



BASIC Control System

USER MANUAL

C3 SERIES

C4 SERIES

TRANSLATION OF THE ORIGINAL INSTRUCTIONS

ID: D03897_EN
REV: A



Read this manual before using the equipment. Failure to comply with instructions and warning may result in serious or fatal injuries or property losses. Keep the manual in a safe place.



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1. INTRODUCTION

This manual contains instructions on using the BASIC control system of Mepu grain dryers.

In order to ensure efficient use and safe installation of the equipment, read all the instructions carefully.

Additionally, make sure that any other persons present on-site are aware of all the safety essentials.

Keep this manual on hand and introduce it to any new personnel members. If you need more information or assistance, contact your dealer or call the service number of Mepu Oy.

2. WARRANTY AND WARRANTY CONDITIONS

The product is intended for professional use. Installation, use and maintenance of the equipment require normal general knowledge and skills related to machines and equipment that a professional farmer should presumably possess.

Warranty conditions

The dryer machinery is covered by a 12-month warranty from the commissioning date, but the maximum duration of the warranty is 18 months from the invoice date of the Goods. Mepu Oy cannot be held responsible for any defects discovered after the aforementioned time limits.

Mepu Oy undertakes to eliminate any design, raw materials, or workmanship-related faults in the Goods through repair or replacement. Mepu Oy is not responsible for any other direct or indirect damages or losses.

The warranty does not cover faults arising from materials provided by the Purchaser or structural solutions specified or set out by the Purchaser. Moreover, Mepu Oy's warranty and liability for faults do not cover minor faults and deviations that exert no substantial influence on the use and functionality of the dryer machinery.

The warranty does not cover faults caused by any factors discovered after transfer of the burden of risk. For example, the warranty does not cover faults caused by failure to comply with the use and storage conditions specified for the Goods or instructions for use, or improper use of the Goods. In this connection, inter alia, feeding the equipment with material significantly differing from the average quality of the material processed or with material that does not belong in the equipment is also considered improper use, for example, feeding of grain dryers with material of significantly higher-than-average moisture content and/or of significantly higher-than-average weed and/or other impurities (such as rocks, dirt or foreign objects) content, or feeding of material containing large rocks onto the conveyors. The warranty does not cover faults arising from inadequate maintenance or incorrect installation carried out by the Mepu Oy, or faults arising from modifications or repairs performed without the Seller's written consent. Moreover, the warranty does not cover normal wear and tear.

Whenever a fault is detected, the Seller is required to submit a written fault report without undue delay. The fault report must describe the nature of the fault. If there is reason to assume that the fault could cause additional damage, use of the Goods must be discontinued and the fault report submitted immediately. Otherwise, the Purchaser shall lose its right to submit claims regarding damages that could have been avoided by immediate termination of the use and/or submission of a fault report.

If the Purchaser has reported a fault and it is determined that the Goods are free of faults covered by Mepu Oy's warranty, Mepu Oy shall have the right of demanding compensation for the work and expenses incurred because of the fault report. If intervention with Goods other than those delivered by Mepu Oy is required in order to repair a fault, Mepu Oy shall not be responsible for the related works and expenses.

If a fault in some component of the Goods has been eliminated, Mepu Oy shall be liable for the repaired or replaced component in the same way as for the original delivery for 18 months. However, Mepu Oy shall not be liable for faults in any



component of the Goods or damage caused by the Goods for longer than 36 months from the beginning of the original liability period.

3. SAFETY

Important: *The general safety section contains instructions related to all safety routines. Instructions pertaining to certain specific subjects (for example, assembly-related safety) can be found in the respective section. Always read all the instructions, not only the summary of safety practices, before commencing any operations with the equipment.*

YOU are responsible for **SAFE** use and maintenance of the product. **YOU** need to make sure that you and any other persons working in the vicinity of the product are aware of all procedures and information related to **SAFETY** and contained in this manual.

Remember – **YOU** are the key to safety. Good safety practices will keep you and the people around you safe. Make these procedures a functional part of the safety programme.

- The user or operator is responsible for reading, understanding, and following the manual's safety instructions. All accidents can be avoided.
- The equipment owner needs to provide guidance and go through the instructions prior to commissioning of the equipment and at least once a year with all the employees before they are allowed to use the equipment. Untrained users/operators expose themselves and bystanders to the risk of serious or fatal injuries.



- Use the equipment only for its intended purpose.
- Do not modify the equipment in any way. Unauthorised modifications may impair the functionality and/or safety and affect the product's service life. Any modification of the product voids the warranty.
- Keep children and unauthorised persons away from the work area.
- Keep first aid means available at all times and make sure you know how to use them.
- A fire extinguisher must be readily available at the work site. Keep it in a visible place.
- Use proper personal protection equipment. This list is not exhaustive:

- hard hat
- gloves
- anti-slip safety shoes
- safety goggles
- hearing protection



- Electrical equipment: Before electrical equipment maintenance, adjustment or repair, disconnect the plugs, set all switches to the neutral or OFF position, stop the motors, remove the ignition key or disconnect the power supply, and wait for all moving parts to stop.
- Comply with good work area practices:
 - Keep the usage area clean and dry.
 - Make sure the electrical outlets and tools are properly



grounded.

- Use adequate lighting for works performance.
- Consider SAFETY! Work SAFELY!



3.1 General safety instructions



The safety-related warning sign marks important safety instructions on the product and in the manual. If you see this symbol, consider the possible risk of serious or fatal injury. Follow safety instructions.

Why is SAFETY important?

Accidents cause injuries and death.

Accidents are expensive.

Accidents can be avoided.

SIGNAL WORDS: Pay attention to the following signal words in the safety instructions: **DANGER**, **WARNING**, **CAUTION**, and **NOTE**. The signal words used in the safety instructions have been chosen based on the following definitions.

DANGER



Indicates an imminent danger to life that may result in serious or fatal injuries unless avoided.

WARNING



Indicates a potential danger to life that may result in serious or fatal injuries unless avoided.

CAUTION



Indicates a dangerous situation that may result in minor or moderate injuries unless avoided.

NOTE

Indicates a potentially dangerous situation that may result in property damage unless avoided.



3.2 Important safety instructions for dryer user

Mepu grain dryers have been designed to be as safe as possible. However, depending on local conditions, installation, and equipment configuration, the user needs to consider some safety precautions when using or servicing the device.



Unexpected starting

Before performing any maintenance operations, always turn off the main power of the grain dryer.

Get to know the operation of dryer control.



Instructions for use

Read all the instructions on use of the grain dryer equipment prior to installation and commissioning.



Main switch

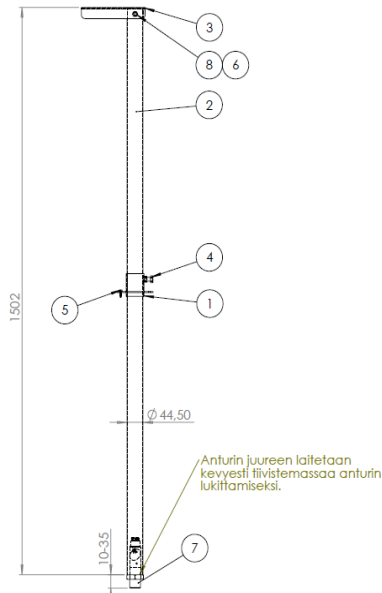
Before servicing the dryer or opening the covers of dryer equipment, turn the main switch to the 0 position.

4 Control system

4.1 Sensors

4.1.1 Filling guard

The filling guard is installed in the dryer's buffer silo. The filling guard is installed by drilling a 45 mm hole in the grain space roof. The filling guard height is steplessly adjustable.



4.1.2 Temperature measurements

Temperature measurements are aimed at the dryer's supply and exhaust air. Burner operation is controlled using the supply air temperature. Exhaust air temperature measurement is used to control the transfer from drying to cooling. Temperature probes are installed in the supply and exhaust air enclosures.



4.2 Control centre

4.2.1 Control centre

The dryer is equipped with a modern logic control centre used for controlling all dryer functions. The electrical centre houses all electrical equipment necessary for dryer operation.

On the right side of the centre, there are quick connectors for connection of the sensors and the cable from the oven thermostat housing.





4.2.2 Control centre location

The control centre must be located in a place where it is practically safe against any damage during normal dryer operation. The location must also be chosen so that exposure of the centre to water, dirt, and dust is minimised (not above pouring chute, for example). Leave some room in front of the centre for opening of the centre door or doors. Considering year-round operation, the control centre should be installed to a dry and warm room.

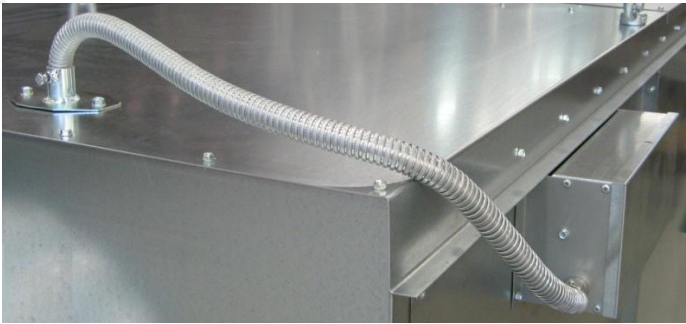
4.2.3 Power supply

Choose the correct power cable based on the power supply details specified in the electrical drawings. The motor sizes provided in the electrical drawings represent the maximum values of the motor output in question. When dimensioning motor cables, check the motor size from the delivery. Such motors include elevator motors, fan motors, conveyor motors, and pre-cleaner motor. Undersized cables may heat up, causing hazards and operation failures. Also, pay attention to the special motor connections and shielded cables required for frequency inverters. You can find electrical diagrams inside the centre. The sensors necessary for temperature measurement and other sensors are also located in the centre or in the same package.

4.2.4 Thermostat enclosure

The thermostat enclosure is delivered with the control centre. The thermostat enclosure is installed in the immediate vicinity of the oven. The thermostat enclosure is equipped with overheating and fan thermostats. In case of normal delivery, the thermostat sensors (capillaries) are disconnected from their holder and must be connected to the holder at the installation site. Insert the capillary protection tube inside the sleeve, so that the tightening screw can be used for tightening against the protection tube. Remember to tighten the locking screw at the holder. Capillaries may not be bent under sharp angles. Capillaries may not be cut or extended. Test proper operation of the thermostats in connection with dryer commissioning.

In case of dryers equipped with direct gas burners, the thermostats are installed into blowpipe at the distance of approx. 3 m from the burner.



The thermostat enclosure is delivered pre-cabled. If the cable supplied is too short, it can be extended.



4.2.5 Thermostat settings

Thermostat values are read from the zero position. In case of the overheating and fan thermostats, the zero positions are located at the 9 o'clock position.

| Thermostat | Type | Setting, °C |
|------------------------|-----------|-------------|
| Fan thermostat | Capillary | 50 |
| Overheating thermostat | Capillary | 120 |

4.3 Actuators

1.1.1. Electric motors

All of the motors used in the dryer are three-phase induction motors. Mains power supply voltage to motors is 400 V (except feeder motor). In order to avoid incorrect connections, the connection method must always be checked from the motor's nameplate.

If the order involves special solutions tailored to the customer's needs, such as frequency inverter-controlled equipment, for example, connections of respective motors must be checked for compliance with the frequency inverter's power supply.

4.3.1 Feeder

The feeder motor is frequency inverter-controlled. The inverter for the feeder is located in the electrical centre and controlled using a screen installed to the centre cover. Feeder connections must be made with consideration of the frequency inverter's 230 V power supply. When connecting the motor, check the connection scheme in case of 230 V voltage from the motor nameplate.



4.3.2 Elevator motor

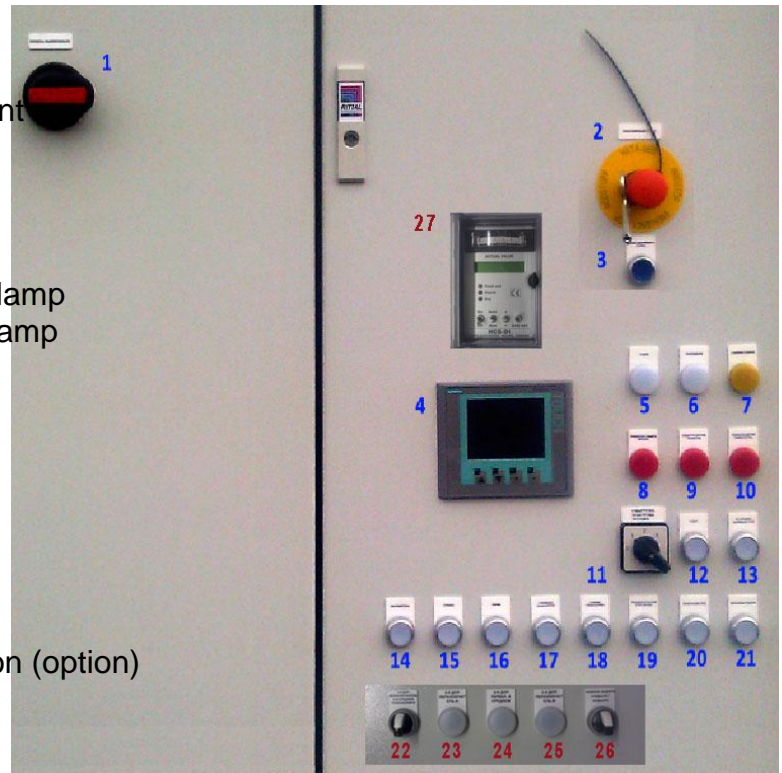
Soft starting is used in large elevator motors. This does not require deviation from the regular motor connection instructions – the elevator is connected according to the 400 V voltage scheme.

When checking the elevator direction of rotation, detach the elevator reverse rotation prevention switch. Remember to reattach the switch after the testing.

5 Control centre

5.1 Control panel

1. Main switch
2. Emergency stop
3. Emergency stop acknowledgement
4. Display
5. Drying indicator
6. Cooling indicator
7. Dryer full-indicator
8. Motor protection tripped-warning lamp
9. Rotation sensor tripped-warning lamp
10. Dryer overheating
11. Operation selector
12. Start button
13. Fault acknowledgement
14. Fan manual operation
15. Burner manual operation
16. Elevator 1 manual operation
17. Elevator 2 manual operation
18. Bottom conveyor manual operation (option)
19. Pre-cleaner manual operation
20. Spreader manual operation
21. Feeder manual operation
22. 3-way divider position switch (option)
23. 3-way divider position A (option)
24. 3-way divider dryer position (option)
25. 3-way divider position B (option)
26. (not in use)
27. Humidity meter



5.2 Emergency stop

The control console is equipped with an emergency stop button (2). Emergency stop buttons may also be located elsewhere on the dryer. Conveyor jam shutters may also be connected to the emergency stop circuit. Tripping of the emergency stop circuit stops the operation of the entire dryer. The emergency stop circuit can be reset from the emergency stop circuit acknowledgement button (3).

5.3 Operation selector switch

Automatic dryer functions are controlled using the operation selector switch (11). The operation selector switch has 4 positions.

- Position 0
- Position 1: discharge
- Position 2: filling
- Position 3: drying

Choose the required function using the selector and press Start (12) to activate the function. The function chosen can be terminated by turning the operation selector switch to Position 0.



5.4 Manual control

Manual control buttons (14-22) are located at the bottom of the panel. The manual control buttons are equipped with a signal lamp for the respective actuator indicating the actuator status.

If the indicator for an actuator is on, the actuator is on. If the indicator flashes rapidly (0.5 s), there is a fault with the respective actuator. If the indicator flashes slowly (2 s), the respective actuator is in the lock mode.

For example, if the elevator is started and the spreader is not running, the elevator will not start but wait for the spreader to start. In this case, the elevator is in the lock mode and the elevator indicator flashes slowly. If the elevator and spreader are running and the spreader is stopped, it goes into lock mode and the spreader indicator flashes slowly. The spreader will not turn off until the elevator is turned off.

Manual control will only work if the operation selector switch is in Position 0.

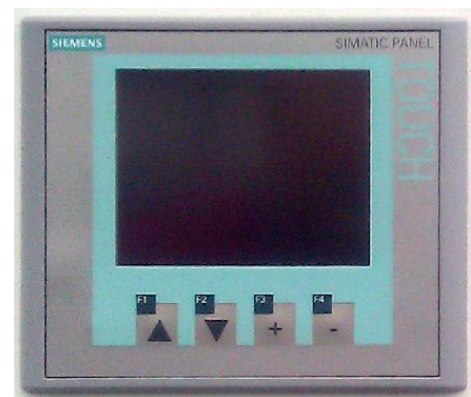
5.5 Display

The display has four buttons

- 1.F1 Up (next screen)
- 2.F2 Down (previous screen)
- 3."+" button
- 4."-" button

Pressing the button F1 or F2 allows switching between screens.

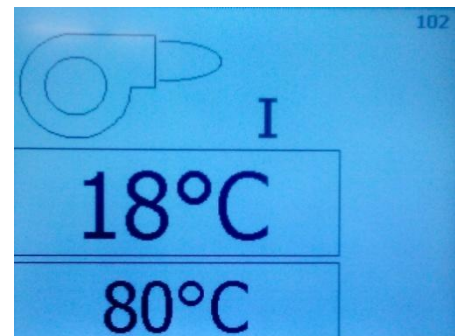
After centre power-up, the first screen is displayed.



5.5.1 Burner flame I

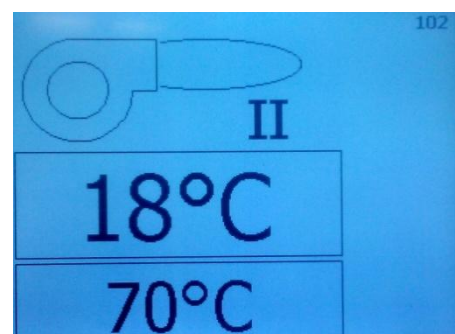
Under this mode, burner flame I settings can be made. The current temperature is displayed on the top line. The set temperature is displayed on the second line. The latter temperature can be adjusted using the "+" or "-" buttons.

If the dryer is equipped with a direct gas burner or wood chip furnace, this screen displays only the temperature of the blowing air and cannot be used for burner temperature adjustment.



5.5.2 Burner flame II

This screen allows changing burner flame II settings. The top line shows the current temperature. The second line allows changing the set temperature. Flame II temperature can be adjusted using the "+" or "-" buttons. Remember that the temperature difference between flame I and flame II must be at least 10°C. The software prevents attempts to input values closer than that.



If the dryer is equipped with a direct gas burner or wood chip furnace, this screen cannot be displayed.



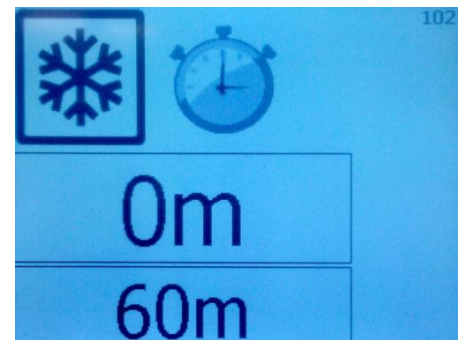
5.5.3 Starting cooling

The top line shows the exhaust air channel temperature. The next field, set temperature, establishes the point of transfer from the 'Drying' mode to the 'Cooling' mode. The "+" or "-" buttons can be used for setting the temperature on the second line.



5.5.4 Cooling time setting

The top line displays the remaining cooling time. The second line can be used for setting the cooling time. Use the "+" or "-" buttons for setting the time.

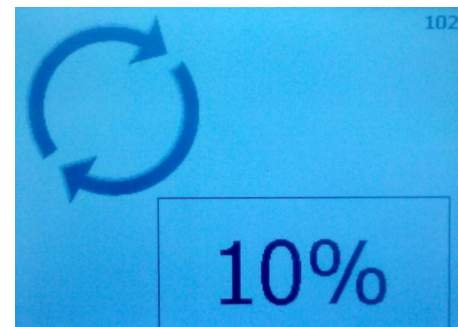


5.5.5 Feed rate adjustment

In this screen, the feed rate can be adjusted in %. The minimum setting is 1% and maximum setting 100%. The grain should be recycled in the dryer once every hour. This rate can be reached at approx. 50% setting. The exact value needs to be checked when discharging the dryer.

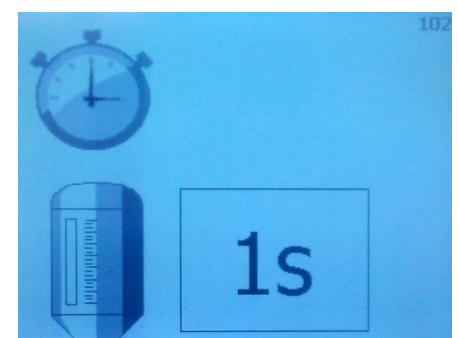
In case of corn drying, the rate 15-20% is recommended during the first hour.

In case of oil plants, a quick recycling rate of 65-70% can be used, in which case a smaller temperature drop is required.



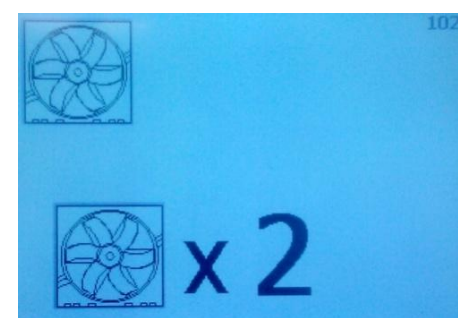
5.5.6 Filling guard delay

In this screen, filling guard delay can be set. The delay is counted in seconds. The recommended setting is 1 second. In this case, the elevator stops almost immediately after grain detection. If slower stopping of the elevator is preferred, set a longer delay.



5.5.7 Fan control

This screen allows setting of how many fans are in use in the course of drying. The number of fans varies depending on the dryer delivery. The function can be used to limit the number of fans. When drying oil

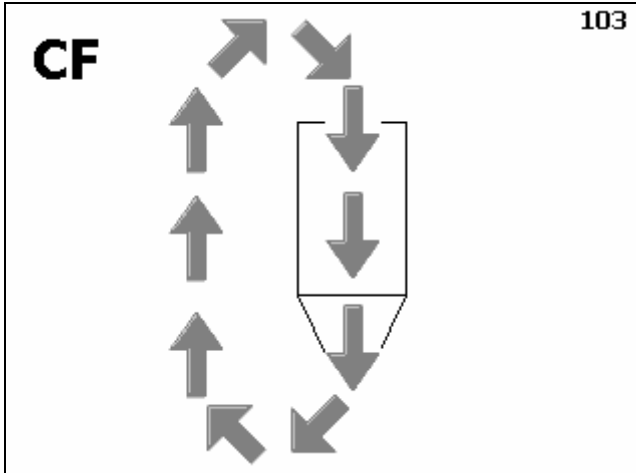


plants or mustard, for example, this allows switching off the desired number of fans.

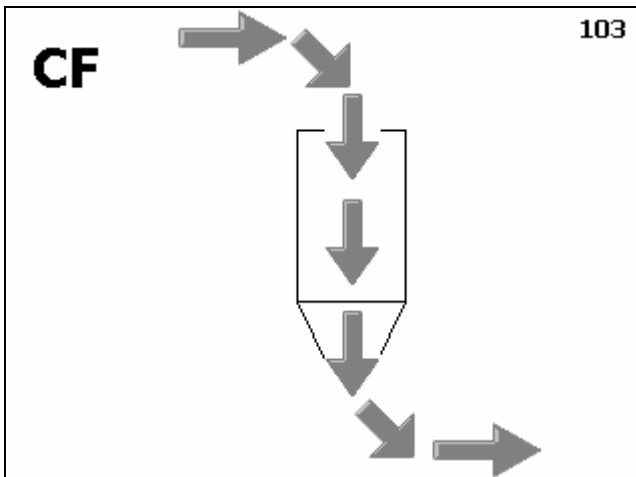
5.5.8 Selection of dryer operation mode

This window indicates the drying process mode. By pressing the buttons "+" and "-" you can toggle between the continuous and recycling modes of grain drying. The respective screen is displayed.

Recycling mode.



Continuous mode.



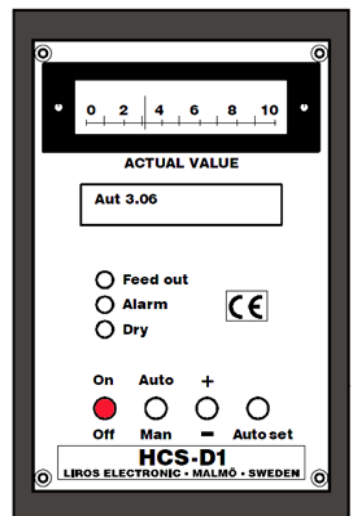
The two-way divider under the dryer's bottom cone must be set to the respective position, so that the grain either returns to the dryer or is discharged from the dryer.



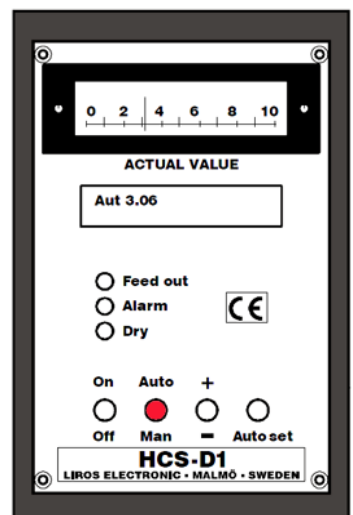
6 Drying

6.1 Starting drying

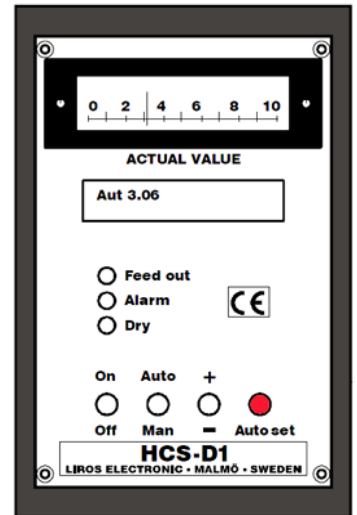
1. Turn the main switch to “ON” position.
2. Close the feeder bottom hatches.
3. Set the two-way divider at the dryer bottom so that the grain is returned to the grain dryer.
4. Determine the discharge temperature for switching from drying to cooling.
5. Set the cooling time – 1 hour, for example. In this case, cooling will start automatically at the end of the drying process.
6. Choose ‘Filling’ by the selector switch and press the Start button. Filling is started.
7. The yellow indicator lights up when the dryer is full.
8. Set ‘Recycling’ as the dryer operation mode.
9. Choose ‘Drying’ by the selector switch and press the Start button. Drying is started.
10. The drying process operates in the Recycling mode. The grain completes a full cycle in the dryer in about an hour. The grain humidity is checked by taking samples during the drying.
10. After the desired grain humidity reading has been reached (for example, 14% in case of wheat), turn the switch of the automatic humidity control unit inside the grain dryer to the “ON” position.



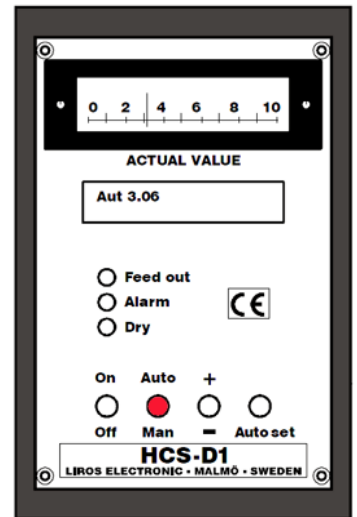
11. The “Auto/Man” switch of the automatic humidity control unit must be in the position “Man”.



- 12. Store the actual current humidity values in the automatic humidity control unit by turning the “Auto set” switch.

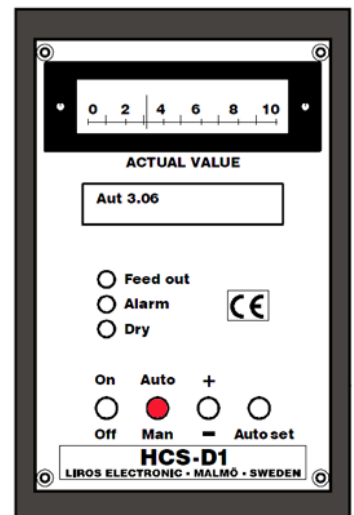


- 13. Set the “Auto/Man” switch of the automatic humidity control unit back to the “Man” position.



- 14. Switch the dryer to “Continuous” mode.
- 15. In this mode, the grain dryer must be in operation for 15 minutes. Before proceeding, check the cooled grain temperature displayed on the screen. If the temperature of the cooled grain complies with process requirements to the grain variety in question (for example, +20°), turn the two-way divider so that the grain is directed away from the dryer.

- 17. After the grain dryer has been used for 30 minutes in this mode, turn the “Auto/Man” switch of the automatic humidity control unit to the “Auto” position.



18. Now the grain dryer operates in the continuous mode. Regardless of the length of operation in this mode (a day, week, month, year), a moment will come when the last grain is loaded to the dryer. Termination of dryer operation requires special attention, in the same way as the starting of the drying.

6.2 Termination of continuous operation

19. After the last grain has been loaded to the dryer, the continuous operation can be completed by batch drying. First, set the two-way divider under the dryer's bottom cone in the position to return the grain to the grain dryer.



20. Switch the dryer to "Recycling" mode.
21. At the end of the drying mode, the dryer is switched to cooling, after achievement of the correct discharge temperature.
22. Turn the two-way divider in the discharge position to discharge the dried and cooled grain from the dryer.
23. Choose 'Discharge' by the selector switch and press the Start button. Discharging is started.
24. After five minutes, the feeder bottom hatches can be opened.
25. After complete discharge of the grain dryer, close the feeder shutters.
26. Perform the necessary maintenance procedures after full discharge of the grain dryer.

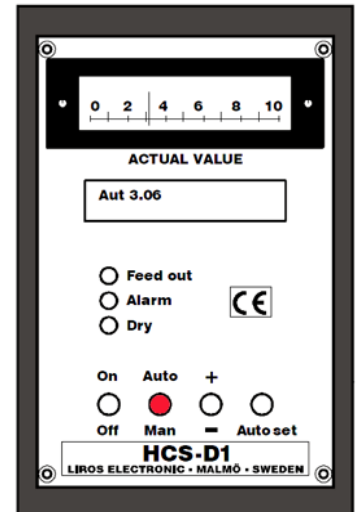
6.3 Starting drying if there is dry grain in the dryer

Operator's actions during the next uses, when the grain humidity level has already been set.

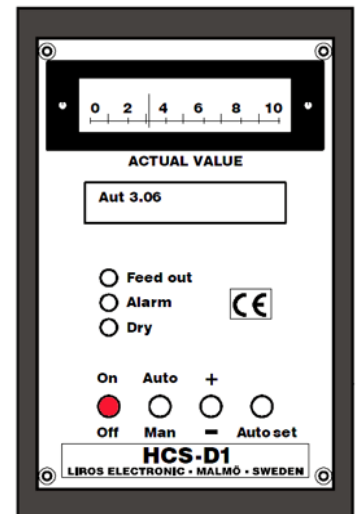
1. Turn the main switch to "ON" position.
2. Close the feeder bottom shutters.
3. Set the bottom divider so that the grain is returned to the grain dryer.



4. Set the cooling time – 1 hour, for example. In this case, cooling will start at the end of the drying process.
5. Determine the discharge temperature for switching from drying to cooling.
6. Choose 'Filling' by the selector switch and press the Start button. Filling is started.
7. The yellow indicator lights up when the dryer is full.
8. Choose 'Drying' by the selector switch and press the Start button. Drying is started.
9. The "Auto/Man" switch of the automatic humidity control unit must be in the position "Auto".



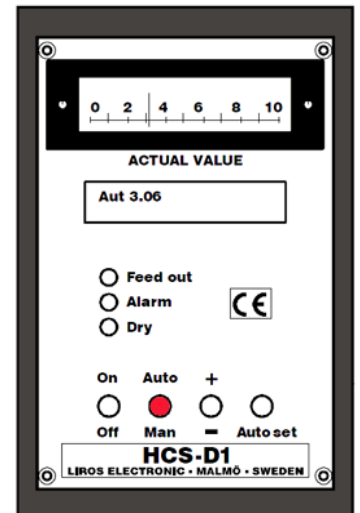
9. After the desired grain humidity reading has been reached (for example, 14% in case of wheat), turn the switch of the automatic humidity control unit inside the grain dryer to the "ON" position.



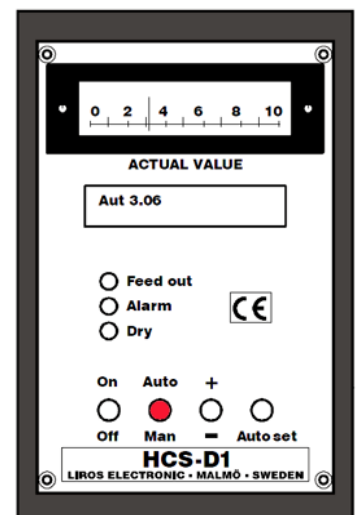
10. Switch the dryer to "Continuous" mode.



- The “Auto/Man” switch of the automatic humidity control unit must be in the position “Man”.



- In this mode, the grain dryer must be in operation for 15 minutes. Before proceeding, check the cooled grain temperature displayed on the screen. If the temperature of the cooled grain complies with process requirements to the grain variety in question (for example, +20°), turn the two-position switch to the “Continuous” mode, i.e., towards the grain discharge cup lifter.
- After the grain dryer has been used for 30 minutes in this mode, turn the “Auto/Man” switch of the automatic humidity control unit to the “Auto” position.



- Now the grain dryer operates in the continuous mode. Regardless of the length of operation in this mode (a day, week, month, year), a moment will come when the last grain is loaded to the dryer. Termination of dryer operation requires special attention, in the same way as the starting of the drying.
- After the last grain has been loaded to the dryer, turn the bottom divider so that grain is returned to the dryer.
- Turn the two-way divider in the discharge position to discharge the dried and cooled grain from the dryer.
- Choose ‘Discharge’ by the selector switch and press the Start button. Discharging is started.
- After five minutes, the feeder bottom hatches can be opened.
- After complete discharge of the grain dryer, close the feeder shutters.

21. Perform the necessary maintenance procedures after full discharge of the grain dryer.



7COMMISSIONING

These are some of the steps to be taken before commissioning of the grain dryer:

| What? | Task | How? |
|-------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electrical connections | Check connections | Check that the electrical connections have been made properly. Check that the motors rotate in the right direction. Check also the direction of rotation of the burner. See control system instructions. |

8IN-SEASON MAINTENANCE



Before performing any maintenance operations, turn off the main power.

| What? | Task | How? | When? |
|--------------------------|-------|----------------------------------------------------------------------|--------------|
| Filling guard | Check | Check that the filling guard works | Regularly |
| Overheating thermostat | Check | Check overheating thermostat operation | Regularly |
| Fault current protection | Check | Trigger fault current protection by test button (with main power on) | Once a month |



9 POST-SEASON MAINTENANCE



Before performing any maintenance operations, turn off the main power.

| What? | Task | How? |
|-----------------------------|----------------|-------------------------------------------------------------------------------------------------------------|
| Electrical equipment | Check | Check power cables and electrical equipment. Repair / have repaired / replace damaged cables and equipment. |
| Control centre | Check / clean | Make sure there is no debris or dust in the electrical centre / Clean if required. |
| Motors | Check / clean | Check the condition of motors. Clean the cooling ribs. |
| Pneumatic equipment | Check / repair | Check the pneumatic equipment and repair the defects discovered. |

10 Operation failures

In the following, we present a short overview of some of the possible failures associated with the use of the control centre. Check the following list for the failure and possible remedies. If the problem persists, contact a competent service centre or the manufacturer.

| Failure | Cause | Remedy |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No power supply to the centre | <ul style="list-style-type: none"> Blown power supply fuses Tripped fault current protection. | <ul style="list-style-type: none"> Check power supply fuses Check fault current protection |
| Impossible to light burner (the warning lamp is not on) | <ul style="list-style-type: none"> Burner power switch in position 0 Burner thermostat is incorrectly adjusted Tripped burner automatic fuse | <ul style="list-style-type: none"> Check burner power switch Check burner automatic fuse Check burner thermostat settings Check drying thermostat settings |
| Impossible to light burner (dryer is in operation). Burner warning lamp is on. | <ul style="list-style-type: none"> Not enough oil Fuel filter blocked Incorrect burner settings Burner damaged | <ul style="list-style-type: none"> Check if there is oil Check oil hoses condition. Check hose installation Check/replace filter and gaskets Acknowledge fault |
| Frequency inverter failure | <ul style="list-style-type: none"> Insufficient network voltage Mechanical problem in feeder Power failure | <ul style="list-style-type: none"> Check feeder |
| Three-way divider fails to move | <ul style="list-style-type: none"> Excessive load on three-way divider from pipes or other structures | <ul style="list-style-type: none"> Properly support other structures or piping. Minimise load on divider. |
| Elevator motor protection trips | <ul style="list-style-type: none"> Blockage in elevator Loose elevator belt | <ul style="list-style-type: none"> Check elevator. Clear possible blockage. Tension the belt |
| Machine has stopped | <ul style="list-style-type: none"> Tripped motor protection Tripped rotation sensor | <ul style="list-style-type: none"> Check whether the fan or conveyor involved is blocked |
| Spreader motor protection trips repeatedly | <ul style="list-style-type: none"> Machine is too full Motor damaged | <ul style="list-style-type: none"> Check machine filling level. If the machine is too full, discharge some of the grain. Have a specialist check the electric motor condition |
| Fault current protection switch is triggered during operation | <ul style="list-style-type: none"> One of the active motors 'leaks' | <ul style="list-style-type: none"> Call an electrician |





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