



DG-321

Control cabinet

Operation Manual / Installation Instructions / Parts List
(Original operating instructions)

5560-9001-058

01. April 2019

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1 General

1.1 Information on the document

Right reserved to make changes in the data and illustration due to further technical development of the equipment

Reproductions, translations and copies of any kind, even of extracts, require written authorisation from the manufacturer.

The abbreviations, units, technical terms, special names or industry-specific terminology used in this manual are explained in more detail in the "Appendix".

This manual is supplied with the product.

- It must be kept ready to hand and must remain with the equipment, including if it is sold subsequently.
- This manual is not subject to an amendment service. The most recent version of this manual can be obtained at any time through the technical dealer or directly from the manufacturer.

Target group

This manual includes information for the following target groups:

Information (see chapter)	Target group			
	Carrier	Installation mechanic	Maintenance personnel	Users
Transport and storage	x			
Assembly and installation		x		
Commissioning		x	x	x
Operation and control		x		x
Maintenance			x	
Troubleshooting		x	x	x
Repair work		x	x	x
Decommission		x		



For information on appropriate personnel qualification, please see Chapter:
on:

Safety / Personnel qualifications

Purpose of the manual

This manual describes the following subjects in detail:

- Fitting the control cabinet
- Operating the control cabinet and software
- Commissioning and maintenance of the control unit

Necessary documents

- Instructions on components connected with the product:
(not a complete list)

Part No.	Description	
5560-90 . . -003	Drive unit	Duo Compact I-260
5560-90 . . -006	Drive unit	Duo Compact II
5560-90 . . -014	Drive unit chain	13 mm
5560-90 . . -016	Drive unit chain	10 mm
5560-90 . . -017	Rope drive unit	Economy
5560-90 . . -025	Rope drive unit	XScape Rope DD
5560-90 . . -026	Drive unit chain	XScape Chain
5560-90 . . -036	Manure scraper	Combiscraper
5560-90 . . -055	Rope drive unit	
5560-90 . . -056	Manure scraper	Superclean
2005-90 . . -001	Drive unit	SW drive
5560-90 . . -015	Frost protection	
5560-90 . . -007	Limit switch	

Instructions for other subsystems used.

- Foundation plans
- Circuit / wiring diagrams
- Electrical Diagrams

Structure of the manual

This manual has a modular structure and is intended exclusively for the named product.

For more information on the product and its components refer to the corresponding documents and manuals.

This applies, in particular, to the safety instructions!

Layout elements

Pictograms used



Note

This signal word indicates important information relating to the product and the environment.



This pictogram refers to an information source.
(Chapter, manual, Internet, etc.)

70 .. -90 .. -000 If a manual number is given, the middle 4 figures indicate the language, as follows:

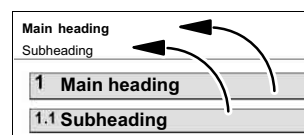
	Language		Language		Language
-9000-	German	-9013-	Dutch	-9032-	Serbian
-9001-	English (United Kingdom)	-9015-	English (North American)	-9034-	Slovak
-9002-	French (France)	-9016-	Polish	-9035-	Chinese
-9003-	Italian	-9018-	Japanese	-9036-	Lithuanian
-9004-	Romanian	-9021-	Danish	-9038-	Portuguese (Brazil)
-9005-	Spanish (Spain)	-9022-	Hungarian	-9039-	French (Canada)
-9007-	Swedish	-9023-	Czech	-9040-	Latvian
-9008-	Norwegian	-9024-	Finnish	-9041-	Estonian
-9009-	Russian	-9025-	Croatian	-9043-	Spanish (Central America)
-9010-	Greek	-9027-	Bulgarian	-9050-	Vietnamese
-9012-	Turkish	-9029-	Slovene		
All of the above languages may not be available.					



A correction bar in the margin indicates changes compared to the previous edition.

Header

The top line on each page provides information on the main subject of that page.



Aids for use

The character string "!!" in the search field of the PDF document jumps to correction bars. The character string "!!" in the search field of the PDF document is used to locate correction bars.



1.2 Manufacturer's address

Royal de Boer Stalinrichtingen B.V.
Vestaweg 5
8932 AV Leeuwarden
The Netherlands

 + 31 (0)58 284 33 00

 + 31 (0)58 284 33 01

 info@royaldeboer.com

 www.royaldeboer.com

EC – DECLARATION OF CONFORMITY FOR MACHINES IN ACCORDANCE WITH EC MACHINERY DIRECTIVE 2006/42/EC, ANNEX II 1.A

Manufacturer Royal de Boer Stalinrichtingen B.V.
Vestaweg 5, 8938 AV Leeuwarden, The Netherlands

We, as manufacturer, declare in sole responsibility that the machinery

Name Manure scraper control cabinet

Model DG-321

Type 5560-0321-010, 5560-0321-011, 5560-0321-030, 5560-0321-031
5560-0321-035, 5560-0321-036

Serial number 2019-010001 and above, 2019-011001 and above,
2019-030001 and above, 2019-031001 and above.
2019-035001 and above, 2019-036001 and above

complies to all relevant provisions of this and the following directives and standards:

2014/35/EU – Low Voltage Directive (LVD)

2014/30/EU – Electromagnetic Compatibility (EMC)

Harmonised Standards

EN-IEC 61000-6-3:2007/A1:2011/C11:2012, Electromagnetic compatibility (EMC) – Part 6-3:
Generic Standards – Emission standard for residential, commercial and light-industrial
environments

EN-IEC 61010-1:2010, Safety requirements for electrical equipment for measurement, control,
and laboratory use – Part 1: General requirements

2011/65/EU – Restriction of the use of certain hazardous substances (RoHS)

Harmonised Standards

EN-IEC 63000:2018, Technical documentation for the assessment of electrical and electronic
products with respect to the restriction of hazardous substances

We also declare that the special technical documentation for this machine has been created in
accordance with Annex VII, Part A and we obligate to provide these upon reasoned request from
the individual national authorities by data transfer.

Leeuwarden, April 15, 2019



Leo Eekhof
Senior Manager Operations

Pieter van Dellen
Senior Director Finance

2 Safety

2.1 Correct applications

The product described has been designed for use in agricultural (mainly milk producing) operations.

It is only intended for:

- use in conjunction with RdB manure scraper systems
- use in combination with one, two or three manure removal systems (depending on the version)

Any applications which are not listed here are not part of the intended purpose and are therefore considered as improper use!

The manufacturer/supplier is not liable for any resulting damage. The user alone bears the risk.

Intended use also includes reading the instructions and observing the inspection and maintenance conditions.

- The manufacture expressly points out that only original parts, accessories and chemicals matched to the product have been tested and approved.
- The installation or use of products from other manufacturers may adversely affect the specified properties of the original parts and lead to hazards to persons and animals.
- The manufacturer does not accept any liability for injury to people or animals, or damage to the product, caused by the use of products from other manufacturers.

2.2 Owner's duty of care

The product was designed and manufactured following a risk analysis and careful selection of the harmonised standards that are to be complied with, as well as other technical specifications. It therefore guarantees a maximum level of safety.

This level of safety can only be achieved in practice on the farm, however, if all the necessary measures have been taken. It is part of the owner's duty of care to plan these measures and check that they are carried out.

(producing appropriate operating instructions for example).

The operator must ensure the following:

- A complete, legible copy of the manual must always be available at the place where the control cabinet is used.
- All persons who work with the product must be able to consult the manual at all times.
- The instructions in Chapter: "Basic safety instructions" must be observed.
- The legal requirements are observed.
- The product may only be used for its intended purpose.
- The product may only be used if it is in perfect working condition. The safety equipment, in particular, must be checked regularly to ensure it is working properly.
- The work to be carried out may only be performed by suitably qualified persons.
- These persons must be regularly trained in all relevant matters in regarding safety at work and protection of the environment, and must know the instruction manual and the safety information it contains
- Operating personnel in training may only work with the product under the supervision of an experienced operator. Their successful completion of training is to be confirmed in writing.
- Safety marks, plates and decals which are attached to the product must be replaced immediately if they become illegible or go missing!
- Escape routes must be indicated by signs in accordance with national regulations.
- Any personnel protective equipment required for persons carrying out operation, maintenance and repairs must be provided and used.
- The presence of unauthorized persons (e.g. children) in the danger zone is strictly forbidden.
- Persons fitted with medical implants (e.g. a pacemaker) are not allowed to enter indicated no-go areas.

2.3 Subsequent changes

Unauthorised modifications to the product can adversely affect the safety, service life and operation of the product.

Any modifications not described in the product documentation are deemed to be prohibited.

For safety reasons, do not carry out any unauthorised changes!

Planned changes must be approved by the manufacturer in writing.

Any unauthorised modifications to the product will invalidate the warranty and may invalidate the conformity or installation declaration provided.

2.4 Explanation of the safety symbols / warnings used

Safety symbols draw attention to the importance of the adjacent text.

The design of the warnings is based on ISO 3864-2 and ANSI535.6.

Safety symbols and key words



Danger!

The signal word indicates an immediate danger that could lead to loss of life or serious physical injury.



Warning!

The signal word indicates an immediate danger that could lead to loss of life or serious physical injury.



Caution!

The signal word indicates hazardous situations that could cause physical injury.

Attention!

The signalling word indicates hazardous situations that could cause damage to property or malfunction.

2.5 General safety instructions and dangers

**Note**

Additional dangers are indicated in the corresponding chapters!

- Work or activities connected with the product might involve risks.
The safety information and operating instructions in this manual must always be followed to ensure that the product is used safely.
- The chapter on "Technical data" gives the permissible working conditions (pressure ranges, temperature ranges, airflow quantities, etc.) and these must be observed!
- Observe measures on protection against noise!
- Do not stand underneath suspended loads.
- Do not open or dismantle devices (risk of injury)!
- Do not remove any protective devices (risk of injury)!

Welding work

- There is a risk of fire during welding work!
Before starting welding work, remove any easily inflammable material from the work area and obtain a hot work permit from the operator.
- Electronic components (e.g. control cards) may be destroyed by welding work.
 - Always disconnect these components from the mains before carrying out any welding work.
 - Disconnect components within a radius of 2 metres.

Electrical components

- Always keep the control cabinet / all electricity supply units / electrical control units closed. Access is only permitted to authorised personnel with a key or special tool.
- Protect live and high-voltage components against moisture. Under no circumstances may water jets or high-pressure cleaners be directed at these!

Plant and equipment

- Building
Escape routes, emergency exits, emergency exits, escape hatches and doors in escape routes must be marked according to national regulations.
- Machines
- Installations

2.6 Qualification of personnel

All personnel who perform work on or with the product must carefully read and understand the manual and act in accordance with it

- Generally, all work on electrical equipment and electrical connection work should only be performed by trained electricians.
- All welding work must only be carried out by qualified welders.
- Have work on network connections carried out by network experts.

In addition, special qualifications are required to perform the following activities:

- Transport and storage
- Clean
- Assembly and installation
- Maintenance
- Troubleshooting
- Repair work
- Decommission



Note

Work that requires special qualifications is described in the relevant chapters!

2.7 Protective Equipment

- Safety markings
Safety symbols, warnings, warning signs and labels
- Emergency stop systems for the entire installation (control cabinet, drive station and manure scraper).

2.8 Residual risks

Not all hazards can be eliminated by construction measures.



Note

Additional dangers are indicated in the corresponding chapters!

Mechanical hazards:

When working on the control cabinet, there is a danger of

- the manure scraper starting operation automatically

When working on the electrical system:

All work on the electrical equipment and electrical connection work may only be carried out by trained specialist electrical personnel in accordance with the wiring diagrams in this installation manual.

Observe local regulations and safety requirements (VDE, EVU, etc.)!

Warning mains voltage!

Before any work is performed on conductive components or lines the power supply must be switched off and secured against being switched back on again.

Whenever any unavoidable work is carried out on live components (e.g.: testing to locate a fault), a second person must be present who can disconnect/interrupt the power supply in the event of an emergency.

Protecting the environment:

Always observe the requirements on avoiding waste when working, and on the correct recycling or disposal of waste.

In particular, when installing, servicing or decommissioning the equipment, it should be ensured that substances which are harmful to groundwater - such as manure - do not pollute the ground or enter the sewage system.

These substances must be collected, stored, transported and disposed of in suitable containers.

In the event of fire:

In case of fire switch off the product immediately at main switch.

Special fire-fighting measures are to be followed for

- electrical cables

Electrical hazards:

There is a risk of electric shocks when working on the control cabinet

- from direct contact with live parts or parts which have become live because of a fault
- from electrostatic processes
- from high voltage
- from short circuits/overloads, when molten particles may be ejected as well

"Residual energy" hazards:

Always remember that even after the equipment has been switched off or has come to a standstill, different types of energy may still be present - for example:

- in components that run on
- in live power lines

2.9 Dangerous Areas



Danger!

**Risk of crushing!**

There is a danger of being trapped between moving and stationary parts.

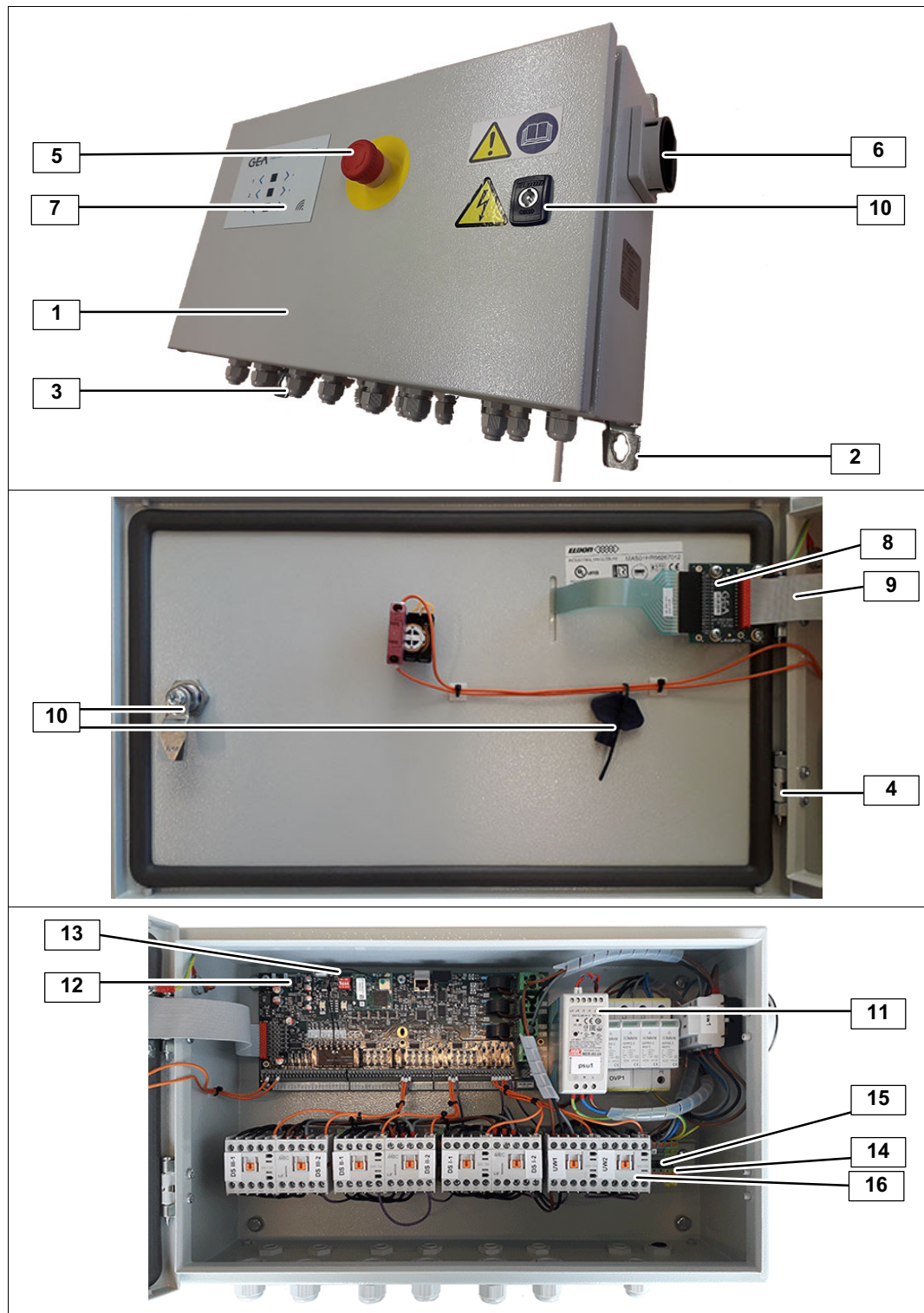
- Standing in the danger area is strictly forbidden.
-

2.10 What to do in an emergency

- Press the emergency stop button to bring the system to a standstill
- In the event of serious injury, ring 999 in the UK or 911 in the USA.

3 Description of the control cabinet

3.1 Description of the design



Note

The DG-321 is not fitted with a loudspeaker and does not emit any sound.

1	Cabinet	9	Ribbon cable
2	Mounting lugs	10	Lock with key
3	Cable glands	11	Power supply unit
4	Hinges	12	Printed circuit board
5	Emergency stop button	13	Wi-Fi antenna
6	Main power switch	14	Earthing wire connection
7	Air cushion film	15	Three-phase and neutral cable connections
8	MMS circuit board	16	Switch

3.2 Description of function

3.2.1 Compatibility

The DG-321 is a microprocessor-based control cabinet for controlling RdB manure scraper installations (closed-loop and open-loop control) that are currently controlled by the BLC, USC750, RSC250750, RSC +, IVRPRO and Max@cces control cabinets.

3.2.2 Versions

The control cabinet is available in four versions:

- for 1 drive
- for a maximum of 3 drives
- for 1 drive with overvoltage protection
- for a maximum of 3 drives with overvoltage protection



Note

The second and fourth versions can control one, two or three drive systems. Drive systems cannot run simultaneously.

3.2.3 Master-slave Configuration

Two control cabinets are used in a master-slave configuration. One cabinet controls one or more drive systems and starts another DG-321 which controls a cross-gutter scraper, for example.

3.2.4 General description

The control cabinet consists of a box with push buttons on the front and a special circuit board which incorporates a microprocessor, a Wi-Fi module and a series of standard electrical components (main power switch, emergency off switch, contacts) and an optional overvoltage protection switch.

3.2.5 Access to the control cabinet

Settings, operation and problem-solving can in most cases be carried out using a smartphone within a distance of 50 m from the control box.

The control cabinet contains an incorporated web server and Wi-Fi network. It also has a USB 2.0 connection.

The connected drive station can also be started and stopped by pressing the appropriate button on the front of the cabinet.

The Wi-Fi can be set to "Access mode" or "Client mode".

The default setting is "Access mode". The user sets up a connection to the Wi-Fi module of the control cabinet and after opening a web browser on the control unit is connected directly to the internal website of the control cabinet.

If this is connected to the barn Wi-Fi network in client mode, the control cabinet can be operated from anywhere connected to the network.

The way this can be achieved depends on the situation. Special IT qualifications are required which are not covered in this manual.

Working in client mode has the advantage, however, that there is no need to establish a connection to the control cabinet Wi-Fi network every time it is used.

The control unit only requires a web browser: there is no need to install an app. The connection the cabinet can be established without a password. This is left to the end user.

3.2.6 Overload protection

The control cabinet is fitted with comprehensive overload protection. This includes motor protection, cow protection and wire breakage detection.

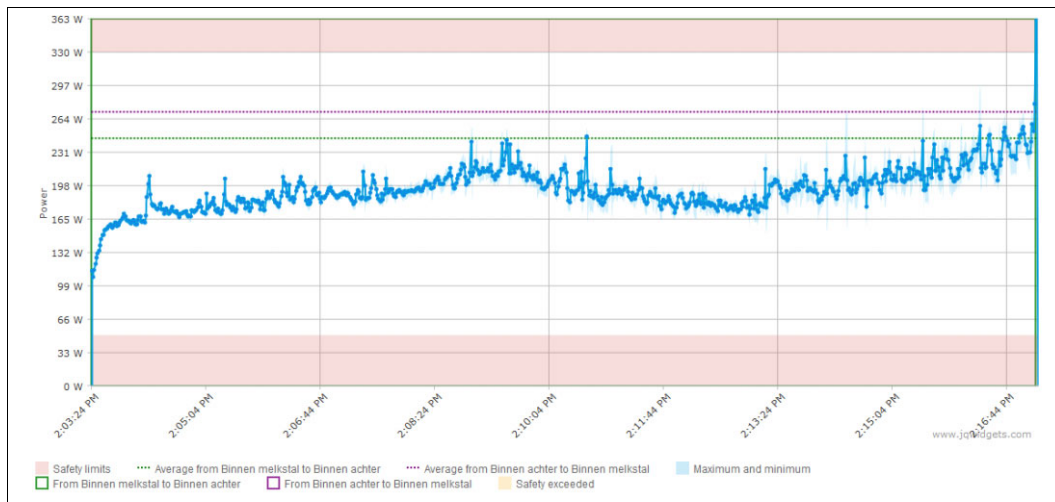
The cow protection and wire breakage parameters can be set and kept up to date manually or automatically to rule out weather influences or a "Manure and scraper to cow protection" condition.

The overload protection operates by monitoring the active power consumed by the drive system: active power is the parameter that responds most sensitively to the changes in the load of the drive systems.

3.2.7 Diagnostics, logs and fault rectification

The control cabinet offers extensive diagnostic and logging functions, which assist in problem solving:

1. Current displays and logs in a graph showing active power over time for all the cycles completed in the last four months. A scraper not running smoothly can be identified by peaks in the curve:



2. Logs of the numerical values of the maximum and minimum voltages in all three phases during each cycle.
3. Current monitoring and logging of the voltage in all three power phases of all cycles.

Expert ▲	
Phase 1: Minimum voltage: 229.9 V	Maximum voltage: 230.1 V
Phase 2: Minimum voltage: 229.9 V	Maximum voltage: 230.1 V
Phase 3: Minimum voltage: 229.9 V	Maximum voltage: 230.1 V

4. Active monitoring of condition of all associated components, e.g. limit switches or transducers, individual drive systems, and the system in general (e.g. external emergency stop).
5. Logging the numerical value of the maximum and minimum active power during each cycle.
6. Logging all changes in the settings. All settings and logs are saved in two downloadable files. These files can be uploaded into support software, which allows remote fault rectification. It is also possible to upload a settings file into the control cabinet.

3.2.8 Overvoltage protection device

- 1. Electrical equipment is sensitive to voltage spikes over 1.5 kV. The overvoltage protection devices are specially designed to protect low-voltage equipment against overvoltages and lightning strikes.
- 2. Use the overvoltage protection in conjunction with the overvoltage devices mounted on the control cabinets if necessary.
- 3. This is within the discretion of a qualified expert electrician.

3.3 Connectivity

Terms:

Control cabinet	DG-321 Control cabinet
Control unit	Smartphone, tablet, laptop or PC
User	The end user who operates the control cabinet

The DG-321 control cabinet can be set up and operated over Wi-Fi or Ethernet. Basic commands can be entered over the buttons on the front panel of the cabinet. LEDs indicate its status.

The Ethernet is configured in the default setting for DHCP. When connected to a RJ45 Ethernet, this infrastructure supports a DHCP server (as is the case with most routers). This allows automatic connection to the local infrastructure and the Internet.

When the control cabinet is connected to the Internet and the system settings allow it, automatic time synchronisation is carried out.

A Wi-Fi access point network is provided near the cabinet. This Wi-Fi network has a name (SSID) which is the same as the unique number on the CE sticker on the box housing. A password is not set up as standard, but this can be changed later.

The password can be bypassed by pressing a certain button combination.

The most usual scenarios are described in Chapter 6 "Commissioning". They describe the situation, the installation and daily operation.

3.4 Important system accessories and options (not included)

Motor protection switches (5 types)

Every motor must be fitted with its own protection switch, unless two motors are connected in series and always in operation at the same time.

In this case a single motor protection switch is sufficient.



Document wallet or folder

The document wallet or folder is waterproof and allows the manual to be kept near the control cabinet. The wallet or folder can be mounted on the wall.



Frost protection set

The frost protection set protects the entire system against freezing.



3.5 Technical specifications

Available versions and powers

5560-0321-010	1 Drive unit	2,2 kW
5560-0321-011	1 Drive, overvoltage protection	2,2 kW
5560-0321-030	3 Drives	2,2 kW
5560-0321-031	3 Drives, overvoltage protection	2,2 kW

Electrical data

Input voltage	3~230/400V±10% 50 Hz + N + PE 3~230V±10% 50 Hz
Maximum power	2300 Watt
Max. voltage	600 V
Maximum current	15 A (continuous), 104 A (inrush)

Motor thermal protection

5560-0321-690	0,63 - 1,0 A
5505-9999-001	1,0 - 1,6 A
5505-9999-004	1,6 - 2,5 A
5505-9999-002	2,5 - 4,0 A
5560-0321-700	4,0 - 6,3 A

Rated withstand impulse voltage

2,5 kV

Housing

300 x 500 x 170 mm	
Coated for rough conditions, protection class C4 (ISO 23944)	
Cabinet:	Sheet steel IP65
Weight:	12 kg
Front door with hinges	

Relay outputs

max. 30 V DC 1.25 A, 125 V AC 1.25 (resistive)

- External machinery
- Fault detector
- Operational indicator lamp

Inputs

nom. 24 V DC, max. 30 V DC, min. 12 Vdc

- Transducer
- Limit switch
- Emergency stop button
- External start
- External stop
- Frost protection

External supply voltage

24 Vdc, 1A protected against short-circuits and overloads
 ► (E-fuse, automatic restart)

Connections

Wi-Fi	IEEE 802.11 b/g/h (2,4 GHz)
Ethernet	RJ45 plug connector in the cabinet, 10/100 Mbit/s
USB	USB A plug connector in the cabinet, USB 2.0

Operating environment

Operating Temperature	-20 °C - +50 °C
Air humidity	0 - 95 %, non-condensing

Main power switch

4-pole, 16 A, grey/black, interlocked

Rating plate

The rating plate is located on the right-hand side of the control cabinet.



3.6 Factory settings

Other settings can be used!

Attention!

Incorrect settings can have a negative effect on the health of the animals, the quality of the milk and milking results.

- Changes may only be made by trained personnel.
- Check all factory settings before commissioning and adjust to the individual requirements of the installation or animal if necessary.



For further information, please refer to Chapter:
Commissioning

4 Transport and storage

4.1 Special personnel qualifications

Transport may only be carried out by specially qualified personnel in accordance with the safety instructions.

- National driver's licence for self-propelled machines, forklifts and other industrial trucks.

4.2 Particular risks

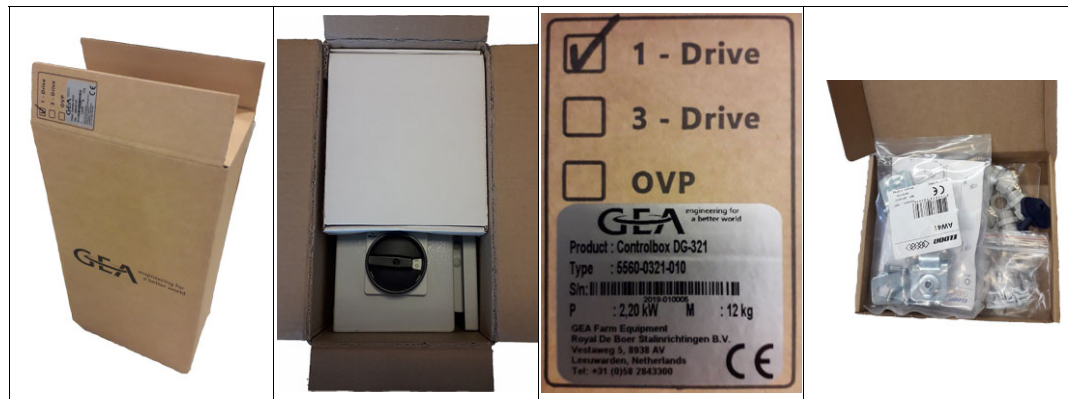
- Projecting sharp edges may cause injury.
- Parts stacked too high can fall over.
- Suspended loads can fall, with a risk of death - do not stand underneath suspended loads!
- Lifting or carrying heavy loads can result in injuries.
Only use the specified tools for transport.
- There is a fire hazard due to the highly flammable packing material - open flames and smoking prohibited!

4.3 Dimensions / Weights

Package unit (content)	Dimensions (mm)	Weight (kg)
Box	300 x 170 x 550	12

4.4 Packing

A copy of the rating plate is affixed on the outside of the cardboard packing. There is also a check box which indicates whether this is a control cabinet for one or three drive systems, and whether the control cabinet is fitted with overvoltage protection or not.



The mounting plates, cable glands and housing key are supplied separately in a small box on the control cabinet.

4.5 Storage conditions

Attention!

Danger of corrosion!

Dissimilar metals or metal compounds react with an electrically-conductive liquid (electrolyte).

► Do not store stainless steel together with steel!

When storing the goods supplied, the location must provide protection against:

- Moisture
- Frost
- external damage (shocks, impacts, rodents, insects, etc.)
- Direct sunlight
- Remove the heat-shrink film and adhesive tape if the product is to be stored for any length of time.

4.6 Disposing of packaging material

After unpacking, the packing material must be handled properly and disposed of carefully in accordance with the valid local regulations on waste disposal and utilization.

5 Assembly and installation

If necessary, please contact your nearest authorized technical dealer.

5.1 Special personnel qualifications

Installation may only be carried out by specially qualified personnel in accordance with the safety instructions.

- Relevant product training is required.
- Do not allow anyone except a qualified electrician install the electrical components.

See the "Personnel Qualifications" chapter on this.

5.2 Safety Instructions

To prevent damage to property and/or life-threatening injury to personnel, always observe the following:

- Observe applicable national standards and requirements during installation!
 - Carry out electrical installation work in accordance with the following standards and requirements:
EN 60204, Point 14 (Electrical equipment of machines).
- Before installation, look for any damage caused during transport. Do not use damaged components!
- Do not carry out any welding on the product!
- All electrically conductive parts with which the animals might come into contact must be connected to each other and to the system's protective earth conductor by additional equipotential bonding.
- In the cases of devices with 24 V direct voltage, the power supplies stipulated by the manufacturer and approved for the devices must be used, because the safety of personnel and of the building cannot be ensured otherwise.
- Disconnect electrical installations or equipment (components, housings, etc.), from the mains before working on them.
Any on/off or emergency stop switches are to be fitted with a lock to immobilize them in the open position and a warning sign is to be put up.
- Read the "Safety" chapter as well.

5.3 Particular risks

- The electrical current can cause injury from live cable ends and components.
- Cables that have not been laid property (e.g. too small a bending radius) may cause smouldering or cable fires.
Eliminate a bending radius if too small.
- Electrostatic processes can cause damage to electronic components.
 - Only touch the edges of the circuit board and avoid static caused by clothing.
- Components which are incorrectly fitted or not properly fastened can fall down or fall over.

5.4 Preconditions

The product must be installed in a well-ventilated room.

Attention!

Electrical components can be destroyed by condensate.

- The housing of electrical devices should not be exposed to direct sunlight!

5.5 Installation Parameters

Install the product at a location in the manure scraper system as close to the drive as possible but out of reach of the cows.

Install the product in a well-ventilated room.

The optimum ambient temperature is between -20 °C and +50 °C.

Installation of cabinet heating is not necessary, as it has been tested down to -20 °C.

Make sure that the cabinet interior is sufficiently well illuminated during installation so that the electrical connections are clearly visible. Use a head torch if necessary.

The cabinet is constructed to degree of protection IP 65. The ambient environment must comply with this rating.

Do not connect the control cabinet to an inverter/frequency converter, as this can damage the electronics in the cabinet.

The RCD must be part of the power supply unit.

For the control cabinet to function properly, the input voltage of all three phases should not vary significantly from 230 V AC and a neutral conductor (N) and an earth conductor should be present. The control cabinet can also be operated with 3 x 230 V AC (in delta configuration: without a neutral conductor (N)).

The internal power supply of the control cabinet can work with voltages from 85 to 264 V AC (50/60 Hz). If the voltage is outside this range, the system switches off.

As soon as the voltage is back within this range, the system will switch back on. An error message will be displayed, and for safety reasons the system will only be restarted after a manual command.

The input voltage must be 230 VAC +6%/-10% for the entire scraper installation to work properly.

Heavy electrical machinery (e.g. mixers or pumps) connected to the same power supply as the control cabinet can cause temporary malfunctions of the control cabinet.

Connect transducers to the control cabinet with a screened cable (5500-9999-001).



Warning!

Moving parts

Unintentional, inadvertent, and/or incorrect behaviour must not under any circumstances lead to contact with one of the components that can be set in motion from the control cabinet.

- Pay particular attention in this respect to traction components (chain, rope) and return pulleys outside the cow area.
Screen these off sufficiently with gratings or cover plates.

5.6 Installing the DG-321

5.6.1 Installation

1. Install the other components of the manure scraper system first:
 - drive stations (including wiring)
 - manure scraper, traction components (rope, chain) and pulleys;
 - end point switch (if applicable)
2. Install the scraper a few metres away from an end point.
3. Mount the on/off button.

- Step 1: Starting situation: button is supplied loose



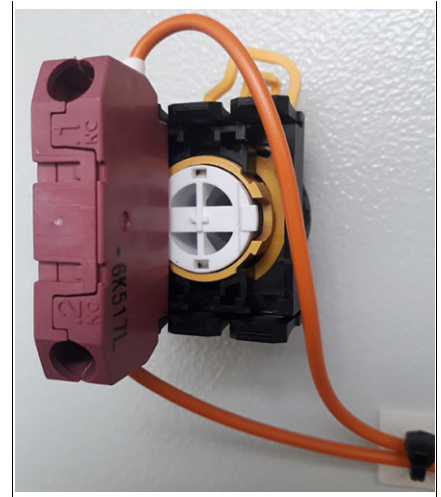
- Step 2: Push the button through the hole in the front panel from the outside and then screw the cable gland over the button against the front panel. Make sure the button is correctly aligned on the inside: the long recess in the yellow ring must be at the top left and bottom right.



- Step 3: With the yellow clip in the left position, push the switch over the button as far as possible. If the yellow clip is in the right-hand position, it can be moved to the left-hand position by pulling it upwards and simultaneously turning it to the left.



- Step 4: Push the yellow clip into the right-hand position.



4. Seven M20 and eight M16 cable glands including blanking plugs are provided from the factory. Fit all these cable glands in the openings on the underside of the control cabinet.
Fit a blanking plug into each cable gland not used for a cable.
If additional openings are necessary, drill holes in the underside of the housing of 16 and/or 18 mm diameter.



Warning!

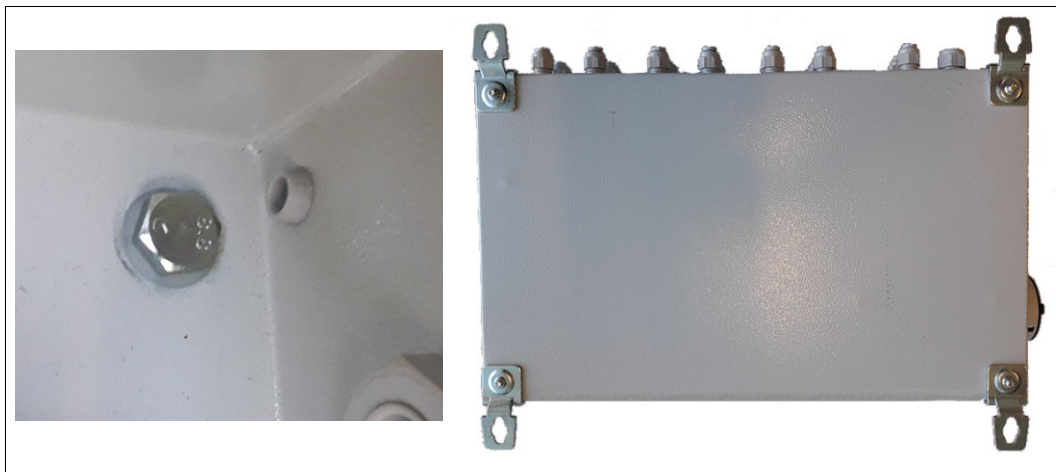
Burrs / swarf

Residual burrs and swarf can lead to corrosion and short circuits.

- Deburr the holes after drilling and remove all burrs and swarf from the control cabinet.



5. Position the control cabinet as near to the drive stations as possible.
6. Mount the control cabinet on the wall. Note the following:
 - Keep the control cabinet and cables out of reach of cows.
 - A person of average physical size must be able to reach all the buttons and switches by hand.
 - Do not place the control cabinet in strong sunshine.
 - Do not allow the control cabinet to become wet as result of rain or snow.
 - Fasten the mounting plates at the height of the four 8 mm diameter holes in the rear panel of the control cabinet. Secure the plastic washers under the screw heads. (M8).



- Fasten the control cabinet to the wall at all four mounting points.
Hole pattern: 460 mm horizontal x 345 mm vertical (575 mm diagonally)
The wall must be able to hold all four screws for an extended period (20 years)
7. Switch off the power supply and secure the power supply of the DG-321 with a lock. Affix a sign with the wording "Electrical Work in Progress".

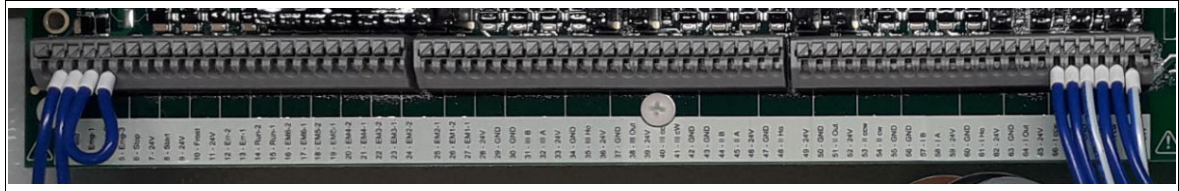


5.6.2 Connection

All the cables must be fitted with wire ferrules to ensure a reliable working connection.

The wires/cables that have to be connected to the connections on the bottom edge of the circuit board must be run under the DIN rails/motor connection terminals.

Connecting the terminals 1 to 72 at the bottom of the circuit board:



An overview of terminals 1 to 72 can be found in Appendix 13.2:

Chapter: Description of the control cabinet connection terminals

Connecting the power supply and motors/motor protection switches



The following applies to all connections:

Cross-section:	1,5mm ²
Wire ferrule	1,5mm ² - 8mm (GLW 15-01557k)

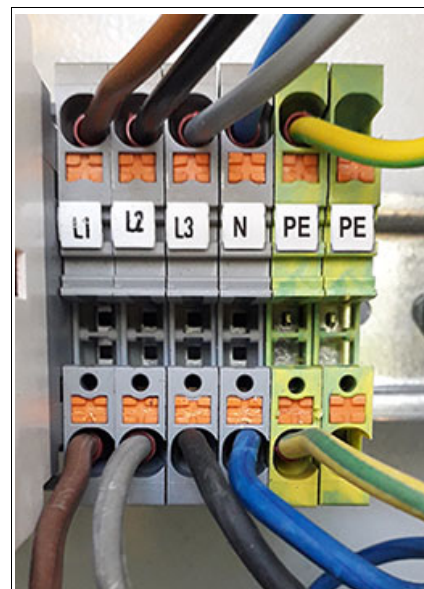
Tag	contact	Element	Incoming or outgoing	Voltage
Electric motors				
DS III - 1	2/T1	L1 - electric motor	Outgoing	400VAC
	4/T2	L2 - electric motor	Outgoing	400VAC
	6/T3	L3 - electric motor	Outgoing	400VAC
	PE	Protective earth terminal	Incoming	-
DS III - 2	2/T1	L1 - electric motor	Outgoing	400VAC
	4/T2	L2 - electric motor	Outgoing	400VAC
	6/T3	L3 - electric motor	Outgoing	400VAC
	PE	Protective earth terminal	Incoming	-
DS II - 1	2/T1	L1 - electric motor	Outgoing	400VAC
	4/T2	L2 - electric motor	Outgoing	400VAC
	6/T3	L3 - electric motor	Outgoing	400VAC
	PE	Protective earth terminal	Incoming	-
DS II - 2	2/T1	L1 - electric motor	Outgoing	400VAC
	4/T2	L2 - electric motor	Outgoing	400VAC
	6/T3	L3 - electric motor	Outgoing	400VAC
	PE	Protective earth terminal	Incoming	-
DS I - 1	2/T1	L1 - electric motor	Outgoing	400VAC
	4/T2	L2 - electric motor	Outgoing	400VAC
	6/T3	L3 - electric motor	Outgoing	400VAC
	PE	Protective earth terminal	Incoming	-
DS I - 2	2/T1	L1 - electric motor	Outgoing	400VAC
	4/T2	L2 - electric motor	Outgoing	400VAC

Tag	contact	Element	Incoming or outgoing	Voltage
	6/T3	L3 - electric motor	Outgoing	400VAC
	PE	Protective earth terminal	Incoming	-

Tag	contact	Element	Incoming or outgoing	Voltage
Power supply				
	L1	Power supply L1	Incoming	400VAC
	L2	Power supply L2	Incoming	400VAC
	L3	Power supply L3	Incoming	400VAC
	N	Zero current	Incoming	400VAC
	PE	Protective earth terminal	Incoming	400VAC

1. Connect the power supply //unit

- With a 3 x 230/400 VAC mains with a neutral conductor (N) and a protective earth (PE), connect the mains cable to L1, L2, L3, N and PE



- With a delta-connected 3 x 230 VAC mains without a neutral conductor (N) and protective earth conductor (PE):
 - Connect terminal L3 to terminal N.
 - Have the control cabinet connected to a protective earth in accordance with local regulations by a qualified electrician.



2. Connect the motor(s)

- Install one motor protection switch between each motor and the DG-321. Position each motor protection switch in the immediate vicinity of the DG-321.

**Note**

A motor protection switch is not a working switch.



- In a system with a closed control loop (i.e. a drive system with only one motor, e.g. XScrape Chain or SW drive), leave the bridges (cable connections between 2/T1, 6/T3, 4/T2 and 4/T2, 6/T3), 2/T1) in the corresponding motor connection.

It then makes no difference whether the motor is connected to the left or right half of the corresponding motor connection terminal.

If two motors are running at the same time in a closed control loop, it is immaterial whether both motors are connected to the same terminal of the set of terminals in question, or whether one motor is connected to the left and the other to the right of the set of terminals.

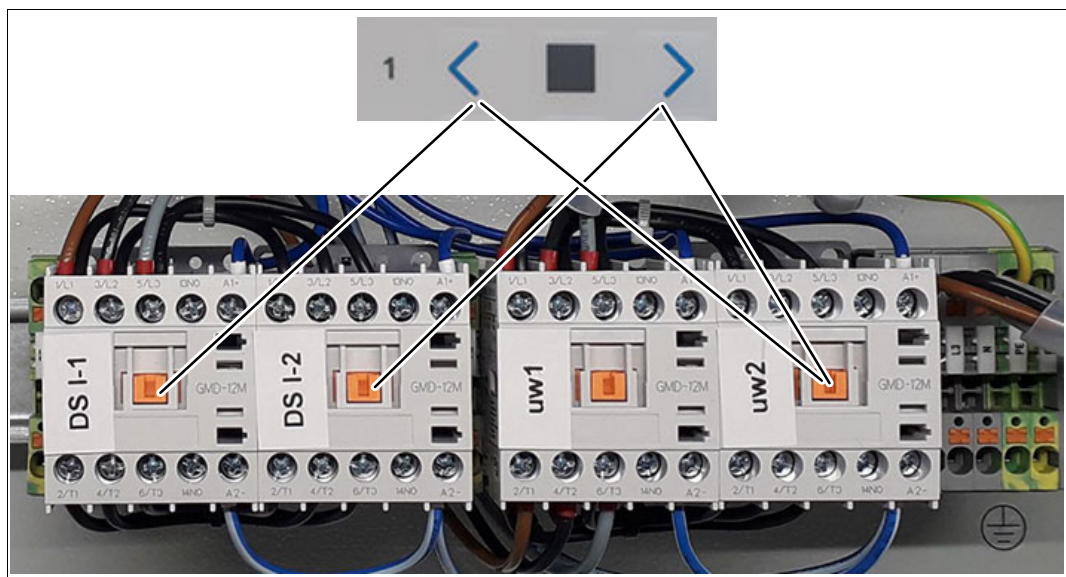
Make sure that both motors rotate in the same direction, however.



In a system with an open control loop (i.e. a drive system with two motors, e.g. Polyrope or Duo Compact I/II), remove the bridges from the underside of the corresponding motor terminals. The bridges at the top motor terminals must remain in place.

- Read carefully how the motor(s) of the individual drive systems should be connected: it is advisable that when the "<" button is pressed (left start button that activates the left side of the motor switch set), the direction in which the scraper moves corresponds to the operator's expectations. The end point of this movement is the start position.

The end point of the system after pressing the ">" button is the end position.

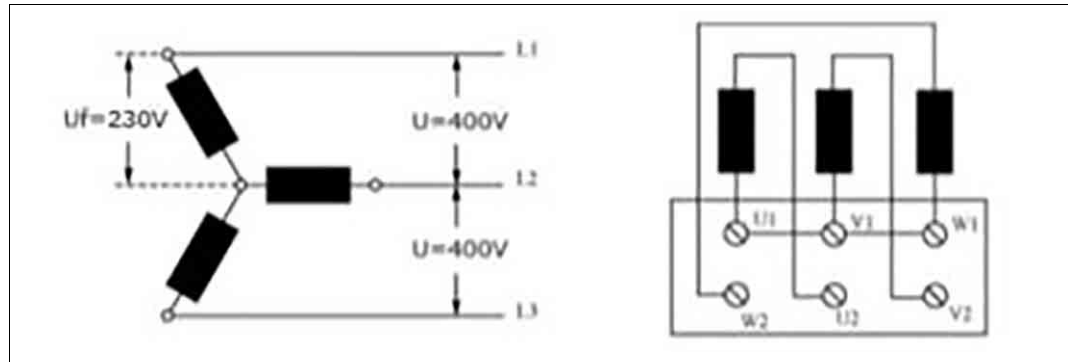


For more information see the following Chapter:

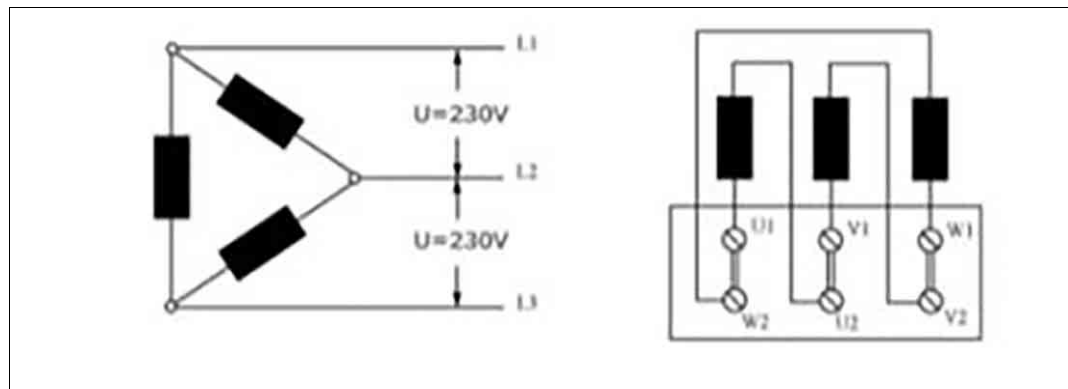
Chapter: First use - drive system settings

- All types of asynchronous three-phase motors with a maximum power of 2.2 kW can be connected to the control cabinet.
Connect motors set for 230/400 VAC 50/60 Hz in a star (Y) configuration if the control cabinet is connected to 3 x 230/400 VAC. This is the case in most European countries.
In countries where the control cabinet is fed from a 3 x 230 VAC power supply, connect the motors in a delta configuration (Δ). anschlie

Star connection:



Delta connection:



3. Switching on the main power switch

Switch on the main power switch at the control cabinet and wait a few minutes until the LED on the front panel lights up.

4. Check the direction of rotation of the motors

Press the orange-coloured button at UW2, the right half of the wind/unwind reversing set, with a pen or screwdriver while simultaneously pressing the orange-coloured button of the half of the reversing set where the motor being checked is connected. The drive station in question must then wind (open circuit) or go to the parked position (closed circuit).

Explanation:

- In systems with an open control loop, the motor connected to the left half of a reversing set is the motor that brings the system into its start position; the left half is fed with power by the "<" start button. The motor connected to the right half of the reversing set brings the system into its end position, and the right half is fed with power by the ">" start button.
- In systems with a closed control loop, the motor is connected to both the left and right halves of the reversing set by the cable bridges that are fitted.
- UW1, In systems with an open control loop, the left half of the winding/unwinding reversing set is only provided with power during the "Wind" function in the second screen of the operator menu (if the traction component needs to be replaced).
- UW1 is activated in systems with a closed control loop during the "Stationary" function in the second screen of the operator menu to make the system run in the opposite direction (towards the end position).

5. Setting the motor protection switches

Set all the motor protection switches to a nominal current of +0.1A of their respective electric motor. The nominal current will depend on how the motor is connected: Δ or Y.



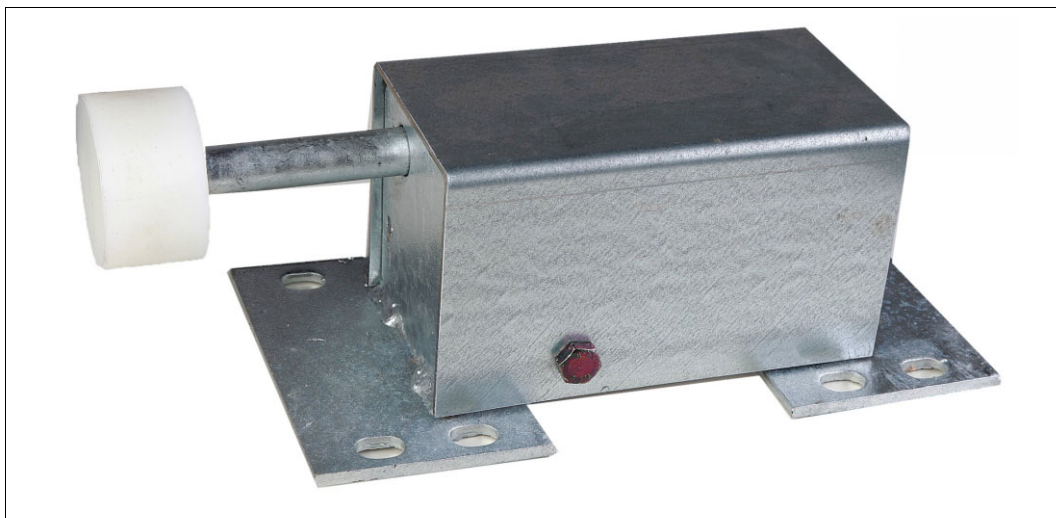
For more information on this, see the following page:

Page: 32 - 2. Connecting the motor(s)

MADE IN VIETNAM		 Bonfiglioli		Riduttori			
3 ~ Mot BN71B4				No 64075820088			
Cod. R30720156				IM B 14 IP 55			
V Δ/Y		I.CL. F		S 1		cos ϕ	
Hz		kW		A Δ/Y		min-1	
230/400		50 0.37		1.82 - 1.05		1370	
460		60 0.45		1.09		1660	
220/240		V Δ 1.85-1.85		A		50Hz	
380/415		VY 1.07-1.07		A		60Hz	
440/480		VY 1.10-1.09		A		60Hz	

6. Connecting the limit switches

If no limit switch is used, there is no need to bridge the relevant terminals on the circuit board.



Connect the limit switches as follows:

Limit switch cable for "Start" motor:	Terminal for drive system 1	Terminal for drive system 2	Terminal for drive system 3
brown	62 24V	49 24V	36 24V
blue	61 I Ho	48 II Ho	35 III Ho

The limit switch for the "Start" motor is the limit switch that switches off the motor that brings the system into its start position. This motor is started with the "<" button.

Limit switch cable for "End" motor:	Terminal for drive system 1	Terminal for drive system 2	Terminal for drive system 3
brown	65 24V	52 24V	39 24V
blue	64 I Out	51 II Out	38 III Out

The limit switch for the "End" motor is the limit switch that switches off the motor that brings the system into its end position. This motor is started with the ">" button.

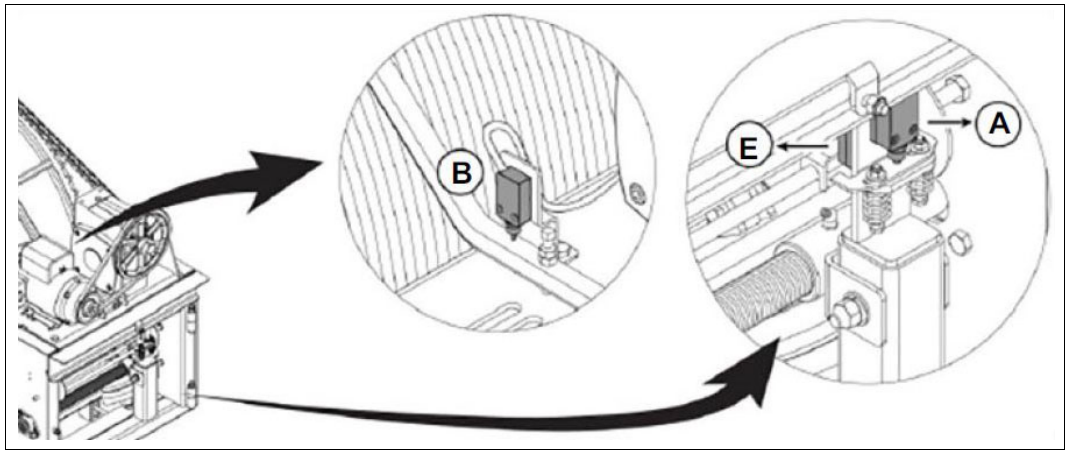
SW drives

SW drives are fitted with a Telemécanique limit switch (A). We urgently recommend replacing this limit switch by two separate limit switches, as described below.

This offers more flexibility in operation; during a single work phase, the drive system can be stopped and moved backwards without the plate that moves the limit switch having to be moved in the other direction. This is also a restriction when configuring a cycle; the direction of the system can only be changed after the limit switch has been operated.

If the Telemécanique switch is used, connect it as follows:

Telemécanique Wire	Terminal for drive system 1	Terminal for drive system 2	Terminal for drive system 3
black	65 24V	52 24V	39 24V
black-white	64 Out	51 Out	38 Out
blue	62 24V	49 24V	36 24V
brown	61 I Ho	48 II Ho	35 III Ho



Switch B acts as a rope winding protection, connect it as an external stop signal (see "External Stop").

Switch E is optional and is used to start external machinery, e.g. a pump or cross-gutter scraper. This is laid down in the cycle configuration of the DG-321. For this reason, do not switch on the " switch.

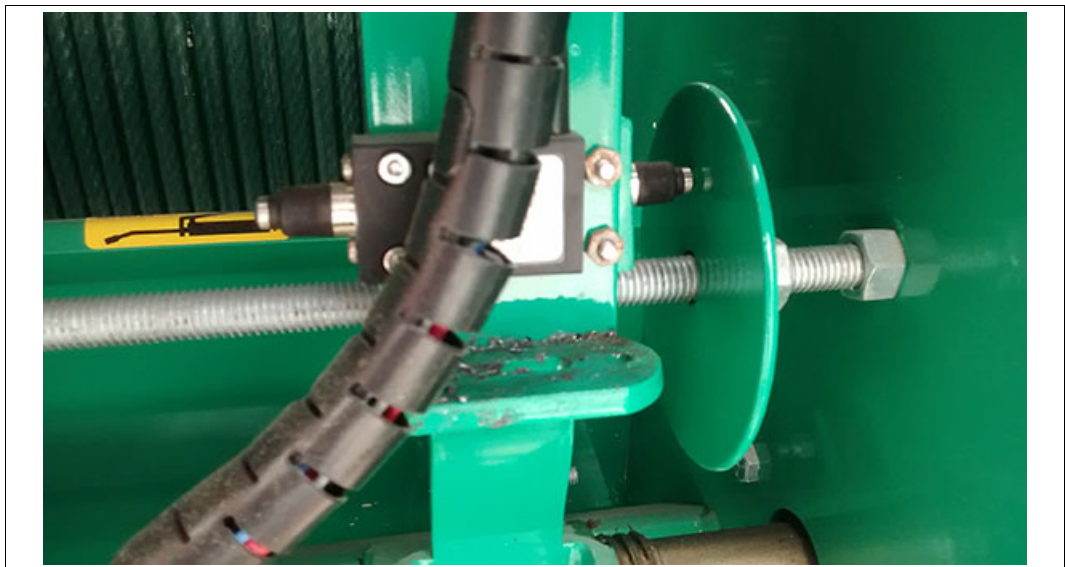
If the Telemécanique limit switch A is replaced by two NC switches (set 5560-1310-365), remove switches A and E and also the thrust plate and springs from switch A.

Then drill 2 x 2 holes (5 mm. diameter) in the mounting plate at the place where the limit switches are provided.

Pay attention to the following here:

- Mount one limit switch on the front and rear of the mounting plate.
- The limit switches must move freely over the entire width. Above all, the limit switch at the end of the threaded rod must not have any contact with the threaded rod.

Then fasten the limit switches with socket-head cap screws, hexagonal lock nuts and washers.



Connect the NC limit switch as follows (as for the above-mentioned limit switches):

"Start" position limit switch wires	Terminal for drive system 1	Terminal for drive system 2	Terminal for drive system 3
black	62 24V	49 24V	36 24V
grey	61 I Ho	48 II Ho	35 III Ho

"End" position limit switch wires	Terminal for drive system 1	Terminal for drive system 2	Terminal for drive system 3
black	65 24V	52 24V	39 24V
grey	64 I Out	51 II Out	38 III Out

7. Check the limit switches

Push the limit switch to check that it operates properly: the corresponding LED must light up (in the case of an NO limit switch) or extinguish (in the case of an NC limit switch).

8. Connecting the limit switches

Connect the transducer for the XScrape chain as follows:

Transducer wire	Terminal for drive system 1	Terminal for drive system 2	Terminal for drive system 3
brown	59 24V	46 24 V	33 24 V
blue	56 GND	43 earth	30 earth
black	58 A	45 A	32 A
white	57 B	44 B	31 B

9. Connecting external machinery/a slave DG-321

Connect external machinery with floating contacts "16 Em6-2 to '27 Em1-1':

External machine	Floating contacts	Note
External machine 1	'26 Em1-2' and "27 Em1-1"	
External machine 2	'24 Em1-2' and "25 Em1-1"	Do not use with a single drive DG-321.
External machine 3	'22 Em3-2' and "23 Em3-1"	Do not use with a single drive DG-321.
External machine 4	'20 Em4-2' and "21 Em4-1"	
External machine 5	'18 Em5-2' and "19 Em5-1"	
External machine 6	'16 Em6-2' and "17 Em6-1"	

No. 1 external machine can only be started from drive system 1, etc.

External machines nos. 4, 5 and 6 can be started from all the drive systems.

External machines can be started by a 1-second signal pulse (24 VDC, 1 A) or a continuous signal (24 VDC, 1 A). This is set in Chapter 6, "Settings".

If an external machine is started by a signal pulse, it requires an internal timer in order to stop after a specified time, as it cannot be stopped by the control cabinet.

Select a continuous signal so that the external machine can be started and stopped from the control cabinet.

A slave control cabinet, which for example starts a cross-gutter scraper, is also regarded as an external machine here.

10. Connecting error indicator lamps, operational indicator lamps

Connect error indicator lamps to floating contacts "12 Err-2" and '13 Err-3'.

Connect the operational indicator lamps to floating contacts "14 Run-2" and '15 Run-1'.

11. Connecting the emergency stop switch

Attention!

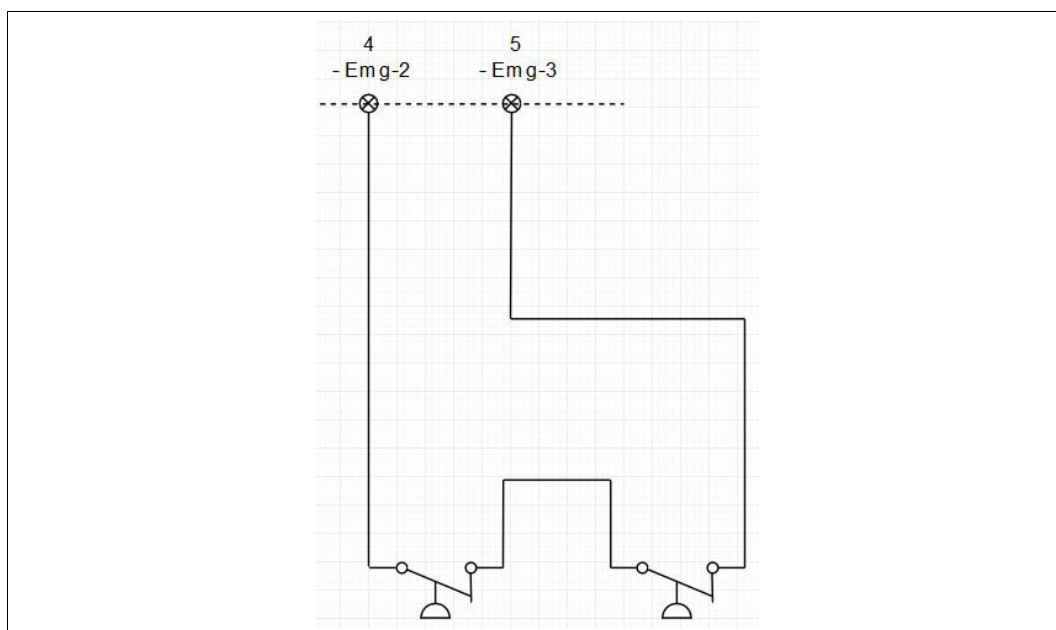
Mounting

Always mount an external emergency stop switch at a location which is always easily accessible and label it with the marking "Manure removal system"

A cable bridge is factory fitted between the contacts and "4 Emg-2" and "5 Emg-3". An external emergency stop must be connected to these contacts if the cable bridge is removed.

An emergency stop switch is always a normally-closed switch; when an emergency stop switch is pressed, the circuit is broken.

If a number of external emergency stop switches have to be connected to the control cabinet, connect them to the DG-321 in series, not in parallel: wire 1 from emergency stop switch 1 must be connected to the "4 Emg-2" contact, wire 2 from emergency stop switch 1 must be connected to wire 1 of emergency stop switch 2, etc. Wire 2 from emergency stop switch N must be connected to contact '5 Emg-3'.



12. Connecting external start buttons: master-slave configuration, waiting area scraper

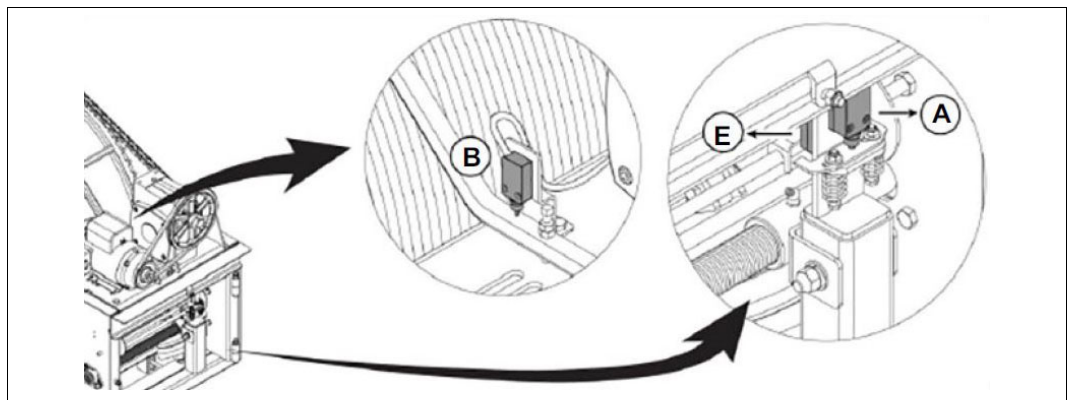
Connect external starter cables to the terminals "8 Start" and '9 24V'.

There are two situations in which an external start is used:

- The control cabinet is the slave in a master-slave configuration. For example, if the master DG-321 controls both one or more drive systems and the slave. The slave only controls the drive system for the cross-gutter scraper. The master control cabinet issues a start command to the slave.
- The control cabinet controls a waiting area scraper and is started from an external start button in the milking room.

13. Connecting an external stop button

Connect the cable from the external stop button to the terminals "6 Stop" and '7 24V'.



Connect the cable for the rope winding protection of an SW drive (B) as an external stop button.

If more than one SW drive is connected, connect the rope winding protection devices in series.

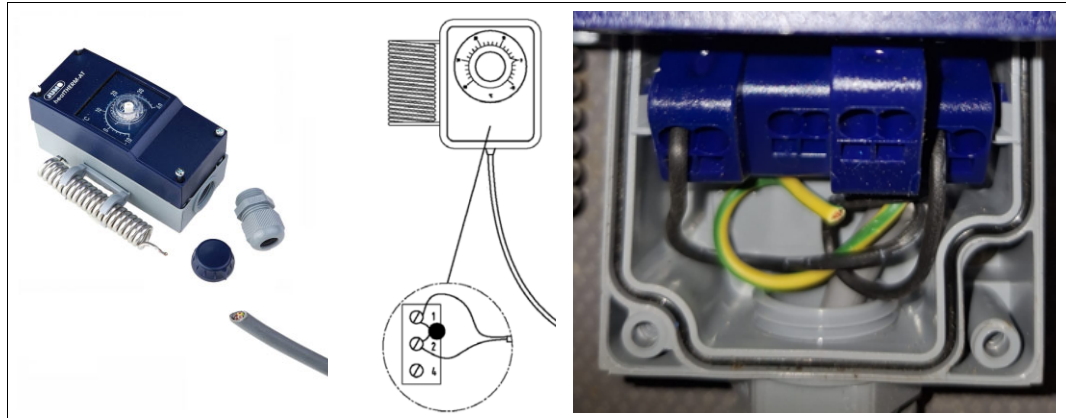
Connect the cables as follows:

Cable for detecting incorrect winding	Connections
blue	7 24V
black	6 Stop

14. Connecting the frost protection

Connect the two-core cable with the terminals "10 Frost" and "11 24V".

Set the frost protection manually so that all the drive systems requiring frost protection start a specified cycle automatically as soon as the temperature drops below the set value.



5.7 Disposal of installation material after installation is completed.

Handle unused installation material properly and dispose of it in accordance with current valid local regulations on waste disposal and utilization.

6 Commissioning

6.1 Special personnel qualifications

Initial commissioning may only be carried out by specially qualified personnel in accordance with the safety instructions.

- All employees must have undergone the product training.

In this respect, please also read the section on "Personnel Qualification".

6.2 Safety Instructions

To prevent damage to property and/or life-threatening injury to personnel, always observe the following:

- Before starting for the first time, check that all tools and foreign bodies have been removed from the danger area.
- Activate all safety equipment and emergency-off switches before commissioning.
- Check the direction of rotation of the motor before commissioning.
- Is all the plant and equipment suitable, present and connected?
- Secure all high temperature areas
- Read the "Safety" chapter as well.

6.3 Particular risks

- Incorrectly wired connections may destroy electrical/electronic components.
- Incorrect connections can cause the product to start up unexpectedly or make uncontrolled movements.
- Connections that have been mixed up will cause the motor to run in the wrong direction. This may cause serious damage to property and/or life-threatening injuries to persons.
- Electrostatic processes or power failures may endanger electronic components and also lead to software faults and data loss. Always back up data regularly.
- Electrostatic processes can cause damage to electronic components.

6.4 Establishing a connection (Wi-Fi/Ethernet)

There are various ways of connecting to the DG-321 with a smart phone, table or PC (referred to in the following as the "controller"). The controller must be equipped with Wi-Fi and an Internet browser.

The DG-321 is equipped with a Wi-Fi network given a unique name at the factory, the sequence of numbers of which will coincide with the serial number on the CE sticker on the side of the control cabinet.

This name consists of "DG-321", the year of manufacture, the last three numbers of the control cabinet product number and a three-digit consecutive number. Example: "DG-321 2019-030059".

This Wi-Fi network is not given a password at the factory. If required, the user can set up a password later.

6.4.1 Option 1: Wi-Fi connection (one Wi-Fi network)

Initial situation and conditions:

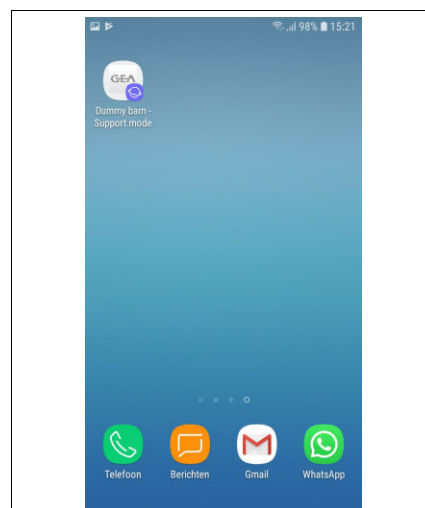
There are no other Wi-Fi networks within the range of the DG-321. The DG-321 is switched on.

Installation:

Change to the Wi-Fi settings on the controller, select the DG-321 Wi-Fi network, establish a connection and leave the Wi-Fi settings. The controller will always connect to this Wi-Fi network in future whenever it is brought near to the DG-321.

If required, a symbol for the DG-321 can be created on the home screen of the controller:

- Open the Internet browser. If the operator menu of the DG-321 does not open automatically, go to "dg321RdB.com". The operator menu of the DG-321 will open.
- Go to "Settings", "2. System Settings", "2.1. General" and change the name entered under "2.1.1. Name". This name will then be displayed by the symbol.
- Go to "Control"
- Select the "Add to home screen" option in the controller settings. A symbol will be created. If the controller is then brought near the DG-321 and this symbol is clicked, the operator menu of the DG-321 will be opened at once.



Daily use:

When the controller is brought within the range of the "DG-321" network and automatic connection is activated, the controller network ensures that the controller is immediately connected to the operator menu of the control cabinet.

When the controller is connected, it does not have a connection to the Internet. The controller Wi-Fi only allows a connection with the control cabinet.

Advantage	Disadvantage
Simple installation and access	No Internet connection

6.4.2 Option 2: Wi-Fi connection (several Wi-Fi networks)

Initial situation and conditions:

One or more Wi-Fi networks are available within the range of the DG-321, e.g. from another DG-321 or a local farm network. The DG-321 is switched on.

Installation:

Go to the Wi-Fi settings on the controller, select the Wi-Fi network of the (right) DG-321, establish a connection and leave the Wi-Fi settings.

If required, a symbol for the DG-321 can be created on the home screen of the controller. This is described under option 1.

Daily use:

If the controller is within the range of the DG-321 and automatic connection is activated, it automatically establishes a connection to the network with the strongest signal. The user must set up the connection for the DG-321 manually.

When the controller is connected to the network of the DG-321, it does not have a connection to the Internet. The controller Wi-Fi only allows a connection with the control cabinet.

Advantage	Disadvantage
Simple installation and access	No Internet connection Wi-Fi network has to be selected specifically.

6.4.3 Option 3: Wi-Fi connection (client mode)

Initial situation and conditions:

The DG-321 is within the range of the local Wi-Fi network. Other networks may also be present in the proximity of the DG-321, and possibly the network of another DG-321. The DG-321 is switched on.

Installation:

1. Go the Wi-Fi settings on the controller, select the Wi-Fi network of the (right) DG-321, establish a connection and leave the Wi-Fi settings.
2. Open the Internet browser. If the operator menu of the DG-321 does not open automatically, go to "dg321.RdB.com". The operator menu of the DG-321 will open.
3. Go to "Settings". "7. Network Settings", "7.2. Wi-Fi";
 - Under "7.2.1. Wireless Mode", select the "Client" option.
 - Enter the name of the farm network under "7.2.2. SSID".
 - Enter the farm network password under "7.2.3. Password".
 - Press "Save" and wait until the network connection is set up.
4. Go to the Wi-Fi settings on the controller, select the local Wi-Fi network, enter the password, set up the connection and leave the Wi-Fi settings.
5. Search for the IP address of the DG-321 in the router of the local network or use an app (e.g. Network Analyzer from Techet, obtainable from the Apple Store or Android Play Store). If the app is used:
Install and start the app. It will search the network with which the control cabinet is connected and output a list of the IP addresses of all the devices connected to the network. Make a note of the IP address of the DG-321.
6. Create a symbol for the DG-321 on the home screen of the controller:
 - Open the Internet browser and call up the IP address of the DG-321. The operator menu of the DG-321 will open.
 - Go to "Settings", "2. System Settings", "2.1. General" and change the name entered under "2.1.1. Name". This name will then be displayed by the symbol.
 - Go to "Control"
 - Select the "Add to home screen" option in the controller settings. A symbol will be created. If the controller is with the range of the local network and this symbol is clicked, the DG-321 operator menu will open at once.

Daily use:

If the controller is within range of the local network and automatic connection is activated, the user can establish a connection with the DG-321 from the symbol on the home screen.

If the stop button on a connected DG-321 is held pressed for at least 5 and no longer than 10 seconds (the LED flashes differently), the control cabinet with switch temporarily into access mode.

If no further interaction then takes place with the DG-321 for a period of 5 minutes, the device returns to client mode.

If the controller is within the range of the Wi-Fi network of the DG-321, the controller can establish a direct connection with the control cabinet from the symbol on its home screen.

If the local network has Internet access, the Internet connection of the controller will continue to be maintained while the network is being used. DG-321.

Advantage	Disadvantage
Internet connection remains active No manual network selection	The installation requires knowledge of networks in order to find the IP address. The DG-321 must remain within range of the local network.

6.4.4 Option 4: Ethernet connection

Initial situation and conditions:

The DG-321 is within the range of the local Wi-Fi network. Other networks may also be present near the DG-321, and possibly the network of another DG-321. The DG-321 is switched on.

Installation:

1. Connect the DG-321 to the router or network switch of the farm network with an Ethernet cable. The Ethernet cable must not be longer than 100 m. If a longer length is necessary, a Wi-Fi booster must be installed.
An IP address in the farm network will now be allocated to the DG-321 over the DHCP protocol.
2. Go the Wi-Fi settings on the controller, select the Wi-Fi network of the (right) DG-321, establish a connection and leave the Wi-Fi settings.
3. Open the Internet browser. If the operator menu of the DG-321 does not open automatically, go to "dg321.RdB.com". The operator menu of the DG-321 will open.
4. Go to "Settings", "7. Network settings", "7.1 Ethernet" and make a note of the IP address given under "7.1.2. IP Address".

**Note**

This IP address will also be issued if you establish a Wi-Fi connection with the farm network and use an IP scan app, as described in option 3.

5. Go to the Wi-Fi settings on the controller, select the local Wi-Fi network, enter the password, set up the connection and leave the Wi-Fi settings.
6. Create a symbol for the DG-321 on the home screen of the controller:
 - Open the Internet browser and call up the IP address of the DG-321. The operator menu of the DG-321 will open.
 - Go to "Settings", "2. System Settings", "2.1. General" and change the name entered under "2.1.1. Name". This name will then be displayed by the symbol.
 - Go to "Control"
 - Select the "Add to home screen" option in the controller settings. A symbol will be created. If the controller is within range of the local network and this symbol is clicked, the DG-321 operator menu will open at once.

Daily use:

If the controller is within range of the local network and automatic connection is activated, the controller will automatically establish a connection with the network.

If the local infrastructure of the network allows Internet access, the Internet connection will also remain active while the control cabinet is being used.

Advantage	Disadvantage
Internet connection remains active No manual network selection	The installation requires knowledge of networks in order to find the IP address. The DG-321 must be within range of the Wi-Fi access point.

7 Setting

7.1 Settings

The DG-321 is set up by connecting the controller to the DG-321 and carrying out the steps in the submenus "1. Authorisation" to "6. Plans" in the "Settings" menu one by one.

A calibration cycle must be carried out after "3. Drive settings" have been entered.

The calibration cycle is necessary to be able to enter usable values under "4. Security settings".

The calibration cycle is also necessary for setting the duration of the movement in each direction. "5. Cycle configuration" cannot be set up until this is done.



For further information on settings under "7. Network settings" see the following chapter:

Chapter: 6. Commissioning

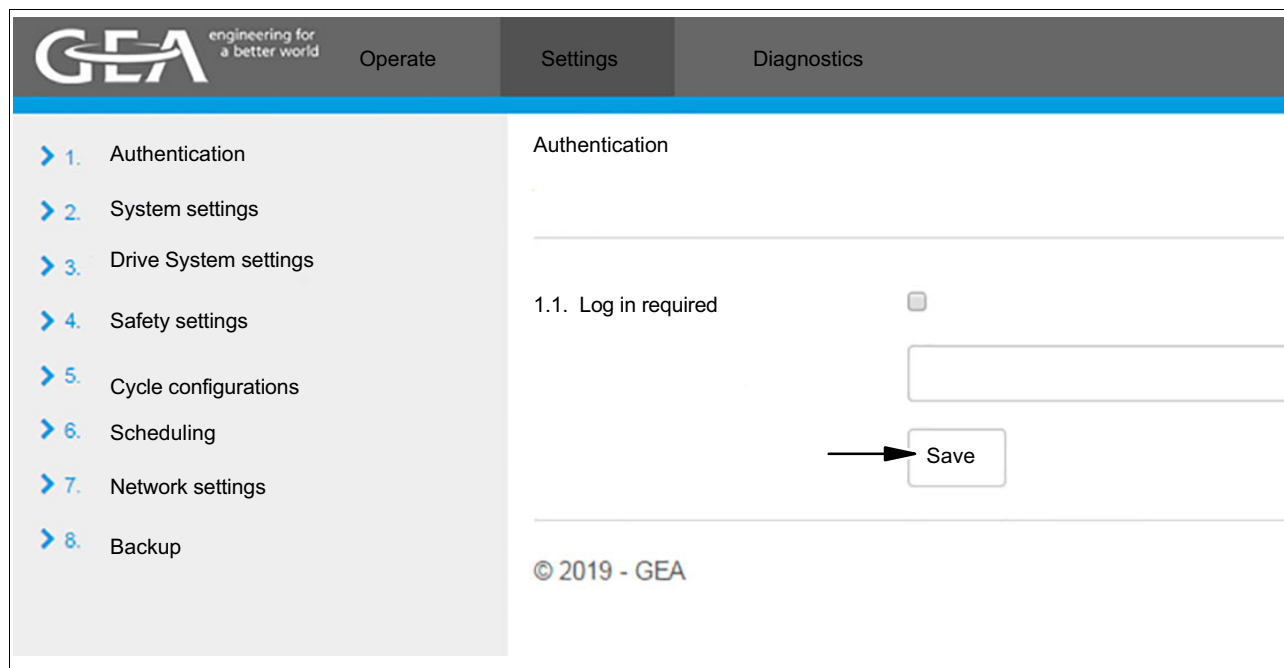
The "8. Backup" settings sub-menu is discussed in detail in Chapters 8 and 9.

The way of carrying out the other settings correctly and completely is described in detail in the following.



Note

Don't forget to click on "Save" after entering the settings on each settings page.



7.1.1 1. Authorisation



Note

A password is not necessary.

If access by password is selected, this can still be bypassed by pressing and holding the stop button on the control panel for 15 to 20 seconds.

The corresponding LED will then light up red continuously and the password will be inactive for 30 minutes.

Use of a password means that it is highly unlikely that the control cabinet will be used by malicious or untrained persons, especially if the control cabinet is connected to a farm network that can be hacked.

7.1.2 2. System settings

7.1.2.1 2.1. General

> 2. System settings
> 2.1. General
> 2.2. Inputs
> 2.3. Outputs
> 2.4. Date / Time
> 2.5. Language
> 3.
> 4.
> 5.
> 6.
> 7.

2.1.1. Name

2.1.2. Number of phases ☐ 1 ☒ 3

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The name of the system (setting 2.2.1.) is shown in the header of the user screen and on the symbol in the control system home screen.

The number of phases will be asked, since in certain situations there is only one phase.

7.1.2.2 2.2. Inputs

System settings

2.2.1. External start ☒ Yes

2.2.2. Aandrijfsysteem

2.2.3. Externe stop ☒ Yes

2.2.4. Drive system

Save

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An external start (setting 2.2.1.) can be used in two situations:

- The DG-321 is the slave of another DG-321, e.g. if the control cabinet controls a drive system for the cross-gutter scraper and needs to be activated by a DG-321 that controls one or more drive systems.
- The DG-321 controls a drive system for a waiting area scraper and is controlled from an external start button in the milking parlour pit.

Always select the drive system where the external start is used (setting 2.2.2).

An external stop can be used on one or all drive systems (setting 2.2.3).

On an SW drive, the rope winding protection acts as an external stop. If more several SW drives are connected to the DG-321, select the option "All" under "2.2.4 Drive systems".

7.1.2.3 2.3 Outputs

The screenshot shows the GEA logo at the top left with the tagline "engineering for a better world". Below it is a navigation menu with items 1 through 8. Item 2, "System settings", is selected and expanded, showing sub-items 2.1. General, 2.2. Inputs, 2.3. Outputs (which is highlighted), 2.4. Date / Time, and 2.5. Language. The main content area is titled "System settings" and contains two sections. The first section has a checkbox for "2.3.1. External machine 4" which is checked, followed by a text input field for "2.3.2. Name". The second section has a checkbox for "2.3.3. External machine 5" which is checked, followed by a text input field for "2.3.4. Name". A "Save" button is located at the bottom right of the main content area. The footer of the page shows "© 2019 - GEA".

It is possible to switch on three external machines during the cycles of all connected drive stations by switching on the settings 2.3.1, 2.3.3 and/or 2.3.5.

Each machine can be given a suitable name, e.g. "pump" or "cross-gutter scraper".

7.1.2.4 2.4 Date/time

The time is changed from summer to winter time and back automatically. If the control cabinet is connected to the local Wi-Fi network, the time is synchronised with the Internet.

7.1.2.5 2.5. Language

The screenshot shows a single setting "2.5.1. Language" with a text input field next to it. Below the input field is a "Save" button. The interface is minimalist with a light gray background and a vertical gray bar on the left side.

Select the required language with the setting "2.5.1. Language".

This is the language of the display to each user when he contacts the control cabinet.

Using the button at the top right of the screen, you can also select the language that will only be displayed on the controller of the user who has selected it.

This means that, for example, several users in contact with the DG-321 at the same time can read the menu in their preferred language.

7.1.3 3. Drive system settings

Drive System settings

3.1. Enabled ☒ Yes

3.2. Name

3.3. Home name

3.4. Out name

3.5. External machine ☒ Yes

3.6. Name

3.7. Layout ☒ 1. Open loop ☐ 2. Closed loop

3.8. Nominal motor power W

3.9. Home limit switch

3.10. Out limit switch

3.11. Encoder present ☐ Yes

3.12. Continuous cycle

The cycle to use in Continuous mode. Only cycles that contain strokes in both directions are available.

3.13. Continuous duration sec. Maximum duration of standstill when in Continuous mode.

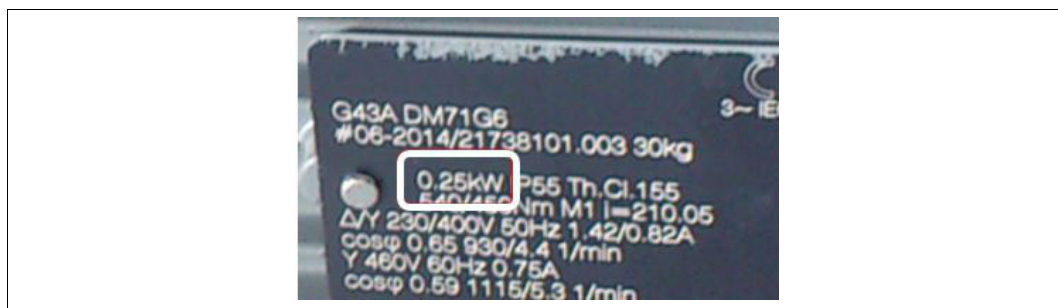
3.14. Frost protection ☒ Yes Activate Continuous mode on frost detection.

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1. Activate the check box "3.1 Activated".
2. Enter a name for the drive station (e.g. Duo Compact I). If there are several drive stations of the same type, these can be given unique names, e.g. "South Drive".
3. Under "3.3. Name Start", enter a brief description of the position of the scraper when it is at the start of its work phase (starting/rest position). For example, "South" if the scraper is at the south position, or "Milking parlour". "Speaking" names make it easier to configure a cycle (see "6. Planning"). Carry out exactly the same procedure under the setting "3.4. Name end": the position of the scraper when it is at the end of its cycle (Off position).
The start buttons on the cabinet and the controller correspond to the start and end:
 - "<" button: the system moves to the position given in the "3.3 Name Start" setting .
 - ">" button: the system moves to the position given in the "3.4 Name End" setting.

4. The settings "3.5 External Machine" and "3.6 Name" describe the machine that can only be started from this drive system. Give the machine an appropriate name to make configuring a cycle understandable (see "5. Cycle Configurations").
5. The setting "3.7 Layout" offers two options:
 - "Open loop": A drive system consists of two drive stations. One of the drive stations moves the scraper in one direction, and the other station moves it in the opposite direction. Examples: Polyrope drive stations, Duo Compact I, Duo Compact II.
 - "Closed loop": A drive system consists of one drive station, which can move the scraper in both directions. Examples: chain drive, SW drives.

Select the appropriate option for the system.
6. Enter the power of the electric motor in W in the setting "3.8 Motor rated power". Take the correct figure for the setting from the rating plate of the electric motors/geared motors of the drive system in question:



Note

Enter the motor power in W, not kW.

If two motors are always used simultaneously in a drive system, e.g. 2 x 0.75 kW in the SW300, enter double the figure quoted on the rating plate for the power.

Drive system	Rated output (W)	Scraper speed (m/min)
XScrape Chain 0,37 kW	370	3,3
XScrape Chain 0,55 kW	550	2,8
XScrape Chain 0,75 kW	750	2,7
DuoCompact I-260 met polyrope 18 mm	250	4,0
DuoCompact I-260 met Euroneema 8-10 mm	250	3,6
DuoCompact II 0,55 kW	550	2,9
DuoCompact II 0,75 kW	750	3,2
Polyrope 18 mm/ 0,25 kW	250	3,5
Polyrope 18 mm/ 0,37 kW	370	3,0
Polyrope with Euroneema 8-10 mm/ 0,25 kW	250	3,4
Polyrope with Euroneema 8-10 mm/ 0,37 kW	370	2,9
Xscrape Rope DD	720	3,0
SW300/0,75 kW	750	2,2
SW300/1,1 kW	1100	2,8
SW300/2 x 0,75 kW	1500	3,7
SW450/ 0,75 kW	750	2,2
SW450/ 1,1 kW	1100	2,8
SW450/2 x 0,75 kW	1500	3,7
SW650/2 x 0,75 kW	1500	3,8
SW650/ 2 x1,1 kW	2200	6,1

7. The limit switches can be set with the settings "3.9 Start limit switch" and "3.10 End limit switch".

The type of limit switch that stops the work phase at the position set in "3.3. Name Start" can be given in "3.8 Start limit switch". A similar connection exists between "3.10 End limit switch" and "3.4. Name End".

"3.9 Start limit switch" and "3.10 End limit switch" do not have to have the same option selected. For example, there is no reason why a scraper path cannot be bounded at one end by a normally-closed limit switch and not have a limit switch at all at the other end, e.g. by having a scraper run against a return pulley (which blocks it).

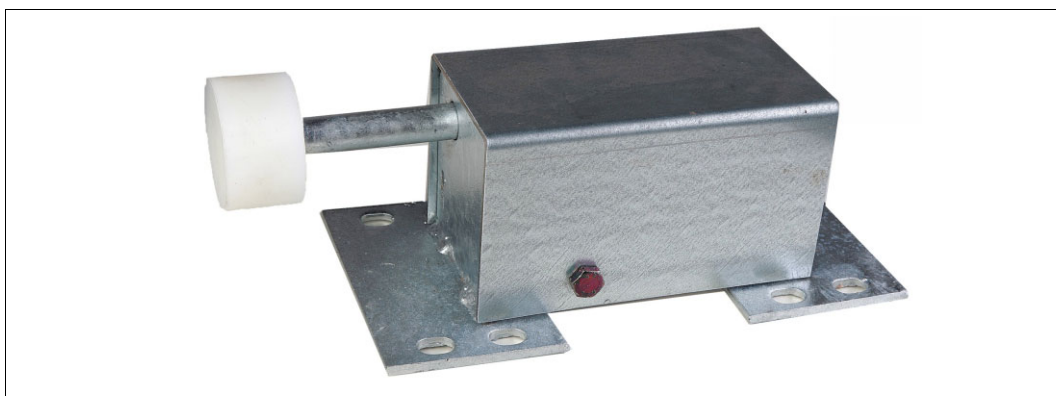
There are three ways of ending a work phase:

- Use of a limit switch: select the following options under "3.9 Start limit switch" and "3.10 End limit switch".
 - Normally-open contact
 - Normally-closed contract
 - Telemécanique ZCMD21
- Use of a blockage. Select the first option "1. None" for "3.9 Start limit switch" and "3.10 End limit switch".
- Use of a transducer. Activate the "Yes" check box under "3.11 Transducer present".



Note

If the normal limit switch 5560-1310-040 is used for the settings "3.9 Start limit switch" and "3.10 End limit switch", set the setting to "3. Normally-closed contact".



The following restrictions apply if a Telemecanique ZCMD21-limit switch is used:

- A work phase can only be ended by a limit switch, not by time, power (blocking) or a transducer.
- If a work phase is discontinued before the end, the scraper can only travel in the opposite direction if the limit switch plate is manually reset. This changes the limit switch signal.
- Due to the cow protection, the scraper only runs in reverse if the work phase has already lasted twice as long as the reverse travel set under setting "4.14 Reverse travel duration".
- The Telemecanique limit switch influences the work cycles in both directions. If this option is entered in setting 3.9, setting 3.10 is no longer visible (and vice-versa).



See also the following manual for more information on this:

2005-90 . . -001 SW Drive

8. The setting "3.12 Continuous operation" is used to select a specific cycle. Depending on the situation and personal preference, a cycle can be configured consisting of two work phases in which the drive system runs intermittently (start-stop). The sole purpose of this cycle is frost protection.
9. The setting "3.14 Frost Protection" is activated by default. If no frost protection module is connected, no warning or error message is given.

We advise activating frost protection to prevent the scraper from freezing to the ground.

If a frost module is connected, the drive systems are automatically activated continuously by the control cabinet as soon as the temperature drops below the set frost protection temperature,

The cycle set under "3.12 Continuous operation" will be started and runs until the temperature rises above the set minimum again.

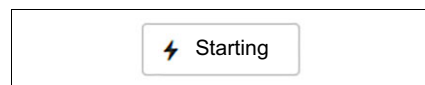
If frost protection is set for more than one drive system, the control cabinet will ensure that these systems run alternately and are not at a standstill for longer than the time set in "3.13 Continuous", to avoid the scrapers freezing solid.

7.2 Carrying out a calibration cycle

Carry out a calibration cycle from the expanded operator menu (click on the button shown).



Under "Calibration", click on "Start".



The scrapers will first move in the "Parking" direction, and then from "Parking" to "End" and back. The system will then stop in the parking position.

Attention!

Monitoring calibration

Always carry out calibration under supervision.

- ▶ There is only one safety device the drive system (motor protection switch and motor rated power setting) and no cow protection.
- ▶ Check whether the scraper arrives at the correct end points.

During the calibration cycle, the system will determine how long it takes until the scrapers have moved from one end of the manure alley(s) to the other and back.

These times can vary greatly, particularly in the case of Polyrope systems.

When the calibration cycle has finished, check the force-time graph. If this graph shows sharp spikes, the scrapers are not moving smoothly. In such a case, carry out the following steps:

1. Retension the traction components.
2. Make sure that the scrapers are not impeded by height differences and/or slots in the floor and/or box edges/guides.
 - Adjust the scrapers (particularly on slatted floors).
 - Improve the floors/box edges (if necessary).
 - Adjust the lead-ins (if necessary).



The force-time graph of an XScrape chain is generally flat, while that of the Polyrope is more sinusoidal due to the way the rope is wound on to the drum.

7.3 Settings (2)

7.3.1 4. Safety settings

Select "4. Safety Settings" under "Settings" and enter these starting at the top and working downwards.

The safety settings apply to all cycles/work phases of this drive system: it is not possible to specify different safety settings for different work phases. It is possible, however, to deactivate the safety settings for (part of) a working cycle. This is described in more detail below.

The screenshot shows the GEA Duo Compact I safety settings interface. On the left is a navigation menu with items 1 through 8, where '4. Safety settings' and its sub-item 'Duo Compact I' are highlighted. The main area is titled 'Duo Compact I' and contains the following settings:

- 4.1. After blockage**: Two radio button options: '1. Automatic restart at the next scheduled time' (selected) and '2. Stop until manual operation'.
- 4.2. Detection method**: Two radio button options: '1. Automatically detect maximum and minimum (adaptive)' (selected) and '2. Manually specify maximum and minimum'.
- A status bar displays: 'Last cycle: Maximum power: {0} W | Minimum power: {0} W | Average power: {0} W'.
- 4.3. Maximum power**: Input field with value '250' and unit 'W'.
- 4.4. Minimum power**: Input field with value '150' and unit 'W'.
- 4.5. Maximum power increase**: Input field with value '70' and unit 'W'.
- 4.6. Maximum power decrease**: Input field with value '70' and unit 'W'.
- 4.7. Duration**: Input field with value '0,5' and unit 'sec'.
- 4.13. Number of retries**: Input field with value '2' and unit 'time'.
- 4.14. Withdrawal duration**: Input field with value '5' and unit 'sec'.
- A 'Save' button is located at the bottom of the settings list.

At the bottom left of the interface, the copyright notice '© 2019 - GEA' is visible.

The setting "4.1 After blocking" specifies how the system responds after a blocking during a cleaning cycle:

- It will attempt either to start again at the next programmed start time and complete the cycle, and then continue with the next cycle.
- Or it will not attempt to restart and complete the cycle until after a manual start, in order to continue then with the normal schedule.

The safety settings determine the sensitivity of the system to blockings by cows (increase in power) and traction component breakage (decrease in power).

The option of having the lower and upper power limits set automatically by the control system can be selected under the setting "4.2. Detection methods". If this option is activated, the settings "4.3. Maximum power" and "4.4. Minimum power" are not visible, as these limits are variable.

These values correspond to the maximum and minimum power that occurred during the previous work phase in the same direction, increased/reduced by the values of the setting "4.5. Increase in maximum power" and "4.6. Decrease in maximum power".

If the option "Manual determination of maximum and minimum" is selected under setting "4.2. Detection Methods", a value must be entered for the settings "4.3. Maximum power" and "4.4. Minimum power".

The guideline for the value under "4.3. Maximum power" is the highest value that occurred during the calibration cycle, plus 70 W.

One guideline for the value under "4.4. Minimum power" is the lowest value that occurred during the calibration cycle, less 50 W.

The guideline for the value under "4.5. Increase in maximum power" is 70 W; this is the (additional) power required by a drive station to push away a weight of 400 kg (corresponding to a light cow).

The guideline for the value of "4.6. Decrease in maximum power" is 35 W.

The setting "4.7. Duration" specifies for how long the value of the previous four settings must be exceeded before the system stops and moves in the opposite direction.

The settings "4.14. Duration of reversing"/"4.13. Number of repeated attempts" specify for how long the system travels in the opposite direction and then how often the system travels forwards again.



Note

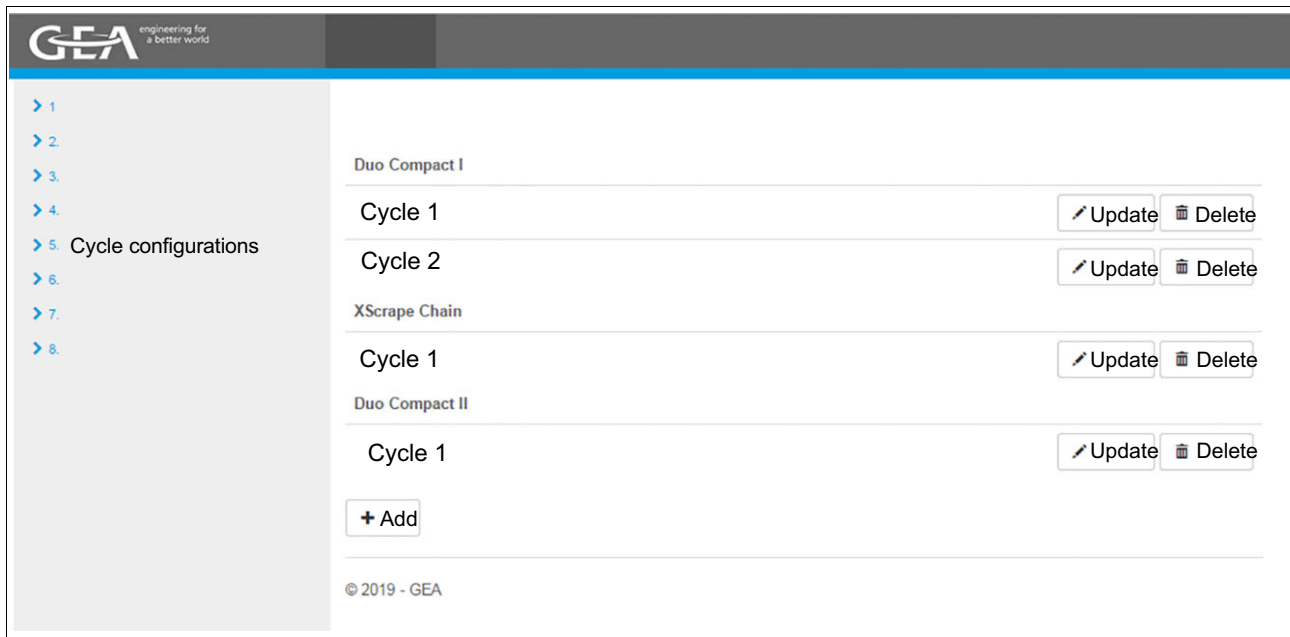
In the event of a breakage of the traction component (chain or rope) and the settings in "4.4 Minimum power" and "4.6 Decrease in minimum power" being exceeded, the system will not start until after a manual start, even if the option "1. Automatic restart at next planned time" in "4.1 After blocking" has been selected.

Check whether the cow protection setting is acceptable by allowing the scraper to run up against a weight of approximately 400 kg, corresponding to eight tractor front weights of 45 kg each on two pallets.

The scraper must stop when it bumps against this obstacle. The additional force required to push this obstacle away is approximately 70 W.



7.3.2 5 Cycle configuration



A cycle relates to a single drive system.

A cycle can consist of up to six work phases.

Each work phase is shown as a blue bar on a grey bar. The grey bar shows the time necessary for the system to travel from its start position to its end position, or vice-versa.

The work phase (blue bar) can be shorter than the grey bar.

The following information is displayed on the grey bar:

- The length of the end zone (setting "5.3.5. End zone") as the end of a work phase is determined by a safety device being exceeded (blockage).
The end zone is the last part of the work phase. If one of the safety settings is exceeded when the system is in the end zone, e.g. because a scraper has run up against a pulley, the work phase is ended and the system is ready for the next work phase in the opposite direction.
- The part of the work phase that takes place in "Waiting area scraper" mode (setting "5.3.6. Protection").
- The part of the work phase during which scraping takes place with interruptions (start-stop operation; setting "5.3.10 With interruptions").
- The part of the work phase in which the cow protection is switched off; setting "5.3.15 Safety deactivated".
- The time or period in which one or more external machines are started.

The screenshot shows the GEA Cycle configurations web interface. On the left is a sidebar with a list of numbered items (1-8), where item 5, 'Cycle configurations', is selected. The main content area is titled 'Cycle configurations' and 'Update cycle'. It contains three sections: '5.1. Name' with a text input field, '5.2. Drive system' with a dropdown menu, and '5.3. Strokes' with a table of stroke configurations. The table has a header '# Destination' and four rows. Row 1 has a hatched bar and an 'Update' button. Row 2 has a blue bar, an 'Endzone' label, an 'Update' button, and a 'Delete' button. Row 3 has a blue bar, an 'Update' button, and a 'Delete' button. Row 4 has a blue bar, an 'Update' button, and a 'Delete' button. Below the table is an '+ Add' button. At the bottom of the main area is a 'Save' button. The footer of the page shows '© 2019 - GEA'.

#	Destination	Update	Delete
1	[Hatched bar]	Update	
2	[Blue bar] Endzone	Update	Delete
3	[Blue bar]	Update	Delete
4	[Blue bar]	Update	Delete

The bar for the first work phase is hatched to indicate that the start point of this work phase lies in the hatched zone.

Subsequent work phases must follow on from each other: the end point of the first work phase must be the start point of the second.

If this is incorrectly set, the bar of the second work phase is red instead of blue.

If the scraper has to be parked outside the end zone to prevent it obstructing the cows, or because it has to be parked frost-free, a work phase can be added to the last cycle in which the end (setting "5.3.2 Stop") is defined by "2. Time".

The setting "5.3.3. Duration" gives the duration of this work phase.



5.3.1. Direction

- ☒ From {...} to {...}
- ☐ From {...} to {...}

5.3.2. Stop

- ☐ 1. Limit switch
- ☒ 2. Time
- ☐ 3. Safety

5.3.3. Duration

16 sec.

> 1.
> 2.
> 3.
> 4.
> 5. Cycle configurations
> 6.
> 7.
> 8.

Maximum duration stroke: {...} sec.

5.3.1. Direction ☒ From {...} to {...}
☐ From {...} to {...}

5.3.2. Stop ☐ 1. Limit switch
☒ 2. Time
☐ 3. Safety

5.3.3. Duration sec.

5.3.6. Herding ☐ Yes

5.3.10. Intermittent ☐ Yes

5.3.15. Safety disabled ☐ Yes

5.3.... External machine ☐ Yes

5.3.... External machine ☐ Yes

5.3.... External machine ☐ Yes

Save

5.3.1. Forwards movement

Specify the direction of movement for the system in each work phase.

5.3.2. Stop

If "None" is entered for setting "3.9 Start limit switch" or "3.10 End limit switch", the option "1. Limit switch" cannot be selected for "5.3.2. Stop".

If "Transducer" is entered, the setting "5.3.4 Duration" is displayed with two options for defining the end of the work phase:

- "After start": the work phase lasts for the specified number of seconds.
- "Before end": the work phase lasts for the maximum work phase duration (see setting "5.3.1. Forwards direction") less the specified number of seconds.

If "Safety" is selected, the setting "5.3.5 End zone" is displayed. Enter the duration of the end zone.

**Note**

The guideline value for the end zone is 10% of the maximum work phase duration.

On the one hand the end zone must be as short as possible, since after a cow blockage in the end zone the rest of the end zone will not be scraped.

On the other hand the end zone should not be too short, since it will then be possible for the physical end of the work phase to be reached before the time for the end zone is reached, with the result that the system displays cow protection behaviour and often runs up against the physical end unnecessarily.

The latter is particularly likely to occur with Polyrope drives, since the actual work phase duration can vary considerably from the maximum duration established during the calibration work phase:

If the system exceeds the limit values laid down in "4. Safety settings" when in the end zone, it stops and starts the next work phase (if specified) or waits for the next start command.

If the system exceeds the set limit values when outside the end zone, it stops and reverses as stated in "4.13 Number of repeated attempts" and "4.14 Duration of reversing". It will then travel forwards again.

There are two possibilities:

- The system overcomes the obstacle.
- The system stops after the specified number of attempts, displays a warning message and waits for the next start command. At the next start comment the system first attempts to conclude the interrupted cycle before starting the cycle to which the start command (planned or manual) refers.

5.3.6. Protection (waiting area scraper)

Provides simple cleaning of the waiting area.

5.3.6. Herding	☒ Yes
5.3.... From	0 sec.
5.3.... Until	0 sec.
5.3.... Move duration	0 sec.

To clean a waiting area, it is recommended to configure a cycle that consists of two work phases, where the setting "5.3.6 Protect" of the first work phase is activated during the entire work phase.

When this is activated, the drive system stops after the duration set in "5.3.9 Duration of movement". It will not restart until after a manual start command is given. This command can be given from the controller, an external start button or one of the start buttons on the cabinet.

If a manual start command in the opposite direction is given, this starts the second work phase in the cycle and moves the scraper to the start of the waiting area, whereupon the cycle ends.

5.3.10. With interruptions

5.3.10. Intermittent	☒ Yes
5.3.... From	0 sec.
5.3.... Until	0 sec.
5.3.... Move duration	0 sec.
5.3.... Wait duration	0 sec.

Scraping with interruptions can be useful at a manure dump or grating. It can be better to let the system run with interruptions at a manure dump, so as to give the slatted floor scraper more time to remove the manure.

This gives the cows more time at a grating to leave the area between the scraper and the grating.

Depending on the situation and personal preference, a cycle can be configured that consists of two work phases in which the drive system always runs with interruptions (start-stop).

The purpose of a cycle of this kind can be that it is only carried out during frost periods.

This can be selected from "Settings" - "3. Drive system settings" - "3.1.2 Continuous operation".

5.3.15. Safety deactivated

5.3.15. Safety disabled	☒ Yes
5.3.... From	0 sec.
5.3.... Until	0 sec.

Switches the cow protection off.

Only the motor protection switch and the setting "3.8 Motor rated power" are active. The safety settings "4.3 Maximum power" and "4.5 Increase in maximum power" are switched off.

Examples of situations where this can be desirable:

- When the manure must be pushed as far as possible to the end of the alley.
- When an additional quantity of cubicle material has to be removed after filling the boxes.



Note

If interruptions or the deactivation of safety settings are necessary for more than part of the alley, divide the cleaning of this alley into two work phases in which interruptions are switched on and safety settings are switched off in each section.

> 1.

> 2.

> 3.

> 4.

> 5. Cycle configurations

> 6.

> 7.

> 8.

Cycle configurations

Update cycle

5.1. Name

5.2. Drive system

5.3. Strokes

#	Destination	Actions
1	 Met onderbrekingen Quertransport	<button>✎ Update</button>
2	 Met onderbrekingen Sprinkler +6 Quertransport	<button>✎ Update</button> <button>🗑 Delete</button>
3	 Met onderbrekingen Veiligheid uitgeschakeld	<button>✎ Update</button> <button>🗑 Delete</button>
4	 Met onderbrekingen Veiligheid uitgeschakeld	<button>✎ Update</button> <button>🗑 Delete</button>

+ Add

Save

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Starting external machines

Each drive system can start an external machine which can only be started from this particular drive station.

Each drive station can start up to three external machines, which can also be started by all the other drive stations (settings 5.3.22 to 5.3.33, the name of the setting corresponds to the one under "2. System settings" and/or "3. Drive system settings").

It is possible to start an external machine before the work phase begins or after it ends. The running time before or after the work phase is displayed in the bar for the external machine.

It is possible to start an external machine with one drive station after a scraping cycle, while another scraping cycle of a different drive station is started immediately after the end of the first scraping cycle.

5.3.... External machine	☒ Yes
	☐ 1. Start between
5.3.... From	0
5.3.... Until	0
	☐ 2. Start at
5.3. ... At	14

7.3.3 6. Plans

A weekly plan can be drawn up for each drive system.

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1.

2.

3.

4.

5.

6. Scheduling

7.

8.

Scheduling

Duo Compact I

Every {0} hour

Update Delete

Every {0} minutes

Update Delete

Golfing-area

Update Delete

XScrape Chain

Every {0} minutes

Update Delete

Normal-cycle

Update Delete

Duo Compact II

Every {0} hour

Normal cycle

Update Delete

+ Add

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1.

2.

3.

4.

5.

6.

7.

8.

Scheduling

6.1. Enabled

Yes

6.2. When

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

Sunday

6.3. Every

6.5. From

0 : 00

6.6. Until

0 : 00

6.7 Cycle

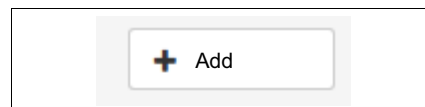
Save

© 2019 - GEA

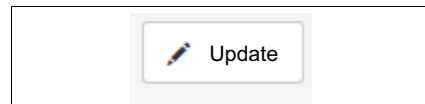
A schedule for a drive system cannot be drawn up until one or more cycles have been configured ("5. Cycle configuration").

Any number of schedules can be drawn up.

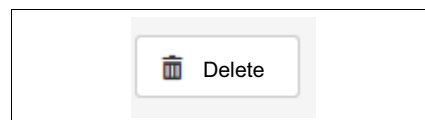
- To create a new schedule, click on "Add".



- To update an existing schedule, click on the schedule name or on "Update".



- To delete a schedule, click on "Delete".



- Activate the schedule with "6.1 Activated" - "Yes".

This allows a schedule to be easily deactivated without having to lose it. If a schedule is deactivated, it remains visible in the overview but its name is crossed out.

- Mark the days under "6.2 When" when the schedule should be active.
- Enter the desired interval for the cycle start times under "6.3 All":
 - Enter the desired start time when selecting the "Day" under the setting "6.4 At". If a cycle should be started several times a day without a regular time interval, draw up a schedule for each start time. There is no limit on the number of schedules/start times that can be drawn up.
 - The settings "6.5 From" and "6.6 To" are displayed for any other of the time interval options. Enter the desired start and end times of the schedule here.

Possible time intervals:

1	15 minutes
2	30 minutes
3	hour
4	2 hours
5	3 hours
6	4 hours
7	6 hours
8	12 hours

If the selected time interval is valid for the entire day, the settings "6.5 From" and "6.6 To" can be left at "0:00".

- Enter the cycle that is valid for the schedule under "6.7 No. of cycles".

As soon as the schedule is saved, it is displayed in the overview.

Note that the desired schedule must be realistic: the entire duration of the cycle(s) must be shorter than the time between two start times.

No schedule needs to be drawn up for a drive station used for a waiting area scraper.

Switch this drive station to manual operation ("Control" menu) and start it manually from an external start button in the milking parlour, a button on the control cabinet or the controller.

Take the following drive speeds into account here:

Drive system	Rated output (W)	Scraper speed (m/min)
XScrape Chain 0,37 kW	370	3,3
XScrape Chain 0,55 kW	550	2,8
XScrape Chain 0,75 kW	750	2,7
DuoCompact I-260 met polyrope 18 mm	250	4,0
DuoCompact I-260 met Euroneema 8-10 mm	250	3,6
DuoCompact II 0,55 kW	550	2,9
DuoCompact II 0,75 kW	750	3,2
Polyrope 18 mm/ 0,25 kW	250	3,5
Polyrope 18 mm/ 0,37 kW	370	3,0
Polyrope with Euroneema 8-10 mm/ 0,25 kW	250	3,4
Polyrope with Euroneema 8-10 mm/ 0,37 kW	370	2,9
Xscrape Rope DD	720	3,0
SW300/0,75 kW	750	2,2
SW300/1,1 kW	1100	2,8
SW300/2 x 0,75 kW	1500	3,7
SW450/ 0,75 kW	750	2,2
SW450/ 1,1 kW	1100	2,8
SW450/2 x 0,75 kW	1500	3,7
SW650/2 x 0,75 kW	1500	3,8
SW650/ 2 x1,1 kW	2200	6,1

If the nominal duration of a cycle (= the maximum duration of all the work phases in the cycle) is shorter than the time between two corresponding start times but the cycle lasts for longer, e.g. due to cow protection or manual stops and starts, and the next start time has already elapsed before the cycle has been completed, the system will attempt to compensate for the delay; after the cycle has been completed, the cycle whose start has already elapsed will begin.

If a schedule definitively cannot be maintained because the nominal duration of one or more cycles excess the time intervals between the cycles, the system will attempt to make up the (structural) delay.

This may result at some stage in a cycle being skipped if two start times have elapsed.

If cycles of different drive systems have the same planned start time, the cycle of drive system 1 will start first, followed by that of drive system 2 and finally that of drive system 3.

If a different order is desired, set the cycles to have a difference of 1 minute: it is not necessary to plan the cycles carefully and take delays into account.

7.3.4 7. Network settings



For further information, please refer to Chapter::

Chapter: 6.4 Establishing a connection

Network settings ("7.1. Ethernet" and "7.2. Wi-Fi") are important for setting how a connection with the DG-321 is established in everyday operation. See also on this options 3 and 4 in Chapter 6.5.

Network settings ("7.3. E-mail address") are also important so that a message can be sent by e-mail in the event of a fault.

However, this is only possible if the DG-321 is connected to the Wi-Fi network over the above-mentioned options 3 and 4, and if this local network is connected to the Internet.

The settings are only briefly described. Consult an IT specialist if necessary.

The screenshot shows the GEA Settings web interface. The top header includes the GEA logo and the text 'engineering for a better world'. The 'Settings' tab is selected. The left sidebar contains a menu with items 1 through 8, where '7. Network settings' is highlighted. The main content area is titled 'Network settings' and contains the following fields:

- 7.1.1. Mode: Radio buttons for '1. DHCP' (selected) and '2. Static'.
- 7.1.2. IP address: Text input field containing '192.168.9.163'.
- 7.1.3. Subnet mask: Text input field containing '255.255.255.0'.
- 7.1.4. Default gateway: Text input field.
- 7.1.5. Primary DNS server: Text input field.
- 7.1.6. Secondary DNS server: Text input field.

Below the fields, there are two yellow warning boxes:

- 'The displayed IP address may only be valid after saving and reloading this page.'
- 'You may need to update your network settings or browser url after saving this page.'

A 'Save' button is located at the bottom of the form. The footer of the page indicates '© 2019 - GEA'.

7.1.1. Mode

Selected DHCP (recommended) to obtain an IP address dynamically when starting.

Select Static to use the static configured IP address.

7.1.2. IP address

Allocate the Internet protocol address (IP address). Ask your network administrator to give you the address.

7.1.3. Subnet mask

This value is also known as a network mask and covers a range of IP addresses. Ask your network administrator for this, search for a different computer in the same subnet or calculate the value with an on-line subnet calculator.

7.1.4. Default Gateway

The network node that acts as the access point for the rest of the network may only be blank if DHCP is used. Enter the IP address of the system if the network does not have a default gateway.

7.1.5. Primary DNS server & 7.1.6. Secondary DNS server

The domain name server (DNS server) translates legible host names into corresponding IP addresses. Enter the IP address of the system if there is no DNS server in the network.

This value may only be blank if DHCP is used. DHCP.

**Note**

If DHCP does not operate correctly, contact a network specialist.

7.3.4.1 7.2. Wi-Fi

The screenshot shows the GEA Settings interface. The left sidebar contains a navigation menu with items 1 through 8, where '7. Network settings' is expanded to show '7.1. Ethernet', '7.2. WiFi', and '7.3. Email'. The main content area is titled 'Network settings' and 'WiFi'. It contains several configuration fields: '7.2.1. Wireless mode' with radio buttons for 'Access point' (selected) and 'Client'; '7.2.2. SSID' with a text box containing 'DG-321'; '7.2.3. Password' with a text box and the instruction 'Leave empty for open network'; '7.2.6. IP address' and '7.2.7. Subnet mask' with empty text boxes. Below these fields is a yellow warning box stating: 'The displayed IP address may only be valid after saving and reloading this page. You may need to update your network settings or browser url after saving this page.' At the bottom of the form is a 'Save' button. The footer of the page shows '© 2019 - GEA'.

7.2.1. Wireless mode:

The way in which the user establishes a connection to the DG-321. If "Access point" is selected, a direct wireless connection is established between the user and the DG-321. If "Client" is selected, this connection is indirect: the DG-321 is connected to the local Wi-Fi network and the user establishes contact with the DG-321 over the local Wi-Fi network. DG-321.

7.2.2. SSID:

The name of the Wi-Fi network of the DG-321.

This name is displayed in the list of Wi-Fi networks when the controller is used to select the Wi-Fi settings.

7.3.4.2 7.3. E-mail address

If the DG-321 is connected to the local Wi-Fi network in client mode and this local Wi-Fi network is connected to the Internet, a message (e-mail) can be sent to one or more email addresses in the event of a fault.

The text of the message will depend on the nature of the fault and cannot be specified by the user.

The screenshot shows the GEA Settings interface. The top bar has the GEA logo and the text 'engineering for a better world'. The main header is 'Settings'. On the left is a sidebar with a tree view containing items 1 through 8, with '7. Network settings' selected. The main content area is titled 'Network settings'. It contains several input fields: '7.3.1. Recipient's email', '7.3.2. SMTP server', '7.3.3. SMTP port' (with a value of 0), '7.3.4. Authentication required' (checkbox), '7.3.7. Secure connection (SSL/TLS)' (checkbox), '7.3.8. Sender name', and '7.3.9. Sender email'. Below these fields is a note: 'If empty, the first recipient's email address that you specified above will be used.' At the bottom of the form are 'Save' and 'Test' buttons. The footer of the interface shows '© 2019 - GEA'.

7.3.1. Recipient's e-mail address:

Enter the e-mail address of the recipient here. If necessary, enter several e-mail addresses separated by commas.

7.3.2. SMTP server:

Enter the address of the mail providers for outgoing SMTP mail. 7.3.3. SMTP Port: The port number comes from the e-mail provider.

7.3.4. Authorisation required:

When checking the authorisation, an additional user name and password must be entered. These come from the service provider.

7.3.7. Secure connection (SSL/TLS) required:

This setting also comes from the service provider and normally requires a different port number to be entered under "7.3.3. SMTP Port".



Note

Default G-mail SMPT settings:

► G-mail SMTP server:	smtp.gmail.com
► G-mail user name:	Your G-mail address
► G-mail password	Your G-mail password
► G-mail SMTP port:	587
► SSL:	465
► Secure connection required:	Yes

7.3.8. Sender's name:

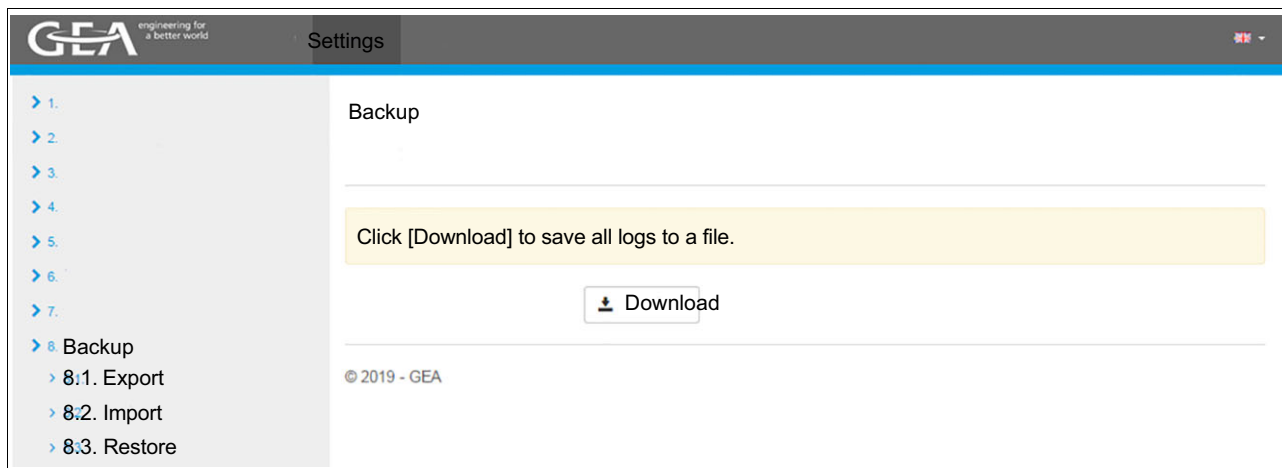
The name of the sender of messages.

7.3.9. E-mail sender's address:

This e-mail address is used as the sender: if recipients reply to the message, the reply is sent to this e-mail address.

If nothing is entered, the e-mail address of the first recipient is used.

7.3.5 8. Backup



For various reasons, e.g. for support when setting up or when solving problems, it may be necessary for the end user/operator to pass on all the settings in digital form to a service provider (dealer, technical support).

The latter can enter the settings into a support application and if necessary adapt them, save them and sent them back to the end user/operator.

The latter can then in turn import the settings into the DG-321. The back-up functions are described more fully below.

Exporting and importing covers all the settings in the settings menu and the software list given in the diagnostics menu under "4. Firmware" - "4.1. Versions".

8.1. Exporting

Click on "Download" to save all the settings in a file. This will be a single file with the filename suffix "ar", and will be very small in size (approx.. 20 KB).

If a USB stick is plugged into the control cabinet, a backup of all the settings to the USB stick is automatically carried out every day. This backup overwrites the backup from 7 days earlier, so that the stick contains a backup file for every day of the last seven days.

As soon as a USB stick is inserted into the socket, all the settings are automatically saved to the stick

8.2. Importing

Press on "Upload" to delete all the DG-321 settings and save the settings in a file in the DG-321. DG-321.

8.3. Restore

Pressing "Confirm" deletes all the settings and returns the factory default settings.

7.4 Handing over to the owner

Settings report

Create a settings report and have it signed by the owner of the system. Point out any changes that are specific to the farm.

Declaration of conformity and CE mark

(only necessary for European Union member states)

A declaration of conformity must be produced and a CE mark applied if an entire operational installation is assembled from individual components.

If several Directives apply to the overall installation, the CE mark means that the requirements of all relevant Directives have been met.

The technical centre/specialist dealer performing the installation work must:

- perform the installation work in accordance with the installation and safety information given in the relevant operating and installation manuals
- complete the hand-over report and have it signed
- produce the declaration of conformity for the total installation being handed over
- apply the CE mark so that it is clearly visible on the installation.

Handing-over report for the milking installation

Complete the handover report and have it signed by the system owner!



Test report / Hand-over report

5560-90 . . -059 Hand-over report for DG-321

8 Operation, control and diagnostics

Workplaces for operating personnel

The system can be operated from anywhere in the barn with an active Wi-Fi connection (from a smart phone, tablet, laptop or PC).

It can of course also be operated from the control cabinet itself.

8.1 Special personnel qualifications

The system may only be operated by qualified personnel in accordance with the safety instructions.

The operator may only carry out work on the machine if he has been trained, instructed and authorized to do so by the owner.

This applies in particular to:

- network specialists
- plumbers/electricians

8.2 Safety Instructions

To prevent damage to property and/or life-threatening injury to personnel, always observe the following:

- Use the product for its intended purpose only.
- If the correct procedure is not followed in cases of emergency, serious injury to personnel and damage to property can occur. Familiarise yourself with the emergency instructions.
- Read the "Safety" chapter as well.

Prior to operation, the operator should be adequately familiar with the following:

- the operating and control elements
- The equipment
- Method of operation
- The immediate environment
- The safety devices

Carry out the following checks before every start:

- Check and make sure that all the plant and equipment is suitable, present and connected.
- Check and make sure that all the protective devices (gratings, emergency stop buttons, etc.) have been installed and operate properly.
- Check the product for visible damage; rectify any faults that are found immediately (observe any necessary personnel qualifications) or contact your specialist dealer - the product may only be used if it is in perfect condition.
- Check and make sure that only authorised personnel are in the work area and that no other person will be put at risk when the machine starts.
- Check and make sure that there are no objects or materials in the working area if they are not necessary for operation.

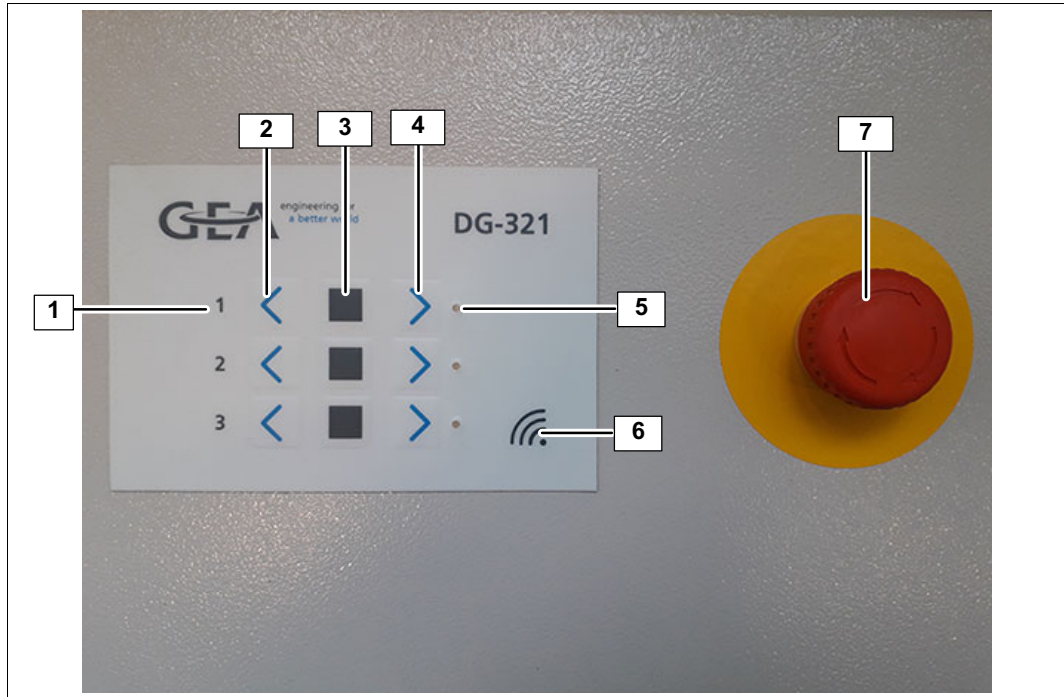
During normal operation:

- Operating personnel must remain at their specified work stations during operation.
See section on "Work stations for operating personnel"
- No safety devices may be removed or deactivated during operation.
- Remaining within the hazard area during operation is strictly forbidden.
- Operating personnel should make sure that no unauthorized personnel are in the working area.

8.3 Particular risks

- Incorrect use may lead to serious damage to property and/or life-threatening injury to people.

8.4 Description of the control elements on the cabinet

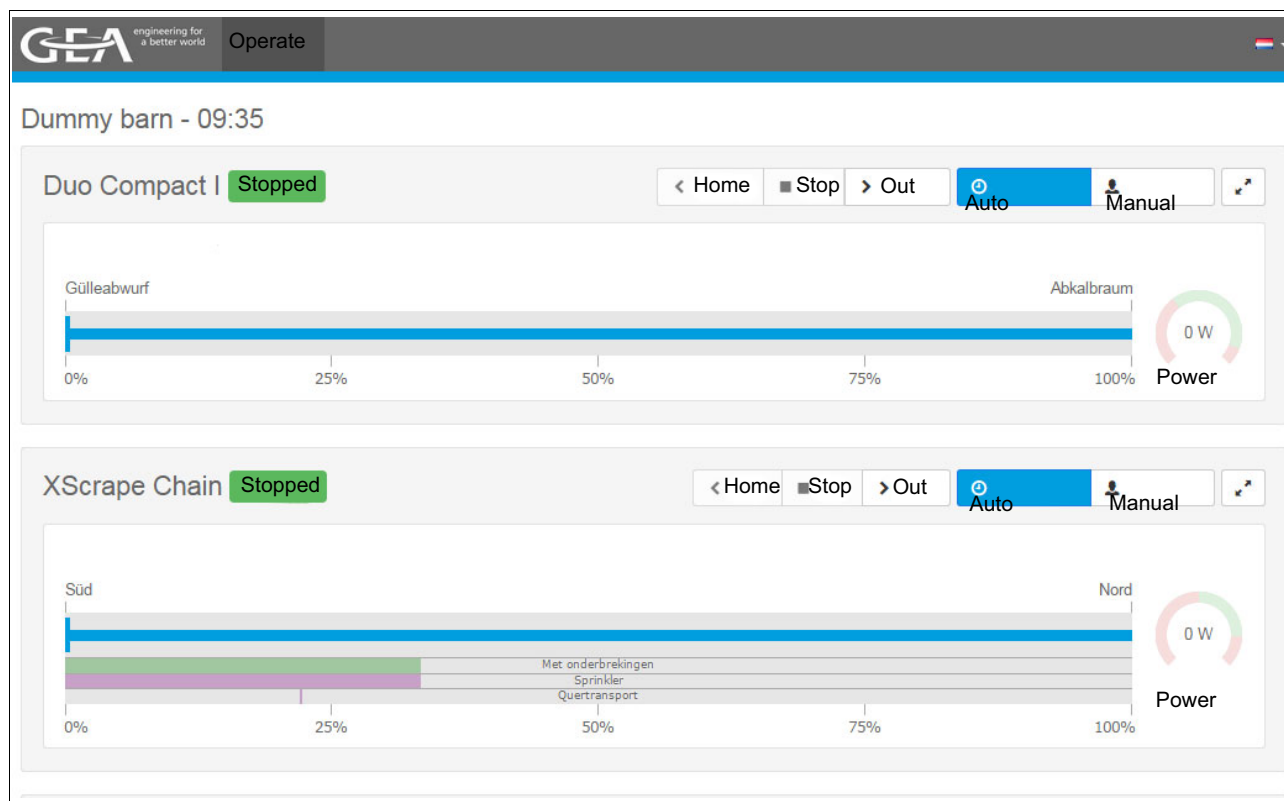


1	Number of the drive system
2	Start in the direction of the start position
3	Stop
4	Start in the direction of the end position
5	Status LED (green, orange or red)
6	Wi-Fi symbol
7	Emergency stop button

8.5 Operation / Control

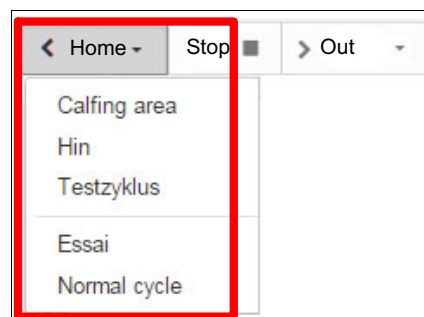
8.5.1 Functions, information, warnings and error messages

The operator menu has two screens. The first screen shows the most important functions and the information/data about all the drive systems.



Functions on the first screen of the operator menu:

1. Starting a cleaning cycle.
If more than one cycle is configured for a drive system, select the desired cleaning cycle.

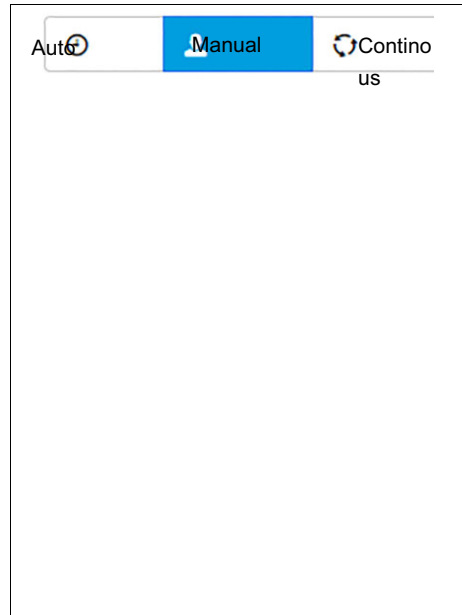


2. Stopping a cleaning cycle.



3. Selecting how a cleaning cycle is started.

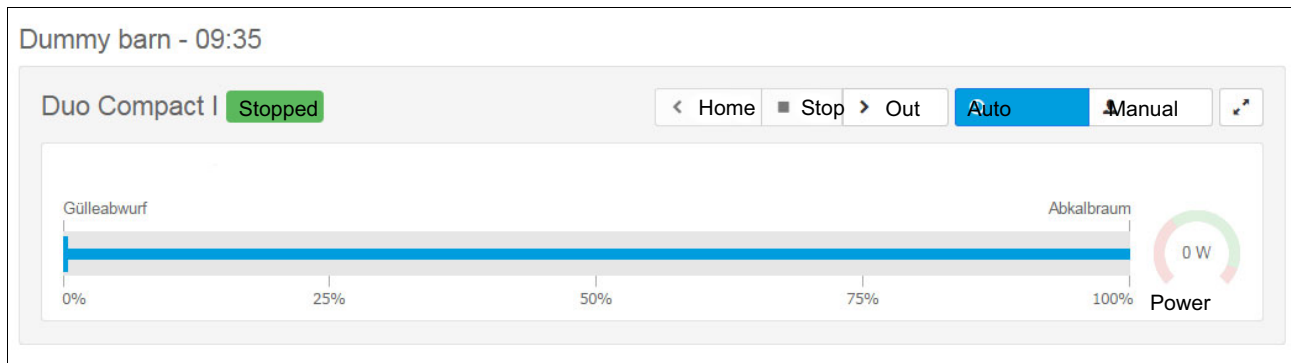
- Automatically. The drive system starts a fixed times during a selected cycle (see Settings - 6. Planning). This is only visible if there is at least one schedule for the drive system in question in "6. Schedule".
- Manually. The drive system will only start if a start button on the cabinet or controller is pressed.
- Continuously. This option is only possible if a cycle has been selected under "3.12 Continuous operation" in the settings menu. The drive station will then repeat this cycle continuously.



4. The expanded operator menu.



Information on the first screen of the operator menu



1. Name of the drive system.

Duo Compact

2. Status of the drive system.



- Stopped

The drive system has completed a cycle and is now at the start or end position, or the system has been stopped during a cycle.

- Warning message

The drive system has ended a cycle early. A text message near the status display will describe the problem.

- Fault

A fault has occurred, either during the cycle or during a standstill. A text message near the status display contains a description of the problem.

- Waiting

The drive system has received a manual start command and is waiting until another drive system has completed its cycle before starting.

- Active

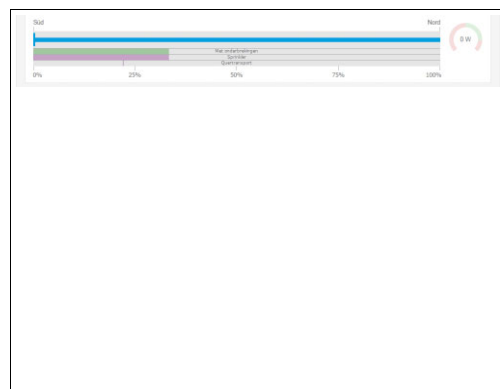
The drive system is performing a cycle.

3. The status of the cycle, i.e. which work phase is in progress.

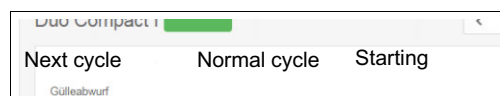


4. The status of the current work phase or the last combined work phases is shown by a bar representing the progress of the work phase as a horizontal line which ends in a vertical blue line.

This shows the current position in time as a percentage of the total work phase duration. The names of the parking and end positions entered by the user are shown at the end of the bar.



5. Name, start and end times of the next planned cleaning cycle.



Warning messages:

Warning message	Cause(s)	Action
Motor rated power exceeded	The value under "3.8 Motor power" has been exceeded because: • the scraper is obstructed by a cow. • the scraper is obstructed by an obstacle. • accumulation of manure on the scraper.	• Remove the injured or dead cow. • Clear the obstacle in the alley. • Clean more often.
Maximum safety power exceeded when reversing Maximum number of restart attempts exceeded.	The value of "4.2 Maximum power" or "4.5 Increase in maximum power" has been exceeded because: • the scraper is obstructed by a cow • the scraper is obstructed by an obstacle. • accumulation of manure on the scraper.	• Remove the injured or dead cow. • Clear the obstacle in the alley. • Clean more often. • After filling the cubicles, start a new cycle with the safety settings switched off by pressing "Stop" or "Start" simultaneously. Or configure a cycle in which safety is switched off in all work phases and start it from the controller.

Error messages

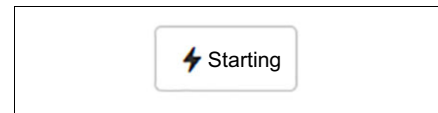
Error message	Cause(s)	Action
Time exceeded.	Cable/rope/chain broken: the work phase lasted more than 50% longer than set under "5. Cycle configuration".	Replace or repair the cable/rope/chain.
Emergency stop button pressed	The emergency stop button has been pressed.	Reset the emergency stop button.
Transducer fault	The transducer cable is faulty or not connected.	• Replace the transducer or the transducer cable (use a shielded cable). • Connect the transducer cable correctly.
Transducer connected the wrong way round.	The transducer has been connected incorrectly.	Connect the transducer cable correctly. See under Installation and Assembly.
Power failure	• Motor protection switch is switched off. • No motor(s) connected.	• Switch on the motor protection switch • Connect the motor(s).
Minimum safe power exceeded.	Cable/rope/chain broken.	Replace or repair the cable/rope/chain.
Short-circuit detected.	One or more field components are short-circuited.	Replace or repair field components.

The functions of the second screen

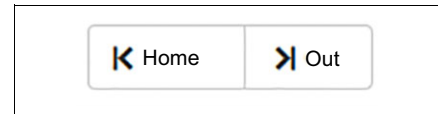
This screen displays additional functions and information for an individual drive system.



1. Start of the calibration cycle.



2. Set the current situation as the point described under "3.3 Name start", or under "3.4 Name end".



3. Continuous operation



4. Winding or unwinding (open control loop) or rotation to left or right (closed control loop). This option is visible if manual operation is selected. Which buttons are visible depends on the design of the drive system (closed or open control loop):

- Open control loop



- Closed control loop



The cycle display remains unchanged during winding and unwinding: the position of the drive system remains practically unchanged.

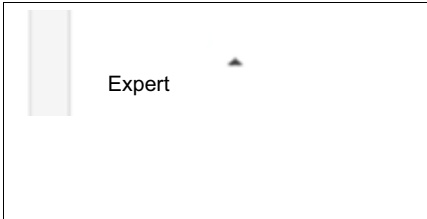
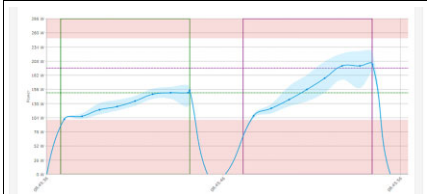
No cow protection is activated during winding and unwinding. Only the motor protection switch and the "3.8 Motor rate power" setting are active.

Information on the second screen of the operator menu:

1. The set points of the maximum and minimum active power (settings 4.3 and 4.4), if applicable.
2. The actual values of the maximum and minimum active power.
3. Graph of the active power against the duration of the current or previous cycle. If a drive system such as an XScrape Chain, for example, uses a transducer, an additional graph of the transducer pulses per second (PPS) plotted against the duration of the actual or previous cycle is displayed. This allows a check to be made as to whether the transducer pulses generated by the drive station arrive at the control cabinet.
4. If "Expert" is selected, the maximum and minimum voltages of all three phases during the last cycle are shown. This information can be helpful in problem solving if there are doubts about the stability of the power supply grid.

Safety: Maximum power {0} W | Minimum power {0} W

Last cycle: Maximum power: {0} W | Minimum power: {0} W | Average power: {0} W



8.5.2 Control cabinet LEDs

The LED lamps on the front panel of the control cabinet indicate the status of the respective drive systems:

No.	LED display	Drive station status
1	Flashing green	Running, cow protection on
2	Flashing orange	Running, cow protection off
3	Flashing orange	Running, calibration
4	Orange, on continuously	Stopped prematurely due to manual stop command: restart at the next programmed start time
5	Orange, on continuously	Stopped prematurely due to overload: restart at the next programmed start time
6	Red, on continuously	Stopped prematurely due to overload
7	Red, on continuously	Stopped prematurely due to insufficient load
8	Red, on continuously	Stopped due to time being exceeded
9	Red, on continuously	Stopped prematurely with emergency stop
10	Red, on continuously	Stopped without any fault, emergency stop at standstill
11	Green, on continuously	Stopped without any fault, no start planned
12	Green, on continuously	Stopped without any fault, start planned
13	Alternating green and orange, on continuously	Stopped without any fault, manual start command given, waiting for end of cycle of another system.

At a glance:

- Flashing System running.
- On continuously System at standstill.

- Green Everything in order.
- Orange Unusual situation, no action required to make the system run. If the system is at a standstill it will be automatically restarted at the next programmed start time.

- Red Unusual situation, the drive station was switched into manual mode by the control system and will not restart until after a manual start command. If necessary, switch the drive station to automatic mode after this start command.

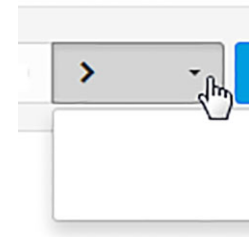
- If a drive station is connected correctly, the corresponding LED should always light up. Check whether the setting "3. Drive settings" - "3.1 Switched on" is marked.
- If an error message is shown in the operator menu, one or more LEDs will light up in red on the control cabinet. In the event of a malfunction the cabinet will switch automatically into manual mode. The malfunctioning drive system will not be restarted until after a manual start command. The system can then be switched (back) to automatic mode if desired.

 On

8.5.3 Setting

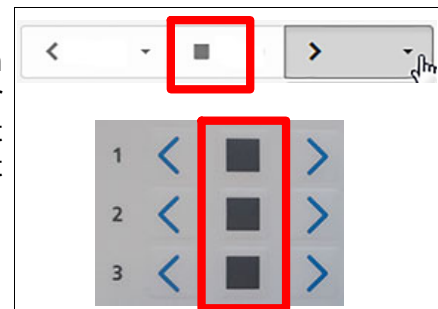
1. Cycle selection

If the controller is used to restart a cycle manually and more than one cycle is configured for the drive system, select one of the cycles shown in the pull-down menu. The list in the pull-down menu consists of two sections, separated by a line: planned cycles above, and unplanned cycles below. Both sections are sorted alphabetically. Cycles that cannot be selected in the selected direction are greyed out. If you press the start button on the control cabinet, the first non-grey cycle in the list is started.



2. Manual stop

If a cycle in automatic mode is stopped with the manual stop on the control cabinet or controller, the drive station ends the cycle at the next planned start; the next cycle start immediately afterwards.

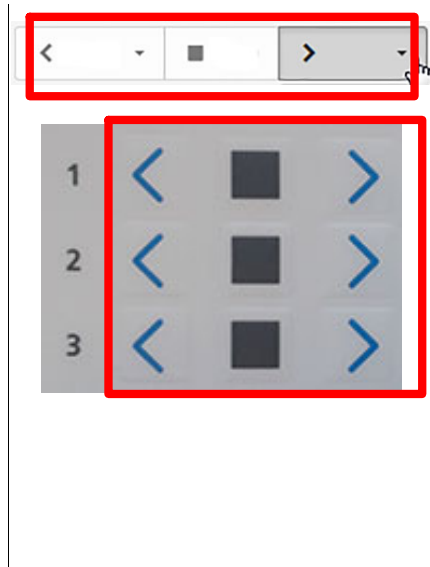


3. Safety deactivated (boost)

To start a cycle without cow protection (protection deactivated), hold the stop button and the start or end button pressed at the same time: press the stop button first, followed by the start or end button within one second.

The drive system will start the next planned cycle, but without cow protection; only the motor protection switch and the setting "3.8 Motor rated power" are active. This is useful if you want to fill the cubicles with green bedding, for example.

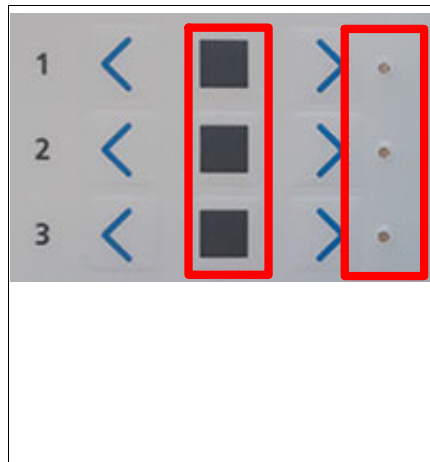
This prevents a pre-programmed cycle (with protection switched on) from being unable to clean the manure alleys.



4. Access with Wi-Fi in client mode

To access the control cabinet when the Wi-Fi network is in client mode and without having to establish a connection to the farm network, e.g. because the user does not know the farm network password, press one of the stop buttons for 5 to 15 seconds until the corresponding LED flashed red instead of orange.

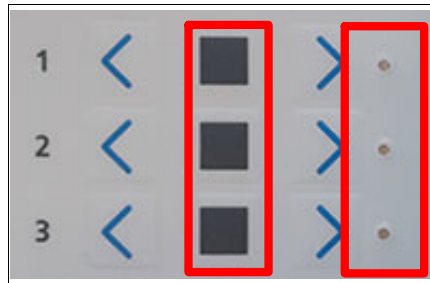
The control console will then remain in access point mode; after 5 minutes without a user input, the console will switch back to client mode.



5. Access without a password

TO access a control console protected by an unknown password, hold one of the stop buttons pressed for 15 to 20 seconds until the corresponding LED is continuously alight in red.

The control cabinet will now allow access without a password for 30 minutes.

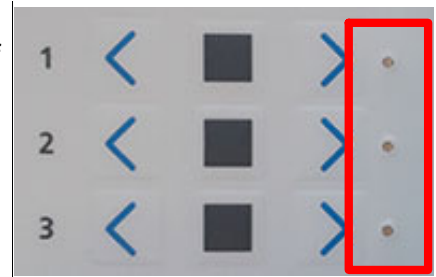


6. Work phase duration exceeded

If a work phase lasts for more than 150% of the planned time, the drive system will stop and output an error message. The drive system will not be restarted until after a manual start command, as this could mean that the traction component is faulty. In this case an automatic restart is not wanted.

If the safety settings are exceeded the system will attempt to overcome the obstacle by moving to and fro (cow protection behaviour).

The time for these additional movements is not added to the work phase duration.



7. Power fault

A power fault occurs if no current flows through one of the three power phases, i.e. if no motor is connected, a motor has failed or if the motor protection switch has been switched off manually or by an overload.

8. Cow protection

When an unusually high resistance occurs in the system, it needs more current than specified under setting "4.3. Maximum power" and/or the power will increase faster than the value set under "4.5. Max. power increase".

An unusually high resistance occurs in the system when a scraper encounters a cow or if a scraper is obstructed by an obstacle in the manure alley. The system then stands still.

If no end position switch or transducer is present and the system is in the end zone, the DG-321 regards the work phase as having ended.

In all other cases the system will reverse a number of times, which can be set, to overcome the obstacle.

If the system is stopped prematurely while reversing, the cycle is interrupted and a warning is output.

As soon as the system has carried out a forwards movement that lasts for twice as long as the value specified for reversing movements, the number of attempts is reset to zero.

See also Section 7.1.4. "4. Safety settings".

9. Automatic work phase duration correction and restart behaviour

The initial value of the work phase duration is zero in the following instances:

- The previous work phase was the last work phase of calibration cycle.
- The last work phase was stopped because a limit switch was activated.
- The current position is marked as "Start" or "End" in the second screen of the operator menu.

If the end of a work phase is defined by a blockage (Setting "5.3.2. Stop": 3. Safety") and the system is blocked while it is in the end zone.

The initial value for the work phase duration of the of next work phase/cycle is half the difference between the actual work phase duration and the maximum work phase duration.

For example, if the maximum work phase duration is 20 minutes, the end zone is 2 minutes long and the system is blocked after 19 minutes, the initial value of the next work phase will be $(20 \text{ minutes} - 19 \text{ minutes})/2 = 30 \text{ seconds}$.

This method is also used if the work phase duration is longer than the maximum work phase duration determined during the calibration cycle.

If the system is blocked while it is still in the end zone (setting "5.3.2 Stop": "3. Safety") or is blocked during the work phase by a limit switch, or a period should be ended (setting "5.3.2. Stop": "1. Limit switch" or "2. Time") and remains blocked after the set number of attempts, the cycle is discontinued.

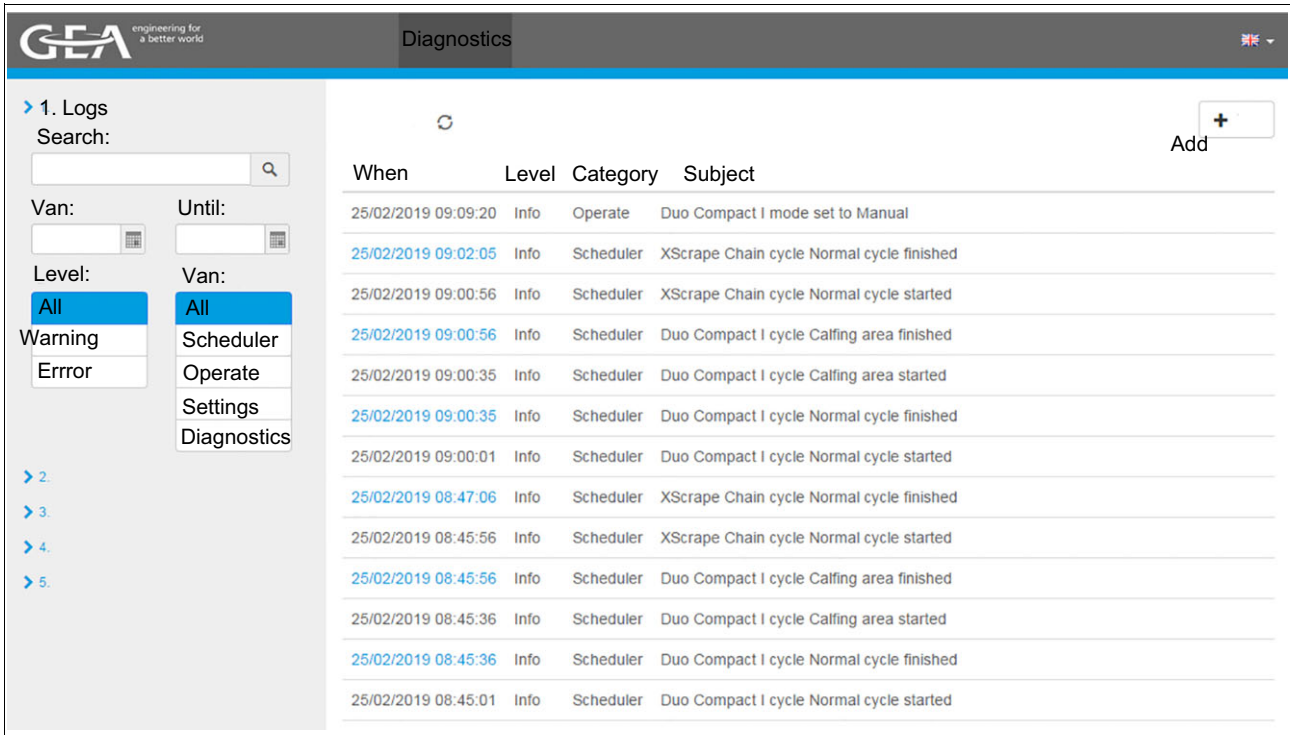
An attempt will be made at the next programmed start time or after a manual start command to complete this discontinued cycle.

Regardless of this is successful or not, the programmed or (manually) selected cycle will be carried out next.

8.5.4 Diagnostics

The diagnostics menu allows system data to be logged or exchanged.

8.5.4.1 1. Log data



The screenshot shows the GEA Diagnostics interface. On the left, there is a sidebar with a search bar and filters for 'Van', 'Until', 'Level', and 'Van'. The 'Level' filter is set to 'All'. The main area displays a table of log entries with columns: When, Level, Category, and Subject. An 'Add' button is visible in the top right corner of the table area.

When	Level	Category	Subject
25/02/2019 09:09:20	Info	Operate	Duo Compact I mode set to Manual
25/02/2019 09:02:05	Info	Scheduler	XScrape Chain cycle Normal cycle finished
25/02/2019 09:00:56	Info	Scheduler	XScrape Chain cycle Normal cycle started
25/02/2019 09:00:56	Info	Scheduler	Duo Compact I cycle Calving area finished
25/02/2019 09:00:35	Info	Scheduler	Duo Compact I cycle Calving area started
25/02/2019 09:00:35	Info	Scheduler	Duo Compact I cycle Normal cycle finished
25/02/2019 09:00:01	Info	Scheduler	Duo Compact I cycle Normal cycle started
25/02/2019 08:47:06	Info	Scheduler	XScrape Chain cycle Normal cycle finished
25/02/2019 08:45:56	Info	Scheduler	XScrape Chain cycle Normal cycle started
25/02/2019 08:45:56	Info	Scheduler	Duo Compact I cycle Calving area finished
25/02/2019 08:45:36	Info	Scheduler	Duo Compact I cycle Calving area started
25/02/2019 08:45:36	Info	Scheduler	Duo Compact I cycle Normal cycle finished
25/02/2019 08:45:01	Info	Scheduler	Duo Compact I cycle Normal cycle started

All activities relating to cycles, operator commands, changes to settings, data transfer, warning and error messages are logged.

Click on "Add" to add report to the overview.



If the date and time are shown in blue at "When", you can click on it to obtain a detailed view of the log data.

Click on "Category" and then "Settings" to display the changes in the selected setting. This quickly and simply shows what was changed and with what result.



Diagnostics

1. Logs

21-3-2019 09:47:41

Safety Duo Compact II updated

Safety settings

After blockage	Automatic
Detection method	Manual
Check power	Ja
Maximum power	250 W
Minimum power	150 W
Maximum power increase	70 W
Maximum power decrease	70 W
Duration	0,5 sec.
Check speed	
Maximum speed	200 PPS
Minimum speed	100 PPS
Maximum speed increase	5 %
Maximum speed decrease	5 %
Duration	0,5 sec.
Number of retries	2
Withdrawal duration	5 sec.

8.5.4.2 2. Statistics

This is where hours of operation, safety warnings and the drive system power consumption is shown. Emergency stops are logged here as well.

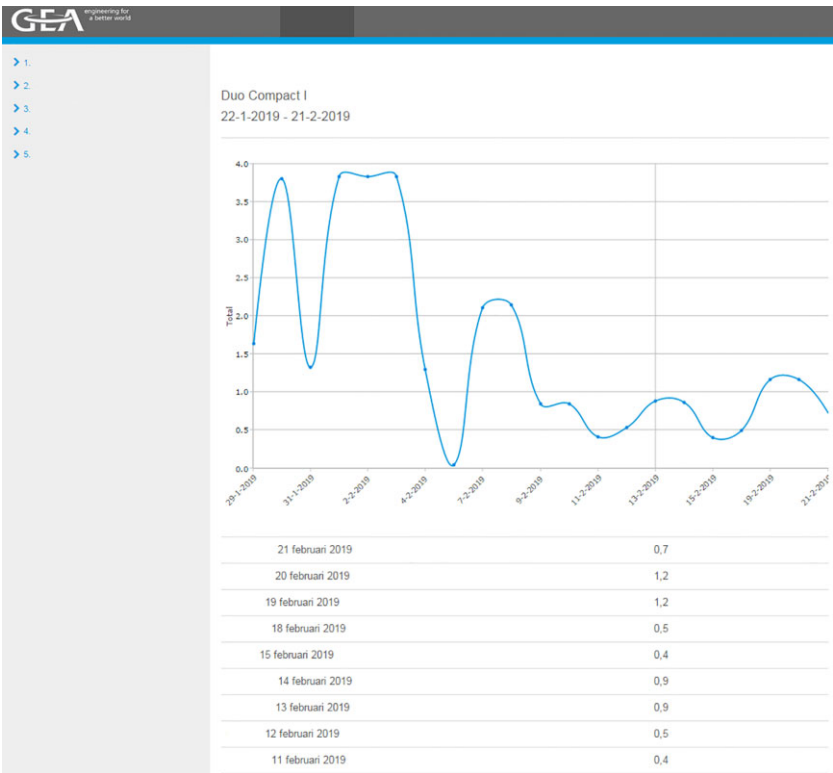
The hours of operation can be used to fine tune the maintenance of the drive system and/or scraper.

The safety history gives an indication of the sensitivity of the safety settings: if there are only a few safety warnings, the cow protection may be inadequate. Reduce the settings under "4.3 Maximum power" and/or "Increase in maximum power".

The screenshot displays the GEA Diagnostics web interface. The top navigation bar includes the GEA logo and the word "Diagnostics". A left sidebar contains a menu with items 1 through 5, where "2. Statistics" is selected. The main content area is titled "2. Statistics" and lists four categories: Duo Compact I, XScrape Chain, Duo Compact II, and System. Each category has a table of statistics and a "History" button.

Category	Running hours	Safety exceeded today	Power today	Speed today	Emergency stops today
Duo Compact I	198	4	: 206 W : 0 W : 85 W	: 100 PPS : 0 PPS : 49 PPS	-
XScrape Chain	121	7	: 325 W : 0 W : 198 W	: 99 PPS : 0 PPS : 67 PPS	-
Duo Compact II	160	2	: 221 W : 182 W : 207 W	-	-
System	-	-	-	-	0

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8.5.4.3 3. Inputs/outputs

This submenu gives a quick overview of the individual drive systems and the overall system including field components and the connected external machines.

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Diagnostics

Inputs / Outputs

3.1. Duo Compact II

3.1.1. Vermogen

3.1.4. Limit switch Home (61) ☐ Off ☒ On

3.1.5. Limit switch Out (64) ☐ Off ☒ On

3.1.6. Motor CCW (66) ☒ Off ☐ On

3.1.7. Motor CW (67) ☒ Off ☐ On

3.1.8. Sprinkler (26, 27) ☒ Off ☐ On

3.4. System

3.4.1. Phase 1 (L1)

3.4.2. Phase 2 (L2)

3.4.3. Phase 3 (L3)

3.4.4. Short circuit detection ☐ Off ☒ On

3.4.5. Emergency stop (3, 4, 5) ☐ Off ☒ On

3.4.6. External stop (6) ☐ Off ☒ On

3.4.7. External start (8) ☐ Off ☒ On

3.4.8. Frost detection (10) ☐ Off ☒ On

3.4.9. Cross gutter scraper (20, 21) ☒ Off ☐ On

3.4.10. External machine (18, 19) ☒ Off ☐ On

3.4.14. Reversing CCW (69) ☒ Off ☐ On

3.4.15. Reversing CW (70) ☐ Off ☒ On

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The external machines (3.1.8, 3.2.8 and 3.3.8, 3.4.9, 3.4.10 and 3.4.11), the "Running indicator" (3.4.12) and the "Error indicator" (3.4.13) can be switched on and off here manually. The numbers in brackets refer to the connections in the individual components on the circuit board.

If a relay is switched on manually, the corresponding LED (at terminal 26, 24, 22, 20, 18, 16, 14 or 12 on the circuit board) must light up orange and the external machine or display must be switched on.

If the corresponding LED does not light up, the circuit board is faulty and must be replaced.

If the corresponding LED lights up but the machine or display is not switched on, the wiring is incorrect and must be repaired.

9 Maintenance, diagnostics and repair of the drive motor

If necessary, please contact your nearest authorized technical dealer.

9.1 Special personnel qualifications

Maintenance work may only be performed by specially qualified personnel in accordance with the safety instructions.

- Relevant product training is required.
- Only allow trained electricians to work on electrical components.
- Only allow network specialists to work on the network.

In this respect, please also read Chapter: on "Personnel Qualification".

9.2 Safety Instructions

To prevent damage to property and/or life-threatening injury to personnel, always observe the following:

Attention!

The installation or use of products from other manufacturers may adversely affect the specified properties of the original parts and lead to hazards to persons and animals.

► Only use original spare parts / original wear parts / original accessories.

The manufacturer does not accept any liability for injury to people or animals, or damage to the product, caused by the use of products from other manufacturers.

-
- All of the steps involved in the maintenance work must be worked through in the order specified.
 - The maintenance work specified in the instructions (adjustment, cleaning, lubrication, inspection, etc.) must be performed at the times specified.
 - Maintenance should only be carried out using the tools designated for this purpose.
 - Also note the special information in this manual for the individual components.
 - Only use the operating media specified.
 - All warnings and warning signs must be present and legible.
 - Immediately replace any components that are not in perfect condition
 - Read the "Safety" chapter as well.

Before carrying out any maintenance work, ensure the following:

- The area for the maintenance work and access to the working area should be secured over a wide area and there should not be any unauthorised persons in the working area.
- Before performing any work on electrical installations or equipment (components, housing, etc.) switch off all power supplies and make sure they cannot be switched back on again. Put up a sign warning against switching them back on again.
Observe the safety regulations:
 - Activate
 - Ensure devices cannot be switched back on again
 - Verify safe isolation from supply.
 - Earth and short circuit if necessary.
 - Cover or enclose any nearby live parts.
- Suitable lifting gear and load suspension equipment must be available when replacing larger components.
- Suitable collection vessels must be provided for all substances that might be harmful to ground water (oils, manure, cleaning water, etc.)

Check the following after the maintenance work has been completed:

- Default system settings must not be changed when the measures are carried out.
- All bolted joints that were previously loosened must be tightened again.
- All protective devices, covers, lids, strainers, filters, etc. that were removed previously must be reinstalled correctly.
- Safety equipment must be in perfect working order again.
- All tools, materials and other equipment used have been removed from the working area.
- After maintenance has been carried out or parts have been replaced, check that they are working. If required, draw up a full test report.

9.3 Particular risks

- Serious damage to property may occur if incorrect replacement or wearing parts are installed.
- Serious injury to persons or damage to property may result if energy sources are switched on inadvertently.
- There is a risk of injury from accessible components/tools etc. with sharp edges.
- No welding work may be carried out at the control cabinet.
- There is a fire hazard associated with welding work.
 - Always disconnect these components from the mains before carrying out any welding work.
 - Disconnect components within a radius of 2 metres.
- Lines which are not laid properly (e.g. bending radius too small) can cause scorching and electrical fires.
- Electrostatic processes can cause damage to electronic components.
 - Only touch the edges of the circuit board and avoid static caused by clothing.
- Connections that have been mixed up will cause the motor to run in the wrong direction. This may cause serious damage to property and/or life-threatening injuries to persons.
- Incorrectly wired connections may destroy electrical/electronic components.
- Serious injury to persons or property can be caused if incorrect torque is applied when tightening screws.

9.4 Servicing and preventive maintenance

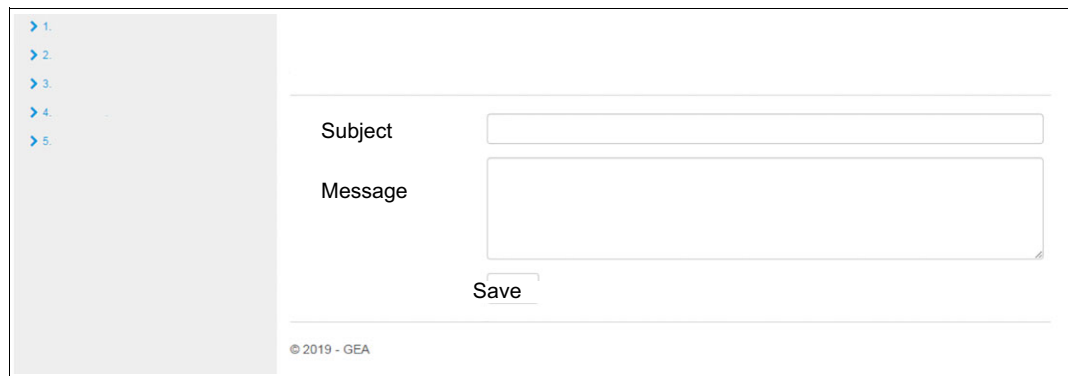
9.4.1 General

Adding a note

It may be useful to include a description of the maintenance or repair in the logbook for examination later. Go to the "Diagnostics" menu and click on "+Add".



Enter the desired text here and click on "Save".

A screenshot of a software interface for adding a note. On the left is a vertical sidebar with a list of numbered items (1-5) each preceded by a blue right-pointing arrow. The main area contains a form with two input fields: 'Subject' and 'Message'. The 'Message' field is a larger text area. Below these fields is a 'Save' button. At the bottom left of the main area, there is a small copyright notice: '© 2019 - GEA'.

9.4.2 Cleaning the control cabinet, checking the safety equipment

Clean the exterior of the control cabinet once a year with a damp cloth. Make sure in particular that the edges of the front panel are clean.

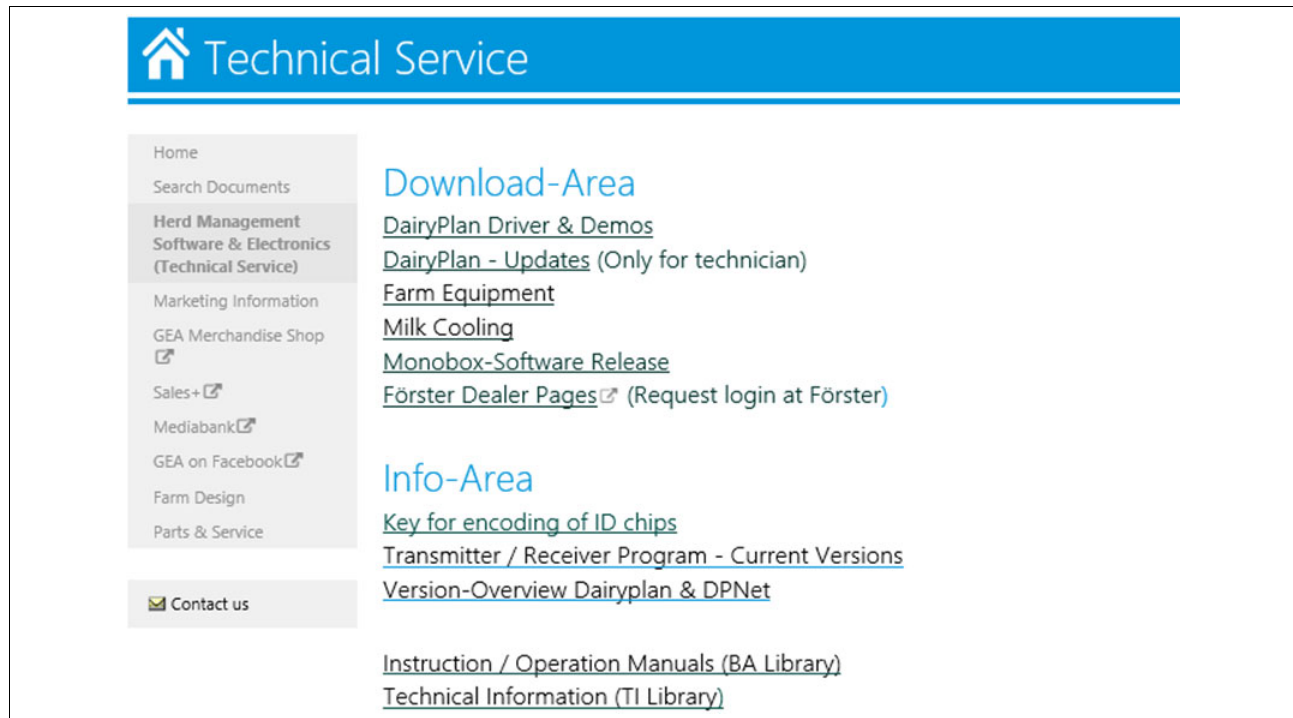
Check the interior of the cabinet once a year and remove any moisture and dirt present.

Check once every quarter of a year at least that the emergency stop functions:

- Press the emergency stop button during a scraping cycle and check that the system//installation stops.
- Reset the emergency stop (turn the knob clockwise) and press the start button corresponding to the direction in which the scraper cycle was running.

9.4.3 Software Update

New software with the name "dg321-application -..." will be made available in the RdB Extranet download area under "Farm Equipment".



The screenshot shows the 'Technical Service' website. On the left is a navigation menu with links: Home, Search Documents, Herd Management Software & Electronics (Technical Service), Marketing Information, GEA Merchandise Shop, Sales+, Mediabank, GEA on Facebook, Farm Design, and Parts & Service. Below the menu is a 'Contact us' button. The main content area is divided into two sections: 'Download-Area' and 'Info-Area'. The 'Download-Area' contains links for DairyPlan Driver & Demos, DairyPlan - Updates (Only for technician), Farm Equipment, Milk Cooling, Monobox-Software Release, and Förster Dealer Pages (Request login at Förster). The 'Info-Area' contains links for Key for encoding of ID chips, Transmitter / Receiver Program - Current Versions, Version-Overview Dairyplan & DPNet, Instruction / Operation Manuals (BA Library), and Technical Information (TI Library).

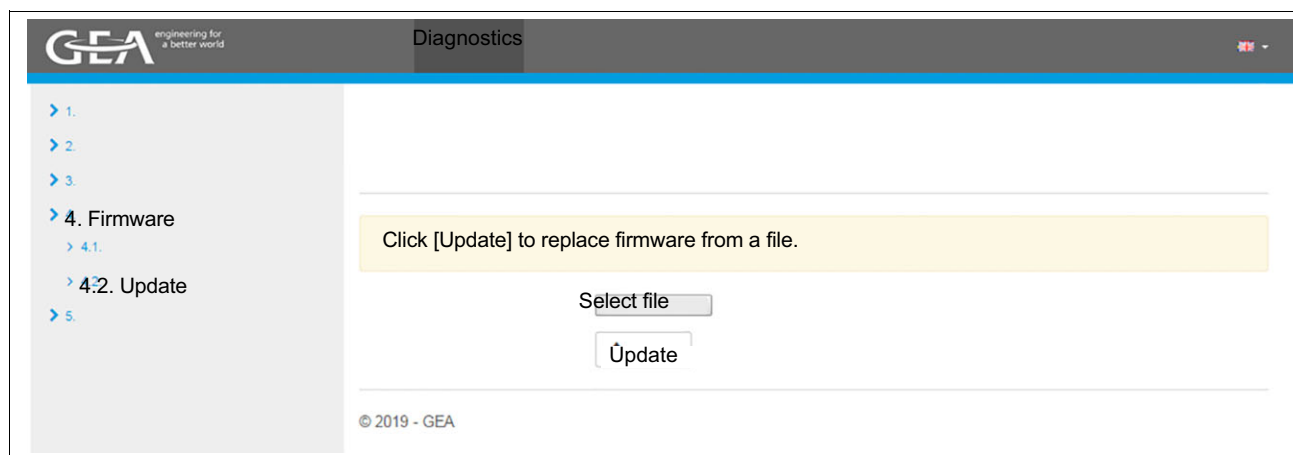


Note

Before loading new software, make a backup copy of the settings (at "Settings" - "8. Backup" - "8.1. Export") and of the logs "Diagnostics" - "5. Backup" - "5.1 Export"). If an error occurs and the settings and/or logs are lost, the old settings/logs can be reloaded.

See also Chapter 7.3.4 - 8. Backup

The software can be loaded under "Diagnostics" - "4. Firmware" - "4.2 Update":



The screenshot shows the GEA Diagnostics software interface. The top bar has the GEA logo and the word 'Diagnostics'. On the left is a navigation tree with the following structure: 1., 2., 3., 4. Firmware, 4.1., 4.2. Update, and 5. The '4.2. Update' option is selected. The main content area has a yellow box with the text 'Click [Update] to replace firmware from a file.' Below this is a 'Select file' button and an 'Update' button. At the bottom left, there is a copyright notice: '© 2019 - GEA'.

9.4.4 Support application for service organisations

Service organisations can download a folder with the name "RdB DG-321 ..." from the download area of the RdB Extranet under "Farm Equipment".

Install this software in a folder with the name "VMWARE" on the C: drive. Start this software by double-clicking on the file "DG-321 Support mode".

Reset any error messages and update the screen if necessary. As soon as the program starts, the menu structure as with a DG-321 will be visible.

The maximum work phase duration is set at 20 minutes as the factory default and cannot be changed. For safety reasons a calibration must always be carried out.

The settings file and/or the log file of a DG-321 used in the barn can remotely loaded for remote analysis with this program.

Settings can be changed, saved, sent and then imported from the same DG-321 in this program.

Templates with settings for simplifying/speeding up the settings of a DG-321 can also be created with this program.

9.4.5 Replacing/shortening/tensioning the traction component

After replacing the traction component (rope or chain) carry out a calibration cycle to establish the end points correctly.

Wait until the calibration cycle has finished to ensure that the desired end points have been achieved and no cows have been injured, since cow protection is not activated during calibration.

The only protection active during the calibration cycle is the motor protection switch and the setting "3.8 Motor rated power".

9.4.6 Troubleshooting log

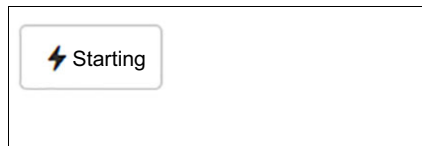
Follow the instructions below to carry out a correct system assessment in the event of a malfunction of one or more drive systems.

These indicate what happened and when, allowing the situation to be speedily rectified.

In most cases drive system malfunctions are caused by a mechanical problem.

Moving the scraper

If the system does not move for reasons which are unclear, we recommend starting a calibration cycle. After this cycle the system will be in the start position.



In addition, the system can always be moved in both directions with the function buttons "Wind/Unwind" or "Stationary". Go to the expanded operator menu and select manual mode.



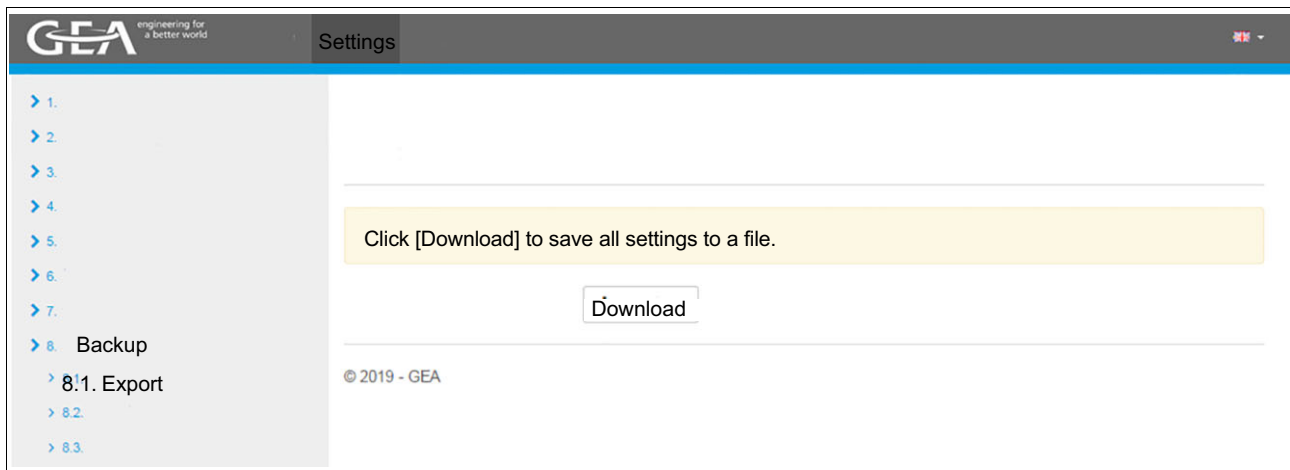
After you have brought this system to one end of the manure alley, set the position to "Start" or "End" with the "Zero" function.



Fault rectification log

Try to rectify the fault with steps 1 and 2 before calling on outside support with steps 3 to 6.

1. Check the status of all the drive systems (operation): are any warning or error messages output?
2. Check the log data (Diagnostics - log data - level: all - category: all). Compare the power graph of the last/interrupted cycle with the graph for previous cycles: what differences are there, and how were they caused?
3. Export the settings (Settings -Backup - Export). These can be exported as a file and imported back into the support application (Settings - Backup - Import) of the service organisation.



4. Export the logs (Diagnostics -Backup - Export). These can be exported as a file and imported back into the support application (Settings - Backup - Import) of the service organisation.
5. Check and make a note of the set values of all motor protection switches.
6. Contact the service organisation and copy the collected data to them if necessary.

9.4.7 Checking and replacing hardware

When replacing the circuit board, only grip it by its edges. Do not allow the circuit board to come into contact with clothing so as to prevent an electrostatic charge.

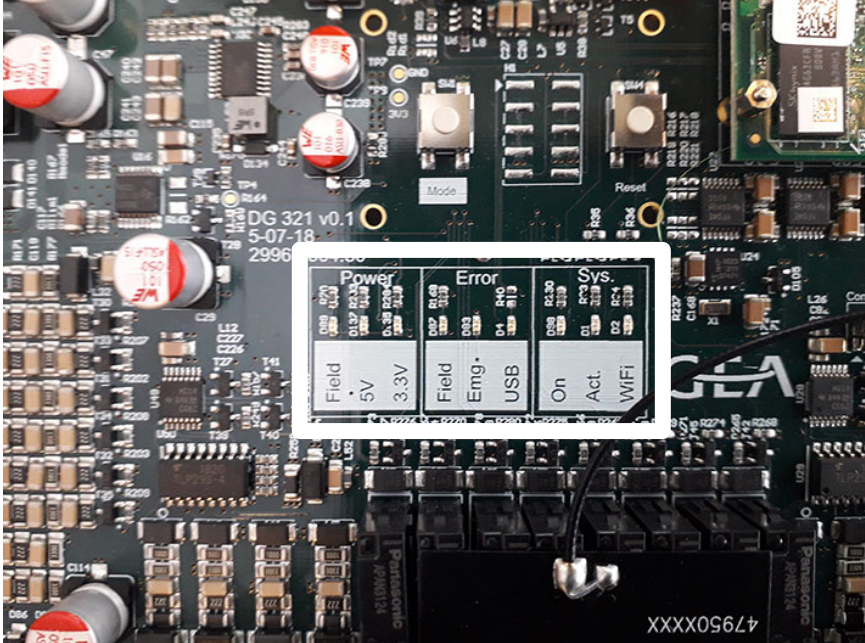
If the front panel of the control cabinet is damaged or corroded, order a complete control cabinet. The front panel of the cabinet can be removed by taking out the hinge pins.

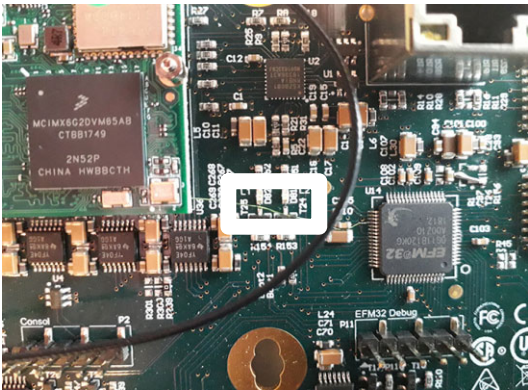


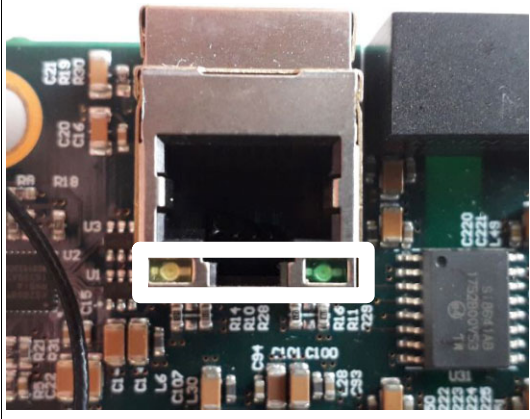
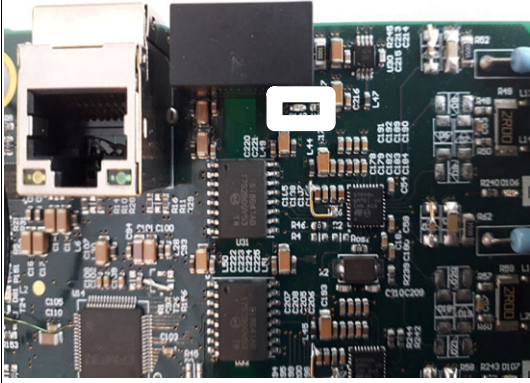
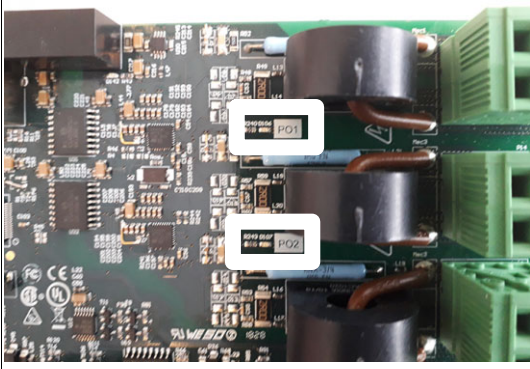
If there are (suspected) hardware problems with any of the following components, replace them under the following conditions:

Component	Condition(s):
Test film	• The LEDs are out. Check whether the drive station is switched on (tick at "Settings" - "3. Drive system settings" - "3.1 Switched on"). • The film has become detached from the cabinet in places.
Main power switch (SW1)	• Visible damage • No noticeable click when switching on and off.
Emergency off switch (ES1)	• Visible damage • No noticeable click when switching on and off.
Cabinet	• Distortion affecting the position of the components • Excessive corrosion or dents adversely affecting the structural integrity of the enclosure protection class (IP 65: Protection against the ingress of moisture and dust/dirt)
Power supply unit (PSU1)	• If the "DC OK" LED does not light up, even if the connection to "V+" is disconnected. • If the "DC OK" LED does not light up, but does light up if the connection of "V+" is disconnected, the circuit board is faulty and must be replaced.
Contactor	• If a drive system is in operation, one of the two orange-coloured buttons of the contactor set is in the lower position, as is one of the two orange-coloured buttons of the contactor set UW1+ UW2. The corresponding LEDs light up on the circuit board (terminals 40 or 41, 53 or 54, 66 or 67 and 69 or 70). • If the corresponding LEDs light up but the drive system does not move, the following situation exists: - If the two corresponding orange-coloured buttons are in the lower position, a contact in one of the two contactors is disconnected. Replace the contactors one after the other in order. If this does not help, the circuit board is faulty and must be replaced. - If only one of the two orange-coloured buttons is in the lower position, the coil of the other contactor is faulty and this contactor must be replaced.

9.4.8 Circuit board

Component	Significance/Meaning
Print board	
	
Power-LED 'Field' (green)	• If this does not light up, there is no 24 V DC current in the field components (motors, emergency off switches, transducers, external start, external stop, frost protection). • Find out by disconnecting the field components one after the other in order or all at once whether the LED lights up or not, which field components had a short-circuit or whether the circuit board is faulty and must be replaced.
Power-LED '5V' (green)	• If this is no green and the "Field" operational indicator LED lights up, the circuit board is faulty.
Power-LED '3.3V' (green)	• If this is not green and the "Field" operational indicator LED lights up, the circuit board is faulty.
Power-LED 'Field' (green) Power-LED '5V' (green) Power-LED '3.3V' (green)	• If these three LEDs do not light up, there are three possibilities: - The power supply unit has failed. - The circuit board is faulty. Replace the power supply unit first. If the LEDs still do not light up, replace the circuit board.

Component	Significance/Meaning
Error-LED 'Field' (red)	● If this LED lights up, there is a short-circuit in one or more field components. The "Field" operational indicator LED (green) does not light up. ● See below under "Field" operational indicator LED.
Error-LED 'Emg' (red)	● If this lights up, the emergency off switch is activated.
Error-LED 'USB' (red)	● If this LED lights up, the USB stick or the USB cable is faulty. Remove and replace the USB stick or cable. ● If the LED is still lit up after the USB stick or cable has been removed, the circuit board is faulty. Replace it.
Sys-LED 'On' (green)	● If the LED does not light up, the processor has not started. If this is the case, replace the circuit board.
Sys-LED 'Act.' (green)	● If this LED does not flash, the processor is not active. ● Switch the DG-321 off and on again. If it still does not flash, replace the circuit board.
Sys-LED 'WiFi' (green)	● If this LED is continually lit, the control cabinet is in access point mode. ● If this LED flashes, the control cabinet is in client mode and is connected. ● If it does not light up, the control cabinet is in client mode but not connected.
The two LEDs to the right of the processor circuit board 	● The left LED (orange) should flash and the right LED (green) should light up. If this is not the case, replace the circuit board.
2 LEDs at the Ethernet connection (green/yellow)	● The left LED (yellow) flashes to indicate data traffic. ● The right LED (green) lights up if the data rate is 100-base-TX (1pp Mbit/s). IT does not light up if the data rate is 10Base-TX (10 Mbit/s).

Component	Significance/Meaning
	
LED at the right-hand Ethernet connection (green/yellow) 	• IF this does not light up, replace the circuit board
"PO1" and "PO2" (green) LEDs 	• The faster these LEDs flash, the more current the control cabinet is consuming.
LEDs above in the in/out connections//terminals	• These should light up when the circuit is complete. If this is not the case, check and complete the current circuit.



Note

The circuit board contains a processor. The circuit board and processor belong together, as certain circuit board settings are stored in the processor (e.g. calibration values and serial number). There is no option to replace only one of these.

Attention!**Submitting complaints**

If you report a complaint about the circuit board, please give the status of the LEDs.

- This speeds up determining the problem.
- Give the status of the LEDs in the table below by circling them, for example.

	LED	Colour	Status
1	"Field" operational indicator LED	Green	On/Off
2	"5V" operational indicator LED	Green	On/Off
3	"3.3 V" operational indicator LED	Green	On/Off
4	"Field" fault LED	Red	On/Off
5	"Emg" fault LED	red	On/Off
6	"USB" fault LED	red	On/Off
7	"On" system LED	Green	On/Off
8	"Act." system LED	Green	On/Off
9	"Wi-Fi" system LED	Green	On/Flashing/Off
10	2 LEDs right of the CPU	Orange Green	Left LED: Flashing/Off Right LED: On/Off
11	2 LEDs at the Ethernet connection	Yellow Green	Left LED: Flashing/Off Right LED: On/Off
12	LED next to the Ethernet connection on the right	Green	On/Off
13	"PO1" LED	Green	Flashes/Off
14	"PO2" LED	Green	Flashes/Off
15	LEDs above terminals 1 to 72	Yellow	on

10 Decommission

10.1 Special personnel qualifications

Decommissioning may only be performed by specially qualified personnel in accordance with the safety instructions.

- Only allow electrical components to be removed by a qualified electrician.

In this respect, please also read Chapter: on "Personnel Qualification".

10.2 Safety Instructions

To prevent damage to property and/or life-threatening injury to personnel, always observe the following:

- All of the steps involved in the decommissioning work must be worked through in the order specified.
- First, secure a wide zone around the working area for decommissioning.
- Read the "Safety" chapter as well.

10.3 Particular risks

- Incorrectly mounted components can drop off or fall over.
- Exposed sharp-edged components/tools may cause injury.
- Suspended loads can fall, with a risk of death - do not stand underneath suspended loads!
- Using load suspension devices other than those specified here may result in serious injury to persons and damage to property.

10.4 Final decommissioning

10.5 Disposal

After final decommissioning, handle all components properly and dispose of them in accordance with valid local regulations on waste disposal and utilization.

11 Spare parts

11.1 Notes on ordering

Original parts



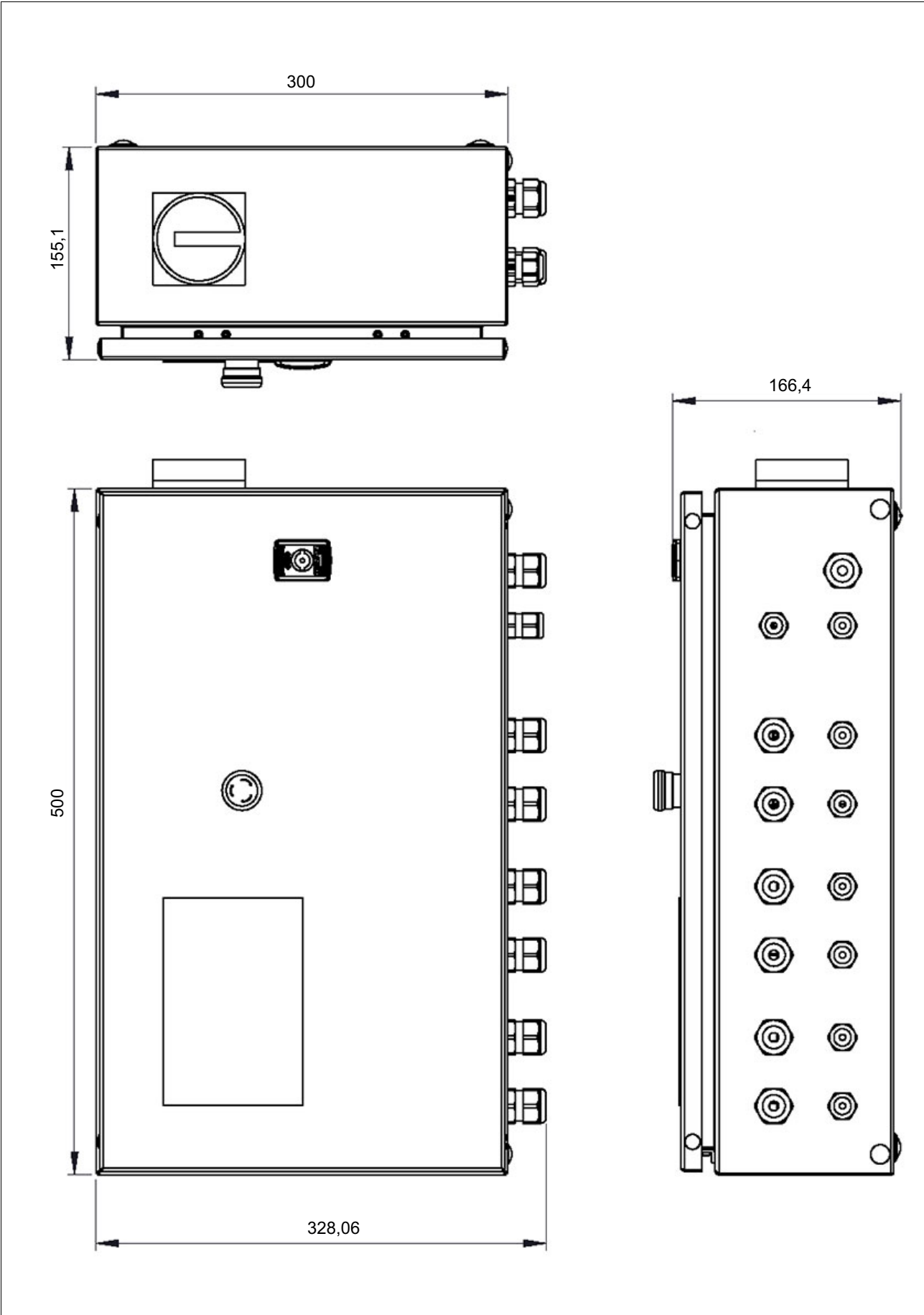
Note

The manufacture expressly points out that only original parts, accessories and chemicals matched to the product have been tested and approved.

The installation or use of products from other manufacturers may adversely affect the specified properties of the original parts and lead to hazards to persons and animals.

Part No.	Description	
5560-0321-010	Control cabinet	DG-321, 1-Drive, EU-Version
5560-0321-011	Control cabinet	DG-321, 1-Drive, OVP, EU-Version
5560-0321-030	Control cabinet	DG-321, 3-Drive, EU-Version
5560-0321-031	Control cabinet	DG-321, 3-Drive, OVP, EU-Version
5560-0321-500	Housing	DG-321, Complete, Excl.Brackets
5560-0321-510	Set of hinges	
5560-0321-520	Mounting lug set	
5560-0321-530	Set of cable glands and blanking plug	
5560-0321-540	Lock + key	
5560-0321-550	Main breaker	Complete
5560-0321-560	Emergency stop button	
5560-0321-570	Air cushion film	For 1 Drive System
5560-0321-575	Air cushion film	For 3 Drive Systems
5560-0321-580	Print board	For Button foil
5560-0321-590	Print board	Mainboard
5560-0321-600	Wi-Fi antenna	
5560-0321-610	Electricity	
5560-0321-620	Magnetic switch	
5560-0321-630	Connection	Phase+Neutral wire
5560-0321-640	Connection	Earth wire
5560-0321-650	Document wallet or folder	370x280x55mm, Black
5560-0321-680	Overvoltage protection device	
5560-0321-690	Motor protection switch	0.63 - 1.0 Amp. In Casing
5560-0321-700	Motor protection switch	4.0 - 6.3 Amp. In Casing
5560-0321-720	Rope	Flat
5560-0321-730	Decals	Warning: Manual
5500-5000-121	Decals	5x5x5cm 'Dangerous Voltage !!'
5505-9999-001	Motor protection switch	1.0 - 1.6 Amp. In Casing
5505-9999-002	Motor protection switch	2.5 - 4.0 Amp. In Casing
5505-9999-004	Motor protection switch	1.6 - 2.5 Amp. In Casing
5500-9999-001	Electrical cable with shield	4x0.75mm
5505-9995-000	Frost protection set//kit for control cabinet	DG-321+BLC Incl 10Mtr powercable
5560-1310-041	Limit switch set	
5560-1310-365	Switch assembly	For SW-Drive

12 Diagrams



13 Appendix

13.1 Directories

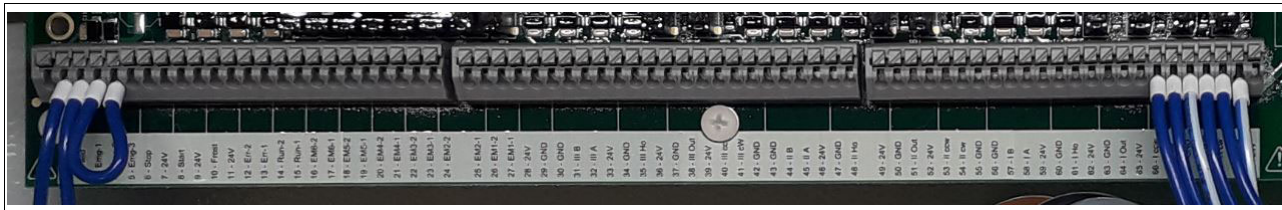
Abbreviations

Term	Explanation
Ø	Diameter symbol
HMI	User interface (Human - Machine - Interface)
GUI	Graphical User Interface (Graphical User Interface)
LED	Light Emitting Diode
PCB	Electronic circuit board (PCB)
DHCP	Dynamic Host Configuration Protocol

Units

Unit	Explanation
°	Degree (angle)
°C	Degrees Celsius/ centigrade
s	Second
min	Minute
' (in)	Inch (= 25.4 mm)
mm	Millimetres
cm	Centimetres
m	Metres
g	Gram
kg	Kilograms
kW	Kilowatts
A	Amp (current)
V	Volt (voltage)

13.2 Circuit board terminals



The following applies to all connections:

Cross-section:

0.75 mm²

Wire ferrule

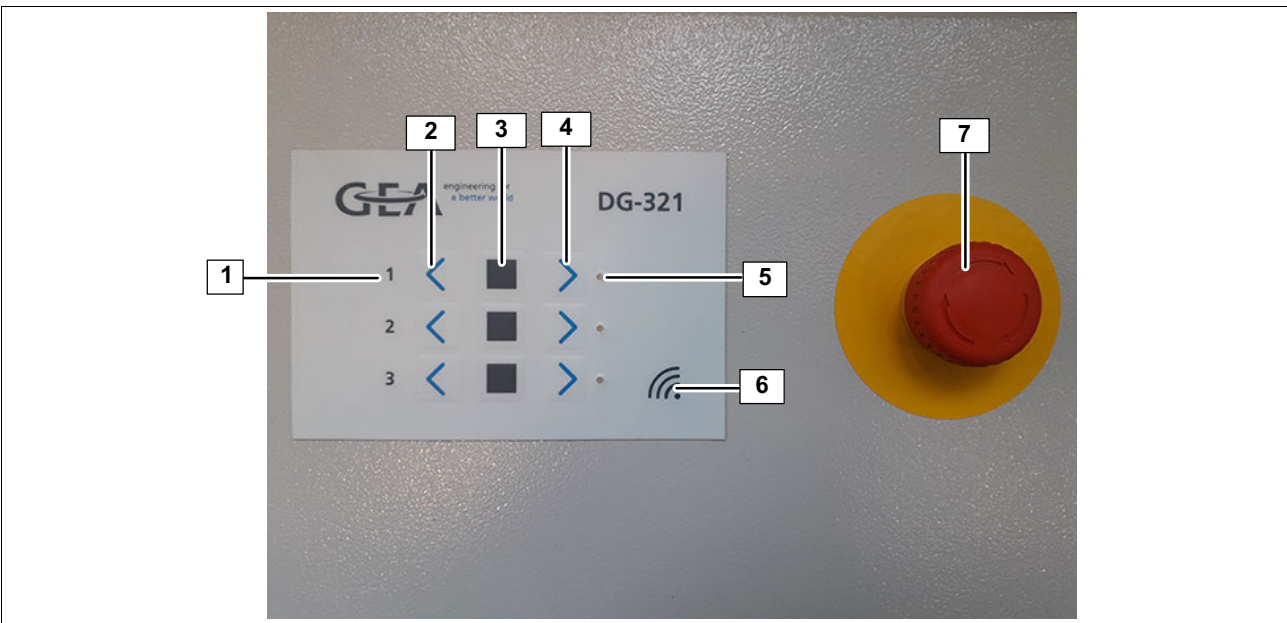
0.75 mm² - 8 mm (GLW 15-00757k)

contact	Element	Incoming or outgoing	Voltage	LED
1. GND	GND for external use	Incoming	24Vdc	
2. Field	Internal emergency off button 1	Outgoing	24Vdc	
3. Emg-1	Internal emergency off button 2	Incoming	24Vdc	
4. Emg-2	External emergency off button 1	Outgoing	24Vdc	
5. Emg-3	External emergency off button 1	Incoming	24Vdc	
6. Stop	External stop	Incoming	24Vdc	x
7. 24V	Power supply external stop	Outgoing	24Vdc	
8. Start	External start	Incoming	24Vdc	x
9. 24V	External start power supply	Outgoing	24Vdc	
10. Frost	Frost detection	Incoming	24Vdc	x
11. 24V	Frost detection power supply	Outgoing	24Vdc	
12. Err-2	"General fault" floating contact	Outgoing	24Vdc 1A	x
13. Err-1	"General fault" floating contact	Outgoing	24Vdc 1A	
14. Run-2	Scraper floating contact active	Outgoing	24Vdc 1A	x
15. Run-1	Scraper floating contact active	Outgoing	24Vdc 1A	
16. Em6-2	External machine 6 floating contact	Outgoing	24Vdc 1A	x
17. Em6-1	External machine 6 floating contact	Outgoing	24Vdc 1A	
18. Em5-2	External machine 5 floating contact	Outgoing	24Vdc 1A	x
19. Em5-1	External machine 5 floating contact	Outgoing	24Vdc 1A	
20. Em4-2	External machine 4 floating contact	Outgoing	24Vdc 1A	x
21. Em4-1	External machine 4 floating contact	Outgoing	24Vdc 1A	
22. Em3-2	External machine 3 floating contact	Outgoing	24Vdc 1A	x
23. Em3-1	External machine 3 floating contact	Outgoing	24Vdc 1A	
24. EM2-2	External machine 2 floating contact	Outgoing	24Vdc 1A	x
25. Em2-1	External machine 2 floating contact	Outgoing	24Vdc 1A	
26. Em1-2	External machine 1 floating contact	Outgoing	24Vdc 1A	x
27. Em1-1	External machine 1 floating contact	Outgoing	24Vdc 1A	
28. 24V	Power supply for external use	Outgoing	24Vdc 150mA	
29. GND	GND for external use	Outgoing	24Vdc	
30. GND	Earth for motor pulse generator Group III	Outgoing	24Vdc	
31. III B	Pulse generator input B	Incoming	24Vdc	x
32. III A	Pulse generator input A	Incoming	24Vdc	x
33. 24V	Power supply for motor group III pulse generator	Outgoing	24Vdc	
34. GND	Earth for "Home" motor group III limit switch	Outgoing	24Vdc	

contact	Element	Incoming or outgoing	Voltage	LED
35. III Ho	Motor group III "Home" limit switch	Incoming	24Vdc	x
36. 24V	Power supply for "Home" motor group III limit switch	Outgoing	24Vdc	
37. GND	Earth for "Out" motor group III limit switch	Outgoing	24Vdc	
38. III Out	Motor group III "Out" limit switch	Incoming	24Vdc	x
39. 24V	Power supply for "Out" motor group III limit switch	Outgoing	24Vdc	
40. III ccW	Motor group III "Anticlockwise" coil connection contactor	Outgoing	24Vdc	x
41. III cW	Motor group III "Clockwise" coil connection contactor	Outgoing	24Vdc	x
42. GND	Earth for anticlockwise and clockwise coils	Incoming	24Vdc	
43. GND	Earth for motor group II pulse generator	Outgoing	24Vdc	
44. II B	Pulse generator input B	Incoming	24Vdc	x
45. II A	Pulse generator input A	Incoming	24Vdc	x
46. 24V	Power supply for motor group II pulse generator	Outgoing	24Vdc	
47. GND	Earth for "Home" motor group II limit switch	Outgoing	24Vdc	
48. II Ho	Motor group II "Home" limit switch	Incoming	24Vdc	x
49. 24V	Power supply for "Home" motor group II limit switch	Outgoing	24Vdc	
50. GND	Earth for "Out" motor group II limit switch	Outgoing	24Vdc	
51. II Out	Motor group II "Out" limit switch	Incoming	24Vdc	x
52. 24V	Power supply for "Out" motor group II limit switch	Outgoing	24Vdc	
53. II ccW	"Anticlockwise" motor group II contactor coil connection	Outgoing	24Vdc	x
54. II cW	"Clockwise" motor group II contactor coil connection	Outgoing	24Vdc	x
55. GND	Earth for anticlockwise and clockwise coils	Incoming	24Vdc	
56. GND	Earth for motor group I pulse generator	Outgoing	24Vdc	
57. I B	Pulse generator input B	Incoming	24Vdc	x
58. I A	Pulse generator input A	Incoming	24Vdc	x
59. 24V	Power supply for motor group I pulse generator	Outgoing	24Vdc	
60. GND	Earth for "Home" motor group II limit switch	Outgoing	24Vdc	
61. I Ho	Motor group I "Home" limit switch	Incoming	24Vdc	x
62. 24V	Power supply for "Home" motor group I limit switch	Outgoing	24Vdc	
63. GND	Earth for "Out" motor group I limit switch	Outgoing	24Vdc	
64. I Out	Motor group I "Out" limit switch	Incoming	24Vdc	x
65. 24V	Power supply for "Out" motor group I limit switch	Outgoing	24Vdc	
66. I ccW	"Anticlockwise" motor group I contactor coil connection	Outgoing	24Vdc	x
67. I cW	"Clockwise" motor group I contactor coil connection	Outgoing	24Vdc	x
68. GND	Earth for anticlockwise and clockwise coils	Incoming	24Vdc	
69. R ccW	"Anticlockwise" winding/unwinding contactor set coil connection	Outgoing	24Vdc	x
70. R cW	"Clockwise" winding/unwinding contactor set coil connection	Outgoing	24Vdc	x
71. GND	Earth for anticlockwise and clockwise winding/unwinding set coils	Incoming	24Vdc	
72. 24V	Power supply for external use	Outgoing	24Vdc 150mA	

13.3 Quick reference guide for using the cabinet

Overview of two-hand operation of the cabinet



1	Number of the drive system
2	Start in the direction of the start position
3	stop
4	Start in the direction of the end position
5	Status LED (green, orange or red)
6	Wi-Fi symbol
7	Emergency stop button

Status LED	Details
Green - continuous	Stopped normally.
Green - flashing	Drive system running.
Orange - continuous	Stopped prematurely. ► Due to manual stop. ► Due to overloading. ► Wait for automatic restart, no action necessary.
Orange - flashing	Drive system running. ► Cow protection is deactivated, or the calibration cycle is running.
Alternating green/orange - continuous.	Stopped normally. ► A manual start command has been given. Wait for the conclusion of another cycle of the drive system.
Red - continuous	Stopped prematurely. ► Wait for a manual start command due to excessive load. ► Load too small: traction component broken as a result ► Cycle too long: traction component broken as a result ► Emergency stop pressed (prematurely or normally) ► The drive system will not run again until after a manual start.

Additional cycle without cow protection

Press the start and stop buttons simultaneously (LED will flash orange).

Establishing contact in client mode

Press the stop button for 5 to 15 seconds (LED flashes red). A connection to the Wi-Fi network of the DG-321 can now be established via the Wi-Fi settings of the controller.

Bypassing the password:

Press the stop button for 15 to 20 seconds (LED lights up red).



Where cows feel at home

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