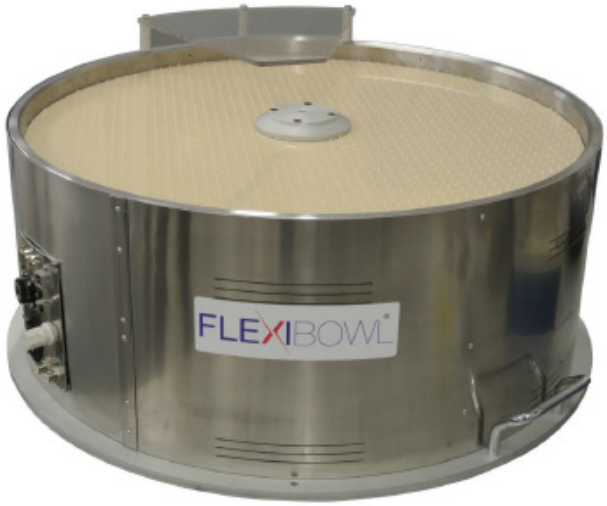
INSTRUCTIONS FOR USE AND WARNINGS

ENGLISH TRANSLATION OF THE ORIGINAL INSTRUCTIONS



FlexiBowl®

models 350 - 500 - 650 - 800

Year of Manufacture	2019

Revision 1.0 - Edition 01/2019

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INTRODUCTION

The Manufacturer is in no way responsible for the consequences resulting from any incorrect operations carried out by the user.

EDITOR'S NOTE

This documentation is specifically intended for technicians; therefore, some of the information that can easily be understood from reading the texts and analysing the drawings might not be detailed further.
The Editor is in no way responsible for the information and data in this manual: all of the information contained herein has been provided, checked and approved by the Manufacturer.
The Editor is in no way responsible for the consequences resulting from any incorrect operations carried out by the user.

GENERAL OBSERVATIONS

All of the operating and maintenance instructions and recommendations described in this manual must be followed. To obtain the best results, the Manufacturer recommends that the cleaning and maintenance operations be carried out regularly to keep the system in perfect working order.
It is particularly important to train staff in charge of the machine on its use, as well as on maintenance and monitoring compliance with the operating procedures and with all of the safety regulations set forth in this manual.

Revision: 1.0
Edition: 01/2019

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1. IDENTIFICATION

1.1 Manufacturer's ID

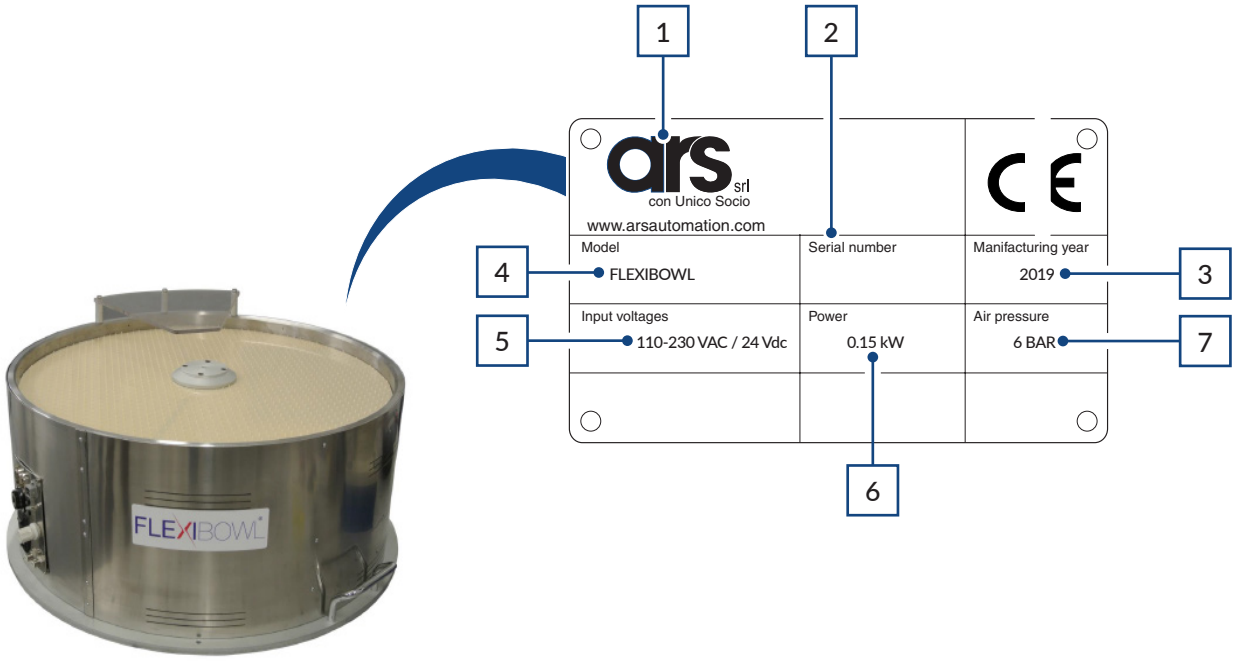
Manufacturer	ARS S.r.l.
Address	Via P.Gobetti, 19 52100 Arezzo (AR) - Italy Tel. +39 0575 398611 - Fax +39 0575 398620 info@arsautomation.com - www.arsautomation.com

1.2 Identification of the machine

Machine	FlexiBowl®
Model	350 - 500 - 650 - 800
Year of Manufacture	2019

1.3 Identification plate

The machine has an identification plate on its casing.
The plate bears the machine's identification data to be given to **ARS S.r.l.** in case of need.



Pos.	Element
1	Manufacturer's Logo
2	Serial no.
3	Year of manufacture
4	Machine model
5	Input voltage
6	Power
7	Air pressure

CAUTION!
It is strictly forbidden to remove the CE plate and/or replace it with another plate. If the plate is damaged or removed accidentally, the customer must inform the Manufacturer.

1.4 EC Declaration of conformity (copy)

"CE" DECLARATION OF CONFORMITY

We

ARS S.r.l.
Via P. Gobetti, 19
52100 Arezzo (Italy)

Declare under our exclusive responsability that the Product:

FLEXIBOWL 350/500/650/800

this declaration refeers to, compliant with the following standards or with other regulations:

DLGS 17/2010
2006/42/EC: "Partly completed machinery"

In compliance with the directive 17/2010 including the use of 2006/42/EC.

We also hereby declare that the machinery described above is intended to be incorporated into other machinery and must not be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity with the essential health and safety requirements of Council Directive 2006/42/EC.

Place: Arezzo Signature:

Date: Full Name: Marco Mazzini

1.5 Reference directives

The machine supplied by **ARS S.r.l.** does not fall under one of the machine categories listed in Annex IV of the Directive; therefore, for the purpose of certifying compliance of the machine with the provisions of this Directive, **ARS S.r.l.** applies the conformity assessment procedure with internal control of machine manufacturing, as set forth in Annex VIII.
To certify compliance of the machine with the provisions of the Directive, before placing it on the market **ARS S.r.l.** carried out the risk assessment in order to verify compliance with the essential health and safety requirements of the Directive as well as the tests and inspections required by the applicable reference standards.
The technical construction dossier was prepared in compliance with the provisions of Annex VII of **Directive 2006/42/EC** and is available for inspection by the supervisory bodies upon a reasoned request, as required by the legal provisions in force.

ARS S.r.l. therefore places the machine on the market together with:

CE Marking	
EC Declaration of Conformity	
Instruction manual and safety warnings	(Documentation prepared according to section 1.7.4 of Machinery Directive 2006/42/EC)

it should also be noted that the machine has been designed in compliance with the following Directives:

2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive

2. GENERAL PRELIMINARY INFORMATION

2.1 Recipients

The manual is intended for operators in charge of using and controlling the machine throughout all stages of its technical life.

It contains topics that refer to correct use of the machine, in order to maintain its functional and qualitative features unchanged over time. It also contains all of the information and warnings needed for safe and correct use.

The manual, like the EC certificate of conformity, is an integral part of the machine and must always accompany it if it is relocated or resold. It is the responsibility of the user to keep this documentation intact so that it can be consulted throughout the machine's service life.

2.2 Supply and storage

The manual is supplied in**paper and electronic format.**

All of the additional documentation (wiring and pneumatic diagrams, sub-supplier manuals) are provided attached to this manual.

Store this manual with the machine so that it can be easily consulted by the operator.

The manual is an integral part for safety purposes, therefore:

- **it must be stored intact** (in its entirety). If it is lost or damaged, immediately request another copy;
- **it must follow the machine until it is scrapped** (even if it is relocated, sold, hired, etc.);
- **the attached manuals are an inherent part of this documentation**, therefore the same recommendations/requirements contained in this manual apply to them.

The **Manufacturer** declines any liability for improper machine use and/or for damages caused following operations not specified in the technical documentation.

2.3 Updates

If the machine requires modifications or functional replacements, the Manufacturer is responsible for reviewing or updating the manual. The Manufacturer is in charge of delivering the updated manual.

Moreover, if this document is altered in any way by the Manufacturer, the user is responsible for ensuring that only the updated version of the manual is actually made available in the points of use.

2.4 Language

The original manual is written in **Italian.**

Any translations into additional languages must be done from the original instructions.

The Manufacturer shall be held responsible for the information in the original instructions; translations into different languages cannot be completely verified, therefore, if an inconsistency is found, please follow the text in the original language or contact our Technical Documentation Office.

2.5 Operators

In order to establish with certainty what the skills and qualifications are of the operators assigned with the various tasks (start-up, cleaning, routine maintenance), see the table below:

Qualification	Definition
Operator	User's trained staff who are qualified to use and run the machine for production purposes for the activities it was built and supplied for. Must be able to perform all of the operations required for smooth operation of the machine and to safeguard himself/herself and any coworkers. Must have proven experience on correct use of this kind of machine and be duly trained, informed and instructed. If in doubt, he/she must report any anomalies to his/her supervisor. **Note:** he/she is not authorised to carry out any maintenance work.
Mechanical Maintenance Technician	Qualified technician able to carry out preventive/corrective maintenance work on all mechanical parts of the machine subject to maintenance or repairs. Qualified technician able to access all parts of the machine for visual inspections, control of equipment status, adjustments and calibrations. Qualified technician able to: • run the machine as an operator; • work on the mechanical parts for adjustments, maintenance and repairs; • read pneumatic and hydraulic diagrams, technical drawings and spare parts lists. In extraordinary cases, he/she is trained to operate the machine with reduced safety devices. Where necessary, he/she can give the operator instructions on how to use the machine properly for production purposes. **Note:** he/she is not qualified to work on live electrical systems (if present).
Electrical Maintenance Technician	Qualified technician able to carry out preventive/corrective maintenance work on all electrical parts of the machine subject to maintenance or repairs. Qualified technician able to access all parts of the machine for visual inspections, control of equipment status, adjustments and calibrations. Qualified technician able to: • run the machine as an operator; • work on the adjustments and electrical systems for maintenance, repairs and replacement of worn parts; • read the wiring diagrams and ensure that the functional cycle is correct. Where necessary, he/she can give the operator instructions on how to use the machine properly for production purposes. He/she can work with live voltage in the electrical panels, junction boxes, control equipment, etc. only if he/she is a person in charge of an electrical installation (SP, suitable person). (See standard **EN50110-1**). He/she does not program system software such as: PLC (logic or safety), cannot change system passwords.

Expert software technician	Qualified technician able to: • carry out preventive/corrective work on all software parts of the machine; • access all parts of the machine for visual inspections, control equipment status, adjustments and calibrations. Manufacturer's qualified technician with proven experience and training on systems based on: PLC/PC drives, etc. (knowledge of programming, machine functions, etc.) for complex operations such as: • changing machine data; • creating work programs; • adjustment of drive parameters, etc. as he/she knows the production, technological and construction cycle of the supplied machine. He/she can work in the electrical panels, junction boxes, control equipment, etc. with live voltage only if he/she is a person in charge of an electrical installation (i.e. suitable person - SP) (see **EN50110-1**). The skills are electronic- and/or software-based.
Manufacturer's Technician	Qualified technician employed by the Manufacturer and/or its supplier for complex operations, as he/she knows the construction production cycle of the machine. This person intervenes following requests from the user. The skills are mechanical-based.

The qualifications indicated in the table on this page obligatorily fall under a category of persons defined as **"trained person"**.

Type	Definition
Trained Person	An individual that has been informed, instructed and trained on the job and on any hazards resulting from improper use. He/she also knows the importance of the safety devices, the accident prevention regulations and the safe working conditions.

2.6 Symbols used in the manual

In order to establish with certainty what the skills and qualifications are of the operators assigned with the various tasks (start-up, cleaning, routine maintenance), see the table below:

Symbol	Definition
	Symbol used to identify important warnings for the safety of the operator and/or the machine.
	Symbol used to identify electrical hazards.
	Symbol used to identify important information in the manual. The information also concerns the safety of staff involved in machine use.

2.7 Glossary

Technical terminology or terminology with an uncommon meaning is used in the manuals.
The terms and abbreviations used are explained below:

Term	Definition
Lifting accessories	Component or equipment not attached to the lifting machinery, allowing the load to be held, which is placed between the machinery and the load or on the load itself, or which is intended to constitute an integral part of the load and which is placed on the market separately. Slings and their components are also regarded as lifting accessories.
Failure	Different kinds of faults that prevent normal operation of machinery, of a system, etc.
Chains, ropes and webbing	Elements designed and built for lifting purposes as part of lifting machinery or lifting accessories.
Harm	Any negative consequence deriving from the occurrence of a hazardous event.
P.P.E.	Personal Protective Equipment (PPE) is clothing or equipment designed to protect the worker (operator, maintenance technician, technician, etc.) wearing it or carrying it against health and safety hazards.
Machine	An assembly, fitted with or intended to be fitted with a drive system, consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application.
Malfunction	Defective or inadequate operation of a machine or its element in performing a certain function.
Hazard	Potential source of injury or damage to health.
Safeguard	Defence against what could cause harm. An element that is placed between who may be harmed and what can cause said harm due to hazards that cannot be reasonably eliminated or due to risks that cannot be sufficiently reduced through the design. Identified as follows: • active safeguard that the operators themselves must activate (for example emergency stops) and/or wear (PPE); • passive safeguard that intervenes without human control.
Guard	Physical barrier, designed as part of the machine to provide protection.
Risk	Combination of the probability and the degree of an injury or damage to health that can arise in a hazardous situation.
Residual Risk	Risk remaining after protective and preventive measures have been implemented.
Intended use	Use of machinery in accordance with the information provided in the instructions for use.
Reasonably foreseeable misuse	Use of machinery in a way not intended by the designer, but which may result from readily predictable human behaviour.

2.8 Personal protective equipment

When working close to the machine, either for assembly operations or for maintenance and/or adjustments, it is necessary to fully comply with the general accident prevention regulations; for this reason it is important to use the personal protective equipment (P.P.E.) required for each operation.

Below is a full list of the **personal protective equipment (P.P.E.)** that may be required for the different procedures:

Symbol	Description
	**Obligation to wear safety or insulating gloves.** Indicates a requirement for staff to wear safety or insulating gloves.
	**Obligation to wear safety glasses.** Indicates a requirement for staff to wear safety glasses to protect eyes.
	**Obligation to wear safety shoes.** Indicates a requirement for staff to wear safety shoes to protect feet.
	**Obligation to wear noise protection devices.** Indicates a requirement for staff to wear headphones or ear plugs to protect hearing.
	**Obligation to wear protective clothing.** Indicates a requirement for staff to wear specific protective clothing.
	**Obligation to read the instruction manual/booklet.** Indicates a requirement for staff to read (and understand) the instructions for use and safety warnings for the machine before using it.

The clothing for operators and line maintenance technicians must comply with the essential safety requirements defined by **EU Regulation 2016/425** and the laws in force in the country of installation.

2.9 User's safe area

The **zones around the machine** are divided as follows:

Term	Description
Control zones	These are the zones where the user and the other operators can control the machine's cyclic functions (**"operator station"**), in both automatic mode and semi-automatic mode, with the control panels or to perform manual operations.
Maintenance/ adjustment zones	These are the zones where the mechanical maintenance technicians can carry out maintenance work or adjustments. These zones are considered risky and not accessible during normal machine operation. Operators must be fully aware of the safety warnings and personal protective equipment to be worn.
Danger zones	These are any zones within (or around) the machine where there are residual risks that can cause harm to people. In these zones, access is forbidden to everyone during machine operation.

The hazards and risks in these zones are protected, as much as possible, with **guards** (casings, doors) and with **safety devices** (sensors, micro switches, light curtains) which, if activated, completely shut down the machine.
However, when the machine is running, **it is strictly forbidden to work in the danger zones as some of the risks might not have been completely eliminated.**

2.10 Warranty

The full warranty terms are included in the sales contract.

The conditions set forth in the sales contract (if different) have priority over the contents of this section.

The warranty **is subject** to the following general conditions:

- **opening of packaging and installation** must be carried out in the presence of technicians authorised by the Manufacturer;
- the **first start-up and positive testing** of the installed machine must be done in the presence and under the guidance of the Manufacturer's technicians; the machine's installation/test report must be filled in.
- **the machine must be used within the limits declared** in the contract and specified in the technical documentation.
- **maintenance** must be carried out within the times and in the ways indicated in the manual, using original spare parts **ARS S.r.l.** and entrusting the operations to qualified staff.

The warranty shall be rendered **null and void** in the event of:

- failure to follow the **safety regulations**;
- failure by the user to request any **authorisations required by the applicable regulations for use**;
- installation and use of the machine in **unsuitable environments**;
- **removal or tampering** of the control and safety devices (guards, photocells, sensors, micro switches, etc.);
- **removal of or tampering** with the identification plate;
- **removal of or tampering** with the safety pictograms applied on the machine;
- **changes to the safety conditions** established by the Manufacturer in the machine management software;
- **misuse** of the machine;
- use of the machine by **untrained and/or unauthorised staff** or failure to comply with the skills of the various operators, as indicated in the manual;
- **modifications or repairs** made by the user without written authorisation from the Manufacturer;
- **tampering** of the machine's electrical or compressed air circuits;
- partial or total failure to comply with the instructions;
- **power supply faults** (electrical, compressed air, etc.);
- **failure to implement the** machine's **maintenance plan**;
- **use of non-original spare parts** or incorrect order for them;
- disposal of the machine not in compliance with the regulations in force;
- exceptional events such as floods, fire (if not caused by the machines).

IMPORTANT!
Further details may be contained in the sales contract.
The conditions set forth in the sales contract (if different) have priority over the contents of this section.

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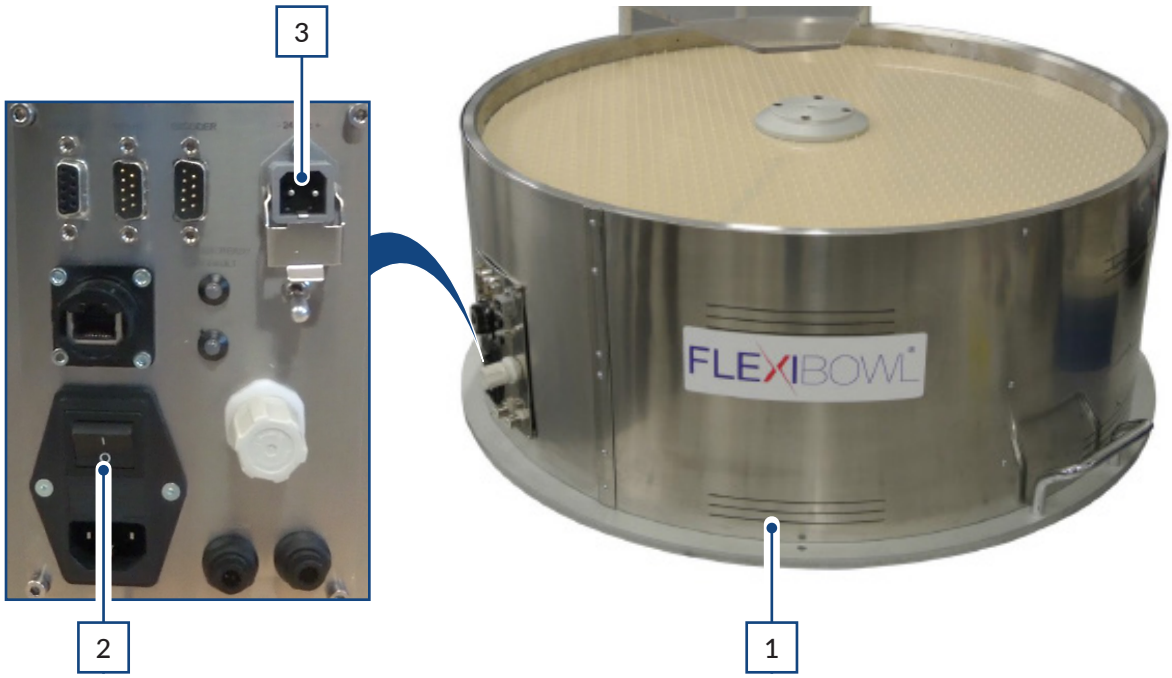
3. SAFETY MEASURES

3.1 Safety devices

To fully safeguard the operator and prevent access inside the machine while it is moving, the machine has been fitted with a number of **safety devices** which, if they are activated, completely shut down the machine. The machine is designed and fitted with safety systems to minimise risks for the operator.

The machine features the safety devices described in the table below. For the position of these devices, see the drawing on the next pages.

Pos.	Element	Description
1	FIXED GUARDS	These consist of fixed perimeter protections (casings), which have the function of preventing access to the movements of the various machine parts during the operating cycle and which can only be removed with specific tools.
2	ELECTRICAL SWITCH	IT is located on the control panel and is used to cut off the power supply in the event of: • danger to the operator's safety; • electrical hazard on the machine; • mechanical or electrical operations on the machine.
3	24Vdc/STO POWER SUPPLY	If the power supply in question is disconnected, it safely disables the FlexiBowl® controls.



CAUTION!

In case of emergency, disconnect the 24Vdc power supply connected to the control panel to safely disable the Flexibowl controls.

This power supply is directly connected to the Safety Torque Off (STO) channels of the motor control Driver.

3.2 Noise

The noise was measured in compliance with the provisions of **UNI EN 11200** and **UNI EN ISO 3746**.
During the operating cycles, **staff are exposed to a noise level of 90 dB.**

The actual noise level during operation of the machine installed on site in a production process is different to the one measured because the noise is affected by a number of factors, such as:

- type and characteristics of the site;
- type of machine that the sweeper is installed on;
- other adjacent machines in operation.

OBLIGATION!
It is mandatory to use the appropriate personal protective equipment.

3.3 Vibrations

The vibrations produced by the machine, based on its operating mode, **are not dangerous** to the health of the operators.

CAUTION!
Excessive vibrations can only be caused by a mechanical breakdown that must immediately be reported and fixed, so as not to compromise the safety of the line or of the operators.

3.4 Electromagnetic compatibility

The supplied machine contains electronic components subject to the regulations on Electromagnetic Compatibility, affected by conducted and radiated emissions.
The emission values are within the regulatory requirements thanks to the use of components that comply with the Electromagnetic Compatibility directive, suitable connections and installation of filters where necessary.
Thus the machine complies with the Electromagnetic Compatibility (EMC) directive.

CAUTION!
Any incompliant maintenance work carried out on the electrical equipment or incorrect replacement of components can compromise the efficiency of the adopted solutions.

3.5 Residual risks

The machine is designed to guarantee the essential safety requirements for the operator.

Safety has been integrated into the design and construction of the machine as much as possible; however, some risks still remain that operators must be protected from, especially during:

- transport and installation;
- normal operation;
- adjustment and tuning;
- maintenance and cleaning;
- disassembly and dismantling.

Below is a description of every residual risk, the zone or part of the machine subject to the risk (unless the whole machine is subject to the risk) and the procedural information on how to avoid it:

Risk	Description and procedural information
HAZARDS DUE TO HANDLING PICTOGRAMS: 	The handling procedures are described in the **"Transport and installation"** chapter in this instruction manual. **Residual risk:** These operations: • unloading the packaging, • opening the packaging, • handling the machine, expose the operators to the risk of suspended loads and crushing. These operations must only be carried out by staff skilled in using lifting equipment and who have been appropriately trained for this purpose.
ABRASION, CUTTING, IMPACT HAZARD PICTOGRAMS: 	Due to the presence of spikes on the surface of the belts, the operator could be exposed to the hazard of abrasion and/or cuts in case of contact with them. Wear the appropriate P.P.E. when working near these belts.
ELECTRICAL HAZARD PICTOGRAMS: 	Maintenance operations and access to the machine expose the operators to an electrical risk. Work on live equipment must only be carried out by expert and qualified staff. These safety measures should be followed: • pay full attention to the safety pictograms related to electrical risks: • do not carry out maintenance work without first cutting off the power; • consult the commercial equipment manuals for any specific instructions; • periodically inspect the equipotential bonding circuit, making sure there are no discontinuities and tightening the connection junction screws.
HAZARD FROM LIGHTING INTERFERENCES PICTOGRAMS: 	The backlight is inside the machine body, out of view of the operator, and is almost completely shielded by the guards protecting the machine's body. **Residual risk:** The operator can suffer eye damage if the intense light of the lamp is observed for a long time.

HAZARD FROM DUSTS, SPLINTERS, ETC. PICTOGRAMS: 	At the end of the work cycle, there may be residues of fed parts or dust accumulations on the machine surface. Thoroughly clean the vibrating surface after every use, as described in chapter 7 of this manual.

CAUTION!
Do not carry out any maintenance or cleaning operations unless the applied energies have been de-energised.

CAUTION!
It is strictly forbidden to remove the safety protections installed on the machine or open the fixed guards without first having disconnected the machine's electrical and air supply.

It is the responsibility of the user to:

- **analyse the risks that could occur while handling and installing on site** (the analyses carried out on handling the machine were made only taking into account its characteristics);
- **create awareness and instruct the staff involved in the operations on the work stations** and the staff involved in running the machine;
- **put visual safety signs around the workplace** after assessing the risks in the transit or control areas.

3.6 Safety pictograms affixed to the machine

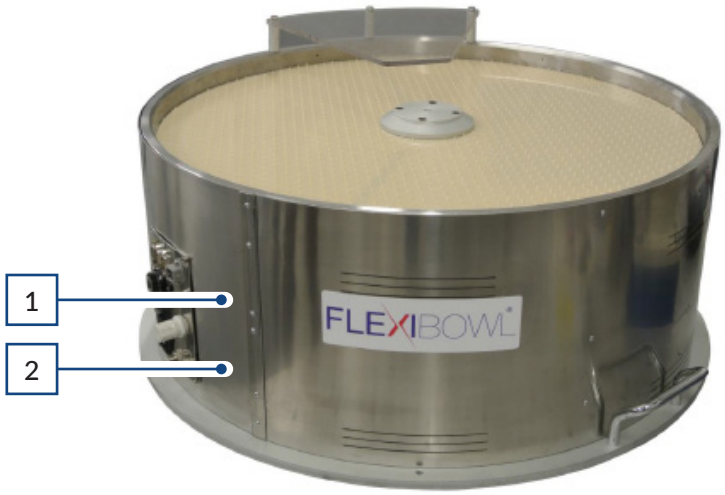
The machine has a number of pictograms affixed to it, the purpose of which is to warn the operator of any residual risks.

CAUTION!
It is strictly forbidden to remove the warning plates from the machine. ARS S.r.l. declines any liability for machine safety if this prohibition is not complied with.

CAUTION!
The user must replace the warning plates which may become illegible as a result of wear.

The table below lists the pictograms on the machine. Refer to the picture for their position.

Pos.	Pictogram	Description
1	DANGER MAINTENANCE AND REPAIR TO BE PERFORMED BY AUTHORIZED PERSONNEL ONLY	DANGER! MAINTENANCE AND REPAIR TO BE PERFORMED BY AUTHORISED PERSONNEL ONLY. Indicates a prohibition for unauthorised staff to perform maintenance work or repairs.
2	CAUTION BEFORE CLEANING OR SERVICING DISCONNECT POWER SUPPLIES	CAUTION! BEFORE CLEANING OR SERVICING, DISCONNECT POWER SUPPLIES. Indicates a prohibition to perform maintenance or cleaning operations before disconnecting the power supply.



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4. DESCRIPTION OF THE MACHINE

4.1 Intended use (correct)

FlexiBowl® is available in four models: **350**, **500**, **650** and **800**.

The machine in question is designed for industrial use for:

Operation	Permitted	Not permitted	Processing environment
HANDLING AIMED AT PICKING up:	Components of maximum variable weight and dimensions according to the machine model.	Any other component not included in the permitted range of maximum weight and dimensions.	Industrial.

IMPORTANT!
For more information on the type of components permitted, see the "Technical specifications" section in this manual.

The machine is designed to:
- meet the specific requirements indicated in the sales contract;
- be used according to the instructions and limits of use given in this manual.

The machine is designed and built to safely work if:
- it is used within the limits stated in the contract and in this manual;
- the procedures in the instruction manual are followed;
- routine maintenance is carried out within the times and in the ways indicated;
- unscheduled maintenance is promptly carried out if required;
- the safety devices are not removed and/or bypassed.

4.2 Reasonably foreseeable misuse

Reasonably foreseeable misuse is given below:
- processing liquids and fine granules;
- changing any safety-related work parameters;
- transporting people;
- using the machine as a support point;
- using the machine to obtain production values above the prescribed limits;
- changing/tampering with the machine's electrical and compressed air connections or any of its other components;
- using the machine with a product that is not listed in the **"Intended use (correct)"** section;
- using the machine in a way that is not specified in the **"Intended use (correct)"** section.

Any other machine use that is not specified must be authorised in writing beforehand by the Manufacturer. In the absence of this written authorisation, the use is considered **"improper use"**; therefore the Manufacturer declines any liability for damages caused to property or people and deems every type of machine warranty null and void.

IMPORTANT!
Improper use of the machine excludes any liability of the Manufacturer.

4.3 Obligations and prohibitions

4.3.1 Obligations of users

The user (contractor or employer) must:

- take into account the skills and conditions of the operators in relation to their health and safety;
- provide the personal protective equipment adequate for the individual procedures;
- provide standard lifting means and procedures;
- ensure that individual workers respect the company rules and regulations on safety and on use of the collective and personal protective equipment available;
- instruct staff on the procedures in case of an accident;
- instruct staff on the applicable residual risks;
- instruct staff on the devices in place for operator safety;
- instruct staff on the risks of noise emissions in the workplace;
- instruct staff on the general accident prevention rules provided for by European directives and by the legislation in the country of machine installation.

Only allow staff who have read this manual and are properly trained to work on the machine.

4.3.2 Obligations of staff in charge (operators/maintenance technicians/technicians)

Staff **must**:

- Only carry out maintenance work with the machines switched off. Not lubricate moving parts.
- When the machine is in operation, do not work near it wearing necklaces, bracelets, ties, or other clothing that could get caught in the mechanisms.
- An operator with long hair must tie it back to prevent it from getting entangled.
- Only work on the electrical panel, on the junction boxes, on the cables and on all electrical components with the main switch turned off.
- When starting the machine, make sure there is nobody inside the danger zones.
- During operation, pay the utmost attention that nobody can directly access the moving parts.
- Use the protective devices provided by the employer properly.
- Immediately report any safety device faults to the employer, manager or supervisor.

4.3.3 Prohibitions of staff in charge (operators/maintenance technicians/technicians)

Staff **must not**:

- use the machine improperly, i.e. for uses that are not specified in the **"Intended Use"** section;
- remove or change the safety devices or signs without authorisation;
- carry out operations or manoeuvres of their own initiative which do not fall under their responsibility or which can compromise personal safety or that of other workers;
- wear bracelets, rings, necklaces that can dangle and be dragged by moving parts, thereby creating danger for the operator;
- replace or change the speeds of the machine's components without authorisation from a manager;
- change the machine cycle;
- change the electrical connections to exclude the internal safety devices;
- use the machine if it has not been installed in compliance with applicable regulations;
- use the machine as a support point even if it is not working (with a risk of falling and/or damaging the machine);
- use the machine outside of the permitted environmental conditions (see **"chapter 5"**).

CAUTION!

ARS S.r.l. shall not be held liable for damage caused to property or people if:

- it is ascertained that the machine was used in one of the unpermitted environments;
- the obligations and prohibitions described herein have not been followed.

4.4 Technical specifications

Power supply specifications	
Power supply	110 - 230 Vac
Frequency	50/60 Hz
230 VAC current	6 A
24 VDC current	3 A
Auxiliary circuits input	24 Vdc

Air supply specifications	
Air pressure	6 bar
Air characteristics	• Dried • Filtered

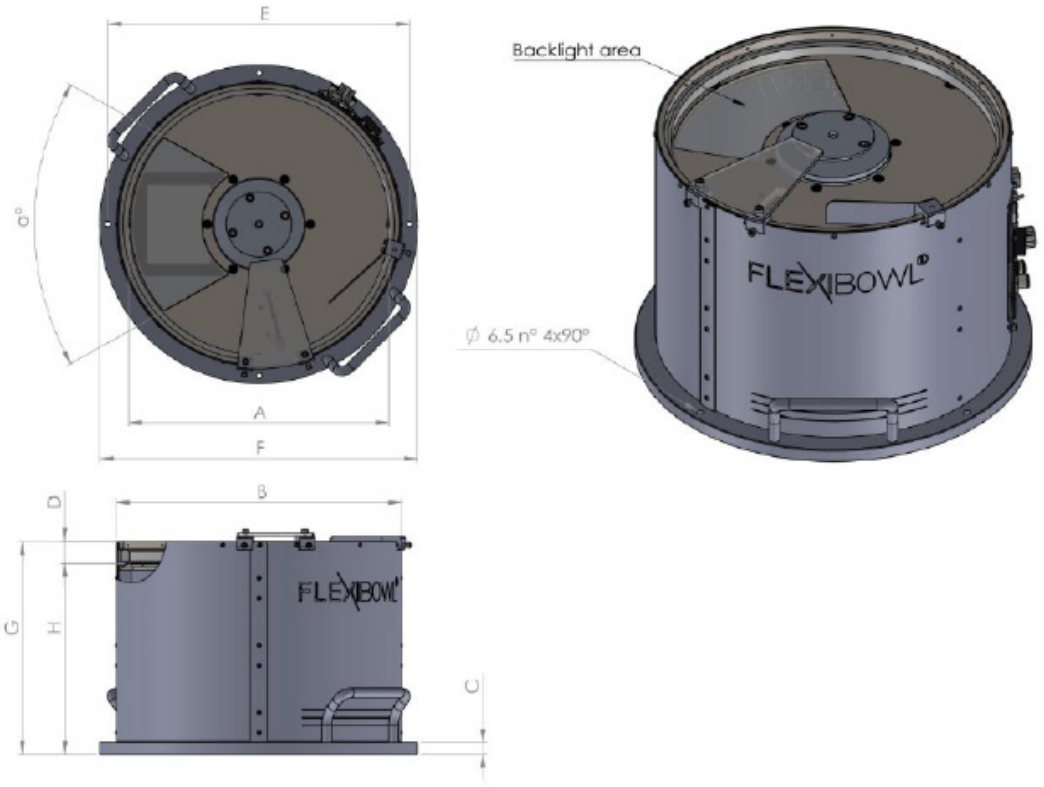
General specifications	FlexiBowl® 350	FlexiBowl® 500	FlexiBowl® 650	FlexiBowl® 800
Backlit area dimensions	177 cm^2	475 cm^2	900 cm^2	1183 cm^2
Infrared backlight	20,000 - 30,000 hours; 850 nm LED			
Ethernet ports	1			
Encoder ports	1			
Digital I/O	6 inputs, 3 outputs			

Weight	FlexiBowl® 350	FlexiBowl® 500	FlexiBowl® 650	FlexiBowl® 800
Net weight	25 Kg	36 Kg	51 Kg	71 Kg

Component specifications	FlexiBowl® 350	FlexiBowl® 500	FlexiBowl® 650	FlexiBowl® 800
Maximum single component dimension	15 mm	40 mm	110 mm	250 mm
Maximum single component weight	40 g	100 g	170 g	250 g
Maximum loading capacity	3 kg	5 kg	5 kg	5 kg

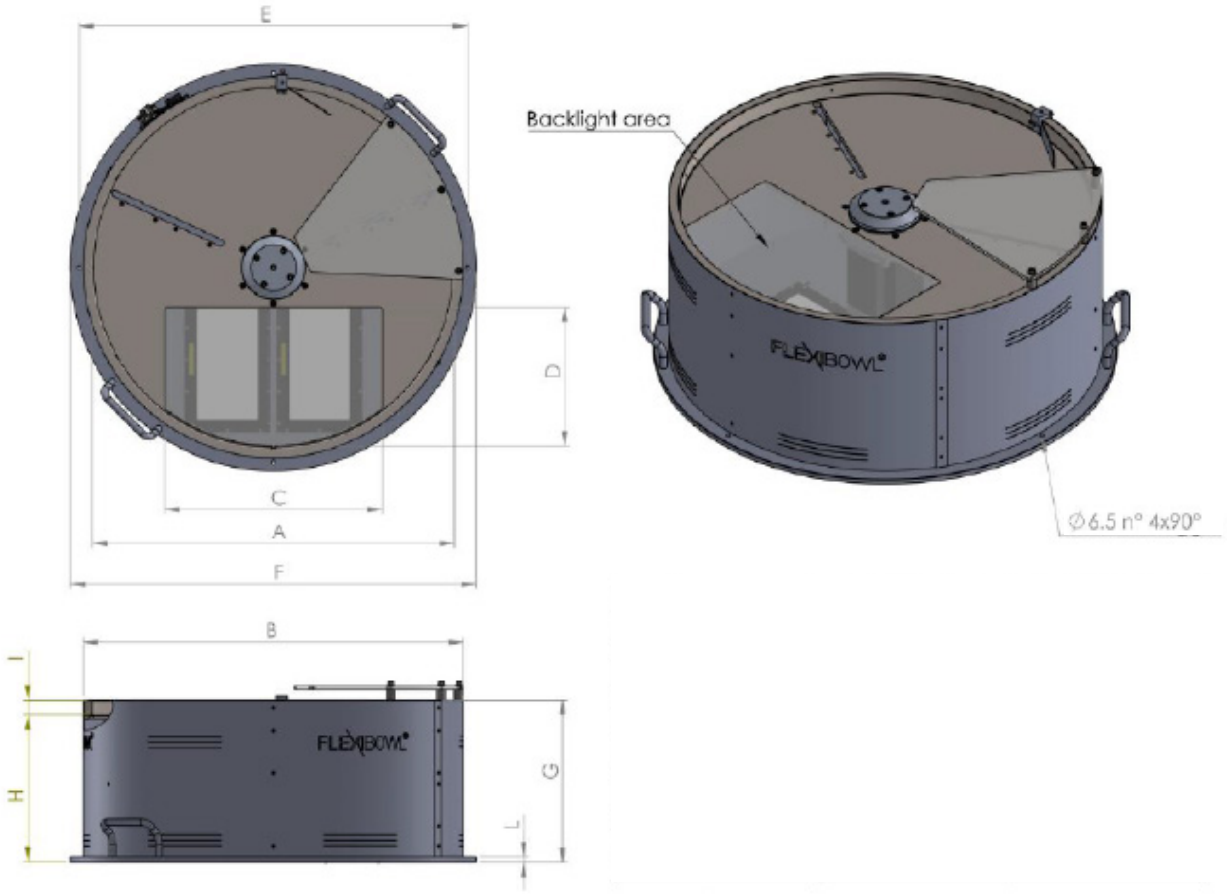
4.5 Layout of measurements

4.5.1 FlexiBowl® version 350 - 500



Reference	FlexiBowl® 350	FlexiBowl® 500
A	325 mm	500 mm
B	360 mm	533 mm
C	15 mm	10 mm
D	26.5 mm	28 mm
E	384 mm	560 mm
F	404 mm	580 mm
G	268.5 mm	267 mm
H	242 mm	239 mm
α°	58°	88°
Backlight Area	17700 mm^2	47500 mm^2

4.5.2 FlexiBowl® version 650 - 800

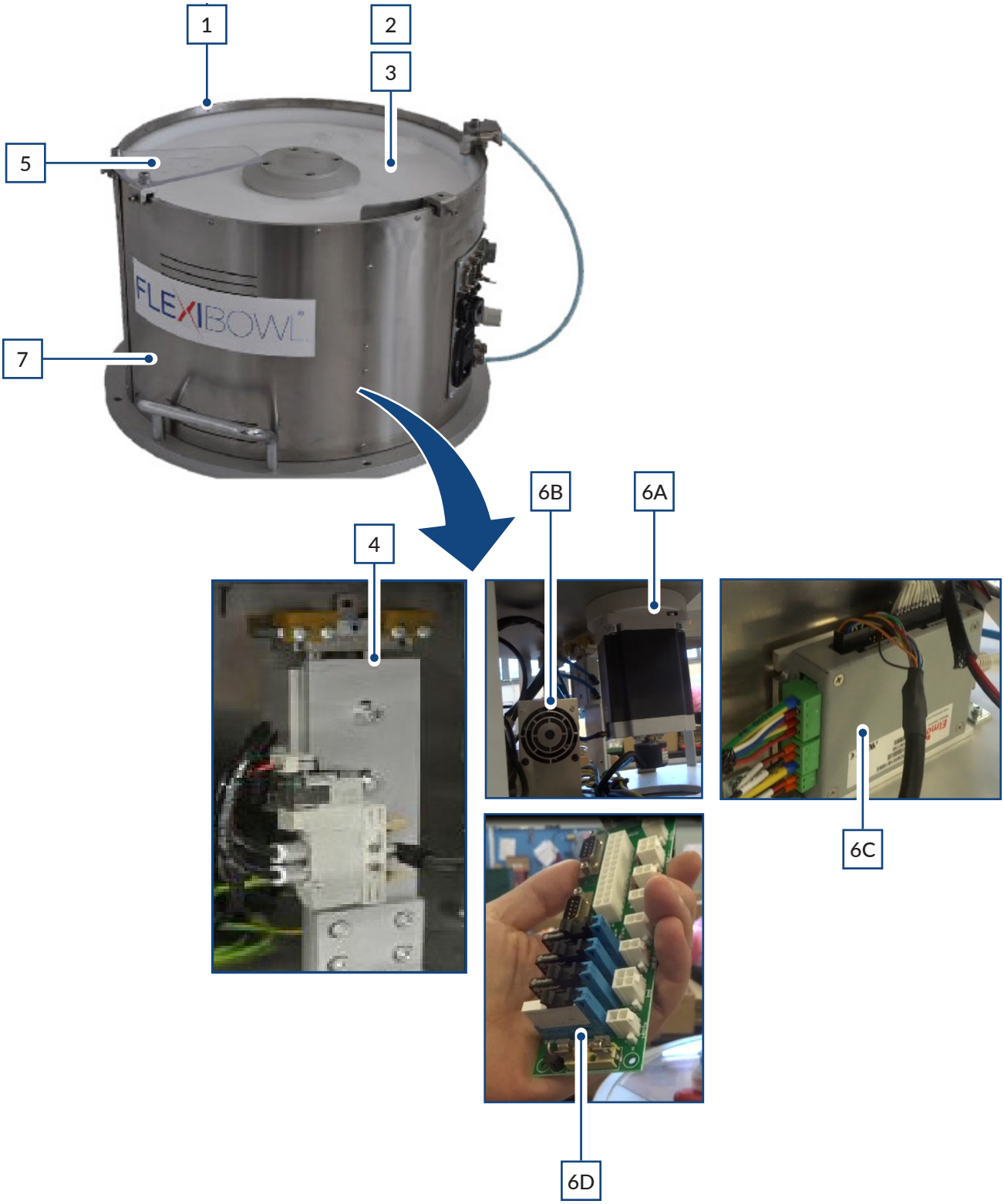


Reference	FlexiBowl® 650	FlexiBowl® 800
A	660 mm	810 mm
B	690 mm	840 mm
C	391 mm	391 mm
D	347 mm	312 mm
E	709 mm	858.5 mm
F	740 mm	890 mm
G	296 mm	296 mm
H	268 mm	258 mm
I	28 mm	28 mm
L	10 mm	10 mm
Backlight Area	90000 mm^2	118300 mm^2

4.6 Main components

The machine is made up of the following essential parts:

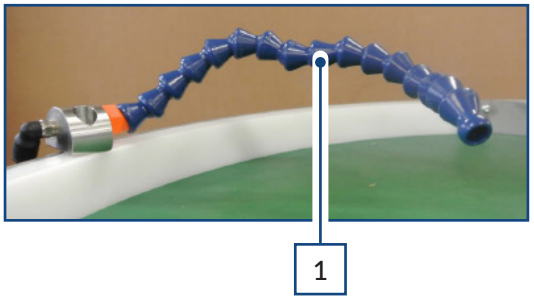
Pos.	Element	Description
1	FRAME	
2	ROTATING SURFACE	In the standard version the FlexiBowl® is supplied with a white surface. It is driven by a motor inside the frame. **Note:** if there is a backlight, it must be seen through the surface. The material of the rotating surface is available in different materials and thicknesses (see the **"Optional Components"** section).
3	SLIDING SURFACE	This acts as a support for the rotating surface. It features a Lexan window that lets the backlighting (if present) shine through.
4	FLIP (PNEUMATIC SHAKING UNIT)	THIS consists of a pneumatic cylinder that generates an impulse, from underneath, onto the rotating surface to flip the objects. IT is located before the parts reach the inspection window to enable correct orientation. The frequency and duration of the impulse can be programmed in order to correctly flip the parts. The force of the impulse is moderated through the compressed air regulator, located on the connection unit.
5	FLIP GUARD	THISis mounted on the top ring over the Flip. It prevents objects from flipping over the edge.
6	MOTOR WITH ENCODER AND CONTROL	The motor with encoder **(6A)** is inside the FlexiBowl® frame and moves the rotating surface. In addition to the motor, there are: driver **(6B)**, power supply unit **(6C)** and interface card **(6D)**.
7	COVER	This contains and protects the elements inside the FlexiBowl®. It protects the user from unnecessary exposure to electrical voltage and moving components.

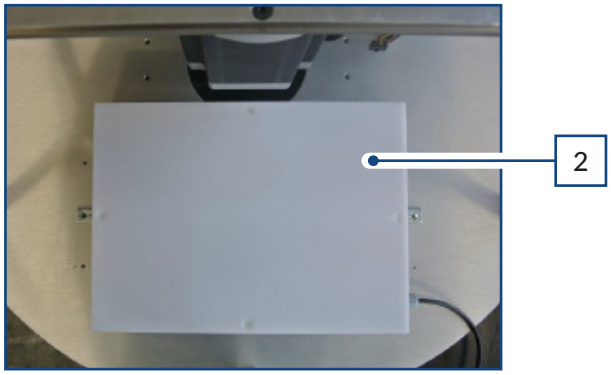

1
2
3
5
7
FLEXIBOWL
6B
6A
4
6C
6D

4.7 Optional components

The machine can be fitted with the following optional components:

Pos.	Element	Description
1	BLOW	This helps separate the components better. It is mounted on the top ring of the power supply unit.
2	BACKLIGHT	THIS is a light under the Lexan window of the sliding surface **(Note:** models 650 and 800 have two backlights), so that its light can shine on the rotating surface and the profile of the components above becomes visible to the vision system. The backlight is available with the following lights: • white, • red, • infrared. **Note:** The infrared backlight shines an invisible light and therefore may not appear to be working. Use a camera with an infrared filter installed to check that it is working properly. Most smartphones can see infrared lights.
/	ROTATING SURFACE	Other types of surfaces are available as options. Some of the optional surfaces available are: • Blue negative pyramid • Black negative pyramid • White silicone (various thicknesses) • White (various thicknesses) • Spike (not available for Model 350)
/	SECOND FLIP	A second Flip can be installed on the right-hand side of the Lexan window. This second unit can be controlled separately from the first. **Note:** The FlexiBowl® 350 cannot be fitted with a second Flip. But it can still have a blow unit.





4.8 General description

The machine described in this manual is a rotary feeding system able to feed a wide range of loose parts in combination with any industrial robot and artificial vision system. The parts can be in different shapes and materials.
FlexiBowl® is available in four models: **350**, **500**, **650** and **800**. Each model is built mainly in stainless steel with anodised aluminium parts.

4.8.1 Processing cycle

A simplified description of the **processing cycle** is described below. The cycle is divided into the following phases:

Phase	Description
1	The operator manually places the product to be processed onto the rotating surface.
2	The machine cyclically performs rotations (set by the operator) to shake the pieces, in order to constantly ensure that they are in the pick-up position.

5. TRANSPORT AND INSTALLATION

IMPORTANT!
Lifting and handling operations must only be carried out by specialised and trained staff who are qualified for these activities.

During installation, **ARS S.r.l.** technicians must be supported by the operators who will be in charge of maintenance and running the machine.
The machine is designed to be packed, transported and assembled using a forklift truck of adequate capacity. The machine does not have any attachment points (for example, eye bolts) for lifting.

5.1 Packaging

The machine is shipped by **ARS S.r.l.** from the production factory to the Customer's premises.
Based on the distance to be transported, on the specific requests from the Customer, and on how long the load will remain in the packaging, the machine will be shipped in the following ways:

- normal protective packaging for short and medium distances;
- special protective packaging for long distances.

It must be shipped using closed or curtain-sided vehicles depending on the type of load.

When the machine is received, it is mandatory for the customer to check that there are no damages caused by the mode of transport or by the staff in charge of the specific operations.

- **If any damage is discovered**, leave the packaging in question as it was found and immediately ask the competent shipping company to assess the damage; afterwards, send a damage report to inform the transport company's insurance company and the point of sale of the discovered damage.
- **If the machine is delivered in a crate on a pallet or on wooden planks** protected by heat-shrink cellophane, first remove the packaging or the cover. To completely free the machine, remove the screws and the metal strapping. Then lift the machine with a crane or forklift truck as described in the table and remove the pallet used for transport.

5.1.1 Table of units and weights - with packaging

Follow the table below for the weights and dimensions including packaging.

Specification	FlexiBowl® 350	FlexiBowl® 500	FlexiBowl® 650	FlexiBowl® 800
Gross weight (with packaging)	50 kg	55 kg	68 kg	78 kg
Wooden crate dimensions	700 x 700 x 500 mm	700 x 700 x 500 mm	1000 x 1000 x 500 mm	1000 x 1000 x 500 mm

5.1.2 Handling with packaging

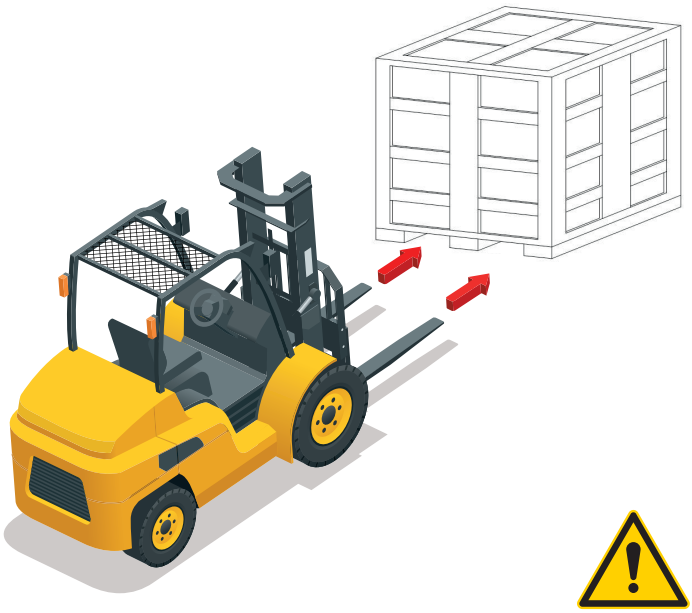
HANDLING THE MACHINE BODY WITH PACKAGING	
Operator qualification	Lifting vehicle driver
PPE required	
Lifting vehicle	Forklift truck with capacity of at least 50 kg

CAUTION!
Only use suitable and approved lifting vehicles; compatible with the dimensions and weight of the machine.

CAUTION!
Make sure that no one is standing under or within the operating range of the lifting vehicle.

Proceed as described to **handle the machine body with packaging**:

Step	Action
1	Put the forks of the forklift truck under the wooden crate containing the machine.
2	Make sure the forks come out of the front of the load (by at least 5 cm), far enough to eliminate any risk of the transported part from overturning.
3	Lift the forks until they touch the load. **Note:** if necessary, fasten the load to the forks with clamps or similar devices.
4	Slowly lift the load ten centimetres or so off the floor and check its stability, making sure that the centre of the load is in the middle of the lifting forks.
5	Tilt the mast backwards (towards the driver's seat) to use the tilting moment to ensure greater stability of the load during transport.
6	Adjust the transport speed according to the floor and type of load, avoiding sudden manoeuvres.



CAUTION!
Place the forklift truck forks as shown in the figure.

5.1.3 Removing the packaging

Proceed as follows to **remove the packaging**:

Step	Action
1	Put the machine in its intended place.
2	Unscrew FlexiBowl® from the base of the wooden crate used for shipping.
3	Take the CD and the test dossier out of the crate. Keep them for future use.
4	Use the side handles on the FlexiBowl® to lift it out of the crate.

CAUTION!
2 operators are needed to manually lift the FlexiBowl® out of the wooden crate.

To handle the machine and/or its parts, see the **"Transport and handling"** section.

5.1.4 Disposing of the packaging

The packaging is an integral part of the supply and is not collected, hence it must be disposed of by the buyer.
Any disposal or destruction must be carried out in compliance with the regulations in force in the user's country, taking into account the nature of the materials:

- wood for the crates;
- plastic sheet to protect the machine and adhesive tape to secure the plastic;
- moisture absorber bags;
- etc.

5.2 Transport and handling

ARS S.r.l. uses packaging and fasteners according to the mode of transport to guarantee integrity and conservation during transport.
When the machine is received, make sure no part was damaged during transport and/or handling.

If damage is found, it is mandatory to immediately inform the Manufacturer.

The handling activities described in this section must be carried out by staff who are qualified for these operations: staff duly trained to safely perform the loading, unloading and handling operations with lifting vehicles, and who are aware of the accident prevention rules.

CAUTION!
ARS S.r.l. shall not be held liable for damage, to property or to people, due to accidents caused by failure to follow the instructions in this manual.

5.2.1 Table of units and weights

After unpacking the machine, it is already fully assembled.
Follow the table below for the weights and dimensions of the various models.

Model	Weight	Maximum dimensions
FlexiBowl® 350	25 Kg	Ø 404 x 360 x 268.5 mm
FlexiBowl® 500	36 Kg	Ø 580 x 533 x 267 mm
FlexiBowl® 650	51 Kg	Ø 740 x 690 x 296 mm
FlexiBowl® 800	71 Kg	Ø 890 x 840 x 296 mm

5.3 Installation

5.3.1 Preparations by the customer

Notwithstanding any different contractual agreements, preparation of the following **is usually the responsibility of the Customer**:

- **rooms** (including masonry, such as foundations or ducts that may be required, lighting);
- **electrical systems** up to the machine's power points, in compliance with the regulations in force in the country of installation and/or requested by the machine Manufacturer. All technical specifications requested by the Manufacturer are in the sales contract. The Manufacturer declines all liability if the customer fails to guarantee the technical characteristics of the electrical system requested in the sales contract;
- the **power supply for the machine**, including the earthing conductor, according to the characteristics and tolerances requested and specified in this manual;
- auxiliary services adapted to the machine's requirements;
- **tools and consumables** required for assembly and installation;
- **lubricants** necessary for starting the machine;
- the **compressed air supply** for the machine adjusted as specified in the **"Technical specifications"** section;
- suitable lifting and handling means.

5.3.2 Permitted environmental conditions

The environment where the machine will be installed and used is indoors, protected from atmospheric agents such as: rain, hail, snow, fog, suspended dust, combustible dust, protected from aggressive agents such as corrosive vapours or sources of excessive heat and it must not be ATEX classified.
It is not permitted to use the machine, associated control systems and drive equipment under conditions other than those listed.
Namely, the environment of installation and use must not be:

- Exposed to corrosive fumes;
- Exposed to excessive humidity (above 85%) and rapid changes in relative humidity (above 0.005 p.u./h);
- Exposed to excessive dust;
- Exposed to abrasive dust;
- Exposed to oily vapours;
- Exposed to explosive mixtures of dust or gas;
- Exposed to salty air;
- Exposed to abnormal vibrations, impact or shock;
- Exposed to bad weather outside the permitted range or dripping;
- Exposed to unusual transport or storage conditions;
- Exposed to high or quick temperature variations (above 5K/h);
- In the presence of nuclear radiations.

The machine is designed and built to work safely in the following environmental conditions:

Permitted environmental conditions	
Environmental temperature	5 - 40°C
Humidity range	5 - 90% (without condensation)
Environmental lighting	Neon lights

CAUTION!
Different environmental conditions to those specified can cause serious damage to the machine.
The position of the machine in environments not corresponding to those above will void the warranty for the parts to be replaced.

IMPORTANT!
The work surface must be sufficiently lit. If there are shady or uneven zones in the workplace, it is up to the user to provide suitable lighting devices.

If these requirements are not met, the Manufacturer declines all liability.

5.3.3 Installation site

For installation, prepare an area suitable for the dimensions of the machine and lifting vehicles, paying attention to any obstacles (other machines, walls or similar) along the path of the handling vehicles.

5.3.4 Machine position

Step	Action
1	Place the FlexiBowl® on a stable surface. **Note:** if the FlexiBowl® is installed on a machine platform (sensitive to vibrations), put some insulating and vibration damping material between the platform and the FlexiBowl®.
2	Fix the FlexiBowl® through the holes. **Note:** the FlexiBowl® has 4 x 6.5 mm holes on its base so that it can be fixed to a surface.
3	Connect as necessary (see the **"Connections"** section).

CAUTION!
Make sure the machine support surface is flat and horizontal, and can withstand its weight.

5.4 Connections

To start the machine, it must be properly connected to the local networks:

- **electrical connection** (including connection to the earthing system),
- **compressed air connection**,

in compliance with the regulations in force in the country of installation.

It might also be necessary to connect the machine to the **LAN.**

It is the user's responsibility to guarantee the requested connection characteristics.

CAUTION!
The connections requested must be set up by qualified and authorised staff.

5.5 Electrical connection

CAUTION!
Before doing any electrical connections, it is important to ensure that the machine is turned off.

CAUTION!
Make sure the customer's power supply has already been disconnected.

The buyer is responsible for compliance of the connection between the machine and the earthing system.

CAUTION!
The operation must only be carried out by specialised and authorised staff (electrical maintenance technician).

Before proceeding with the **electrical connection**, ensure that:

- the maintenance technician is fully aware of the regulations in force in the country of installation;
- the frequency and power input values of the machine match the mains values;
- the cross-section of the electric cables is adequate for the power consumption;
- the power line can withstand the maximum machine power consumptions;
- earthing of the circuit complies with **EN 60204-1**;
- the materials used in the earthing system have adequate strength or adequate mechanical protection.

CAUTION!
Do not work with wet hands or objects. In case of fire, do not use water on the electrical components.

ELECTRICAL CONNECTION - AC	
Operator qualification	Electrical maintenance technician
PPE required	

Proceed as described below for **connection to the mains - AC**:

Step	Action
1	Connect the system to the power supply. **Note:** the power cable is not supplied by **ARS S.r.l.**
2	Make sure the earthing system is installed correctly.

IMPORTANT!
The power supply range is 110 - 230 VAC.

ELECTRICAL CONNECTION - DC	
Operator qualification	Electrical maintenance technician
PPE required	

The24 VDC power supply is the responsibility of the purchaser, which must comply with the following specifications:

Device	Features
Power supply provided by the user	24 VDC (-10%, +5%), 150 W (6 A)

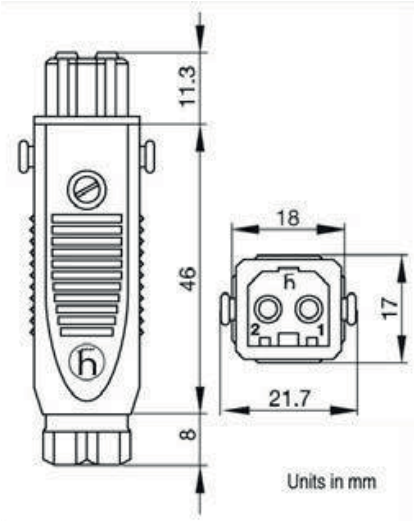
IMPORTANT!
There must be a cable and power supply system which comply with the specifications in the table above.

CAUTION!
An incorrect power supply can cause problems to the system and stop it from working properly.
See the following table for the recommended power supplies.

RECOMMENDED 24VDC POWER SUPPLIES		
Supplier	Model	Specifications
XP Power	JPM160PS24	24 VDC - 6.7 A - 160 W
Mean Well	SP-150-24	24 VDC - 6.3 A - 150 W
Astrodyne	ASM150-24	24 VDC - 6.66 A - 150 W

5.5.4.1 Connector assembly

Use the connector supplied to connect your 24 VDC power supply to the FlexiBowl®.



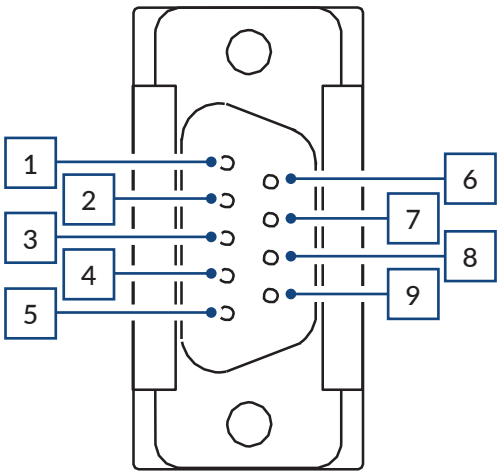
Pin	Connection
1	24 VDC RETURN
2	+24 VDC

IMPORTANT!
Use an earthed 15 or 16 mm cable to connect the power supply to the connector.

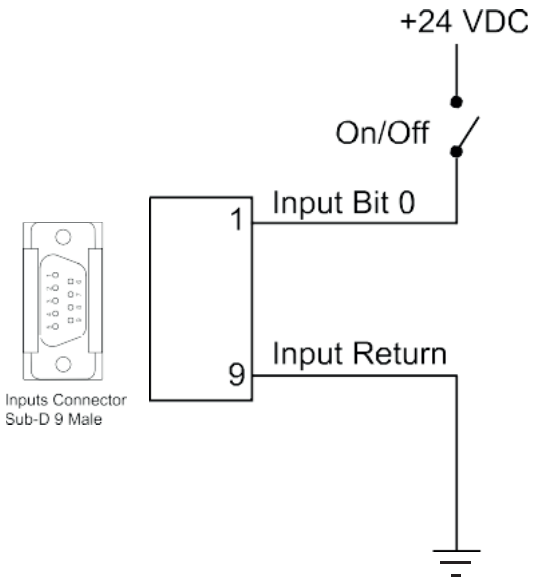
Step	Action
1	Position the 24 VDC connector, supplied with the FlexiBowl®.
2	Remove the screw that fastens the black end to the connector body. **NOTE: Keep the screw for reassembly.**
3	Take the black end off the grille. **NOTE: Keep the square plastic gasket to be inserted on the black end.**
4	Take the grey plastic cable gland off the connector body. Also remove the metal washer. **NOTE: Keep the cable gland and washer.**
5	Pass the 24 VDC cable through the cable gland, the washer and the connector body.
6	Connect the VDC cable to the end of the connector: • Connect the negative pole to pin 1. • Connect the positive pole to pin 2. • Connect the connector's earth to the 24 VDC earth. **NOTE: Make sure the various wires are firmly secured to the connector.**
7	Insert the black end into the connector body. **NOTE: Make sure the screw hole is aligned with the black end.**
8	Tighten the screw.
9	Squeeze the cable gland.
10	Plug the 24 VDC connector into the control panel.

5.5.1 Input pinouts

The following table displays the functions of each contact of the input connector (DE9M):

Pin	Signal	Picture
1	FUNCTION BIT 0	
2	FUNCTION BIT 1	
3	FUNCTION BIT 2	
4	FUNCTION BIT 3	
5	STROBE	
6, 7, 8	-	
7	RETURN INPUTS	

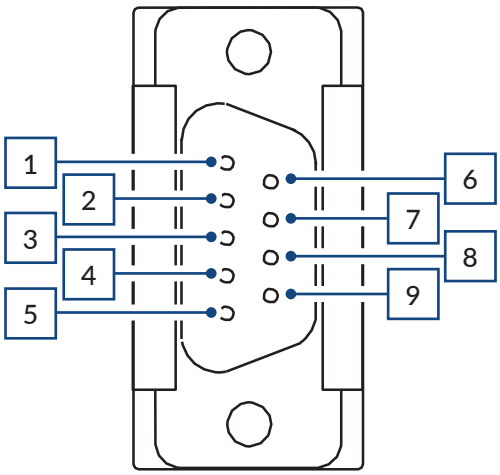
The following is an example of the input connection:



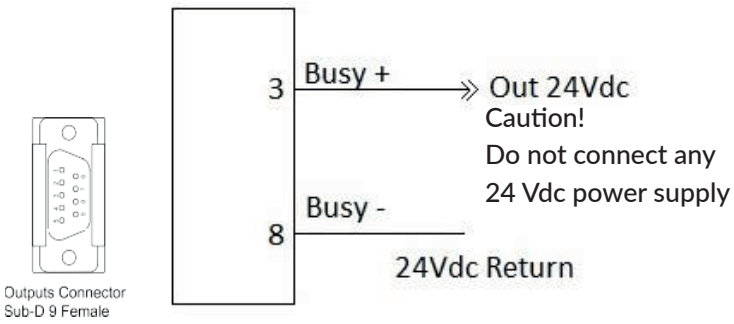
Inputs electrical specifications	
Power supply range	0 - 30 VDC
OFF status range	0 - 7 VDC
ON status range	12 - 30 VDC
Current range	0 - 9 mA
Current range for the ON status	2 - 9 mA
Impedance (V_{in} / I_{in})	2.49 kΩ
24 VDC input current	$I_{in} \leq 7$ mA

5.5.2 Outputs pinouts

The following table displays the functions of each contact of the output connector (DE9F):

Pin	Signal	Picture
1	FAULT +	
2	READY +	
3	BUSY +	
4, 5, 9	-	
6	FAULT -	
7	READY -	
8	BUSY -	

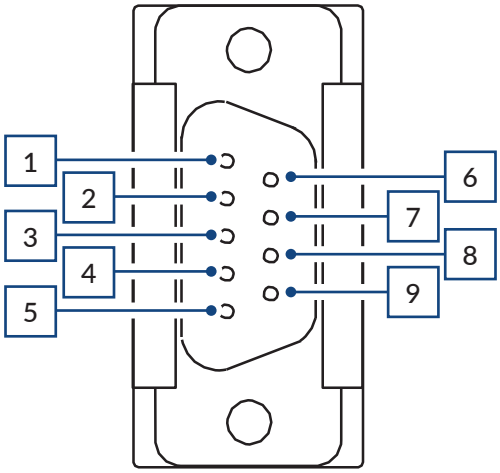
The following is an example of the output connection:



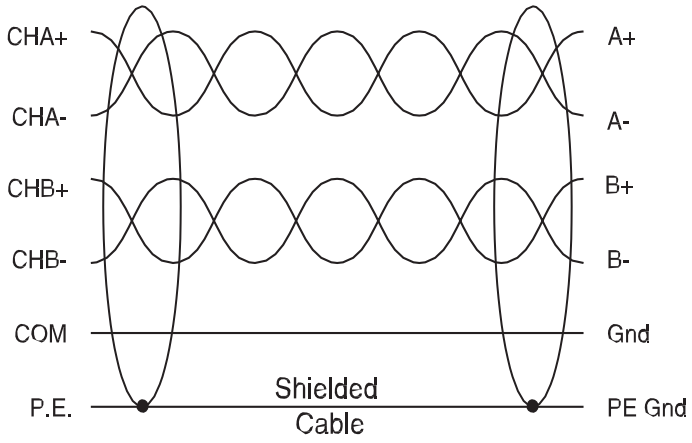
Outputs electrical specifications	
Output power supply	0-24 VDC
Output current	$I_{out} \leq 250$ mA

5.5.3 Encoder pinouts

The following table displays the functions of each contact of the encoder connector (DE9M):

Pin	Signal	Picture
1, 2, 9	-	
3	CHA +	
4	CHA -	
5	CHB +	
6	CHB -	
7	COM	
8	P.E.	

The following is a typical encoder connection:



5.5.4 Compressed air connection

The machine has a pneumatic drive.

Before proceeding with the **compressed air connection**, ensure that:

- the compressed air supply system guarantees the right amount of air to the machine at the right pressure;
- the compressed air tank provided is properly sized.

The compressed air connection must be set up by connecting the main line to the machine circuit.

The customer must also guarantee an air supply with the characteristics listed in the **"Technical Specifications"** section in this manual.

CAUTION!
Never exceed a pressure of 6 bar in the machine's compressed air system.

CAUTION!
It is the responsibility of the user/customer to ensure that the main air handling unit is connected properly with rigid pipes, firmly fixed to prevent a whip effect or protected with other guards that prevent or block "jet" leaks.

COMPRESSED AIR CONNECTION	
Operator qualification	Mechanical maintenance technician
PPE required	

Proceed as described below for **connection to the compressed air line**:

Step	Action	Picture
1	Connect a Ø6 mm air pipe to the "Air Supply" socket in the control panel (as shown in the picture). **Note:** make sure there is a shut-off valve between the room air supply and the FlexiBowl®.	

5.5.5 Other connections

5.5.5.1 Blow connection (if applicable)

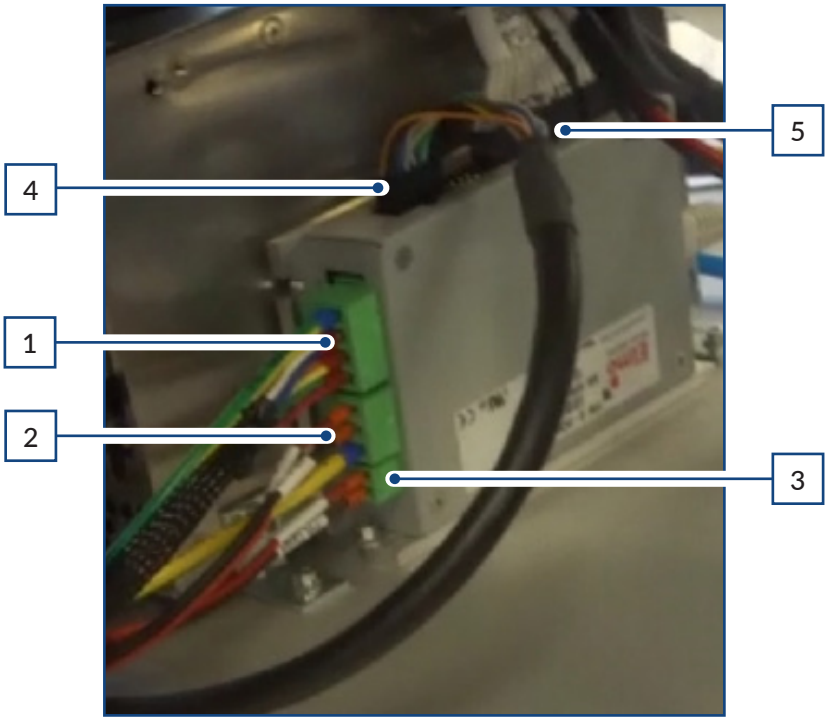
If the optional blow component is present, connect as follows:

Step	Action	Picture
1	Connect a Ø6 mm air pipe from the “Air Blow” socket in the control panel to the blow unit.	

5.5.5.2 Mapping of connections between the control devices

The FlexiBowl® is supplied already wired. If necessary, below is a map of the connections between the control devices.

Pos.	Element
1	OUTPUT CONNECTOR TO THE MOTOR
2	VDC POWER SUPPLY CONNECTOR
3	LOGIC CONNECTOR
4	ENCODER CONNECTOR
5	I/O INTERFACE CONNECTOR



5.5.5.3 Connecting the user interface

Proceed as described below to connect the user interface:

Step	Action	Picture
1	Connect the user interface to the Ethernet socket with an Ethernet cable.	

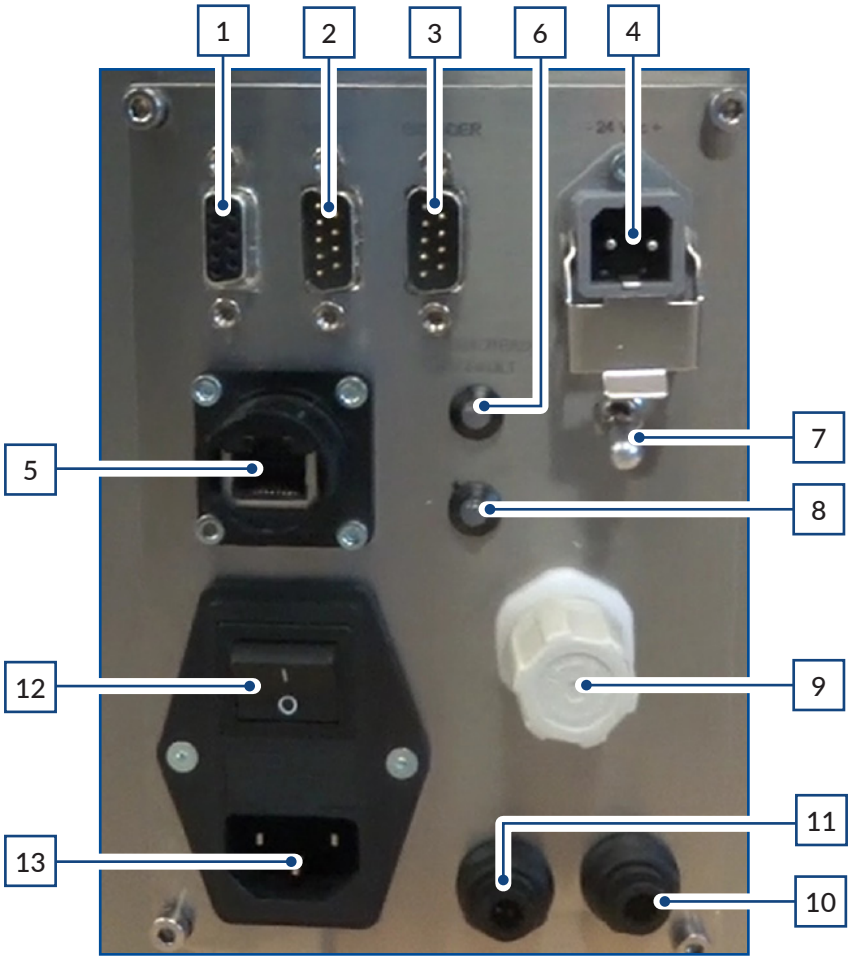
6. CONTROLS AND USE

During operation, the machine does not need to be continuously manned by an operator.

CAUTION!
Using the machine for a purpose other than intended by the Manufacturer can cause serious damage to people and/or property and/or animals.
ARS S.r.l. shall not be held liable for damage caused by improper machine use.

6.1 Description of the control panel

Pos.	Element	Connector	Notes
1	OUTPUTS CONNECTOR	DE9F	
2	INPUTS CONNECTOR	DE9M	
3	ENCODER CONNECTOR	DE9M	Output, that can be used for circular tracking.
4	24 VDC CONNECTOR	HIRSCHMANN	
5	ETHERNET PORT	802.3	
6	STATUS LED		
7	ETHERNET/IO SELECTOR SWITCH		
8	BACKLIGHT STATUS LED		
9	PRESSURE REGULATOR		Checks the force, that the Flip unit supplies the impulse with under the rotating surface, to flip the parts. Also checks the pressure of the blower unit, if present.
10	COMPRESSED AIR CONNECTION	6 mm	
11	AIR CONNECTION FOR THE BLOWER	6 mm	
12	AC SWITCH		
13	110-230 VAC CONNECTOR		

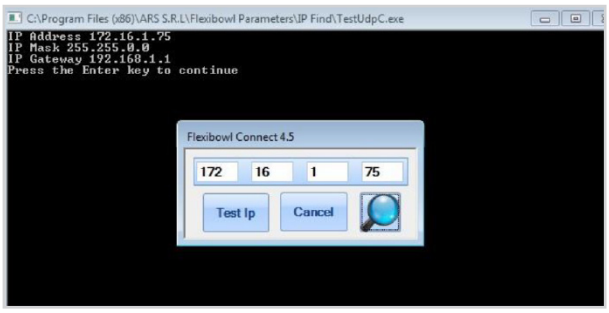
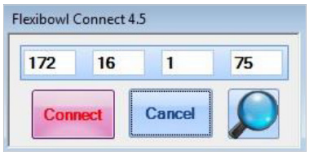
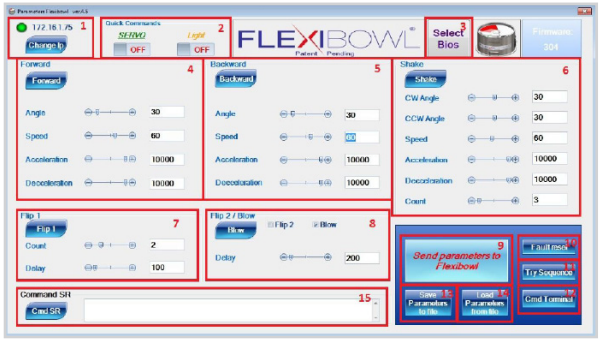


6.2 User interface - FlexiBowl Parameters

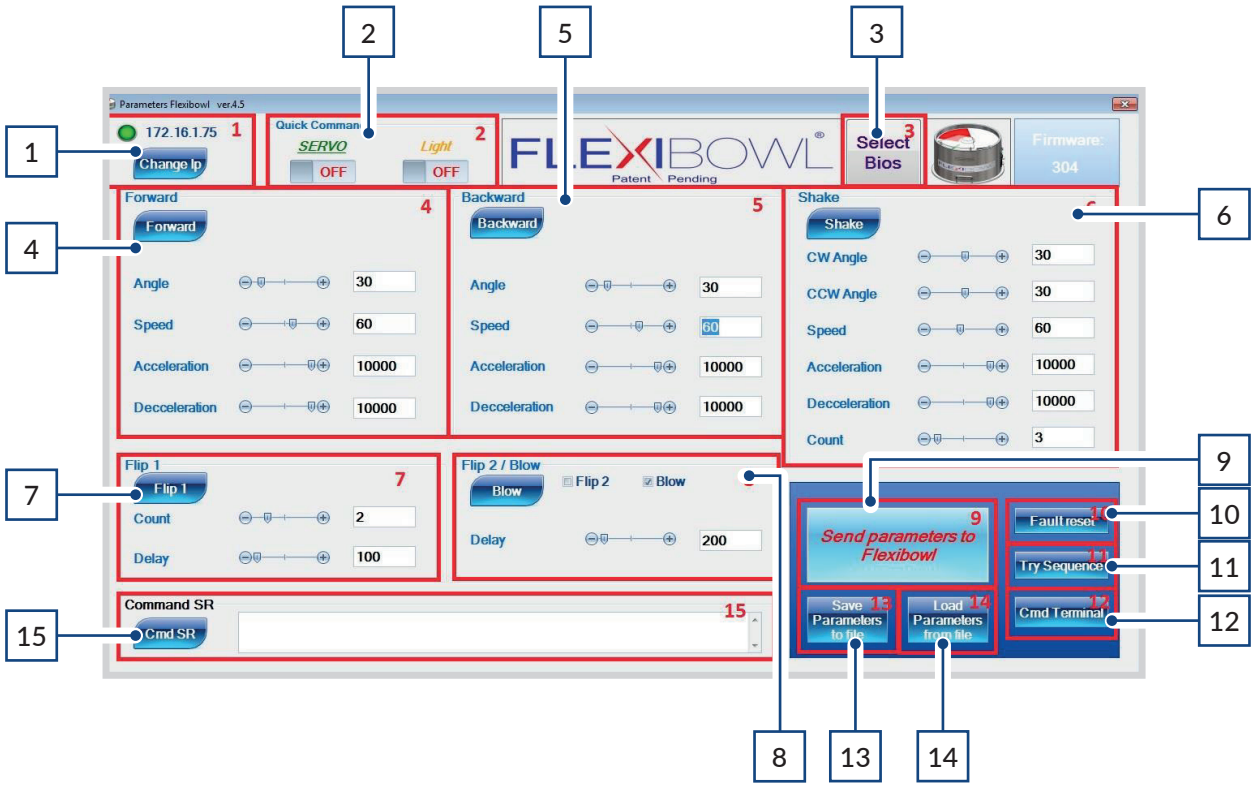
The **FlexiBowl Parameters** program is used to set the various movement and stationary parameters available. To change the various parameters, the communication mode must be set on Ethernet.

6.2.1 Installing and using the FlexiBowl Parameters program

Proceed as described below to **use the program**:

Step	Action	Picture
1	Install the program supplied on the USB. **Note:** if you have an older version of the program it must be uninstalled first.	
2	Connect the FlexiBowl® with an Ethernet cable.	
3	Select the Ethernet mode on the control panel with the selector switch.	
4	Turn the device on.	
5	Run the program. **Note:** if the IP address of the FlexiBowl® is unknown, tap the magnifying glass to run the search utility in the network.	
6	Once the FlexiBowl® is found in the network, it might be necessary to change the IP address of the PC (IP address and Subnet mask) to make it compatible: • Enter the address found in the fields of the open window. • You can now connect to the FlexiBowl®. First press the **Test IP** button (a pop-up window with **"FlexiBowl® found"** will appear). Press **OK** to enable the button for connection.	
7	After connecting, the home screen will be displayed.	

6.2.2 Home screen

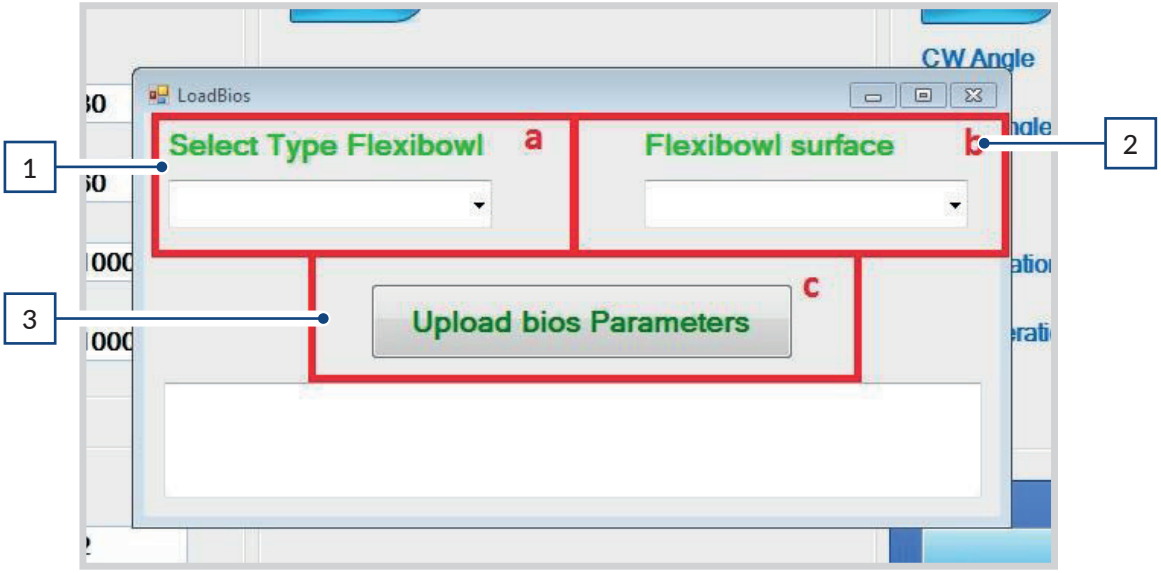


Pos.	Element	Description
1	CHANGE IP	Displays and enables the IP address to be changed. **Note:** restart the FlexiBowl® to save the changes.
2	QUICK COMMANDS	Enables Servo and Backlight (their current status is not shown).
3	SELECT BIOS	Opens the pop-up window for loading the parameters for the different models of FlexiBowl® and surfaces.
4	FORWARD	Used to perform a single movement with clockwise rotation with the parameters below. **Note:** to execute the movement command, press the Forward button.
5	BACKWARD	Used to perform a single movement with counterclockwise rotation with the parameters below. **Note:** to execute the movement command, press the Backward button.
6	SHAKE	Used to perform a combined clockwise and counterclockwise movement with the parameters below. **Note:** the first movement is in the counterclockwise direction and the number of movements is given in the “Count” parameter. The clockwise angle is “CW Angle” and the counterclockwise one is “CCW Angle”.
7	FLIP 1	Used to activate the Flip movement with the parameters below. **Note:** to activate the Flip, press the “FLIP 1” button.
8	FLIP 2 / BLOW	Used to activate the second solenoid valve, if installed. Possibility of operating the second solenoid valve as “FLIP 2” or “BLOW”. **Note:** the set default mode is for the “BLOW” command.

Pos.	Element	Description
9	SEND PARAMETERS TO FLEXIBOWL	Used to save all of the movement parameters in the FlexiBowl®.
10	FAULT RESET	Used to reset the FlexiBowl® after an error.
11	TRY SEQUENCE	Opens the pop-up window where you can try a sequence of combined movements.
12	CMD TERMINAL	Command reserved for maintenance technicians.
13	SAVE PARAMETERS TO FILE	Used to save the movement parameters in a file.
14	LOAD PARAMETERS FROM FILE	Used to load the movement parameters from a previously saved file.
15	COMMAND SR	Returns the current status of the driver.

6.2.2.1 "SELECT BIOS" pop-up window

This pop-up window can be used to set the parameters for the different models of FlexiBowl® and surfaces.

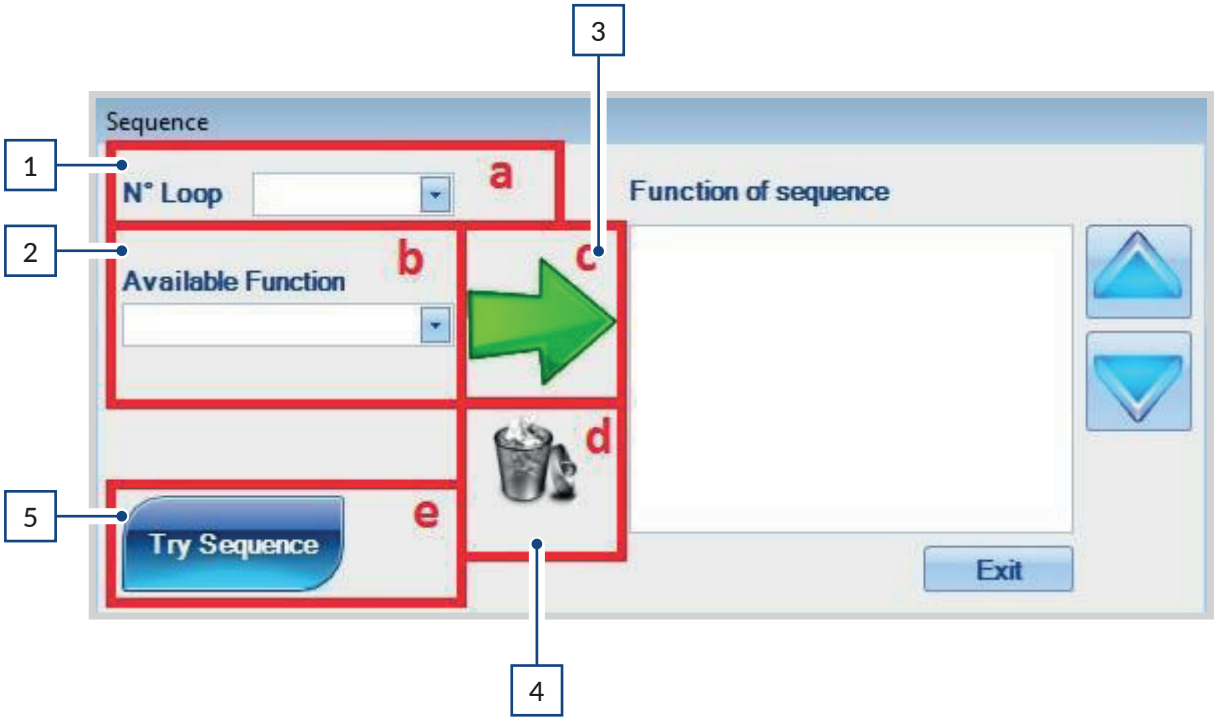


Pos.	Element	Description
1	SELECT TYPE FLEXIBOWL	Used to select the type of FlexiBowl® .
2	FLEXIBOWL SURFACE	Used to select the type of FlexiBowl® surface.
3	UPLOAD BIOS PARAMETERS	Used to upload the set parameters to the FlexiBowl®.

CAUTION!
If a different surface is installed to the one supplied by ARS S.r.l., the FlexiBowl® might not work properly.

6.2.2.2 "TRY SEQUENCE" pop-up window

This pop-up window can be used to try a set sequence of movements.



Pos.	Element	Description
1	N° LOOP	Used to set the number of loops for the commands to be executed.
2	AVAILABLE FUNCTION	Used to select the commands available.
3	ARROW	Used to enter the command selected in the work sequence.
4	TRASH	Used to delete the command selected from the work sequence.
5	TRY SEQUENCE	Used to try the created sequence.

6.2.3 Alarms

IMPORTANT!
For the list of alarm codes, see the relative document attached to this manual.

6.3 Operating procedures

CAUTION!
After carrying out the transport and installation operations, and before starting the machine, make sure the robot vision system has been calibrated. Contact ARS S.r.l. to calibrate the vision system.

6.3.1 Preliminary inspections

Before starting the machine, the following checks need to be carried out:

- Check that the machine is placed on a surface that can withstand its weight.
- Make sure the safety devices are working properly.
- Make sure all opening guards are closed properly.
- Check that the space around the machine is free from obstacles and/or obstructions.
- Check that the machine is connected to the mains.
- Check that the power supply phases are correct.
- Check **that the surface is free to rotate.**
- Check **that the Flip can run its stroke without obstruction.**
- Check that the machine is not under **"Maintenance"**.

6.3.2 Start-up

CAUTION!
When the compressed air is first supplied, the Flip unit may move unexpectedly. Before turning the air on, make sure that:

- **the power supply is fully assembled,**
- **the Flip guard is in place,**
- **there is nobody near the FlexiBowl®.**

Proceed as described to **start** the machine:

Step	Action
1	Turn the power switch on and supply 24 Volt.
2	Make sure the green light on the control panel is on. If it is not, check the 110-230 VAC and 24 VDC power supply.

6.3.3 Programming

IMPORTANT!
The machine must only be programmed by expert and qualified staff.

The **FlexiBowl®** can be managed and programmed in one of the following ways:

- Programming with UDP protocol.
- Programming with digital I/O.

6.3.3.1 Programming with UDP protocol

IMPORTANT!
The TCP/IP addresses are indicated on the test sheet in the shipping crate.
The UDP port is 5001.

For each string sent to the FlexiBowl®, an ECHO of the command received will be returned in the following form:

- If the sent string is a command that does not return a value, the ECHO will be "**Message_sent{CR}**";
- If the sent string is a command that must return a value, the ECHO will be "**Message_sent{CR}Answer**";

IMPORTANT!
The ASCII decimal value of the character {CR} is 13.

Once you are connected to the FlexiBowl®, simply send the following strings to obtain the result described:

String	Description
servo=	1 = turns the servo on. 0 = turns the servo off.
light=	1 = turns the backlight on. 0 = turns the backlight off.
forward=1	Moves the FlexiBowl® clockwise with the current parameters.
fwd_flip=1	Moves theFlexiBowl® clockwise and turns the Flip on during the movement.
fwd_valve2=1	Moves theFlexiBowl® clockwise and turns the second valve on during the movement.
fwd_fl_val2=1	Moves theFlexiBowl® clockwise and turns the Flip and the second valve on during the movement.
backward=1	Moves the FlexiBowl® counterclockwise with the current parameters.
bwd_fl=1	Moves theFlexiBowl® counterclockwise and turns the Flip on during the movement.
bwd_valve2=1	Moves theFlexiBowl® counterclockwise and turns the second valve on during the movement.
bwd_fl_val2=1	Moves theFlexiBowl® counterclockwise and turns the Flip and the second valve on during the movement.
shake=1	Shakes the FlexiBowl® with the current parameters.
flip=1	Turns the Flip on with the current parameters.
valve2=1	Turns the second valve on. If valve2_mod is 0 then the second valve works as a blow, but if it is 1, then it works as a flip.
flip_valve2=1	Turns the Flip and the second valve on at the same time.

To reset the FlexiBowl® after a UDP error, the command strings must be sent in the following sequence:

- kl{CR}.
- xq##init{CR}.

To know if the FlexiBowl® has finished the command, send string "**ob[4] {CR}**".
If the answer is "**0**", the FlexiBowl® is ready to accept another command.

To know if the Flexibowl is Faulty, send string "**ob[16] {CR}**".
If the answer is "**0**", the FlexiBowl® is Faulty.

PARAMETERS:

String	Description	Default values	Range
speed	Speed, in RPM, used to move the FlexiBowl® clockwise. Used in the Forward instruction.	60	1 - 100
angle	Angle that the FlexiBowl® moves at clockwise. Used in the Forward instruction.	30	n/a
acc	Acceleration used with every Forward instruction.	10000	10 - 10000
dec	Deceleration used with every Forward instruction.	10000	10 - 10000
b_speed	Speed, in RPM, used to move the FlexiBowl® counterclockwise. Used in the Backward instruction.	60	1 - 100
b_angle	Angle that the FlexiBowl® moves at counterclockwise. Used in the Backward instruction.	30	n/a
b_acc	Acceleration used with every Backward instruction.	10000	10 - 10000
b_dec	Deceleration used with every Backward instruction.	10000	10 - 10000
sh_speed	Speed, in RPM, used to shake the FlexiBowl®. Used in the Shake instruction.	90	1 - 130
sh_acc	Acceleration used with every Shake instruction.	10000	10 - 10000
sh_dec	Deceleration used with every Shake instruction.	10000	10 - 10000
cw_angle	Clockwise angle that the FlexiBowl® moves at with every Shake instruction.	30	n/a
ccw_angle	Counterclockwise angle that the FlexiBowl® moves at with every Shake instruction.	30	n/a
sh_count	Number of movements, in alternating directions, that are made with every Shake instruction. **Example**: sh_count=3 means that the FlexiBowl® will move counterclockwise at an angle of ccw_angle, clockwise at an angle of cw_angle, and will return at an angle of ccw_angle.	3	positive
fl_count	Number of times the Flip will be turned on. It must be positive.	2	positive
fl_delay	Time, in milliseconds, between the Flip turning on and off. It must be positive.	100	positive
blw_time	Blow turning on time, in milliseconds.	200	n/a
valve2_mod	Put on 0 if the second valve works as a Blow or on 1 if it works as a Flip	0	0 - 1

6.3.3.2 Programming and handling with digital I/O

CAUTION!
Disconnect the input connectors, if connected.

The program to modify the movement parameters of the FlexiBowl® is on the USB flash drive, sent with the system.
Proceed as follows for **programming using the digital I/O**:

Step	Action
1	Use the FlexiBowl® utility parameters supplied by ARS to set the default parameters.
2	Place the Ethernet-I/O switch on the control panel on I/O.
3	Turn the FlexiBowl® off and then on again.
4	Wait for the Ready/Fault LED to turn green, after about 2 seconds the FlexiBowl® will be in I/O mode.

The operating principle is as follows:

- Apply the command code to be made to Function Bits 0,1,2,3. Logic level 1 is given by applying 24V to the Function Bit.
- Apply 24V to the Strobe (Pin 5) and the return (Pin 9) for a limited time (about 50ms);
- The Busy output is available between Pin 3 and 8 of the Output connector.

IMPORTANT!
The strobe signal is inhibited until the FlexiBowl has completed the current command.
The Busy output remains active until the current command has been completed.

IMPORTANT!
Operation of the second valve (Flip2 / Blow) is established by a variable in the program. This variable can be set from the PC Utility, FlexiBowl® parameters. The second valve is set as Blow by default.

FUNCTION BITS INPUT CODING TABLE:

Function Bits				Command
3	2	1	0	
0	0	0	0	Reset the Flexibowl Fault
0	0	0	1	Servo ON
0	0	1	0	Servo OFF
0	0	1	1	Backlight ON
0	1	0	0	Backlight OFF
0	1	0	1	Forward
0	1	1	0	Forward-Flip1
0	1	1	1	Forward-Valve2
1	0	0	0	Forward-Flip1-Valve2
1	0	0	1	Shake
1	0	1	0	Backward
1	0	1	1	Backward-Flip1
1	1	0	0	Backward-Valve2
1	1	0	1	Flip1
1	1	1	0	Valve2
1	1	1	1	Continuous Turn

6.3.4 Pressure adjustment

To **adjust the pressure**:

Step	Action
1	Pull the knob on the power supply body and turn it. **Note:** turning it counterclockwise will lower the pressure, turning it clockwise will increase it.
2	When the pressure has been adjusted as required, push the knob towards the power supply and the setting will automatically be locked in. **Note:** This prevents accidental changes to the pressure settings.

6.3.5 Switching off

Proceed as described to **switch the machine off**:

Step	Action
1	Check that the machine has finished the work process.
2	Disconnect the power switch.

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7. MAINTENANCE

CAUTION!
Perform maintenance operations when the machine is turned off.

CAUTION!
Maintenance operations must be carried out by qualified and authorised staff.

Machine maintenance includes the operations (inspections, checks, adjustments and replacements) that become necessary following normal use.

For good maintenance:

- only use original spare parts and tools that are suitable for the purpose and in good condition.
- follow the intervention frequencies indicated in the manual for scheduled maintenance (preventive and periodic). The distance (indicated in time or in work cycles) between one intervention and another is intended as the maximum acceptable; therefore it must not be exceeded, but it can be shortened.
- good preventive maintenance requires constant attention and continuous monitoring of the machine. Immediately check the cause of any anomalies, such as excessive noise, overheating, fluid leaks, etc., and fix it.
- timely removal of any causes of anomaly or malfunction prevents further damage to the equipment and ensures operator safety.

Machine maintenance staff must be well trained and have thorough knowledge of the accident prevention regulations; unauthorised staff must stay outside the work area during the operations.
Machine/system cleaning and adjustments must also be carried out only during maintenance and with the machine/system stopped and disconnected from the electrical panel, as shown in the use and maintenance manual.

IMPORTANT!
In case of doubt, it is forbidden to operate. Contact the Manufacturer for any explanations.

CAUTION!
Any repairs or maintenance work not indicated herein can only be carried out following authorisation from ARS S.r.l.
ARS S.r.l. shall not be held liable for any damage to people or property for operations other than those described or carried out in ways different than indicated.

Machine maintenance jobs, in terms of operation, are divided into two main categories:

Routine maintenance	All those operations that the operator must perform preventively to ensure smooth operation of the machine over time; routine maintenance includes inspections, checks, adjustments, cleaning and lubrication.
Unscheduled maintenance	All those operations that the operator must perform when required by the machine. Unscheduled maintenance includes inspections, repairs, restoration of nominal operating conditions or replacement of a broken, faulty or worn unit.

7.1 Safety warnings

CAUTION!
Before starting any maintenance work on the machine, disconnect and padlock all energy sources and safely block all of its moving units. Put the "Machine under maintenance - do not switch on" sign on the main switch.

CAUTION!
To stop the machine from being accidentally switched on while it is under maintenance, put signs on it saying: "CAUTION! MACHINE UNDER MAINTENANCE".

- Maintenance technicians must wear the necessary personal protective equipment (gloves, glasses, overalls) for the job at hand.
- During maintenance operations, unauthorised staff must stay outside the operation area.
- If the operation requires the guards to be removed, the area of intervention must be fenced off and persons unrelated to the maintenance work must be forbidden access.

The need to put the machine in working condition and/or with the protections disabled requires adequate skill and knowledge, and extreme care by the maintenance technician who must be appropriately trained on possible and subsisting risks.

The accident prevention precautions in this section must always be strictly adhered to during machine/system maintenance, in order to avoid injury to staff and damage to the equipment.

Before starting any maintenance work, ensure that the energy sources are disconnected (electricity, compressed air, hydraulic energy, etc.).

- Carry out the operations only with the machine/system stopped and disconnected.
- Put up specific warning signs such as: **EQUIPMENT UNDER MAINTENANCE - DO NOT SWITCH ON, WORK IN PROGRESS - DO NOT OPERATE** or **DO NOT SWITCH ON** on the main switch and in the machine access zones.
- Carry out the operations covered by the skillset (Mechanical, Electrical, Fluid) that you are authorised for.
- Be able to use the most suitable and appropriate instrumentation for troubleshooting and know the most suitable equipment for maintenance.

7.2 Routine maintenance

When the machine is delivered to the user, it is already adjusted to work properly; however, in order to ensure smooth operation over time, periodic and preventive checks and maintenance work must be carried out.

Routine maintenance includes inspections, checks and interventions that, to prevent breakdowns, keep the following under control:

- the mechanical conditions of the machine,
- cleanliness of the machine.

The following tables list a series of checks and interventions to be carried out following a recommended timetable. The frequency of the routine maintenance operations indicated refers to normal operating conditions, i.e. that meet the intended conditions of use.

The table below lists a series of routine maintenance procedures valid for all types of machines manufactured by **ARS S.r.l.**

The operator must take into consideration only the procedures relating to the machine described in this manual.

IMPORTANT!

For the routine maintenance of machines from external suppliers, see the sub-supplier manuals for said machines attached hereto.

IMPORTANT!

Always use LOCTITE 243 threadlocker to ensure the screws are properly secured (except for the flange screws on the FlexiBowl® belt).

7.2.1 Checks and inspections

7.2.1.1 Routine maintenance table - checks

Operation	Frequency				
	Daily	Weekly	Monthly	Six-monthly	Yearly
Check that the general pressure regulator works properly.				◈	
Check that the safety devices work properly.				◈	
Check the belt conditions before every start-up.	◈				
	(Replace at least once a year)				
Check for wear of the relays.					◈
Check that the fuse works properly.					◈
Check for wear of the FlexiBowl®.		◈			
	(Replace completely according to the degree of wear)				
Check that the solenoid valves work properly.				◈	
	(Completely replace every 2 years)				
Check for wear of the shaker.			◈		
	(Completely replace every year)				

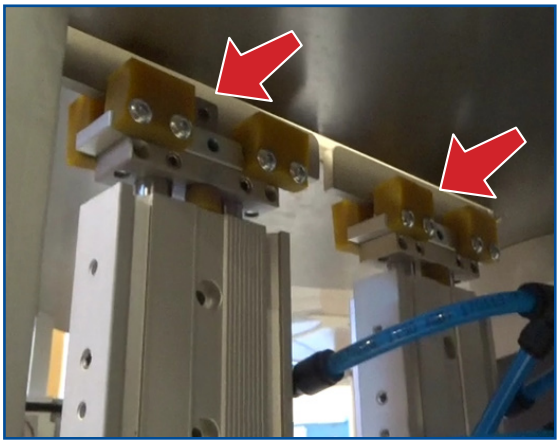
7.2.1.2 Inspection of safety devices

Perform the following checks to **ensure that the safety devices work properly**:

Step	Action
1	Check that the machine covers are in place and fixed properly.
2	Check that the power cable is not damaged and/or worn.

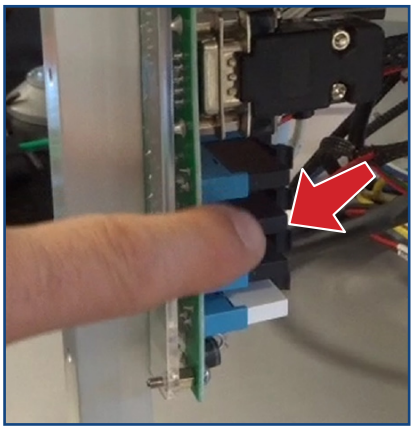
7.2.1.3 Checking wear of the shaker

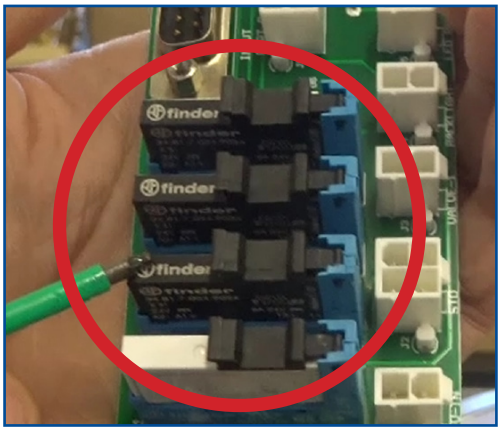
Proceed as follows to **check for wear of the shaker**:

Step	Action	Picture
1	Disconnect the power and air supply of the machine.	
2	Take the cover off the FlexiBowl®.	
3	Visually check for wear of the shaker.	

7.2.1.4 Checking for wear of the relays

Visually check for wear of the relays.
There are: 3 static relays (that control the light, valve 1 and valve 2 respectively) and 1 mechanical relay (that controls the "READY/FAULT" STATUS LED on the control panel).





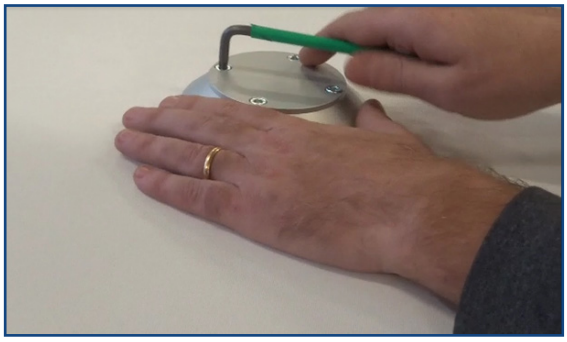
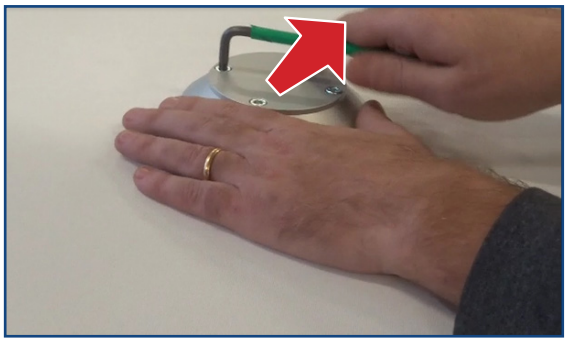
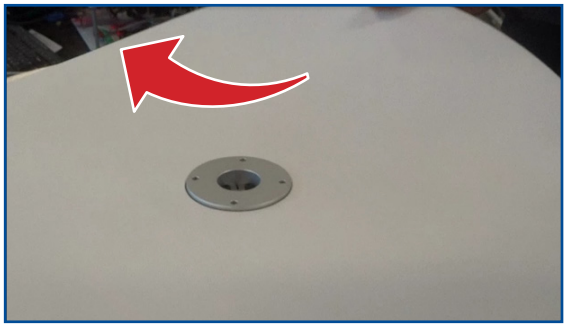
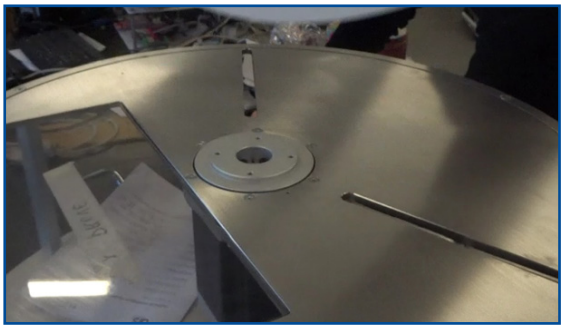
When the "FAULT" STATUS LED is on and the FlexiBowl® works correctly, check the relay.
If this condition is not the one indicated above, connect to the FlexiBowl Parameters user interface program and press Cmd SR. A window will be displayed containing any error messages.

7.2.2 Replacing the FlexiBowl® belt

The FlexiBowl® belt must be replaced according to the following frequencies:

- **at every format change:** each component format may require a different belt surface to be used;
- **every 3 months**: the belt should be replaced every 3 months if used with particularly sharp components;
- **yearly**: in any case, it is recommended to replace the belt at least once a year.

Proceed as follows to **replace the belt of the FlexiBowl®**:

Step	Action	Picture
1	Unscrew the flange fixing screws with an Allen key.	
2	Remove the flange.	
3	Remove the belt and replace it.	 
4	Fit a new belt on and tighten the fixing screws to 10 Nm.	

7.2.3 Cleaning

CAUTION!
Cleaning operations must be carried out by qualified and authorised staff.

CAUTION!
To clean the machine, do not use bits of sponge, damp and/or abrasive cloths, rags with loose threads, petrol or flammable solvents as detergent.

IMPORTANT!
Use neutral, non-abrasive products such as degreasers or common household soap. To remove fragments and dust, use a brush and wear safety glasses.

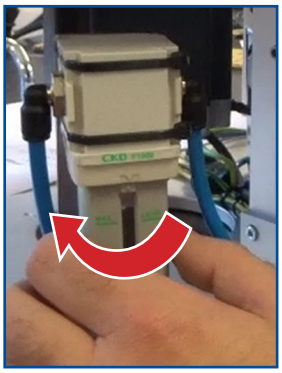
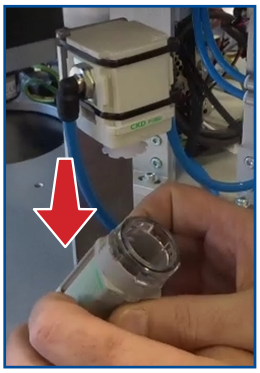
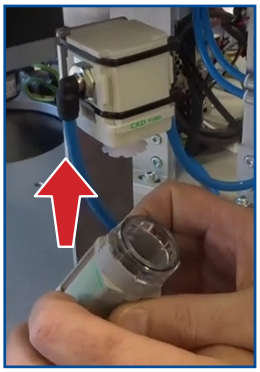
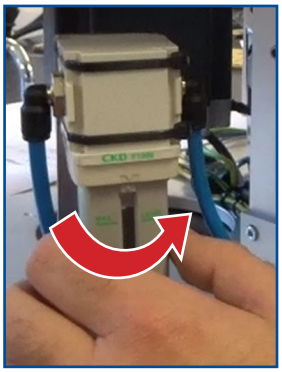
CAUTION!
Do not use acids or solvents to clean the rotating disk.

7.2.3.1 Routine maintenance table - cleaning

Operation	Frequency				
	Daily	Weekly	Monthly	Six-monthly	Yearly
Remove processing residues and waste from the rotating surface.	◈				
Remove any grease or oil with neutral products or solvents.	◈				
Clean the air filter.				◈	
Clean the FlexiBowl® belt.		◈			
	(and whenever it is dirty following a visual check)				
General cleaning.		◈			

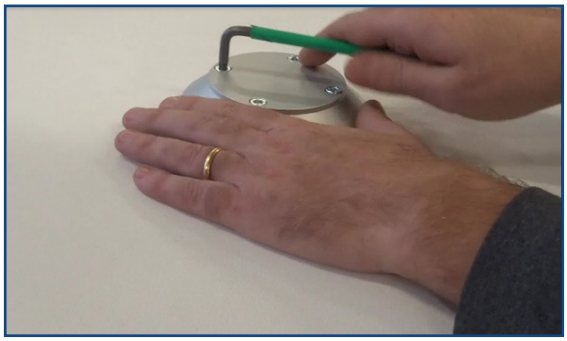
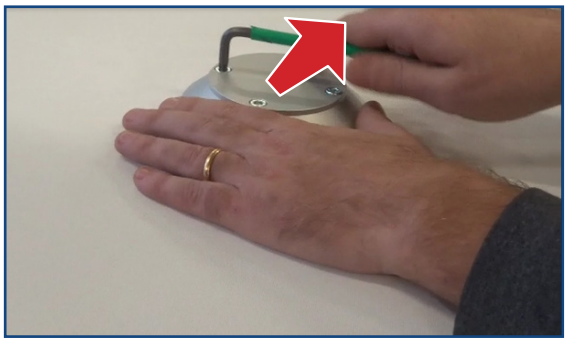
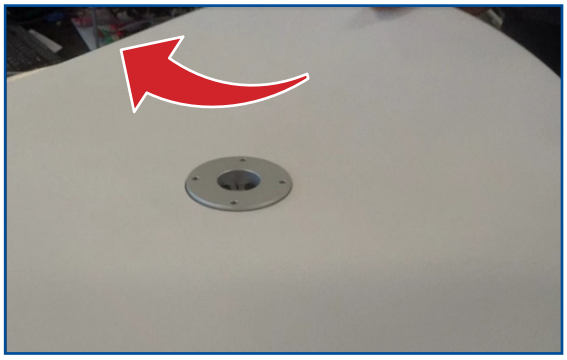
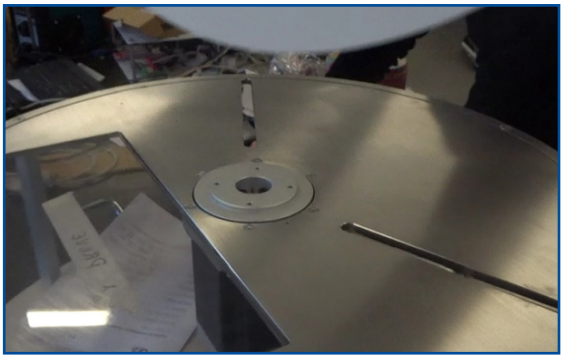
7.2.3.2 Cleaning the air filter

Proceed as described below to **clean the air filter**:

Step	Action	Picture
1	Disconnect the power and air supply of the machine.	
2	Take the cover off the FlexiBowl®.	
3	Rotate the filter holder to unlock it and remove it.	 
4	Clean it with compressed air.	
5	Put the filter holder back in place.	 

7.2.4 Cleaning the FlexiBowl® belt

Proceed as follows to **clean the belt of the FlexiBowl®**:

Step	Action	Picture
1	Unscrew the flange fixing screws with an Allen key.	
2	Remove the flange.	
3	Remove the belt and clean it with alcohol or degreaser. Also clean its support surface with degreaser.	 
4	After cleaning, fit the belt back on and tighten the fixing screws to 10 Nm.	

7.2.4.1 General cleaning

The machine must be kept in a good condition of cleanliness.
Proceed as described below to **give the machine a general clean**:

Step	Action
1	Disconnect the power and air supply of the machine.
2	Manually remove any product residues.
3	Remove the dirt with non-flammable and non-toxic commercial cleaning solvents.
4	If necessary, use a vacuum cleaner to remove any residues from the rotating surface.
5	After cleaning, restore all machine connections.

IMPORTANT!
The machine must be given a general clean whenever the type of component to be processed is changed, in order to remove any residues from previous processes.

7.3 Unscheduled maintenance

CAUTION!
Unscheduled machine maintenance and repairs shall only be carried out by qualified, trained and authorised technicians, employed by the Manufacturer or by the authorised service centre.
These interventions require thorough and specialised knowledge of the machine, of the operations required, of the risks involved and of the correct procedures to work safely.

If exceptional events occur, which require unscheduled maintenance work to be carried out, the user's routine maintenance technicians must follow these procedures:

- check the condition of the damaged or out-of-phase units;
- perform the operations described in this section;
- if the operations to be carried out are not indicated in this manual, send the report of what occurred, the result of the inspection and any observations to the Manufacturer.

The Manufacturer or the authorised service centre will evaluate the situation case by case. Then the type of work to be carried out will be agreed with the routine maintenance technicians, and the most suitable solution will be chosen from the list below:

- the Manufacturer will send an authorised, trained and qualified technician to carry out the necessary work;
- or the Manufacturer will authorise the user's routine maintenance technicians to carry out the work and send any additional instructions.

CAUTION!
Replacement spare parts must be ordered from ARS S.r.l.
If the customer does not use spare parts that are original or authorised in writing by the Manufacturer, the latter shall be deemed free from any liability concerning machine operation and operator safety. Authorisation and/or instructions must always be provided in writing. In the absence of written authorisation, it is forbidden to operate and the Manufacturer declines all liability.

CAUTION!
Maintenance operations must be carried out only by qualified and authorised staff.

CAUTION!
Disconnect the power supply before taking the cover off.

CAUTION!
Disconnect the power and air supply before starting any maintenance operations.

IMPORTANT!
Always use LOCTITE 243 threadlocker to ensure the screws are properly secured (except for the flange screws on the FlexiBowl® belt).

7.3.1 Replacing the backlight

IMPORTANT!
The infrared backlight shines an invisible light and therefore may not appear to be working. Use a camera with an infrared filter to check that it is working properly.
Note: Most smartphones can see infrared lights.

REPLACING THE BACKLIGHT	
Operator qualification	Mechanical maintenance technician
PPE required	
Tools to be used	Allen key

CAUTION!
Disconnect the power supply before taking the cover off.

Proceed as follows to **replace the backlight**:

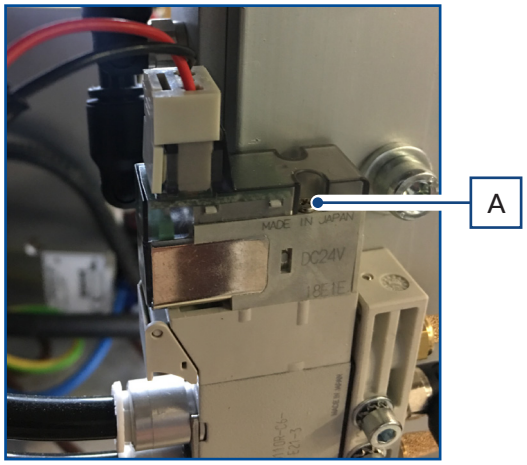
Step	Action
1	Unplug the power cable from the control panel.
2	Take the cover off. **Note:** keep the removed screws for reassembly.
3	Remove the connector between the backlight and the connection board.
4	Unscrew the socket head cap screws fixing the backlight to the FlexiBowl®. **Note:** keep the removed screws for reassembly.
5	Install the new backlight, using the screws kept from the previous operation.
6	Connect the backlight cable to the connection board.
7	Put the cover back in place.

7.3.2 Replacing the solenoid valve

REPLACING THE SOLENOID VALVE	
Operator qualification	Mechanical maintenance technician
PPE required	
Tools to be used	Allen key

CAUTION!
Disconnect the power supply before taking the cover off.

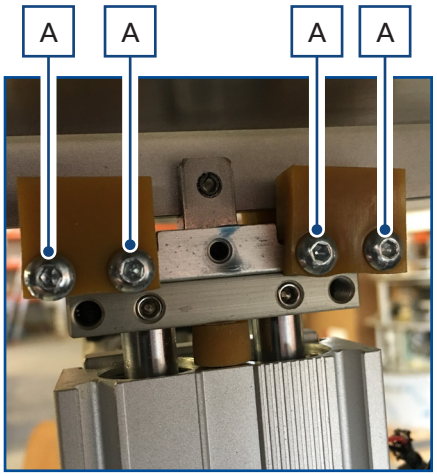
Proceed as follows to **replace the solenoid valve**:

Step	Action	Picture
1	Unplug the power cable from the control panel.	
2	Take the cover off the FlexiBowl®.	
3	Remove the solenoid valve power cable.	
4	Unscrew the 2 fixing screws **(A)**. **Note:** keep the screws removed for its reassembly.	
5	Remove the solenoid valve and replace it with one with the same characteristics.	

7.3.3 Replacing the anti-vibration mounts

REPLACING THE ANTI-VIBRATION MOUNTS	
Operator qualification	Mechanical maintenance technician
PPE required	
Tools to be used	Allen key

Proceed as follows to **replace the anti-vibration mounts**:

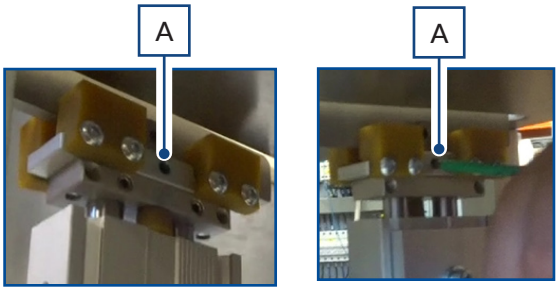
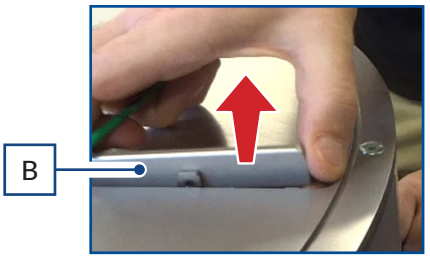
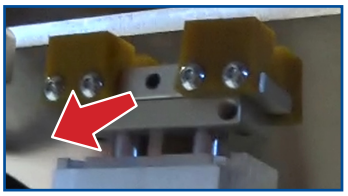
Step	Action	Picture
1	Unscrew the fixing screws **(A)**.	
2	Pull the worn mounts out and replace them with new ones with the same characteristics.	
3	Tighten the fixing screws **(A)**.	

7.3.4 Replacing the shaker

REPLACING THE SHAKER	
Operator qualification	Mechanical maintenance technician
PPE required	
Tools/Products to be used	• Allen key • Loctite 243

CAUTION!
Disconnect the power supply before taking the cover off.

Following a visual inspection, if the rubber mounts and screws in the top part of the cylinder are worn, the shaker must be replaced. Proceed as follows to **replace the unit**:

Step	Action	Picture
1	Unplug the power cable from the control panel.	
2	Take the cover off the FlexiBowl®.	
3	Unscrew the two grub screws **(A)** so that the bar **(B)** can be removed.	
4	Pull the bar out **(B)**.	
5	Unscrew the screws **(C)**.	
6	Remove the unit and replace it.	

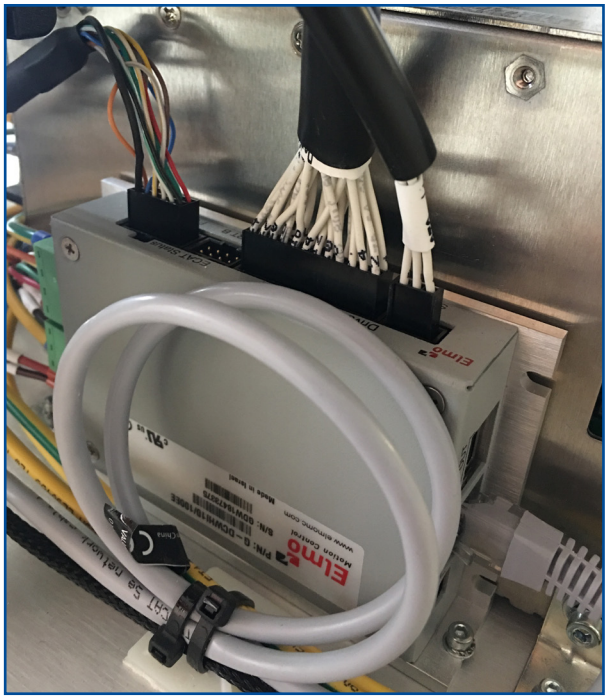
IMPORTANT!
Always use LOCTITE 243 threadlocker to ensure the screws are properly secured.

7.3.5 Replacing the Driver

REPLACING THE DRIVER	
Operator qualification	Mechanical maintenance technician
PPE required	
Tools to be used	Allen key

CAUTION!
Disconnect the power supply before taking the cover off.

Proceed as follows to **replace the Driver**:

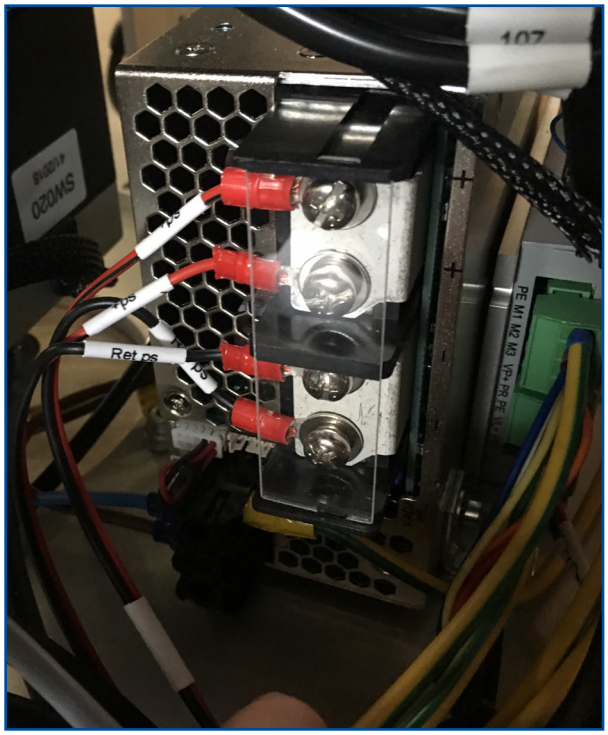
Step	Action	Picture
1	Unplug the power cable from the control panel.	
2	Take the cover off the FlexiBowl®.	
3	Remove the Driver connectors.	
4	Unscrew the 2 fixing screws.	
5	Insert the new Driver. **Note:** the Driver will arrive with standard IP address 172.16.xx.yy.	

7.3.6 Replacing the power supply unit

REPLACING THE POWER SUPPLY UNIT	
Operator qualification	Mechanical maintenance technician
PPE required	
Tools to be used	Allen key

CAUTION!
Disconnect the power supply before taking the cover off.

Proceed as follows to **replace the power supply unit**:

Step	Action	Picture
1	Unplug the power cable from the control panel.	
2	Take the cover off the FlexiBowl®.	
3	Remove the power cables.	
4	Remove the fixing screws.	
5	Insert the new power supply. **Note:** the red cables plug into + on the power supply and the black cables plug into -.	

7.3.7 Replacing the motor

REPLACING THE MOTOR	
Operator qualification	Mechanical maintenance technician
PPE required	
Tools to be used	Allen key

CAUTION!
Disconnect the power supply before taking the cover off.

Proceed as follows to **replace the motor**:

Step	Action
1	Unplug the power cable from the control panel.
2	Take the cover off the FlexiBowl®.
3	Take the surface off.
4	Loosen the shrink disk that attaches the flange to the motor.
5	Remove the flange.
6	Remove the shrink disk.
7	Remove the 4 screws that fix the motor to the FlexiBowl®.
8	Replace the motor with one with the same characteristics. **Note:** the flange must be installed at 1.5 mm from the sliding surface.

7.4 Troubleshooting

No.	Problem	Solution

1	The status LED (Ready/Fault) is red.	• If the FlexiBowl® is working, check operation of the LED or the mechanical relay inside the interface.
		• Check the condition of the fuse inside the power input module and replace it if necessary.
		• Check that the power output voltages are correct:
		  • 48 Vdc - for FlexiBowl® 350;
		  • 60 Vdc - for FlexiBowl® 500, 650, 800.
		Note: if the problem persists, contact ARS S.r.l.

2	The FlexiBowl® vibrates/oscillates excessively.	• Check that the screws are tightened properly. • If the rotating belt needs replacing, make sure that the correct operating parameters have been set for the type of belt (the instructions are on the USB flash drive supplied). **Note:** if the problem persists, contact ARS S.r.l.
3	The status LED (Ready/Fault) is off.	• Check that the power supply is correct and working. • Check the condition of the fuse inside the interface and replace it if necessary. **Note:** if the problem persists, contact ARS S.r.l.
4	The Flip does not work.	• Check the air pressure inside the air supply system control panel. • Check the condition of the pressure regulator. • Check that the power supply is correct and working. • Check that the valves work properly. • Make sure the valve relay inside the interface is working properly. • Check the condition of the fuse inside the interface and replace it if necessary. **Note:** if the problem persists, contact ARS S.r.l.

No.	Problem	Solution
5	The blow does not work.	• Check the air pressure inside the air supply system control panel. • Check the condition of the pressure regulator. • Check that the power supply is correct and working. • Check that the valves work properly. • Make sure the valve relay inside the interface is working properly. • Check the condition of the fuse inside the interface and replace it if necessary. **Note:** if the problem persists, contact ARS S.r.l.
6	The backlight does not work.	• Check that the power supply is correct and working. • Check operation of the backlight relay inside the interface. • Check the condition of the fuse inside the interface and replace it if necessary. **Note:** if the problem persists, contact ARS S.r.l.

8. DECOMMISSIONING AND DISPOSAL

CAUTION!
Decommissioning and dismantling operations must be assigned to staff specialised in such activities. Namely, only the person in charge of dismantling and disposal at the end of the service life can:

- disconnect the parts mechanically and electrically following the disassembly instructions and blueprints.
- transport the parts from the system site to the disposal centre for sorting the parts.

The machine mainly consists of the following materials:

- painted, plasticised or galvanised ferritic steel;
- 300/400 series stainless steel;
- plastic polyethylene material;
- elastomers, PTFE, graphite;
- gear oil;
- lubricating grease;
- electric motors;
- power cables with relative sheaths;
- electronic control and actuation devices.
- etc.

CAUTION!
The machine does not contain any components or hazardous substances that require special removal procedures.

8.1 Decommissioning

If the machine **will not be used for a long time**, it must be made safe and stored properly. Proceed as described:

Step	Action
1	Disconnect the power.
2	Disconnect the air supply.
3	Protect electrical equipment that is particularly prone to wear over time and dust.

IMPORTANT!
When decommissioning machines from external suppliers, see the sub-supplier manuals for said machines attached hereto.

8.2 Disposal

Machine scrapping operations must be assigned to qualified staff, each for their own area of expertise.

When the **machine will be disposed of**, make sure it is made safe.

CAUTION!
Disconnect the power and air supply of the machine.

CAUTION!
For disassembly of trade parts or sub-supply materials that are part of the machine supplied by ARS S.r.l., please see the relative supplier's manual.

Pursuant to the **"WEEE" Directive 2012/19/EU**, if the component/equipment purchased is marked with the following crossed-out wheelie bin, it means that at the end of its service life the product must be collected separately to other waste.

CAUTION!
It is mandatory to comply with the laws in force regarding disposal in the country of machine installation.

9. ATTACHMENTS

ATTACHMENTS
ALARMS LIST

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MF – Drive Fault

MF reports and latches the reason that caused the motor to be disabled (MO = 0).

CANopen/CoE

Elmo_parameters_objects: 0x313D

An EMCY message is transmitted when MF occurs. The message contains the fault reason. EMCY messages are valid to any DS-402 channel either by EtherCAT or CANopen.

Note that the CANopen "Fault reset" command does not clear the MF value and allows the next motor enable command.

ATTRIBUTES

Attribute	Description
Type	Bit field, Read-only
Source	All
Restrictions	None
Range	None
Default	0
Unit modes	All
Non-volatile	No

ATTRIBUTES

MF will not report the reason if the motor was shut off from any of the interpreting channels, such as User Program, Serial Communication, CANopen, EtherCAT or TCP/IP.

MF is automatically set to 0 on the next motor enable command from any source: an

MO = 1 interpreter command, the DS-402 state machine or INH/ENA input.

After the motor is shut down due to a fault, the drive should prevent enabling of the motor for 7.5 milliseconds.

If the fault is caused by an amplifier fault, the red LED will be set, and the AOK function will be activated (see the OL[] command).

The AUTO_ER routine of the user program should be activated upon an MF event.

The following table details the bit-field structure with respect to the fault reason.

MF Value (Hex)	Description	Type CAN EMCY (Hex)	Notes
1 (0 x 1)	Main feedback error	81 7300	Immediate Abort: Servo Off For analog feedbacks check the threshold level in **CA [48]** and **CA [49]** For an absolute encoder check the reason in **EE [1]**. The fault causes a commutation search on the next motor enable.
2 (0 x 2)	Commutation process fail during motor on	81 7382	Immediate Abort: Servo Off For looking the phase Planar motor when on alignment process

MF Value (Hex)	Description	Type CAN EMCY (Hex)	Notes
4 (0x4)	Hall main feedback mismatch	81 7380	Immediate Abort: Servo Off Illegal Halls
8 (0x8)	Current exceeded peak limit	21 8311	Immediate Abort: Servo Off The current has exceeded the value of MC but has not yet reached the level of a short. This is typically caused by instability of the current loop.
16 (0x10)	External Inhibit was triggered (INH/ENB)	21 5441	According to **0x605E** See **IL [ ]** for more details about the Inhibit/Abort functions. Note the Additional Abort function. The Inhibit function is also activated if both limit switches (FLS & RLS) are active simultaneously in Cyclic Synchronous Position motion mode.
32 (0x20)	AC fail: Loss of phase	11 3130	According to **0x605E** Requires specific hardware configuration dependent on drive. Loss of phase.
64 (0x40)	Halls sensor speed is too high.	81 7381	Immediate Abort: Servo Off
128 (0x80)	Speed tracking error	81 8480	According to **0x605E** The difference between the commanded speed to the control loop and the feedback exceeded the value defined in **ER [2]**. This indication is not related to the Max Slippage Error as defined in the DS-402 Profile Velocity mode.
256 (0x100)	Position tracking error	21 8611	According to **0x605E** The difference between the commanded position to the control loop and the feedback position exceeded the value in **ER [3]**. This indication is not related to the Following Error as defined in the DS-402 Profile Position mode.
1024 (0x400)	Gantry Yaw or Stepper closed loop Position error		The Yaw difference in gantry or position error in stepper closed loop, between profile (defined in **CA [98]**) and feedback (defined in **CA [99]**) which exceeded the value in **ER [5]**. This indication is not related to the Following Error as defined in the DS-402 Profile Position mode.
2048 (0x800)	Heartbeat event or frame loss. (communication)	11 8130	According to **0x605E** The motor was shut due to a heartbeat event according to CANopen DS301 object 0x1016.

MF Value (Hex)	Description	Type CAN EMCY (Hex)	Notes
4096 to 32768 (0x1000 to 0x8000)	Amplifier problem	(See table below)	Immediate Abort: Servo Off Indicates the problem that the power section of the drive has encountered.
131072 (0x20000)	Overspeed indication	81 8481	According to **0x605E** The motor speed has exceeded the value which is defined in **HL [2]**. The motor main speed is reported in VU.
2097152 (0x200000)	Motor is stuck	21 7121	According to **0x605E** A stuck motor indication can be requested by using **CL [2]**, **CL [3]** and **CL [4]** according to the following format: If the motor speed is lower than **CL [2]** (in counts/sec) and the measured current is higher than **CL [3]** (in amperes), and if this is observed for more than **CL [4]** msec, the motor is considered to be in the "Motor Stuck" state.
4194304 (0x400000)	Feedback is out of position limits	81 8680	According to **0x605E** The main position feedback exceeded the **HL [3]** or **LL [3]** limit. The main feedback is reported in PU.
8388608 (0x800000)	Numeric overflow - ambiguity in results	81 FF30	Immediate Abort: Servo Off An internal mathematical problem occurred.
16777216 (0x1000000)	Gantry slave disabled		Immediate Abort: Servo Off Gantry master disable because gantry slave is not enabled at current mode
67108864 (0x4000000)	BEMF observer error		Immediate Abort: Servo Off Sign of estimated velocity does not match the velocity command sign
536870912 (0x20000000)	Failed to start motor	81 FF10	The reason of motor start fail can be retrieved with the EC command. Refer to EC command description.

The following table details the Amplifier Status bits indication.

MF Indication 0x1000 to 0x8000 Value (Hex)	Description	Type CAN EMCY (Hex)	Notes
0	All OK		
12288 (0x3000)	Undervoltage: The amplifier is not measuring the minimum required voltage.	5 3120	The minimum allowed value is reported in the **WI [37]** (burnt) and **WI [38]** (actual) command. Actual bus voltage is reported **AN [6]**.
20480 (0x5000)	Overvoltage: The amplifier is measuring a voltage which is higher than the allowed threshold.	5 3310	The maximum allowed voltage is reported in the **WI [35]** (burnt) and **WI [36]** (actual) command. The actual bus voltage is reported in **AN [6].**
28672 (0x7000)	Safety: One or two of the safety inputs are in safety state.	5 FF20	The safety indications are reported in SR bits 14 and 15.
45056 (0xB000)	Short Protection: The current has exceeded a range which is considered as a phase-tophase or phase-to-ground short.	3 2340	This instantaneous fault is measured by the hardware and typically cannot be recorded or indicated outside of the MF command.
53248 (0xD000)	Over-temperature: The drive is sensing a temperature which exceeds the maximum allowed temperature limit.	9 4310	The actual temperature is reported by the **TI [1]** (**TI [2]** in Fahrenheit) command.
61440 (0xF000)	Additional Abort was activated. The drive sensed an input switch that is defined as Additional Abort (refer to **IL [ ]** command)	81 5442	The fault is similar to "Abort" function with different value report. This allows user to distinguish between two different faults states such as Inhibit and PTC.

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