FASTERHOLT
IRRIGATORS

OPERATOR INSTRUCTION
FOR
PROGRAM RAIN 10 - 12

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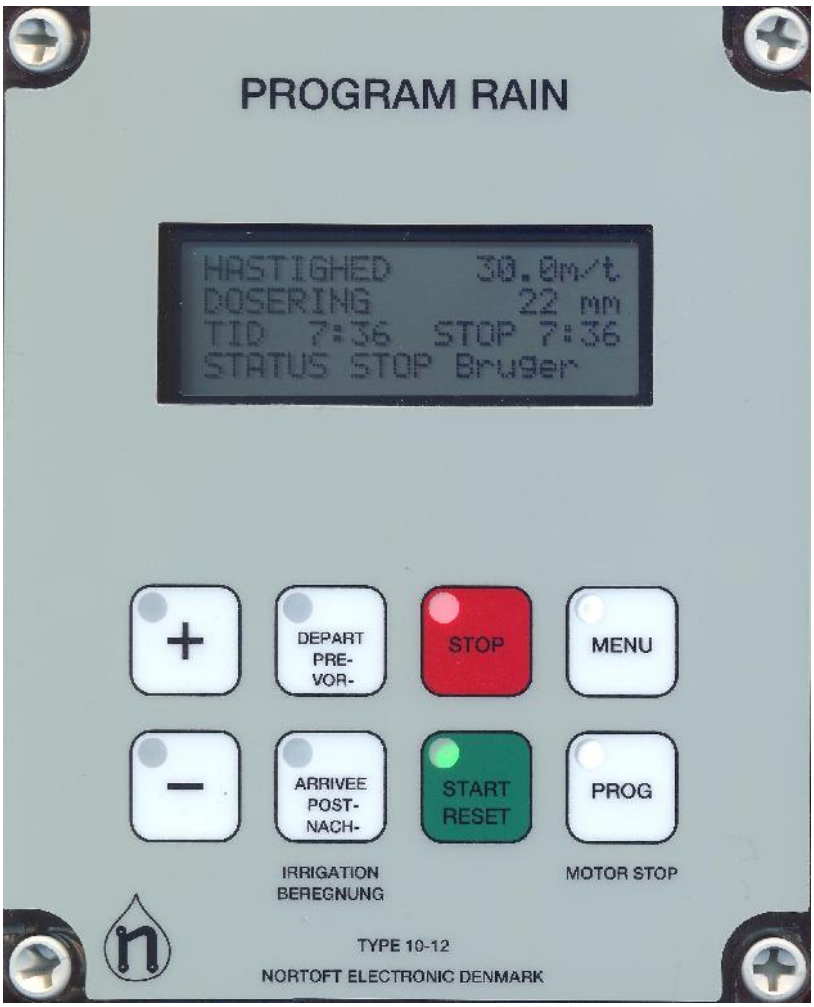
Dato: 25-02-2014

Fasterholt Maskinfabrik A/S
Program Rain 10-12



Features:

Speed regulation
Pre- and post-irrigation
4 different speeds
Clock
Start time is adjustable
Stop time is shown in the display
Length of the pipe
Actual speed
Battery voltage

Charge regulation
Pressure sensor
Stop sensor
Speed sensor
Motor 1, regulation motor
Motor 2, stop motor
Slowly start of turbine
Slowly opening for inlet of water

GSM SMS messaging for remote control

Short hand manual

Place machine:

```
SPEED  30.0m/t
DOSE   22 mm
TIME   7:28 STOP 7:28
STATUS STOP Sensor
```

Place machine at hydrant, Display shows the same start and stop time. Wheel out hose to the end of lane. (ex 250m)

Select speed:

```
SPEED  30.0m/t
DOSE   22 mm
TIME   7:56 STOP17:16
STATUS STOP Sensor
```

Display now shows stop after 8h20m. Press "**+**" or "**−**" keys for the right speed. Speed can be changed during Irrigation.

```
SPEED  25.0m/t
DOSE   26 mm
TIME   7:58 STOP17:58
STATUS STOP Sensor
```

SPEED has decreased, **DOSE** and **STOP** has increased.

Start irrigate, select PRE- and POST irrigation.

```
SPEED  25.0m/t
DOSE   26 mm
TIME   7:58 STOP17:58
STATUS STOP Sensor
```

Press **START** for starting. For PRE- and POST Irrigation, press **PRE-**and**POST-**irrigation key's. STOP time will increase when pressing PRE- and Post irrigation.

Starting:

```
SPEED  25.0m/t
DOSE   26 mm
TIME   8:00 STOP18:38
STATUS Running
```

Turbine will start, as water pressure increases. After a while the regulator finds the correct speed. Irrigation is continued until end of lane and **STOP SENSOR** is activated.

-PRE irrigation:

```
SPEED  25.0m/t
DOSE   26 mm
TIME   8:02 STOP18:38
STATUS PREirrigation
```

If PRE irrigation is activated, the turbine will stop again immediately and PRE Irrigation takes place. When pre irrigation time has elapsed, turbine starts and state changes to **Running**.

-POST irrigation:

```
SPEED 25.0m/t
DOSE  26 mm
TIME  18:20 STOP18:38
STATUS POSTirrigation
```

If POST irrigation is activated, the turbine will stop at the end, when stop sensor is activated, and POST Irrigation will take place.

Stop:

```
SPEED 25.0m/t
DOSE  26 mm
TIME  18:38 STOP18:38
STATUS STOP Sensor
```

Stop sensor is activated, Turbine and Irrigation is shut down. Machine is ready for disconnection and transport to a new lane.

MENU's

```
SPEED 30.0m/t
DOSE  22 mm
TIME  14:10 STOP 7:43
STATUS Running
```

Standard readout

```
ZONE  1  30.0m/t
DOSE  22 mm
TIME  14:10 STOP 7:43
STATUS Running
```

Standard readout, Zone Active

```
DISTANCE    123m
BATTERY     12.8V
CHARGE ON   0.231A
PRE. 0:45 POST 0:45
```

Press the key ***MENU*** once for showing menu 2

```
PRESS SENSOR       ▐
STOP  SENSOR       ▐
SPEED SENSOR      ▐ ▐
MOT1 0.0A MOT2  1.8A
```

Press the key ***MENU*** twice for showing menu 3

```
ACTUAL SPEED   22m/t
START          0:00

WORKING HOURS  123t
```

Press the key ***MENU*** three times for showing menu 4

```
  0m    30.0m/t   0m
  0m    30.0m/t   0m
  0m    30.0m/t   0m
  0m    30.0m/t   0m
```

Press the key ***MENU*** four times for showing menu 5

```
SIGNAL  23
NETWORK HOME
A: +45123456
B: +45234567
```

Press the key ***MENU*** five times for showing menu 6
(Only when GSM is selected)

When the sign ▐ is shown in the display, it means that this function is ON

Standard menu:

```
SPEED 30.0m/t
DOSE  22 mm
TIME  14:10 STOP 7:43
STATUS Running
```

Standard readout

SPEED Speed can be changed at any time during the irrigation, using "**+**" and " **–**" keys.

ZONE Actual Zone 1.4 with corresponding speed. Speed cannot be changed. (Zone Active)

DOSE Dose is calculated by means of constants, and shows the actual mm for irrigation. When **SPEED** increases, **DOSE** decreases. (Constants 11 and 12)

TIME To set the time: first set the speed to 11.1 m/h, and then press the ***PROG*** key 3 times, showing <**CONST 1 TIME**>, the time can then be set with the "**+**" and " **–**" keys. When the battery has been removed the time is 00:00, and is remaining zero until it is set.

STOP Time when the irrigation is finished incl. pre- and post-irrigation.

STATUS Status of irrigating ei:

```
<Stop Sensor   >
<Running       >
<PRE irrigate  >
<POST irrigate >
<LOW pressure  >
```

see explanation in **STATUS** chapter.

If the display shows: **LOW BAT** instead of SPEED, the battery voltage is lower than 11.8 V, and the battery need to be charged.

MENU 2

```
DISTANCE      123m
BATTERY       12.8V
CHARGE ON     0.231A
PRE 0:45 POST 0:45
```

DISTANCE

The remaining length of the pipe. Distance can be changed immediately after pressing ***PROG*** key 3 times, with the "**+**" an " **–**" keys.

BATTERY

The battery voltage.

CHARGE ON

Shows if the battery id charged from the solar panel.
The battery is charged when the voltage is below 14.0 volt.

PRE.

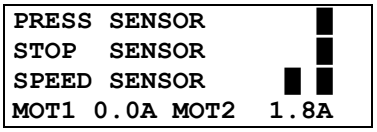
The actual pre irrigation time.

POST

The actual post irrigation time.

Pre- and Post irrigation time can be changed immediately after pressing ***PRE-*** or ***POST-*** with the "**+**" and " **–**" keys.

MENU 3



PRESS SENSOR

Shown if the pressure is high. The marker is on, when the water pressure is high.
The machine can only work when the pressure is high.

STOP SENSOR

Shown if the stop switch is activated. The marker is on, when the stop switch is on.
The machine can only work when the stop switch is on.
The stop switch has 3 functions:

1: Resets the distance counter
2: Post-irrigation
3: Inhibits the pulses to the regulator-motor.

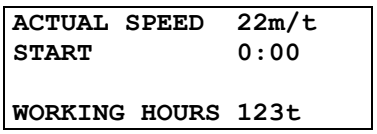
SPEED SENSOR

For testing the speed sensor. The markers is on, when the magnets activates the speed sensors.

MOT1, MOT2

The actual power used by motor. The motor is stopped when the power exceeds 4.5 A.
If the power exceeds 4.5 A, and the motor has not reached the end position, there is a blocking inside the valve.

MENU 4



ACTUAL SPEED

Shows the actual speed that means the speed the machine is running now. This can be used to check the maximum running speed for the machine, if the Program Rain is set to a much higher speed than the machine can run. The actual speed can differ from the set speed, especially in the start, this is not an error because the Program Rain ensures that the mean speed over 10 m is correct.

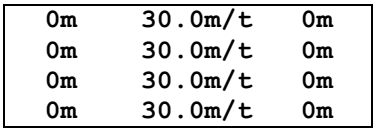
START

The starting time. This is a time delay so that the machine will start up to 24 hours later. To set the starting time, press the ***PROG*** key 3 times and the time can be set by using the "**+**" and "**–**" keys.

WORKING HOURS

The total working hours since the eletronic was started the first time.

MENU 5



This is for irrigation with 4 different speeds in the retraction.
Press the ***PROG*** key 3 times for programming the zones.
See later in this paper for more details.

MENU 6

```
SIGNAL  23
NETWORK HOME
A: +45123456
B: +45234567
```

SIGNAL	GSM signal strength.
NETWORK	GSM netwok type
A:	First ophone number on "SMS" list.
B:	Second phone number on "SMS" list.

Detailed explanation in chapter GSM.

START:
The turbine can only start if the magnet activates the stop sensor (or stop sensors), see menu 3 for controlling the stop sensor. When the ***START*** key is pressed, the main valve opens. Next the by-pass valve closes (the turbine starts). If the magnet does not activate the stop sensor, it is only the main valve that opens; this is used if the pressure should be released before disconnecting the hose at the hydrant.

DELAYED START TIME OF IRRIGATION
First press ***STOP*** key for closing for inlet of water. Next press ***PROG*** key 3 times (Menu 3) and you can set the start time. Then at last select Pre- or post irrigation if wanted.

STOP:
When the magnet is removed from the stop sendor, the turbinde stops and the main valve closes (opens at low-pressure stop). If porst-irrigation is chosen, the turbine stops and after the post-irrigation time, the main valve closes. If the key ***STOP*** is pressed, the turbine stops and the main valve closes regardless of post-irrigation.

SUPERVISION:
The Program Regn has a built-in system for supervision. The supervision starts to work if , for some reason, the machine irrigates at the same place longer than the specified time. This time is factory adjusted to 20 minutes. See programming for changing the time. If it is set to 0, there is no supervision.

SPEED:
The speed is adjusted with the "**+**" and "**–**" keys. First the speed changes in step of 0.1 m/t. Then after 10 steps it changes by 1.0 m/h. tælles op med 1 m/t. The speed can be changed any time, even when the machine i running. If the time is changed it shows the new time for the remaining irrigation.

PRE-IRRIGATION:
Pressing the key ***PRE-*** can activate pre-irrigation. The time for pre-irrigation is calculated by the Program Rain as 8 x the time for running 1 metre at the actual speed. The constant ” 8 ” (constant no. 2) can be changed, see programming. If the pre-irrigation is om, the machine starts and run ½ metre, then it stops for the pre-irrigation time. By pressing the key ***START*** the pre-irrigation is cancelled. The magnet at the stop sensor should be in place before activating the pre-irrigation.

POST-IRRIGATION:
Post-irrigation can be activated by pressing the key ***POST-*** . The time for post-irrigation is calculated by the Program Rain as 8 x the time for running 1 metre at the actual speed. The constant ” 8 ” (constant no. 3) can be changed, see programming. The post-irrigation starts to count down when the magnet is removed from the stop sensor. When the magnet is removed, the motor for speed regulation stops the turbine. After the post-irrigation time, the main valve closes, (opens at machines with stop for low pressure). At machines with only one motor for speed regulation, the turbine starts after the post-irrigation time. By pressing the key ***START*** the post-irrigation is cancelled. The magnet at the stop sensor should be i place before activating the post-irrigation. If Early stop, constant #8, is selected, this function is activated. Shutdown will take place when distance is reached.

PROGRAMMING OF 4 DIFFERENT SPEEDS:
The display should be set to the 5th menu. The pip eshould be pilled out before programming, so the computer knows the distance of the field to be irrigated. In the following it is assumed that the field length is 400 metres. Press the ***PROG*** key 3 times and the display will show:

```
400m     30.0m/t   0m
  0m     30.0m/t   0m
  0m     30.0m/t   0m
  0m     30.0m/t   0m
```

The desired speed can now be set, here 25.0 m/h, then press the ***PROG*** key once, and the display will show:

```
400m     25.0m/t   0m
  0m     30.0m/t   0m
  0m     30.0m/t   0m
  0m     30.0m/t   0m
```

The desired distance can now be set, here 300 m, then press the ***PROG*** key once, and the display will show:

```
400m     25.0m/t 300m
300m     30.0m/t   0m
  0m     30.0m/t   0m
  0m     30.0m/t   0m
```

Now the first zone is programmed, and the procedure is continued for all 4 zones. Zone 4 automatically ends at 000 m.
When zone 4 is programmed press again the ***PROG*** key and the dispaly will sjow:

```
DELETE   PRESS   MENU
SAVE     PRESS   PROG
```

Is the ***PROG*** key is pressed the program is saved, and the watering is carried out according to the program.
If the ***MENU*** key is pressed the program is deleted, and the speed is the same for the whole field.

STATUS	Status messages in display
EMERGENCY:	Machine has not been started, anyway speed pulses is received and it is trying to maintain the speed requested.
RUNNING:	The machine is irrigating, and everything is working properly.
LOW PRESSURE:	Water pressure is below pressure switch treshold. Machine acts depending on Machine data.
STARTING:	Operator has pressed ***START*** key, and start sequens is in process.
START REMOTE:	Machine is starting due to an ***SMS.***
START DELAY:	Machine is waiting for start delay to elapse. (See menu 4).
START PRESSURE:	Machine has started due to pressure rise. Machine is using pressure level, to start 2'nd machine on string.
START DENIED:	Operator is holding ***STOP*** key to prevent ***PRESSURE*** and ***REMOTE*** start.
STOP USER:	Machine has stopped due to operator ***STOP.***
STOP REMOTE:	Machine has stopped due to an ***SMS.***
STOP SENSOR:	Machine has reached end and is stopped by ***STOP SENSOR.***
STOP DISTANCE:	Machine has reached distance for stop. (See constant for early stop).
STOP DELAY:	Machine has reached stop but waits nn Seconds to proceed stop sequence.
STOP DENIED:	Operator is pressing ***START*** key, preventing ***REMOTE*** stop.
SUPERVISION TIME:	Machine has stopped due to supervision time is elapsed. Machine has not moved in nn minutes. (See constant for supervision time).
FORCE LOW PRES:	Machine opens valve, to force pressure drop, to stop main pumpe. After 2 minutes, valve closes to prevent draining of pipes.
PRE IRRIGATION:	Machine is performing pre irrigation
POST IRRIGATION:	Machine is performing post irrigation

There are different constants that can be set by the user.
These constant will be saved for years even if the battery is disconnected.

Programming procedure:
The speed should be adjusted to **11.1 m/h** to reach the constants.
Press rapidly the ***PROG*** key 3 times to gain access to change the constants.
Then by pressing the ***PROG*** key, it steps forward to the constant, which should be altered.
With the "**+**" and " **–**" keys the constant value can be changed. Press the ***MENU*** key to save, and the Program Rain display goes back to normal. If the ***MENU*** key is not pressed, the Program Rain switches back to normal after 1 minute, and the changes of the constants are not saved.

The user can change the following constants:

Constant number flashing digits		Possible setting	Factory setting
0	Enter 111 to reach machine data		100
1	Time in line 2 is set	00:00 - 24:00	00:00
2	Pre irrigation: 8 steps = time for 8 m. Forward drive at the actual pace	0-15 steps	8
3	Post irrigation: 8 steps = time for 8 m. Forward drive at the actual pace	0-15 steps	8
4	Supervision time Supervision time: 0 = no supervision	2-99 min.	20
5	Languages: 1 = English, 2 = Danish, 3 = German, 4 = French, 5 = Dutch, 6 = Swedish, 7 = Spanish, 8 = Italian, 9 = Polish, 10 = Japanese	1-4	2
6	0 = Stop for high pressure slow shutdown 1 = Stop for low pressure, valve opens and close again after 3 minutes 2 = Motor for stop disconnected	0-2	0
7	Pipe length [m], if the length has been deleted		
8	Early stop [m] (* Is only performed when Post irrigation is selected *)	0-1000	0
9	Post irrigation before stop [m]	0-1000	0
10	Distance for alarm [m] (0 = no alarm)	0-1000	0
11	Water flow [m3/h]	5-120	50
12	Spacing between irrigation lanes [m]	5-100	75

Constant nr. 11 (the code) is set to 111 to enter the machine data.
Then press ***PROG*** and the machine data is shown.

The user can change the following machine data:

Machine data Number Flashing digits		Possible setting	Factory setting
0	Pipe length	0-1000 m.	Not used
1	Pipe diameter	40-200 mm.	Not used
2	Reel drum int. diameter	500-3000 mm	Not used
3	Number of windings of pipe per layer	5.00-30.00	Not used
4	Large cogwheel on reel drum	50-1000	Not used
5	Small cogwheel on gearbox	5-40	Not used
6	Number of magnets	1-20	Not used
7	Ovality compared 100 %	0.70-1.00	Not used
8	Length of first pulses to stop valve	0-45 sec.	3
9	Length of following short pulses to stop valve	0-300 m/sec.	160
10	Time between short pulses to stop valve	1 - 5 sec.	2
11	Number of short pulses to stop valve	0 - 250	100
12	Mechanic stop (with only 1 motor) Electric stop (Closed low pressure) even if pressure switch detect low pressure	0 1	1
13	Length of pulses to regulation motor at start (Oil pump motor 1)	26.1-0.9 sec.	4.5
14	Pressure switch not mounted Pressure switch mounted (to start/stop) or Radio start Pressure switch mounted: (can be used (to start only) for 2 machines on the same system. Auto start with special pressure switch.)	0 1 2	1
15	Running length per pulse: 0 = running by the formula FM 4300 + 4300H = (2 magnets) = 73.5 mm. FM 4500 + 4500H = 85.0 mm. Rear axle with 6 bolts FM 4500 + 4500H (4 magnets) = 42,5 mm FM 4700 = 106.6 mm. Rear axle with 8 bolts FM 4700 (4 magnets) = 53.3 mm. FM 4800 (4 magnets) = 53.3 mm. Rear axle with 8 bolts FM 4900 = 103 mm. Rear axle with 8 bolts FM 4900 (4 magnets) = 51.5 mm. FM 5500 (4 magnets) = 62,5 mm	0-160.0 mm.	
16	Speed sensor 0 = Round sensor for roller 1 = Double sensor	 0 1	1
17	Opening of main valve 0 = Fast opening 1 = Slow opening	 0 1	0
18	Pressure switch 0 = Main valve stay open at low pressure 1 = Main valve closes at low pressure	 0 1	0
19	Delay from stop sensor to the turbine stops (sec)	0	0

The Program Rain can be adjusted to 2 different types of sensors.

See Machine Data #16 Sensor

One is a round sensor 60 mm in diameter and 4 sensors inside; this is only for rollers with one magnet. When the battery is connected the display for 2 sec. shows **`VERSION n.n0`**.

The other is a square sensor, or 2 separate sensors; this is used for rollers with more than one magnet and for discs with 1 to 20 magnets.
When the battery is connected, the display will show **`VERSION n.n1`**. for 2 sec.

Cable connection

Double sensor.

Program Rain 10	**18 Pol Connector**	
Cable connection	**Version n.n1**	**Double sensor**
1 + Battery	Brown	12 V
2 - Battery	Blue	
3 + Solar Panel	Brown	
4 - Solar Panel	Blue	
5 Motor 1	Speed Regulation	
6 Motor 1	Speed regulation	
7 Speed Sensor 1 *	Blue	
8 Speed Sensor 1 *	Black	
9 Speed Sensor 2 *	Yellow/green	
10 Speed Sensor 2 *	Brown	
11 Stop Sensor	Blue or Brown	
12 Stop Sensor	Blue or Brown	
13 Motor 2		Stop Motor
14 Motor 2		Stop Motor
15 Pressure	Blue or Brown	
16 Pressure	Blue or Brown	
17 - BIP		
18 + BIP		

* If the distance counter count the wrong way, the speed sensor should be turned or sensor 1-1 swapped with sensor 2-2.

Round sensor

Program Rain 10		
Cable connection	**Version n.n0**	**Round sensor**
1 + Battery	Brown	12 V
2 - Battery	Blue	
3 + Solar Panel	Brown	
4 - Solar Panel	Blue	
5 Motor 1	Speed Regulation	
6 Motor 1	Speed regulation	
7 Speed Sensor	Blue	
8 Speed Sensor *	Black	
9 Speed Sensor *	Yellow/green (Red)	
10 Speed Sensor	Brown	
11 Stop Sensor	Blue or Brown	
12 Stop Sensor	Blue or Brown	
13 Motor 2		Stop Motor
14 Motor 2		Stop Motor
15 Pressure	Blue or Brown	
16 Pressure	Blue or Brown	
17 BIP -		
18 BIP +		

* If the distance counter count the wrong way, the cables on terminal 8 and 9 must be swapped.

Program Rain 10	**6 Pol Connector**	
19 + GSM	Brown	+12 V
20 - GSM	Blue	
21 Reserved		
22 Reserved		
23 Reserved		
24 Reserved		

Technical data

Dimensions (h*w*d)	170*140*100
Voltage	10-15V dc
Current	6 mA (Idle) 30 mA (with GSM)
	80 mA (Light)
	5A motor max current
Fuse	5A Fast **5A Fast**

Fault localisation.

? The turbine can not start by pressing START. Pre-and post-irrigation can not take place.

Answer:
Magnet for stop-sensor is not on its place, or cable or sensor is damaged.
Stop sensor: The mark ■ must be on when the magnet is on place, and it disappears when the magnet is removed. See menu 3.
A damaged cable can be repaired but absolutely watertight. At least encapsulated in epoxy.
But a new sensor and cable is recommend.

If pressure sensor is used there must be pressure on the water. The mark ■ for pressure must be on.

? No digits in the display.

Answer:
Battery interrupts. Fuse inside the box is blown. The fuse is for wrong connection of + and - .
From the factory there are an extra fuse on a single fuse-holder on the printed circuit.
Fuse 5 A. Battery electric voltage 12 V. See menu 2.

? The clock shows 00:00.

Answer:
If the power has been interrupted the clock will go to zero. Therefore instead of showing the finishing time it is the number of hours and minutes to the irrigator is finished that is shown. If the clock is set the time to the irrigator has finished will be show. See setting the clock.

? Distance meter is not correct and the speeds not correct.

Answer:
See after damaged cable or sensor. The 2 marks ■ ■ must during pulling out the tube appear in order from the left as following: The first appear the second appear the first disappear the second disappear. During retraction it must go in opposite order. See menu 3 speed sensor.
It is the same if a roller running on the tube measures the speed.

? Only maybe the half or 2/3 of the real length is counted up.

Answer:
The stop mechanism can be activated a short time by hopping of the tube or if the windings around the drum are losing. It can cause the magnet removed from the stop sensor a short moment. It will set the counter to zero.
In spite of the meter of the tube is not correct the irrigator will run to the end and stop normal. But incorrect speed depends of the incorrect registration of the actual layer.
If wanted the correct number of metre can be set in. See CONSTANT no 7.

The most used combination of different constants:

With constants factory adjusted the machine always will run. But there are different conditions from farm to farm and there are also different wishes from the farmer. Therefore some constants can be adjusted for local wishes.

1. Slow start of turbine.
Machine data no. 13 is adjusted to 2-4 to start. Now the valve for control of speed will close about half and continue stepwise until the adjusted speed are reached. Correct adjustment is: Continuously closing of the valve until the turbine is start running and stepwise until adjusted speed is reached.

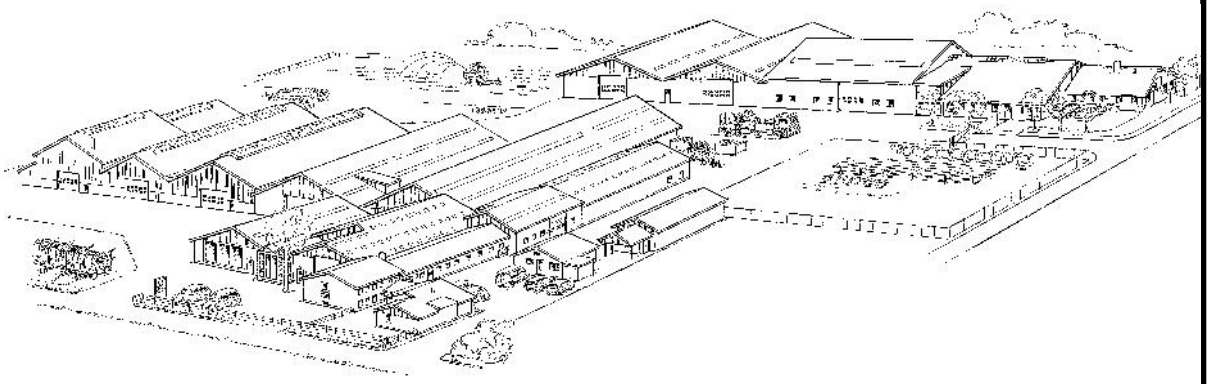
2. Slow opening for inlet of water.
Machine data no. 17 is set to 1. Opening for the water will be stepwise.

3. Only 1 motor for speed regulation.
Machine data no. 12 is set to 0. Post irrigation will take place as following: When the stop sensor is activated the turbine stops. After the time for post irrigation the machine start again and run to the mechanic stop.

4. Start up of no. 2 machine when no. 1 machine reaches the stop.
Machine data no. 14 is set to 2. Both machines must be equipped with adjustable pressure switch. Adjust the pressure switch to a point between normal pressure and the pressure when the pump will stop. For instance: Normal pressure can be 7 bar and pressure for pump stop 9 bar. Adjust the pressure switch to 8 bar on both the machines. Start no. 1 machine as normal by pressing start. Set up no. 2 machine but press stop. When no. 1 machine comes to slow close down, no. 2 machine will start up when the pressure reach 8 bar. Please note that if the field's height difference is too large, the necessary pressure differences, the pressure switch may be set to be too large

5. Stop the machine because of low pressure and pressure switch mounted.
Constant no. 6 is set to 1 and machine data no. 12 must be set to 2. (= Stop motor from turning in opposite direction.) It means that with the same cable connection to the motor, the valve will open instead of closing for stop. After 2 minutes the valve closes again, otherwise it is impossible to obtain pressure to start. When machine data 12 is 2, the valve only opens in connection with the stop-sensor, stop-button and supervision. But not when the pressure switch is turned off.

6. Pre-irrigation before the gun reaches the stop.
Constant no 9 can be set to the number of meters; you want the gun to stop before the end stop. Now post irrigation should take place before the pipe starts lifting the gun wagon, which causes a wrong position of the gun. This can be up to 15 meters before the end stop. The drive stops within post irrigation og then run to normal stop.



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