PELLON

GPro2

Contents

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Table 1: Revision history of instruction

Date	Change author	Description of change
01/12/2020	AH	This is the first version of the document.

2 Key concepts

2.1 Belt feeder

A belt feeder distributes mixed feeds or silage to animal groups. A belt feeder consists of the following devices:

- Feed supply devices - Fodder components are brought to the feed supply devices with, for example, a tractor.
- Mixing devices - Fodder components are mixed with each other in mixing devices.
- Transfer devices - Fodder components are moved from one device to another with transfer devices.
- Fodder distribution devices - Fodder is distributed to animals with fodder distribution devices. Fodder distribution devices are also referred to as feeding lines.
- Control devices — The system is controlled by a control sys**G-Pro2**tem.

If the control **G-Pro2**system controls the mixer, feeding starts by making a mixture, after which it is distributed to the desired groups. If there is not enough mixture for the selected groups, the feeder will produce more mixture. Making and distributing the mixture is based on weighing. Multiple mixtures can be distributed to the same group, but they must be distributed at different feeding times.

Mixtures and components can be entered in the system as normal natural weight or dry matter content quantities. When using a filling method based on dry matter content, the system will automatically compensate the fodder quantities as component moisture levels fluctuate according to the set dry matter concentrations.

A weighing doser or a doser with flow measurement and without weighing can also be used as a feed supply device for the belt feeder.

2.1.1 Groups

Groups refer to the animal groups being fed by the system. You can set the following data for each group:

- Group name.
- Number of animals in the group.
- Group place given as plow location pulses. The group place determines the travel interval of the plow when feeding the group in question. The plow position is calculated using the pull cable free wheel sensors and reference sensors. The position numbering ascends in the direction of the belt's rotation. If there are multiple belts, the numbering starts at the nearest belt and ascends as it moves away from the mixer.
- The group feeding side (if feeding sides are being used).
- The group is put in the desired feeding time group. Feeding time groups can be used to set the times when the group will be fed. The feeding time groups are identified by letters, such as A, B, C, etc.

  Multiple groups may be fed during the same feeding time, but only using one mixture. The groups are fed in order of position, starting from the lowest position number on the selected side. Both sides of the belt are fed entirely before the plow reverses direction. You can select the side to be fed first in the **Basic information** menu.

In the group feeding data, the daily portion for a single animal is set for mixtures to be fed. The daily portion can be a standard dose set by you, or it can be taken from the feeding curve or mixture data. When using a standard dose, you can also set the change period, during which the dose is steadily changed to a new level.

You can also change the dose with a group-specific change percentage, which always functions in the same way regardless of the daily portion calculation method.

You can monitor and set group consumption data in the group feeding menu.

2.1.2 Components

When the feed supply device for the belt feeder is a mixer or semi-automatic mixer, you can set the component data in the **Components** settings menu. If the feed supply device is a component doser, the system will not use component data - the feed settings are to be made to the mixture data instead.

2.1.3 Mixtures

As a rule, fodders to be distributed are referred to as "mixtures" in the feeding computer menus. You can assign names to mixtures. Later in this manual, the term "mixture" may also refer to individual feeds, such as silage.

The feed supply device makes mixtures based on the set components, their intake order and any mixing and absorption periods. Mixture percentages can be set as natural weight percentages, dry matter content percentages or by specifying the quantity of each component in kilograms, such as the quantity of a desired component for a single animal.

If the feed supply device is:

- an automatic mixer, the system will make the feed mixture automatically before feeding.
- a semi-automatic mixer, the user must always start the mixture production, even though mixtures can be made fully automatically.
- a weighing or component doser, whose components must be added to the mixer manually.

Multiple different mixtures can be distributed to a given group. The feeding time specifies the mixture or fodder to be distributed at a given time.

If the system feed supply device is a weighing or component doser, you can name the fodder based on mixture data, monitor its consumption and adjust the mixture-specific change percentage. You can use the change percentage to change the mixture quantity for all groups being fed as well as compensate for any changes in the feed.

2.1.4 Feeding

Animal feeding is done in the order of position, starting with the smallest position number.

At the start of feeding, the plow is turned in the necessary direction and run to the group place. When the plow reaches the desired place, the machine begins dosing feed onto the conveyor. When the desired feed quantity has been dosed, the belt(s) continues running and the plow is run back and forth until all fodder has been distributed to the group place.

2.2 Feeding computer

2.2.1 User interface

The feeding computer user interface is described in the next figure:

Figure 1: Feeding computer user interface

The user interface consists of the following areas:

- **Date** — Date.
- **Function symbols** — The function symbols indicate which functions or modes are in use.
- **Time** — Time of day.
- **Operating mode** — The operating mode in use.
- **Process view** — The Process view shows the progress or status of the function in use. The menus used to control the machine are also shown in this part of the screen.
-
- **Buttons** — Buttons are used to make selections in the user interface.

2.2.2 Buttons

The feeding computer is operated with a touch screen. You can select the desired function on the touch screen by pressing the desired menu or function button. The button functions vary according to situation. The symbol describing each function of a given button or key is displayed at the bottom of the screen. These button symbols look like they are being pressed when a key is pressed down.

Note: If there is no image in the button symbol, the key does not have a function on the screen in question.

The button can also be temporarily locked out, such as when a function is currently running. In this case, the button symbol appears darker.

The functioning of a key at any given time will not be activated until the button is released.

2.2.3 Menus

All setting values are entered to the feeding computer and functions are used through menus. Functions are grouped in submenus, which are opened from the main menu.

Figure 2: Selecting menus

The content of menus differs slightly according to how the equipment has been set up or the user level of the equipment.

You can navigate the menus as follows:

- You can select the desired option by touching the line in question on the screen
- You can move up the menu options list using the up arrow button.
- You can move down the menu options list using the down arrow button.
- You can select the menu option with the **Enter** button.
- You can go back in the menu with the **Esc**button.
- The **Pellon**button is a special button taht appears if special functions, such as adding new lines, deleting lines or rearranging lines, are available.

If there are more lines on the selection list than will fit in the screen, a scrolling bar will appear next to the list. You will be able to see where your current selection is in relation to the entire list.

2.2.4 Editing settings

You can edit the feeding computer settings in two ways:

1. You can edit the setting values using the keyboard. There are two types of keyboards in the system:

   - A numeric keyboard, which you can use to enter, for example, the time or kilogram quantities.

Figure 3: Numeric keyboard

   - A text keyboard for editing text-based settings.

Figure 4: Text keyboard

Common buttons are:

- The **Arrow left** ← and **Arrow right** → buttons can be used to move forward and backward in a string one character at a time.
- You can accept the changes by pressing the **Enter** button ↵.
- If desired, you can reject changes by exiting the editor with the **ESC** button ⬆ .

If the value entered in the editor is not within the permitted value range, the feeding computer will specify the permitted range and return to editing mode.

2. You can select the desired alternative(s) in the dialog box.

There are two types of dialog boxes:

- In a single-choice dialog box, you can select an item by pressing the desired line on the screen.

  If you do not want to change your original selection, you can exit by pressing the **Quit** button.
- In a multiple-choice dialog box, you can select multiple items and accept your selections by pressing the **Enter** button.

  If you do not want to change your original selection, you can exit by pressing the **Quit** button.
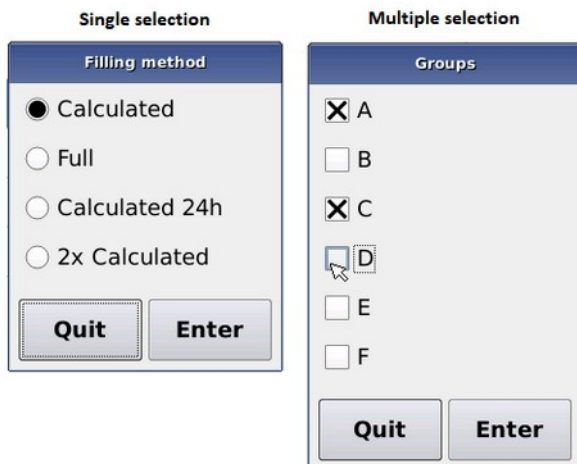
Figure 5: Dialog boxes

⚠️ **Important:** No changes will be put into effect until you have confirmed "accept changes" on the feeding computer. If you do not confirm "accept changes", the changes will be discarded and the feeding computer will resume using unchanged data. This confirmation is requested when exiting the selected data group menu, not directly after changing the value.

2.2.5 User levels

The feeding computer has three user levels, which prevent users from accidentally changing settings that affect the machine's operation.

Not all menus are visible to the lower user levels. For example, on the main menu the **Setup** option is not shown.

- **Maintenance** — At the **Maintenance** user level you can make maintenance settings, such as adding components to the system, calibrating scales, etc.
- **Normal** —At the **Normal** user level you can perform daily functions: adding and removing animals, making changes to fodder doses, feeding times, mixtures and components, etc.
- **Stand-in** — At the **Stand-in** user level you can protect the machine from all setting changes; the machine will feed normally and manual functions are possible.

  ℹ️ **Tip:** You can also use this level when performing routine tasks in order to prevent inadvertent changes to settings. However, nearly all data is available for viewing.

The following table shows the password levels, access rights and the passwords required to activate them.

Table 2: User levels

Level name	Access rights	Password	Power shutoff
Maintenance	You are able to view and edit all settings data.	1,3,1,4,1,5	Return to Normal user level

Level name	Access rights	Password	Power shutoff
Normal	You are able to edit animal and feeding data as well as less critical settings data.	1,2,1,2,1,3	This level is kept
Stand-in	You are not able to edit data. Manual operation and feeding functions operate normally.		This level remains in place

Changing the user level

This section describes changing the system user level.

After starting the feeding computer, the user level will be **Normal**.

Note: If the user level was **Stand-in** before shutting down, the user level will also be **Stand-in** when the feeding computer is started.

1. Select **Settings** > **Password**.
2. Enter the password for the desired level and press **Enter**.

   Pressing the **Esc** button or entering the incorrect password will set the password level at **Stand-in**.

2.3 Belts

2.3.1 Belt connections

One belt feeder can control no more than 16 logical belts, which can be branched out from the feed supply device(s) in two different branches. In other words, two belts can leave straight from the feed supply device and the remaining belts can always be connected to other belts. In this context, connection means that fodder runs first along one belt, from which it is directed by a plow or drops off the end of the belt onto the next belt.
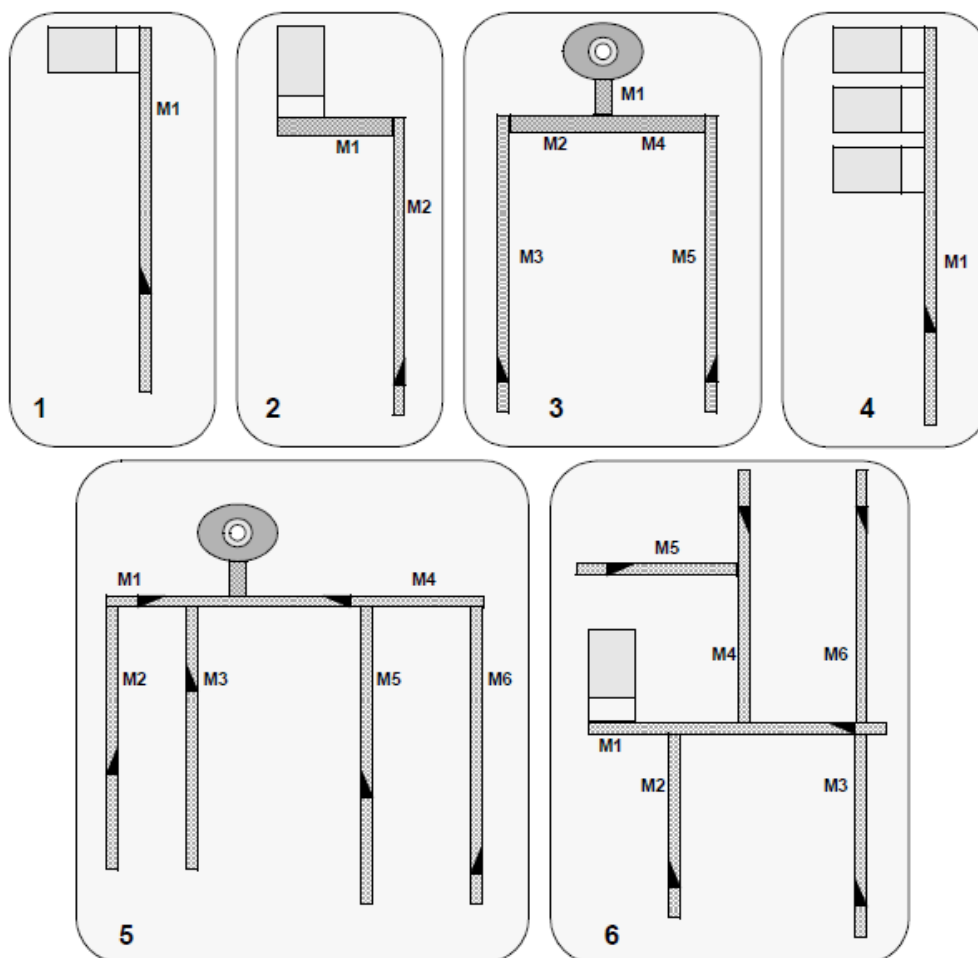
Figure 6: Examples of belt connections

> ℹ️ **Tip:** A logical belt is a belt whose use must be controlled individually. One logical belt might include, for example, multiple consecutive belt conveyors, which are required for structural engineering reasons, but can be turned on simultaneously. For example, two of the belts in the example above could be set up as a single logical belt.

2.3.2 Plow and belt function

The position of the plow is monitored by calculating the pulses emitted from the plow wheel. If the I/O module has been powered off (the emergency button has been pressed or the main switch is in 0 position), the plow(s) will be put through a reference run, in which the plow(s) are run backwards until the I/O module receives data from the external sensor that the plow(s) have reached the end. The reference position number is the highest position number of the belt. The position numbers will decrease as the plow moves forward. The position frequency (i.e. the distance between positions) depends on the measuring wheel used (the place is usually around ten centimetres).

A connection point will be set for the belt, i.e. the point from which the feed will come is set by entering the mother belt, its plow position and direction. If the feed comes directly from the feed supply device to the belt, the setting for mother belt is 0.

If the mother belt has no plow, the plow position naturally cannot be programmed (e.g. two and three). Likewise, if the plow direction on the mother belt is fixed, the side does not have to be programmed.

During feeding, the feeding computer calculates the forward speed of the feed belt according to the rotation speeds set for the belts and starts the next belt when the fodder reaches it.

If the last or the first place of the mother belt has been set as the plow position at the connection point, the computer will understand that the plow has been run to the end of its area and will not direct fodder to the next belt - the fodder

will instead be dropped to the next belt at the end of the conveyor. In this case, the travel distance of the mother belt in question is the entire belt length. Otherwise, the travel distance is calculated based on the connection point and set plow range.

If the system has a belt moving in two directions (e.g. three and five), the different rotation directions must be set for different belts. In this case, two plows may be set for the same physical belt.

Animal feeding is always done starting from the lowest position number and ascending toward the higher position numbers. The recommended and logical approach is to set position numbering so that it continues numerically on the next belt. Also, belts with larger numbers cannot be set as the mother belt. However, belts cannot be positioned so that a belt with lower numbering is closest to the feed supply device, either - belts should be able to be numbered in the desired feeding order. In other words, when using five belts, the numbering of two and three could be interchanged if the outermost belt is to be fed first (also applies to belts 5 and 6).

CAUTION:

When using a single physical belt as two logical belts, the connections must be set to ensure that both belts are not being operated simultaneously (use a reversal contactor or circulate contactor controls via the opening contact of the contactor in the reverse direction).

3 Setup

This section briefly describes the steps on how the system is started for automatic feeding. These steps are described later in greater detail in their own sections.

3.1 Setting the Basic information

This section describes the setting of the Basic information.

Do as follows:

1. Select **Setup** > **Basic information**.
2. Enter the number of belts.
3. If necessary, enter the number of mixtures, components and feeding time groups.

3.1.1 Basic information

Make the basic feeding system settings, such as how many decimals are shown in doses, the number of components and mixes used, and other values typically entered only when first starting use of the system.

- **System type** — The **System type** is Belt feeder.
- **Number of belts** — The **Number of belts** indicates the number of belts being used in the system.
- **Number of mixtures and components** — With the **Number of mixtures and components** you can select the maximum number of mixtures and components to be used.

  If the belt feeder feed supply device type is a component doser, the number of feeds to be used is set as the number of mixtures and components. On other feed supply devices, the value is set according to the quantities being used.
- **Feeding time groups** — With **Feeding time groups** you can select the number of groups to be used.
- **Number of decimals** — With **Number of decimals** you can select the number of decimals to be used in doses.
- **Feeding start** — With the **Feeding start** setting you can select from which side and which end feeding will start. The options are: *from left front, from right front, from left rear, from right rear*. This selection applies to all belts. If the feeding order is not important, feed the reference side first, i.e. the side to which the plow turns when running to the reference point.
- **Consumption-based feeding** — With the **Consumption-based feeding** setting, it is possible to take the quantity of fodder already dosed into consideration in the amount to be dosed. If this setting is not in use, the feeder will dose the same 1/n fraction of the daily batch for each group - n is the number of feeding times of the group and mixture in question.
- **Start-up warning** — **Start-up warning** determines how long any Start-up warning devices will be controlled before the actual operation is started.
- **Dry matter content feeding** — With the **Dry matter content feeding** setting you can select the feed method for dry matter feed mixtures and doses. This selection is used together with a percent-based mixture feed and its use requires the user to have a good command of the method, but it facilitates the easy adjustment of the system when the moisture of the components changes. When the moisture of the component(s) changes, only the change will be entered into the system. The portions to be distributed change automatically, and as the consumption is registered as dry matter, the system can use consumption-based feeding through the changes of the day.
- **GSM alarms** — The **GSM alarms** setting turns the alarms on/off.
- **Manual outputs** — This specifies the number of **Manual outputs**. You can use manual outputs for, among others, remote control use.
- **Uneaten portion warning limit** — The **Uneaten portion warning limit** setting range is 0-100%. The default value is not in use (0). At the turn of the day, the amount of fodder dispensed for a given animal group is compared with the amount of fodder dispensed on the previous day. If the difference is greater than the value specified for the warning limit, an error notification will be issued.

- **Max. portion adaptation %** — The **Max. portion adaptation %** setting range is 100-250%. The percentage indicates how much the system can increase the feed for a given animal group if the **Feeding time** > **Feeding to remainder** setting is in use.
- **Operation watchdog (min)** — **Operation watchdog (min)** indicates how long the system can be in Stopped state before an error notification of the stoppage is issued. For example, if feeding is interrupted, an error notification will be issued after this delay if feeding does not resume or is rejected entirely.
- **Number of scales** — The **Number of scales** is usually one, but, for example, a small scale (or scales) may be added to the system for each component.
- **Number of mixers** — **Number of mixers**.

3.2 Setting belt data

This section describes the setting of belt data.

Do as follows:

1. Select **Setup** > **Belts**.
2. Set the plow area length as position calculation pulses and enter the corresponding area in metres.

    Note: Report the feed flow travel lengths on the belt to the feeding computer. Do not enter the maximum dimensions.

3.2.1 Setting belt and plow setting values

This section describes the setting of belt and plow setting values.

Do as follows:

1. Select **Setup** > **Belts**.
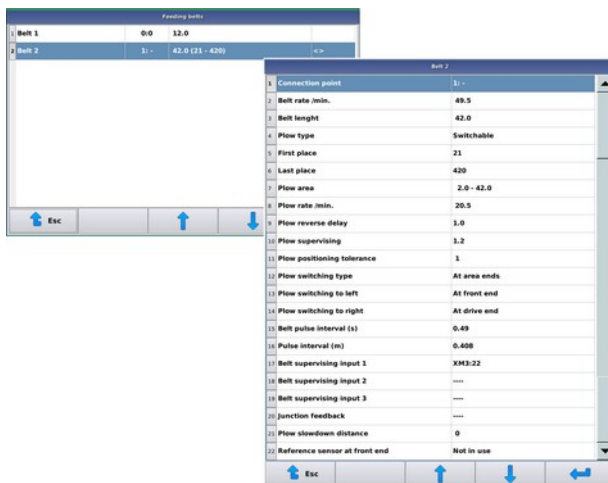
Figure 7: Belts

2. Select the desired belt
3. Make the necessary settings. The settings are:
    - **Connection point** — The **Connection point** can be used to tell the system from where the fodder is coming to the belt. The mother belt determines the belt from which the fodder is coming. Correspondingly, the plow position and side determine the plow station and direction when fodder is directed onto this belt. If the fodder comes directly from the feed supply device to the belt, the connection point for the mother belt is 0. The number of the mother belt cannot be greater than the number of the child belt. The child belt may be the mother belt for other belts.
    - **Belt rate /min** — The **Belt rate /min** is shown as metres per minute. The default belt rate is 49.5 m/min.

- **Belt length** — The **Belt length** is the distance feed travels on the belt to an accuracy of ten centimetres. This value is used when calculating the time it takes for fodder to progress. On a belt conveyor, the travel is the distance from the input point of the fodder to the end of the belt. On a belt feeder, it is the distance from the input point to the plow reference point.
- **Belt supervising input 1-3** — An input port is placed at the **Belt supervising input** for the belt rotation sensor signal. The system uses the rotation sensor signal to monitor the belt rotation. If there is no signal, the system will be stopped. A single missing pulse is permitted.
- **Belt pulse interval (s)** — The **Belt pulse interval** is the interval (in seconds) between two rotation sensor pulses. This is used to monitor the belt rotation.
- **Belt pulse interval (m)** — The **Belt pulse interval** measured in metres. It indicates the distance the belt travels between pulses. The HC feature is used to calculate the travel of feed.
- **Plow type** — The **Plow type** determines whether a plow is in use and, if necessary, the plow direction. On a belt conveyor, the type No plow is selected - no settings lines will appear in this case.
- **First place** — The **First place** is indicated by the smallest position number.
- **Last place** — The **Last place** is indicated by the belt reference position number.

  At Setup, make the belt's first position one number greater than the last position of the preceding belt. Set the last position so that the plow will reach the desired point when running to the foremost position. Depending on the measuring wheel used, the place is approximately ten centimetres.

- **Plow area** — The **Plow area** is the plow's range of travel on the belt measured in metres. The starting point is the distance between the first position and the fodder input point, and the end point is the distance between the plow reference point and the fodder input point (usually the same as the belt length).
- **Plow rate /min** — Using the **Plow rate /min** value and plow area definition, the feeding computer calculates how long it will take the plow to reach the desired position. The default plow rate is 20.5 m/min.
- **Plow reverse delay** — The **Plow reverse delay** determines how long the feeding computer delay will be before the plow reverses direction. The default value (1.0 second) is usually the value used. If the delay is set too short, the plow's transmission machinery will be unnecessarily overloaded and the motor's thermal protection or primary fuses may be triggered.
- **Plow supervising time** — The **Plow supervising time** sets the delay between plow position pulses. If no new position pulse is received after the preceding pulse or after starting the plow within the set plow supervising time, the machine will shut down with an error notification. In the event of an error, determine its cause, such as a loose pull cable, an obstruction in the plow area, malfunctioning position calculation, etc. If the monitoring time is overextended without finding the actual cause of the problem, the plow's pull cable may be damaged.
- **Plow positioning tolerance** — The **Plow positioning tolerance** indicates the permitted deviation in the plow's location after positioning. If the plow overruns its target position while it is coming to a stop (or jerks backward for some reason), thus exceeding the permitted tolerance, the feeding computer will attempt to re-position the plow no more than five times.
- **Junction feedback** — The Junction feedback signal from the I/O input stud is for locating the position of the station.
- **Turning station feedback** — The turning station feedback signal from the I/O input stud.
- **Inverse feedback** — Selections: Not in use / In use.
- **Plow slowdown distance** — The plow slowdown distance is a number of positions, i.e. how long before the plow reaches the turning point it will take the slowdown distance I/O output to be activated.
- **Reference sensor at the front end** — The plow reference sensor is typically located at the rear end of the belt. However, if the reference sensor is located at the front end of the belt, mark this setting In use.

  The alternatives are:

  - Not in use — The reference sensor is located at the rear end of the belt. This is the default.
  - In use — The reference sensor is located at the front end of the belt.

If the belt is fitted with a reversible plow, you can make the following settings:

- **Plow switching type** — The **Plow switching type** can be either At the ends or the Turning station.

- **Plow switching to left**, **Plow switching to right** — You can use these settings to determine at which end and in which direction the plow will turn. You may freely decide which side will be considered "right" and "left". The side being fed first (applies to all belts) is selected using the system settings.

4. Exit by pressing the **Esc** button ⬆.

3.3 Setting feed supply device data

This section describes the setting of feed supply device data.

Do as follows:

1. Select **Setup** > **Feed supply device**.
2. Set one of the following as the feed supply device:
   - Mixer refers to a fully automatic solution, in which the feeder automatically makes the desired mixture and quantity according to the animals being fed by automatically taking all components.
   - The Semi-automatic mixer setting differs from the mixer in that the feeder automatically feeds the desired animals according to given feeding times, but the user must initiate mixture production manually. In this case, mixture production can also be done automatically, but you must initiate production yourself. As a rule, the semi-automatic function is used if not all components can be taken automatically into the mixer, such as when bales are being loaded by a tractor into the mixer.
   - A Component doser may contain several different feed supply devices, which dose different fodders. Weighing is not required in feed supply device - the dosing in all devices is instead monitored with a flow meter, which measures the quantity of feed flowing over it.

     A component doser controls the component outputs according to the component being taken. The setting of outputs is presented below (see Output table on page 56).
3. Set the discharge rate for all feed supply devices, i.e. how much feed must come from the feed supply device within a certain period of time.

   The system monitors dosing based on this value.

3.3.1 Setting the feed supply device setting values

This section describes the setting of the feed supply device setting values.

Do as follows:

1. Select **Setup** > **Feed supply device**.

	Feed supply device	Mixer
1	Feed supply device	Mixer
2	Hatch limit switches	In use
3	Hatch opened switch delay	0.2
4	Hatch closed switch delay	1.0
5	Hatch max. operating time	00:30
6	Minimum flow	10.0 / 00:30
7	Refilling limit	100
8	Limit for refilling (mass)	20
9	Limit for refilling (%)	20%
10	Tank low output limit	0
11	Tank low output hysteresis	0
12	Extra display for scale	Not in use
13	Lubrication interval (h)	Not in use

Esc

Figure 8: Feed supply device

2. Select the desired setting
3. Make the necessary setting changes. The settings are:

- **Feed supply device** — The **Feed supply device** value selects the feed supply device to be used. Possible values are:

  - Mixer
  - Semi-automatic mixer
  - Component doser

  This setting is intended for all types of feed supply device.
- **Minimum flow** — **Minimum flow** specifies how much feed must come to the belt within a set period of time. Enter the required quantity in kilograms and monitoring time. Except for during the first monitoring time, at least the set quantity (in kilograms) of fodder must come to the belt. After the start of dosing and the first monitoring time, dosing cannot be stopped for an error, because the feed supply device may be initially running no-load or the flow element may be so far from the doser that not enough feed has reached it in time. If the dosing rate falls below the set value, the error will cause the feed supply device and system to stop. The error will not stop the automatic mixer in a situation described in the next section.

  This setting is intended for all types of feed supply device.
- **Refill limit** — When the dosing rate falls below the minimum flow limit, the error will not cause the system stop if the feed supply device is a mixer and there is less fodder in the tank than set as the **Refill limit** - feeding is stopped and more mixture is to be made. More mixture is also automatically made if the tank weight is less

than half of the refill limit, and more fodder than is in the tank will be required for feeding. The system will not begin making more mixture if the quantity to be made is less than that specified in the refill settings given later.

This setting is intended for the following types of feed supply device: Mixer.

- **Measuring belt** — The **Measuring belt** specifies the where on the belt the flow measuring element is in a component doser.

This setting is intended for the following types of feed supply device: Component doser.

- **Measuring period** — The **Measuring period** notifies the system how often the flow measurement result is updated. A suitable initial value is 3.10 seconds for flow measurement on a belt conveyor and 2.00 seconds on a belt feeder. The calibration and tuning of flow measurement is presented below (see Flow meter on page 23).

This setting is intended for the following types of feed supply device: Component doser.

- **Taring times** — The **Taring times** value indicates how many flow elements will be tared during the measuring period before feeding begins. A value of at least 20 is recommended.

In the winter, if the measuring belt is being used in cold conditions, more time should be allowed for taring and the belt's winter operating mode should also be used.

This setting is intended for the following types of feed supply device: Component doser.

- **Lubrication interval** — The **Lubrication interval** value specifies the lubrication interval of automatic central lubrication (if any) in hours or can be used to issue a lubrication notification to the user. The operating and notification interval is calculated based on the feed supply device's operating hours. If there is no central lubrication or lubrication notifications are not desired, the value is set to 0 (not in use).

If the system is fitted with central lubrication, a control output for it must also be included in the output table, and the length of the operating cycle with the **Lubrication pulse** setting. The length of the operating cycle can be calculated using lubricating device and bearing data. The recommended period is 15-20 seconds per lubrication point.

> **ⓘ Tip:**
>
> You can also use the **Lubrication interval** as a service indicator. If you do not set an output for central lubrication, the system will issue a lubrication notification on the need for lubrication every day until the user acknowledges that lubrication has been completed in the service menu.

This setting is intended for all types of feed supply device.

- **Limit for refill (%)** and **Limit for refill (kg)** specify the limits which the automatic mixer uses to decide whether additional mixture should be made or not when feeding the last group and when the discharge rate falls below the minimum flow rate. Additional mixture is made if the amount remaining exceeds the set refill weight or if the percentage of undosed mixture from the last group is higher than the setting calls for.

If this is not a case of the last group falling below the dosing rate, the necessary quantity of additional feed will be made in any case, and the group fed during the interruption will also be fed to completion.

In practice, the kilogram limit specifies the refill, if the dose for the group being fed is for more animals than normal and the percentage limit if the dose being fed is small.

This setting is intended for the following types of feed supply device: Mixer.

- **Hatch limit switches** — The **Hatch limit switches** setting specifies whether the limiter switches in the mixer hatch are in use or they should only be used on a time basis. In general, the hatch is fitted or should be fitted with limiter switches, but in certain exceptions, the hatch can be used only on a time basis Set the close and open time separately in seconds.

This setting is intended for the following types of feed supply device: Mixer or semi-automatic mixer.

- The **Hatch closed switch delay** and **Hatch opened switch delay** values specify how long the hatch limit switches should be on uninterrupted before the hatch can be considered as having reached the desired position. In many cases, the hatch closure sensor in particular must be placed so that it will be activated even when there is some quantity of fodder caught in the hatch. In this case, the setting can also be used to specify the "weighing time", during which the system closes the hatch even though the sensor is already activated. When

adjusting the sensor, attention should be given to the fact that it should remain activated even when the hatch is fully closed.

This setting is intended for the following types of feed supply device: Mixer or semi-automatic mixer.

- The **Hatch max. operating time** value sets the hatch close/open time frame during which the limiter switch should be activated before an error notification is issued.

This setting is intended for the following types of feed supply device: Mixer or semi-automatic mixer.

- **No feeding start (%)** — The **No feeding start (%)** setting specifies the smallest portion of the original feeding time dose for the semi-automatic mixer, what will be fed with a reduced dose and will not be stopped by an error.

Example: a 1000 kg mixture is needed for feeding, but there is only 500 kg in the tank. If the **No feeding start** setting is less than 50%, all groups will be fed half of the original dose (in proportion to the tank contents and need). If the setting is over 50%, feeding will not be started - the error will stop the function.

- The **"Tank low" output limit** is a limit value in kilograms, where the "Tank low" output is activated. This setting is used to run the mixer at a higher speed when there is less fodder in the tank.

This setting is intended for the following types of feed supply device: Mixer or semi-automatic mixer.

- The **"Tank low" output hysteresis** is a hysteresis value before the "Tank low" output is deactivated.

This setting is intended for the following types of feed supply device: Mixer or semi-automatic mixer.

- The possible values for the **Extra display for scale** setting are:

  - Not in use — The setting is not in use.
  - Scale — Only shows the scale value on the extra display.
  - Recipe — Shows the scale reading in stand-by mode, the recipe component requested in stand-by mode and how much of the component has not been taken yet.

This setting is intended for the following types of feed supply device: Mixer or semi-automatic mixer.

3.4 Scale

Some type of weighing is done with all dosing devices. Weighing must be calibrated before use. Calibrate weighing from the service menu, zeroing out the scale while it is empty and placing a known weight on the scale and entering it in the system.

The filtering parameters related to weighing and calibration are described in greater detail below (see Scale calibration on page 21).

3.4.1 Scale calibration

This section describes scale calibration.

A belt feeder system always has a scale or scales. Scales are calibrated in the same way as all devices.

In calibration, the system learns the scale's zero point and, with a known weight on the scale, its calibration point. The calibration point must be precisely identified and sufficiently sized in proportion to the mass being weighed. A good weight for the flow meter is, for example, a sack of feed or canister filled with water. A Big Bag or similar container can be used for a feed mixer.

⚠️ **Important:** The careful calibration of the scale is extremely important to ensuring precise feeding. Always zero out the scale and set the known weight when calibrating the scale.

Before calibrating, ensure that the scale moves freely and is not under any tension. When a weight is placed on the scale, the A/D number on the display should increase and, when the weight is removed, the A/D number should return to the same point it was before the weight was placed on the scale. If this does not happen, check to see that the mixer is resting freely on the scale sensors and that there are no extraneous objects between the floor and mixer. Also ensure that the component intake devices are not touching the mixer. Correspondingly, check between the scale plate and frame in the flow element.

Do as follows:

1. Go to the **Maintenance** user level.
2. Select **Service** > **Weighing**.

3. The screen shown here will open:

	Weighing	
1	Scale	17.00
2	AD online	4034
3	Calibration weigh	100.00
4	Calibration point	4200
5	Zero point	4000
6	Mixing filter	5.00
7	Basic filter	0.00
8	Time to basic filter	5.00
9	Postflow estimation time	0.0
10	Flow delay	3.0

Figure 9: Scale calibration

You will see the following information:

- **Scale** — The **Scale** value is the current mass of the scale in kilograms, calculated using the calibration values. This value has no meaning until the calibration has been fully completed.
- **Current A/D number** — The **Current A/D number** shows a number comparable to the scale mass (the term A/D number will be used from now on), which increases when a load is placed on the scale. As a rule, this number varies by a few points even when there is no change in the scale load.
- **Calibration weight** — The **Calibration weight** refers to a item whose weight is precisely known.
- **Calibration point** — The **Calibration point** refers to the A/D number of the calibration point. The numerical value of the calibration point must be greater than the value of the zero point.
- **Zero point** — The **Zero point** refers to the A/D number of the zero point. Take the **Zero point**, when the mixer is mostly empty or there is no feed in the flow element.

4. Zero out the scale by selecting **Zero point**.

The feeding computer will ask for confirmation by requesting permission to take the zero point. This prevents you from accidentally zeroing out the scale.

5. Set the **Calibration weight** by selecting the Calibration weight.

6. Set the calibration weight as close to the centre of the mixer or on the flow element.

7. Calibrate the scale by selecting the Calibration point.

The feeding computer will ask for confirmation of the calibration point setting.

After zeroing out and calibrating the scale, the mass on the scale will appear on the screen on the **Scale** line. When the calibration weight is on the scale, the calibration weight should also appear on the line, and when the scale is empty, the reading should be close to zero. If the scale does not do this, recalibrate it.

3.4.2 Scale filter settings

This section describes setting the scale filter settings.

1. Go to the **Maintenance** user level.

2. Select **Service** > **Weighing**.

3. Filter settings:

- **Mixing filter** — With the **Mixing filter** setting you can slow down weighing while mixing. The system calculates the moving average from the original weighing results during the set value. The larger value means a slower weighing result.

  A suitable value depends on the mixer type used. A suitable value for a large vertical screw mixer can range from two to four seconds, while values of less than a second can be used for a small TMR mixer. A value of 0.01 second means that no extra filtering is used for the weighing result.

  Mixing filter is usually needed during dosing, to ensure that the vibrations from the weighing result do not stop the dosing prematurely. The impact of weighing vibrations during mixing can be eliminated by stopping the mixer well before the component intake stops (see).

  This setting is intended for the following types of feed supply device: Mixer or semi-automatic mixer.

- **Basic filtering** — The **Basic filtering** setting is similar to mixing filter, but the setting is always used when the mixer is not running. As a rule, the value can be 0.01 second, but, if necessary, you can further filter the weighing result. For example, the use of a component feed supply device can affect weighing with extra vibration, which must be filtered.

  This setting is intended for the following types of feed supply device: Mixer or semi-automatic mixer.

- **Time to basic filter** — The **Time to basic filter** setting indicates how quickly basic filtering starts after the mixer stop command is issued. For example, if a large mixer stops gradually, mixing filter can still be used while it is stopping. Normally, the value should be kept short - less than a second.

  This setting is intended for the following types of feed supply device: Mixer or semi-automatic mixer.

- **Post-flow estimation time** — With the **Post-flow estimation time** setting you can adjust the system's ability to anticipate continued flow after the doser stop command has been issued. This allows you to anticipate the delay caused by the mechanical slowness of the devices, not the occasional clumps of fodder dripping out. As a rule, values of less than a second are used.

  This setting is intended for the following types of feed supply device: Mixer, semi-automatic mixer or componenrt doser.

- **Flow Time** — The **Flow Time** setting tells the system how long fodder might still flow from the feed supply device after stopping the doser. The system will continue weighing for the same length of time after the feed supply device stops (with a component doser, the distance of the component from measurement is accounted for). A dosing plow keeps running after dosing until the fodder flow (including any post-flow) reaches the last position of the group being fed. There is no need to anticipate the feed that comes during post-flow, but its is taken into consideration as a group consumption if consumption-based feeding is being used.

  This setting is intended for all types of feed supply device.

3.5 Flow meter

If you use a component doser (i.e. a device which cannot be used to weigh feed) as a feed supply device, you will have to use a flow meter, which calculates the quantity of fodder being moved.

Place the flow meter on the conveyor or feeding belt so that it is between the first animal feeding position and the dosing device(s). If possible, place the flow meter as close as possible to the dosing device. However, fodder may not be dosed directly onto the flow meter and the plow cannot be run in the flow meter area.

When selecting a place to set the flow meter, you should also consider the following points: the belt tension is lowest as close as possible to the free end of the conveyor and the belt feeder belt is thinner than a belt conveyor, thus enhancing sensitivity.

The distance of the flow meter from the feed supply device(s) is shown in seconds. The computer weighs the the given dose after the dosing ends. The computer also assesses the fodder quantity between the feed supply device and flow element, assuming that the fodder flow will remain the same for the specified time. In other words, if 60 kg of fodder a minute has come during dosing and the distance between the scale and feed supply device is 10 seconds, the

computer will estimate that the fodder quantity between the weighing element and feed supply device is 10 kg and then stop the feed supply device when the measured dose is roughly ten kilograms before completion.

If there are multiple feed supply devices, specify the time for each component separately.

3.5.1 Calibration of the flow meter

This section describes calibration of the flow meter.

The flow meter is calibrated by means of a test feeding.

Note:

Calibrate the scale before starting calibration of the flow meter.

Do as follows:

1. Assign the group to be fed to a single position by setting the same start and end position.

   When the start and end position are the same, the plow will not move during feeding and a sufficiently large amount of fodder will be used in the test feeding (tens of kilograms).

2. During the test feeding, increase the component distance value Distance from the flow meter by a couple of seconds.

   The dose may remain a bit smaller than the set quantity, but it will surely be weighed in its entirety.

3. Start feeding.

4. If the fodder quantity differs significantly from the quantity weighed by the computer, change the **Measuring period** value.

   Note:

   Estimate the fodder quantity based on the weighing value, not the setting value.

   If:

   - the real dose is smaller than the dose weighed by the computer, increase the **Measuring period** value.
   - the real dose is larger than the dose weighed by the computer, decrease the **Measuring period** value.

   Because the measurement is not entirely precise, dose several times and carefully change the measuring period value.

   Good starting values are:

   - When the flow meter is on a belt conveyor: 3.10
   - When the flow meter is on a belt feeder: 2.00

3.6 Components

When the feed supply device for the belt feeder is a mixer or semi-automatic mixer, you can set the component data in the **Components** settings menu. If the feed supply device is a component doser, the system will not use component data - the feed settings are to be made to the mixture data instead.

3.6.1 Setting components

This section describes the setting of components.

Do as follows:

1. Select **Components** > **Desired component**.

Component 1	
1 Name	Grass
2 Dry matter content	100.0%
3 Flow time	00:05
4 Mixer stop	20.00
5 Minimum flow	5.00 / 00:30
6 Total consumption	11033.0
7 Correction	0.10
8 Correction value limits	- 1.00 <> 20.00
9 Aux output control	Not in use
10 Pause time (s)	00:01
11 ON time (s)	00:05
12 Ripper output	Not in use
13 Time based intake	Not in use
14 Component belt	Not in use
15 Additional weighing	Not in use
16 Silo content	-11033.0
17 Alarm limit for silo	Not in use

Esc

Figure 10: Selecting a component

2. Make the necessary settings. The settings are:

- **Name** — The **Name** setting is the free-form name given to a component.
- Settings when the feed supply device is a mixer or semi-automatic mixer:
  - **Dry matter content** — The **Dry matter content** is entered for components when using fodder with dry matter content. The dry matter content is shown in brackets if it is less than 5%. In this case, the system treats the component as a "wet component", whereupon its percentage in a mixture is entered as a natural weight, not dry matter content. This facilitates entering liquid components for a mixture.
  - **Post-flow delay** — The **Post-flow delay** setting can be used to determine how long the system will wait to start the next function after controlling a component output. The final number of components is entered and any corrections to be made are calculated after the flow time.
  - **Mixer stop** — The **Mixer stop** setting tells the system (in kilograms) how long it will take to stop the mixer before the desired component quantity is reached. The mixer can be stopped before the quantity to be taken is reached by increasing the weighing accuracy. If the quantity to be taken is lower or only slightly higher than the stopping limit, the mixer will not be started at all.
  - **Minimum flow** — The **Minimum flow** setting is used to determine the component quantity to be achieved during the monitoring time. After the first monitoring time, the intake is not stopped even when no quantity is set for the component.
  - **Total consumption** — The **Total consumption** counter always goes up after a component intake. You can change the consumption value as desired.
  - **Correction** — With the **Correction** setting you can anticipate the amount of fodder that will flow into the mixer after a component intake. When making a correction, an initial value other than zero must be

entered for the system to update. If zero is used for the correction, the system will not use or calculate the correction - it will instead control the component intake until the desired quantity is achieved. The system will use positive correction values to stop component intake at the quantity specified in the correction before the amount to be taken is reached. A negative value will cause the component intake to continue until the amount to be taken exceeds the correction. A negative correction value can result in, for example, a situation where a liquid component enters the mixer at a high flow rate, thus putting pressure on the mixer.

Use the **Correction** function if the component inflow is relatively even and remains so even after the component intake stops. If the fooder flow from the component dosing device fluctuates wildly, you will probably achieve a better result if you do not use the **Correction** function.

- **Correction value limits** — The **Correction value limits** setting is only available when the **Correction** setting is in use. This setting limits the weight range within which reasonable corrections might be found. You can use this to prevent corrections from inadvertently ending up far removed from the real actual figure, such as if the operator has climbed onto the mixer service platform during component intake.
- **Pause time (s)** — The **Pause time** setting determines the time which the component output is off during operation/pause.
- **ON time (s)** — The **Operating time** setting determines the time which the component output is on during operation/pause.
- **Ripper output** — Setting the **Ripper output**.
- Settings if the feed supply device is a component doser:

  - **Consumption** — **Consumption** increases automatically with the quantity dosed. You can change the consumption as desired.
  - **Modification %** — Component-specific change percentage range between 0-250%. For example, if the change percentage is 150% and the requested component quantity is 100 kg, 150 kg of the component will be dispensed.
  - **Distance to flow meter (s)** — The **Distance to flow meter (s)** value indicates how many seconds it will take for fodder coming from each feed supply device to reach the measuring element. The system uses this data to estimate how much fodder will reach flow measurement after the doser stops.
  - **Pause time (s)** — The **Pause time** setting determines the time which the component output is off during operation/pause.
  - **ON time (s)** — The **Operating time** setting determines the time which the component output is on during operation/pause.
  - **Ripper output** — Setting the **Ripper output**.

3. Exit from the menu by pressing the **Esc** button .

3.7 Mixtures

As a rule, fodders to be distributed are referred to as "mixtures" in the feeding computer menus. You can assign names to mixtures. Later in this manual, the term "mixture" may also refer to individual feeds, such as silage.

The feed supply device makes mixtures based on the set components, their intake order and any mixing and absorption periods. Mixture percentages can be set as natural weight percentages, dry matter content percentages or by specifying the quantity of each component in kilograms, such as the quantity of a desired component for a single animal.

If the feed supply device is:

- an automatic mixer, the system will make the feed mixture automatically before feeding.
- a semi-automatic mixer, the user must always start the mixture production, even though mixtures can be made fully automatically.
- a weighing or component doser, whose components must be added to the mixer manually.

Multiple different mixtures can be distributed to a given group. The feeding time specifies the mixture or fodder to be distributed at a given time.

If the system feed supply device is a weighing or component doser, you can name the fodder based on mixture data, monitor its consumption and adjust the mixture-specific change percentage. You can use the change percentage to change the mixture quantity for all groups being fed as well as compensate for any changes in the feed.

3.7.1 Setting mixture data

This section describes the setting of mixture data.

In mixture recipes, you specify the percentages and intake order of components as well as the duration of final mixing and any intermediate mixing or absorption pauses. Pauses and mixing durations are set separately for the first and subsequent feed mixes.

Do as follows:

1. Select **Menu** > **Mixtures** > **Mixture selection**.

Mixture 1	
1 Name	Mixture 1
2 Consumption	1333.50
3 Modification %	100.0%
4 Tank capacity	1000
5 Components	22.00
6 1 - Grass	10.00 / 45.5%
7 2 - Recalculation	
8 3 - Corn	5.00 / 22.7%
9 4 - Oat	7.00 / 31.8%
10 5 - Mixing	01:00 / 01:00

Figure 11: Mixture selection

2. Make the necessary settings. The settings are:

    *   **Name** — The **Name** setting is the free-form name given to a mixture.
    *   **Consumption** — **Consumption** always increases automatically with the quantity dosed. You can change the consumption as desired.
    *   **Modification %** — When you enter components as natural weight or dry matter content percentages, you will not always exit the screen if the combined **Modification %** of the components is not 100%.
    *   **Tank capacity** — With the **Tank capacity** setting you can specify the maximum dosage the feeder will begin adding to the mixer for each mixture.

        If you are using dry matter fodder, enter **Tank capacity** as dry matter.

        If there is a need to exceed the tank capacity while making the mixture, do so. In practice, this means that, if there is more of a certain component than you wanted and you are making the maximum quantity of mixture, the quantity of the other components is not to be decreased. Likewise, if the mixture includes a **Recalculation** line, the final components will be calculated without taking the **Tank capacity** setting into consideration.

        You can use this feature in, for example, situations where you are using silage in bales and want to prevent two bales from being put into the mixer at the same time. In this case, set the mixture **Tank capacity** low enough to

ensure that the machine does not take two bales at once, but will still take the other components in proportion to the bale size.

- **Components** — You can add and remove component lines with the ![button] button. In addition to available components, either **Recalculation**, **Mixing**, **Pause** or **Auxiliary output control** may be selected as a component.

  Components are taken in the order they are to be added to the mixture. You can take the same component multiple times.

  The component percentages for the mixture are, by default, specified in kilograms, whereupon the combined total of components will appear on the **Components** line. When making entries in kilograms, you can use mixture-based feeding. (See Mixture-based feeding)

  When using dry matter feeding, you will see the entire dry matter content of the mixture on its own line on the mixture screen as well as the component percentages of dry matter content and natural weight. If the component entered is a "wet" component (dry matter content less than 5%), the dry matter in the component in question is not taken into consideration at all and the component is entered as a percentage of the natural weight.

3.8 Feeding times

With feeding times, you can specify the times when feeding starts as well as select the mixture to be distributed and groups to be fed. You can select groups by using feeding time groups.

3.9 Groups

Groups refer to the animal groups being fed by the system. You can set the following data for each group:

- Group name.
- Number of animals in the group.
- Group place given as plow location pulses. The group place determines the travel interval of the plow when feeding the group in question. The plow position is calculated using the pull cable free wheel sensors and reference sensors. The position numbering ascends in the direction of the belt's rotation. If there are multiple belts, the numbering starts at the nearest belt and ascends as it moves away from the mixer.
- The group feeding side (if feeding sides are being used).
- The group is put in the desired feeding time group. Feeding time groups can be used to set the times when the group will be fed. The feeding time groups are identified by letters, such as A, B, C, etc.

  Multiple groups may be fed during the same feeding time, but only using one mixture. The groups are fed in order of position, starting from the lowest position number on the selected side. Both sides of the belt are fed entirely before the plow reverses direction. You can select the side to be fed first in the **Basic information** menu.

In the group feeding data, the daily portion for a single animal is set for mixtures to be fed. The daily portion can be a standard dose set by you, or it can be taken from the feeding curve or mixture data. When using a standard dose, you can also set the change period, during which the dose is steadily changed to a new level.

You can also change the dose with a group-specific change percentage, which always functions in the same way regardless of the daily portion calculation method.

You can monitor and set group consumption data in the group feeding menu.

3.10 Outputs

This section describes the setting of outputs.

There are several different types of belt feeding systems: systems are fitted with different kinds of devices and belts, and the number of components varies by installation, etc. As a result, the I/O module outputs can be partly set by the user. The settings for belt and plow control outputs are fixed, but nearly all other function control outputs may be freely set. Unused belt and plow control outputs can also be used to control other devices.

You can activate functions by setting outputs. If, for example, you select a central lubrication output, you will be able to use automatic central lubrication.

> **Note:**
>
> By default, no changes will need to be made to the belt feeder output table if the system is not fitted with any accessories.

> **Important:**
>
> An output table and default output positions are included with the operating manual as appendices. Enter changes in the table and keep a copy of the table close to the belt feeder control centre.

Do as follows:

1. Select **Setup** > **Output table**.
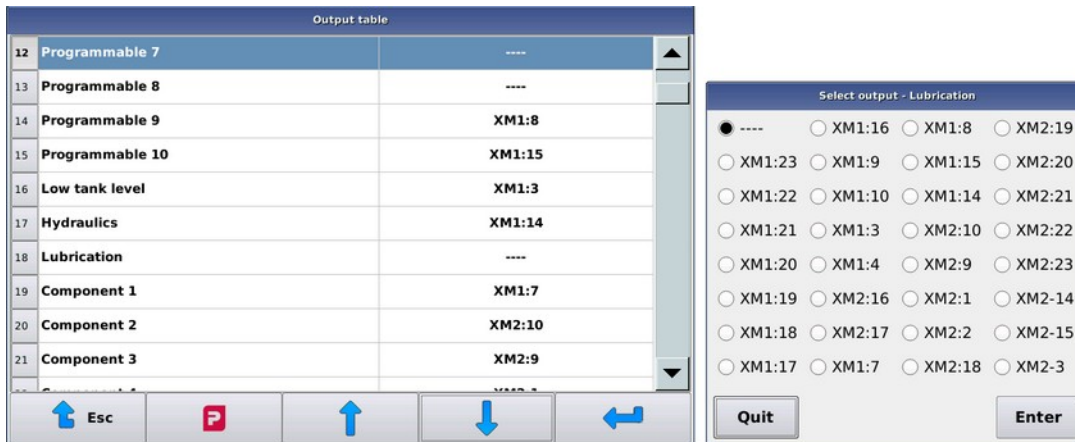2. Select the desired output.

Figure 12: Outputs

3. Select the output (interface:contact) to be used for controlling a function.

   If there are multiple I/O modules in use, also select the module to be used.

   > **Note:** If there are multiple I/O modules in use, set the component outputs for the module into whose scale the component in question will be dosed.

   Outputs with a colon (:) between the connector and pin, are connected to the output pin +24 VDC. Outputs marked with a minus symbol are connected active to the 24 VDC ground (GND) of the pin system in question. A grounded pin can be used to control the ground of devices no greater than 24 VDC.

   The maximum load for both output types is 3 A, while the maximum combined current of devices being controlled simultaneously is 5 A.

   The computer will issue a notification when you are controlling several functions with the same output, but it will accept the setting because the function may be intentional.

4. Exit the **Outputs** view by pressing the **Esc** button.

4 Operating instructions

4.1 Switching power on

This section describes switching the feeding computer power on.

Starting the feeding computer usually takes a few seconds.

Do as follows:

1. Reset the emergency stop circuit so that the control voltage can be supplied to the device.
2. Switch the feeding computer power on by turning the main device switch.

    The feeding computer screen will turn on.

The feeding computer is ready to use when the button symbols appear at the bottom of the screen.

4.2 Calibrations

4.2.1 Scale calibration

This section describes scale calibration.

A belt feeder system always has a scale or scales. Scales are calibrated in the same way as all devices.

In calibration, the system learns the scale's zero point and, with a known weight on the scale, its calibration point. The calibration point must be precisely identified and sufficiently sized in proportion to the mass being weighed. A good weight for the flow meter is, for example, a sack of feed or canister filled with water. A Big Bag or similar container can be used for a feed mixer.

> ⚠️ **Important:** The careful calibration of the scale is extremely important to ensuring precise feeding. Always zero out the scale and set the known weight when calibrating the scale.

Before calibrating, ensure that the scale moves freely and is not under any tension. When a weight is placed on the scale, the A/D number on the display should increase and, when the weight is removed, the A/D number should return to the same point it was before the weight was placed on the scale. If this does not happen, check to see that the mixer is resting freely on the scale sensors and that there are no extraneous objects between the floor and mixer. Also ensure that the component intake devices are not touching the mixer. Correspondingly, check between the scale plate and frame in the flow element.

Do as follows:

1. Go to the **Maintenance** user level.
2. Select **Service** > **Weighing**.

3. The screen shown here will open:

	Weighing	
1	**Scale**	17.00
2	**AD online**	4034
3	**Calibration weigh**	100.00
4	**Calibration point**	4200
5	**Zero point**	4000
6	**Mixing filter**	5.00
7	**Basic filter**	0.00
8	**Time to basic filter**	5.00
9	**Postflow estimation time**	0.0
10	**Flow delay**	3.0

Figure 13: Scale calibration

You will see the following information:

- **Scale** — The **Scale** value is the current mass of the scale in kilograms, calculated using the calibration values. This value has no meaning until the calibration has been fully completed.
- **Current A/D number** — The **Current A/D number** shows a number comparable to the scale mass (the term A/D number will be used from now on), which increases when a load is placed on the scale. As a rule, this number varies by a few points even when there is no change in the scale load.
- **Calibration weight** — The **Calibration weight** refers to a item whose weight is precisely known.
- **Calibration point** — The **Calibration point** refers to the A/D number of the calibration point. The numerical value of the calibration point must be greater than the value of the zero point.
- **Zero point** — The **Zero point** refers to the A/D number of the zero point. Take the **Zero point**, when the mixer is mostly empty or there is no feed in the flow element.

4. Zero out the scale by selecting **Zero point**.

The feeding computer will ask for confirmation by requesting permission to take the zero point. This prevents you from accidentally zeroing out the scale.

5. Set the **Calibration weight** by selecting the Calibration weight.

6. Set the calibration weight as close to the centre of the mixer or on the flow element.

7. Calibrate the scale by selecting the Calibration point.

The feeding computer will ask for confirmation of the calibration point setting.

After zeroing out and calibrating the scale, the mass on the scale will appear on the screen on the **Scale** line. When the calibration weight is on the scale, the calibration weight should also appear on the line, and when the scale is empty, the reading should be close to zero. If the scale does not do this, recalibrate it.

4.2.2 Calibration of the flow meter

This section describes calibration of the flow meter.

The flow meter is calibrated by means of a test feeding.

Note:

Calibrate the scale before starting calibration of the flow meter.

Do as follows:

1. Assign the group to be fed to a single position by setting the same start and end position.

   When the start and end position are the same, the plow will not move during feeding and a sufficiently large amount of fodder will be used in the test feeding (tens of kilograms).

2. During the test feeding, increase the component distance value Distance from the flow meter by a couple of seconds.

   The dose may remain a bit smaller than the set quantity, but it will surely be weighed in its entirety.

3. Start feeding.

4. If the fodder quantity differs significantly from the quantity weighed by the computer, change the **Measuring period** value.

   > **Note:**
   >
   > Estimate the fodder quantity based on the weighing value, not the setting value.

   If:

   - the real dose is smaller than the dose weighed by the computer, increase the **Measuring period** value.
   - the real dose is larger than the dose weighed by the computer, decrease the **Measuring period** value.

   Because the measurement is not entirely precise, dose several times and carefully change the measuring period value.

   Good starting values are:

   - When the flow meter is on a belt conveyor: 3.10
   - When the flow meter is on a belt feeder: 2.00

4.3 Starting the feeder

This section describes the starting of the feeder.

> ⚠️ **Attention:** Before resetting the emergency stop circuit, ensure that there are no people in the operating area of the machine.

Do as follows:

1. Turn the main switch to the I position.

2. The machine control voltage is switched on by resetting the emergency stop circuit and pressing the green button on the control box.

   If the control voltage is not switched on, the graphics unit will issue a notification that it has no connection to the I/O module.

4.3.1 Referencing plows

This section describes the referencing of plows.

The position of the feeding plow(s) is set based on the count of the magnets in the free wheel, and a separate "reference sensor" is used to locate the plow home position at the end of the mat.

The position of the plow is calculated by the I/O module, which has operating voltage when the control voltage is activated.

The plow(s) must always be referenced when starting the system.

If there are any unreferenced plows when the feeding is activated, they will be referenced before the actual feeding begins. Referencing can always be interrupted, but the system will not allow unreferenced plows to run forward.
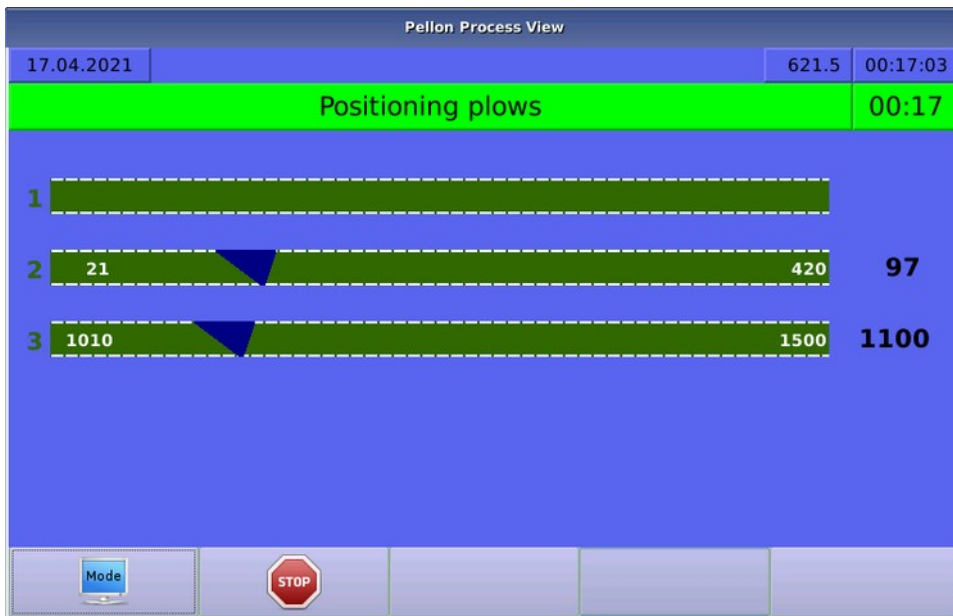
Figure 14: Referencing plows

4.3.2 Starting feeding

Feeding is started automatically when the system clock reaches the set feeding time.

4.4 Setting components

This section describes the setting of components.

Do as follows:

1. Select **Components** > **Desired component**.

	Component 1	
1	Name	Grass
2	Dry matter content	100.0%
3	Flow time	00:05
4	Mixer stop	20.00
5	Minimum flow	5.00 / 00:30
6	Total consumption	11033.0
7	Correction	0.10
8	Correction value limits	- 1.00 <> 20.00
9	Aux output control	Not in use
10	Pause time (s)	00:01
11	ON time (s)	00:05
12	Ripper output	Not in use
13	Time based intake	Not in use
14	Component belt	Not in use
15	Additional weighing	Not in use
16	Silo content	-11033.0
17	Alarm limit for silo	Not in use

Esc

Figure 15: Selecting a component

2. Make the necessary settings. The settings are:

- **Name** — The **Name** setting is the free-form name given to a component.
- Settings when the feed supply device is a mixer or semi-automatic mixer:

  - **Dry matter content** — The **Dry matter content** is entered for components when using fodder with dry matter content. The dry matter content is shown in brackets if it is less than 5%. In this case, the system treats the component as a "wet component", whereupon its percentage in a mixture is entered as a natural weight, not dry matter content. This facilitates entering liquid components for a mixture.
  - **Post-flow delay** — The **Post-flow delay** setting can be used to determine how long the system will wait to start the next function after controlling a component output. The final number of components is entered and any corrections to be made are calculated after the flow time.
  - **Mixer stop** — The **Mixer stop** setting tells the system (in kilograms) how long it will take to stop the mixer before the desired component quantity is reached. The mixer can be stopped before the quantity to be taken is reached by increasing the weighing accuracy. If the quantity to be taken is lower or only slightly higher than the stopping limit, the mixer will not be started at all.
  - **Minimum flow** — The **Minimum flow** setting is used to determine the component quantity to be achieved during the monitoring time. After the first monitoring time, the intake is not stopped even when no quantity is set for the component.
  - **Total consumption** — The **Total consumption** counter always goes up after a component intake. You can change the consumption value as desired.
  - **Correction** — With the **Correction** setting you can anticipate the amount of fodder that will flow into the mixer after a component intake. When making a correction, an initial value other than zero must be

entered for the system to update. If zero is used for the correction, the system will not use or calculate the correction - it will instead control the component intake until the desired quantity is achieved. The system will use positive correction values to stop component intake at the quantity specified in the correction before the amount to be taken is reached. A negative value will cause the component intake to continue until the amount to be taken exceeds the correction. A negative correction value can result in, for example, a situation where a liquid component enters the mixer at a high flow rate, thus putting pressure on the mixer.

Use the **Correction** function if the component inflow is relatively even and remains so even after the component intake stops. If the fooder flow from the component dosing device fluctuates wildly, you will probably achieve a better result if you do not use the **Correction** function.

- **Correction value limits** — The **Correction value limits** setting is only available when the **Correction** setting is in use. This setting limits the weight range within which reasonable corrections might be found. You can use this to prevent corrections from inadvertently ending up far removed from the real actual figure, such as if the operator has climbed onto the mixer service platform during component intake.
- **Pause time (s)** — The **Pause time** setting determines the time which the component output is off during operation/pause.
- **ON time (s)** — The **Operating time** setting determines the time which the component output is on during operation/pause.
- **Ripper output** — Setting the **Ripper output**.

- Settings if the feed supply device is a component doser:

  - **Consumption** — **Consumption** increases automatically with the quantity dosed. You can change the consumption as desired.
  - **Modification %** — Component-specific change percentage range between 0-250%. For example, if the change percentage is 150% and the requested component quantity is 100 kg, 150 kg of the component will be dispensed.
  - **Distance to flow meter (s)** — The **Distance to flow meter (s)** value indicates how many seconds it will take for fodder coming from each feed supply device to reach the measuring element. The system uses this data to estimate how much fodder will reach flow measurement after the doser stops.
  - **Pause time (s)** — The **Pause time** setting determines the time which the component output is off during operation/pause.
  - **ON time (s)** — The **Operating time** setting determines the time which the component output is on during operation/pause.
  - **Ripper output** — Setting the **Ripper output**.

3. Exit from the menu by pressing the **Esc** button .

4.5 Mixtures

As a rule, fodders to be distributed are referred to as "mixtures" in the feeding computer menus. You can assign names to mixtures. Later in this manual, the term "mixture" may also refer to individual feeds, such as silage.

The feed supply device makes mixtures based on the set components, their intake order and any mixing and absorption periods. Mixture percentages can be set as natural weight percentages, dry matter content percentages or by specifying the quantity of each component in kilograms, such as the quantity of a desired component for a single animal.

If the feed supply device is:

- an automatic mixer, the system will make the feed mixture automatically before feeding.
- a semi-automatic mixer, the user must always start the mixture production, even though mixtures can be made fully automatically.
- a weighing or component doser, whose components must be added to the mixer manually.

Multiple different mixtures can be distributed to a given group. The feeding time specifies the mixture or fodder to be distributed at a given time.

If the system feed supply device is a weighing or component doser, you can name the fodder based on mixture data, monitor its consumption and adjust the mixture-specific change percentage. You can use the change percentage to change the mixture quantity for all groups being fed as well as compensate for any changes in the feed.

4.5.1 Setting mixture data

This section describes the setting of mixture data.

In mixture recipes, you specify the percentages and intake order of components as well as the duration of final mixing and any intermediate mixing or absorption pauses. Pauses and mixing durations are set separately for the first and subsequent feed mixes.

Do as follows:

1. Select **Menu** > **Mixtures** > **Mixture selection**.

Figure 16: Mixture selection

2. Make the necessary settings. The settings are:

    *   **Name** — The **Name** setting is the free-form name given to a mixture.
    *   **Consumption** — **Consumption** always increases automatically with the quantity dosed. You can change the consumption as desired.
    *   **Modification %** — When you enter components as natural weight or dry matter content percentages, you will not always exit the screen if the combined **Modification %** of the components is not 100%.
    *   **Tank capacity** — With the **Tank capacity** setting you can specify the maximum dosage the feeder will begin adding to the mixer for each mixture.

        If you are using dry matter fodder, enter **Tank capacity** as dry matter.

        If there is a need to exceed the tank capacity while making the mixture, do so. In practice, this means that, if there is more of a certain component than you wanted and you are making the maximum quantity of mixture, the quantity of the other components is not to be decreased. Likewise, if the mixture includes a **Recalculation** line, the final components will be calculated without taking the **Tank capacity** setting into consideration.

        You can use this feature in, for example, situations where you are using silage in bales and want to prevent two bales from being put into the mixer at the same time. In this case, set the mixture **Tank capacity** low enough to

ensure that the machine does not take two bales at once, but will still take the other components in proportion to the bale size.

- **Components** — You can add and remove component lines with the button. In addition to available components, either **Recalculation**, **Mixing**, **Pause** or **Auxiliary output control** may be selected as a component.

  Components are taken in the order they are to be added to the mixture. You can take the same component multiple times.

  The component percentages for the mixture are, by default, specified in kilograms, whereupon the combined total of components will appear on the **Components** line. When making entries in kilograms, you can use mixture-based feeding. (See Mixture-based feeding on page 42.)

  When using dry matter feeding, you will see the entire dry matter content of the mixture on its own line on the mixture screen as well as the component percentages of dry matter content and natural weight. If the component entered is a "wet" component (dry matter content less than 5%), the dry matter in the component in question is not taken into consideration at all and the component is entered as a percentage of the natural weight.

4.5.2 Making a mixture with a mixer

A mixture consists of different components. The feeder takes the components in the order set by the user. A component may also be taken in several parts. Component percentages are given in kilograms, as a percentage of natural weight or dry matter content.

The maximum quantity of mixtures and components is set in the Basic information menu.

The desired number of mixing or pause periods at the desired points can be specified for a given mixture. The durations of mixing or pause periods can be specified separately for the first mixing and any refills.

4.5.3 Making a mixture with a semi-automatic mixer

The operation of a semi-automatic mixer differs from that of a mixer in that the semi-automatic mixer system will not make any mixtures when a feeding time is active - the animals will only be fed with the mixture in the mixer. If there is not enough mixture in the mixer for feeding, the system will feed the animals reduced doses. The user sets a percentage limit, which will not allow doses smaller than the original to be fed. The system will instead shut down due to the error.

Manually operated functions (see Manual operation of the mixer and semi-automatic mixer on page 46) are used to begin making a semi-automatic mixture. First, the mixture to be made is selected and the system suggests using the set tank capacity as the quantity of the selected mixture. The system takes components by controlling outputs in the same way as with automatic functions. For manually entered components, an output can be connected to, for example, an indicator light, which is lit for as long as the system wants additional components. Intake monitoring (see Components on page 6) should be set loosely enough and the use of corrections should possibly be avoided for manual components.

4.5.4 Mixture quantity

The number of animals in a given group and the mixture-specific daily portion for a single animal are entered in the group data.

You can enter the daily portion mixture quantity for a single animal without change in the group feeding data or obtain the mixture quantity from the feeding curve.

The third alternative in setting the daily portion is to use the combined quantity of mixture components as the daily portion for a single animal. This method requires the mixture component percentages to given in kilograms. This mixture-based filling method is recommended if you intend to maximise the quantity of fodder being consumed by the animals. In this case, you can easily balance, for example, the silage quantity by changing it according to the entry, and keeping the kilogram quantities of other components unchanged.

The method for calculating the daily portion may be freely selected for each group and mixture.

4.5.5 Using bales

If the component to be used comes in bales or, for some other reason, in large batches, the system will accept the components as long as the desired quantity is achieved. When components come in large batches (bales), the desired quantity is usually exceeded, which means that the quantity of components coming after the bale component can be recalculated in proportion to the desired and received quantity of the bale component by adding recalculation to the mixture as the next line.

You can use the tank capacity setting to prevent the system from accepting too many bales at one time.

4.6 Groups and feeding

4.6.1 Group management

This section describes group management.

The following figure shows the screen for managing groups:

1	1	Group 1	A	10	21 - 30	2	--
2	3	Group 3	B	25	121 - 220	2	--
3	5	Group 4	A	25	300 - 420	2	--
4	6	Group 6	A	10	31 - 60	2	--
5	7	Group 7	B	15	21 - 100	2	--
6	8	Group 8	C	5	101 - 150	2	--
7	10	Group 10	A	20	201 - 300	2	--

Group list

- ● Add a group
- ○ Add a group by copying group 1
- ○ Remove group 1
- ○ List order by number
- ○ List order by place
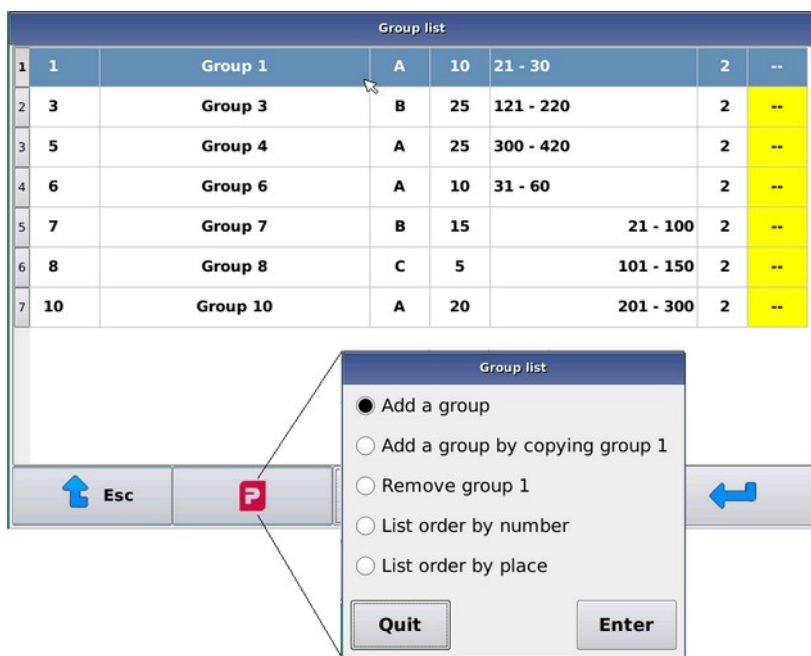
Quit   Enter

Esc

Figure 17: Groups

On the **Groups** list, you can see the group number, name and number of animals in brackets. You can also see the feeding time group code, group place and feeding side.

With the [P] button, you can add/remove groups as well as re-arrange the group list order between the Number and Position order .

Groups are added as follows:

1. Select **Groups**.
2. Press the **Pellon** button [P] .
3. Select **Add group**.
4. Assign the group a number.

   You will not be able to edit this group number later. If necessary, you can remove the group in question and create a new group with the desired number.
5. Select **Basic information**
6. Make the following settings:
   - **Group name** — The group number and name are used to identify the group in all group data.
   - **Animals in the group** — The **Animals in the group** setting specifies the number of animals in the group. Daily portions are given for each animal and the number of animals indicates the number of individuals to be fed. If desired, you can put "1" as the number of animals and enter the fodder quantity for the entire group in

the feeding data. If you are using consumption-based feeding and the number of animals changes in the middle of the day, the remaining feeding times for that day will use the standard percentage of the daily portion, because it is not sensible to use consumption data when the number of animals changes.

- **Feeding time groups** — With the **Feeding time groups** setting you can select which groups will be fed at given times. If you want to remove a group from feeding temporarily, enter a "0" for that group. You need groups if you want to feed the same mixture to different groups at different feeding times.
- **Places** — You can use the **Places** setting to specify the position of a given group. If the last position of the group is the same as the first, the plow will remain in place during feeding.
- **Feeding side** — The **Feeding side** setting determines on which side of the belt the group will be.

7. Press the **Enter** button ↵.

4.6.2 Feeding management

This section describes feeding management.

You can enter one or more mixtures (or fodder when using devices with no mixers) for a given group. Enter the daily portion for the group as a portion for one animal. The computer will specify the dose by the number of animals. If you want to feed the group dose directly to the entire group, enter one as the number of animals.

The following figure shows the screen for setting up feeding:

Figure 18: Mixture data

The mixture list contains the following columns:

- **Mixture name** — The **Mixture name** column contains the mixture names to be used.
- **Daily portion** — The **Daily portion** column contains the daily portion for one animal. The change percentage for the entire group's dose is shown in brackets.
- **Curve** — The **Curve** column contains the number of the feeding curve (if any) or, in place of it, a dose identifier (M) for the mixture. When standard feeding is selected,this column will be empty.
- **Consumption** — The **Consumption** column contains the consumption of the current day for the entire group.
- **Change %** — The **Change %** column contains the group-specific change percentage of a mixture. The group change percentage at the end of the day is underlined.

You can manage feeding as follows:

1. Select **Groups** > **Group**.
2. Select a mixture.

3. Make the following settings:

> **Note:** The fields shown on the group's mixture-specific screen vary according to the setting method used for the daily portion. The fields which change according to the filling method are explained in their own sections. Common settings for all filling methods are described below.

> **Note:** If you calculate feeding based on dry matter content, the doses and consumption levels are shown as dry matter kilograms.

- **Filling method** — The **Filling method** setting is used to determine the setting method of the desired daily portion.
- **Fodder change percentage** — On the **Fodder change percentage** line you can specify a mixture quantity differing from the standard dose for the group. A change percentage of 100 means that the daily portion is shown as the amount entered, while still taking into consideration any mixture-specific change percentage.
- **End-of-day modification** — On the **End-of-day modification** you can specify a mixture quantity differing from the standard dose for the group at the end of the day. This setting will be cleared at the end of the day, i.e. the change percentage will be set to 100%.
- **Portion limit** — In consumption-based feeding, the **Portion limit** percentage value is used to indicate the maximum percentage of the daily portion given during a single feeding time.
- **Consumption today** — The **Consumption today** value indicates how much of the mixture has been distributed to the group today.
- **Consumption yesterday** — The **Consumption yesterday** value indicates how much (in percent and kilograms) of the daily portion was distributed yesterday.
- **Total consumption** — **Total consumption** is a counter to which the distributed fodder quantity is always added after dosing. This value will increase until you make changes to it.
- **Test calculation** — On the **Test calculation** line you can see the animal-specific daily portion, with or without any change percentages. When you select the **Test calculation** line, the computer will display step by step how it calculates the dose to be distributed. You can use this pre-calculation to check the dose setting if you are not yet entirely clear about how calculation works. The pre-calculation shows all the steps when at least one group in question and the mixture feeding time have been activated.

> **Tip:**
>
> In mixture feeding, only one mixture is usually entered for a given group, but if the single dose of a component being entered, such as a mineral, is low in proportion to the mixer size, you can improve the accuracy of the component intake by using two different mixtures.
>
> In this case, set the mixtures as identical, but add the small component in question to one of them. The mixture containing the small component is fed only once or twice a day, with most feedings done using a "basic mixture". Set the daily portions of the basic mixture and small component mixture in proportion to the feeding times.
>
> You can also improve the small component intake accuracy by using a separate small scale.

4.6.3 Standard feeding

The daily portion for a single animal is set in the system in kilograms. If you are using dry matter-based feeding, enter the dose as dry matter content in kilograms. The system will then calculate the fodder quantities in natural weight based on the moisture content of components.

When using standard feeding, you can set the desired length of the change cycle, during which the dose is steadily changed every day until it reaches the set level. After the change cycle, a new daily portion will come from the end level. You can set the change cycle to begin within no more than 31 days of the present moment. The maximum change cycle length is 250 days.

4.6.4 Feeding curve

The daily portion for a single animal can also be determined based on the feeding curve you have set. Set the desired number of days and their corresponding mixture quantities for the feeding curve (for dry matter content feeding the mixture quantity is shown as dry matter). Set the group mixture to follow the curve on the desired day, after which the daily portion will automatically follow the feeding curve.

You can set the feeding curve by selecting **Menu** > **Feeding curves**. The feeding curve is set up using the group mixture data by selecting **User curve** as a filling method.

You can set the feeding curve to follow, for example, the animal's age, production phase or other equivalent data.
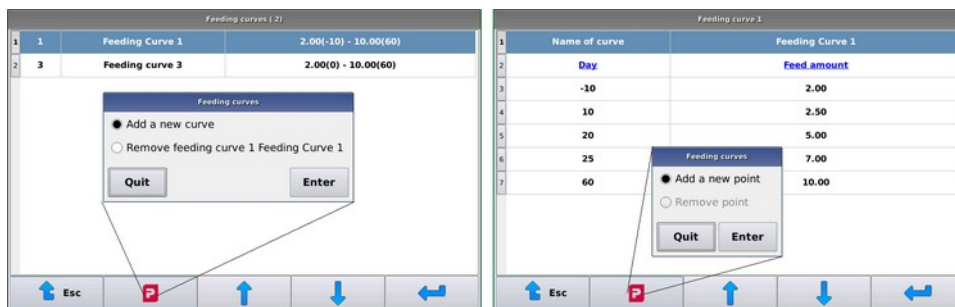

Figure 19: Feeding curve

4.6.5 Mixture-based feeding

You can use mixture-based feeding if you enter the mixture components in kilograms. If a group's mixture uses a mixture-based filling method, the combined quantity of mixture components is used as the daily portion for a single animal.

You can change a mixture-based daily portion with mixture and group-specific change percentages.

Mixture-based feeding is generally used with key animal groups, whose feeding is to be maximised, with individual components, whose quantity is set according to consumption, being used to maximise it. Typically, the percentage of silage is changed according to the entry and the percentage of other components is kept constant.

If mixture-based and consumption-based feeding is being used and the mixture composition is changed in the middle of the day, the feedings for the rest of the day are to be made as equal doses.

4.7 Setting feeding times

This section describes the setting of feeding times.

Feeding time allow you to set the time at which animals will be fed. You can also determine the criteria for setting groups, mixtures and the mixture quantity to be made in the mixer system. You can also use intermediate mixing in the mixer system, where the mixer is only used for a set time.

Do as follows:

1. Select **Menu** > **Feeding times**.

2. If necessary, add a new feeding time with the ![button] button or select a time you would like to edit.

   If you add a new feeding time, the system will copy the parameters into new feeding time object (except the start time) from the feeding time currently selected by selection bar.

3. Make the necessary settings.

Feeding time: 12:00	
1 **Time**	**12:00**
2 **Mixture**	Mixture 1
3 **Groups**	A,B,C
4 **Filling method**	Calculated
5 **Extra mixture**	100
6 **Feeding to remainder**	Not in use
7 **Share**	Auto

Figure 20: Selecting a time

The settings are:

- **Start time** — The **Start time** setting determines when feeding time begins. Feeding will begin when the clock in the display module is a couple seconds past the set time. If you are using pre-set feeding times (see Basic information on page 14), the system will start the next feeding time immediately after the end of the preceding time, if the module clock has passed the feeding time in question.
- **Mixture** — With the **Mixture** setting you can select either the mixture to be fed or intermediate mixing.
- **Feeding time groups** — With **Feeding time groups** you can set the animal groups to be fed. Each animal group must belong to one of the selected groups and a mixture dose for the day must be set for the group in order for it to be fed.
- **Filling method** — This setting is available when using an automatic mixer. Possible settings are:
  - Calculated — The necessary mixture quantity is made for feeding along with a possible extra mixture.
  - Full — The mixture quantity is made according to the tank capacity specified in the mixture data. If this quantity is insufficient, feeding will be done with tank refills.
  - Calculated for 24 h — Mixture amounting to the combined quantity of daily portions is made for the the groups to be fed during the feeding time. You can also specify the desired **Extra mixture**. The tank capacity may limit the quantity of fodder that can be made on a daily basis. The daily portion-based filling method may be feasible if you want to use the maximum infusion time and/or if only a single mixture is being used for all cattle.
  - 2x Calculated — Twice the necessary mixture quantity is made for feeding along with a possible extra mixture.
- **Extra mixture** — The **Extra mixture** can be used to determine how much surplus mixture will be made, if necessary. A small amount of extra mixture should always be set. This allows you to ensure that the mixture

will last fully to the last group, and there will not be a need to run the mixer until empty. If there is a large number of groups to be fed, the extra mixture should be increased.

> **Tip:** If you are using the same mixture for the next feeding time, you can increase the **Extra mixture** significantly. Depending on the mixer, this will accelerate feeding, because there is no need to fully empty the tank.

- **Feeding to remainder** — When **Feeding to remainder** is selected while in In use mode, the dose being distributed is increased so that a **Extra mixture** quantity of feed is left in the tank. The feed dose is not increased beyond what is set in **Basic information** > **Max. adaptation %** (default value 150%).

  Esimerkki: Group dose request 100 kg. Extra mixture 100 kg. Max. adaptation 150%. If there is 235 kg of feed in the tank, the quantity of fodder to be distributed is then 135 kg. If there is 275 kg of feed in the tank, the quantity of fodder to be distributed is then 150 kg, because the max. adaptation limit has been reached before the extra mixture limit.

- **Share** — The **Share** indicates what portion of the total day's fodder will be distributed during a given feeding time (mixture and group-specific).

  The selection can be between 1-100%.

  0% == **auto** where the system calculates the percentage automatically, taking into consideration the feeding percentages of other feeding times. The system first calculates the fixed percentages and divides the remaining percentage among all **auto** feeding times.

4.8 GSM modem

4.8.1 GSM modem

The feeder can be fitted with a GSM modem, which allows the feeder to send an SMS notification if feeding stops due to an error. You can also use SMS messages to change the mix-specific change percentages.

4.8.2 Starting use of the GSM modem

This section describes how to start using the GSM modem.

Before starting use of the GSM modem:

- Using a mobile phone, check to ensure that the subscription is open and working.
- Using a mobile phone, ensure that you can send an SMS via the subscription. If necessary, enter the operator SMS settings on the phone.
- Disable the PIN code request (if any).

> **Note:** If the subscription uses a PIN code request, a "no PIN code entered" notification will appear in the error log, and a field in which you can enter the PIN code will appear in the **Network Settings**menu.

Do as follows:

1. Shut off the feeder power at the main switch.
2. Insert the SIM card in the feeder GSM modem.

   Do not force the SIM card into the feeder GSM modem.
3. Turn on the feeder power at the main switch.
4. Enter the installation password.
5. Select **Setup** > **Basic information** > **SMS alarms** and enable SMS alarms.

6. Open **Setup** > **GSM alarms**

   The box shown below will open:

Phones to alarm		
4	+358123456789	In use
5	+358098765432	In use
6	-----	Not in use
7	-----	Not in use
8	-----	Not in use
9	-----	Not in use
10	-----	Not in use
11	Modem type	LTE
12	State of GSM-module	Ready 75% (4G)
13	Alarm delay	05:00

Figure 21: GSM settings

7. Select the phones to receive alarms and enter the phone numbers to which the alarms will be sent.

8. Select **Alarm delay** and set the alarm delay in minutes.

   Alarm delay indicates how long it will take for an alarm message to be sent after an error shutdown.

   > *i* **Tip:** If you press any computer button after the error occurs, but before the message is sent, then no message will be sent.

9. Check the **GSM module status**.

   Possible modes are:

   - Initialising
   - Stand-by mode

   The modem will be ready for use when the **GSM module status** changes to Stand-by mode.

   The signal strength level of the GSM network appears after the **GSM module status**. The level ranges between 0-100. If the signal strength is one (1) or higher, the modem will be able to send an SMS.

10. When in stand-by mode, ensure that it will be possible to send an SMS by selecting [P] -> **Send SMS** next to the desired phone number.

4.8.3 GSM modem troubleshooting

This section describes how to troubleshoot the GSM modem.

If there is no connection, do the following.

If you cannot get the modem to work by taking the measures shown below and all the connections seem to be in proper working order upon a visual inspection, please contact Service.

The modem indicator lights indicate the following:

- When the GSM modem finds a network, the modem indicator light will blink once approximately every three seconds.
- When the GSM modem is looking for a network, the modem indicator light will blink once approximately every one second.

- If the indicator light does not blink at all, the modem is malfunctioning or powered off.

1. Ensure that the subscription and text messages work when the SIM card is inserted in the mobile phone.

2. Ensure that the network signal strength is sufficient while in operating mode.

   If the mobile phone uses the same subscription while in operating mode, the network signal strength is usually sufficient.

   If an ordinary mobile phone does not work in operating mode, you can still, in many cases, use the GSM modem, as the modem has higher transmission power and is more sensitive than ordinary mobile phones. In any case, look for the best possible place for the antenna. If necessary, you can extend the length of the antenna cable with a special extension cord, which are available at, for example, mobile phone automotive installation firms.

4.9 Operating devices manually

4.9.1 Manual operation of the mixer and semi-automatic mixer

This section describes the manual operation of the mixer and and semi-automatic mixer.

On the manual mixer control tab, you can operate the mixer and control the unloading hatch as well as start manually making mixtures that are set in the system.

Do as follows:

1. Go to manual operating mode by selecting the manual operating mode button in the **Pellon Process View**.

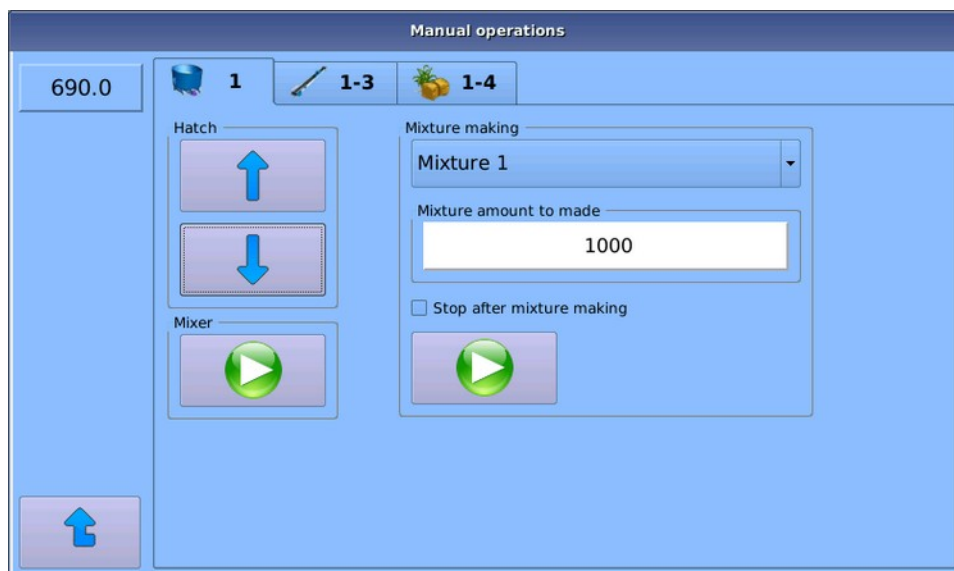2. The system will go to **Stopped** mode and the manual operation view will open.

Figure 22: Manual operation - Mixer

The sections are:

- **Hatch** — Control to open/close the unloading hatch.
- **Mixer** — Control to start/stop the mixer.
- **Mixture making** — Making mixtures entered in the system at the desired quantities. The maximum allowable mixture quantity value is the same as the mixture's *tank capacity* setting.

   The **Stop after mixture is made** dialog box will put the system into **Stopped** mode when the mixture has been made.

3. Exit by selecting another manual operation tab or go back to the **Process** view by pressing the **Esc** button.

4.9.2 Manual operation of the belt and plow

This section describes the manual operation of the belt and plow.

Do as follows:

1. Go to manual operating mode by selecting the manual operating mode button in the **Pellon Process View** [✋].

2. The system will go to **Stopped** mode and the manual operation box will open.
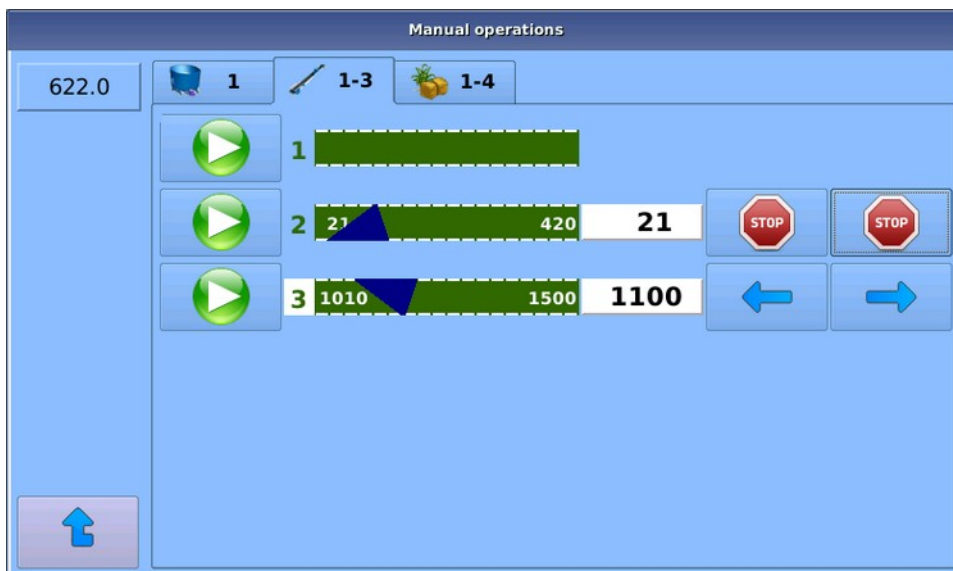
3. Select **1-3**.

Figure 23: Manual operation - Belts and plows

The belts set in the system are listed in the **Belts and plows** view.

4. You can turn individual belts on/off by pressing the **Play** [▶] or **Stop** [⊖] button to the left of the belt in question.

5. You can move the plow with the **Arrow left** [←] and **Arrow right** [→] buttons.

When the plow is in motion, you can stop it with the same buttons. The plow also stops automatically when it reaches the end position.

The real-time position data of the plow is updated on the right side of the belt.

6. If there is a turning or junction station on the belt, pressing the belt on the screen will open a new window, where the station can be run **forwards** and **backwards**.

Figure 24: Manual operation - Junction station

7. Exit by selecting another manual operation tab or go back to the **Process** view by pressing the **Esc** button [↰].

4.9.3 Using components manually

This section describes the manual use of components.

Do as follows:

1. Go to manual operating mode by selecting the manual operating mode button in the **Pellon Process View** [✋].
2. The system will go to **Stopped** mode and the manual operation view will open.
3. Select **1-4**.

Figure 25: Manual operation - Components

The components set in the system are listed in the **Components** view.

4. You can turn individual components on/off by pressing the **Play** [▶] or **Stop** [⛔] button to the left of the component in question.

The quantities taken will be updated in kilograms to the right of the component.

5. Exit by selecting another manual operation tab or go back to the **Process** view by pressing the **Esc** button [↑].

4.9.4 Abandoning interrupted feeding

This section describes abandoning an interrupted feeding.

Do as follows:

1. Stop manual operation and return to manual operating mode.

   Manual operating mode is indicated by the text **Stopped** in the user interface.

Figure 26: Process mode: stopped

2. Abandon the interrupted feeding by pressing the **Abandon** button ![X] .

3. The feeder will go into stand-by mode to wait for the next feeding.

   If you are using set feeding times, the system will wait for the next feeding time. In this case, start any interrupted feeding times manually by changing the system clock or feeding time.

4.10 Backup copying

4.10.1 Creating a backup copy

This section describes how to create a backup copy.

Backup copies are saved on a USB thumb drive, which must be connected to the GPro2 computer before saving the backup copy.

Do as follows:

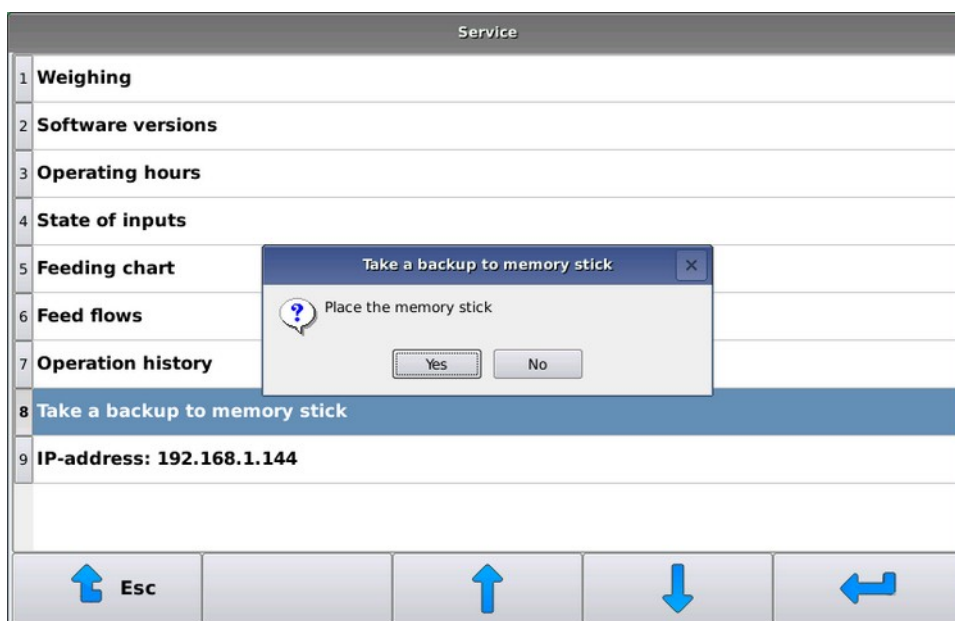Select **Service** > **Copying data on a thumb drive**.

Figure 27: Saving backup copies

4.10.2 Restoring a backup copy

This section describes how to restore a backup copy.

Backup copies are restored using the **Pellon service mode** tool, and the function requires a system restart.

The backup copy is restored from a USB thumb drive.

Do as follows:

1. Insert the thumb drive into the GPro2 computer
2. Activate the service mode during the next Setup by selecting **Service** > **Service mode during the next Setup**.
3. Restart the system and wait until the **Service tool** program launches.
4. Select **Backup** > **Return to GPro2**.
5. Restart the system.

4.11 Errors

4.11.1 Error log

The system saves all errors and exceptional situations, along with the event times, in an error log. Notifications, whose purpose is to notify the user of any unusual activity or, for example, the need for servicing, are also kept in the error log.

A blinking attention symbol, which notifies the user of any new entries in the log, will appear until you open the error log. The errors are listed in the log in chronological order. You cannot clear the error log - the oldest error notifications are automatically deleted from the log.

4.11.2 Error acknowledgement

This section describes error acknowledgement.

When an error stops the device, a pop-up window describing the error situation will appear on the screen.

Do as follows:

1. When the error notification appears, check to see whether you can retry the function.
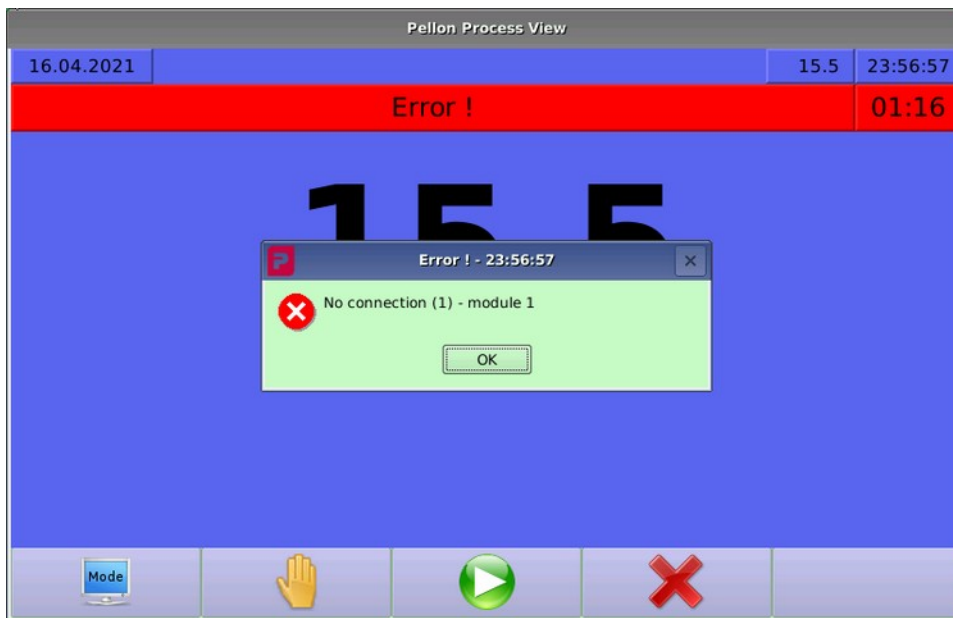

Figure 28: Error notification

2. Acknowledge the error by pressing the **OK** button [OK].

After acknowledging the error notification, the system will stay in **Error** mode.

You can:

- Continue the interrupted function by pressing the **Play** button [▶].
- Return to stand-by mode by pressing the **Abandon** button [✖]. The system will not resume any interrupted function.

4.11.3 Errors

This chapter describes most of the system error notifications, their most common causes and any suggested corrective measures.

Error notification	Cause and suggested corrective measures

`No connection (1) - module n`
 	
`No connection (2) - module n`
	The graphics unit cannot establish a connection to the specified I/O module on the CAN bus. The system will issue this error notification whenever the device's emergency stop circuit has not been reset either after a power cut or the emergency stop button has been pressed.
	
	Other possible reasons include:
	
	• The selected options require more I/O modules than are in the system.
	• There is a fault in the telecommunications wiring.
	• The telecommunications circuits have been subjected to powerful electrical interference.
	
	If the error is caused by a failure to reset the emergency stop circuit or changes made to settings and the situation cannot be corrected by toggling the power supply to the centre off and on again, contact Service.
	
	ⓘ **Tip:** Because the surge protection for telecommunication circuits is based on the generation of heat, the device involved in the suspected fault must be kept de-energised for several tens of minutes to allow the components to cool.

`Connection returns module n`	This notification is given: • When the connection with the I/O module is re-established after the previous error states. • After resetting the emergency stop circuit.
`Module startup`	The display module adds a mark to the error log upon Setup. You can use the error notification to monitor, for example, any power outages.
`Plow rotation supervisor: Belt N`	Data on turning in the right direction has not been sent by the plow on the belt in question within the set time period. If the error occurs when starting up the belt for the first time, the A and B pulses are probably in the wrong order. In this case, reverse the A and B sensors. If the sensor order is correct, check the sensor distance from the wheel and the wiring. In the feeder being used, the cause of the error is usually a slack plow pull cable or a mechanical obstacle in the path of the plow. Do not extend the monitoring time to delete an error notification, because slipping of the pulling wheel can destroy the cable.

Error notification	Cause and suggested corrective measures
`Component flow too small`	Component not coming at the set speed. Determine the cause and, if necessary, change the monitoring settings.
`Delivery flow too small`	The dosing device is not dispensing feed during feeding time at the set speed.
`Corr.value out of limits`	After the component intake, the calculated correction would exceed the set maximum limits, so it is ignored. If the error occurs occasionally or there is a clear cause, no actions need to be taken. If the error occurs regularly to some components, check to ensure that the limit is correct. If the post-flow fluctuates wildly in the correction area, you can force the correction in an area where post-flow usually occurs and accept notifications as part of the functions.
`Reference sensor still on belt N`	The reference limit for the belt in question is still in use, even though the plow has run forward for ten pulses. This error notification usually causes a device malfunction, in which the reference sensor issues activity data even though the plow has left the home position.
`Place not defined NN`	A position number where there is no plow has been set as the start and end position of the animal group. Correct the animal group setting or plow setting.
`Hatch closing timeout` `Hatch opening timeout`	The mixer hatch will not close or open within the set maximum time (see Setting the feed supply device setting values on page 17). Possible causes include: • Fodder caught in the hatch. • Faulty sensor adjustment. • The opening of the hatch is not mechanically limited and the sensor delay times are so long that the hatch "bypasses" the sensor.
`Circuit breaker`	The thermal protection or motor protection of an actuator has been triggered. Reset the protection and determine the cause of the trigger.
`No mixer rotation information`	No rotation data has been received from the mixer within the set maximum time (see Setting the feed supply device setting values on page 17). If the mixer is not fitted with a rotation monitoring sensor, set **Not in use (0.0)** as the monitoring time.
`Undefined output nn`	No output has been set in the output table for a component to be taken or another notification function (see Output table on page 56).
`No portion or animal to be fed`	There are no groups in the feeding time groups set for a given feeding time, there are no animals in the groups or doses. In consumption-based feeding, there is no more dose left for the animals being fed (see Basic information on page 14).

Error notification	Cause and suggested corrective measures
`Weighing error component n`	The component in question is set to take a quantity that exceeds the weighing range. The most likely reason for this is that the mixer scale has not been calibrated, was calibrated incorrectly or is malfunctioning. Another possible cause is the incorrect setting of the mixture or tank capacity.
`Reboot module 1/2/3/4`	The system I/O module has rebooted during feeding. This may be caused by an electrical fault, but the most common reason is that the user has made settings whose implementation requires the I/O module to reboot, such as by changing the belt position data, etc. If the error recurs even though you have not made any changes to the settings, check the electrical connections, particularly grounds and the cabling for sensors and modules. The most common cause in a flow measurement system is the insufficient or incorrect grounding of the flow meter sensor plate.
`No such user curve n`	You have set the group to be fed with the feeding curve *n*, but the curve was later removed. The computer will issue this error notification and feed the group with a set standard dose (if any).

`Not enough mixture for feeding`
 	
`Caution! Reduced portion -> n%`
	There is not enough mixture in the semi-automatic mixer for feeding with the original dose. If the mixture contains less than is specified in the mixer settings, feeding will have to be done with reduced doses, where an effort is made to empty the mixer by reducing the doses for all groups being fed (latter error notification). If the mixture quantity in the mixer is less than the percentage set for the required quantity, the error will cause the operation to stop.
	
	If the system is also fitted with a GSM modem, the warning is also sent by text message.

`Lubricate machine!`	When using the service notification function, the machine will send an error notification on the need for servicing once a day until acknowledgement of the completed servicing is given (see Setting the feed supply device setting values on page 17).
`GSM: PIN not accepted`	The subscription PIN code has not been entered in the system. Enter the PIN code.
`GSM: Signal too weak`	The GSM signal is too weak to send text messages.
`GSM: No connection`	The software is unable to communicate with the modem. Reboot the system and check connectors and wires.
`GSM: other error function description`	Reboot the system and check connectors and wires.
`Error in loading external language`	The language files loaded into the display module are insufficient or incompatible with the module software version.
`Error log does not exist`	The display module memory has been reset and the previous error log cannot be found. This is a normal function after resetting the module.

Error notification	Cause and suggested corrective measures
New software - old version n.nn	The display module software has been updated to a newer version or the module has been reset.
Forced day change Forced day change to all animals	When using consumption-based feeding calculation, the daily consumption levels of an individual group or all groups are reset.
Flash error code n	There are problems writing or reading the Flash drive. In a system already in use, the most common cause is a low operating voltage (less than 22 VDC). When using a new module, if you frequently experience errors involving the Flash drive, you are dealing with an unformatted memory, which must be formatted before using the module for the first time.
Other error notifications	In addition to the above-mentioned notifications, the system will also issue other notifications, some of which are entirely informative, while others refer to malfunctions. If errors that refer to malfunctions recur, the cause of the malfunction should be determined and corrected.

4.12 Operating examples

4.12.1 Component doser with two feeds

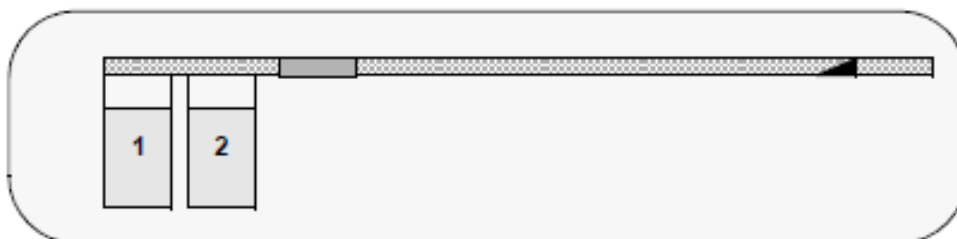In this example system, you can dose with two different green feeds.

Figure 29: Two component dosers and flow measurement

Set two mixtures and two components in the system. Set the component distances from the flow meter by clocking or calculating the distances based on the belt rate and travel

If you want to enter both feeds for the same group, specify the daily dosing and separate feeding times for both feeds.

You can also enter feeds at the same time as a mixture if the precise portions of the feeds are not critical. In this case, set a third mixture and third component, and connect the third component electrically so that it will control both filling devices. You can adjust the ratio of components with the feed rate of the filling devices.

You can set up a similar type of system even when one of the feeds is being dosed by an auger. You can also concentrate the mixture semi-automatically using the last example.

4.12.2 Semi-automatic mixer for manually produced mixtures

This example system has a feed mixer, but all components are brought to the mixer manually with a front loader. Silage comes in bales. In this case, choose the semi-automatic mixer as your feed supply device. You can set up the system in two ways:

- In the first alternative, the system guides the intake of components with an indicator light.

    Start making the mixture manually and select the desired mixture and mixture quantity for the system (see Making a mixture with a semi-automatic mixer on page 37). Direct all component controls to the same output (see Output table on page 56) and keep component monitoring times loose enough to ensure that the machine operation is not interrupted by unnecessary disruptions. Also program adequately long drip times.

    Set the first bale fodder for the mixture. After taking in the bale fodder, add recalculation to the mixture and, if necessary, mixing before the intake of other components.

    The system guides the tractor operator with an indicator light. The indicator light remains on for as long as more component is to be added. You can compensate for operator response time by using corrections or manual settings.

    After making a mixture, the system will return to automatic mode if a stop after mixing was not selected during Setup.

    Feeding is done automatically.
- In another alternative, the system is fitted with an extra scale display (Pellon 584148).

    Close the hatch and start mixing using manual operating controls. Add components in the desired order. After making the mixture, return the mixer to stand-by mode, after which feeding will be done automatically.

4.12.3 Semi-automatic mixer and concentration during feeding

This example system has a semi-automatic mixer, in which you can manually make a mixture that will be fed to all groups. However, concentrated fodder, for example, is added to the mixture for some groups during feeding time.

In this example, you can use the feeding time group control outputs for the group being fed. For the first six feeding time groups (A-F) set the I/O module output, which is always on when the animals in the group in question are being fed. With this or these outputs, you can control, for example, the concentrated fodder spiral and, if necessary, you can use the variable speed drive to adjust the dosing rate. You can use two separate relays to set the maximum run time.

4.13 Appendices

4.13.1 Output table

This section describes the belt feeder outputs.

Output	Default	Setting
Not in use		
Pre-warning	XM1:8	
Error data	XM1:15	
Error (delayed)		
GSM-reset		
Programmable 1		
Programmable 2		
Programmable 3		
Programmable 4		
Programmable 5		
Low tank level		
Machinery		

Output	Default	Setting
Central lubrication		
Component 1	XM1:7	
Component 2	XM2:10	
Component 3	XM2:9	
Component 4	XM2:1	
Component 5	XM2:2	
Component 6	XM2:18	
Component 7	XM2:19	
Component 8	XM2:22	
Component 9	XM2:23	
Component 10	2-XM1:14	
Component 11	2-XM2:10	
Component 12	2-XM2:9	
Component 13	2-XM2:1	
Component 14	2-XM2:2	
Component 15	2-XM2:18	
Component 16	2-XM2:19	
Mixer	XM1:10	
Mixing	XM1:3	
Unloading	XM1:4	
Belt 1	XM1:23*	Cannot be changed
Plow 1 forward	XM1:22*	
Plow 1 reverse	XM1:21*	
Belt 2	XM1:20*	Cannot be changed
Plow 2 forward	XM1:19*	
Plow 2 reverse	XM1:18*	
Belt 3	XM1:17*	Cannot be changed
Plow 3 forward	XM1:16*	
Plow 3 reverse	XM1:9*	
Belt 4	XM1:10*	Cannot be changed
Plow 4 forward	XM1:3*	
Plow 4 reverse	XM1:4*	
Belt 5	2-XM1:23*	Cannot be changed
Plow 5 forward	2-XM1:22*	

Output	Default	Setting
Plow 5 reverse	2-XM1:21*	
Belt 6	2-XM1:20*	Cannot be changed
Plow 6 forward	2-XM1:19*	
Plow 6 reverse	2-XM1:18*	
Belt 7	2-XM1:17*	Cannot be changed
Plow 7 forward	2-XM1:16*	
Plow 7 reverse	2-XM1:9*	
Belt 8	2-XM1:10*	Cannot be changed
Plow 8 forward	2-XM1:3*	
Plow 8 reverse	2-XM1:4*	
Belt 9	3-XM1:23*	Cannot be changed
Plow 9 forward	3-XM1:22*	
Plow 9 reverse	3-XM1:21*	
Belt 10	3-XM1:20*	Cannot be changed
Plow 10 forward	3-XM1:19*	
Plow 10 reverse	3-XM1:18*	
Belt 11	3-XM1:17*	Cannot be changed
Plow 11 forward	3-XM1:16*	
Plow 11 reverse	3-XM1:9*	
Belt 12	3-XM1:10*	Cannot be changed
Plow 12 forward	3-XM1:3*	
Plow 12 reverse	3-XM1:4*	
Belt 13	4-XM1:23*	Cannot be changed
Plow 13 forward	4-XM1:22*	
Plow 13 reverse	4-XM1:21*	
Belt 14	4-XM1:20*	Cannot be changed
Plow 14 forward	4-XM1:19*	
Plow 14 reverse	4-XM1:18*	
Belt 15	4-XM1:17*	Cannot be changed
Plow 15 forward	4-XM1:16*	
Plow 15 reverse	4-XM1:9*	
Belt 16	4-XM1:10*	Cannot be changed
Plow 16 forward	4-XM1:3*	
Plow 16 reverse	4-XM1:4*	

Output	Default	Setting
Hatch open	XM2:20*	Cannot be changed
Hatch close	XM2:21*	
Feeding A		
Feeding B		
Feeding C		
Feeding D		
Feeding E		
Feeding F		

4.13.2 SMS control codes

You can change the mixture-specific change percentages of the belt feeder via SMS. Changes are permitted from the numbers on the list of contact phones regardless of whether the numbers in question are in use or not.

The SMS format is:

```
Mx y [Mx y] ...
```

Where:

- **M** is the unchangeable message identifier.
- **x** is the mixture number.
- **y** is the desired change percentage.

Note: There must be space between the mixture number and change percentage.

If you want to, for example, set the change percentage for mixture three at 110% and the change percentage for mixture four at 90%, enter the message **M3 110 M4 90**.