GRIPHI - PIEZOELECTRIC MICROGRIPPERS

ABSTRACT

Assembly, manipulation and pick-and-place operations with small parts can be easily performed by means of the GriPhi microgrippers by Phi Drive. The piezoelectric actuation provides great accuracy and remarkable gripping force despite the small size of the device.

This Application Note describes the possible configurations of the GriPhi microgrippers and how to start working with them.

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REVISION HISTORY

List of changes from original release to current revision.

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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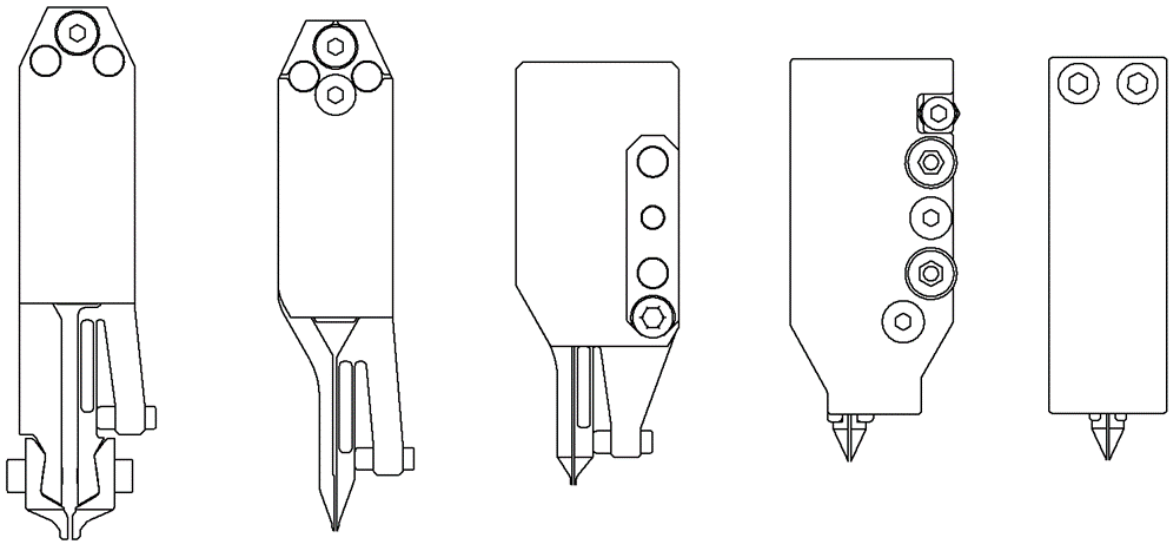
1. Types of GriPhi microgrippers

GriPhi microgrippers exist in a **wide variety of models**. Each model is identified by the combination of both morphological and functional features dictated by applications, such as sample size, actuation type or encumbrance.

Fig. 1: variety of GriPhi microgrippers



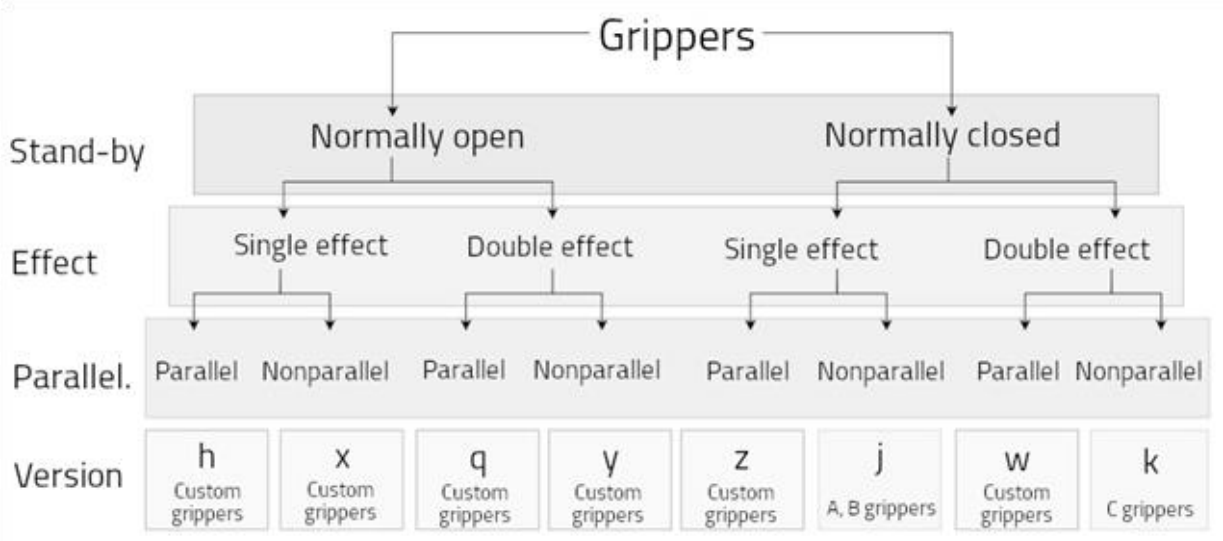
1.1. Mechanical Features

Main morphological and functional features characterizing GriPhi microgrippers are:

- **stand-by configuration**, when power supply is not provided to the grippers (*normally open/normally closed*);
- **effect** (*single effect/double effect*), whether or not one of the two gripper jaws is stationary and, therefore, whether or not it can be assumed as a position reference;
- **parallelism** of the gripper jaws, meaning if the gripper jaws stay parallel during the entire opening/closure process.

Each specific GriPhi version is a combination of these three features and it is identified according to Fig. 2.

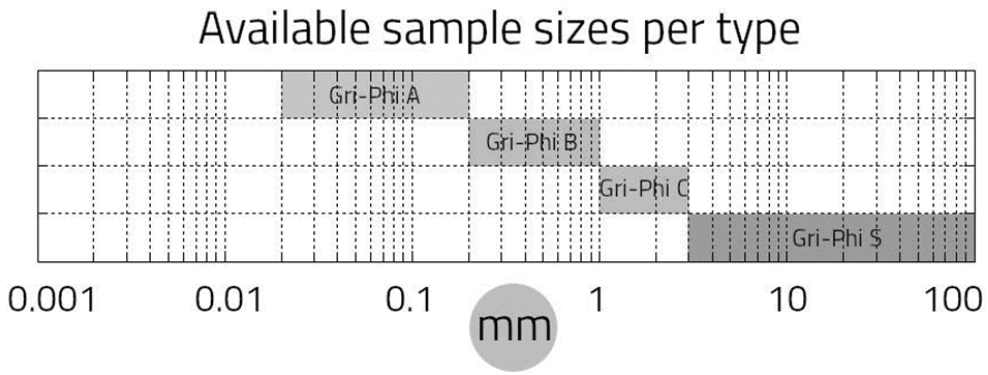
Fig. 2: types of GriPhi microgrippers



1.2. Sample sizes

Depending on the specific size of the samples to handle, one can choose the best GriPhi product from the Phi Drive collection. The current list of piezoelectric microgrippers includes products able to handle samples whose size is higher than 20 µm.

Fig. 3: GriPhi microgrippers for different sample sizes



In addition, grippers are identified also on the size of the samples to handle,:

- **A grippers** cover samples between 20 µm (0.02 mm) and 200 µm (0.2 mm);
- **B grippers** cover samples between 200 µm (0.2 mm) and 1000 µm (1 mm);
- **C grippers** cover samples between 1000 µm (1 mm) and 3000 µm (3 mm);
- higher sizes are covered by custom piezoelectric grippers (**S grippers**).

1.3. Gripper jaws replaceability

Microgrippers can be:

- **monolithic**, *M*, with irreplaceable gripper jaws;
- **interchangeable**, *I*, witch replaceable gripper jaws.

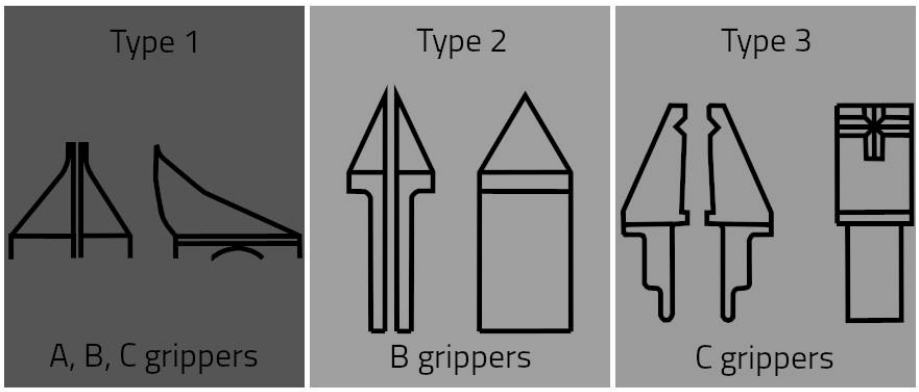
A grippers include only the monolithic solution, while B and C grippers allow both the M and the I configurations.

1.4. Gripper jaws

Gripper jaws are classified into four different categories.

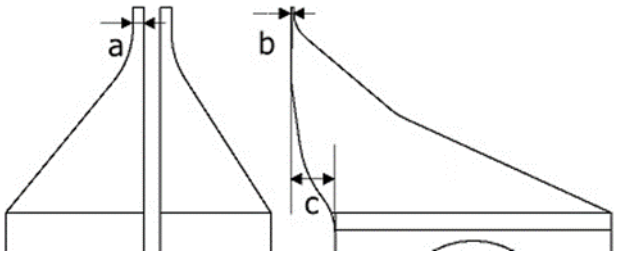
- **type 0** includes custom gripper jaws. They are available for B and C grippers;
- **type 1** includes monolithic gripper jaws which are available for A, B, and C grippers;
- **type 2** includes interchangeable gripper jaws which are available for B grippers;
- **type 3** includes interchangeable gripper jaws which are available for C grippers.

Fig. 4: types of grippers jaws



1.5. Type 1 standard dimensions

Fig. 5: Type 1 grippers standard dimensions



a: 0.5 mm – **b**: 0.6 mm – **c**: 1 mm

2. Product code

Given the previous classification of the GriPhi microgrippers, the product code is made as follows:

GRIPHI-XY

- X represents the type of gripper, according to Fig. 2;
- Y represents the required sample size, according to Fig. 3;

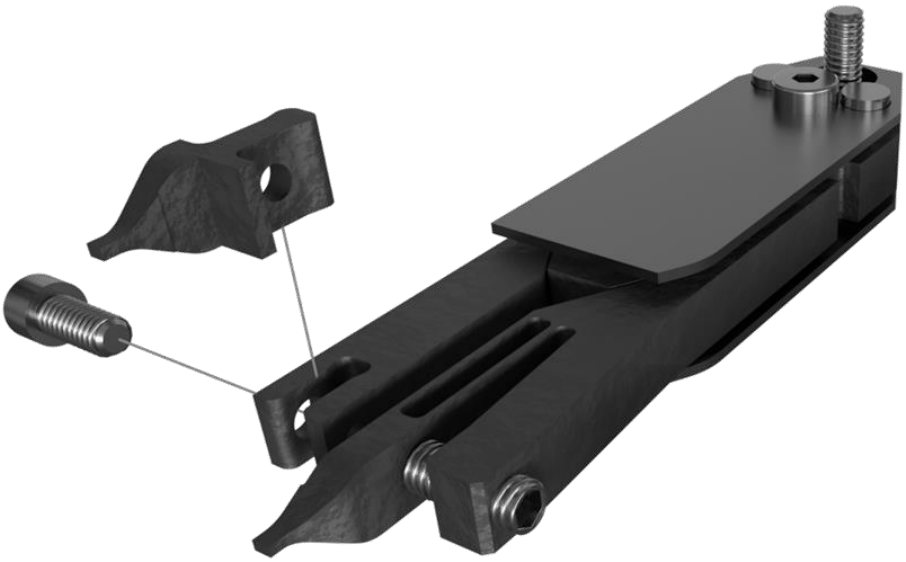
3. Usage

The GriPhi microgrippers can be easily put into service after appropriate hardware and software tuning.

3.1. GriPhi hardware setup

While the monolithic solution is focused on a single sample size, the GriPhi microgrippers with interchangeable jaws can manipulate samples of various sizes. Depending on the specific needs, one can replace a pair of jaws with different ones, thus obtaining a different initial opening. An M2.5x5 screw guarantees a solid pairing between each jaw and the gripper body.

Fig. 6: interchangeable jaws insertion and removal



After inserting the right jaws, fine tuning on the initial opening can be performed by means of an M3x8 grub screw. If *x* is the sample size, the initial opening should always be equal to $x - y$, where $y > 0$ is accurately selected to provide the correct amount of gripping force.

Fig. 7: location of the grub screw and attachment screw

An M3 attachment screw makes it possible to connect the GriPhi assembly to the customer's equipment. Microgrippers can be used both vertically and horizontally; however, Type 1 and similar jaws are optimized for horizontal usage, while other jaws can be used with good results in both cases.

3.2. GriPhi software setup

The GriPhi microgrippers can be easily actuated by means of GriPhi Driver. Additional information about GriPhi Driver and how to operate it can be found in AN0002 and AN0003.

NOTES:

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