. / 3 - 30 sec : Incremented by 0.1 sec. / 30 - 3600 sec : Incremented by 1 sec.)		0.30	
14	Acceleration mode selection	LIn Linear / S-1 S shape-1 / S-2 S shape-2		LIn	
15	Deceleration mode selection			LIn	
16	Stop mode selection	FrEE Free-run stop / dEC Speed reduction stop		FrEE	
17	Free-run waiting time	0.0 - 10.0 sec	0.1 sec	1.0	
1A	Velocity loop proportional gain	0 - 10000	1	400(800) *2	
1b	Velocity loop integration gain	0 - 10000	1	500(1000) *2	
30	Run command selection	PnL RUN and STOP of Digital key pad / TEr I1/I2*3		TEr	C
31	Speed command selection	PnL "00 Internal speed (0-th speed)" / VoL-A FIN*4		VoL-A	C
33	I1/I2 function selection	F-r I1: CCW run/stop, I2: CW run/stop / r-F I1: CW run/stop, I2: CCW run/stop / rS.Fr I1: run/stop, I2: CW /CCW direction / F-rST I1: CCW run/stop, I2:Trip reset / r-rST I1: CW run/stop, I2:Trip reset		rS.Fr	C
3A	Lower speed limit	0 – "3b Upper speed limit "	1 r/min	0	C
3b	Upper speed limit	0 - 3000 r/min	1 r/min	3000	C
3C	Torque limit	50 - 150	1%	150	

*1 **When parameter marked with C in the check column is changed and stored, the unit is tripped for safety. It is not allowed to change them while the motor is running.**

*2 **Parameter in ( ) is the default of 90W and 130W.**

*3 **Corresponds to RUN/STOP switch of the console A or signal input.**

*4 **Corresponds to the speed potentiometer or analogue speed instruction of the console A.**

Parameter No.	Name of parameter	Parameter setting			
		Setting range	Minimum unit	Default	Check *1
40	O1 function selection	TrIP Trip STbL Arriving rUn Running FrEE Free-run F CCW run r CW run Ck-L Overload detection POUT Speed pulse signal		TrIP	
42	O1 output polarity selection	nOr Normal polarity rEV Reverse polarity		nOr	
44	Speed matching range	20 – " **3b** Upper speed limit"	1 r/min	50	
45	Output pulse count selection	1, 2, 3, 4, 6, 8, 12, 24		24	
46	Monitor mode selection	O.-r Rotation speed (Actual speed) O.-L Torque AV.-L Load factor S.-r Command speed dC-V Internal DC voltage		O.-r	
47	Numerator of display magnification factor	1 – " **48** Denominator of display magnification factor" x 10	1 time	1	
48	Denominator of display magnification factor	1 - 1000	1 time	1	
4A	Trip history clear	nO No operation YES Clear trip history		nO	
4b	Trip history 1	-		-	
4C	Trip history 2			-	
4d	Trip history 3			-	
4E	Trip history 4			-	
4F	Trip history 5			-	
50	Undervoltage trip selection	nO No trip YES Trip		nO	C
51	Retrial selection	nO , 1 - 4		nO	C
52	Retrial start time	1 - 120 sec	1 sec	5	
54	Parameter initializing	nO No operation YES Initialize to default		nO	
57	Parameter copy function	nO No copying of parameter P.InIT Initializing the data of Digital key pad P.LOAd Reading a parameter to the Digital key pad P.PrOG Writing a parameter to the motor		nO	
F0	For manufacturer use	-		-	

LED display

LED display

Figures displayed on the 7 segment display of the Digital key pad are shown below:

Alphanumeric	LED display
A	A
B	b
C	C
D	d
E	E
F	F
G	G
H	H
I	I
K	k
L	L
N	n
O	o、0 *
P	P
Q	q
R	r

Alphanumeric	LED display
S	5
T	t
U	U
V	U
Y	y
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Example of LED display

Example)

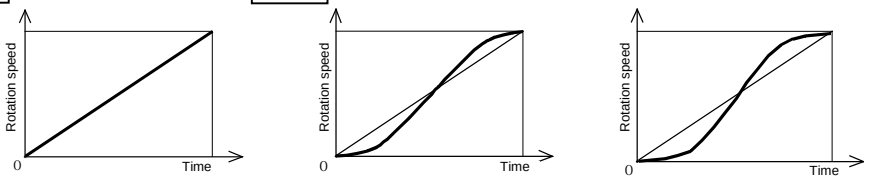
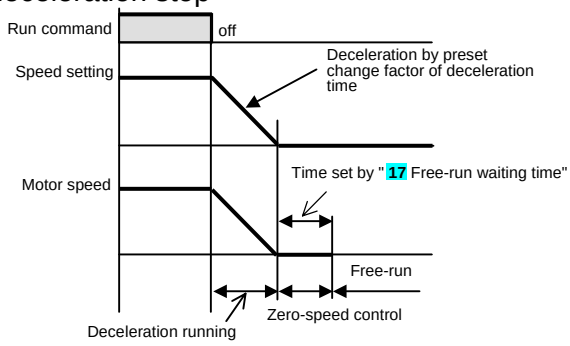
Description in the text	Display on Digital key pad
「PnL」	「PnL」
「TEr」	「tEr」
「FrEE」	「FrEE」
「rST」	「r5t」

* LED display of "0" is available in two types.

Example)

Description in the text	Display on Digital key pad
「VoL-A」	「UoL-A」
「nO」	「n0」

Detail of parameter

Parameter No.	Name of parameter	Description
00	Internal speed (0-th speed)	Desired running speed can be set. This is effective when " **31** Speed instruction selection" is [PnL] (PANEL). Upper limit is limited by " **3b** Upper speed limit".
10	1st acceleration time	The change factor of output speed in acceleration can be determined. ・ **Set by time for changing 1000r/min.** When it is 0.3 sec (default), time taken for accelerating from 0 to 3000 r/min is 0.9 sec. ・ Time can be incremented by 0.01 sec for below 3 sec, by 0.1 sec from 3 sec up to 30 sec exclusive, and by 1 sec from 30 sec upward.
12	1st deceleration time	The change factor of output speed in deceleration can be determined. ・ **Set by time for changing 1000r/min.** When it is 0.3 sec (default), time taken for decelerating from 0 to 3000 r/min is 0.9 sec. ・ Time can be incremented by 0.01 sec for below 3 sec, by 0.1 sec from 3 sec up to 30 sec exclusive, and by 1 sec from 30 sec upward.
14 **15**	Acceleration mode selection Deceleration mode selection	Straight line acceleration/deceleration and curve (S-shape) acceleration and deceleration can be chosen individually for acceleration and deceleration. [LIn] LINEAR [S-1] "S"SHAPE-1 [S-2] "S"SHAPE-2  Straight line up to speed setting. Standard mode for accelerating and decelerating. Relaxes the speed change in start and end of acceleration and deceleration. Curve is emphasized more than S shape-1.
16	Stop mode selection	You can select how to stop the motor. [FrEE] (FREE) Power supply to the motor is cut off and the motor is stopped naturally when stop command is input (free-run stop). It takes longer for the motor to completely stop when load inertia is big. [dEC] (DECEL) When stop command is input, the motor reduces its speed according to preset deceleration time, Electric-brake is performed by Zero-speed control, and then power is cut off to the motor after elapse of time set by " **17** Free-run waiting time", and the motor is set in free-run state. <Example or running pattern in deceleration stop> ■ The motor is servo-locked in Zero-speed control. (Electrically controlled so that motor speed is Zero) 
17	Free-run waiting time	When " **16** Stop mode selection" is set to [dEC] (DECEL) deceleration stop, servo lock time(Zero-speed control)after deceleration can be adjusted. (Free-run state is set after that.)
1A	Velocity loop proportional gain	Enables setting of proportional gain of velocity amplifier. It need not be changed normally. When this value is made greater, gain is increased, which improves responsiveness of the motor. When this value is made too large, operation is vibratory. Setting range: 0 – 10000, Setting resolution: 1
1b	Velocity loop integration gain	Enables setting of integration gain of velocity amplifier. It need not be changed normally. When this value is made greater, gain is increased, which improves rigidity of the motor (strength of servo lock). When this value is made too large, overshooting becomes greater, and the motor is vibratory. Setting range: 0 – 10000, Setting resolution: 1
30	Run command selection	Run Command can be chosen from the following: [PnL] (PANEL) : command the motor to stop with [RUN] [STOP] switch of Digital key pad. The motor cannot be operated by signal input "I1" and "I2". Signal input is effective only in setting rotation direction, etc. See " **33** I1/I2 function selection". [TEr] (TERMINAL) : Only the input terminal "I1" and "I2" are effective. (Corresponds to RUN/STOP, rotation direction selection switch of Console-A.)

Detail of parameter

<table>
<tr><th>Parameter No.</th><th>Name of parameter</th><th>Description</th></tr>
<tr><td>31</td><td>Speed command selection</td><td>You can choose whether to use "00 Internal speed (0-th speed)" or analog input terminal "FIN" for speed command.
PnL (PANEL) "00 Internal speed (0-th speed)"
VoL−A (VOL-A) Analog input terminal "FIN" (voltage instruction DC 0-5V)
(Corresponds to speed potentiometer of Console-A.)</td></tr>
<tr><td>33</td><td>I1/I2 function selection</td><td>(1) For setting "I1" or "I2" function
F−r (FORWARD-REVERSE)
<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop
Deceleration stop when "16 Stop mode selection" is dEC</td></tr>
<tr><td>ON</td><td>OFF</td><td>CCW run</td></tr>
<tr><td>OFF</td><td>ON</td><td>CW run</td></tr>
<tr><td>ON</td><td>ON</td><td>Free-run stop
Trip reset (which must be retained 0.2 sec or longer) *</td></tr>
</table>
r−F (REVERSE - FORWARD)
<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop
Deceleration stop when "16 Stop mode selection" is dEC</td></tr>
<tr><td>ON</td><td>OFF</td><td>CW run</td></tr>
<tr><td>OFF</td><td>ON</td><td>CCW run</td></tr>
<tr><td>ON</td><td>ON</td><td>Free-run stop
Trip reset (which must be retained 0.2 sec or longer) *</td></tr>
</table>
rS.Fr (RUNSTOP. FORWARD-REVERSE)
<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop
Deceleration stop when "16 Stop mode selection" is dEC</td></tr>
<tr><td>ON</td><td>OFF</td><td>CCW run</td></tr>
<tr><td>OFF</td><td>ON</td><td>Stop
Deceleration stop when "16 Stop mode selection" is dEC</td></tr>
<tr><td>ON</td><td>ON</td><td>CW run</td></tr>
</table>
F−rST (FORWARD-TRIP RESET)
<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>OFF</td><td>−</td><td>Stop
Deceleration stop when "16 Stop mode selection" is dEC</td></tr>
<tr><td>ON</td><td>−</td><td>CCW run</td></tr>
<tr><td>−</td><td>ON</td><td>Trip reset (which must be retained 0.2 sec or longer) *</td></tr>
</table></td></tr>
</table>

* Effective only when trip occurs

<table>
<tr><th>Parameter No.</th><th>Name of parameter</th><th>Description</th></tr>
<tr><td>33</td><td>I1/I2 function Selection (continued)</td><td>

r－rST (REVERSE-TRIP RESET)

<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>OFF</td><td>—</td><td>Stop
Deceleration stop when "16 Stop mode selection" is dEC</td></tr>
<tr><td>ON</td><td>—</td><td>CW run</td></tr>
<tr><td>—</td><td>ON</td><td>Trip reset (which must be retained 0.2 sec or longer) *</td></tr>
</table>

(2) When "30 Run command selection" is PnL (PANEL), the motor can be commanded with RUN STOP switch of Digital key pad.
Rotation direction in this case can be set by parameter and "I1""I2" state.
When only the digital key pad is connected, "I1" and "I2" are set to OFF.

F－r (FORWARD-REVERSE)

<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>—</td><td>OFF</td><td>CCW rotation selection</td></tr>
<tr><td>OFF</td><td>ON</td><td>CW rotation selection</td></tr>
<tr><td>ON</td><td>ON</td><td>Free-run stop irrespective of RUN switch
Trip reset (which must be retained 0.2 sec or longer)*</td></tr>
</table>

r－F (REVERSE-FORWARD)

<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>—</td><td>OFF</td><td>CW rotation selection</td></tr>
<tr><td>OFF</td><td>ON</td><td>CCW rotation selection</td></tr>
<tr><td>ON</td><td>ON</td><td>Free-run stop irrespective of RUN switch
Trip reset (which must be retained 0.2 sec or longer)*</td></tr>
</table>

rS. Fr (RUNSTOP. FORWARD-REVERSE)

<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>—</td><td>OFF</td><td>CCW rotation selection</td></tr>
<tr><td>—</td><td>ON</td><td>CW rotation selection</td></tr>
</table>

F－rST (FORWARD-TRIP RESET)

CCW run with RUN switch

<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>—</td><td>ON</td><td>Trip reset(which must be retained 0.2 sec or longer) *</td></tr>
</table>

r－rST (REVERSE-TRIP RESET)

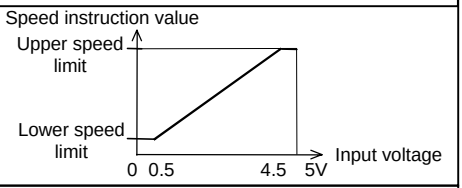
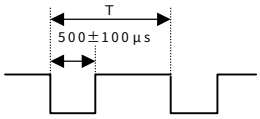
CW run with RUN switch

<table>
<tr><th colspan="2">State of I1 and I2</th><th rowspan="2">Action</th></tr>
<tr><th>I1</th><th>I2</th></tr>
<tr><td>—</td><td>ON</td><td>Trip reset(which must be retained 0.2 sec or longer) *</td></tr>
</table>

</td></tr>
</table>

* Effective only when trip occurs

Detail of parameter

Parameter No.	Name of parameter	Description
3A	Lower speed limit	When " **31** Speed command selection" is analogue speed instruction [VoL−A] (VOL-A), motor setting speed at 0V input is set. 
3b	Upper speed limit	Upper limit of motor command speed. When " **31** Speed command selection" is analogue speed command [VoL−A] (VOL-A), motor setting speed at 5V input is set. Further, upper limit of " **00** Internal speed (0-th speed)" is limited by this parameter.
3C	Torque limit	Upper limit of motor output torque is set. (No precision is provided because torque is not controlled. Use as a guide.) 100% indicates the rated torque.
40	O1 function selection	Output terminal " **01** " can also be selected as follows. Polarity of " **40** O1 function selection " can be inverted by " **42** O1 output polarity selection". [TrIP] (TRIP) : Trip signal (Trip: ON) [STbL] (STABLE) : Arriving signal (When reached to a command value ON) → See " **44** Speed matching range". [rUn] (RUN) : Run/Stop signal (When running: ON) [FrEE] (FREE) : Free-run signal (During free run: ON) [F] (FORWARD) : CCW run signal (During CCW run: ON) [r] (REVERSE) : CW run signal (During CW run: ON) [Ck−L] (CHECK−L) : Overload detection Output when load exceeds 100% (Load exceeds 100%:ON) [POUT] (PULSE-OUT): Speed pulse signal → See " **45** Output pulse count selection".
42	O1 output polarity selection	This is a function for inverting the polarity of signal output between output terminal "O1" and "GND". [nOr] (NORMAL) : Transistor "ON" when activated [rEV] (REVERSE) : Transistor "OFF" when activated
44	Speed matching range	When " **40** O1 function selection " is set to [STbL] (STABLE) Arriving signal, " Speed matching range " for output arriving signal can be adjusted. ・ When difference between actual rotation speed and speed setting is smaller than "Speed matching range", arriving signal is output. ・ Even if the speed is reached, when speed matching range is set too small, arriving signal may turn on and off due to speed fluctuation. ・ Arriving signal is not output when CCW/CW changes.
45	Output pulse count selection	When " **40** O1 function selection " is set to [POUT] (PULSE-OUT), pulse count is set to be output to " O1" while the motor makes one turn. (To be selected from 1, 2, 3, 4, 6, 8, 12, and 24)  (Ex) When rotation number is 3000 r/min, in the case where " **45** Output pulse selection" is 24, $T = \frac{60}{3000 \times 24} = 0.83\text{ms}$ Frequency f = 1/T = 1.2kHz
46	Monitor mode selection	You can choose description to be displayed on 5-digit LED when turning on power. [O.−r] (OUTPUT-REVOLUTION) : Rotation speed [O.−L] (OUTPUT-LOAD) : Torque [AV.−L] (AVERAGE-LOAD) : Load factor (average torque) [S.−r] (SETTING-REVOLUTION) : Speed command [dC−V] (DC-VOLTAGE) : Internal DC voltage (Voltage of smoothing capacitor of power supply) In speed display mode, the value multiplied by " **47** Numerator of display multiplying factor" / " **48** Denominator of display multiplying factor" is displayed.

Parameter No.	Name of parameter	Description
47	Numerator of display magnification factor	You can set the multiplying factor of a value displayed on 5-digit LED. Value of **47** ÷ **48** is a display multiplying factor. Set a value in the range where calculated display magnifying factor is 10 – 1/1000. Rotation number of gear output shaft and the speed of line can be displayed. When the display magnifying factor is changed, the parameter relating to speed (below) is displayed by a value multiplied by display multiplying factor. " **00** Internal speed (0-th speed)" " **3A** Lower speed limit" " **3b** Upper speed limit " " **44** Speed matching range"
48	Denominator of display magnification factor	
4A	Trip history clear	Trip history 1 – 5 can be cleared. <Clearing procedure> Cut off power with [YES] (YES) selection, and turn on power again after display has disappeared, then [-----] is displayed, and trip history is cleared. When power is turned on again, normal operation is started.
4b **4C** **4d** **4E**	Trip history 1 Trip history 2 Trip history 3 Trip history 4 Trip history 5	Trip history for 5 times in the past is stored. Trip history 1 is the latest history. See "Protective function" for displayed description. When no history is available, [-----] is displayed.
50	Undervoltage trip selection	When [nO] (NO) is selection, the motor is not tripped at insufficient voltage. If voltage should fall and undervoltage status is found while the motor is running, the motor stops after running free, while if operation instruction is input after recovery of power, the motor is restarted automatically. (■Be cautious.) When [YES] (YES) is selection, the motor is tripped at undervoltage, and trip signal is output. When normal power is off, trip is not stored in trip history. Trip is stored only when power has stopped instantaneously. (Trip is stored in trip history only when undervoltage once becomes short and then is recovered normal)
51	Retrial selection	Automatic reset in trip (trip retrial) can be set here. Trip can be is automatically reset to allow operation to continue. Use this function only on such equipment that has no problem of safety even if the motor is automatically restarted. ■ Retrial is impossible if trip is by Overcurrent error [E-OC], Sensor error [E-CS],System error [Err], User parameter error [E-UPr], or System parameter error [E-SPr]. When [nO] (NO) is selection, retrial is not effective. When [1]–[4] is selection, retrial is made for the set number of times. When 2 hours has elapsed with no trip, the number of retrying times is initialized to 0. Set the interval between retrials by **52** Retrial start time. When trip occurs in excess of preset number of trials, the motor outputs trip signal and stops. ■ During retrial trip signal is not output (It is stored in trip history.)
52	Retrial start time	You can set waiting time until retrial operation is performed after trip is found. You can set 1 to 120 seconds.
54	Parameter initializing	Parameters can be initialized to the factory default. <Initializing procedure> Cut off power with [YES] (YES) selected, and turn on power again after display has disappeared, then [-----] is displayed , and parameters are initialized to the factory default.
57	Parameter copy	Parameters can be copied. [nO] (NO) Parameters are not copied [P.InIT] (PARAMETER-INITIALIZE) : Initialization of Digital key pad data [P.LOAd] (PARAMETER-LOAD) : Reading parameters into Digital key pad data [P.PrOG] (PARAMETER-PROGRAM) : Writing parameters to the brushless inverter See " How to copy parameter " on page 16 for details.
F0	For manufacturer use	It cannot be changed.

Conformance to EC directive and UL standard

EC Directives

The EC directives apply to all such electronic products as those having specific functions and directly sold to general consumers in EU countries. These products are required to meet the EU unified standards and to be furnished with CE marking.

Our brushless motor meet the EC Directives for Low Voltage Equipment so that the machine or equipment comprising our AC servo can meet relevant EC Directives.

EMC Directives

Our brushless motor can meet EMC Directives and related standards. However, to meet these requirements, the systems must be limited with respect to configuration and other aspects, e.g. the installation and some special wiring conditions must be met. This means that in some cases machines and equipment comprising our servo systems may not satisfy the requirements for wiring and grounding conditions specified by the EMC Directives. Therefore, conformance to the EMC Directives (especially the requirements for emission noise and noise terminal voltage) should be examined based on the final products that include our system.

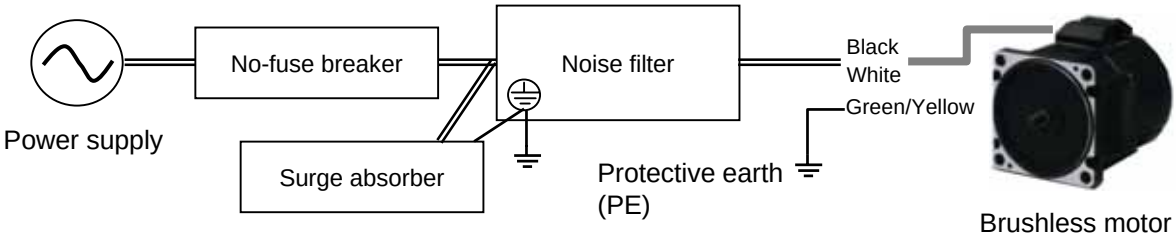
Applicable standard

	Applicable standard	Installation condition
UL	UL1004 Standard for electric motor UL508C Standard for electric converter equipment	—
CE	EN50178 Electronic and electric equipment used for electric power facilities (low voltage directive) EN60034-1 Electric rotation equipment (motor) (low voltage directive) EN55011 Radio interference wave characteristics of industrial, scientific, and medical high-frequency equipment EN61000-6-2 Standards for immunity in industrial environment (EMC directive) IEC61000-4-2 Electrostatics Discharge Immunity Test IEC61000-4-3 Radio Frequency Electromagnetic Field Immunity Test IEC61000-4-4 Electric high-speed transient phenomenon/burst immunity test IEC61000-4-5 Lightening Surge Immunity Test IEC61000-4-6 High Frequency Conduction Immunity Test IEC61000-4-11 Instantaneous Outage-Immunity Test	Overvoltage category II Class I equipment Pollution degree 2 (circuit assembly)

Configuration of peripheral equipment

Power supply	・100 V system: Single phase 100 V – 120 V ± 10%, 50/60 Hz 200 V system: Single phase 200 V – 240 V ± 10%, 50/60 Hz ・Use the equipment under the environment of overvoltage category II specified by IEC60664-1. ・In order to obtain overvoltage category II, insert a transformer conforming to EN standard or IEC standard to the input of brushless motor. ・Use an electric wire size suitable to EN60204-1.
Fuse breaker	Be sure to connect a specified no-fuse breaker certified by IEC standard and UL, or a fuse certified by UL between power supply and noise filter. Observance of this condition allows conformance with UL508C (file No. E164620) and UL1004 (file No. E166557).
Noise filter	When installing one noise filter at the power supply for more than one brushless motor used, contact the manufacturer of noise filter.
Surge absorber	Install a surge absorber on the primary side of noise filter. However, in performing the voltage resistance test of machine and equipment, be sure to remove the surge absorber; otherwise, the surge absorber may be ruptured.
Grounding	Be sure to connect the grounding wire E (green/yellow) of brushless motor and protective grounding wire (PE) of system for preventing electric shock. Do not tighten the grounding wires together but connect them individually.

Wiring of peripheral equipment

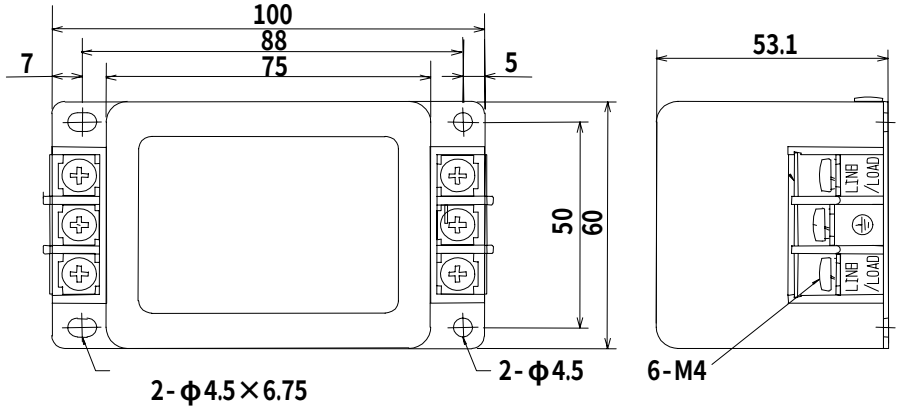


List of compatible peripheral equipment

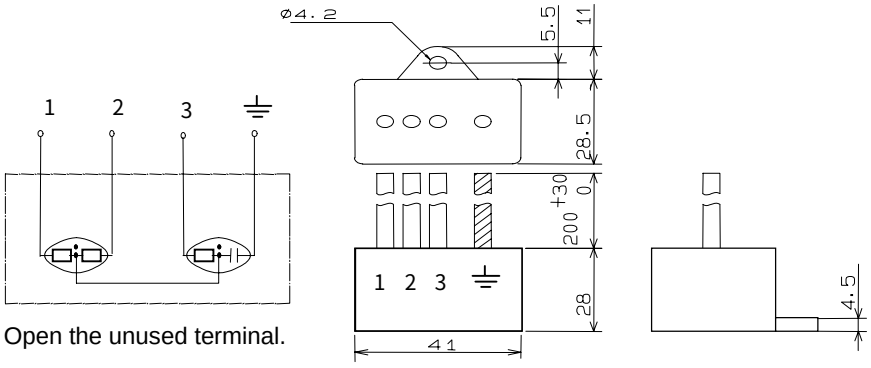
Part name	Optional part number	Manufacturer's part No.	Manufacturer
Noise filter	DV0P3611-5	SUP-EQ5-ER-6	OKAYA ELECTRIC IND. CO., LTD.
Surge absorber	DV0P1450	R.A.V-781BXZ-4	OKAYA ELECTRIC IND. CO., LTD.

Contact: OKAYA ELECTRIC IND. CO., LTD. Japan +81-3-3424-8120

Noise filter



Surge absorber



Open the unused terminal.

Recommended circuit breaker

Made by SANKEN AIRPAX CO., LTD.: **Type IELH-1-11-63-5A-M**
(Rated current 5A, cutoff characteristics DELAY63)
■Recommended cutoff characteristics: DELAY61-63

Contact: Sanken Airpax Co., Ltd. **http//www. sanken-airpax. co. jp /epage. html**

Specifications

● General specification

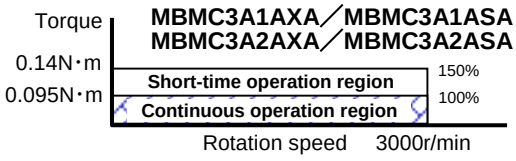
Model name		Rated output (W)	Power input				Rated torque (N・m)	Starting torque (N・m)	Rated rotation speed (r/min)
Toothed shaft	Round shaft		Voltage (V)	Tolerance (%)	Frequency (Hz)	Rated input current (A)			
MBMC3A1AXA	MBMC3A1ASA	30	Single phase 100 - 120	±10	50/60	1.0	0.095	0.14	3000
MBMC3A2AXA	MBMC3A2ASA		Single phase 200 - 240			0.6			
MBMC5A1AXA	MBMC5A1ASA	50	Single phase 100 - 120			1.5	0.16	0.24	
MBMC5A2AXA	MBMC5A2ASA		Single phase 200 - 240			0.7			
MBMC9A1AZA	MBMC9A1ASA	90	Single phase 100 - 120			2.0	0.29	0.43	
MBMC9A2AZA	MBMC9A2ASA		Single phase 200 - 240			1.1			
MBMC1E2AZA	MBMC1E2ASA	130	Single phase 200 - 240			1.5	0.41	0.62	

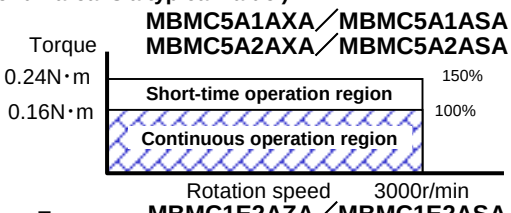
● Common specifications

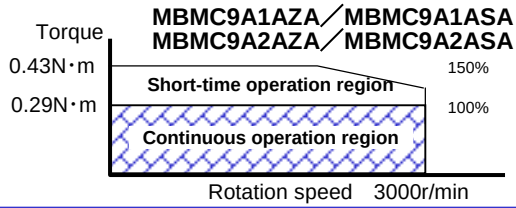
Item		Specification			
Product No.		MBMC3A∗∗∗∗	MBMC5A∗∗∗∗	MBMC9A∗∗∗∗	MBMC1E∗∗∗∗
Rated output (W)		30	50	90	130
Speed control range		30 – 300 r/min (speed ratio 1: 100)			
Speed fluctuation factor	With load	±1% or below (at 0 – Rated torque, Rated rotation speed)			
	With voltage	±1 % or below (at supply voltage ±10%, rated rotation speed)			
	With temperature	±1% or below (Motor: At -10 – 40°C, rated rotation speed)			
Acceleration/Deceleration time		0.3 sec (time for changing from 0 to 1000 r/min) *			
Stopping procedure		Free-run stop*			
Speed setting		0 – 3000 r/min (analogue voltage (0 – 5 V), console A), Setting selection by parameter on console A and Digital key pad			
Speed setting resolution		Analog: approx. 1/200 of upper speed limit Digital: 1 r/min			
Speed setting precision (at 20°C)		Analogue: ±5% or below of upper speed limit (±150r/min or below at upper speed limit 3000 r/min) [Digital: 1% or below of upper speed limit]			
Protective function		Warning: Undervoltage warning *, Overload warning Protect: Overcrrent, Overvoltage, Undervoltage, Overload, User parameter error, System parameter error, System error, Overspeed, Sensor error, Overheat, and setting change warning			
Motor heat resistance class		E (120°C) (UL certification A (105°C))			
Time rating		Continuous			Rating 30 min or continuous load 80%
		(Continuous regenerative operation is not allowed when motor shaft is rotated from load side, such as lowering load operation.)			
Overload warning level		100%			80%
Overload timing characteristics		150% 60 sec			
Motor mass (kg)		1.1	1.3	2.3	2.3

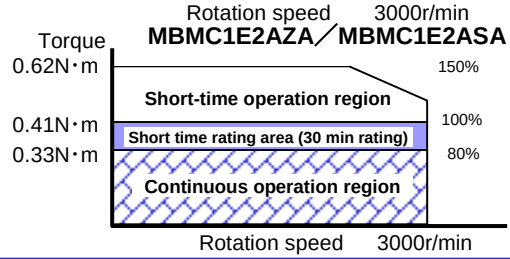
● Speed – Torque characteristics (Torque in short-time run area is a typical value.)

*Changeable by Digital key pad





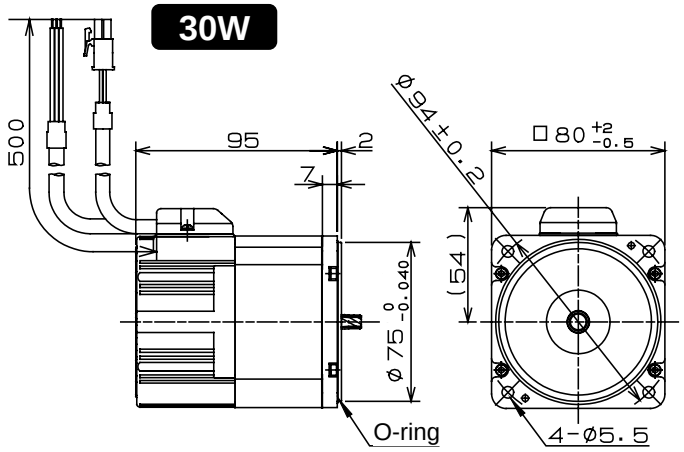




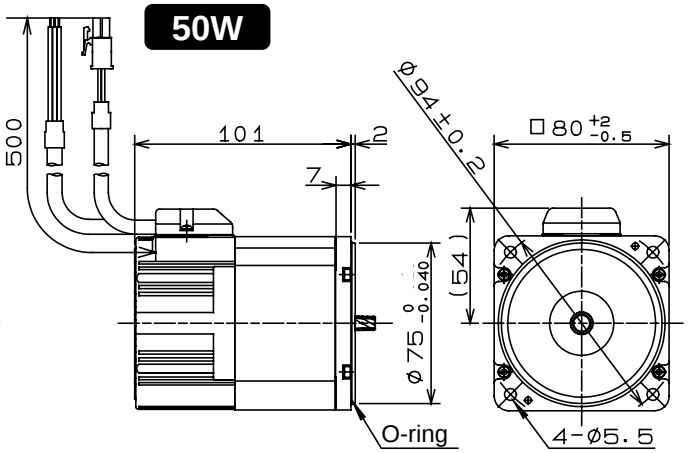
● Dimensional Outline Drawing (in mm)

Motor

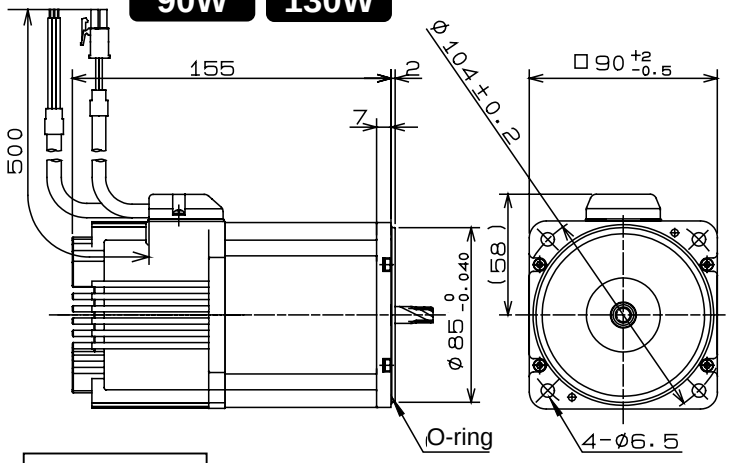
30W



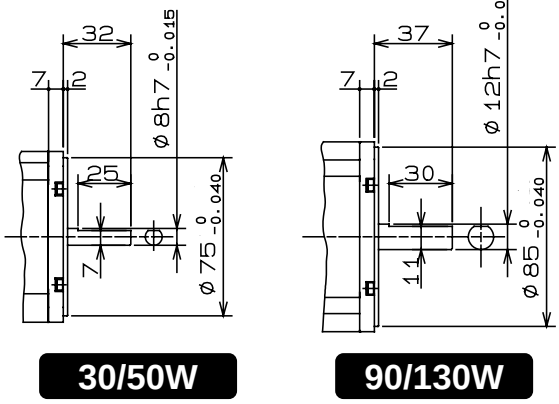
50W



90W **130W**



Shaft end size of round shaft type

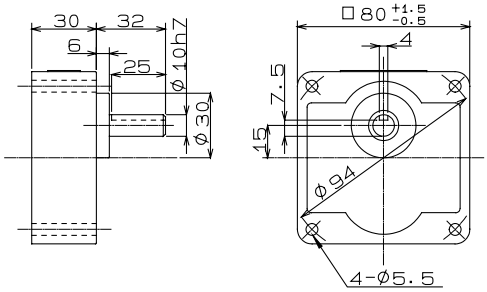


30/50W **90/130W**

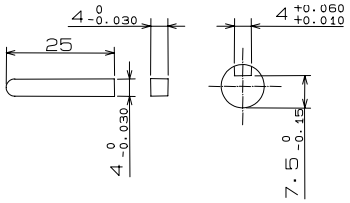
Gear head

● MX8G□B (For 30W/50W motor, sold separately)

- Reduction gear ratio in □
- Reduction gear ratio is available in 22 types: 3, 3.6, 5, 6, 7.5, 9, 10, 12.5, 15, 18, 20, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180

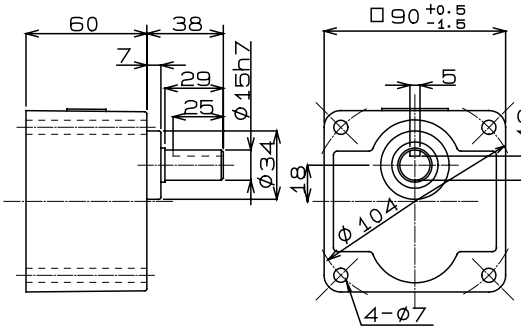


Outer size of key and key groove

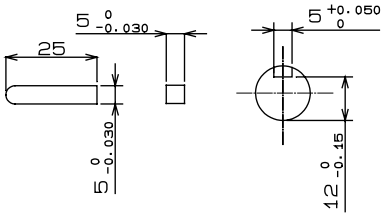


● MZ9G□B (For 30W/50W motor, sold separately)

- Reduction gear ratio in □
- Reduction gear ratio is available in 23 types: 3, 3.6, 5, 6, 7.5, 9, 10, 12.5, 15, 18, 20, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180, 200



Outer size of key and key groove

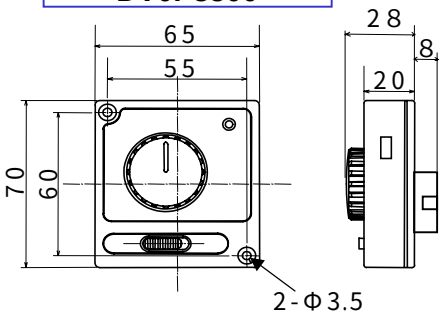


Options

Options

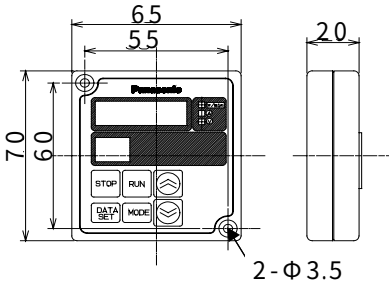
● Console A (attached, sold separately)

DV0P3500

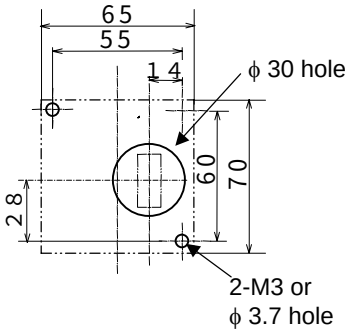


● Digital key pad (sold separately)

DV0P3510



● Mounting hole (Console A/Digital key pad)



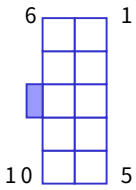
■ Console A connector pin layout

Console A Connector pin No.	Terminal symbol
1	I 1
2	I 2
3	G N D
4	F I N
5	+ 5 V
6	—
7	—
8	—
9	—
1 0	—

■ Digital key pad connector pin layout

Digital key pad Connector pin No.	Terminal symbol
1	—
2	—
3	G N D
4	—
5	+ 5 V
6	—
7	S C K
8	S I N
9	S O T
1 0	—

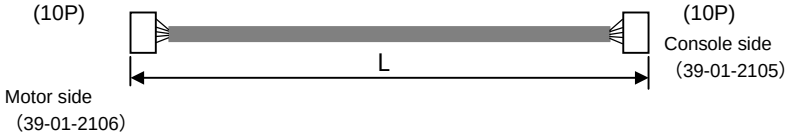
■ Console A, digital key pad connector pin No.



● Control signal extension cable (10P) (Optional)

Model name	Length (L)
DV0P35910	1m
DV0P35930	3m
DV0P35950	5m

● Outer dimension

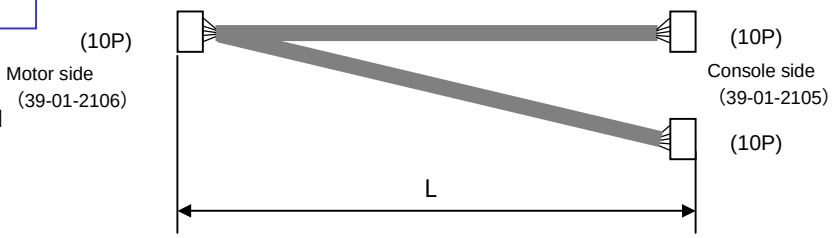


● Control signal branch cable (10P) (Optional)

Model name	Length (L)
DV0P37505	0.5m

- Control signal is branched into two. (Connected to all pins)
- Use it when you want to input a control signal (Console A) while using digital key pad.

● Outer dimension



● Control signal connector kit (optional)

	Model name		Description
A	**DV0P3600**	Engaged with motor	39-01-2106 (5559-10P-210) X 1, pin 39-00-0049 (5558T2L) X 10 (**Nihon Molex**)
B	**DV0P3610**	Engaged with console	39-01-2105 (5557-10R-210) X 1, pin 39-00-0047 (5556T2L) X 10 (**Nihon Molex**)

- Applicable electric wire size: AWG22 - 26
- Applicable manual pressure bonding tool: 57064-5000 or 57038-5300 (**Nihon Molex**)

Warranty

Warranty period

- Warranty period of this product is 1 year from purchasing, or 1.5 years from our manufacturing month.
  However, respective life shall not be exceeded as for standard life describing items.
  (See "How to install/Check of load and use condition" on page 12.)

Detail of warranty

- If any trouble should be found within warranty period under normal use condition in conformance with this instruction manual, it will be repaired free of charge.

  Repair will be chargeable in the following cases even if within warranty period:
  (1) When trouble is caused by wrong use, and inappropriate repair or modification.
  (2) When trouble is caused by dropping after purchase, or damage in transportation.
  (3) When trouble is caused by use out of specification range of the product.
  (4) When trouble is caused by fire, earthquake, lightning stroke, damage by wind and flood, damage by salt, abnormal voltage and any other natural disaster.
  (5) When trouble is caused by entry of water, oil, metal strip, and any other foreign substance.

- Warranty covers only the body of delivered product, and damage induced by trouble of delivered products will be excluded from compensation.

Caution in use

- If you are planning to use this product under special environment, such as atomic power control, aerospace equipment, traffic organization, medical equipment, various safety systems, and equipment which requires cleanliness, please contact us.

- When this product is operated without the shaft electrically grounded, such as in driving the fan, bearing noise may become higher due to the occurence of electrocorrosion depending on the motor used or setting emvironment, so confirm and verify the condition on the customer side in such a case.

- Although we make efforts as far as possible for ensuring the quality of this product, it may operate out of setting due to external noise and static electricity more than expected, or accidental trouble of power supply, wiring, and components, use caution for ensuring safety in your failsafe design and operable range in moving place.

Motor Company, Matsushita Electric Industrial Co., Ltd. Marketing Group

Tokyo: 4-12-4, Higashishinagawa, shinagawa-ku, Tokyo, 140-8587 (Panasonic Tower 17F)
☎(03)6710-3243 FAX (03)6710-3847

Nagoya: 23-30, Izumi Higashi-ku 1-chome, Nagoya, Aichi, 461-8530
☎(052)951-6217 FAX(052)951-3268

Osaka: 1-1, Morofuku 7-chome, Daito, Osaka, 574-0044
☎(072)870-3065 FAX(072)870-3151

After-sale service (repair)

Repair

・Ask the seller where the product was purchased for details of repair work.
When the product is installed in a machine or device, consult first the manufacturer of the machine or device.

GHV Vertriebs-GmbH
Am Schammacher Feld 47
D-85567 Grafing b. München
Tel: +49 8092 8189-0 Fax: +49 8092 818999

Memorandum (Fill in the blanks for convenience in case of inquiry or repair)

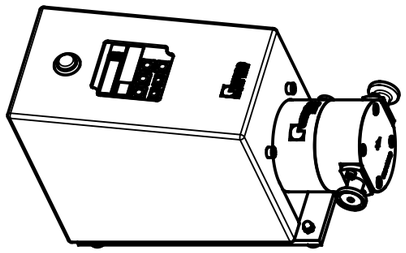
Date of purchase	Date:	Model No.	MBMC□□□A□□
Place of purchase			
	TEL（　　）　　—		

Motor Company, Matsushita Electric Industrial Co., Ltd.
7-1-1, Morofuku, Daito, Osaka 574-0044, Japan
☎ 072-871-1212

IMC63
S0804-0

Parameter No:	Standard parameters of Quattroflow
00	**0r/min**
10	**0,30s**
12	**0,30s**
14	**lin**
15	**lin**
16	**free**
17	**1,0s**
1A	**1500**
1b	**2500**
30	start/stop int**, panel** ext. **Ter**
31	int. **Panel** 0-5V ext. **Vol-A**
33	**rSfr**
3A	**0**
3b	**3000**
3C	**100%**
40	**Trip**
42	**NORMAL**
44	**50**
45	**24**

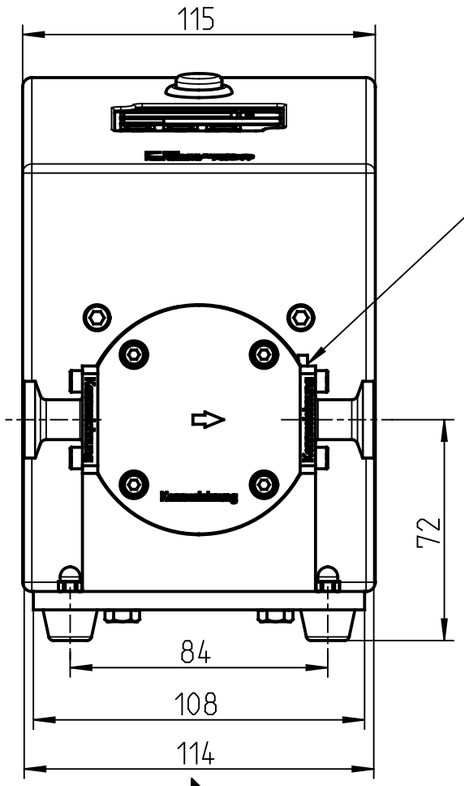
Index	Art der Änderung/ Grund	Datum	Name
a	Neue Klemmringschraubenposition / new clamping bolt position	06.04.10	Sporleder

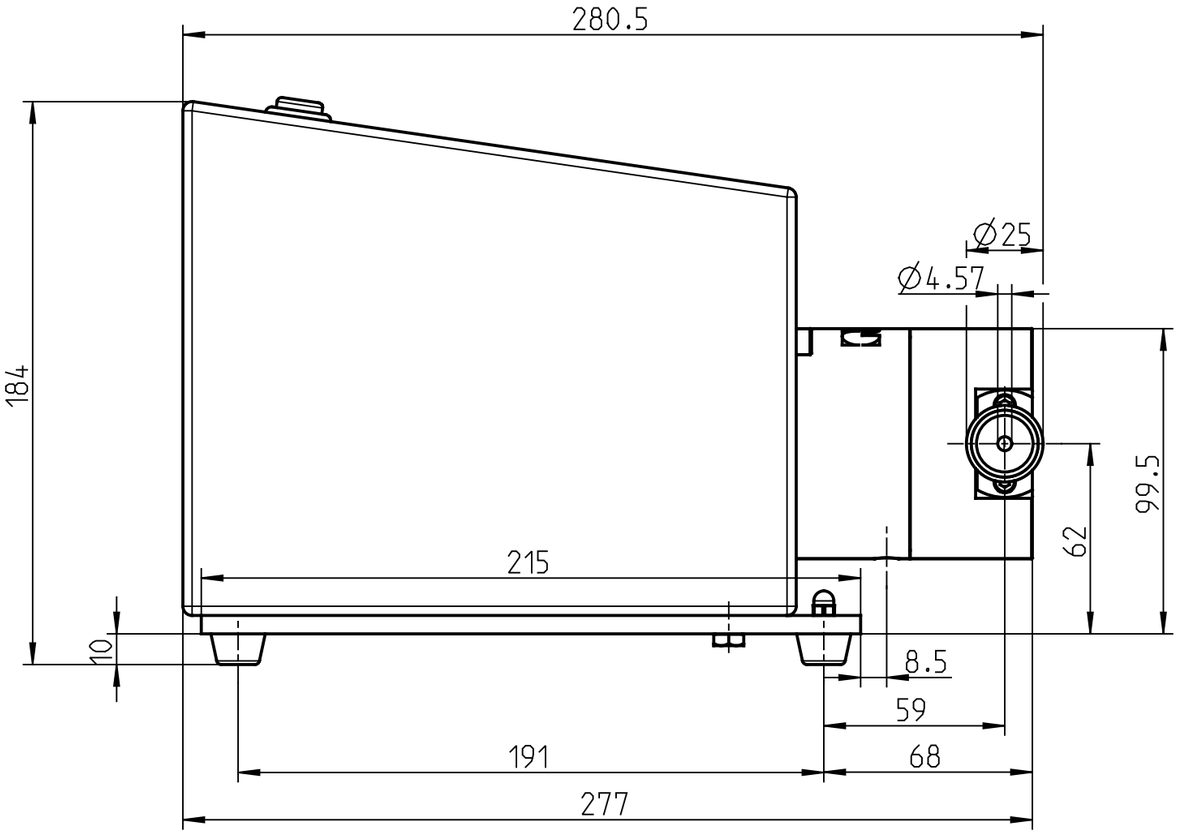


1:5

Wir empfehlen für einen schnellen Förderkammerwechsel diesen Bereich der Pumpe nicht zu verbauen.
We recommend this area of the pump not to obstruct for a quick changing of the pump chamber.

Loch für Innensechskantschlüssel zum Lösen des Klemmringes. (a)
Hole for inside hexagonal key in order to solve the clamp ring of the pump chamber.

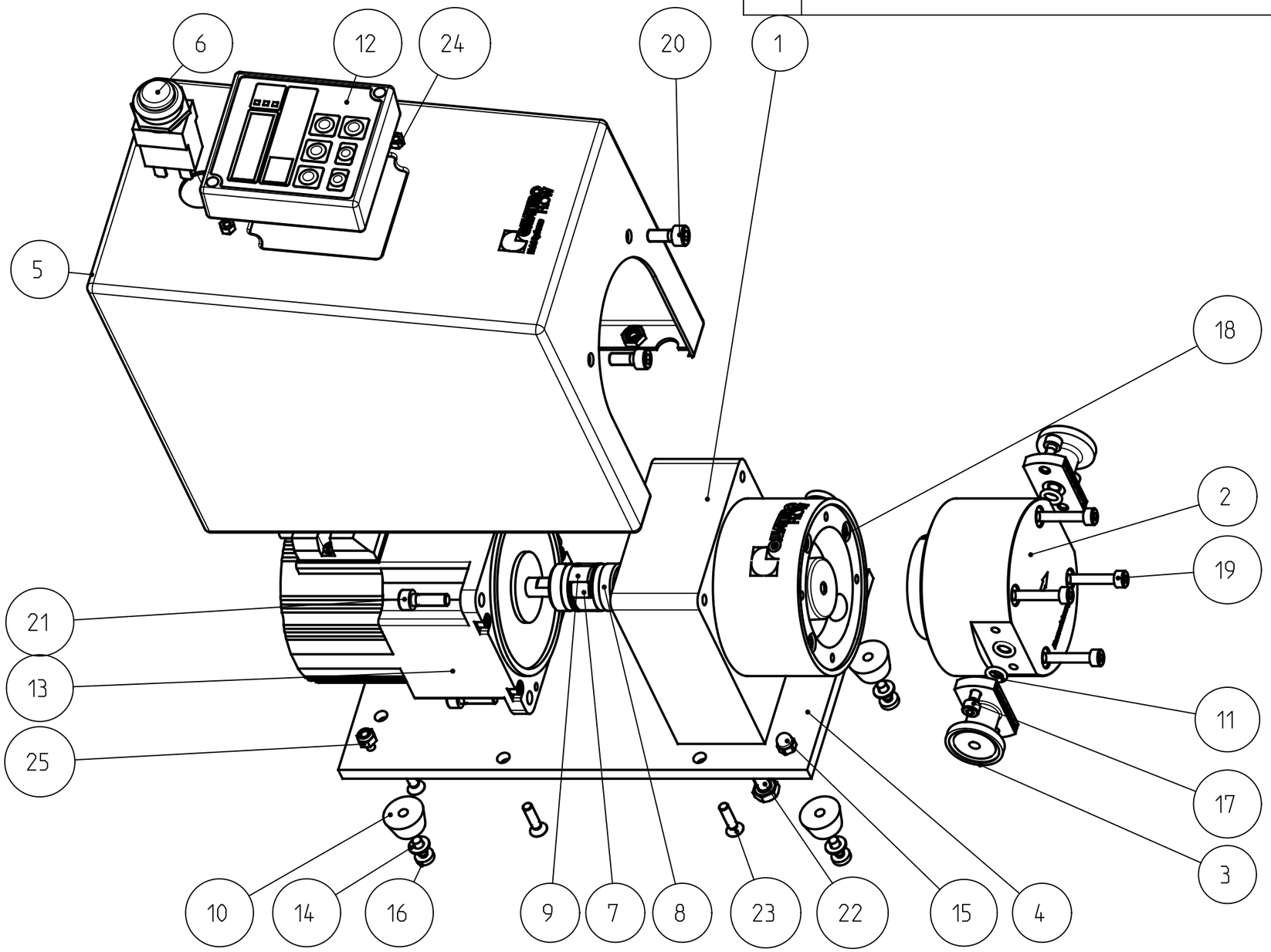




Die Förderkammer kann in 90° Schritten ohne Funktionseinschränkung gedreht werden.
It is possible to turn the pump chamber in 90° steps without functional interferences.

Kanten DIN ISO 13715	Maßstab 1:2		Masse -	Material - / **siehe Stueckliste** Halbzeug -
		Datum	Name	Benennung: Pump — Modell:PQ15PTIE_01
Allgemeintoleranz DIN ISO 2768-m-S	Bear.	31.03.09	Sporleder	**Pumpe, Standard 1/4" TC-Anschluss**
	Gepr.	-	-	
	Norm			
				Zeichnungsnummer+Änderungsindex: Datei:PQ15PTIE_01 — Blatt 1 / 3 Bl.
	QUATTRO FLOW Fluid Systems			**PQ15PTIE_01 a**
				(Ers. f.:) Q150-0000-01 — (Ers. d.:)

Index	Art der Änderung/ Grund	Datum	Name
a	Neue Klemmringschraubenposition / new clamping bolt position	06.04.10	Sporleder



Kanten DIN ISO 13715	Maßstab		Masse	Material - / siehe Stueckliste
	1:2		8.179kg	Halbzeug -
		Datum	Name	Benennung: Pump Modell:PQ15PTIE_01
Allgemeintoleranz DIN ISO 2768-m-S	Bear.	31.03.09	Sporleder	**Pumpe, Standard 1/4" TC-Anschluss**
	Gepr.	-	-	
	Norm			
				Zeichnungsnummer+Änderungsindex: Datei:PQ15PTIE_01 Blatt 2 / 3 Bl.
				PQ15PTIE_01 a
				(Ers. f.:) Q150-0000-01 (Ers. d.:)

QUATTRO FLOW Fluid Systems

Lfd. Nr.	Menge	Einheit	Benennung (Kategorie/Dateiname)	Sachnummer/Norm-Kurzbezeichnung	Bemerkung
1.	1	BG.	Ringantrieb ring drive	PQ15A_01 b	- siehe Stueckliste
2.	1	BG.	Foerderkammer aus Edelstahl pump chamber, stainless steel	PQ15C_01 a	- siehe Stueckliste
3.	2	Stk.	Anschluss Standard connector port	Q150-013-05 b	1.4435 X2CrNiMo 18-14-3
4.	1	Stk.	Grundplatte Baseplate	Q150-016-05 -	1.4301 X6CrNiMoTi 17-12-2
5.	1	BG.	Haube shroud	Q150-020-01 a	1.4301 siehe Stueckliste
6.	1	Stk.	Schalter, vandalensicher, 19.5mm switch	700652 -	- -
7.	1	Stk.	Zahnkranz Rotex-GS 92 Shore A-GS GELB coupling spider	550091000001 -	KTR-spezifisch Elastomer
8.	1	Stk.	Kupplung Rotex GS9 AL-H (l-ø 7mm) coupling	550097150750 -	Lieferanten-spezifisch Aluminium
9.	1	Stk.	Kupplung Rotex GS9 AL-H (l-ø 7mm) coupling	550097150850 -	Lieferanten-spezifisch Aluminium
10.	4	Stk.	Gummi-Puffer, weiss shock absorber, white	#25007 -	Lieferanten-spezifisch Elastomer
11.	2	Stk.	O-Ring O-Ring seal	5.7x1.9 -	EPDM 70 EPDM 291
12.	1	Stk.	Bedienpanel, digital panel	DVOP3510 -	- -
13.	1	Stk.	Bürstenloser Motor, 50W-110V mit gekürzter Welle brushless motor, 50W, 110V	MBMC5A1ASB -	- -
14.	4	Stk.	Scheibe ähnlich ISO7089 washer	DIN125-4.3-A2 -	A2-70 Rostfreier Stahl
15.	2	Stk.	Hutmutter Acorn Nut	DIN1587-M4-A2 -	A2-70 Rostfreier Stahl
16.	4	Stk.	Linsenschrauben philliphead truss screw	DIN7985A M4X10 FORM H	A2-70 Rostfreier Stahl
17.	4	Stk.	Zylinderschraube mit Innensechskant hexagonal socket head cap screw	DIN912-M4x12-A2 -	A2-70 Rostfreier Stahl
18.	3	Stk.	Zylinderschraube mit Innensechskant hexagonal socket head cap screw	DIN912-M4x40-A2 -	A2-70 Rostfreier Stahl
19.	4	Stk.	Zylinderschraube mit Innensechskant hexagonal socket head cap screw	DIN912-M4x45-A2 -	A2-70 Rostfreier Stahl
20.	2	Stk.	Zylinderschraube mit Innensechskant hexagonal socket head cap screw	DIN912-M5x12-A2 -	A2-70 Rostfreier Stahl
21.	4	Stk.	Zylinderschraube mit Innensechskant hexagonal socket head cap screw	DIN912-M5x16-A2 -	A2-70 Rostfreier Stahl
22.	2	Stk.	Sechskantschraube hexagonal bolt	DIN933-M6x20-A2 -	A2-70 Rostfreier Stahl
23.	6	Stk.	Senkkopfschraube mit Kreuzschlitz phillip head socket bolt	DIN965-M4x16-A2 -	A2-70 A2-70
24.	2	Stk.	Mutter, selbsichernd lock nut	DIN985-M3-A2 -	A2-70 Rostfreier Stahl
25.	2	Stk.	Mutter, selbsichernd lock nut	DIN985-M4-A2 -	A2-70 Rostfreier Stahl

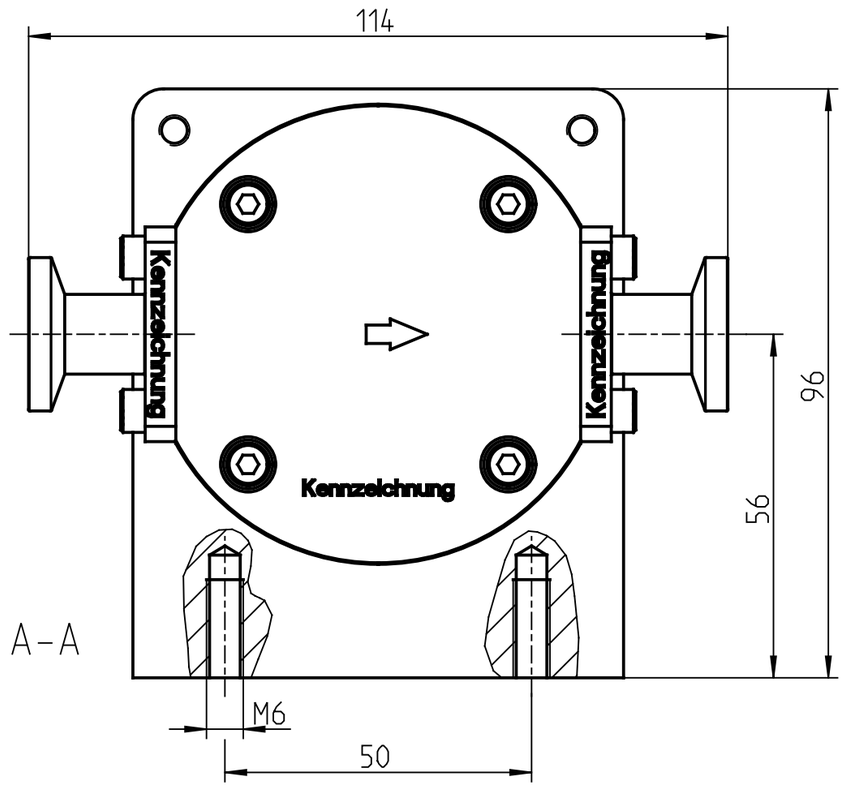
Kanten DIN ISO 13715	Maßstab 1:2	Masse 8.179kg	Material - / siehe Stueckliste	
			Halbzeug -	
	Datum	Name	Benennung: Pump	Modell:PQ15PTIE_01
Allgemeintoleranz DIN ISO 2768-m-S	Bear. 31.03.09	Sporleder	Pumpe, Standard 1/4" TC-Anschluss	
	Gepr. -	-		
	Norm			
			Zeichnungsnummer+Änderungsindex: PQ15PTIE_01 a	Datei:PQ15PTIE_01
			(Ers. f.:) Q150-0000-01	(Ers. d.:)

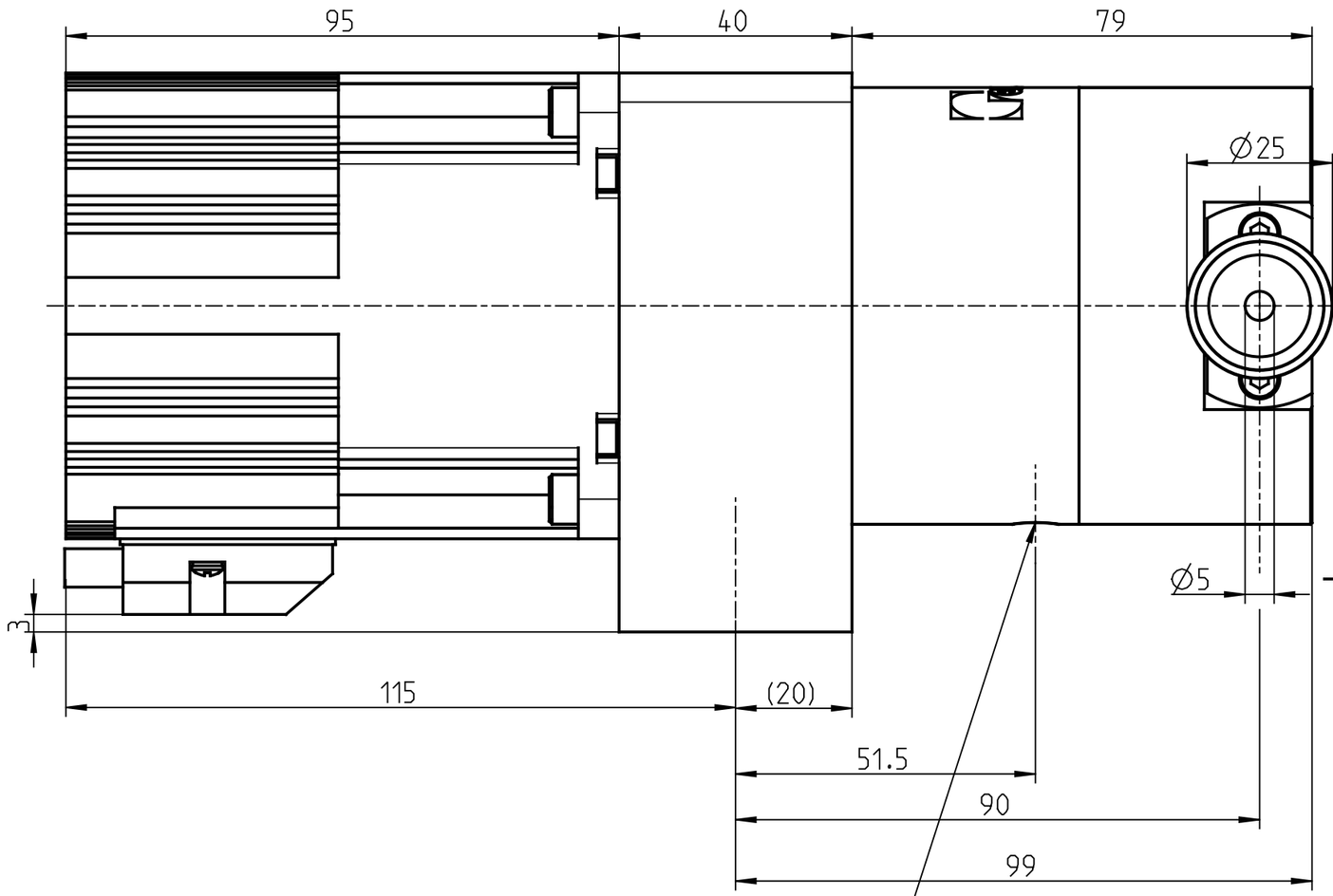
QUATTRO FLOW Fluid Systems

Blatt 3 / 3 Bl.

Index	Art der Änderung/ Grund	Datum	Name

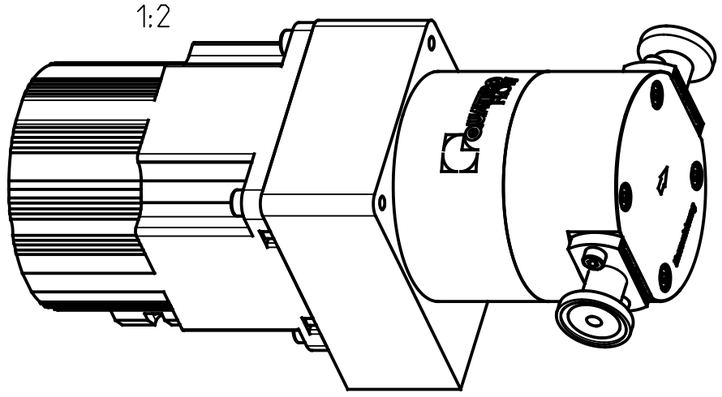
Förderkammer und Motor sind - unabhängig voneinander - jeweils in 90° -Schritten drehbar.
Pump head and motor are - independently - each in 90° steps rotatable.





Loch für Innensechskantschlüssel zum Lösen des Klemmringes.
Hole for inside hexagonal key in order to solve the clamp ring of the pump chamber.

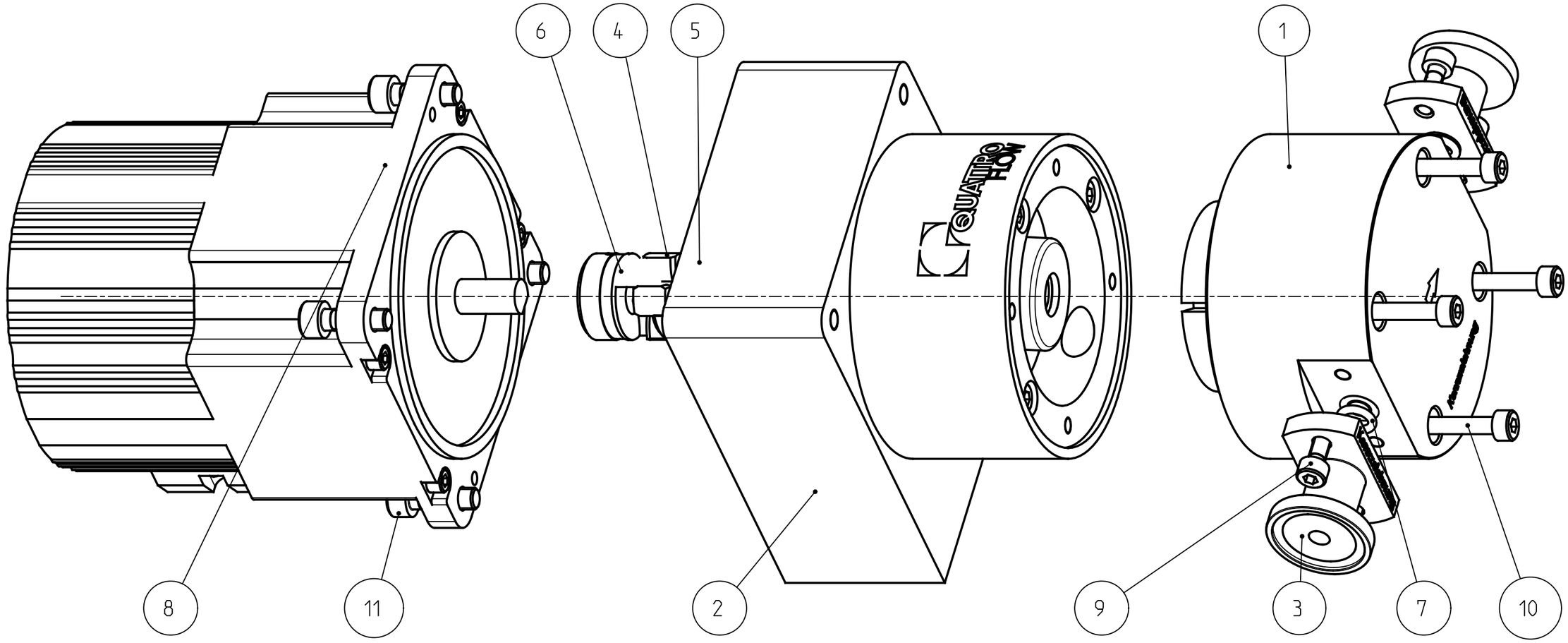
1:2



Wir empfehlen, diesen Bereich vor der Pumpe als Wechselbereich für Pumpenkopf offen zu lassen und nicht zu verbauen.
We recommend to leave open this area in front of the pump as a change area for the pump head and not to obstruct.

Kanten DIN ISO 13715	Maßstab 1:1		Masse 5.420kg	Material - / **siehe Stueckliste** Halbzeug -
		Datum	Name	Benennung: Pump — Modell:PQ15PTIEOG-01
Allgemeintoleranz DIN ISO 2768-m-S	Bear.	20.04.09	Sporleder	**Pumpe, Standard 1/4"-TC Anschluss**
	Gepr.	-	-	
	Norm			
				Zeichnungsnummer+Änderungsindex: Datei:PQ15PTIEOG-01 — Blatt 1 / 3 Bl.
	QUATTRO FLOW Fluid Systems			**PQ15PTIEOG-01 -**
				(Ers. f.:) Q150-0000-03 — (Ers. d.:)

Index	Art der Änderung/ Grund	Datum	Name



Kanten DIN ISO 13715	Maßstab 1:1	Masse 5.420kg	Material - / siehe Stueckliste
			Halbzeug -
	Datum	Name	Benennung: Pump Modell:PQ15PTIEOG-01
Allgemeintoleranz DIN ISO 2768-m-S	Bear. 20.04.09	Sporleder	**Pumpe, Standard 1/4"-TC Anschluss**
	Gepr. -	-	
	Norm		
			Zeichnungsnummer+Änderungsindex: Datei:PQ15PTIEOG-01 Blatt 2
QUATTRO FLOW Fluid Systems			**PQ15PTIEOG-01 -** 3 Bl.
			(Ers. f.:) Q150-0000-03 (Ers. d.:)

Lfd. Nr.	Menge	Einheit	Benennung (Kategorie/Dateiname)	Sachnummer/Norm-Kurzbezeichnung	Bemerkung
1.	1	BG.	Foerderkammer aus Edelstahl pump chamber, stainless steel	PQ15PCES-01 -	- siehe Stueckliste
2.	1	BG.	Ringantrieb ring drive	PQ15RA-01 a	- siehe Stueckliste
3.	2	Stk.	Anschluss connector port	Q150-013-05 -	1.4435 X2CrNiMo 18-14-3
4.	1	Stk.	Zahnkranz Rotex-GS 92 Shore A-GS GELB coupling spider	550091000001 -	KTR-spezifisch Elastomer
5.	1	Stk.	Kupplung Rotex GS9 AL-H (I-ø 7mm) coupling	550097150750 -	Lieferanten-spezifisch Aluminium
6.	1	Stk.	Kupplung Rotex GS9 AL-H (I-ø 7mm) coupling	550097150850 -	Lieferanten-spezifisch Aluminium
7.	2	Stk.	O-Ring O-Ring seal	5.7x1.9 -	EPDM 70 EPDM 291
8.	1	Stk.	Bürstenloser Motor, 50W-230V mit gekürzter Welle brushless motor, 50W, 230V	MBMC5A2ASB -	- -
9.	4	Stk.	Zylinderschraube mit Innensechskant hexagonal socket head cap screw	DIN912-M4x12-A2 -	A2-70 Rostfreier Stahl
10.	4	Stk.	Zylinderschraube mit Innensechskant hexagonal socket head cap screw	DIN912-M4x45-A2 -	A2-70 Rostfreier Stahl
11.	4	Stk.	Zylinderschraube mit Innensechskant hexagonal socket head cap screw	DIN912-M5x16-A2 -	A2-70 Rostfreier Stahl

Kanten DIN ISO 13715	Maßstab 1:1		Masse 5.420kg	Material - / siehe Stueckliste Halbzeug -
		Datum	Name	Benennung: Pump — Modell:PQ15PTIEOG-01
Allgemeintoleranz DIN ISO 2768-m-S	Bear.	20.04.09	Sporleder	**Pumpe, Standard 1/4"-TC Anschluss**
	Gepr.	-	-	
	Norm			
				Zeichnungsnummer+Änderungsindex: Datei:PQ15PTIEOG-01 — Blatt 3 / 3 Bl.
	QUATTRO FLOW Fluid Systems			**PQ15PTIEOG-01 -**
				(Ers. f.:) Q150-0000-03 — (Ers. d.:)

ALMATEC Maschienenbau GmbH
Carl-Friedrich-Gauß-Str.5
47475 Kamp-Lindfort

Zertifikat / Certificate Class VI/FDA

Hiermit bestätigen wir, dass in den Quattroflow Pumpen und Ersatzteilkits der Baureihen QF150/QF150 SU, QF1000, QF1200/QF1200 SU, QF4400/QF4400 SU,QF20K folgende Materialien eingesetzt werden.

We confirm that the following plastic- / elastomeric materials are used for the items of the Quattroflow pumps and spare part kits: Series QF150/150SU, QF1000, QF1200/ QF1200 SU , QF4400/QF4400 SU, QF 20K.

Bauteil **Item**	**In Pumpe / in Kit** **In Pump / in Kit**	**Material** **Material**	**USP Plastic** **Class VI / 121°C**	**FDA 21 CFR** **§177.2600/-.1520**
			Cert. issued by:	**Cert. issued by:**
Polypropylen				
Ventilplatte / Valve Plate	Quattroflow 1000	PP-DWST natur	BioService Proj. Nr. 072098	ISEGA 24903 U 07
Ventilplatte / Valve Plate	Quattroflow 4000/4400	PP-DWST natur	BioService Proj. Nr. 072098	ISEGA 24903 U 07
Ventilplatte / Valve Plate	Quattroflow 20K	PP-DWST natur	BioService Proj. Nr. 072098	ISEGA 24903 U 07
Förderkammer / Pump Chamber	Quattroflow 1200-SU	PP-DWST natur	BioService Proj. Nr. 072098	ISEGA 24903 U 07
Förderkammer / Pump Chamber	Quattroflow 4400-SU	PP-DWST natur	BioService Proj. Nr. 072098	ISEGA 24903 U 07
EPDM				
Ventile / Valves	Quattroflow 150/150SU	EPDM AA7IEZ	BioService Proj. Nr. 063083	Cert.- Kraiburg
Ventile / Valves	Quattroflow 1000	EPDM AA7IEZ	BioService Proj. Nr. 063083	Cert.- Kraiburg
Ventile / Valves	Quattroflow 1200	EPDM AA7IEZ	BioService Proj. Nr. 063083	Cert.- Kraiburg
Ventile / Valves	Quattroflow 1200-SU	EPDM AA7IEZ	BioService Proj. Nr. 063083	Cert.- Kraiburg
Ventile / Valves	Quattroflow 4000/4400	EPDM AA7IEZ	BioService Proj. Nr. 063083	Cert.- Kraiburg
Ventile / Valves	Quattroflow 4400-SU	EPDM AA7IEZ	BioService Proj. Nr. 063083	Cert.- Kraiburg
Ventile / Valves	Quattroflow 20K	EPDM AA7IEZ	BioService Proj. Nr. 063083	Cert.- Kraiburg
O-Ringe/O-rings	Quattroflow 150/150SU	70 EPDM 291	Cert.-Freudenberg	Cert.-Freudenberg
O-Ringe/O-rings	Quattroflow 1000	70 EPDM 291	Cert.-Freudenberg	Cert.-Freudenberg
O-Ringe/O-rings	Quattroflow 1200	70 EPDM 291	Cert.-Freudenberg	Cert.-Freudenberg
O-Ringe/O-rings	Quattroflow 1200-SU	70 EPDM 291	Cert.-Freudenberg	Cert.-Freudenberg
O-Ringe/O-rings	Quattroflow 4400-SU	70 EPDM 291	Cert.-Freudenberg	Cert.-Freudenberg
O-Ringe/O-rings	Quattroflow 4000/4400	70 EPDM 291	Cert.-Freudenberg	Cert.-Freudenberg
O-Ringe/O-rings	Quattroflow 20K	70 EPDM 291	Cert.-Freudenberg	Cert.-Freudenberg
O-Ringe/O-rings	PI2994	70 EPDM 291	Cert.-Freudenberg	Cert.-Freudenberg
Santoprene				
Membran/Diaph.	Quattroflow 150/150SU	281-73 Medical Grade	Cert.-Santoprene	Cert.-Santoprene
Membran/Diaph.	Quattroflow 1000	281-73 Medical Grade	Cert.-Santoprene	Cert.-Santoprene
Membran/Diaph.	Quattroflow 1200	281-73 Medical Grade	Cert.-Santoprene	Cert.-Santoprene
Membran/Diaph.	Quattroflow 1200-SU	281-73 Medical Grade	Cert.-Santoprene	Cert.-Santoprene
Membran/Diaph.	Quattroflow 4400-SU	281-73 Medical Grade	Cert.-Santoprene	Cert.-Santoprene
Membran/Diaph.	Quattroflow 4000/4400	281-73 Medical Grade	Cert.-Santoprene	Cert.-Santoprene
Membran/Diaph.	Quattroflow 20K	281-73 Medical Grade	Cert.-Santoprene	Cert.-Santoprene

05.01.2012
Datum / Date

Unterschrift / Signature

CERTIFICATE

Management system as per
DIN EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures, it is hereby certified that

Almatec Maschinenbau GmbH
Carl-Friedrich-Gauß-Straße 5
47475 Kamp-Lintfort
Germany

applies a management system in line with the above standard for the following scope

Development, production and selling of diaphragm pumps and pulsation dampers; sale of centrifugal pumps, gear pumps, eccentric disc pumps, vane pumps, peristaltic hose pumps and lobe pumps

Certificate Registration No. 04 100 940508
Audit Report No. 3505 2404

Valid until 2013-02-10
Initial certification 1994

Certification Body
at TÜV NORD CERT GmbH

Essen, 2010-02-16

This certification was conducted in accordance with the TÜV NORD CERT auditing and certification procedures and is subject to regular surveillance audits.

TÜV NORD CERT GmbH Langemarckstrasse 20 45141 Essen www.tuev-nord-cert.com

TGA-ZM-07-06-00