Fluid-o-Tech
POWER THE FLOW

INSTRUCTION MANUAL

FGS SERIES PUMP-MOTOR UNIT

This integrated pump-motor unit consists of a Fluid-o-Tech magnetic drive gear pump and a 24V BLDC motor. The units are available in two different versions: with or without integrated electronic control. The version without integrated electronic control only has a BLDC motor with position feedback via Hall sensors. This manual refers only to the version with integrated control.

INSTALLATION

Important information:

- ***Before using the unit, read the operating manual carefully.***
- ***The installation conditions described in this manual must be observed..***

WARNINGS

- *Take particular care when connecting the pump to the fittings to avoid leaks.*
- *If a sealing fluid or Teflon® tape is used, take care not to allow it to enter the pump. We recommend using stainless steel or plastic fittings.*
- *To avoid damage to the pump, avoid operating without fluid.*
- *Before connecting and disconnecting the pump, turn off the power supply.*
- *Do not disassemble the motor from the heat sink.*
- *Do not allow liquids to enter the pump motor.*
- *For food and medical applications, the pump (even if NSF certified) must be sterilized by circulating water at 80°C for at least 20 minutes.*

The water used for this operation must not be reused.

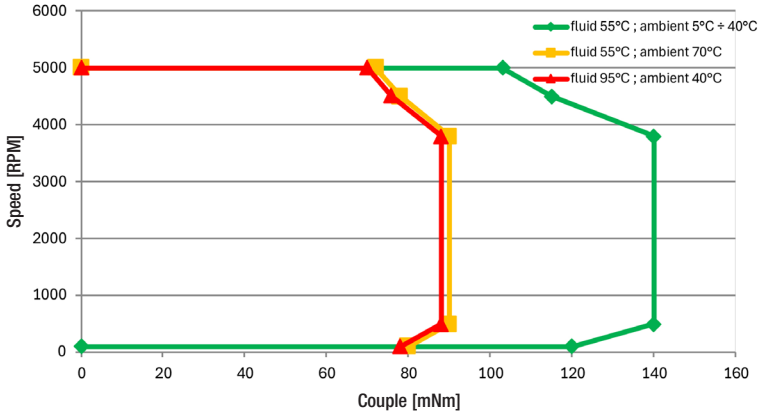
- *Controlling the motor current does not guarantee a specific maximum pressure value. If it is necessary to protect the hydraulic circuit from overpressure generated by the pump, it is essential to use a pump equipped with a bypass or a safety valve to be installed downstream of the pump.*
- *To prevent the accidental entry of solid materials that could damage the internal components of the pump, it is recommended to remove the two protective caps located on the pump inlet and outlet holes only immediately before installing the fittings and pipes.*
- *Use only connectors and wiring of the type indicated in this manual. Replace damaged wiring and loose connections immediately.*
- *Do not use in applications with functional safety requirements. The device cannot be a safety component and cannot perform safety-relevant functions.*
- *Do not use in potentially explosive atmospheres (ATEX) or in the vicinity of flammable materials and components.*
- *The product cannot be used in the following applications: avionics, spacecraft, marine, railway, and automotive vehicles.*

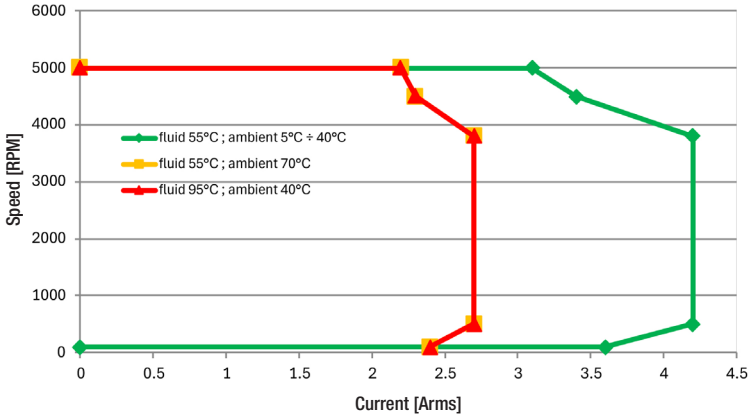
DISPOSAL

The purchaser/user is responsible for the proper disposal or recycling of the product at the end of its use or useful life. For more information on the correct disposal methods, please contact Fluid-o-Tech Customer Care.

NOMINAL DATA AND PERMITTED CONDITIONS OF USE

PROPERTIES	MINIMUM	NOMINAL	MAXIMUM	UNIT
Operating supply voltage	10	24	30	V
Permissible supply voltage	-35		35	V
Controlled motor rotation speed	100	3800	5000 (5300 transient))	RPM
Motor torque @Ambient<40°C; TFluid<55°C		140	160 transient)	mNm
Drive and motor rated current @AmbientT<40°C; FluidT<55°C		4.5		Arms
Motor power @Ambient temperature <40°C; Fluid temperature <55°C		56	67	W
Average current consumption @24V	0.01 standby	3.3	4.3	A
Operating ambient temperature of motor	-40	40	70	°C
Fluid and pump temperature (freezing not permitted)	-20	55	95	°C
IP protection rating (DIN EN 60529) with cable gland			65	
Sampling frequency of digital and analog inputs		100		Hz
Update frequency of digital and analog outputs		100		Hz
Power supply circuit input capacity (if necessary, a charging current limiting circuit must be inserted externally)		660		µF
Software protections: over and under power supply voltage, over-temperature, overload		sì		
Start-up time (from power supply >10V to microcontroller ready for control)			100	ms

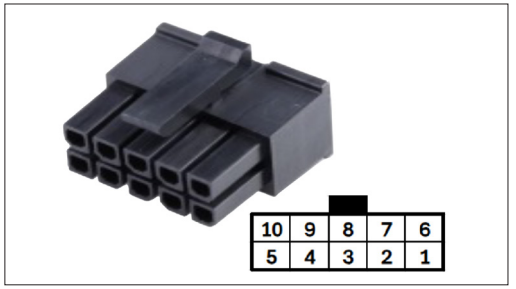




CONNECTIONS

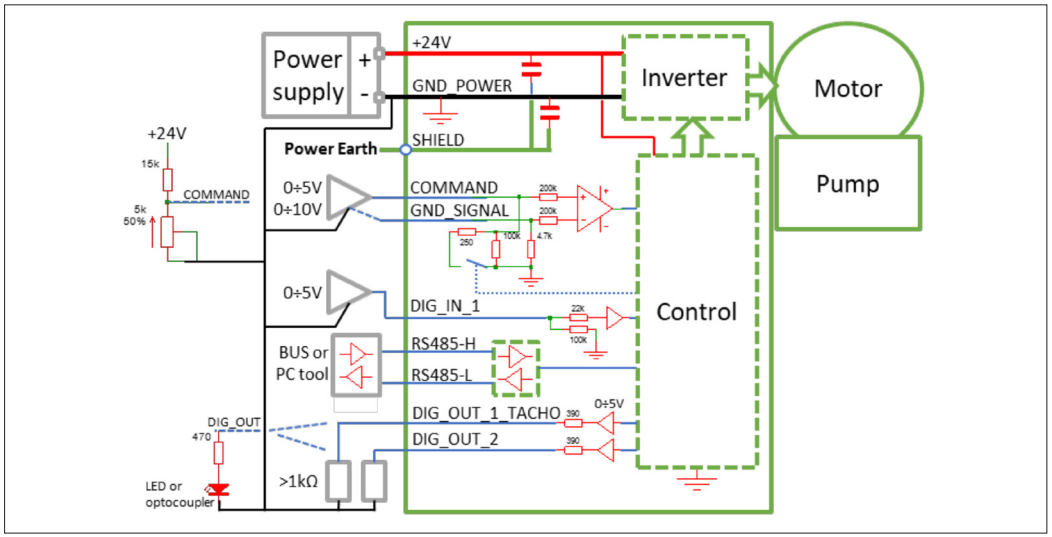
The motor is equipped with a 10-pin connector compatible with:
- Molex 430251000 with pin 430300007 (20-24 AWG)
- Hitaltech or Greencon GHZ242-05AM1 with pin GRZ1C3-0101AB (20-24 AWG)

To ensure protection against liquid or dust intrusion (higher than IP20), the wiring must have a suitable single sheath with a diameter between 4.5mm and 10mm and pass through the supplied cable gland (Elektrozubehor LTBP 750-063).



Connector pinout

PIN	NAME	FUNCTION	RECOMMEND CABLE
1	+24V	Power supply	18-20 AWG
2	GND_POWER	Power mass	18-20 AWG
3	DIG_IN_1	Digital input also configurable as reference (e.g., motor speed) in frequency or with duty cycle modulation	20-24 AWG
4	RS485-H	RS485 serial bus	20-24 AWG
5	RS485-L	RS485 serial bus	20-24 AWG
6	SHIELD	Shield and housing connection	20-24 AWG
7	DIG_OUT_2	Configurable digital output	20-24 AWG
8	DIG_OUT_1_TACHO	Digital output also configurable as tachometer (output frequency relative to rotation speed)	20-24 AWG
9	COMMAND	Configurable analog input (e.g., motor speed). Can be configured for voltage (0-5V or 0-10V) or current (4-20mA): alternatively, it can function as a configurable digital input	20-24 AWG
10	GND_SIGNAL	Ground reference relative to the COMMAND input	20-24 AWG



For product and system safety, in compliance with EC regulations, a 5A fast fuse (>30Vdc) must be installed in series with the power supply terminal (+24V).
Electromagnetic emission levels are affected by cable length and shielding. When using serial communication (RS485), a ferrite filter (Wurth Elektronik 7427153 recommended) must be installed on the two serial cables or on the entire cable harness coming out of the motor. The ferrite must be installed at a maximum distance of 10 cm from the cable outlet.

COMMAND INPUT (default: speed reference)

The COMMAND input assigns reference variables to motor control and can be configured in several ways.

In the default configuration, it is the pump speed reference and is scaled so that the pump activates (Start command) at 300rpm when the input voltage reaches 0.3V and deactivates (STOP command) when the input voltage drops below 0.2V. The speed of 5000rpm is reached by applying 5V to the input.
For greater reference accuracy (independence from the voltage drop on the GND_POWER cable), the command voltage must be applied differentially between the COMMAND and GND_SIGNAL pins without interconnecting the GND_SIGNAL and GND_POWER pins. For a non-differential connection, the command signal can be referenced to GND_POWER, leaving the GND_SIGNAL pin unconnected.

PROPERTIES	MINIMUM	NOMINAL	MAXIMUM	UNIT
Analog reading range configured in voltage	0	5	10 nominal (9.5 guaranteed)	V
Analog reading range configured in current	4		20	mA
Relative error of analog input configured in voltage			4	%
Error related to analog input configured in current			5	%
Analog input circuit bandwidth		300		Hz
Operating voltage of digital input circuit	0		5	V
Input resistance		72		kΩ
Switching threshold L → H		2	2.2	V
Switching threshold H → L	1.8	2		V

The analog reference can be configured by the [Enable Input 4-20mA] parameter in 4÷20mA mode. The COMMAND input also accepts digital signals.
In 4÷20mA configuration and with digital signals, the signal must be referenced to GND_POWER, leaving the GND_SIGNAL pin unconnected.

DIGITAL INPUT

The digital input can be used to create sequences with respect to motor operation or to obtain a reference (speed or torque) via a frequency-modulated or PWM digital signal. In the **default** configuration, when the digital input is set to high, it reverses the direction of motor rotation.

PROPERTIES	MINIMUM	NOMINAL	MAXIMUM	UNIT
Operating voltage of the digital input circuit	0		5	V
Switching threshold L → H		1.7	2.3	V
Switching threshold H → L	0.8	1.1		V
Input resistance		100		kΩ
Frequency reference operating range	100		1000	Hz
Operating range of the reference Pulse Width Modulation @ freq.=100÷500Hz	5		95	%

DIGITAL OUTPUTS (default: tachometer)

The digital outputs can be used to generate feedback on motor operation. In the **default** configuration, digital output 1 is the tachometer signal that repeats the actual motor speed with a square wave replicating a 32-pulseper-revolution phonic wheel.

Below the minimum frequency, the signal remains at a high level. In the event of power supply or temperature protection intervention, the signal goes to a constant low level. In the default configuration, digital output 1 goes high when the motor status is OK (motor active or ready to be activated).

PROPERTIES	MINIMUM	NOMINAL	MAXIMUM	UNIT
Guaranteed output voltage levels @±1mA	0.5		4.4	V
Current draw on digital output		1	5	mA
Short-circuit current			12	mA
Tacho configuration output frequency range	100		3200	Hz
PWM out configuration output frequency range	100		1000	Hz
PWM output configuration duty cycle	1%		99%	%

PROTECTIONS

The motor control manages various protections and consequent alarms to protect you from abnormal events.

The protection that has been activated can be read in the [Motor_Status] parameter.

TYPE OF PROTECTION	DESCRIPTION	INTERVENTION LEVEL	RESET LEVEL	RESET MODE
Under-voltage power supply	Shut down the motor if the supply voltage is too low	9V	10V	Motor stop (default) or Reset Warnings/Errors from RS485
Power supply over-voltage	Stop the motor if the supply voltage is too high	30V	29V	Motor stop (default) or Reset Warnings/Errors from RS485
Over-temperature	Stops the motor if the internal temperature is too high	115°C	100°C	Motor stop (default) or Reset Warnings/Errors from RS485
Motor over-current	Stop the motor if the motor phase current is too high	N.A.	N.A.	Motor stop (default) or Reset Warnings/Errors from RS485
Internal error	Hardware failure or malfunction	N.A.	N.A.	Motor stop (default) or Reset Warnings/Errors from RS485
Current limit	This is the level at which the current on the motor phases is limited. Motor operation is not interrupted. If the motor operates at a phase current higher than the nominal value, a warning flag is recorded	5.6 Arms limit 4.3 Arms warning	N.A.	No reset required Warning flag cancellable with Motor stop (default) or Reset Warnings/Errors from RS485
Under-temperature	If the motor operates at a temperature below this threshold, a warning flag is recorded	-15°C	N.A.	No reset required Warning flag can be cleared with motor stop (default) or Reset Warnings/Errors from RS485

RS485 COMMUNICATION CONFIGURATION AND FIELD BUS (MODBUS)

The motor is equipped with a half-duplex, “master-slave” serial communication channel on an asynchronous RS-485 line.

The interface can be used to configure the operating parameters and load the PLC program (referred to as Fluid-Logic) to execute custom functions. The Fluid-o-Tech configuration tool to be used is Fluid-Control Studio. See the dedicated manual for use.

By default, the motor serial address is 1 and the BAUD Rate is 115200bps 8N1.

The parameters that can be read and configured are as follows:

INDEX	VARIABLE NAME	TYPE	MULTIPLIER AND PHYSICAL UNIT	RANGE	DESCRIPTION
0	Memory in Use	R		0: default 1: user	If 0, the motor is operating with the default Fluid-Logic parameters and program If 1, the motor is operating with userdefined Fluid-Logic parameters and program
1	Info	R			Internal use
13	Analog IN	R	0.001 V 0.004 mA for 4-20mA	0 to 10000	Voltage applied to the analog input COMMAND
14	IN 1	R		0: low level 1: high level	Logic level on digital input 1
15	IN 2 (COMMAND)	R		0: low level 1: high level	Logic level on COMMAND input when used as digital
16	IN Duty	R	0.1 %	50 to 950	Duty cycle of the digital signal applied to digital input 1
17	IN Frequency	R	Hz	100 to 1000	Frequency of the digital signal applied to digital input 1
18	Temperature	R	0.1 °C	-15 to 1200	Temperature measured on the motor control board
19	Supply Voltage	R	0.01 V	0 to 4000	Supply voltage on pin +24V
20	Speed Meas	R	RPM	-8000 to 8000	Actual motor speed estimated by motor control
21	Speed Meas AUX	R	RPM	-8000 to 8000	Actual engine speed measured by physical sensor
22	Tacho Out	R	Hz	-4500 to 4500	Frequency reproduced by the tachometer output
23	Motor Status	R		0: Idle 2: Aligment 4: Start 6: Run 8: Stop 11: Fault over 16: Charge boot cap 17: Offset calib 19: Switch over	0: Motor ready to start 2: Internal use 4: Start phase 6: Motor rotating and controlled 8: Stop phase 11: Fault 16: Internal use 17: internal use 19 internal use
24	Phase Current	R	%	0 to 200	Percentage ratio between phase current and rated motor current

INDEX	VARIABLE NAME	TYPE	MULTIPLIER AND PHYSICAL UNIT	RANGE	DESCRIPTION
25	Phase Voltage	R	%	0 to 150	Percentage ratio between motor phase voltage and supply voltage (modulation index)
26	IQ	R	0.01 Arms	-800 to 800	Measured motor quadrature current (torque). RMS value.
27	ID	R	0.01 Arms	-800 to 800	Direct axis current (drainage) of the motor measured. RMS value
28	Warning/Errors Warning: Motor overcurrent may occur if the motor operates outside the permitted range in the operating characteristic graph or with low supply voltage. Supply over voltage (may occur if the deceleration ramp is too fast).	R		Bitfield: 0 – FOC Duration 1 – Over voltage 2 – Under Voltage 3 – Over Temperature 4 – Start-up fail 5 – Speed feedback 6 – Over current 7 – Software Error 8 – Warning Under Temperature	 0 – Indoor use 1 – Over voltage power supply 2 – Under Voltage power supply 3 – Over temperature 4 – Indoor use 5 – Internal use 6 – Motor overcurrent 7 – Internal use 8 – Warning Under Temperature: ambient temperature is below -15°C (does not interrupt operation) 10 – internal use 11 – Warning limit current (does not interrupt operation). The motor has operated with a current level higher than the nominal value
29 30 31	X rms Y rms Z rms	R	0.00195 g	-2048 to 2047	RMS acceleration value measured by the sensor inside the motor (optional)
36 37 38	X Y Z	R	0.00195 g	-2048 to 2047	Instantaneous acceleration value measured by the internal motor sensor (optional)
43 44 45 46 47 48 49 50 51	Constant_0 Constant_1 Constant_2 Constant_3 Constant_4 Constant_5 Constant_6 Constant_7 Constant_8	R		0 1 2 -1 10 100 1000 1024 32767	Constant values usable by Fluid-Logic
52 53 54 55 56	Life Run MSB Life Run LSB Starts MSB Starts LSB Max temperature	R	S # 0.1 °C		52-53 Total usage time in engine life 54-55 Number of engine starts accumulated during the engine's lifetime 56 Maximum temperature recorded during the engine's lifetime

INDEX	VARIABLE NAME	TYPE	MULTIPLIER AND PHYSICAL UNIT	RANGE	DESCRIPTION
66	Opcode. Software commands. Normally managed by the Fluid-Control Studio tool. Commands are only executed if the status of Pr23 is "STOP."	W		0x0000 – Idle 0x0001 – Reboot 0x0002 – Enable FluiLogic Default 0x0003 – Enable FluiLogic User 0x0004 – Unlock Level 1 0x0005 – Lock Level 1 0x0006 – Save RW register User 0x0007 – Erase RW register User	0 – The motor is ready to receive commands 1 – Software restart 2 – The default Fluid-Logic program is used 3 – The user-defined Fluid-Logic program is used 4 – Writing of RS485 serial (Modbus) configuration parameters is enabled 5 – Writing of RS485 serial (Modbus) configuration parameters is blocked 6 – Parameters are saved in nonvolatile memory 7 – Default parameters are loaded
87	Device_ID	R/W		1 to 247 – Default 1	MODBUS address of the motor
88	BAUD_Rate	R/W	bps	0: 115200 1: 57600 2: 38400 default: 115200	Serial communication speed. Must be configured as the communication master (also applies to the Fluid-Control Studio configuration tool)
89	Parity_bit	R/W		0: None 1: Even 2: Odd default: None	Type of parity used in the serial message
90	Stop_bit	R/W		0: stopbit 1 1: stopbit 2 default: stopbit 1	Type of stop bit used in the serial message
96	Digital Output 1 Cfg	R/W		0: Tacho/Fault 1: General Purpose 2: PWM Out Digital Output default: Tacho/Fault	Configuration of the function performed by digital output 1. If 0, the output performs the phonic wheel simulation. It is set to low in case of error and to high when the motor is stopped. If 1, the output level is set by Pr111. If 2, the pin functions as a PWM generator with frequency and duty set by Pr100 and Pr101
97	Enable Input 4-20mA	R/W	Boolean	0: mode disable 1: mode enable default: disable	If 0, the analog COMMAND input is configured for 0-10V; if 1, the COMMAND input is configured for 4-20mA
98	Tacho Resolution	R/W		From 0 to 31 default:0 Internally add 1, 0 corresponds to 1	Number of pulses per revolution with which the phonic wheel is simulated. Set the desired value to -1. The default value is 31 for 32 pulses/revolution
99	Tacho output selection	R/W		0: Tacho output 1: Tacho output AUX Default: 0	Speed measurement used to generate the tachometer signal. Pr20 or Pr21
100	PWM Output frequency	R/W	Hz	100 -1000	Operating range 100 Hz – 1000 Hz

INDEX	VARIABLE NAME	TYPE	MULTIPLIER AND PHYSICAL UNIT	RANGE	DESCRIPTION
101	PWM Output Duty	R/W	d%	10 - 990	Duty cycle from 1 to 99% expressed in tenths
102	Start Stop	R/W	-	0: Stop 1: Start Default: Stop	If 0, the motor is commanded to stop (inverter disabled). If 1, the motor is commanded to start (inverter enabled)
103	Speed Set Point	R/W	rpm	-5300 to 5300 Default: 0	Motor speed reference. Normal pump operation is given for positive speeds
104	Slope UP	R/W	0.1 RPM/s	3 to 6000 Default: 1000	Defines the maximum acceleration and deceleration gradient of the motor speed. Example: for a ramp from 0 to 3000RPM in 2s, set slope = 3000RPM / 2s * 0.1 = 150
105	Slope DOWN	R/W	0.1 RPM/s	3 to 6000 Default: 1000	Defines the maximum deceleration gradient and deceleration of the motor speed. Example: for a ramp from 0 to 3000RPM in 2s, set slope = 3000RPM / 2s * 0.1 = 150
106	Very low speed current	R/W	0.01 Arms	50 to 800 Default: 200	Current reference at very low speeds. RMS value. For viscous liquids or very fast acceleration ramps, an increase to 400 is necessary
107	Flux Weakening Percent	R/W		50 – 120 default: 120 (the algorithm does not intervene)	PWM modulation index for which the algorithm is activated Drainage. Allows high-speed operation even with low supply voltage. If necessary, set between 80 and 100, checking that the phase current does not exceed 100%
108	Speed Current Limit	R/W	0.01 Arms	50 to 800 Default: 560 (max)	Motor current limit. RMS value. Useful for limiting torque and therefore maximum fluid pressure
109	Speed KP	R/W	Count	1 to 32767	Integral gain of the speed PI controller
110	Speed KI	R/W	Count	1 to 32767	Value of output 1 when set as general purpose
111	Output 1	R/W	Boolean	0: Low level 1: High level default: Low level	Valore dell'uscita 1 quando impostata come general purpose
112	Output 2	R/W	Boolean	0: Low level 1: High level default: Low level	Output value 2
113	Timer Value 0	R/W	ms	10 to 32767	Timer 0 available to the Fluid-Logic program. After setting the initial value in milliseconds, the counter starts counting down to zero. The 100 Hz control decrements the counter in 10 ms steps
114	Timer Status 0	R/W	Boolean	0: Elapsed 1: Running	If 0, the value of Timer_Counter_0 is zero. If 1, the value of Timer_Counter_0 is greater than zero
115	Timer Value 1	R/W	ms	10 to 32767	Timer 1 available to the Fluid-Logic program. After setting the initial value in milliseconds, the counter starts counting down to zero. The 100 Hz control decrements the counter in 10 ms steps
116	Timer Status 1	R/W	Boolean	0: Elapsed 1: Running	If 0, the value of Timer_Counter_1 is zero. If 1, the value of Timer_Counter_1 is greater than zero
117 118 119 120	Osc 0 Osc 1 Osc 2 Osc 3	RW	The same as the selected variables	Default 101 – Speed Meas 26 – IQ (torque) 19 – Supply Voltage 18 – Temperature	These parameters take on the values of the selected variables and are updated every 10 ms. The values are displayed on the oscilloscope traces
121	Fluid-Logic Status	R/W	Boolean	0: Disable 1: Enable 2: Resume Default: Enable	If 0, the Fluid-Logic program is not executed If saved as 1, the Fluid-Logic program runs at startup. When changing from 0 to 1 without restarting, the program is not executed. If changed from 0 to 2, the Fluid-Logic program runs immediately but does not run if the status is 2 at restart
122	Reset Warnings/ Errors	RW		0: Idle 1: Reset	Reset errors and warnings. Motor ready to start again
123 124 127 128	PI FL Kp PI FL Ki PI FL Upper Output Limit PI FL Lower Output Limit				PI settings available in Fluid-Logic. Pr123 and Pr124 are the gains of the controller Pr127 and Pr128 are the maximum and minimum values to be assigned to the regulator output. The regulator is used via Fluid-Logic instructions
129 … 138	Free_0 … Free_9	R/W	Count	-32768 to 32767	Variables available to the Fluid-Logic program
144 145 … 344	Commands 0 Cmd I Data a Command 0 Data_b I Data c	R/W			List of up to 100 Fluid-Logic program instructions (for each instruction there are 2 registers to write)

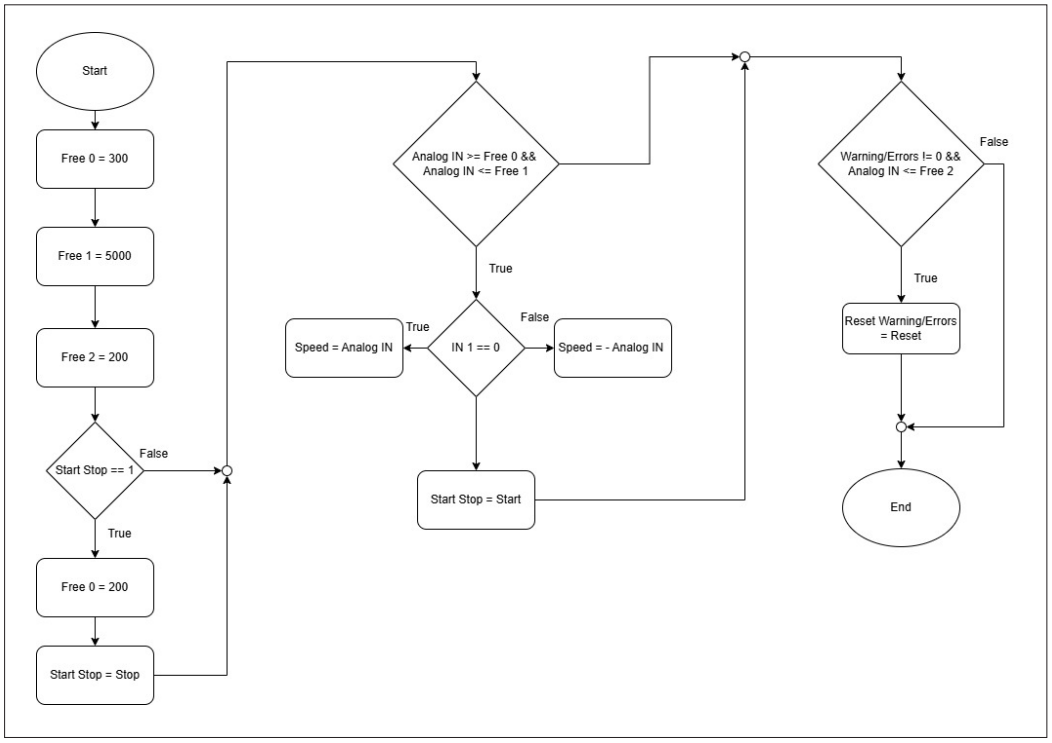
For more details, see the dedicated manual (Modbus)

PROGRAMMING: FLUID-LOGIC

The internal Fluid-Logic programmable area is the means by which it is possible to connect the external world (inputs/outputs) with the pump control and create operating modes dedicated to your application.
For example, with Fluid-Logic it is possible to copy a digital or analog input to a pump control parameter, perform mathematical and Boolean operations. The PLC program must be entered as a list of instructions via serial port using the Fluid-Control Studio configuration tool. The default configuration corresponds to a Fluid-Logic program that satisfies standard applications and performs identically to FG series pumps (MGFR6 motor). The main features of Fluid-Logic are:

- Program steps = 100. This is the maximum number of code that can be used.
- 10 ms scan period. Input readings, output updates, and motor operating parameters are updated every 10 ms.
- 16-bit mathematical operations. All usable variables are fixed point with values between -32768 and 32767.
- 2 configurable 16-bit timer resources. The maximum value is 32767 ms and they are updated at each program scan (every 10 ms).
- 9 predefined constants and 10 variables available to the user.
- Configurable PI controller.

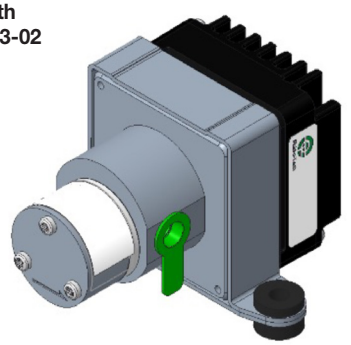
See the dedicated manual (Modbus) for usage and syntax. Default Fluid-Logic program:



HYDRAULIC CIRCUIT OPERATING CONDITIONS

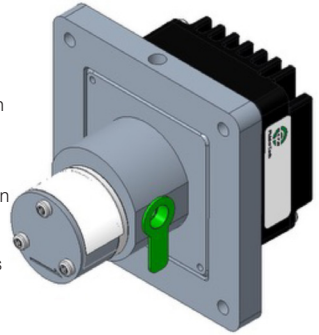
Ensure that the pump material is compatible with the fluid. Fluid-o-Tech pumps are designed to handle clean water under the conditions specified in this manual.
Use with any other type of fluid and/or operating conditions must be approved by Fluid-o-Tech.
It is strongly recommended, especially during suction, to use a pipe with an internal diameter suitable for the pump capacity, in order to avoid cavitation and consequent damage to the pump. The delivery pressure must not exceed 12 bar under any circumstances. The delivery pipe must therefore be able to withstand a pressure of 12 bar.
A minimum safety factor of 1.5 is recommended. It is also recommended to install a filter upstream of the pump, capable of retaining solid particles larger than 10 µm that could cause rapid wear of internal components. The filter must be sized to minimize hydraulic losses to the circuit. It is also important to check the filter cartridge periodically. To monitor the condition of the filter, It is recommended to install a vacuum gauge downstream of the pump. If the vacuum exceeds 0.1 bar, the cartridge must be cleaned or replaced. A dirty filter or insufficient water intake could cause cavitation and premature wear of the pump's internal components. Although gear pumps are selfpriming, they should only be operated under pressure.
Operation without fluid causes premature wear of the pump's internal components.
If the water supply is subject to low pressure or lacks flow, a pressure switch must be installed upstream of the pump in order to shut down the motor in such situations. It is also necessary to protect the system from accidental overpressure with safety devices such as a bypass valve or a pressure switch connected to the motor. The installation of solenoid valves in the circuit is not recommended. If it is essential, the solenoid valve can only be installed downstream of the pump.
Pay attention to the pressure loss introduced by the presence of the solenoid valve. To avoid pressure peaks, the flow to the solenoid valve must only be blocked after the pump has come to a complete stop.

Mounting with bracket 94-83-02



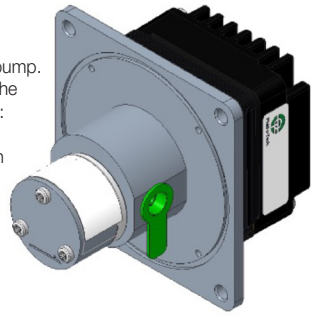
Mounting with frame 94-83-01

Secure the frame to the stator (black section 12 mm) with 2 M5 grub screws on both sides. Use the 4 holes with a diameter of 5 mm on the corners of the frame to secure the unit with M4 screws



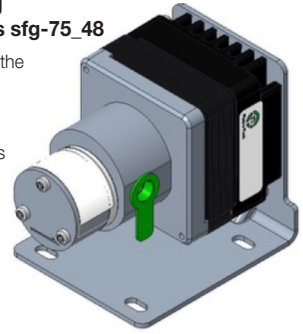
Wall mounting sfg-75_62

The wall flange is integrated into the pump. The dimensions of the Oring are as follows: 69.57 T 1.78.
Use the 4 holes with a diameter of 5 mm on the corners of the frame to secure the unit with M4 screws



Bracket mounting sfg-75_47+screws sfg-75_48

Secure the bracket to the heat sink with M3x6 trilobe (self-tapping) DIN7500C screws.
Use the 4 slotted holes on the bracket to secure the unit with M4 screws



If the pump is equipped with a safety valve (bypass), in the event of accidental excessive pressure, this will limit the pressure thanks to internal fluid recirculation. The safety valve cannot be used as a flow or pressure regulator. If used in this way, the excess fluid will recirculate in the pump through the valve, causing wear and possible damage to the pumping parts. The maximum differential pressure must be at least 1 bar below the safety valve's calibration value. Thanks to the magnetic coupling, the pump does not require a mechanical seal to prevent leaks. This eliminates the usual problems associated with the use of mechanical seals. The maximum pressure varies with the pump model and speed. As the differential pressure decreases, the flow rate increases.

MECHANICAL AND ELECTRICAL INSTALLATION

The FGS unit is cooled by forced or natural ventilation. In the case of natural ventilation, it is necessary to leave a 20 mm clearance around the unit or connect it to a heat sink using the flanges shown in this manual.
The environment must be free of corrosive substances. In the presence of dust, the heat sink must be cleaned periodically to prevent the unit from overheating. The environmental conditions specified in this manual must be observed.
The cable gland must be pierced with an awl before inserting the cable and must adhere to the cable itself. The connector must be assembled to the wiring after inserting the cable gland.

PUMP REPLACEMENT

The replacement and maintenance of parts subject to wear and tear on the units must be carried out by a qualified technician.

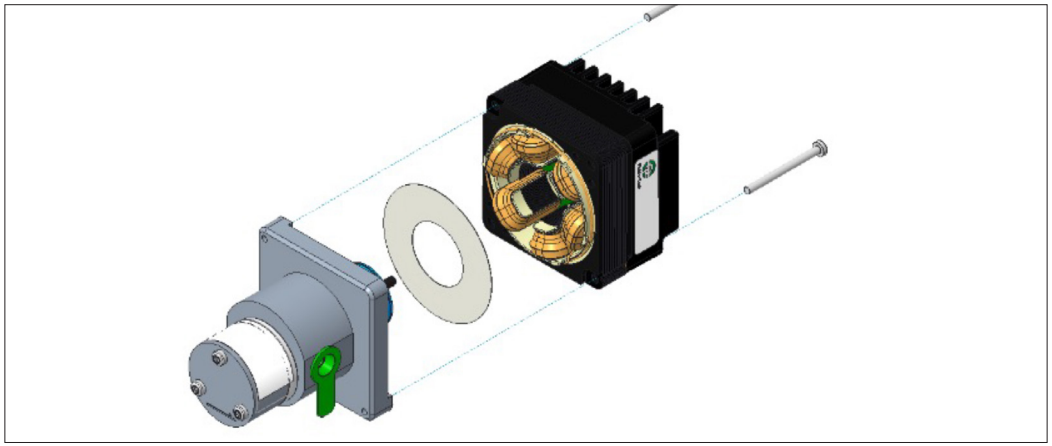
1) Unscrew the 2 screws on the rear of the motor
2) Separate the motor from the pump
3) Replace the pump or motor as necessary
4) Place the plastic film ring and gasket around the metal magnet cup
5) Tighten the 2 screws to 1 Nm ± 0.2

CERTIFICATIONS

NSF-certified FGS units are available for use with food fluids. For a list of all certified models, please refer to the official NSF website (link available at www.fluidotech.it).
The pump/motor units are considered machines and are therefore supplied with the "CE" mark and meet the requirements of the following Directives:

- Directive 2014/30/EU of the European Parliament and of the Council of February 26, 2014, on Electromagnetic Compatibility – EMC.
- Directive 2014/35/EU of the European Parliament and of the Council of February 26, 2014, on electrical equipment designed for use within certain voltage limits – DBT.
- Directive 2014/34/EU of the European Parliament and of the Council of February 26, 2014, on equipment and protective systems intended for use in potentially explosive atmospheres – ATEX.
- Directive 2011/65/EU of the European Parliament and of the Council of June 8, 2011, and Delegated Directive 2015/863 of the European Commission of March 31, 2015, on the restriction of the use of certain hazardous substances in electrical and electronic equipment – RoHS.

A Fluid-o-Tech Declaration of Conformity can be requested to certify compliance with the above Directives.



Warranty

Every new unit manufactured by Fluid-o-Tech is guaranteed to be free from defects in workmanship and materials for 18 months from the date of manufacture printed on the pump label, plus a period of 6 months covering storage and transit time, or for a maximum period of 24 months from the date of purchase until the product is first used. Under no circumstances shall this period exceed 24 months from the date of the original invoice.
Fluid-o-Tech will repair or replace, at its discretion, any part or the entire product that does not comply with this warranty. Fluid-o-Tech's liability under this warranty is limited to the repair or replacement of the defective product returned to us, provided that our analysis reveals that such part or parts were defective at the time of sale.
The warranty is void if:

- The instructions for use have been ignored.
- The unit has been disassembled or modified by personnel not employed by Fluid-o-Tech (or authorized by Fluid-o-Tech) or repaired with nonoriginal components.
- The pump has been operated without fluid or under cavitation conditions.
- Foreign solid particles have been found inside the pump.
- The maximum operating pressure has been exceeded.
- The pump has been used for an unauthorized application, in operating conditions and/or with a pumped fluid that is not compatible with the pump itself, and this application has not been specifically approved by Fluid-o-Tech.
- In the case of pumps equipped with a bypass valve, the operating pressure is less than 1 bar below the valve calibration value.

The warranty does not cover performance degradation due to normal wear and tear of components.
The adjustment or replacement of defective parts under warranty does not extend the original warranty period.

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Fluid-o-Tech srl
Via Leonardo da Vinci, 40
20094 Corsico, Milano, Italy
Tel. +39 02 9995 01
Fax +39 02 9995 0999
info@fluidotech.it

Fluid-o-Tech Int'l Inc.
161 Atwater St.,
Plantsville CT (USA) 06479
Tel. +1 (860) 276 9270
Fax +1 (860) 620 0193
info@fluid-o-tech.com

Fluid-o-Tech Int'l Inc. Japan
2nd Floor, 4-3-8, Espoir Todoroki,
Todoroki, Setagaya, Tokyo 158-0082
Tel. +81 (0) (3) 6432 1812
Fax +81 (0) (3) 6432 1813
erkkato@fluidotech.jp

Fluid-o-Tech Asia (Shanghai) Co., Ltd.
2/F, Factory building 6 (1), No. 258, Zhijiang Road,
Fengxian District, Shanghai City, Z.P.: 201499 China
Tel. +86 (021) 67100 838
Fax +86 (021) 67100 605
info@fluidotech-asia.com