

# DOL 31 Speed Controller

## Technical User Guide



For other language variants of this document we refer to your local dealer or <http://docs.skov.com/1158>. Available from April 2016.



### Program Version

The product described in this manual holds software. This manual corresponds to:

- Software version 1.3

It was released in 2015.

### Product and Documentation Changes

SKOV A/S reserves the right to change this document and the product herein described without further notice. In case of doubt, please contact SKOV A/S.

**Date of change appears from the back of this manual.**



Installation, service and troubleshooting in connection with electrical equipment must be carried out by specialists in accordance with applicable national rules. In Europe in accordance with EN 60204-1 and other applicable EU rules.

The installation of a supply isolator is required for each motor and power supply, so maintenance of electrical equipment can be carried out in a dead environment. Supply isolator is not supplied by SKOV A/S.

### Note

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## PRODUCT DESCRIPTION

This manual deals with installation and connection of the DOL 31 speed controller. The layout of the manual follows the work routines required. By following the instructions of the manual, you will go through all steps in the correct order.

DOL 31 is a single-phase triac speed controller for e.g. regulation of fans, stand-alone heating units or light. DOL 31 can with advantage be used in applications where a complete climate controller is not required.

DOL 31 can be set to three different modes of operation:

- Automatic - Master mode in which the DOL 31 output is controlled on the basis of the ambient temperature. One DOL 12 temperature sensor is included with each DOL 31.
- Automatic - Slave mode in which the DOL 31 output is controlled by a 0 - 10 V input signal.
- Manual control in which the DOL 31 output is set manually by means of the keyboard on the front.

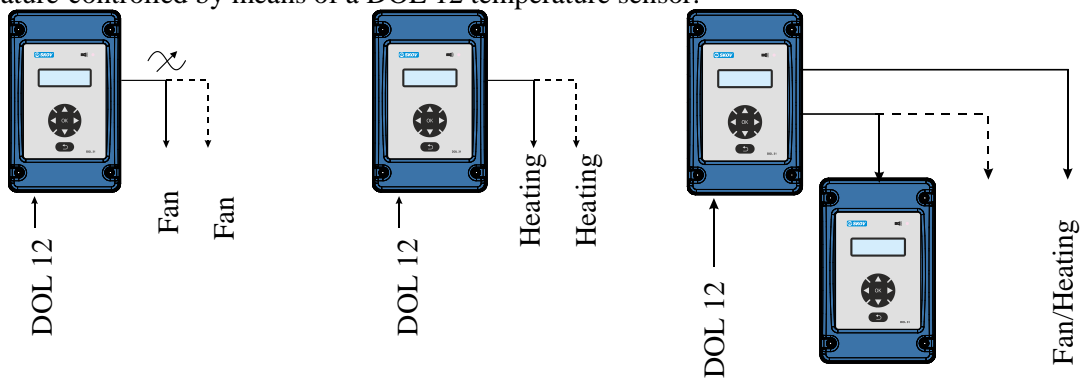
In addition, DOL 31 has an alarm relay (max. 24V, 1 A) plus a control relay (max. 230V, 12 A). The control relay could for instance be used for turning a heat source on and off.

DOL 31 speed controller is available in a 6.8 A and a 16 A version.

### 1 DOL 31 temperature-controlled

#### 1.1 Automatic - Master Mode

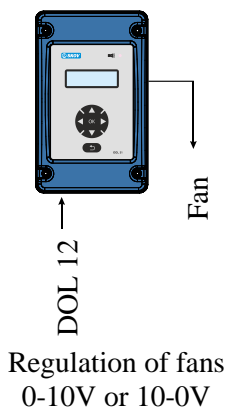
Temperature-controlled by means of a DOL 12 temperature sensor.



Regulation of fans

Regulation of heating

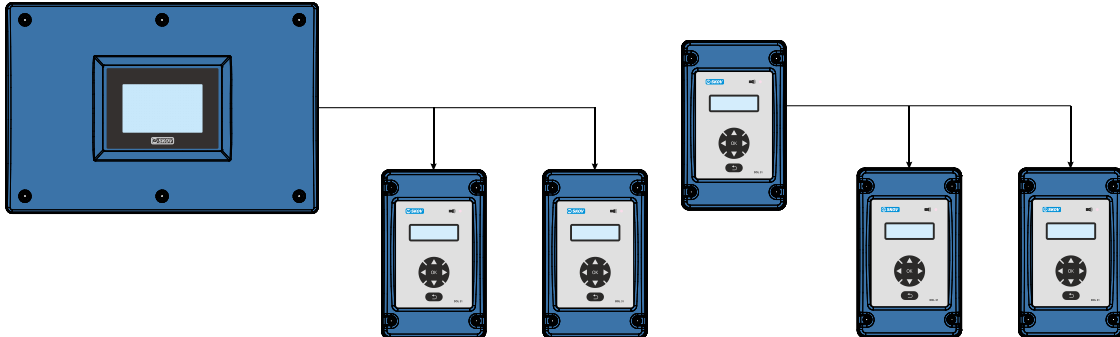
Controls one or several DOL 31, extended capacity



## 2 DOL 31 Slave Controller

### 2.1 Automatic - Slave Mode

Controlled by a 0 - 10 V input signal.



Controlled by SKOV A/S house computer

Controlled by DOL 31

## 3 DOL 31 Manual Control



Fan

Heating



Light

Manually controlled by settings carried on the keyboard. The output can be set to 0 -100%.





## MOUNTING GUIDE

### 4 Checking Parts

#### 4.1 DOL 31 Speed Controller 2 Variants

Figure	Number of	Description
	1	DOL 31 speed controller 16 A
	1	DOL 31 speed controller 6.8 A

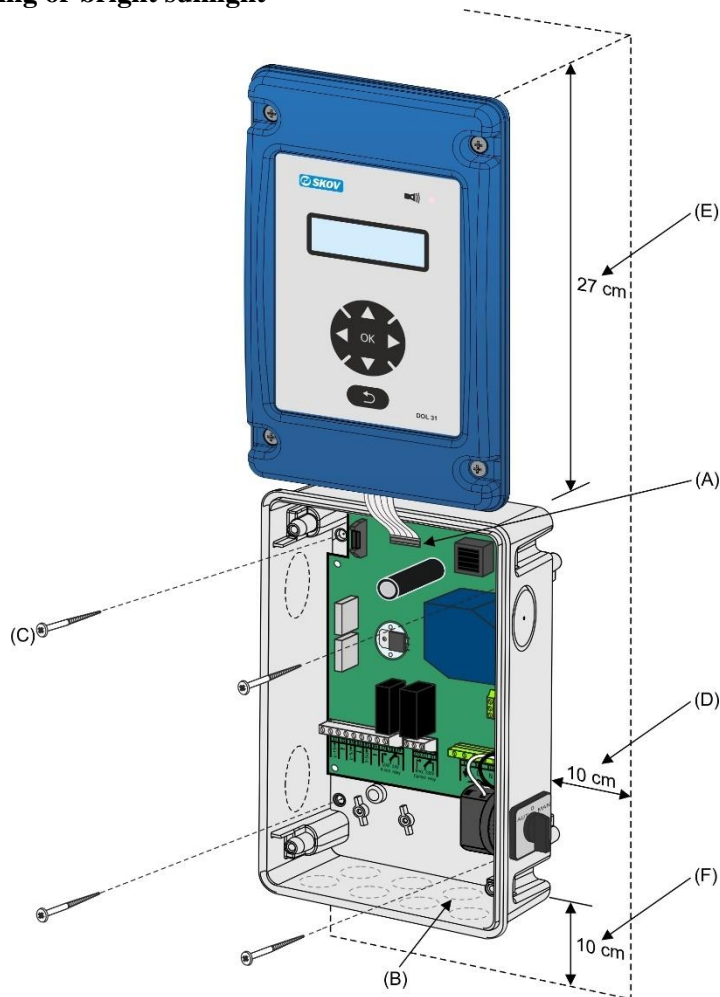
#### 4.2 Manufacturer-supplied Parts

Figure	Pieces	Description
	4	Chipboard screw 5 x 60, A2, pozi, pan
	4	Wall dowel 8 mm
	3	Plastic gland M25
	3	Plastic nut M25
	1	DOL 12
	1	Technical User's Guide



## 5 Mounting of DOL 31 Speed Controller

**NOTE** DOL 31 speed controller must be installed where it is not exposed to frost, high-pressure cleaning or bright sunlight



- 1) Remove the front panel and the flat cable plug **(A)**
- 2) Knock out the required number of knock-out pieces **(B)** at the bottom of the cabinet and mount the plastic glands.
- 3) Prick/drill holes for the four screws **(C)** in the bottom section of the cabinet.
- 4) Remember free space around the cabinet:
  - 10cm **(D)** on the right side for operation of the AUT – 0 – MAN (Auto/Manual) change-over switches.
  - 27cm **(E)** above the cabinet so that the front panel can be placed here during service.
  - 10cm **(F)** below the cabinet to enable air cooling.
- 5) Correct the cabinet to horizontal. Hold the cabinet base against the wall and mark out for the four screws.
- 6) Drill four 8mm holes.
- 7) Mount the box using the enclosed wall dowels and screws.
- 8) Place one or more washer(s) under one of the bottom feet if the wall is not level and the cabinet base moves.

## INSTALLATION GUIDE

### 6 Electric Connection



The installation, service and troubleshooting in connection with electrical equipment must be carried out by specialists in accordance with applicable national rules. In Europe in accordance with EN 60204-1 and other applicable EU rules.

The installation of a supply isolator is required for each motor and power supply, so maintenance of electrical equipment can be carried out in a dead environment. Supply isolator is not supplied by SKOV A/S.

#### 6.1 Cabling

Cables are led through plastic glands in the bottom section. It is recommended to use armoured cable in locations where there is a risk of rodent attacks.

#### 6.2 Dismantling AUT – 0 – MAN Switch

Prior to connection in DOL 31 16 A, you have to dismantle the AUT – 0 – MAN switch in order to gain access to the screw terminals.

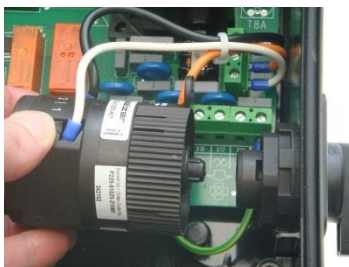


Turn the lock in the opposite direction of the arrow.



Set the switch to 0.

The AUT - 0 - MAN switch is removed by means of a screwdriver. Push the switch housing to the left.



Lift out the switch.

Connect power supply in X13 – X15.

Connect output in X16 - X18.



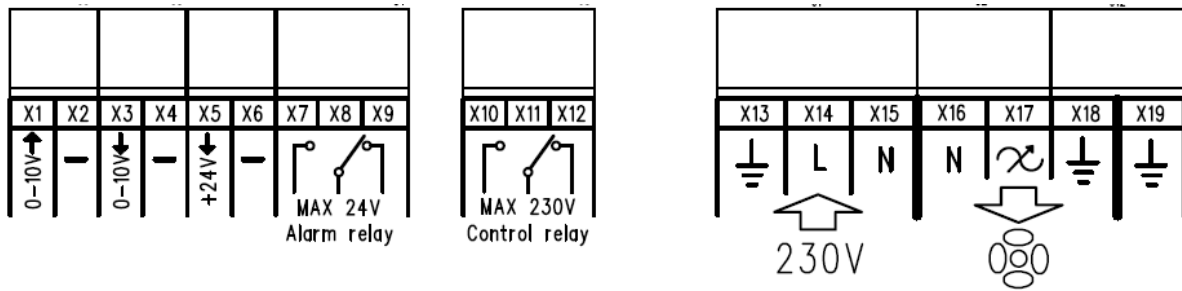
Set the switch to 0.

Mount the AUT – 0 – MAN switch.

Turn the lock. The arrow indicates the direction.



### 6.3 Connection in DOL 31



X1: 0-10V input signal from DOL 12; House computer or another DOL 31.

X2: 0V input

X3: 0-10V or 10-0V output signal.

X4: 0V output

X5: +24V DC output

X6: 0V output

X7: Alarm relay NO

X8: Alarm relay COMMON

X9: Alarm relay NC

X10: Control relay NO

X11: Control relay COMMON

X12: Control relay NC

X13: Supply, earth

X14: Supply, phase

X15: Supply, neutral

X16: Output, neutral

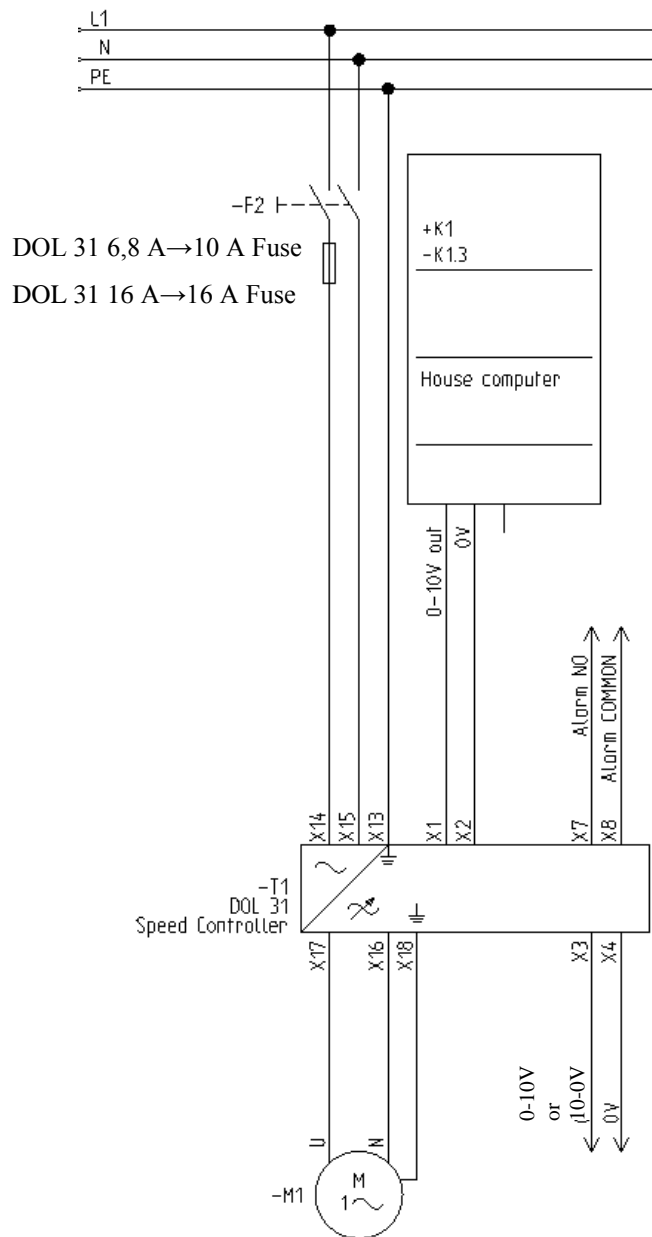
X17: Output, variable phase

X18: Output, earth

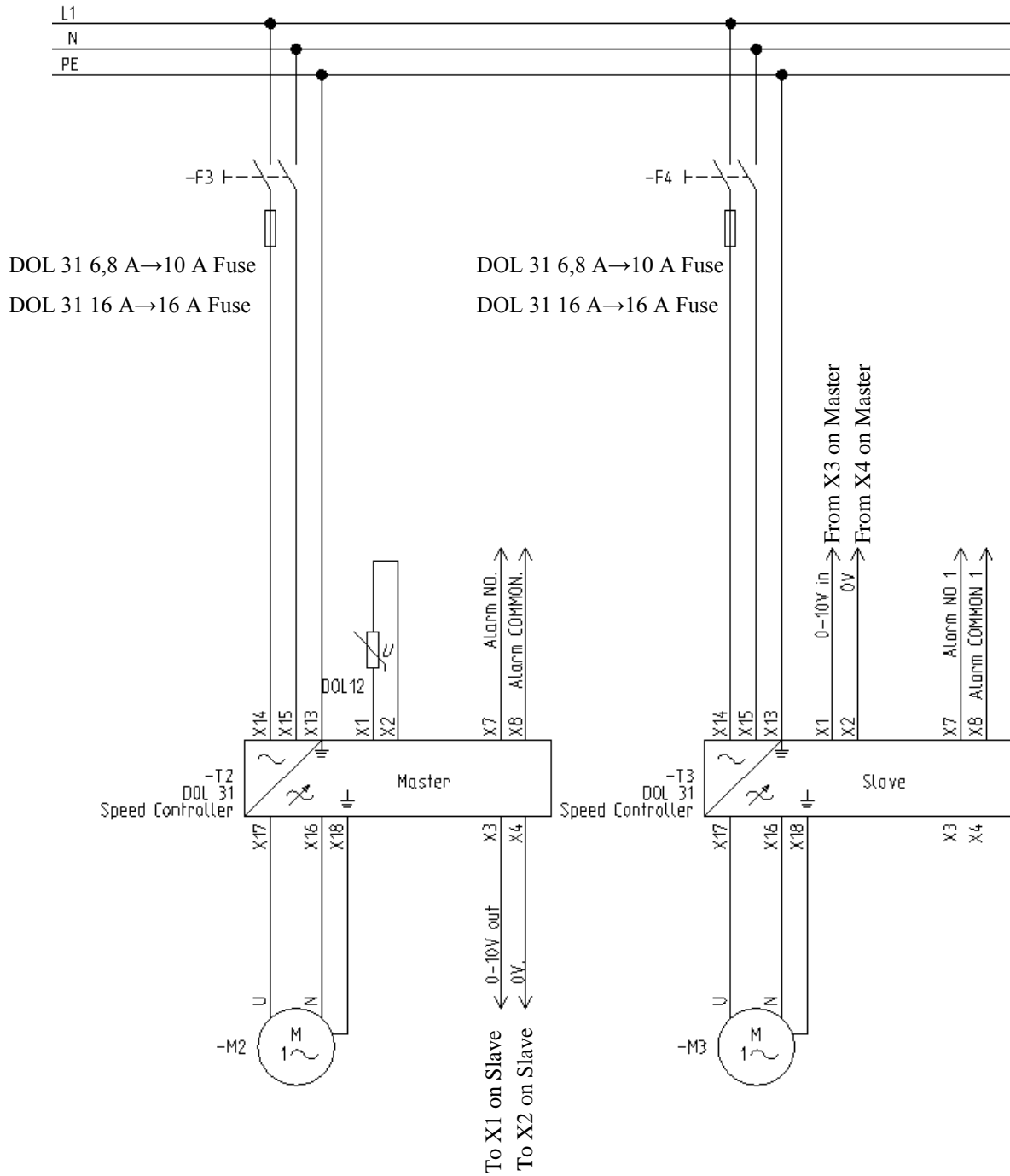
X19: Earth to cooling plate

## 6.4 Circuit Diagram

### 6.4.1 House Computer to DOL 31

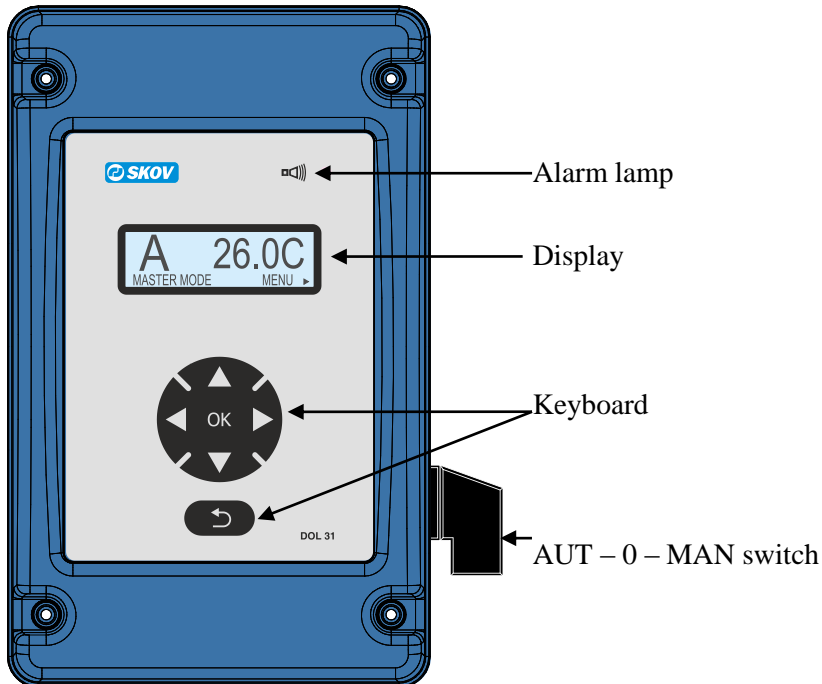


### 6.4.2 DOL 31 Master og Slave



## USER GUIDE

### 7 Operation



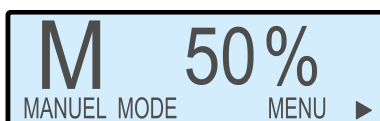
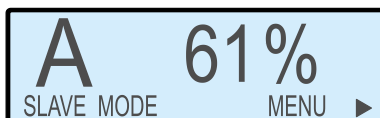
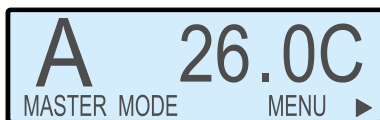
#### 7.1 Alarm Lamp

The alarm lamp is on when:

1. Low Net frequency
2. High Net frequency
3. DOL 12 temperature sensor is disconnected
4. DOL 12 temperature sensor has a short circuit
5. High temperature alarm
6. Low temperature alarm

See **service menu active alarms**

#### 7.2 Display



### 7.3 AUT – 0 – MAN Switch

The change-over switch on the right side of DOL 31.

**AUT (I)** Auto (DOL 31 runs in the current user mode).

**0** Service mode (outputs are dead).

**MAN (II)** 100% (phase directly to output).

### 7.4 Keyboard

**Up, down, right, left keys**



The arrow keys are used for navigation and changing of data and values.

< 0.5 sec. By pressing you change the value by one, either menu point or data  
> 0.5 sec. Pressing quickly changes the value/the menu.

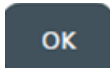
**Return key**



Return is used for:

Returning to previous level or function.  
Data remains unchanged.

**OK key**



OK is used for:

Selecting function.  
Confirming and saving data.

## MENUS

### 8 Icons

Icon	Menu item	Icon	Menu item
	Automatic		Set P-band
	Manual		Set minimum analog output
	Set temperature/output		Set maximum analog output
	Set minimum output		Set temperature scale
	Set maximum output		Invert
	Set mode		Turn-off functions
	Service menu		Contrast
	Active Alarms		Backlight
	Set temperature alarm High temperature alarm		Language
	Low temperature alarm		Version information
	Set control temperature		Low Net frequency
	Sensor short-circuited		High Net frequency
	Sensor disconnected		

Table 1: Icons

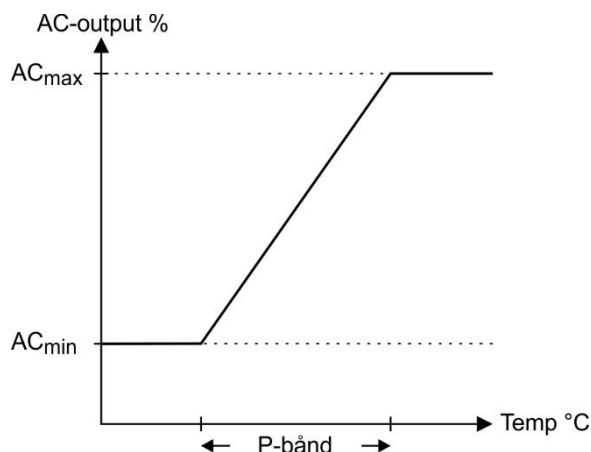
## DAILY USER MENU

### 9 Menu Mode

Set DOL 31 to the required mode. (Automatic master/slave and manual).

#### 9.1 Automatic Master Mode

It is controlled by a signal from the temperature sensor. DOL 31 automatically adjusts according to the set temperature.



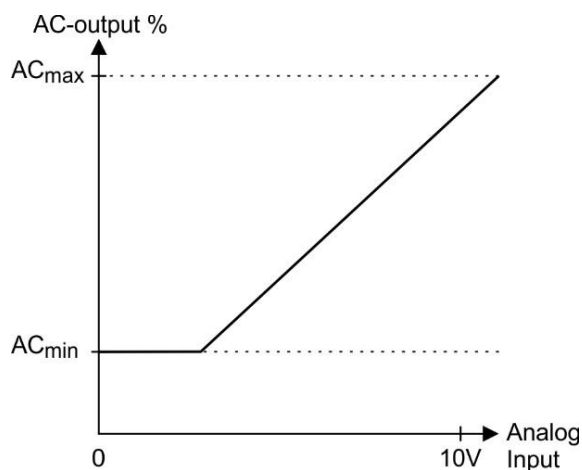
##### 9.1.1 Set temperature

Set required temperature. DOL 31 automatically regulates the output, until the desired temperature has been achieved.



#### 9.2 Automatic Slave Mode

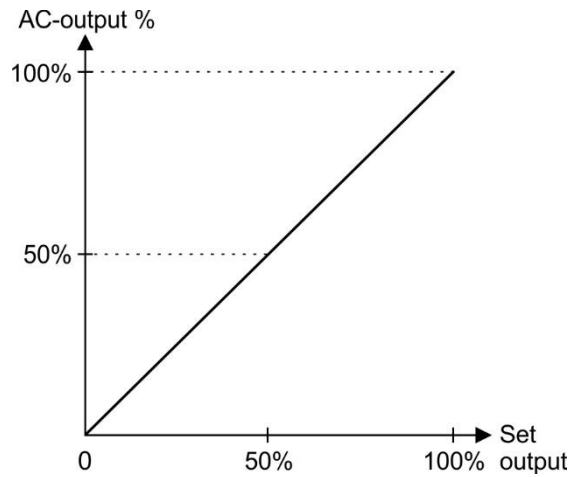
DOL 31 is controlled by the house computer or a master DOL 31. No setting of temperature.





### 9.3 Manual Mode

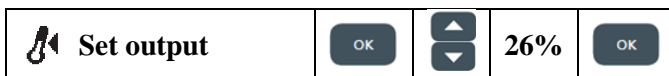
Manual control of output



#### 9.3.1 Set output

Set required output. DOL 31 is manually controlled. Direct control of the output by pressing the up or down key. Output can be set to 0 - 100%. Min. and max. output are left out of account.

**NB** Please note that certain fans require a minimum voltage.



## 10 Minimum Regulation of AC Output

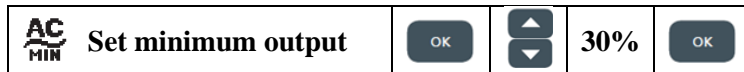
Setting minimum power on output. The setting is made as a percentage of the supply voltage. Control of the output by pressing the up or down key. Min. setting (0-50%) cannot exceed 50%.

For use with e.g. heating control:

Set minimum output to 0%. DOL 31 will then turn off the output, if there is no need for adjustment.

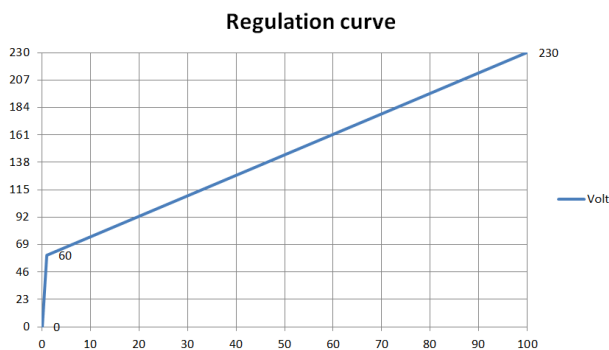
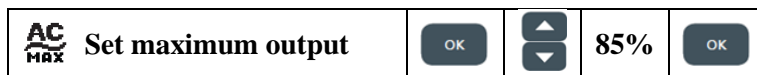
For Automatic Slave mode, see section 20.2.

**NB** Please note that certain fans require a minimum voltage.



## 11 Maximum Regulation of AC Output

Setting maximum power on output. The setting is made as a percentage of the supply voltage. Control of the output by pressing the up or down key. Max. setting (50 - 100 %) cannot be set lower than 50%.



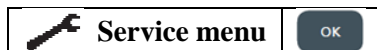
Example:

Set minimum output to = 0 %  
Triac output = 0 V

Set minimum output to = 1 %  
Triac output = 60 V

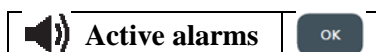
## SERVICE MENUS

Settings of service menus. In the menu **Service menu**.



## 12 Active Alarms

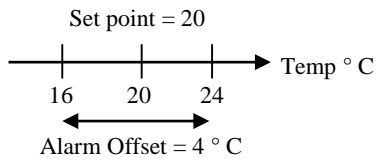
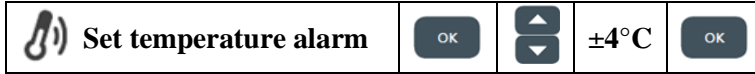
Displays the active alarms.



### 13 Set Temperature Alarm

Temperature offset is set to activate alarm relay and alarm lamp. Alarm is released in case of high and low temperature.

The function is only active in Automatic master mode.



Example:

Alarm offset is a relative temperature compared to the set temperature.

Required temperature = 20°C

Set alarm = ±4°C

The alarm is activated by the temperature.

>24°C

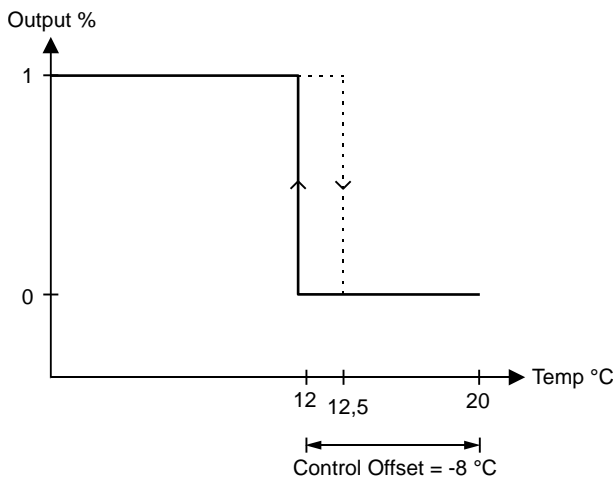
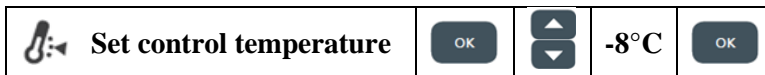
<16°C

### 14 Set Control Temperature

Set the temperature for activation of the control relay. The function is only active in Automatic master mode. Negative offset value can be used for turning the heating system on/off. Positive offset value can be used for extra cooling.

DOL 31 has a 0.5°C hysteresis

This means that the control relay in the below example is deactivated again when the temperature increase to 12.5°C



1 = Active control relay

0 = Not active control relay

Example:

Control offset is a relative temperature compared to the set temperature.

Required temperature = 20°C

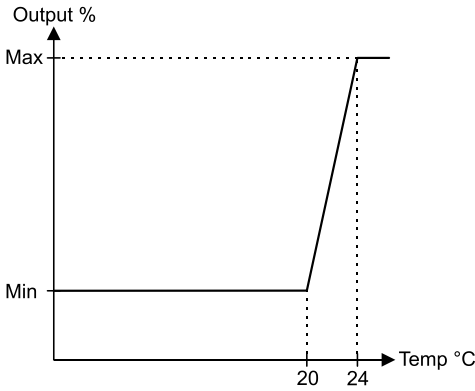
Set control offset = ±8°C

The control relay is activated by the temperature.

12°C

### 15 Set P-band

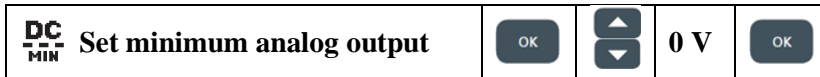
Set the temperature regulation range between min. and max. output.



Example:  
 Required temperature = 20°C  
 Set P-band = 4°C  
 Output min. = 20°C  
 Output max. = 24°C

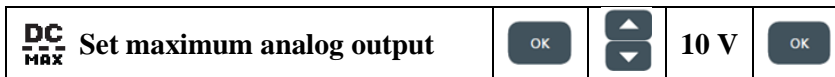
### 16 Set minimum analog DC output

Setting minimum analog output.

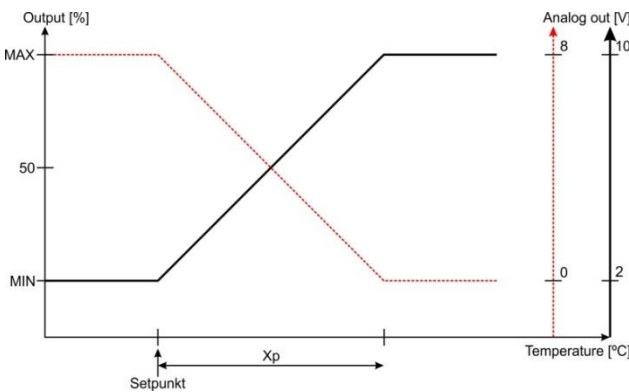


### 17 Set maximum analog DC output

Setting maximum analog output.



The analog output follows the calculated ventilation percentage.



Example:  
 --- DC/MIN = 10 V  
 --- DC/MAX = 0 V  
 — DC/MIN = 0 V  
 — DC/MAX = 10 V

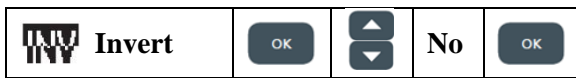
### 18 Selecting Temperature Scale

Select whether the temperature scale indication should be in Celsius or Fahrenheit.

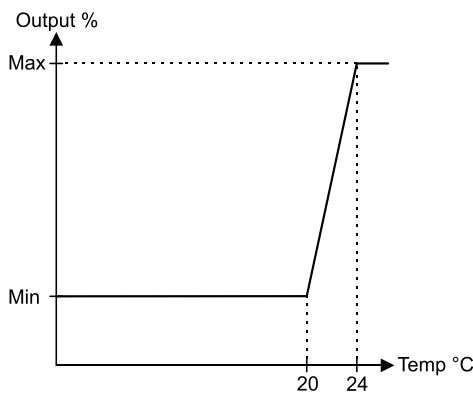


## 19 Invert

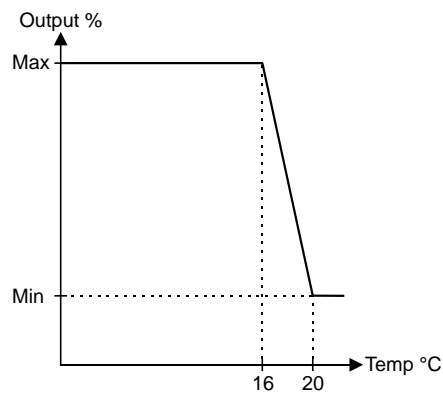
When using DOL 31 for heating or recirculation, the output can be inverted.



Not inverted



Inverted



## 20 Turn-off functions

DOL 31 can be configured with two different safety functions, which ensure a certain mode of operation in case of e.g. malfunction in the controlling climate system.

- 1) **Safety mode** ensures that the DOL 31 output is set to 50 % if the analogue input signal gets lower than 0.5 V. See description in section 20.1.
- 2) **Turn-off limit:** If safety mode *is not selected*, it is possible to select a turn-off limit. When this function is chosen, the DOL 31 output will be switched off if the analogue input signal is lower than this turn-off limit. See description in section 20.2.

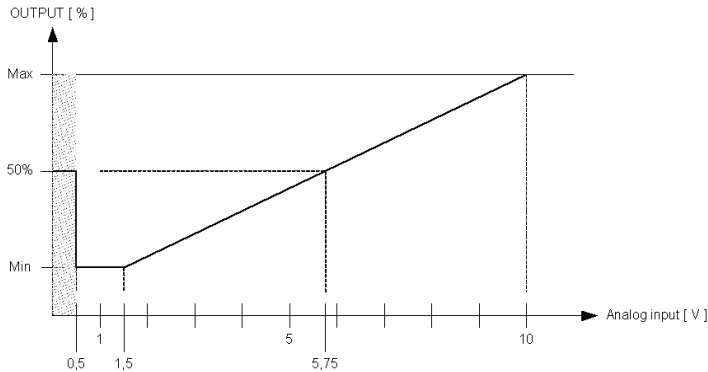
This means that it is not possible to have both safety mode and switch-off limit activated at the same time.

**NB** These safety functions are only active when DOL 31 runs in automatic Slave mode.

## 20.1 Safe Mode

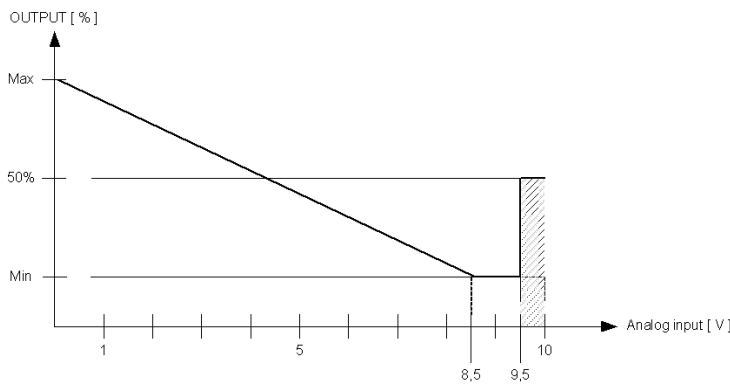
This function can be applied in installations in which security against e.g. ventilation failure is required even though a fault is located on the overhead climate system. If the analog input signal ceases, the output is set to 50% and after 30 seconds the alarm is activated.

The function is only active in Automatic slave mode.



Not inverted

If the analog control signal reaches a level lower than 0.5 V.



Inverted

If the analog control signal exceeds 9.5 V.

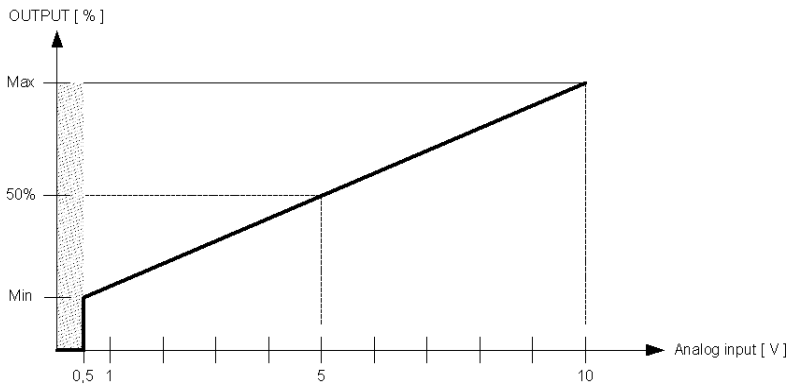
## 20.2 Set Turn Off Limit

The function is applied if there is a requirement for the DOL 31 output be cut off completely at a certain voltage on the analog control signal (turn off limit).

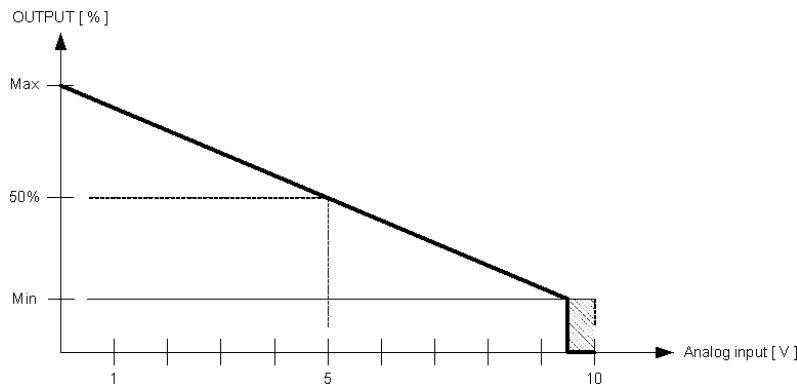
If the turn off limit is set to 0 V, the function is inactive, and the DOL 31 output will remain at minimum (not inverted) or maximum (inverted).

The function is only active in Automatic slave mode.

 <b>Turn Off</b>	<input type="button" value="OK"/>	<input type="button" value="↑"/>	<b>No</b>	<input type="button" value="OK"/>	 <b>Turn off limit</b>	<b>0.5 V</b>	<input type="button" value="OK"/>
---	-----------------------------------	----------------------------------	-----------	-----------------------------------	---	--------------	-----------------------------------



Not inverted  
Relative voltage between  
0 – 2 V.



Inverted  
Relative voltage between  
8 – 10 V.

## 21 Contrast

Adjust contrast in display.



## 22 Backlight

Adjust backlight.




## 23 Language

Choose between Danish, English, German, Finnish, Swedish, Polish, Russian, Estonian and Spanish.



## 24 Version Information

Information about hardware configuration and software version.

	Version	OK	Software	1.3	OK
	Serial no.		1	XXXX	
	Serial no.		2	XXXX	



## SETTINGS

### 25 Factory Settings

The default settings of DOL 31 are as follows:

Menu item	Minimum	Default settings	Maximum
<b>Daily User Menu</b>			
Temperature	0°C	20°C	40°C
Mode	-	Automatic - Slave	-
Minimum AC output	0 V <sub>RMS</sub> = 0%	60 V <sub>RMS</sub> = 26%	150 V <sub>RMS</sub> = 50%
Maximum AC output	150 V <sub>RMS</sub> = 50% *	230 V <sub>RMS</sub> = 100% *	230 V <sub>RMS</sub> = 100% *
<b>Service menu</b>			
Temperature alarm offset	±1°C	±4°C	±20°C
Control temperature offset	- 10°C	- 10°C	= 10°C
P-band	2°C	4°C	10°C
Minimum DC output	0 V	0 V	10 V
Maximum DC output	0 V	10 V	10 V
Input	-	0 – 10 V	-
Temperature scale	-	Celsius	-
Safe Mode	-	Yes	-
Invert	-	No	-
Language	-	English	-

\* Depending on the actual supply voltage

### 26 Functions in Menu Mode

Function	Automatic Master Mode	Automatic Slave Mode	Manual Mode
DOL 12	✓		
0-10 V input signal		✓	
0-10 V or 10-0V output signal	✓	✓	✓
Temperature alarm	✓		
Control temperature	✓		
Control relay	✓		
P-band	✓		
Invert	✓	✓	
Safe mode		✓	
Turn off limit		✓	
Minimum AC output	✓	✓	✓
Maximum AC output	✓	✓	
Alarm relay	✓	✓	✓

## 27 Table relating to DOL 12 Temperature Sensor Checkup

Temp.		DOL 12	Volt
°C	°F	kOhm	V
-10	14.0	44.02	7.12
-9	15.8	42.80	7.06
-8	17.6	41.61	7.00
-7	19.4	40.43	6.94
-6	21.2	39.28	6.88
-5	23.0	38.15	6.82
-4	24.8	37.05	6.75
-3	26.6	35.96	6.69
-2	28.4	34.91	6.62
-1	30.2	33.87	6.56
0	32.0	32.86	6.49
1	33.8	31.88	6.42
2	35.6	30.92	6.35
3	37.4	29.99	6.28
4	39.2	29.08	6.20
5	41.0	28.20	6.13
6	42.8	27.34	6.06

Temp.		DOL 12	Volt
°C	°F	kOhm	V
7	44.6	26.51	5.98
8	46.4	25.70	5.91
9	48.2	24.91	5.83
10	50.0	24.15	5.76
11	51.8	23.42	5.68
12	53.6	22.70	5.61
13	55.4	22.01	5.53
14	57.2	21.35	5.45
15	59.0	20.70	5.38
16	60.8	20.08	5.30
17	62.6	19.47	5.22
18	64.4	18.89	5.15
19	66.2	18.33	5.07
20	68.0	17.78	5.00
21	69.8	17.26	4.92
22	71.6	16.75	4.85
23	73.4	16.26	4.77

Temp.		DOL 12	Volt
°C	°F	kOhm	V
24	75.2	15.79	4.70
25	77.0	15.34	4.63
26	78.8	14.90	4.56
27	80.6	14.48	4.49
28	82.4	14.07	4.41
29	84.2	13.68	4.35
30	86.0	13.30	4.28
31	87.8	12.94	4.21
32	89.6	12.58	4.14
33	91.4	12.25	4.08
34	93.2	11.92	4.01
35	95.0	11.61	3.95
36	96.8	11.31	3.88
37	98.6	11.01	3.82
38	100.4	10.73	3.76
39	102.2	10.46	3.70
40	104.0	10.21	3.64

## 28 Trouble Shooting Instructions

- 1) Is the mains supply correct on terminals X13+X14+X15?
  - Check the installation fuses and the residual current circuit breaker.
- 2) Is the DOL 31 switch set to AUTO – 0 – MAN?
  - Set the switch to the required mode of operation.
- 3) Is the protective motor switch/switch for fans, heating or light in working order?
  - Switch on the protective motor switch/switch. Replace if not working.
- 4) Is the temperature sensor in working order?
  - Check the sensor, see section 27 Table relating to DOL 12 Temperature Sensor Checkup.
- 5) Is the analog output set correctly?
  - Check the set voltage, see section 17 and 18.

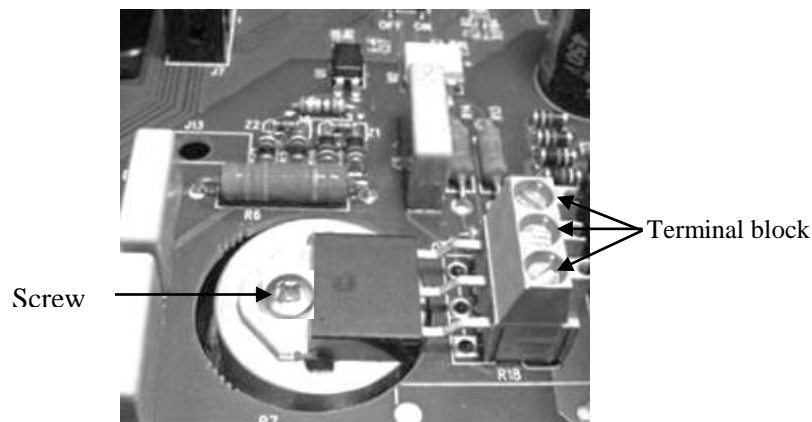
## MAINTENANCE INSTRUCTIONS

DOL 31 speed controller requires no maintenance to function correctly.  
Only use genuine spare parts.

### 29 Replacing Triac

When the DOL 31 is used for light control with incandescent bulbs, the bulbs can short circuit when failing, leading to the Triac also breaking.

1. Order 130828 DOL 31 - 5 unit all-purpose Triac, consisting of 5 individual triacs in a bag.
2. Disconnect the power to the DOL 31
3. Remove the defective triac.
4. Mount the new triac from the bag, tighten the screw and the terminal block well.
5. Connect the power again.
6. Check that the light can be regulated up/down again.



### 30 Cleaning

DOL 31 speed controller may be cleaned with a damp cloth without using solvents. Do not expose the FarmOnline to water or cleaning with a high-pressure cleaner.

As for all electronic equipment, it is best for DOL 31 speed controller to be connected to power all the time as this will keep it dry and free from condensation.

#### Removal for recycling/disposal



The products of SKOV A/S suited for recycling are marked with a pictogram showing a refuse bin that is crossed over. See picture.

Customers can dispose of SKOV A/S products at local collecting points/recycling stations according to local directions. The recycling station will then arrange for further transport to a certified plant with view to recycling, reclaim and reuse.

## TECHNICAL DATA

### DOL 31

#### Electrical Setup

Mains supply [V]	110/230 ± 10%
Net frequency [Hz]	50/60
Motor load max. [VA]	6.8 A version: 700/1500 16 A version: 1700/3600
Motor load min. [VA]	150
Inputs	0-10 V or DOL 12
Outputs	Analog 0-10 V 24 V 100 mA 24 V 1 A alarm relay 230 V 12 A control relay 60 – 230 V triac output

#### Mechanics

Cable knock-out pieces	Seven Ø25.5 mm for M25 screwed cable joint
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#### Environment

Ambient temperature, operation	(-0 to +40°C, +14 to 113°F)
Ambient temperature, storage	(-25 to +60°C, -13 to +140°F)
Ambient humidity, operation	10-90% RH
Protection class **	Splash proof IP54

*\*\*It is assumed that the base is level, i.e. ≤ 1.5mm difference of height and that the screws of the cover are tightened with min. 200 Ncm.*

#### Shipment

Dimensions	H × W × D: 120 × 162 × 261 mm
Dimensions when packed	H × W × D: 165 × 230 × 310 mm
Shipping weight	1900 g

## EU - DECLARATION OF CONFORMITY

Manufacturer: **SKOV A/S**  
Address: Hedelund 4, DK-7870 Roslev, Denmark  
Telephone: +45 72 17 55 55

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Product: DOL 31  
Type, model: Speed controller  
EU directives: 2014/35/EU (Low Voltage Directive (LVD))  
2014/30/EU (Electromagnetic Compatibility (EMC))  
Standards: EN 61000-6-2:2005 + AC:2005  
EN 61000-6-4:2007 + A1:2011

**We declare as manufacturer**

that the products meet the requirements of the listed directives and standards.

Location: Hedelund 4, DK-7870 Roslev

Date: 2016.02.01



Jesper Mogensen  
CTO





