

# FKP

## User's Guide for Integrated Drive System

Rev 2.2



## FUNCTION


The FKP is a complete control center for ventilation fan drives. It is the easiest and most cost-effective way to perform constant pressure control in ventilation systems.

The drive is equipped with an internally mounted pressure sensor, but it can also be connected to an external sensor. Several types of external temperature sensors can be connected in order to perform temperature compensated pressure control.

The FKP can also be equipped with a Real Time Clock, which makes the drive capable of various forms of scheduling. These include lowering the pressure reference at night and weekly pressure schedules.

Monitoring is done with the onboard alarm relay and analog output; and optionally via MODBUS. The drive's enclosure is water-and dustproof to IP54.

Settings and parameters can be viewed and changed in plain English (or Swedish) on the FKP's large display using an easy-to-use menu system controlled by a navigation wheel.



**WARNING!**

**THE DRIVE MAY RESTART AUTOMATICALLY.**

**Always disconnect power and wait 5 minutes before performing work.**

## USAGE INSTRUCTIONS

When the drive is powered, its status is shown on the display. If the start signal is not connected, "*Drive Stopped*" is shown. Upon connection of the start signal to terminal 4 or 6, the drive will start, and the status screen will be shown.

Press the wheel to activate the display backlight, and turn it to enter the menu system. To prevent tampering with the drive, the menu is protected by a code. Turn the wheel to change the digits, and press it when done with a digit. A correct code will activate the menu system, an incorrect will lead back to the status screen (there is no limit on the number of entry attempts). When the code has been entered, the menu system can be accessed for 20 minutes before the code has to be entered again. The code cannot be changed and is always **1764**. It is also printed on the inside of the connection hatch lid.

There is one top-level menu and several sub-menus. The basic menu system has four sub-menus: "*Drive settings*", "*Press/Temp. settings*", "*Motor settings*" and "*System settings*". Navigate between the menus by turning the wheel, and choose a menu by pressing it. To exit a menu level, select "*Back*".

In the sub-menus, there are settings (parameters) that can be changed. To change a parameter, press the wheel when it is selected. This will show the text "*Choose*" or "*Change*" together with the value to be changed. Turn the wheel to change the value, and press it to confirm the change and return to the sub-menu. Some menu items are only informational and cannot be changed. Press the wheel to exit these menus.

If a fault occurs, an error screen will be shown, explaining the nature of the fault. If the fault no longer persists, a countdown to automatic restart will be shown. When this count reaches zero, the drive will restart. If the fault is an alarm, press the wheel to reset it and start the countdown. For further details on error handling, see the chapter **Faults and Alarms**.

Appendix A and B contain a quick reference to all the settings in the FKP and its options.

## CONNECTION

The drive has two circuit boards with screw clamps. On the lower row are the incoming power terminals. These are L and N. Protective earth is connected to the terminals marked with the ground symbol  $\oplus$ .

Outgoing motor phases are marked U, V and W. The motor thermal protection device (PTC type) should be connected to the terminals marked Tk. This terminal is a power terminal and is not safe to touch or connect to low-voltage systems. If the Tk terminals are not used, they must be connected (shorted) together, otherwise the drive will stop with a "*Motor PTC*" fault.

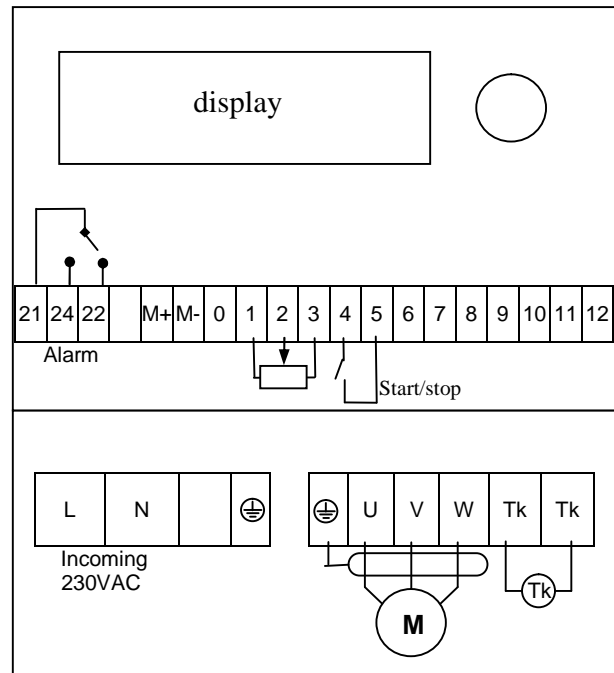


Figure 1: Connections for 0-10V reference and running forwards.

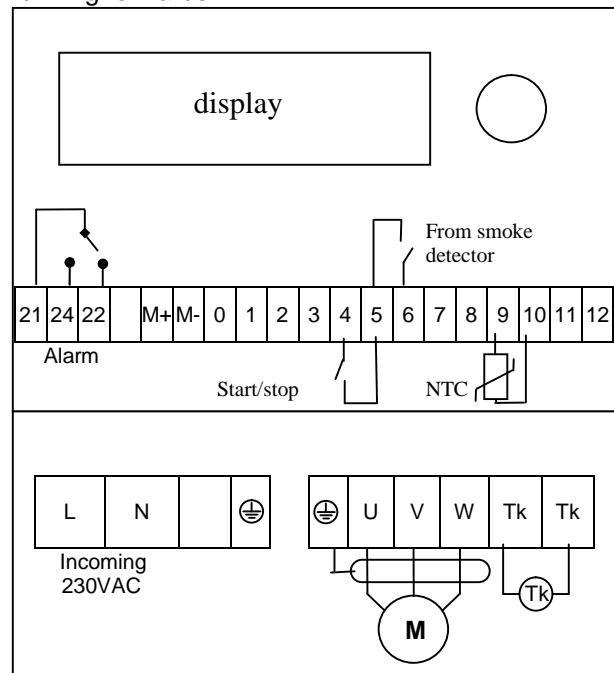


Figure 2. Connection for pressure control with fixed frequency activated by smoke detector.

This product can cause a D.C. current in the protective conductor. Where a Residual Current Device (RCD) is used for protection in case of direct or indirect contact, only an RCD of Type B is allowed on the supply side of this product. Otherwise, another protective measure shall be applied such separation from the environment by double or reinforced isolation.

The upper circuit board is galvanically isolated from the incoming phases. All signal and control cables are connected to screw clamps on this board.

Terminals 21 to 24 are connected to the alarm relay. They are fully isolated from all other voltages within the drive, and are capable of switching 8A at 250VAC. Terminals 21 and 24 are connected by the relay when the drive is free of faults. Terminals 21 and 22 are connected when there is an alarm or the drive is not powered.

Terminals M+, M- and 0 are the MODBUS terminals. M+ corresponds to MODBUS D1 or B, while M- is D0 or A. 0 is the MODBUS common ground potential.

A 10V reference voltage is available on terminal 1. Terminal 2 is the 0-10V frequency reference input. It can also be used to connect an external active temperature sensor. When used as a frequency reference, the frequency is proportional to the input voltage.

Signal common is available on terminals 3, 8, 10 and 12. Signal common is for EMC reasons connected to protective earth through a 40nF capacitor and a 100kohm resistor.

Terminals 4 and 6 are 24V digital inputs. Connecting 24V to terminal 4 makes the motor run forwards. Connecting 24V to terminal 6 either makes the motor run in reverse, or makes the motor run at a fixed frequency. Which depends on the setting of "*System settings/Use fixed freq.*".

A 24V output is available on terminal 5.

Terminal 7 is a 0-10V analog input which can be used to connect an external pressure sensor.

Terminal 9 is used to connect an external passive NTC thermistor. It can also be used to connect an optional PT1000 adapter.

Terminal 11 is a 4-20mA output, which may be loaded with 0-750 ohms. The function of the output is chosen with the setting "*System settings/4-20mA output*". The choices are measured pressure or motor frequency. The values are scaled such that the maximum value of the signal corresponds to 20mA and zero to 4mA. If the internal pressure sensor is used, the pressure range of the output is 0-1000Pa.

If you wish to customize the function of these terminals, do not hesitate to contact us.

Terminal Nr	Function
21	Alarm Common
24	Alarm OK
22	Alarm Fault
M+	MODBUS+ (B or D1)
M-	MODBUS- (A or D0)
0	MODBUS Common
1	10V Reference
2	0-10V IN 1 (frequency/external active temperature sensor)
3	Signal common
4	24V Digital In 1 (forward)
5	24V Output
6	24V Digital In 2 (reverse/fixed frequency)
7	0-10V IN 2 (external pressure sensor)
8	Signal common
9	External passive NTC/PT1000 temperature sensor
10	Signal common
11	4-20mA OUT
12	Signal common

## DRIVE SETTINGS

The FKP has several presets built in which make setting up a drive both faster and safer. A preset is a group of values for all the parameters in the menu system. They allow configuring all the parameters of the drive in a few seconds. Not all presets may be available in all types of the drive.

DRIVE SETTINGS:		
Nr:	Parameter:	Value:
18	Preset setting	Custom, 50Hz Standard, 50Hz Fan
36	Control method	0 - 10V ref, Pressurecont., Tempcomp, Pr.cont, Temp. contr

Note: When chosen, these presets change all the settings of the drive, including those of the pressure controller. As soon as any parameter in the menu system is changed, the chosen preset will return to "*Custom*".

The way the drive is controlled is selected with parameter 36. There are four ways the FKP can be controlled:

- 0 - 10V frequency reference input. The FKP is controlled by a voltage on terminal 2, like an ordinary variable speed drive.
- Pressure control. The FKP will use an external or internal pressure sensor to control pressure with its output frequency.
- Temperature compensated pressure control. This has the same function as pressure control, with the exception that a temperature

sensor is used to compensate the reference pressure.

- Temperature control. Controls the motor frequency using a temperature signal.

### 0 - 10V REFERENCE

The alternative "0 - 10V reference" in parameter 36 sets the drive to be controlled by a 0 - 10V reference like an ordinary variable speed drive. In this mode, 0V on terminal 2 corresponds to minimum motor frequency (parameter 8), and 10V corresponds to maximum motor frequency (parameter 7).

### PRESSURE CONTROL

The FKP is equipped with a built in pressure controller, and a pressure sensor with a range of -1000 - 1000Pa. To use this controller, select "Pressurecont." in parameter 36 ("Control method").

It is also possible to use an external pressure sensor with the FKP. Such a sensor should be designed to emit a 0 - 10V signal proportional to pressure.

The internal pressure sensor has two external 5mm hose connections. The positive side (where overpressure reads as a positive pressure) is marked with a (+) next to the connection.

Setting up the FKP pressure controller is simple and fast. The pressure controller is of PI-type. Its gain is set with parameter 20, and its integration time with parameter 21. If an integration function is not desired, set the time to 0.

The reference pressure of the controller is set with parameter 19. The output of the controller (which is the motor frequency) is limited by the maximum and minimum motor frequency limits (parameters 7 and 8). It is also limited by the ramp times, parameters 9 and 10. Note that parameter 7 to 10 are located in the "Motor settings" menu, and that they affect the operation of the drive in all modes.

PRESS/TEMP. SETTINGS: (Pressure controller settings)		
Nr:	Parameter:	Value:
19	Pressure ref (external) (internal)	0 - 1500Pa 0 - 950Pa
20	Controller gain Kp	0 - 999
21	Integ. time Ti	1 - 999
22	Press. input	Internal, External
24	Ext. min press.	-1500 - 0Pa
26	Ext. max press.	0 - 1500Pa
27	Zero pressure	Yes, No

Parameter 22 is used to select the type of pressure sensor in use, internal or external.

The pressure sensor (internal or external) can be calibrated by setting the zero pressure point. This is done by selecting "Yes" on parameter 27 when there no difference in pressure applied to the pressure inputs. The FKP will use the measured pressure as the new zero pressure point. The internal sensor is calibrated from the factory and usually does not require further calibration.

If an external sensor is to be used, the pressure corresponding to 0V should be set in parameter 24, and the pressure corresponding to 10V in parameter 26. This should always be followed by a zeroing of the pressure as described above.

### OUTSIDE TEMPERATURE COMPENSATION

The FKP is equipped to compensate for pressure changes in ventilation systems caused by the changing outside temperature. When the outside temperature drops, a chimney effect often occurs in ventilation channels, causing increased airflow. To compensate for this, the pressure reference is lowered as seen in figure 3.

To activate temperature compensation, select "Tempcomp. Pr.cont" in parameter 36 ("Control method").

Pressure (Pa)

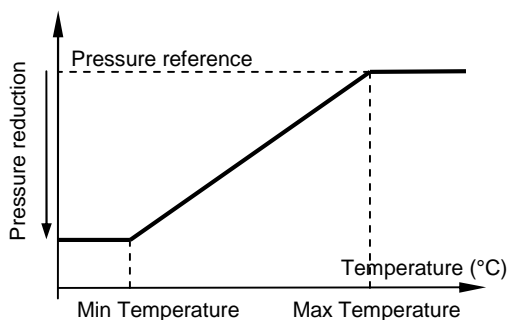


Figure 3. Outside temperature compensation.

The pressure reduction is applied to the reference pressure (parameter 19), and changes

linearly with temperature. The maximum reduction is set with parameter 35.

Pressure reduction starts when the temperature drops below the value set in parameter 34, and continues until the temperature reaches the value set in parameter 33. Below that temperature, the pressure reference is held constant at maximum reduction.

Outside temperature compensation requires an external temperature sensor. Several types of sensors are compatible with the FKP. (4FKP-T1) 100kohm and (4FKP-T2) 10kohm NTC sensors and PT1000 sensors (with optional adapter) are connected to terminal 9. An active (0-10V) sensor can also be used, it is then connected to terminal 2.

In case an active sensor is used, the temperature corresponding to 0V is set in parameter 30, and the temperature corresponding to 10V in parameter 32.

The type of sensor to be used is set in parameter 28.

<b>PRESS/TEMP. SETTINGS: (Outside temperature compensation / Temperature control)</b>		
<b>Nr:</b>	<b>Parameter:</b>	<b>Value:</b>
28	Temp. sensor type	NTC 100k, NTC 10k, PT1000, Active
30	Active temp. min	-50 - 0°C
32	Active temp. max	0 - 100°C
33	Temperature min.	-50 - 50°C
34	Temperature max.	-50 - 50°C
35	Press. reduction	0 - 500Pa

### PRESSURE CONTROLLER ALARMS

The FKP will always indicate a pressure alarm via the alarm relay. If parameter 37 is selected (set to 'yes'), the drive will also stop on these alarms. Otherwise the drive will continue to run the motor during these alarms. Alarm limits for under- and overpressure are set with parameters 38 and 39 respectively.

<b>PRESS/TEMP. SETTINGS: (Pressure controller alarms)</b>		
<b>Nr:</b>	<b>Parameter:</b>	<b>Value:</b>
37	Stop on alarm	Yes/No
38	Alarm upper lim.	-1500 - 1500Pa
39	Alarm lower lim.	-1500 - 1500Pa
40	Alarm delay	0 - 1000s

To prevent the pressure alarms from tripping during short pressure pulses (caused by wind etc), the alarms are delayed. In order to cause an alarm, the pressure must be outside the limits for longer than the time set in parameter 40.

### TEMPERATURE CONTROL

It is also possible to control the FKP by temperature only. This mode is chosen by selecting "Temp. contr" in parameter 28.

Temperature control works by changing motor frequency proportional to temperature, just like how temperature compensation changes the pressure reference. This is shown in figure 4.

Parameter 34 sets the temperature at which maximum motor frequency is used, and parameter 33 sets the temperature for the minimum. The maximum and minimum motor frequencies are set in the usual manner with parameters 7 and 8 in the "Motor settings" menu.

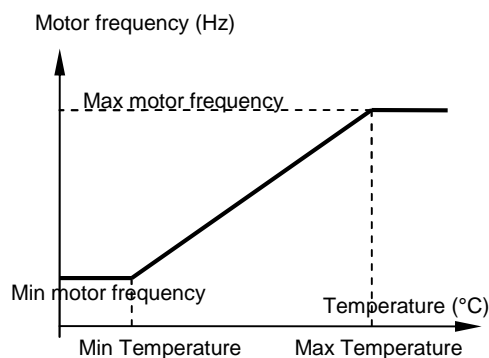


Figure 4. Temperature control.



## MOTOR SETTINGS

The FKP is easily set up to work with the specific motor it is to be connected to.

Simply set nominal voltage and frequency (parameters 14 and 15) to the values printed on the motor. The maximum nominal voltage depends whether the drive is of the 1-phase or 3-phase type.

"Min voltage" (parameter 13) is the voltage the drive would output at 0 Hz motor frequency. This is the voltage needed to overcome the resistance in the motor and make it turn at low speeds. This voltage is used as a compensation factor which decreases as the frequency approaches nominal. In actual use with fans it is seldom necessary to adjust this parameter. However, if the fan does not turn as intended at low speeds, increase this parameter incrementally until it does.

Set maximum and minimum frequencies (parameters 7 and 8) as required in the application. Note that the minimum frequency is the lowest frequency the drive will run at continuously. The drive will always ramp from 1 Hz at startup.

The ramp times (parameters 9 and 10) describe the time taken for the drive to ramp from 0 to 50Hz or 50 to 0Hz. Note that if the down ramp is slightly too fast, the drive will automatically extend it to prevent an overvoltage fault. Overvoltage occurs due to the motor being run as a generator while ramping down.

A fixed frequency (parameter 42) can be chosen, which will be activated by terminal 6 when selected by "System settings/Use fixed freq.". The fixed frequency has priority over the 0-10V reference input and over the temperature and pressure controllers. This means that when activated, the fixed frequency will override pressure control and run the drive at the set fixed frequency.

The drive has a built-in motor protection circuit which works by preventing continuous overcurrents. The parameter "Motor prot." (nr. 11) should be set to the nominal current of the motor. The drive has a 10% continuous overload margin above this setting. It also allows shorter overloads beyond this limit.

If "Coast stop" (parameter 12) is selected, the drive will not attempt to ramp the motor down when the start signal is disconnected. Rather, it will stop driving the motor, allowing it to freewheel to a halt. This parameter generally does not need to be changed in fan applications. The FKP has several voltage profiles (parameter 16), each adapted to a different load. The linear profile will increase the voltage proportionally to the frequency. The fan profile will increase the voltage proportionally to the square of the frequency, which is a good adaptation to fan loads. There is also an automatic profile, which can be useful in special applications with varying load on the motor.

The switching frequency of the drive (parameter 17) can be altered to suit the application. In general, a higher frequency will mean less noise, but higher losses and more electromagnetic interference.

### MOTOR SETTINGS:

Nr:	Parameter:	Value:
7	Max freq.	0 - 200Hz
8	Min freq.	0 - 200Hz
9	Ramp up time	1 - 600sek
10	Ramp down time	1 - 600sek
42	Fixed freq.	0 - 200Hz
11	Motor prot.	0 - 8.8A
12	Coast stop	On, Off
13	Min voltage	0 - 50V
14	Nom. voltage	0 - 230/400V
15	Nom. frequency	0 - 200Hz
16	Voltage profile	Linear, Fan, Auto
17	Switching freq.	5 - 14kHz

## SYSTEM SETTINGS

The language used in the drive's menu system can be changed with parameter 1, "Language". Two choices are available in the current version of the drive, English and Swedish.

A fixed frequency can be chosen with parameter 42, which will be activated by terminal 6 when selected by "Use fixed freq." (parameter 43). The fixed frequency has priority over the 0-10V reference input and over the temperature controller. This means that when activated, the fixed frequency will override pressure control and run the drive at the set fixed frequency.

The error history of the drive can be reset with "Reset logs".

### SYSTEM SETTINGS:

Nr:	Parameter:	Value:
1	Language	Swedish, English
43	Use fixed freq.	Yes, No
44	4 – 20mA output	Motor frequency, Pressure
4	System log	Days and Hours
5	System error log	See error screen
6	Drifts information	Type, firmware
2	Reset logs	Yes, No
3	System states	System data
45	Sys freeze frame	System data

"System states" and "Sys freeze frame" show the internal state of the system at the present time and at the time of the last fault respectively. These are mainly intended for factory troubleshooting.

"System log" (parameter 4) shows the number of hours the drive has been running (with start signal and not faulted). The counter cannot be reset, but shows the total number of hours running since the drive was manufactured.

The type and software revision date of the FKP can be read in parameter 6, "Drive info". An indication of which options are included in the drive is also shown.

## FAULTS AND ALARMS

If a fault occurs, it is always shown on an error screen. The faults are divided into three categories.

The following faults are in the first category:

- "*Phase fault*", which occurs when an incoming phase or neutral is interrupted, or when the input voltage is very low.
- "*Over voltage*", which occurs when the drive's DC voltage is too high. This may occur during grid surges, or when the down ramp is set too fast for the mass of the fan.

The drive will restart automatically 60 seconds after any fault in the first category ceases. The countdown to restart is shown on the screen.

The drive will restart an unlimited number of times after faults in the first category.

If the fault persists, the drive will go into alarm mode after 60 seconds. This will be indicated by the text "*Drive alarm!*", and by the alarm relay changing to the fault state. Once the drive is in alarm mode, it can only be brought out of it by pressing the encoder wheel, or by interrupting the power to the drive long enough for it to turn itself off (15-30 seconds normally).

The second category works exactly like the first, with the exception that only 5 restarts are allowed before the drive goes into alarm mode.

The faults in the second category are:

- "*Over load*" occurs when the drive is subjected to a current of more than 150% of its nominal value.
- "*Over temp.*" occurs when the temperature in the power components of the drive exceed 90°C.

The third category of faults bring the drive directly to alarm mode, and consists of the following faults:

- "*Motor prot.*" is triggered when the motor current is more than 10% higher than the setting of the parameter "*Motor settings/Motor prot.*" for an extended period. The time to fault will be shorter the higher the overcurrent is.
- If a PTC-type thermal protection device is connected to the 'Tk' terminal, it will cause the fault "*Motor PTC*" when it overheats.
- In pressure controlled mode, the drive will also be subject to "*Over press.*" and "*Under press.*" faults. These occur when the pressure is too high or too low compared to the settings of the pressure controller. These faults are special in that they can be set to not stop the drive. This is controlled by the "*Press./Temp. settings/Stop on alarm*".

To aid in troubleshooting, the FKP will record all faults for later viewing. This recording will not be reset by loss of power to the drive. The faults are shown in the "*System settings/System error log*" parameter. The first items shown are the total count of errors of each type that have occurred. Below the separating line, the last 8 faults are shown. The most recent fault is shown at the

top. Each fault has a number to show how many faults have occurred in total. (For example, the third fault to have occurred is numbered 3.)

It is possible to reset the error history of the drive using the "*System settings/Reset logs*" parameter. This will have no other effect on the drive.

In the unlikely event that a fault occurs when reading from the memory where the drive's settings are stored, the screen will show "*Error reading EEPROM data. Default settings used.*" All drive settings will then return to factory defaults. If the error occurs more than once, contact service.

## DRIVE STOPPED

If a start signal is not connected to either terminal 4 (forward) or 6 (reverse), the display will show the drive stopped screen. The menus can as always be accessed by turning the encoder wheel.

## INFORMATION SCREEN

The FKP shows many types of information while running, to aid in diagnostics and troubleshooting.

When the drive is active (a start signal is connected, and no faults have occurred), the display will show relevant status information. Output frequency, motor current, and output voltage will always be shown. If pressure control is selected, the screen will also show the current pressure. If temperature compensation or temperature control is selected, the current outside temperature will also be shown. If no control is selected, the 0 - 10V frequency reference value will be shown.

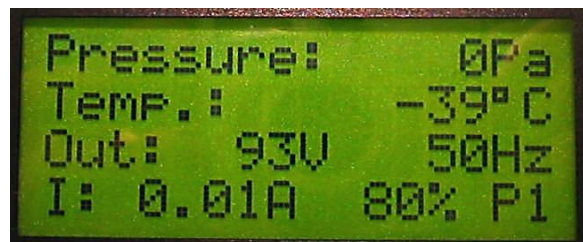


Figure 5. Information screen in pressure controlled mode with temperature compensation. The built-in timer is active and is reducing the pressure reference by 80%.



## MOUNTING

The FKP is water and dust protected up to IP54 classification. It is quickly and easily mounted on almost any flat surface. See Figure 6 for mounting hole drill plan. The hole diameter on the FKP is 5.5mm, and the holes have a convenient keyhole shape to allow quick mounting. To maintain water protection, the seal on the hatch must be undamaged, and the screws tightened. Never attempt to open or disassemble the drive in any way other than opening the hatch, as this will damage the water protection. Always use the cable glands to pass cables through the enclosure. If a cable gland is not in use, replace it with the provided plug.

The drive must always be mounted vertically when mounted in free air, in order to maintain convection for cooling. Allow at least 100mm of free space above and below the FKP when mounted thusly. Mounting the drive in the airflow of the fan it controls is recommended, and allows mounting in orientations other than vertical. In any mounting situation, good cooling will improve the service life of the drive.

The reverse side of the connection hatch contains a quick connection reference. Always use short conductors inside the unit, especially on the incoming and outgoing phases and protective earth. Always use the included EMC cable gland to connect the screen of the motor cable. Excessive slack on these conductors or faulty connection of the cable screen may cause radio interference.

The pressure connections are sized for 5mm PVC hose.

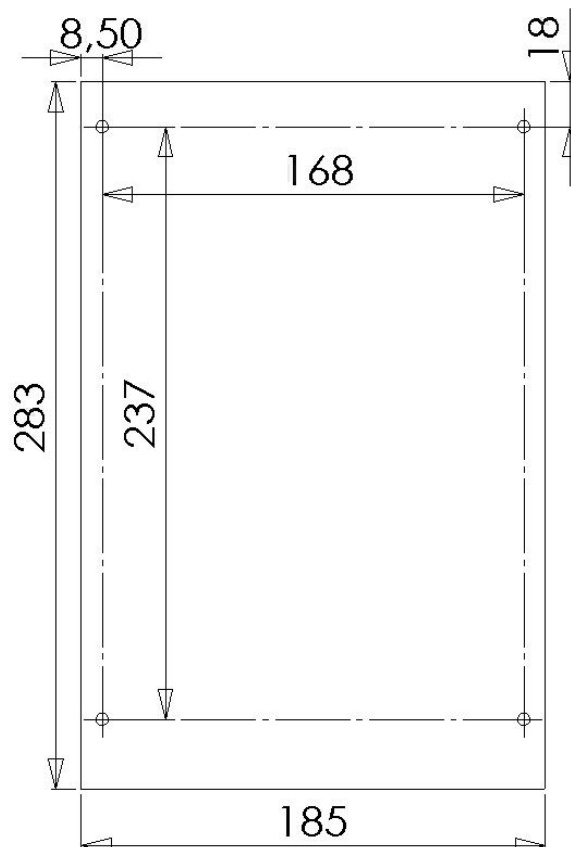


Figure 6. Drill plan and outer dimensions.

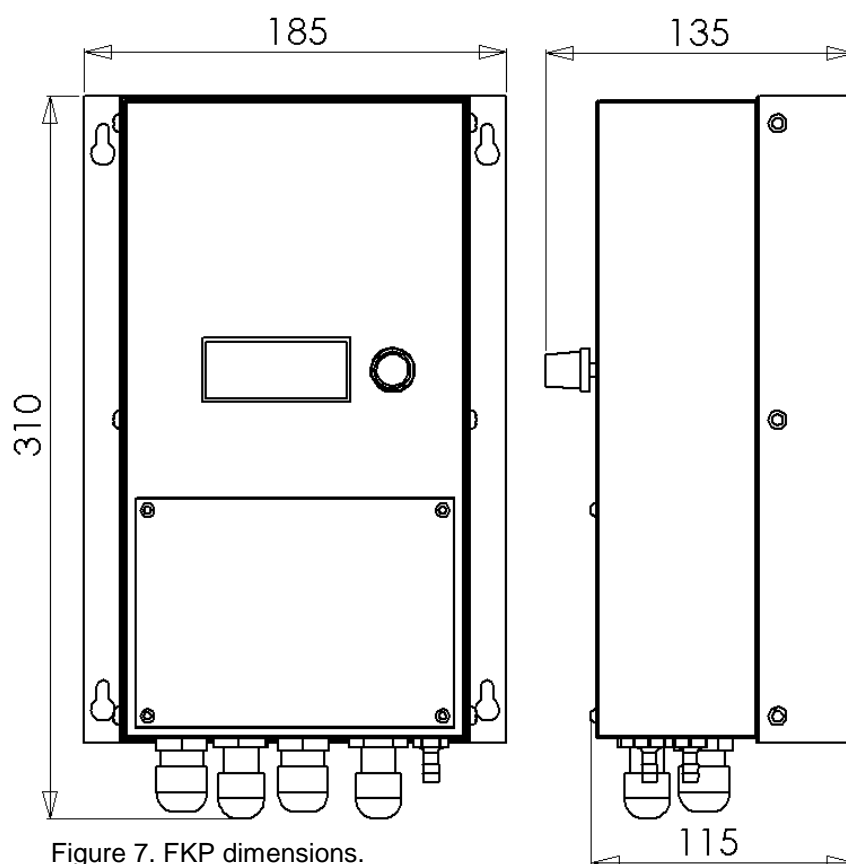


Figure 7. FKP dimensions.

## OPTIONS

The FKP can be equipped with several options in order to provide a complete ventilation control solution. MODBUS/RTU or Ethernet IP allows easy monitoring and remote control. A built-in timer allows control of the drive's pressure or frequency reference based on time-of-day and weekday.

## MODBUS/RTU

With the RS485 MODBUS option, the FKP can communicate with a MODBUS master using MODBUS/RTU. Essentially all the settings that can be changed via the menu system can also be changed via MODBUS. See the MODBUS Data Dictionary for more information, or contact us if you wish to customize the available data.

MODBUS SETTINGS:		
Nr:	Parameter:	Value:
50	MODBUS address	1 - 247
51	MODBUS parity	None, Even, Odd
52	MODBUS baudrate	2400, 4800, 9600, 19200

MODBUS parameters are available under "System settings/MODBUS settings", and consist of address, parity and baudrate (bitrate).

## BUILT-IN TIMER

The optional built-in Real Time Clock (RTC) allows lowering the reference value of the drive (be it pressure, temperature or frequency) based on almost arbitrary schedules.

The RTC has a backup battery to allow it to keep track of the time even when the FKP has no external power applied. The current time and day is set with parameter 56 and 55 respectively (under "System settings").

System clock:		
Nr:	Parameter:	Value:
55	System clock	Monday - Sunday
56	System clock	hh:mm:ss

The weekly schedule is set under "Timer settings" by first choosing one of seven available programs (parameter 50). This is followed by choosing the start and stop times, the day to run the program, and the reference value while running it. From the factory, all programs are deactivated by setting "Run Px on" (parameter 51) to "No days".

The starting time is set with parameter 52, and the stop time with parameter 53. If the stop time is set before or the same as the start time, the program will run from the start time on the chosen day, to the stop time on the next day. For example, if the chosen day is Monday, the starting time is 14:00, and the stopping time is

07:00, the program will run from 14:00 on Monday until 07:00 on Tuesday.

The reference value (parameter 54) is expressed as a percentage of the active reference value of the drive. For example, if the drive has a pressure reference of 100Pa, and the timer program reference is 70%, then the drive will use a 70Pa reference while the program is running.

TIMER SETTINGS:		
Nr:	Parameter:	Value:
50	Chosen program	P1 - P7
51	Run Px on	No days, Mon - Sun, Weekdays, Weekends, All days
52	Start time for Px	00:00 - 23:59
53	Stop time for Px	00:00 - 23:59
54	Refvalue of Px	0 - 100%

If several programs are scheduled to run with overlapping times, the program with the highest number will take priority. For example, if P1 is set from 12:00 to 17:00 with reference 30%, and P7 is set from 15:00 to 16:00 with reference 10%, then the drive will run with 30% reference from 12:00 to 15:00, with 10% reference from 15:00 to 16:00, and with 30% reference from 16:00 to 17:00.

In case one or more programs are active but not performing any reference reduction presently (that is, not scheduled to run at this time), the information screen will show "P\*" in the lower right corner. When a program is running and reducing the reference, the screen will show the program number and the reference reduction (as seen in Figure 5).

## Appendix A. QUICK REFERENCE TO FKP MENU SYSTEM

DRIVE SETTINGS:				
Nr:	Parameter:	Value:	Default:	Description:
36	Control method	0 - 10V ref, Pressurecont., Tempcomp Pr.cont Temp. contr	0-10V ref	Choose the way the drive is controlled. Choices are 0 - 10 V frequency reference; Pressure control with or without temperature compensation; Temperature control only.
18	Preset setting	Custom, 50Hz Standard, 50Hz Fan	-	Preset setting of entire drive, changes both motor and pressure parameters. Returns to Custom as soon as any other parameter is changed.

PRESS/TEMP. SETTINGS:				
Nr:	Parameter:	Value:	Default:	Description:
19	Pressure ref (external) (internal)	0 - 1500Pa 0 - 950Pa	100Pa	Pressure reference of the controller, also shows actual value and pressure reference value after temperature compensation.
35	Press. reduction	0 - pressure ref. (Pa)	15Pa	Magnitude of the decrease of the pressure reference at the lower temperature compensation corner point.
33	Temperature min.	-50 - 50°C	15°C	Upper corner point for temp. comp.
34	Temperature max.	-50 - 50°C	-15°C	Lower corner point for temp. comp.
37	Stop on alarm	Yes, No	Yes	"Yes" will stop the drive (and activate the alarm relay) on pressure alarms, "No" will only activate the alarm relay.
38	Alarm upper lim.	-1500-1500Pa	999Pa	Alarm limit for overpressure.
39	Alarm lower lim.	-1500-1500Pa	-10Pa	Alarm limit for underpressure.
40	Alarm delay	0 - 1000s	100sek	Time until a pressure alarm is generated.
28	Temp. sensor type	NTC 100k, NTC 10k, PT1000, Active	NTC 100k	Type of temperature sensor (active sensors are connected to terminal 2).
30	Active temp. min	-50 - 0°C	-40°C	Temperature with 0V from active sensor.
32	Active temp. max	0 - 100°C	80°C	Temperature with 10V from active sensor.
22	Press. input	Internal, External	Internal	Pressure sensor type.
24	Ext. min press.	-1500 - 0Pa	0Pa	Pressure with 0V from external sensor.
26	Ext. max press.	0 - 1500Pa	999Pa	Pressure with 10V from external sensor.
27	Zero pressure	Yes, No	-	Calibrate actual pressure to zero now.
20	Controller gain Kp	0 - 999	0	Gain applied to the difference between the actual and reference pressures.
21	Integ. time Ti	1 - 999	400	Controller integration time.

The colors mark which parameters are active dependant on the choice of Control method

## Appendix A. QUICK REFERENCE TO FKP MENU SYSTEM

MOTOR SETTINGS:				
Nr:	Parameter:	Value:	Default:	Description:
7	Max motor freq.	0 - 200Hz	50Hz	Upper limit for motor frequency.
8	Min motor freq.	0 - 200Hz	1Hz	Lower continuous limit for motor frequency
9	Ramp down time	1 - 600s	60s	Minimum acceleration time to 50Hz motor frequency.
10	Ramp up time	1 - 600s	60s	Minimum deceleration time from 50Hz motor frequency.
42	Fixed freq.	0 - 200Hz	50Hz	Fixed motor frequency, used when setting 43 is "Yes" and terminal 6 is high.
11	Motor prot.	0.7A to nominal current	0.7A	Rated motor current, drive will trip if this is exceeded by more than 10%.
12	Coast stop	On, Off	Off	"On" will allow the motor to coast to a stop, "Off" will brake it electrically.
13	Min voltage	0 - 50V	20V	Lowest voltage the drive will give out. Also sets I/R compensation.
14	Nom. voltage	0 - 230/400V	230/400V	Nominal (rated) voltage of the motor.
15	Nom. frequency	0 - 200Hz	50Hz	Nominal (rated) frequency of the motor
16	Voltage profile	Linear, Fan, Auto	Linear	Relation between motor frequency and voltage. "Fan" is especially adapted to fan drives.
17	Switching freq.	5 - 14kHz	12.5kHz	Switching frequency of the drive.

SYSTEM SETTINGS:				
Nr:	Parameter:	Value:	Default:	Description:
1	Language	Swedish, English	Swedish	Menu system language.
43	Use fixed freq.	Yes, No	No	Fixed motor frequency is used when setting 43 is "Yes" and terminal 6 is high.
44	4 - 20mA output	Motor freq, Pressure	Motor frequency	The signal output on the 4-20mA output. For scaling, see the manual.
4	System log	Days and hours	-	Shows the time the drive has been running with start signal connected.
5	System error log	See error screen	-	Shows the count of each type of fault, and the 8 most recent faults.
6	Drive info	Type, firmware	-	The type, manufacturer, firmware revision date, power rating and options of the drive.
2	Reset logs	Yes, No	-	Resets the system error log.
3	System states	System data	-	Shown many of the internal variables of the system (for service use).
45	Sys freeze frame	System data	-	Service use.

STATUS SCREENS:		
Screen:	Values:	Description:
Information screen	Pressure/temp/ref, Freq., timer, Voltage, Current	Always shown in when drive is running. Shows "P*" or "xx% Px" if the drive has an active timer function.
Code screen	Menu code	Gives access to the parameters of the drive, see the inside of the hatch lid.
Error screen	Over voltage, Phase fault, Over load, Over temp, Motor prot., Motor PTC, Over press., Under press.	Shows drive faults and alarms. Alarms are reset by pressing the encoder wheel.
Stopped screen	Drive stopped text	Shown when the drive is stopped due to missing start signal.
EEPROM error	Error text	Shown when the internal memory of the drive can not be read.

Appendix B: **QUICK REFERENCE TO FKP OPTIONS MENUS**

<b>TIMER SETTINGS:</b>				
<b>Nr:</b>	<b>Parameter:</b>	<b>Value:</b>	<b>Default:</b>	<b>Description:</b>
50	Chosen program	P1 - P7	P1	Choose a program to change
51	Run Px on	No days, Mon. - Sun., Weekdays, Weekends, All days	No days	Choose which days the program should run on.
52	Start time for Px	00:00 - 23:59	00:00	Choose which time on the chosen day the program starts.
53	Stop time for Px	00:00 - 23:59	00:00	Choose which time the program stops. If the chosen time is before the start time, the program will run until the next day.
54	Ref value for Px	0 - 100%	100%	Percentage of pressure or frequency reference used when the program is active.

<b>CLOCK SETTINGS: (under System Settings)</b>				
55	System clock	Monday-Sunday	-	Sets the current day
56	System clock	hh:mm:ss	-	Sets the current time of day

<b>MODBUS SETTINGS: (under System Settings)</b>				
<b>Nr:</b>	<b>Parameter:</b>	<b>Value:</b>	<b>Default:</b>	<b>Description:</b>
57	MODBUS address	1 - 247	1	Choose the MODBUS address of this drive.
58	MODBUS parity	None, Odd, Even	Even	Choose MODBUS parity.
59	MODBUS baudrate	2400, 4800, 9600, 19200	19200	Choose MODBUS communication bitrate.





## Tillverkardeklaration EMC och Elsäkerhet

(Declaration of Conformity)

### PRODUKT

FKP frekvensomriktare 0.37-2.2kW 230V

### TILLVERKARE

Frabil El AB  
Bjurögatan 38  
21124 Malmö  
Tfn. 040 - 28 70 90

### DIREKTIV EMC

2004/108/EC

### NORMER EMISSION

EN 61000-6-3:2001

EN 55022:1998, A1:2000, -A1 Class B

### NORMER IMMUNITET

EN 61000-6-2:2005

EN 61000-4-2, -3, -4, -5, -6, -11

### DIREKTIV ELSÄKERHET

2006/95/EC (LVD)

### NORMER

EN 50178:1997

Tillverkaren försäkrar på eget ansvar att den produkt som denna försäkran avser överensstämmer med de krav som anges i ovan angivna EU-direktiv.

### DATUM

2007-09-17

### UNDERSKRIFT



Hans Fransson

## TECHNICAL DATA

Type:	FKP	Cable connections:	2st M20x1,5 and 2st M16x1,5 cable glands
Power supply:	230VAC/50Hz 3x400V/50 Hz	Pressure sensor:	±1000Pa (internal) (1Pa resolution)
Motor power:	up to 2.2kW	Pressure connection:	Two 5mmØ
Temperature range:	-25 - +40°C	Alarm relay:	250VAC, 8A
Enclosure:	IP54	Communication:	MODBUS (option)
Outputs:	4-20mA, 10V reference,	Size:	310 x 185 x 135mm
Inputs:	2x 0-10V, 2x 24V digital, Analog NTC, PT1000 Motor PTC	Weight:	3.8kg

230V phase voltage:	0,37 kW/ 230V	0,55 kW/ 230V	0,75 kW/ 230V	1,1 kW/ 230V	1,5 kW/ 230V	2,2 kW/ 230V
Nominal current:	2A	3A	4A	5,5A	7A	9A
Continuous overcurrent:	2,2A	3,3A	4,4A	6A	7,7A	9,9A
Fuse:	10A	10A	10A	16A	16A	20A

3x400V phase voltage:	0,37 kW/ 3x400V	0,55 kW/ 3x400V	0,75 kW/ 3x400V	1,1 kW/ 3x400V	1,5 kW/ 3x400V	2,2 kW/ 3x400V
Nominal current:	1,6A	2,0A	2,5A	3,3A	4,1A	5,6A
Continuous overcurrent:	1,7A	2,2A	2,7A	3,6A	4,5A	6,1A
Fuse:	10A	10A	10A	10A	10A	10A

## PASSIVE TEMPERATURE SENSORS

Type:	4FKP-T1	Type:	4FKP-T2
Sensor element:	NTC 100kohm	Sensor element:	NTC 10kohm
Temperature range:	-39 - +50°C	Temperature range:	-39 - +50°C
Enclosure:	Plastic	Enclosure:	Plastic
Enclosure class:	IP54, cable gland downwards	Enclosure class:	IP54, cable gland downwards
Cable connection:	2,1m PVC cable 2wire x 0,5mm <sup>2</sup>	Cable connection:	2,1m PVC cable 2wire x 0,5mm <sup>2</sup>
Dimensions:	100 x 100 x 38mm	Dimensions:	100 x 100 x 38mm

## Notes

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

