



According to the low voltage directive: 2006/95/EC / the EMC directive: 2004/108/EC

## EN USER GUIDE

Speed controller for single phase voltage controllable motors.

### Technical data

|               |            |                 |
|---------------|------------|-----------------|
| Voltage       |            | 230 Vac - 50 Hz |
| Current range |            | Fuse            |
| DP150-30-DT   | 0.3-3.0 A  | F-5.0 A-H       |
| DP150-60-DT   | 0.5-6.0 A  | F-10.0 A-H      |
| DP150100-DT   | 1.0-10.0 A | F-16.0 A-H      |

Enclosure: plastic R-ABS, UL94-V0, grey RAL 7035, IP54  
 Minimum ambient temperature: 0 °C  
 Maximum ambient temperature: 40 °C  
 For indoor use, no condensation

The DP15 digitally controls the rotational speed of single phase 230 Vac/50 Hz voltage controllable motors according to pressure; manually or by real-time clock setting. The device consists of a control unit and a power unit, mounted into a plastic box.

### 1. MOUNTING

#### 1.2. Power unit

##### Inputs

Temperature sensor: not used  
 Remote control (INP): 12 Vdc up to 24 Vdc (logical inputs)  
 Motor protection (TK): by connecting thermal (overheating) contacts of the motor  
 Analog input: for differential pressure sensor PSE 0-10 V or 0-20 mA (selected by jumper)

##### Outputs

V+: 12 Vdc/300 mA (internal)  
 Motor: 230 Vac / 50 Hz  
 L1: 0 or 230 Vac (unregulated output), when the motor is stopped L1 output is 0 V. When the fan is running L1 output is 230 V  
 Vdc: internal 24 Vdc/300 mA  
 Analog output: 0-10 V or 0-20 mA (selected by jumper)

RS485

Fig.1 High voltage (HV) and low voltage (LV) part of the DP15 power unit

Fig.2 Possible connection of INP

#### 1.2. Pressure sensor

For the connection of the pressure sensor to the board it is necessary to use the analog input (IN GND). V+ is the power supply for the pressure sensor 24 Vdc (non stabilized)/300 mA.

#### 1.3. Control unit

The DP15 control unit consists of two parts: a control for the LCD and a main control. The microcontroller and the keypad of the device are situated on the main control. A ribbon cable connects power and control unit.

### 2. FUNCTIONS

#### 2.1. Operation working modes

The controller has four basic modes:

- Stand-by: the fan is not working (due to real-time clock setting)
- Stop: the fan is not working (the controller is stopped by pressing the I/O button, TK)
- Automatic: fan speed is depending on pressure and settings
- Hand Set: fan speed is controllable between minimum safety speed and maximum speed in auto mode (before entering

in hand set) with the 'UP'/'DOWN' buttons. The initial speed in Hand set mode is the last speed of auto mode.

For each mode an LCD message is prepared:

|                                                      |                                                        |
|------------------------------------------------------|--------------------------------------------------------|
| Automatic mode<br>Auto High/Low hh:mm<br>xx.x Pa yy% | Hand set<br>Hand set hh:mm<br>xx.x Pa yy%              |
| Stop mode:<br>dd/mm/yyyy hh:mm<br>xx.x Pa Stopped    | Stand-by mode:<br>dd/mm/yyyy hh:mm<br>xx.x Pa Stand-by |

For auto and hand set: mode and time are visualized on the first row of the LCD. On the second the submode (for auto mode) is shown, pressure and fan speed in percents (0 V corresponds to 0 % and 230 V to 100 %).

When INP is enabled in Auto mode, '\*' appears on the LCD. The submode of Auto mode is only 'High'. When INP is disabled no '\*' is shown on the LCD in Auto mode. The submodes of Auto mode can be changed due to RTC (real-time clock setting).

Mode screens when INP input is used to change the controller modes:

|                                      |
|--------------------------------------|
| Auto High/Low hh:mm<br>* xx.x Pa yy% |
|--------------------------------------|

#### Change of the modes

In following tables the changing of the modes is shown, when the keypad is free and when the keypad is locked. In the first case it is sufficient to press a button to change the current mode. Otherwise, when the keypad is locked, it is necessary not only to press a button, but to enter the correct code. There is also a third case for change of modes. It concerns only the change from hand set to auto mode and is realized when the day by day programming option is selected via the installer menu.

| From / To | AUTO                   | HAND SET | STOP | STAND-BY            |
|-----------|------------------------|----------|------|---------------------|
| AUTO      |                        | A/M      | I/O  | automatically (RTC) |
| HAND SET  | A/M or High/Low change |          | I/O  | RTC                 |
| STOP      | I/O*                   |          |      | I/O*                |
| STAND-BY  | automatically (RTC)    | A/M      | I/O  |                     |

Modes changing (keypad is free)

\* When you are in STOP mode by pressing I/O button you can change this mode to AUTO or STAND BY due to RTC and day by day settings.

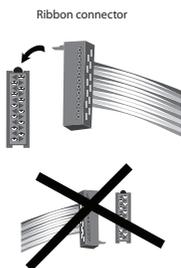
| From / To | AUTO                            | HAND SET     | STOP         | STAND-BY            |
|-----------|---------------------------------|--------------|--------------|---------------------|
| AUTO      |                                 | (A/M & code) | (I/O & code) | automatically (RTC) |
| HAND SET  | (A/M & code) or High/Low change |              | (I/O & code) | RTC                 |
| STOP      | (I/O & code)*                   |              |              | (I/O & code)*       |
| STAND-BY  | automatically (RTC)             | (A/M & code) | (I/O & code) |                     |

Modes changing (keypad is locked)

\* When you are in STOP mode by pressing I/O button you can change this mode to AUTO or STAND BY due to RTC and day by day settings.

#### 2.2. Functionality

Fig.3 Fan speed in function of pressure (auto mode)



1. Max. fan speed
- 2: Set pressure for fan speed at 50 % between min. and max. (proportional range)
- 3: Minimum fan speed (cannot be set under min. safety motor speed)

### 2.3. Start, stop, alarm conditions

Fig.4 Softstart and kickstart

#### Softstart

When the fan is switched on, it starts to work from the least possible value to:

- the chosen maximum speed, if kickstart time is not zero (fig.4), or
- to the fan speed that corresponds to the measured pressure, if there is no kickstart.

Softstart duration is not a user-programmable parameter. For DP1S controllers, the fan voltage increases with 2 V on every 20 ms. For example, if minimum safety voltage is 100 V and maximum voltage is 230 V, softstart time duration will be approximately 1.32 seconds.

#### Kickstart

During a definite time interval, the motor speed is constant (fig.4), equal to the maximum speed. The user can set the kickstart time to any value between 0s and 30 seconds. The default value is 10 seconds.

#### After softstart and kickstart:

The motor speed decreases to voltage corresponding to the input signal.

It is important to note that even if the controller was in Hand set or Stand-by mode before power loss, it restarts in Auto mode.

When the fan is running, L1 output is 230 V, I<sub>max</sub> = 2 A. This output can be used to power rotating field windings of a single phase motor with two coils, or it can be used to control electrically operated valves etc. that don't need to open/close when the fan is running.

#### Shut down conditions

The controller shuts down the fan in case of alarm condition (TK problem). When the motor is stopped L1 output is 0V.

#### Alarm conditions

The DP1S controller can generate an alarm message in case of TK-fault. A text is displayed on the LCD screen.

Note: the fan stops immediately and a fault condition is generated if TK-open is detected within a second. After a fault condition is generated, the controller doesn't restart the motor until the fault condition is reset by the operator (via the I/O button).

At restart of the motor, if starting conditions are met, the L1 output is powered and a kickstart is executed (if the new mode is not stand-by due to RTC), the output voltage is adjusted to the normal working level.

## 3. MENU GUIDE

### 3.1. Menu structure

Fig.6 DP1S controller LCD menus

### 3.2. ENTERING THE INSTALLER MENU

The changing of the mode parameters can be done via installer menu (unlocked or locked with 4-digit code). It can be easily entered from Auto/ Hand set/ Stand-by/ Stop mode by long pressing of A/M button (fig.7).

### 3.3. Navigation in the installer menu

When one has entered a menu, the navigation in it should be done as drawn in fig. 8.

### 3.4. Installer menu parameters

Fig. 6 illustrates all settings that can be done by the installer:

- Change of the language on which the LCD menus are displayed
- Setting the real-time clock in the controller (time and date)
- Change of user code (for speed change in Hand set mode)
- Change of installer code (for mode change and menu entrance)
- Setting the value of the minimum safety motor speed, kickstart time, proportional range
- Adjustment of the values of the set point, min. and max. speed for all possible pressure ranges in auto mode
- DP1S.DT controller supports two factory preset switching intervals:
  - Monday - Friday
  - Saturday - Sunday
- Manual setting of times for high/low mode switching times: maximum 3 time intervals will be supported for each high or low mode, stand-by mode time intervals are automatically calculated, the installer will not be able to change them
- Manual setting of maximum 50 exceptions
- Hard reset (all parameters are loaded with their default values)

## 4. USB GUIDE

### 4.1. Overview

The USB interface gives the installer the possibility to read easily, change and write all device parameters via PC. Installer can save all parameters into file on disk and load them when it's necessary.

There is no need to install a driver or application.

To enter in USB mode, just connect an USB cable to both end of PC or laptop and USB connector on DP1S Control board. Wait for PC to recognize the new hardware.

### 4.2 Host system requirements

- Microsoft Windows XP SP2 / Windows Vista/Windows 7
- Microsoft .NET Framework 2.0 or higher
- One USB port available

Users with WindowsXP SP2 or SP3 must download and install this file from Microsoft site: Microsoft .NET Framework 2.0 Service Pack 1 (x86).

### 4.3. Operations

Download 3SM software from [www.senteracontrols.com](http://www.senteracontrols.com), click 'software'. Install 3SM-Setup.msi and double click the 3SM shortcut on your desktop. After starting you can perform the following operations:

- Default Values – displays the default values of the parameters
- Read parameters from USB device (DP1S)
- View / Change all parameters on PC screen
- Save parameters into USB-device (DP1S)
- Export parameters (save parameters to external file in 'IntelHEX format' on PC)
- Import parameters (load parameters from external file on PC)
- Select program file (to change firmware)

**Note: the firmware of this controller can be changed via the USB interface according to the requirements of the client into DP1S, TE1S, TE2S, CO1S, CO2S, TC1S, TC2S.**

### 4.4. Parameters disposal (two main fields)

#### Main Settings

- Language (English by default)
- Time and data
- User Code (by default is disabled)
- Installer Code (by default is disabled)

#### Installation

- Motor Settings.

Fig. 4

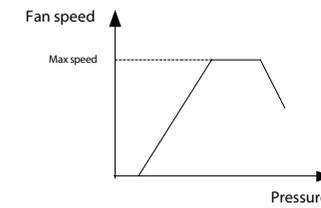


Fig. 5

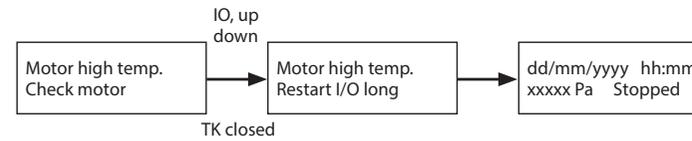


Fig. 7

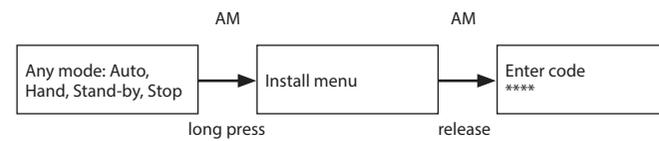
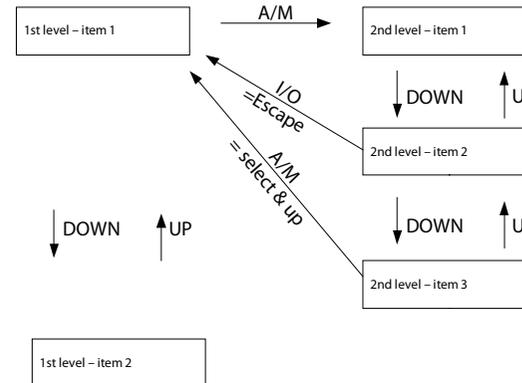


Fig. 8



Scroll through menu: UP/DOWN  
change a parameter: A/M, UP/DOWN, A/M (confirm), I/O (exit)

Fig. 1

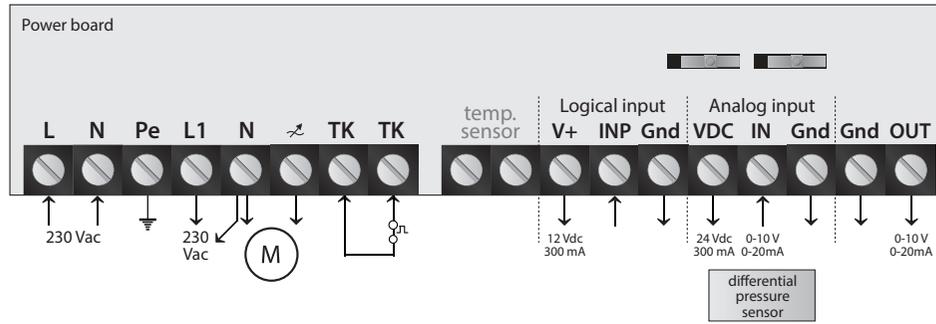


Fig. 2

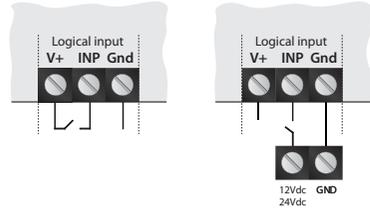


Fig. 3 a

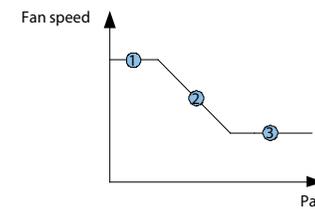


Fig. 3b

| Range              |           | 0 - 100 Pa     | 0 - 250 Pa     | 0 - 500 Pa     | 0 - 1000 Pa    | 0 - 2500 Pa    | 0 - 5000 Pa    | 0 - 10000 Pa   |
|--------------------|-----------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Set Point          | min       | 10             | 30             | 50             | 100            | 300            | 500            | 1000           |
|                    | max       | 90             | 220            | 450            | 900            | 2200           | 4500           | 9000           |
|                    | default H | 75             | 190            | 375            | 750            | 1900           | 3750           | 7500           |
|                    | default L | 25             | 60             | 125            | 250            | 600            | 1250           | 2500           |
| Proportional range | Step      | 1              | 1              | 5              | 10             | 10             | 50             | 100            |
|                    | min       | 5              | 12             | 25             | 50             | 120            | 250            | 500            |
|                    | max       | 75             | 185            | 375            | 750            | 1850           | 3750           | 7500           |
|                    | default   | 50             | 125            | 250            | 500            | 1250           | 2500           | 5000           |
| Min speed          | Step      | 1              | 1              | 5              | 10             | 10             | 50             | 100            |
|                    | min       | Min SafeSp     |
|                    | max       | 80%            | 80%            | 80%            | 80%            | 80%            | 80%            | 80%            |
| Max speed          | default   | 45%            | 45%            | 45%            | 45%            | 45%            | 45%            | 45%            |
|                    | min       | Min Speed + 20 |
|                    | max       | 100%           | 100%           | 100%           | 100%           | 100%           | 100%           | 100%           |
| Safe speed         | default   | 100%           | 100%           | 100%           | 100%           | 100%           | 100%           | 100%           |
|                    | min       | 25%            | 25%            | 25%            | 25%            | 25%            | 25%            | 25%            |
|                    | max       | 80%            | 80%            | 80%            | 80%            | 80%            | 80%            | 80%            |
| Safe speed         | default   | 45%            | 45%            | 45%            | 45%            | 45%            | 45%            | 45%            |
|                    | max       | 80%            | 80%            | 80%            | 80%            | 80%            | 80%            | 80%            |

- Configure Input.
- Presets – ‘Monday-Friday’ and ‘Saturday-Sunday’.  
Format of times may be “h”, “hh”, “hh:mm”, “h:mm”, “hh/mm” or “h/mm”. The start time must be less than end time.  
When a change is made in the start or end times, it is automatically transferred to the Switching Times field (for the corresponding day of the week).
- Switching times – here can be set switching times for the particular day of week.
- Exceptions – there are 50 user programmable exceptions that set switching times different from the previously mentioned. The date of the exception cannot past the current date.
- Standby intervals are all automatically calculated and are updated after each change.

