

Aquarium controls

Task definition

easy is required to automatically control the aquarium lighting and the temperature in the living room of a house during the holiday period.

The aquarium lighting is switched on or off with selector switch S2 or via a time switch (H01) or manually (I01).

Time setting of the time switch:

Time switch H01 = Channel A: Mo - Su 06:00 - 22:00

The temperature of the water must be kept between 22° and 28 °C. This means that easy monitors the temperature and uses comparison functions to switch the heating on and off according to the water temperature.

easy switches the heating on at a temperature below 22 °C until the water temperature reaches 28 °C. easy then switches off the heating and does not switch the heating on again until the temperature falls below 22 °C.

Note!

In this example, an analog value is set for the temperature values. This value has to be determined and parameterised according to the sensor on the aquarium.

You determine the switch-on point via A01 and switch-off point via A02.

The oxygen pump and the filter is switched on and off manually.

Device class used

easyE4

Wiring

Inputs

- I01 S1 Lighting manual on/off
- I02 S2 Selector switch for Manual/Auto lightning
- I03 S3 Button for filter and oxygen
- I07 B1 Temperature sensor
(Analog input: 10 V = 1023)

Outputs

- Q01 H1 Lighting
- Q02 K1 Heating
- Q03 K2 Filter pump
- Q04 K3 Oxygen pump

Parameters

- A01 Switch-on point
- A02 Switch-off point
- H01 Lighting time switch

Safe code lock control

Task

“easy” is required to implement a code lock for access control.

The length of the code is limited to 8 digits. The code can consist of up to 7 different digits. All other digits not required for the code must be associated in parallel with input I8 via the hardware. The number sequence of the code can be selected as required, however, the same digit cannot be used twice in succession (incorrect: 4711).

The entire code must be entered within a set time (default setting: 8 seconds). If an incorrect digit is entered (also unassigned digits = I8), the previous entry is invalid and is cleared. A wait time of 10 seconds must elapse before a new entry is made.

The 10 second entry pause is restarted every time that entry is made during the wait time. If the code is not correct, an indicator light is activated after the entry time (8 sec.) has elapsed and is not switched off until the wait time has elapsed.

Once the correct sequence of digits has been entered, the lock is released for 5 seconds after a time delay (3 sec.).

In the example: required code: 12135156

→ easy input assignment:

1	>	I1
2	>	I2
3	>	I3
5	>	I5
6	>	I6
4,7,8,9,0	>	I8

Wiring

1. Inputs:

I1-I7 Assignment of entry keypad (1-7 different digits)

(e.g.: I1=> 1. I2 => 2. I3 => 3,..., I7=> 7)

I8 Assignment of remaining digits of the entry keypad (e.g. digits 8,9,0)

2. Outputs:

Q1 Open code lock

Q2 Indicator light H1I (code entry aborted)

3. Parameters:

T1	Wait time on incorrect entry (10 sec.)
T2	Duration of code entry (8 sec.)
T3	On-delay of door opener (3 sec.)
T4	On-delay of door opener (5 sec.)

Feed control system

Task definition

easy is required to control automatic feeding systems in a pond. Trout should be fed at different times depending on size and age. A fault message is to be output when the feeding container is empty.

An automatic feeding system consists of a conical container with a motor for the extruder screw. The metering of the feed quantity is determined by the on duration of the motor. The longer it is switched on, the more rotations occur, and therefore the more feed is metered. The conical container design and the vibration of the motor ensure that feed is always supplied.

Automatic feed system 1 at output Q1 supplies the breeding pond. Feed is to be provided each day at hourly intervals between 8:00 am and 18:00 pm. This means that each day a 2-second pulse activates the feed screw motor at hourly intervals between 8 am and 18:00 pm. However, feed is only supplied if the on switch at I1 is actuated and the level indicator at I4 signals "Full".

The second automatic feed system is activated for 2 seconds each day at 12:00 pm and at 16:00 pm, and at 8:00 am over the weekend.

The third automatic feed system is activated for 2 seconds at 9:00 am and 15:00 pm from Monday to Saturday.

Systems 2 and 3 also only supply feed if the on switch at I2 and I3 are actuated and the level indicator at I5 and I6 outputs a "Full" signal.

If one of the automatic feed systems is empty, this is indicated by a signal light via Q4.

Device class used

easy-E4

Wiring

Inputs

I01	On switch - automatic feed system 1
I02	On switch - automatic feed system 2
I03	On switch - automatic feed system 3
I04	Level switch - automatic feed system 1
I05	Level switch - automatic feed system 2
I06	Level switch - automatic feed system 3

Outputs

Q01	Automatic feed system 1
Q02	Automatic feed system 1
Q03	Automatic feed system 3
Q04	Filling level signal lamp

Parameters

H01	Daily signal 1
H02	Daily signal 2
H03	Daily signal 3
T01	1 h clock pulse container 1
T02	2 s Pulse container 1
T03	2 s Pulse container 2
T04	2 s Pulse container 3

Mixing plant

Task definition

The plant consists of two tanks, a mixing tank, a stirrer and an ultrasonic sensor that monitors the filling level in the mixing tank. The plant can be run in Manual and Automatic mode.

Manual mode (S2 switched off)

All valves and the stirrer can be switched on and off independently.

Automatic mode (S2 switched on)

In Automatic mode, the ultrasonic sensor checks whether the mixing tank is empty.

Only when the measured value at I07 is less than 4 does the plant switch to Automatic mode. The plant starts up as follows if the tank is empty:

After a delay of 2 seconds (T01), the valve for tank 1 (Y1) opens until the first level (2.5 V) of the sensor is measured. The stirrer then switches on for 10 seconds. There is a pause of 5 seconds after stirring. Only then does the valve Y2 of the second tank open. Once the second level is reached, the stirrer switches on for 20 seconds.

In order to mix both components sufficiently, there is an additional stirring phase of 20 seconds after a pause of 8 seconds. Once this stirring period has elapsed, the drain valve opens Y3.

The stirrer stays switched on while the mixture runs out until level 1 is reached. Only when the ultrasonic sensor detects the empty state of the tank can the process be restarted after 2 seconds.

This is repeated until the main switch S1 is switched on and no manual operation is selected.

Device class used

easy-E4

Wiring

Inputs

I01	S1 Main switch (ON/OFF)
I02	S2 Main/Automatic selector
I03	S3 Button for valve Y1, tank 1
I04	S4 Button for valve Y2, tank 2
I05	S5 Button for valve Y3, mixing tank
I06	S6 Button for stirrer motor
I07	Analog input for level monitoring via the measuring sensor

Outputs

Q01	Y1 Valve for tank 1
Q02	Y2 Valve for tank 2
Q03	Y3 Valve for mixing tank
Q04	M1 Motor for the stirrer

Parameters

T01	On-delay for open Y1
T02	Stirrer time 1, 10s
T03	Pause time 1, 5s
T04	Stirrer time 2, 20s
T05	Pause time 2, 8s
T06	Stirrer time 3, 20s
A01	$I07 \leq 4$ Mixing tank is empty
A02	$I07 \leq 258$ (2.5 V) Level 1
A03	$I07 \leq 630$ (6.0 V) Level 2

Filter basin control

Task

In order to prevent the excessive contamination of a filter tank in a waterworks, “easy” is required to rinse the basin at regular intervals.

The filter basin is rinsed weekly (every Monday at 12 PM) for a quarter of an hour. At the start of rinsing the water supply must be disconnected. A pump is then switched on with a time delay, in order to backwash the drained basin.

After a runtime of 15 minutes the pump is switched off again.

After a further time delay the valve for the water supply is reopened again
An indicator light (H1) switches on as soon as the rinsing operation is started. A

short horn signal sounds at the start and the end of each rinsing operation.

Wiring

1. Inputs:

I1 Switch S1 (system ON/ OFF)

2. Outputs:

- Q1 Supply valve Y1 (OPEN / CLOSE)
- Q2 Pump M1 (flood filter basin ON / OFF)
- Q3 Indicator light H1 (“Filter basin cleaning”)
- Q4 Horn E1 (“Rinsing - Start / End”)

3. Parameters:

- T1 On-delay pump M1 (rinsing)
- T2 On-delay, open water supply valve Y1
- T3 Pulse duration for horn (rinsing)
- H1 Weekly time of filter basin - rinsing

Fountain control

Task

“easy” is required to control four different fountain jets.

After switching on the fountain via main switch S1, the jets are switched on one by one at specific time intervals. Once all the jets are switched on, jets 2-4 are switched off in order to be switched on again consecutively. Jet 1 is switched on permanently. A time switch and an analog value processing function ensure that the fountain is only in operation at set times of the day and when the temperature is at least +4°C.

Wiring

1. Inputs:

- I1 Main switch S1 (ON/ OFF)
- I7 Analog input for temperature measuring

2. Outputs:

- Q1 Fountain jet E1
- Q2 Fountain jet E2
- Q3 Fountain jet E3
- Q4 Fountain jet E4

3. Parameters:

- T1 On-delay jet 2
- T2 On-delay jet 3
- T3 On-delay jet 4
- T4 Off-delay jet 2-4
- A1 I7 $\geq 4.4V$ Outdoor temperature = +4°C Fountain ON A2
- I7 $\leq 4.2V$ Outdoor temperature = +2°C Fountain OFF
- H1A On time Mon-Fri
- H1B On time Sat-Sun

Garden pond control

Task

“easy” is required to control the fountain pump in a garden pond as well as the lighting of the fountain, pond and garden.

If the system is in Automatic mode, time switches control the different switch times for the weekdays Monday to Friday and the weekend. The fountain, pond and garden lighting is not activated until a twilight switch is triggered in addition to the time switch.

If Automatic mode is deactivated, both the fountain pump and the three lighting systems can be switched separately.

Wiring

1. Inputs:

I1	Selector switch S1	(Automatic mode ON/ OFF)
I2	Switch S2	(fountain pump ON / OFF)
I3	Switch S3	(fountain lighting ON / OFF)
I4	Switch S4	(pond lighting ON / OFF)
I5	Switch S5	(garden lighting ON / OFF)
I6	Twilight switch S6	

2. Outputs:

Q1	Fountain pump E1
Q2	Fountain lighting H1
Q3	Pond lighting H2
Q4	Garden lighting H3

3. Parameters:

H1A	Watering time Mon-Fri
H1B	Watering time Sat-Sun
H2A	Lighting time Mon-Fri (fountain)
H2B	Lighting time Sat-Sun (fountain)
H3	Lighting time Mon-Sun (fountain)
H4	Lighting time Mon-Sun (garden)

Greenhouse Temperature Controls

Task definition

easy is required to control the sun blinds and the heating according to the indoor temperature in the greenhouse. The blinds are also pulled up when the wind is strong.

Selector switch S1 enables you to switch the system to Automatic or Manual mode (e.g. for servicing).

In Automatic mode a temperature sensor compares the measured temperature with the preset value via the analog input:

- If the measured temperature is above 19 °C the blinds are pulled down.
- If the temperature is below 15 °C, the blinds are pulled up and the heating switches on after a ten-minute delay (T01).
- The heating is then switched off again once the indoor temperature reaches 17 °C.

Note!

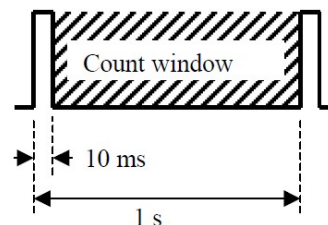
In Automatic mode the blinds can only be pulled up when the time switch is activated (Mo . Su, 8:00 - 18:00).

Time switch H01 = Channel A: Mo - Su 08:00 - 18:00

If the time switch is deactivated, the temperature inside the greenhouse is only regulated directly via the heating: at 15 °C ON and at 17 °C OFF.

To prevent the blinds from being damaged, these should be pulled up when there are strong winds. For this a wind meter measures the wind strength and supplies pulses to counter C01 by the rotation of the wind wheel.

The counter is parameterised so that it counts the pulses generated within 1 second (count window). After this second, the counter is reset by means of a 10 ms signal and starts to count the pulses again.



If the counter receives 10 pulses or more within the count window, it interprets this as a strong wind and activates marker M06 that initiates the pulling up of the blinds. The marker stays active for 20 seconds irrespective of the pulses counted during this time. The count window is not evaluated again until after the 20 second period has elapsed. If the wind is still too strong, the marker remains activated and the blinds remain pulled up. If less than 10 pulses are output during the count window, the marker becomes inactive. In this case, only the measured temperature determines whether the blinds are pulled up or down.

In Manual mode you can move the blinds up or down in jog mode via the P buttons on the easy.

P2 (Jog up)



P4 (Jog down)

Note!

The installed limit switches stop the motors for the blinds both for opening and closing the blinds.

Device class used

easy-E4

Wiring

Inputs

I01	S1 Selector switch (System: MANUAL/AUTOMATIC)
I02	S2 Wind speed signal
I07	Analog signal of the temperature sensor (A01, A02, A03)

Outputs

Q01	M1 Motor 1 down
Q02	M1 Motor 1 up
Q03	E1 Heating system

Parameters

T01	10-minute on delay for heating system E1.
T02	20 s up signal with wind.
T03	1s signal for counting the pulses of the wind meter
C01	Wind counter
A01	$I07 \geq 6.0V = 619$ (= 19 °C Blinds down)
A02	$I07 \geq 5.8V = 599$ (= 17 °C Heating OFF)
A03	$I07 \leq 5.6V = 578$ (= 15 °C Blinds up and heating ON)
H01	Time switch for blinds opening times

Greenhouse ventilation

Task description

easy is required to control the side windows and roof windows of a greenhouse.

The main switch S1 is used to switch the system on and off. Selector switch S2 is used to define whether the windows are to be moved automatically or manually.

Automatic mode

In Automatic mode, the windows open every three hours and close after a fixed time. The opening times are different:

- At 00:00, 03:00, 09:00, 15:00 and 21:00 hours the windows open for 15 minutes
- At 06:00, 12:00 and 18:00 hours they open for half an hour.

If it is raining (S5), the windows close after a delay time of 10 seconds. The windows cannot be reopened until it has stopped raining.

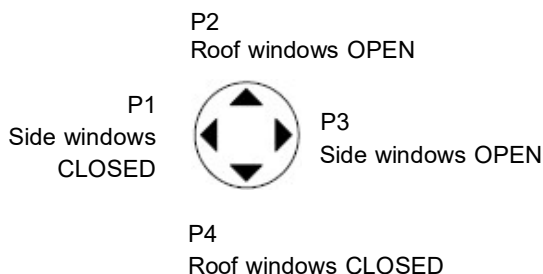
In strong winds, severe drafts must be prevented. For this, a wind monitor outputs a signal (S6) to easy in order to close the side windows.

Note

During servicing, you can bridge the contact of the time switch via S7 in order to test the Automatic function.

Manual mode

In Manual mode, you can use S3/S4 to open and close all windows together. To open or close the windows separately for servicing you use the P buttons on easy.



Note

The integrated limit switches stop the motors of the windows both for opening and closing.

Device class used

easy-E4

Wiring

Inputs

I01	S1 Main switch
I02	S2 MANUAL/AUTOMATIC selector
I03	S3 Manual mode: all windows OPEN
I04	S4 Manual mode: all windows CLOSED
I05	S5 Rain sensor
I06	S6 Wind sensor
I07	S7 Test Automatic function

Outputs

Q01	M1 Motor 1 side windows OPEN
Q02	M2 Motor 2 roof windows OPEN
Q03	M1 Motor 1 side windows CLOSED
Q04	M2 Motor 2 roof windows CLOSED

Parameters

T01	Run time of the side windows, 8 sec.
T02	Run time of the roof windows, 10 sec.
T03	500 ms pulse
T04	500 ms pulse
T10	Time delay for all windows CLOSED in the event of rain 10 sec.
H01+H02	Time switch, opening times of the windows

Time Settings of time switches

Time switch H01=	Channel A:	Mo – Su	00:00-00:15
	Channel B:	Mo – Su	03:00-03:15
	Channel C:	Mo – Su	06:00-06:30
	Channel D:	Mo – Su	09:00-09:15
Time switch H02=	Channel A:	Mo – Su	12:00-12:30
	Channel B:	Mo – Su	15:00-15:15
	Channel C:	Mo – Su	18:00-18:30
	Channel D:	Mo – Su	21:00-21:15

Greenhouse watering

Task definition

easy is required to control the watering of plants in a greenhouse. Watering is varied according to the plant type:

Type 1 covers water plants in a basin. A float switch always regulates the water level in this basin within a defined range.

The plants of the second type are required to be watered for 3 minutes via a time switch at 06:00 am in the morning and at 20:00 pm in the evening.

Time setting of the time switch:

Time switch H01 =	Channel A: Mo - Su	06:00 - 06:03
	Channel B: Mo - Su	20:00 - 20:03

The plants of the third type are watered every two days in the evening for 2 minutes when the twilight switch at I3 is activated.

Device class used

easy-E4

Wiring

Inputs

I01	Maximum value switch input
I02	Minimum value switch input
I03	Twilight switch
I04	Automatic . On switch

Outputs

Q01	Pump for plant type 1
Q02	Pump for plant type 2
Q03	Pump for plant type 3

Parameters

H01	Watering times for plant type 2
T01	2 minute watering pulse

Outdoor irrigation control with different programs

Task definition

easy is required to control an outdoor irrigation system, i.e. for irrigating fields.

Three different switches allow you to activate three irrigation programs which control up to three pumps.

- The first program runs the system in continuous operation, i.e. continuous irrigation.
- The second program irrigates at programmable day times.
- The third program only activates irrigation after a specific number of days without rain. The time of day can also be set in this program.

A selector switch allows you to select between pulsed irrigation and continuous irrigation. If pulsed irrigation mode is set, the water is discharged intermittently for short periods.

You can switch the entire system on or off via a main switch.

An indicator light flashes when a program is activated. If the light is continuously lit, this indicates an operator error (two or three programs active at the same time).

Easy used

easy-E4

Wiring

Inputs

I01	Main switch S1 (ON/OFF)
I02	Switch S2 (Program 1: Continuous operation)
I03	Switch S3 (Program 2: Time switch)
I04	Switch S4 (Program 3: Dry period)
I05	Selector switch S5 (pulsed/continuous irrigation)
I06	Rain sensor S6 (flashing: program active /continuous light: operating error)

Outputs

Q01	Irrigation pump E1
Q02	Irrigation pump E2
Q03	Irrigation pump E3
Q04	Indicator light H4

Parameters

T01	Flash pulse for indicator light
T02	Clock pulse or pulsed irrigation
T03	Pulse generation from counter signal
T04	Irrigation time . Dry period
H01	Irrigation pump program 3 (daily counter signal)
H02	Irrigation time program 2 (time switch)
C01	Counter (counts number of rain-free days before irrigation)

Outdoor irrigation system with time switch

Task definition

easy is required to control the timing of the entire outdoor irrigation system for a 4-pump installation. The individual pumps can be switched individually, and also for a set period.

The irrigation system serves four pumps that can be time controlled separately by means of individual time switches. The pump operating times can be set or modified in minute intervals. During extreme droughts, pushbuttons S2 to S5 can be used to manually carry out finely graduated additional watering. All the times set here can be modified online via the easy display.

Device class used

easy-E4

Wiring

Inputs

- I01 S1 Main switch
- I02 S2 Manual pump control E1
- I03 S3 Manual pump control E2
- I04 S4 Manual pump control E3
- I05 S5 Manual pump control E4

Outputs

- Q01 Pump E1
- Q02 Pump E2
- Q03 Pump E3
- Q04 Pump E4

Parameters

- T01 Additional watering for pump E1 (1.5 min.)
- T02 Additional watering for pump E2 (2.5 min.)
- T03 Additional watering for pump E3 (1.3 min.)
- T04 Additional watering for pump E4 (1.5 min.)

Time switches

- H01 Irrigation time for pump E1
- H02 Irrigation time for pump E2
- H03 Irrigation time for pump E3
- H04 Irrigation time for pump E4

Time switch H01=	Channel A:	Mo-Su	06:00 - 06:02
	Channel B:	Su	20:00 - 20:02
Time switch H02=	Channel A:	Mo-Su	09:00 - 09:04
Time switch H03=	Channel A:	Mo-Su	10:00 - 10:04
	Channel B:	Su	21:00 - 21:04
Time switch H04:	Channel A:	Mo-Su	12:00 - 12:06

Lighting with light intensity measuring

Task

A greenhouse lighting system consists of four lighting groups and is to be controlled by “easy” according to the light intensity measured. In Automatic mode the light intensity is measured with a light meter. This determines the number of lighting groups to be switched on. The lower the light intensity measured, the more lighting groups are switched on. The reference values for switching lighting groups on and off can be set individually. The lighting times are set via a time switch. The Automatic mode is activated via an ON and OFF switch. The individual lighting groups can be switched via the pushbuttons provided when Automatic mode is deactivated as well as outside of the lighting times.

Wiring

1. Inputs:

- I1 Switch S1 (Automatic ON/ OFF)
- I2 Light button S2 (lighting group H1)
- I3 Light button S3 (lighting group H2)
- I4 Light button S4 (lighting group H3)
- I5 Light button S5 (lighting group H4)
- I7 Analog input light intensity measuring

2. Outputs:

- Q1 Lighting group H1
- Q2 Lighting group H2
- Q3 Lighting group H3
- Q4 Lighting group H4

3. Parameters:

- A1 Switch on Light group H1
- A2 Switch off Light group H1
- A3 Switch on Light group H2
- A4 Switch off Light group H2
- A5 Switch on Light group H3
- A6 Switch off Light group H3
- A7 Switch on Light group H4
- A8 Switch off Light group H4
- H1 Duration of Automatic mode
- T1 Reset pulse of lighting groups