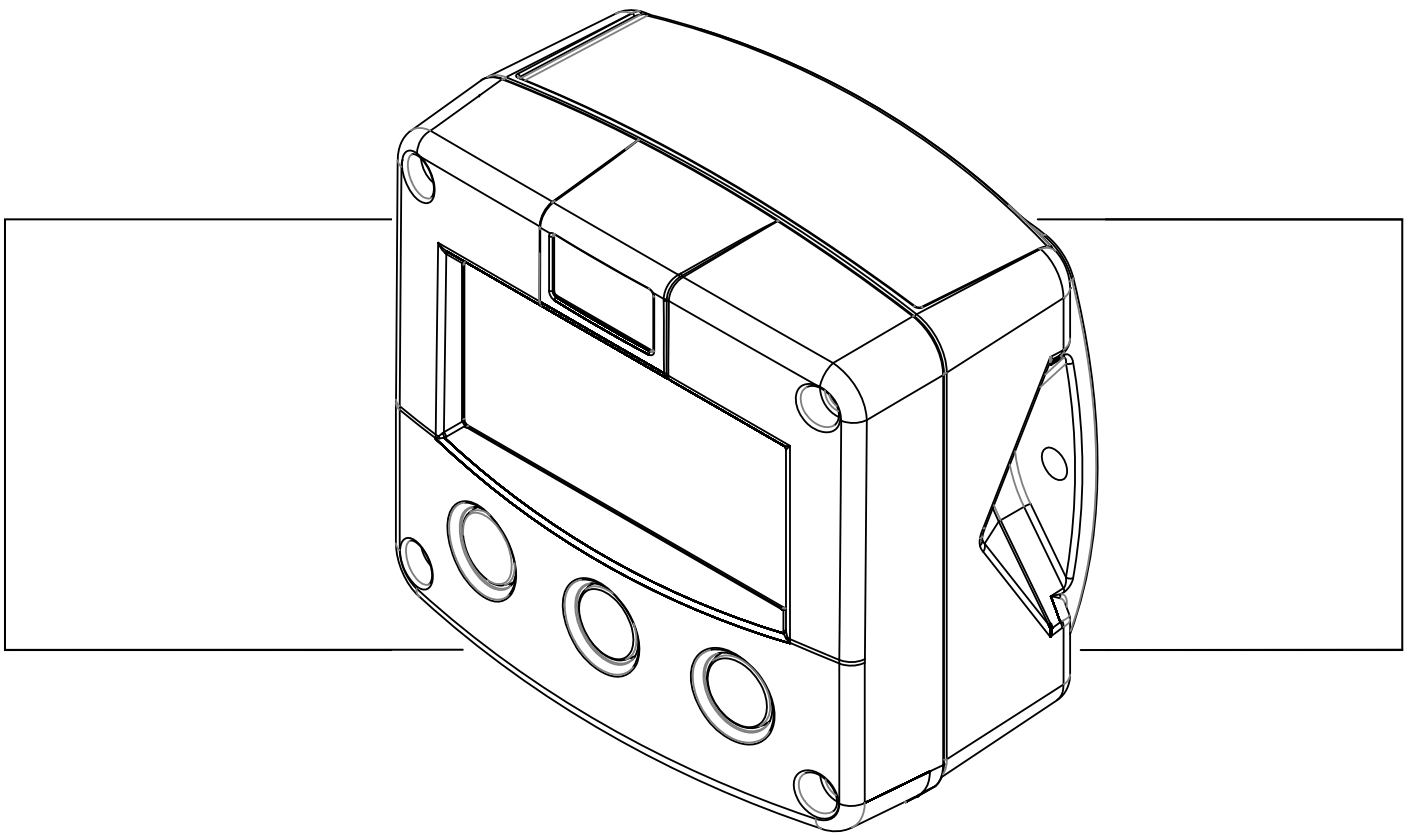


# *F093-P*

*TACHOMETER MONITOR  
ENGINE SPEED AND RUNNING HOURS  
WITH ALARM OUTPUT*



*Signal input Tachometer: pulse, Namur and coil*

*Alarm output: alarm on RPM and running hours*

*Options: Intrinsically Safe*





## SAFETY INSTRUCTIONS

- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- **LIFE SUPPORT APPLICATIONS:** The F093-P is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.
- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.
- This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).
- Do connect a proper grounding to the aluminum casing as indicated if the F093-P has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-casing and removable terminal-block may never be removed.
- Inherently Safe applications: follow the instructions as mentioned in Chapter 5 and consult “Fluidwell F0...-XI - Documentation for Intrinsic Safety”.

## DISPOSAL



- *At the end of its life this product should be disposed of according to local regulations regarding waste electronic equipment. If a battery is present in this product it should be disposed of separately. The separate collection and recycling of your waste equipment will help to conserve natural resources and ensure that it is recycled in a manner that protects the environment.*

## SAFETY RULES AND PRECAUTIONARY MEASURES

- The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and the procedures as described in this manual are not followed.
- Modifications of the F093-P implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Installation, use, maintenance and servicing of this equipment must be carried out by authorized technicians.
- Check the mains voltage and information on the manufacturer's plate before installing the unit.
- Check all connections, settings and technical specifications of the various peripheral devices with the F093-P supplied.
- Open the casing only if all leads are free of potential.
- Never touch the electronic components (ESD sensitivity).
- Never expose the system to heavier conditions than allowed according to the casing classification (see manufacture's plate and chapter 4.2.).
- If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
- The local labor and safety laws and regulations must be adhered to.

## ABOUT THE OPERATION MANUAL

This operation manual is divided into two main sections:

- The daily use of the unit is described in chapter 2 "Operation". These instructions are meant for users.
- The following chapters and appendices are exclusively meant for electricians/technicians. These provide a detailed description of all software settings and hardware installation guidance.

This operation manual describes the standard unit as well as most of the options available. For additional information, please contact your supplier.

**A hazardous situation may occur if the F093-P is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this operating manual indicated by the pictograms:**



A "**warning**" indicates actions or procedures which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the F093-P or connected instruments.



Caution !

A "**caution**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the F093-P or connected instruments.



Note !

A "**note**" indicates actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

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Software version	:	03.06.xx
Manual	:	FW-F093-P-MAN-EN_v0101_01
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# 1. INTRODUCTION

## 1.1. SYSTEM DESCRIPTION OF THE F093-P

### Functions and features

The Tachometer Monitor model F093-P is a microprocessor driven instrument designed to display engine speed, running hours and accumulated running hours as well as the monitoring of the engine speed and running hours for high / low values.

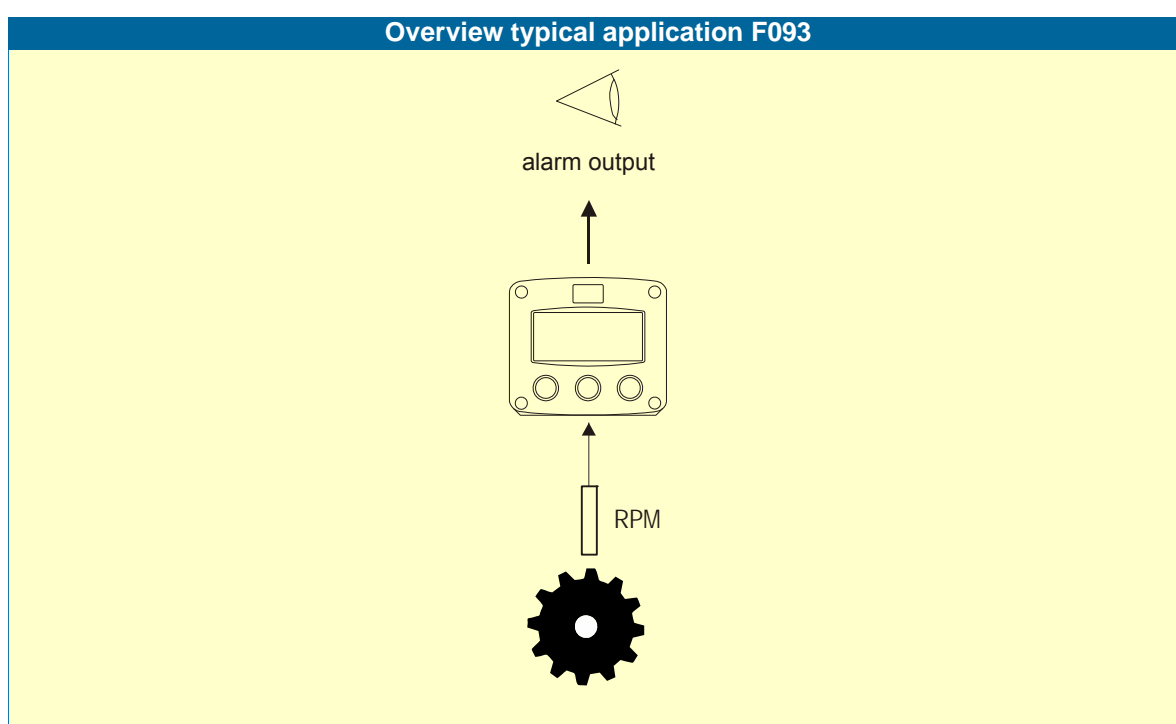
This product has been designed with a focus on:

- ultra-low power consumption to allow long-life battery powered applications (type PB / PC),
- intrinsic safety for use in hazardous applications (type XI),
- several mounting possibilities with GRP or aluminum enclosures for industrial surroundings,
- ability to process all type of Tachometer signals,
- transmitting possibilities with one configurable alarm output.

### Tachometer input

This manual describes the unit with a pulse type input from the Tachometer "-P version".

One Tachometer with a passive or active pulse, Namur or coil signal output can be connected to the F093-P. To power the sensor, several options are available.



*Fig. 1: Typical application for the F093-P.*

### Configuration of the unit

The F093-P has been designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your F093-P according to your specific requirements.

It includes several important features, such as K-factor, signal selection etc. All settings are stored in EEPROM memory and will not be lost in the event of a power failure. To extend the battery-life time, please make use of the power-management functions as described in chapter 3.2.3.

### Display information

The unit has a large transreflective LCD screen with all kinds of symbols and digits to display measuring units, status information, trend-indication and key-word messages.

Engine speed (RPM) and running hours can be displayed either with the small 8mm digits or with the 17mm digits. A backup of the running hours in EEPROM memory is made every minute.

### Options

The following options are available: intrinsic safety, mechanical relay or active outputs, power- and sensor-supply options, panel-mount, wall-mount and weather-proof enclosures, flame proof enclosure and LED backlight.

## 2. OPERATIONAL

### 2.1. GENERAL



- *The F093-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.*

This chapter describes the daily use of the F093-P. This instruction is meant for users / operators.

### 2.2. CONTROL PANEL

The following keys are available:

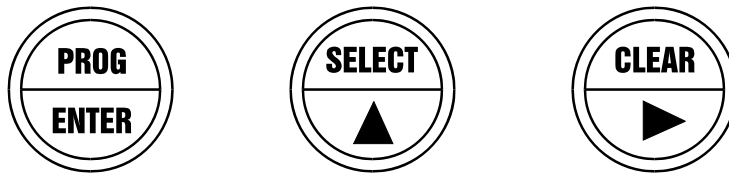


Fig. 2: Control Panel.

#### Functions of the keys



This key is used to program and save new values or settings.  
It is also used to gain access to SETUP-level; please read chapter 3.



This key is used to SELECT accumulated running hours and engine speed alarm values.  
The arrow-key ▲ is used to increase a value after PROG has been pressed or to configure the unit; please read chapter 3.



Press this key twice to CLEAR the value for running hours.  
The arrow-key ► is used to select a digit after PROG has been pressed or to configure the unit; please read chapter 3.

### 2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the F093-P will always act at Operator level. The information displayed is dependent upon the SETUP-settings. The signal generated by the connected Tachometer is measured by the F093-P in the background, whichever screen refresh rate setting is chosen. After pressing a key, the display will be updated very quickly during a 30 second period, after which it will slow-down again.



Auto toggle



Fig. 3: Example of display information during process.

For the Operator, the following functions are available:

- Display engine speed / running hours or engine speed only or running hours only**  
 This is the main display information of the F093-P. After selecting any other information, it will always return to this main display automatically.  
 Running hours is displayed on the upper-line of the display and engine speed on the bottom line.  
 It is possible to display engine speed only with the large 17mm digits; in this instance press the SELECT-key to read the running hours.  
 When "-----" is shown, then the engine speed value is too high to be displayed. The arrows  $\blacktriangle$  indicate the increase/decrease of the engine speed trend.
- Clear running hours**  
 The value for running hours can be re-initialized. To do so, press CLEAR twice. After pressing CLEAR once, the flashing text "PUSH CLEAR" is displayed. To avoid re-initialization at this stage, press another key than CLEAR or wait for 20 seconds.  
 Re-initialization of running hours DOES NOT influence the accumulated running hours.



Note !

**Note:** If pressing CLEAR twice does not clear the running hours, the F093-P is configured not to allow this in Operation mode.

- Display accumulated running hours**  
 When the SELECT-key is pressed, running hours and accumulated running hours are displayed. The accumulated running hours cannot be re-initialized. The value will count up to 99,999,999,999. The unit and number of decimals are displayed according to the configuration settings for running hours.

- **Programming the engine speed alarm values (in Operation mode)**



**Note:** This function might not be accessible due to a configuration setting.

When the SELECT-key is pressed a few times, following engine speed alarm values are displayed:

- low engine speed alarm: enter here 830 RPM for example,
- high engine speed alarm: enter here 5000 RPM for example,

To change the alarm value, the following procedure must be executed:

- 1) press PROG: the word "PROGRAM" will flash or a pass code will be requested,
- 2) use **▶** to select the digits and **▲** to increase that value,
- 3) confirm the new alarm value by pressing ENTER.



Fig. 4: Example of display information during programming minimum engine speed.

When data is altered but ENTER has not been pressed yet, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER during three seconds: the former value will be reinstated.

- **Engine speed alarm**

When the actual engine speed is outside the allowed range, an alarm message will be displayed indicating the type of alarm: "RPM LO" or "RPM HI".

The alarm is terminated automatically as soon as the engine speed is within its range again.

- **Low-battery alarm**

When the battery voltage drops, it must be replaced. At first "low-battery" will flash, but as soon as it is displayed continuously, the battery **MUST** be replaced shortly after!

Only original batteries supplied by the manufacturer may be used, else the guarantee and liability will be terminated. The remaining lifetime after the first moment of indication is generally several days up to some weeks.



Fig. 5: Example of low-battery alarm.

- **Alarm 01-03**

When "alarm" is displayed, please consult Appendix B: problem solving.



## 3. CONFIGURATION

### 3.1. INTRODUCTION

This and the following chapters are exclusively meant for electricians and non-operators. In these, an extensive description of all software settings and hardware connections are provided.



Caution !

- *Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.*
- *The F093-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Ensure that the measuring system is correctly wired up according to the wiring diagrams. The housing may only be opened by trained personnel.*
- *Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.*

### 3.2. PROGRAMMING SETUP-LEVEL

#### 3.2.1. GENERAL

Configuration of the F093-P is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows  $\blacktriangleleft$  will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically.

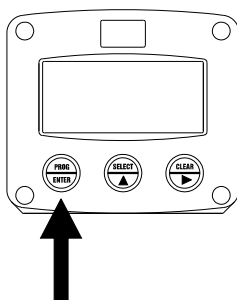
SETUP can be reached at all times while the F093-P remains fully operational.



Note !

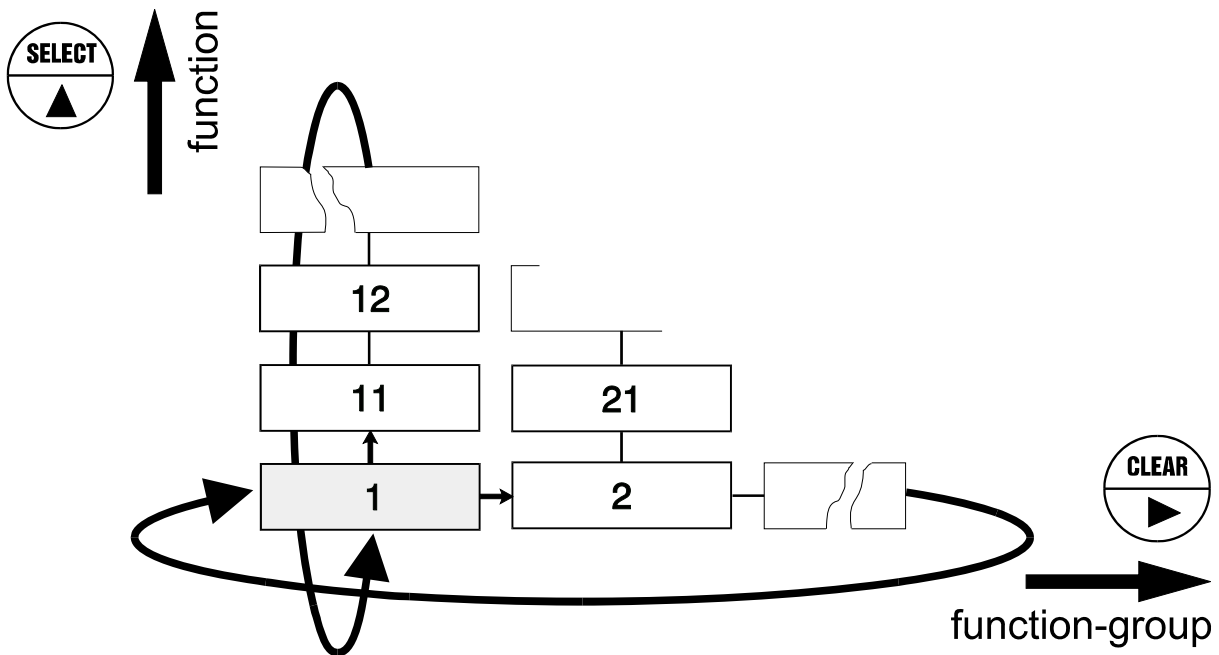
**Note:** A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.

To enter SETUP-level:



Press  for 7 seconds

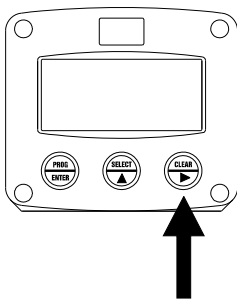
**Matrix structure SETUP-level:**



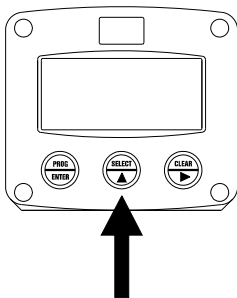
**SCROLLING THROUGH SETUP-LEVEL**

**Selection of function-group and function:**

SETUP is divided into several function groups and functions.



Select function-group with



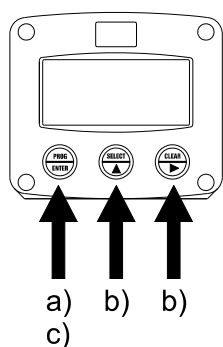
Select function with









Each function has a unique number, which is displayed below the word "SETUP" at the bottom of the display. The number is a combination of two figures. The first figure indicates the function-group and the second figure the sub-function. Additionally, each function is expressed with a keyword.



After selecting a sub-function, the next main function is selected by scrolling through all "active" sub-functions (e.g. 1▲, 11▲, 12▲, 13▲, 14▲, 1▶, 2▶, 3▲, 31 etc.). The "CLEAR" button can be used to jump a step back if you missed the desired function.



To change or select a value:



- a) press  briefly; **PROGRAM** will start flash
- b) select or enter value with  and / or 
- c) press  to confirm the value / selection.

To change a value, use  to select the digits and  to increase that value.

If the new value is invalid, the increase sign  or decrease-sign  will be displayed while you are programming.

To select a setting,  is used to select in one direction and  can be used to select in the other direction.

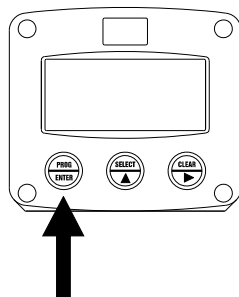
When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for three seconds: the PROG-procedure will be left automatically and the former value reinstated.



Note !

**Note:** alterations will only be set after ENTER has been pressed!

To return to OPERATOR-level:



Press  for 3 seconds

In order to return to the operator level, PROG will have to be pressed for three seconds. Also, when no keys are pressed for 2 minutes, SETUP will be left automatically.

## 3.2.2. OVERVIEW FUNCTIONS SETUP LEVEL

SETUP FUNCTIONS AND VARIABLES			
<b>1</b>	<b>HOURS</b>		
	11	CLEAR	Push Clear – Enter - Cleared
	12	DECIMALS	0 - 1 (Ref: displayed value)
	13	FREQ MIN	0.01 – 999,99 Hz
<b>2</b>	<b>RPM</b>		
	23	DECIMALS	0 - 1 (Ref: displayed value)
	24	K-FACTOR	0.000010 - 9,999,999
	25	DECIMALS K-FACTOR	0 - 6
	26	CALCULATION	per 1 - 255 pulses
	27	CUT-OFF	0.1 - 999.9 seconds
<b>3</b>	<b>ALARM</b>		
	31	ALARM	disable - enable
	32	RPM ZERO	default - no relays - ignore
	33	ALARM LO	0000.000 - 9,999,999
	34	ALARM HI	0000.000 - 9,999,999
	35	DELAY LO	0.1 - 999.9 seconds
	36	DELAY HI	0.1 - 999.9 seconds
	37	ALARM HR	0 - 9999
	38	REL OUT	hi - lo – hi lo – hours - off
<b>4</b>	<b>DISPLAY</b>		
	41	FUNCTION	hours - rpm
	42	DISPLAY	all – toggle –hand
	43	CLR HRS	operator - setup
	44	ALARM SET	operator - setup
	45	ACC HRS	display - hide
	46	BACKLIGHT (optional)	off - green - amber
	47	BL ALARM	off - on - flash
	48	BRIGHTNS	1 - 5
<b>5</b>	<b>POWER MANAGEMENT</b>		
	51	LCD UPDATE	fast - 1 sec - 3 sec - 15 sec - 30 sec - off
	52	BATTERY MODE	operational - shelf
<b>6</b>	<b>SENSOR</b>		
	61	SIGNAL	npn - npn_lp - reed - reed_lp - pnp - pnp_lp - namur - coil_hi - coil_lo - active
<b>7</b>	<b>OTHERS</b>		
	71	TYPE / MODEL	F093-P
	72	SOFTWARE VERSION	03.xx.xx
	73	SERIAL NO.	xxxxxxx
	74	PASS CODE	0000 - 9999
	75	TAGNUMBER	0000000 - 9999999

## 3.2.3. EXPLANATION OF SETUP-FUNCTIONS

1 - RUNNING HOURS	
<b>CLEAR 11</b>	<p>In the CLEAR menu you can reset the running hours to zero: Press PROG, press CLEAR-key to change 'Push Clear' to 'Enter'. Press 'ENTER-key' and 'Cleared' will appear at the bottom and the running hours will be 0. This can normally also be done by pressing CLEAR twice in Operation mode when SETUP 43 is set to "OPERATE". SETUP 11 - CLEAR will always function. The following can be selected:</p> <p style="text-align: center;">Push Clear – Enter - Cleared</p>
<b>DECIMALS 12</b>	<p>The decimal point determines for running hours and accumulated running hours the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">0000000 - 111111.1</p>
<b>FREQ MIN 13</b>	<p>At MINimum FREQUENCY you set the minimum frequency value at which the running hours are being registered. By setting a value disturbances are filtered out. The following can be selected:</p> <p style="text-align: center;">0.01 – 999,99 Hz</p>

2 - RPM	
<p>The settings for running hours and engine speed are entirely separate. The display update time for engine speed (RPM) is one second or more. <b>Note:</b> these settings also influence the alarm output functions.</p>	
<b>DECIMALS 21</b>	<p>This setting determines for engine speed the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">00000 - 1111.1</p>
<b>K-FACTOR 22</b>	<p>With the K-factor, the Tachometer pulse signals are converted to an engine speed (RPM). The K-factor is based on the number of pulses generated by the Tachometer per RPM.. The more accurate the K-factor, the more accurate the functioning of the system will be.</p>
<b>DECIMALS K-FACTOR 23</b>	<p>This setting determines the number of decimals for the K-factor (SETUP 22). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>Please note that this SETUP - influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for "engine speed" (SETUP 21)!</p>
<b>CALCULAT 24</b>	<p>The engine speed is calculated by measuring the time between a number of pulses, for example 10 pulses. The more pulses the more accurate the engine speed will be. The maximum value is 255 pulses. <b>Note:</b> this setting does influence the update time for the analog output directly (maximum update 10 times a second). If the output response is too slow, decrease the number of pulses. <b>Note:</b> the lower the number of pulses, the higher the power consumption of the unit will be (important for battery powered applications). <b>Note:</b> for low frequency applications (below 10Hz): do not program more than 10 pulses else the update time will be very slow. <b>Note:</b> for high frequency application (above 1kHz) do program a value of 100 or more pulses.</p>



Note !

<b>CUT-OFF TIME 25</b>	With this setting, you determine a minimum RPM requirement threshold, if during this time less than XXX-pulses (SETUP 24) are generated, the engine speed will be displayed as zero. The cut-off time has to be entered in seconds - maximum time is 999 seconds (about 15 minutes).
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### 3 - ALARM

*With these settings, it is determined how the engine speed will be monitored and the functionality of the transistor / relay output (terminals 7-8) be determined.*



Note !

<b>ALARM 31</b>	With this setting you determine whether the alarm system is active or not. The following can be selected:  <i>DISABLE - ENABLE</i>
<b>RPM ZERO 32</b>	When the <u>engine speed is zero</u> , then it is possible to ignore or disable the engine speed monitoring. The following settings can be selected: DEFAULT: in case of a low-engine speed alarm, it will switch the alarm output and indicate the alarm on the display. NO RELAY: in case of a low-engine speed alarm, it won't switch the alarm output but will indicate the alarm on the display only. IGNORE: in case of a low-engine speed alarm, it won't switch the alarm output and nothing will be indicated on the display.
<b>ALARM VALUE LOW ENGINE SPEED 33</b>	The low alarm is set with this setting. An alarm will be generated as long as the engine speed is lower as this value. With value 0.0 this function is disabled.
<b>ALARM VALUE HIGH ENGINE SPEED 34</b>	The high alarm is set with this setting. An alarm will be generated as long as the engine speed is higher as this value. With value 0.0 this function is disabled.
<b>DELAY TIME ALARM LOW ENGINE SPEED 35</b>	An alarm generated by SETUP 32 "low" can be ignored during X-time period. If the actual engine speed is still incorrect after this delay time, then an alarm will be generated.
<b>DELAY TIME ALARM HIGH ENGINE SPEED 36</b>	An alarm generated by SETUP 33 "high" can be ignored during X-time period. If the actual engine speed is still incorrect after this delay time, then an alarm will be generated.
<b>ALARM HR 37</b>	The running hours alarm is set with this setting. An alarm will be generated when this value of running hours is met. With value 0.0 this function is disabled.
<b>ALARM OUTPUT TRANSISTOR / RELAY 38</b>	One transistor or relay output is available to transmit the alarm condition. Assign with this function the type of alarm to be transmitted: low engine speed alarm, high engine speed alarm or both alarms.

### 4 - DISPLAY

<b>FUNCTION 41</b>	The large 17mm digits can be set to display running hours or engine speed (RPM). When "running hours" is selected, both running hours and engine speed are displayed simultaneously. When "engine speed" is selected, only engine speed will be displayed with it's measuring unit while running hours will be displayed after pressing SELECT. The following can be selected:  <i>HOURS - RPM</i>
<b>DISPLAY 42</b>	This function determines what is shown on the display. With "ALL" it will show both the RPM and HOURS, at "TOGGLE" it will automatically swap every 3 seconds between RPM and HOURS and with "HAND" you can manually set the display you prefer. The following can be selected:  <i>ALL – TOGGLE – HAND</i>

<b>CLR HRS</b> 43	This function, Clear Hours, determines if the running hours can be reset to zero at Operator level (by clicking CLEAR twice) or only at SETUP-level, (SETUP 11 – CLEAR). The following can be selected:  <i>DISABLE - ENABLE</i>
<b>ALARM SET</b> 44	This function determines if the RPM alarm values can be set at both Operator level and SETUP-level or at SETUP-level only. If SETUP has been selected, the alarm values are still visible for the Operator but can not be changed. The following can be selected:  <i>OPERATE - SETUP</i>
<b>ACC HRS</b> 45	This function determines if the ACCumulated running HouRS are displayed on the display after pressing “SELECT” twice or not.  <i>DISPLAY - HIDE</i>
The functions below will only effect the optional LED-backlight.	
<b>BACKLIGHT (OPTION)</b> 46	If a LED backlight has been supplied, the color can be selected with this function. Following selections are available:  <i>OFF - GREEN - AMBER</i>
<b>BL ALARM (OPTION)</b> 47	In case the F093-P generates any alarm, the backlight can be set to change to red. Following selections are available:  OFF:           during alarm the color is according to setting 47. ON:            during alarm the color is red. FLASH:       during alarm the color flashes red and the color as per setting 47.
<b>BRIGHTNESS (OPTION)</b> 48	The density of the backlight can be set in following range:  <i>1 - 5</i>  One is minimum and five is maximum brightness

## 5 - POWER MANAGEMENT

When used with the internal battery option, the user can expect reliable measurement over a long period of time. The F093-P has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:

<b>LCD NEW</b> 51	The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display update, it is <b>strongly advised</b> to select a slow refresh rate. Please understand that NO information will be lost; every pulse will be counted and the output signal will be generated in the normal way. The following can be selected:  <i>Fast - 1 sec - 3 sec - 15 sec - 30 sec - off.</i>  <b>Example battery life-time:</b> <i>life-time with a coil pick-up, 1kHz. pulses and FAST update: about 2 years.</i> <i>life-time with a coil pick-up, 1kHz. pulses and 1 sec update: about 5 years.</i>  <b>Note:</b> after a button has been pressed by the operator - the display refresh rate will always switch to FAST for 30 seconds. When "OFF" is selected, the display will be switched off after 30 seconds and will be switched on as soon as a button has been pressed.
----------------------	--



Note !

<b>BATTERY-MODE 52</b>	<p>The unit has two modes: operational or shelf. After "shelf" has been selected, the unit can be stored for several years; it will not process the sensor signal; the display is switched off but all settings and running hours are stored. In this mode, power consumption is extremely low.</p> <p>To wake up the unit again, press the SELECT-key twice.</p>
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<b>6 - SENSOR</b>				
<b>SIGNAL 61</b>	<p>The F093-P is able to handle several types of input signal. The type of Tachometer pickup / signal is selected with SETUP 61. Read also par. 4.4.2. or 4.4.3 - Tachometer input terminals.</p>			
TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ. / MV	REMARK
NPN	NPN input	100kOhm pull-up	6 kHz.	(open collector)
NPN - LP	NPN input with low pass filter	100kOhm pull-up	1.2 kHz.	(open collector) less sensitive
REED	Reed-switch input	1mOhm pull-up	600 Hz.	
REED - LP	Reed-switch input with low pass filter	1mOhm pull-up	120 Hz.	Less sensitive
PNP	PNP input	47kOhm pull-down	6 kHz.	
PNP - LP	PNP input with low pass filter	100kOhm pull-down	1.2 kHz.	Less sensitive
NAMUR	Namur input	820 Ohm pull-down	4 kHz.	External power required
COIL HI	High sensitive coil input	-	20mV p.t.p.	Sensitive for disturbance!
COIL LO	Low sensitive coil input	-	90mV p.t.p.	Normal sensitivity
ACTIVE	Active pulse input detection level 1.2V DC	47kOhm	10KHz.	External power required

<b>7 - OTHERS</b>	
<b>TYPE OF MODEL 71</b>	<p>For support and maintenance it is important to have information about the characteristics of the F093-P. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.</p>
<b>VERSION SOFTWARE 72</b>	<p>For support and maintenance it is important to have information about the characteristics of the F093-P. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.</p>
<b>SERIAL NUMBER 73</b>	<p>For support and maintenance it is important to have information about the characteristics of the F093-P. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.</p>
<b>PASS CODE 74</b>	<p>All SETUP-values can be pass code protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.</p>
<b>TAGNUMBER 75</b>	<p>For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.</p>



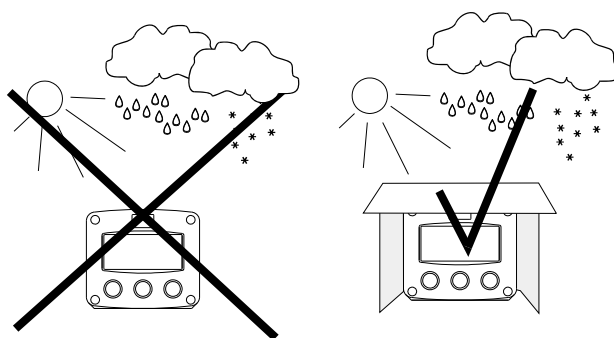
## 4. INSTALLATION

### 4.1. GENERAL DIRECTIONS



- *Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.*
- *The F093-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.*
- *Take careful notice of the " Safety rules, instructions and precautionary measures " at the front of this manual.*

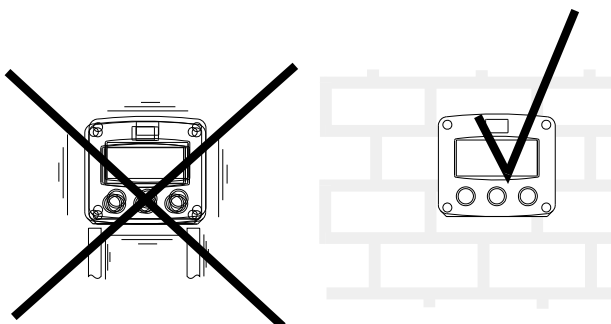
### 4.2. INSTALLATION / SURROUNDING CONDITIONS



Take the relevant IP classification of the casing into account (see manufactures plate). Even an IP67 (NEMA 4X) casing should NEVER be exposed to strongly varying (weather) conditions.

When panel-mounted, the unit is IP65 (NEMA 4)!

When used in very cold surroundings or varying climatic conditions, take the necessary precautions against moisture by placing a dry sachet of silica gel, for example, inside the instrument case.



Mount the F093-P on a solid structure to avoid vibrations.

4.3. DIMENSIONS- ENCLOSURE

Aluminum enclosures:

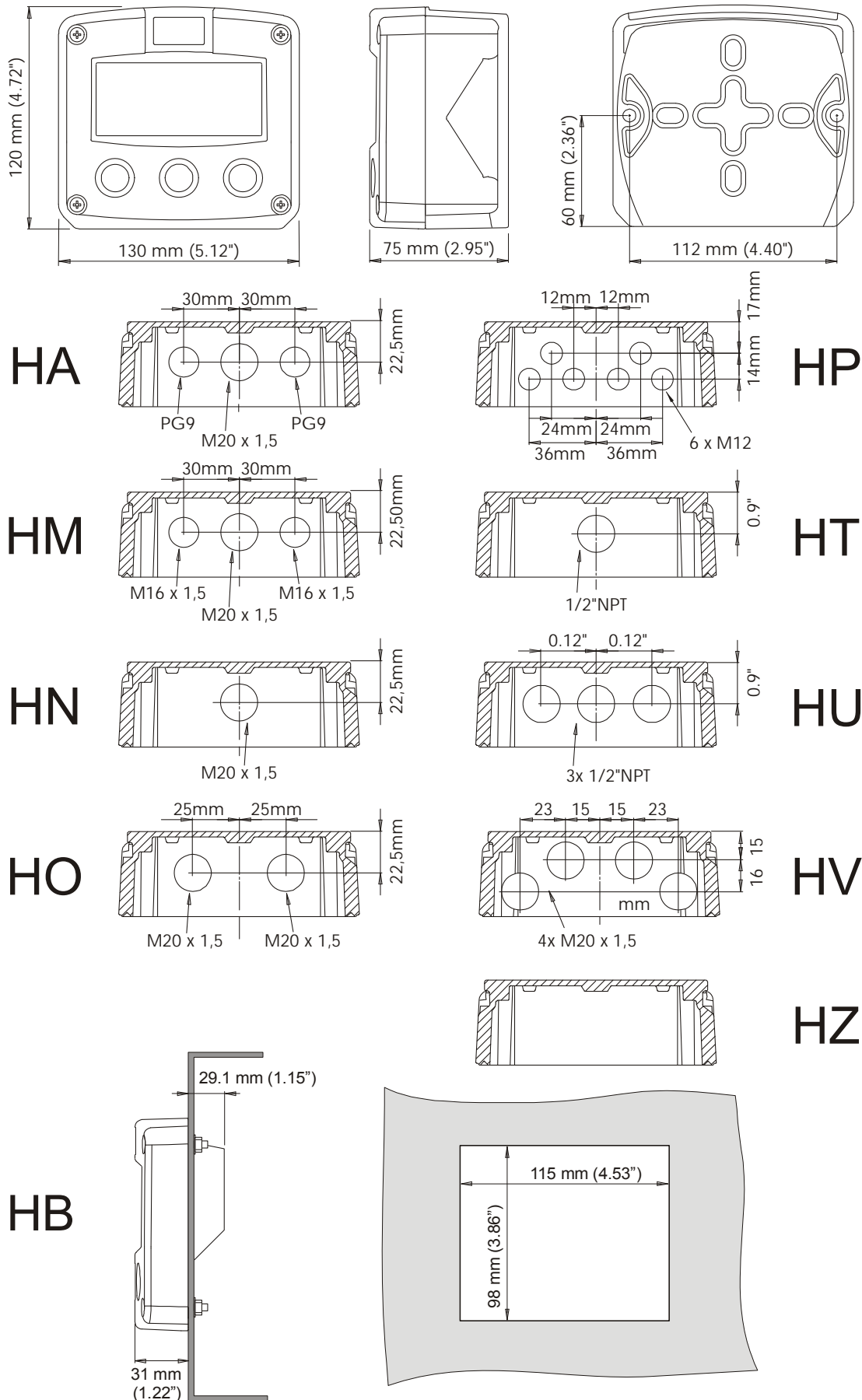
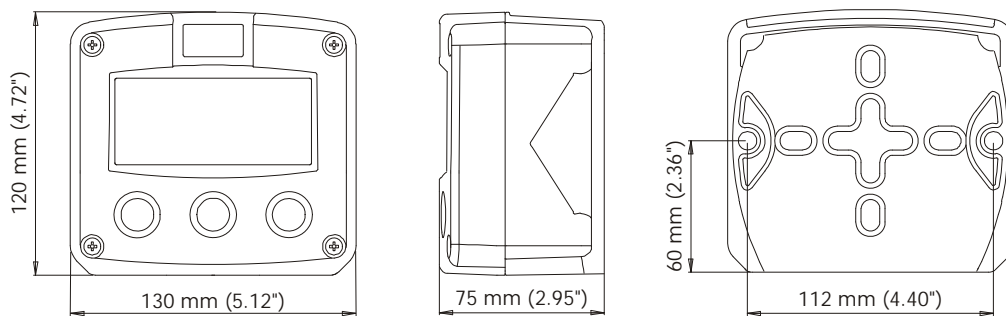
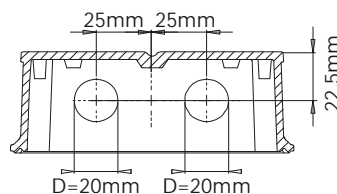
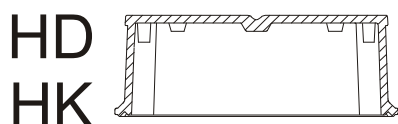
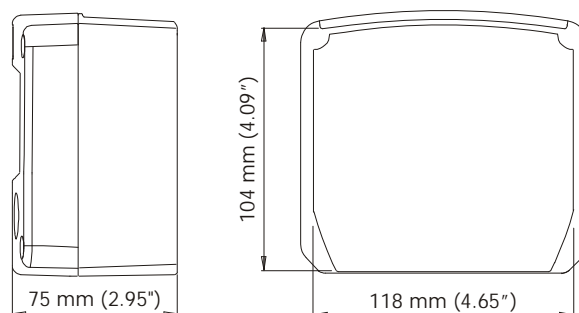


Fig. 6: Dimensions Aluminum enclosures.

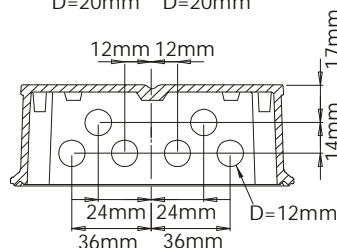
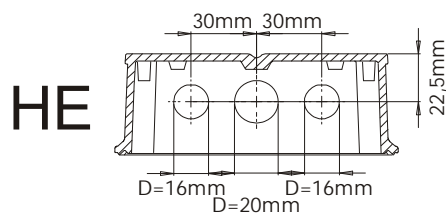
GRP enclosures:



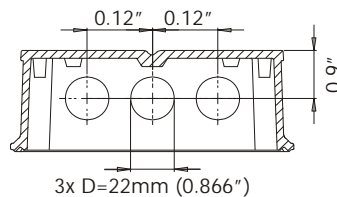
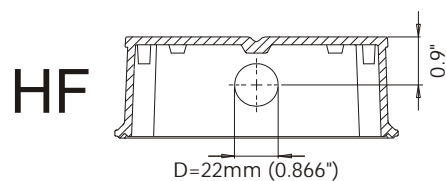
HK back box:  
(flat bottom)



HG



HH



HJ

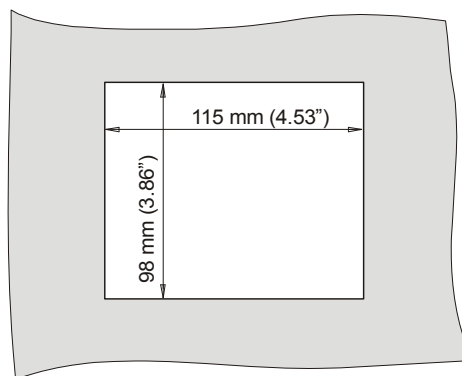
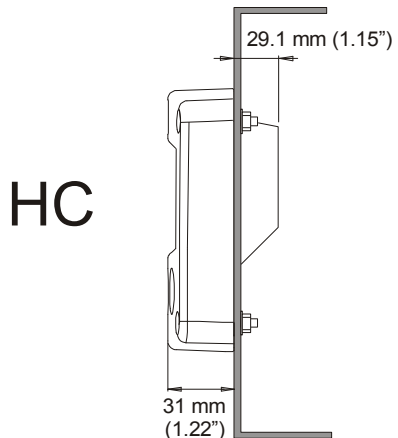


Fig. 7: Dimensions GRP enclosures.

#### 4.4. INSTALLING THE HARDWARE

##### 4.4.1. INTRODUCTION



- *Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.*



- *This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).*



- *Do ground the aluminum casing properly as indicated, if the F093-P has been supplied with the 115-230V AC power-supply type PM. The green / yellow wire between the back-casing and removable terminal-block may never be removed.*

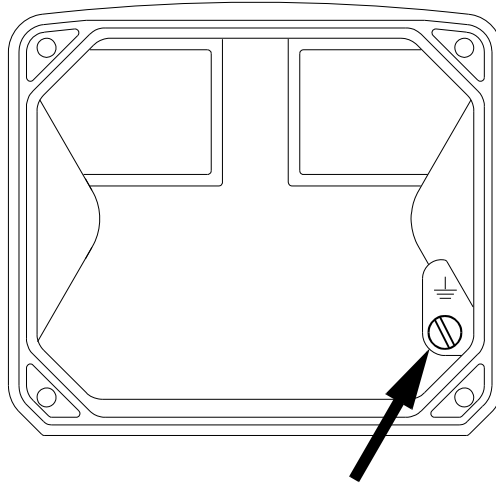


Fig. 8: Grounding aluminum enclosure with option PM 115-230V AC.

#### FOR INSTALLATION, PAY EMPHATIC ATTENTION TO:

- Separate cable glands with effective IP67 (NEMA4X) seals for all wires.
- Unused cable entries: ensure that you fit IP67 (NEMA4X) plugs to maintain rating.
- A reliable ground connection for both the sensor, and if applicable, for the metal casing. (above)
- An effective screened cable for the input signal, and grounding of it's screen to the "⊥" terminal or at the sensor itself, whichever is appropriate to the application.

#### 4.4.2. TERMINAL CONNECTORS WITH POWER SUPPLY - TYPE : PB / PD / PX

For *Intrinsically Safe* applications: read chapter 5.

The following terminal connectors are available:

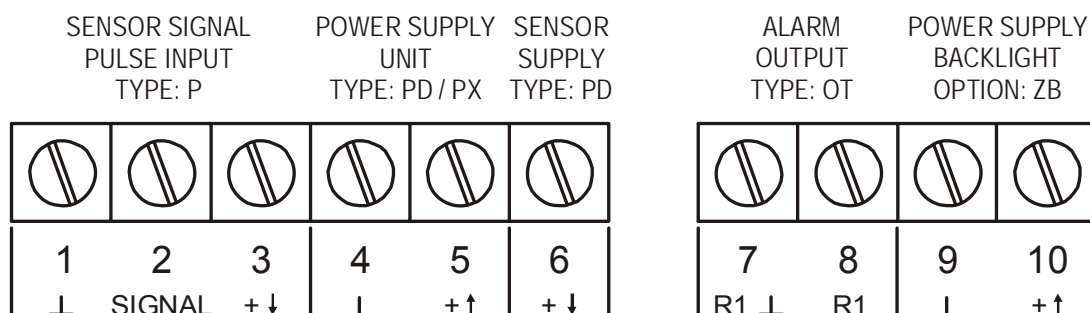


Fig. 9: Overview of terminal connectors F093-P-(PB / PD / PX) and options.

#### SENSOR SUPPLY

##### Type PB / PD / PX - terminal 3: sensor supply 1.2V - 3.2V:

Terminal 3 provides a limited supply voltage of 3.2 V DC (coil signals 1.2V) for the signal output of the Tachometer.



Note !

**Note:** This voltage **MAY NOT** be used to power the Tachometers electronics, converters etc, as it will not provide adequate sustained power ! All energy used by the Tachometers pick-up will directly influence the battery life-time (type PB). It is strongly advised to use a "zero power" pickup such as a coil or reed-switch when operating without external power. It is possible to use some low power NPN or PNP output signals, but the battery life time will be significantly reduced (consult your distributor).

##### Type PD - terminal 6: sensor supply 8.2V:

With this option, a basic but real sensor supply of max. 5mA@8.2V is available to power e.g. a Namur sensor.

#### REMARKS: TERMINAL CONNECTORS:

##### Terminals 1-3; Tachometer input:

Three basic types of Tachometer signals can be connected to the unit: pulse, active pulse or coil. The screen of the signal wire must be connected to the common ground terminal. The input signal type has to be selected with the correct SETUP-function (read par. 3.2.3.)

The F093-P is suitable for use with Tachometers which have a coil output signal.

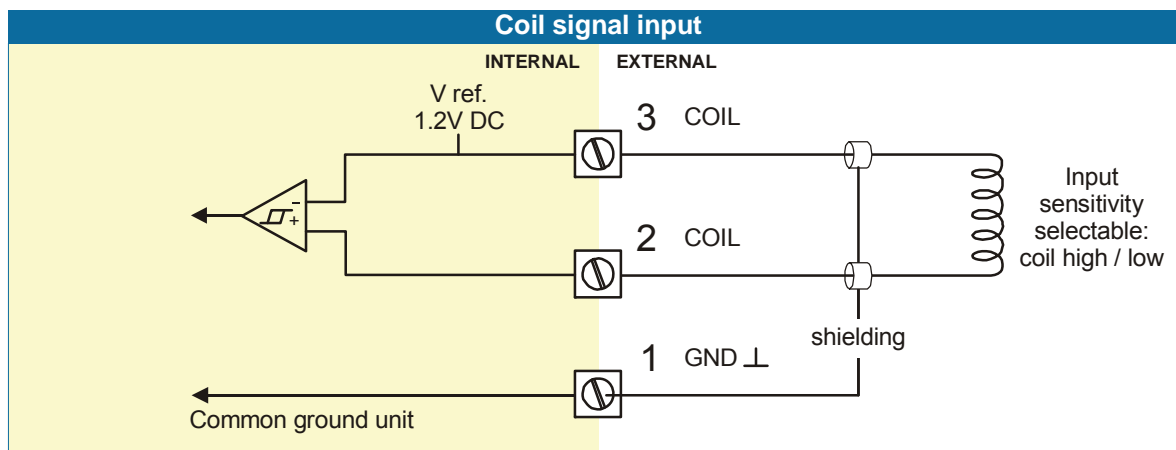
Two sensitivity levels can be selected with the SETUP-function:

COIL LO: sensitivity from about 90mVp-p.

COIL HI: sensitivity from about 20mVp-p.

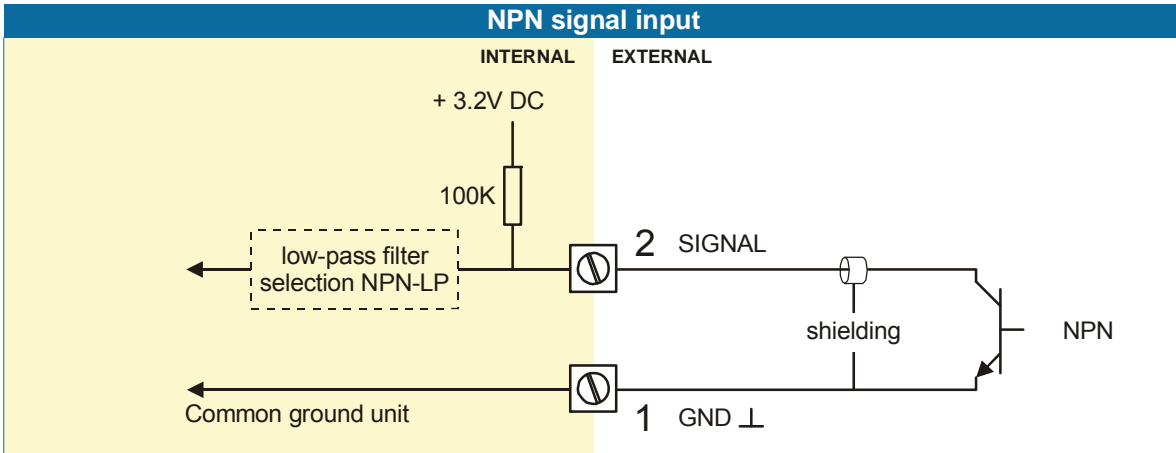
Type ZF (option): offers for setting COIL HI : sensitivity from about 10mVp-p.

Type ZG (option): offers for setting COIL HI : sensitivity from about 5mVp-p.



**Pulse-signal NPN / NPN-LP:**

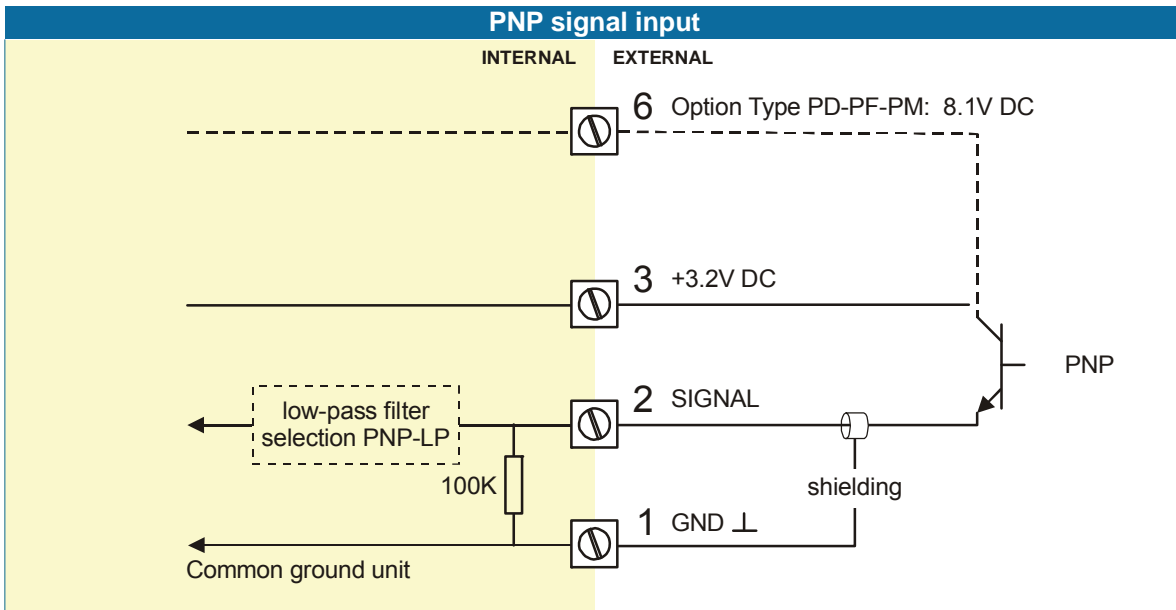
The F093-P is suitable for use with Tachometers which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.



**Pulse-signal PNP / PNP-LP:**

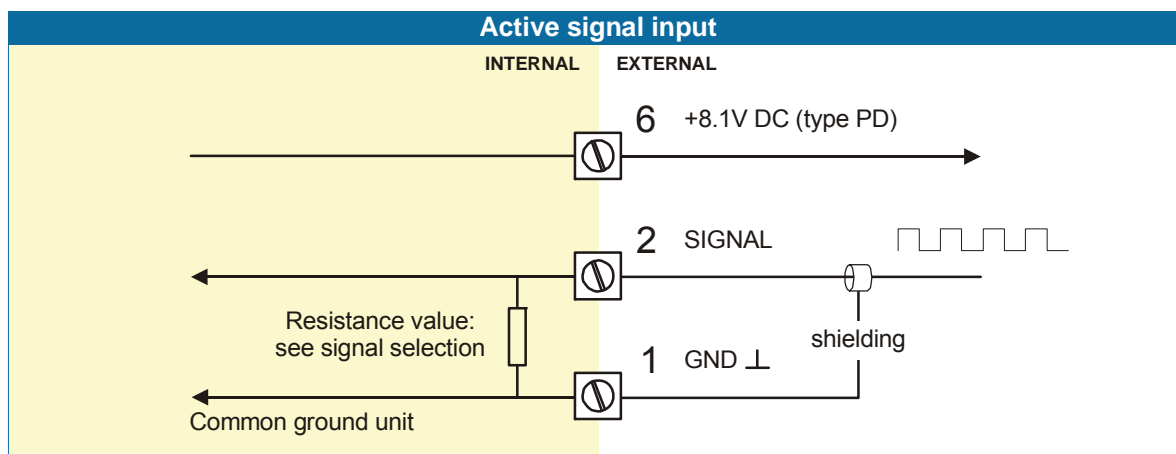
The F093-P is suitable for use with Tachometers which have a PNP output signal. Terminal 3 offers 3.2V which has to be switched by the sensor to terminal 2 (SIGNAL). For a reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.

A sensor supply voltage of 8.1V DC can be provided with option PD on terminal 6.

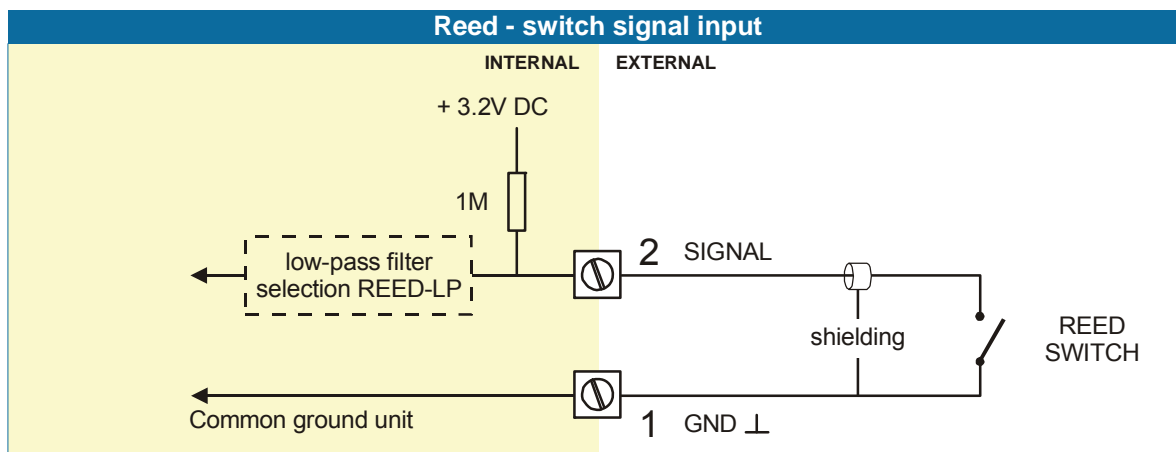


**Active signal:**

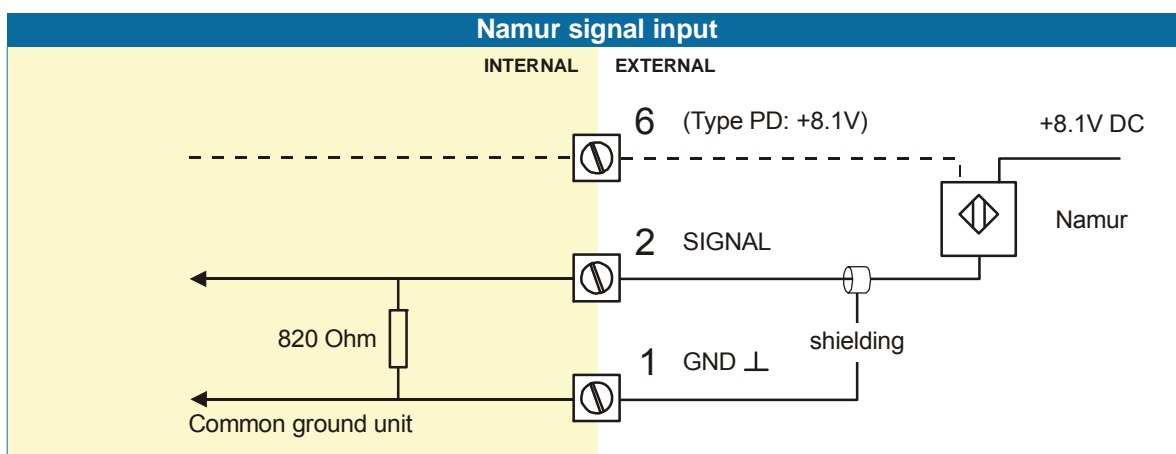
Active signal selection may well be desired in the case of option PD being supplied for sensor supply.

**Reed-switch:**

The F093-P is suitable for use with Tachometers which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass filter (read par. 3.2.3.)

**NAMUR-signal:**

The F093-P is suitable for Tachometers with an Namur signal. The standard F093-P is not able to power the Namur sensor, as an external power supply for the sensor is required. However, a 8.2V sensor supply voltage (terminal 6) can be provided with type PD.



**Terminal 4-5: POWER SUPPLY UNIT - TYPE PD / PX:**

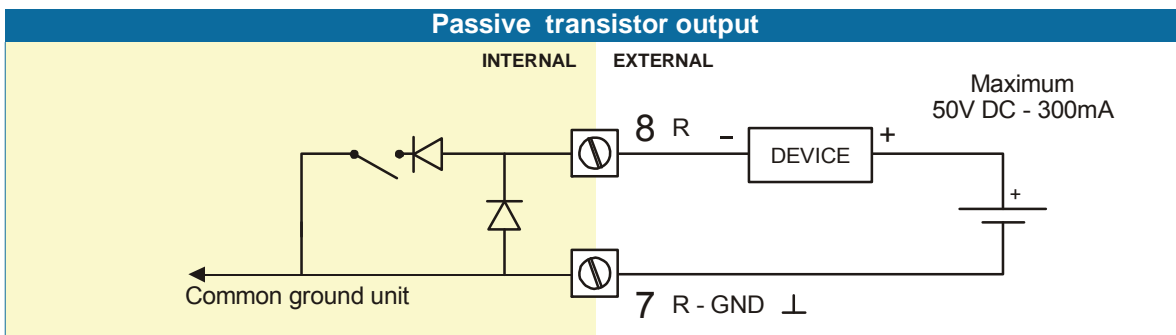
To power the unit an internal battery can be used (type PB) and / or an external DC power supply of 8-30V DC (type PX) or 16-30V DC (type PD).  
 Connect the "-" to terminal 4 and the "+" to terminal 5. When power is applied to these terminals, the optional internal battery will be disabled / enabled automatically to extend the battery life time.

**Terminal 6: Power supply type PD: 8.2V sensor supply.**

With this option, a limited power supply for the sensor is available, for example to power a Namur sensor. It offers 8.2V DC (max. 5mA).  
 Remark: this terminal is only available if option PD has been ordered.

**Terminal 7-8; Alarm output – type OT:**

With SETUP 36, the function of this output is set to a low and / or high engine speed alarm output. A passive transistor output is available with this option. Max. driving capacity 300mA@50V DC.



**Terminal 9-10: power supply backlight - type ZB (option):**

To power the backlight, a voltage in the range 20-30V DC has to be connected. Maximum current 30mA. Connect the "-" to terminal 9 and the "+" to terminal 10.

**4.4.3. TERMINAL CONNECTORS WITH POWER SUPPLY - TYPE : PF / PM**

For Intrinsically Safe applications: read chapter 5.

The following terminal connectors are available:

POWER SUPPLY TYPE: PF / PM			ALARM OUTPUT TYPE: OA-OR-OT		SENSOR SIGNAL TYPE: P: PULSE INPUT		
GND ⊥	1 N	2 L1	3 R⊥	4 R	5 ⊥	6 SIGNAL	7 +↓

Fig. 10: Overview of terminal connectors F093-P-(PF / PM) and options.



## SENSOR SUPPLY

### Type PF-PM: Sensor supply: 1.2, 3.2V, 8.2V, 12V or 24 V:

With this option, a real power supply for the sensor is available. The Tachometer can be powered with 1.2, 3.2, 8.2, 12 or 24 V DC (max. 400mA@24V). The voltage is selected with the three switches inside the enclosure.



- **Warning: be sure that all the leads to the terminals are disconnected from the unit when the internal plastic protection cover has been removed !**
- **HIGH VOLTAGE 400V !! NEVER connect the mains power supply to the unit when the plastic protection cover has been removed !!!**

First, remove the terminal strip(s) after which the internal plastic cover can be removed. The switches are located on the right hand side as indicated:

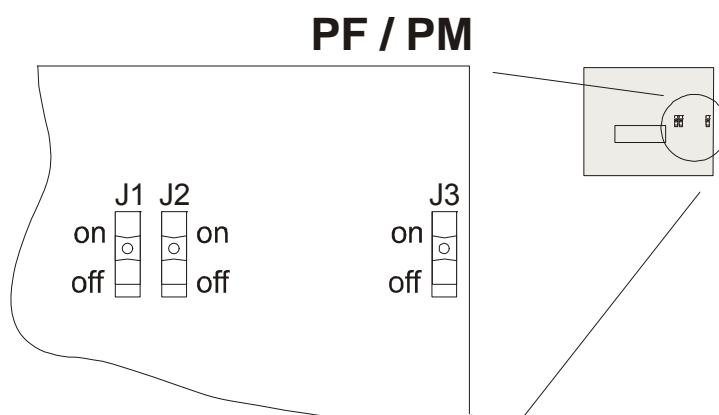


Fig. 11: switch position voltage selection (type PF and PM).

### Switch positions / sensor supply voltage:

VOLTAGE SELECTION				
SWITCH	1.2 / 3.2V DC	8.2V DC	12V DC	24V DC
J1	on	off	off	off
J2	on or off	on	on	off
J3	on or off	on	off	on or off

### REMARKS: TERMINAL CONNECTORS:

#### Terminal GND- 01- 02; POWER SUPPLY only available with type PF / PM:

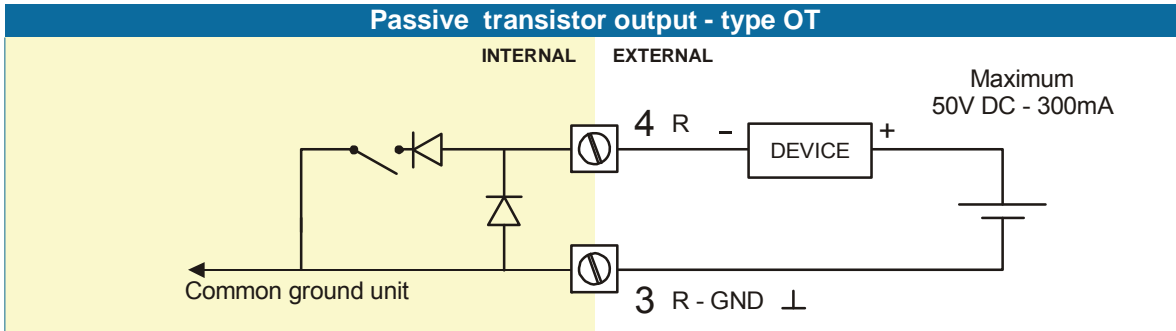
OPTION	SENSOR SUPPLY	Terminal		
		GND	01	02
PF 24V AC $\pm$ 10%	1.2, 3.2, 8.2, 12, 24V max. 400mA@24V DC		AC	AC
PF 24V DC $\pm$ 10%	1.2, 3.2, 8.2, 12, 24V max. 400mA@24V DC	L-	L+	
PM 115-230V AC $\pm$ 10%	1.2, 3.2, 8.2, 12, 24V max. 400mA@24V DC	EARTH	AC	AC
Note PF / PM	The running hours consumption of the sensor, transistor output type OA and backlight type ZB may not exceed 400mA@24V DC.			

**Terminal 3-4; Alarm output:**

With SETUP 36, the function of this output is set to a low and / or high engine speed alarm output.

**Type OT:**

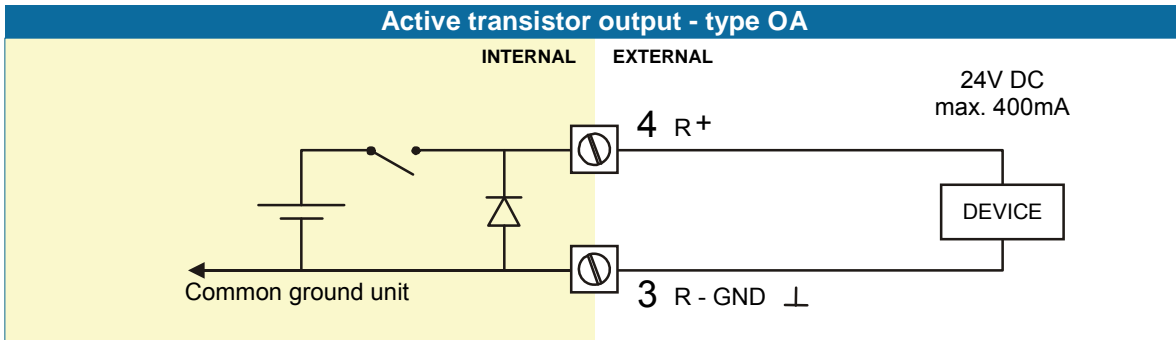
A passive transistor output is available with this option. Max. driving capacity 300mA@50V DC.



**Type OA:**

An active 24V DC signal transistor output is available with this option.

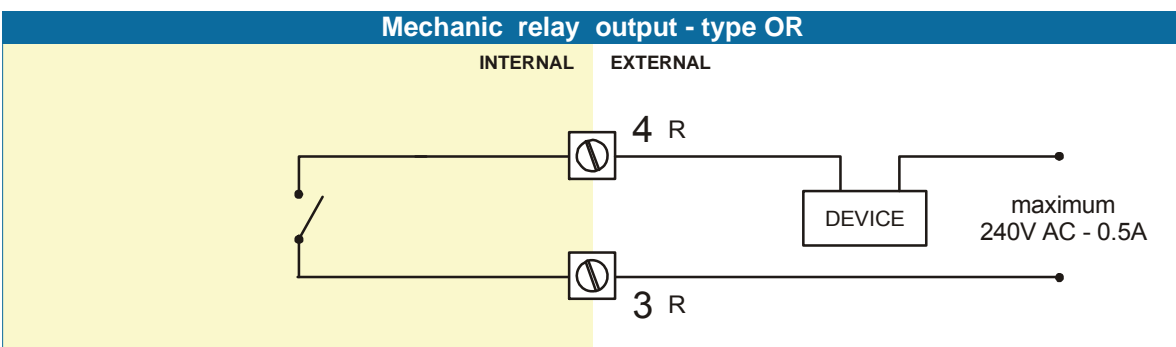
Max. driving capacity 400mA@24V DC. (Requires power supply type PF / PM).



**Type OR:**

An isolated mechanical relay engine speed alarm output is available with this option.

Max. switch power 240V 0,5A. (Requires power supply type PF / PM).



**Terminals 5-7; Tachometer input:**

Three basic types of Tachometer signals can be connected to the unit: pulse, active pulse or coil.

The screen of the signal wire must be connected to the common ground terminal

The input signal type has to be selected with the correct SETUP-function (read par. 3.2.3.)

**Coil-signal:**

The F093-P is suitable for use with Tachometers which have a coil output signal.

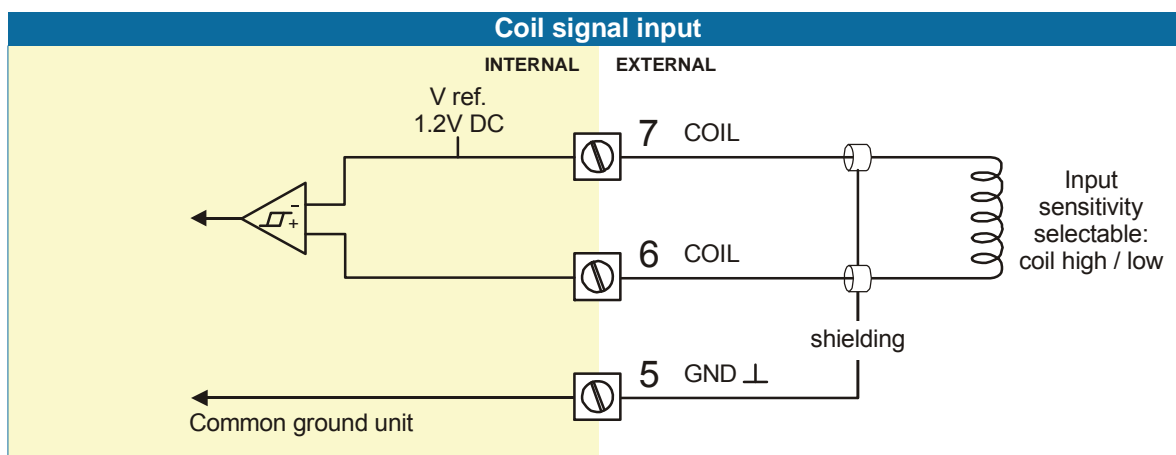
Two sensitivity levels can be selected with the SETUP-function:

COIL LO: sensitivity from about 90mVp-p.

COIL HI: sensitivity from about 20mVp-p.

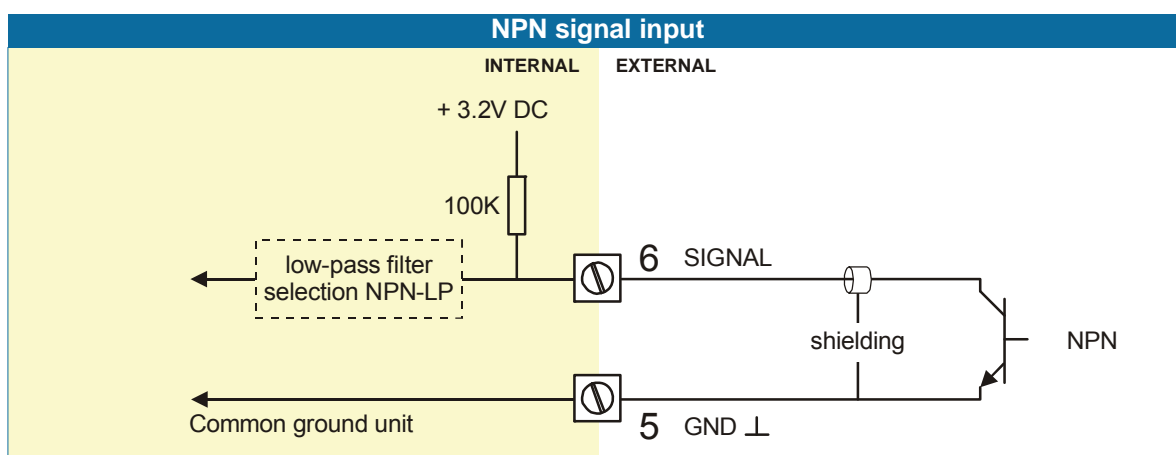
Type ZF (option): offers for setting COIL HI : sensitivity from about 10mVp-p.

Type ZG (option): offers for setting COIL HI : sensitivity from about 5mVp-p.



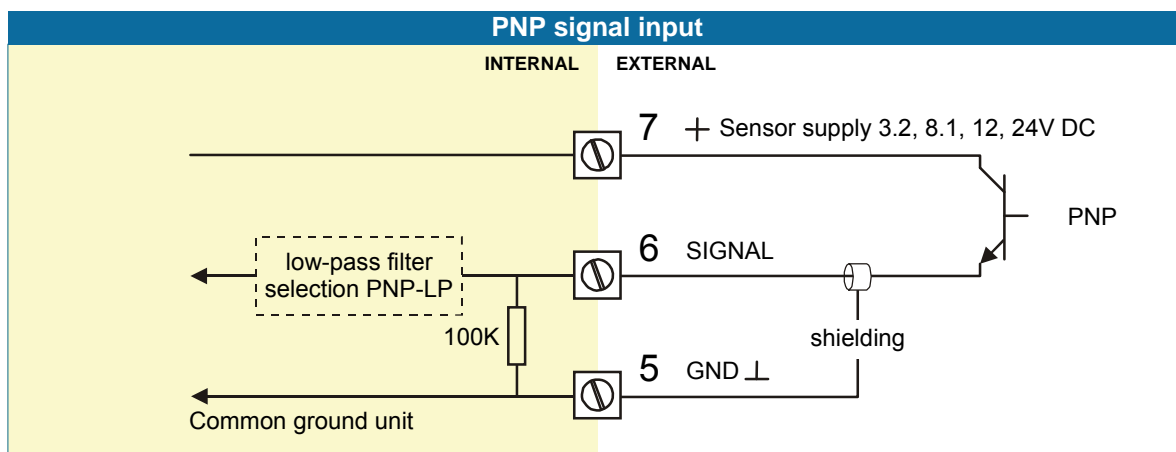
#### Pulse-signal NPN / NPN-LP:

The F093-P is suitable for use with Tachometers which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3.



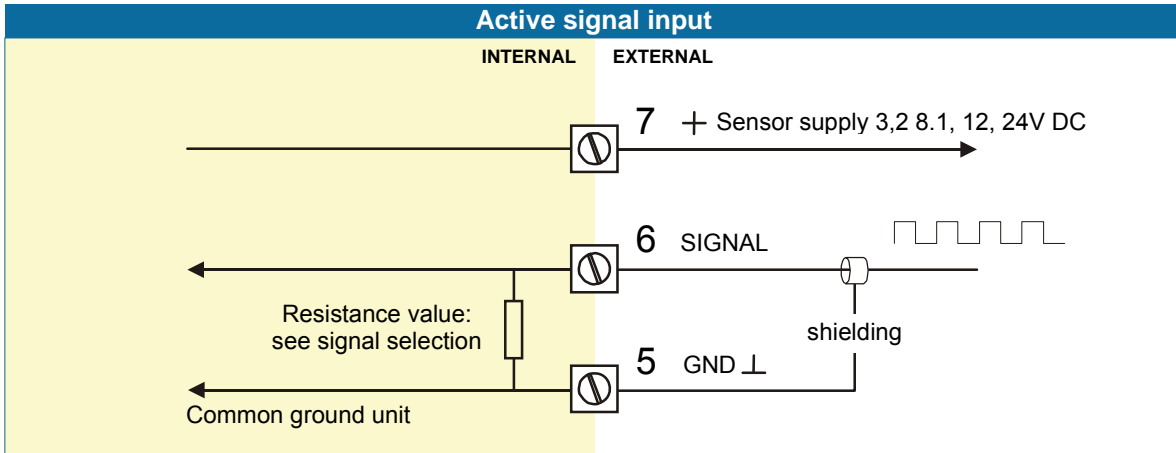
#### Pulse-signal PNP / PNP-LP:

The F093-P is suitable for use with Tachometers which have a PNP output signal. For a reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 3.2.3. A sensor supply voltage is offered with terminal 7.



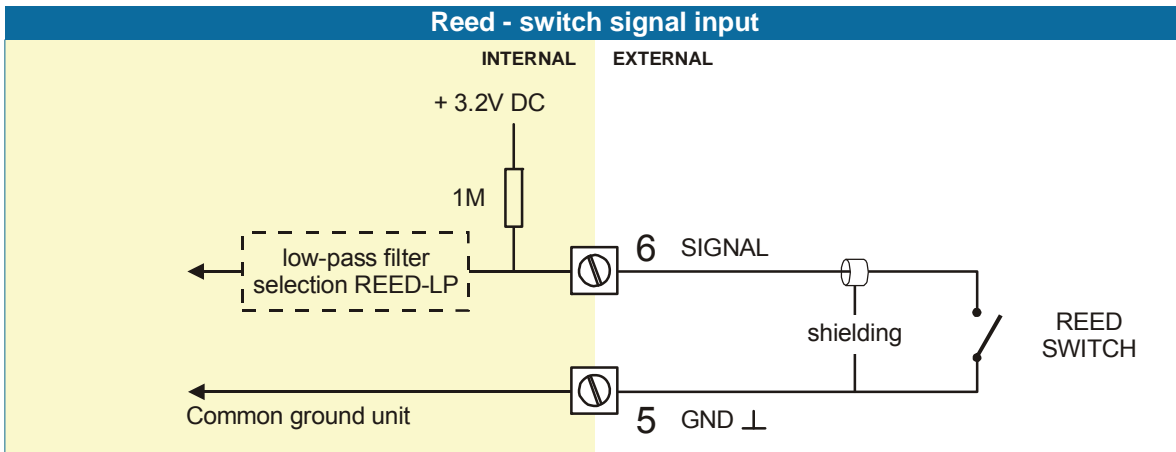
**Active signals:**

Active signal selection may well be desired if an active signal is offered from the sensor.



**Reed-switch:**

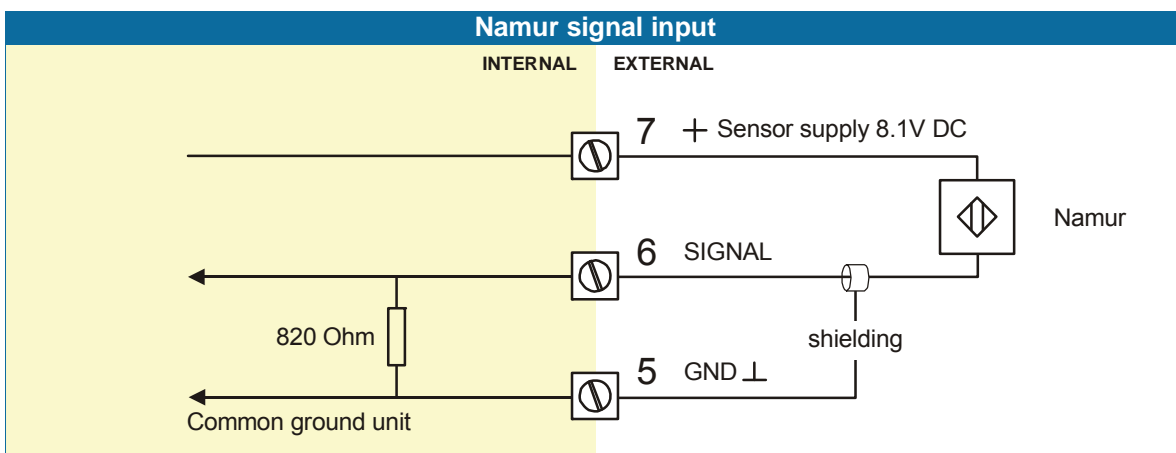
The F093-P is suitable for use with Tachometers which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass filter (read par. 3.2.3.)



**NAMUR-signal:**

The F093-P is suitable for Tachometers with an Namur signal.

Terminal 7 can provide a 8.2V sensor supply voltage (please read section "sensor supply").



## 5. INTRINSICALLY SAFE APPLICATIONS

### 5.1. GENERAL INFORMATION AND INSTRUCTIONS:



- *Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.*
- *This device may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the cabinet has been opened (danger of electric shock). The housing may only be opened by trained personnel.*
- *Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.*

#### *Safety Instructions*



- *Certificates, safety values, control drawing and declaration of compliance can be found in the document named: "Fluidwell F0..-P-XI - Documentation for Intrinsic Safety".*
- *For installation under ATEX directive: this intrinsically safe device must be installed in accordance with the ATEX directive 94/9/EC and the product certificate KEMA 05ATEX1168 X.*
- *For installation under IECEx scheme: this intrinsically safe device must be installed in accordance the product certificate IECEx KEM 08.0006X.*
- *For installation under CSA: this intrinsically safe device must be installed in accordance the product certificate CSA.08.2059461 X.*
- *For installation under FM: this intrinsically safe device must be installed in accordance with the Certificate / Project ID: 3033306.*
- *The control drawing number FWCD-0003 can be found in the document named: "Fluidwell F0..-P-XI - Documentation for Intrinsic Safety".*
- *Exchange of Intrinsically Safe battery FWLiBAT-00x with certificate number KEMA 03ATEX1071 U or IECEx KEM 08.0005U is allowed in Hazardous Area. See paragraph 5.4. for battery replacement instructions.*

#### *Please note*



- *Special conditions for safe use mentioned in both the certificate and the installation instructions must be observed for the connection of power to both input and / or output circuits.*
- *When installing this device in hazardous areas, the wiring and installation must comply with the appropriate installation standards for your industry.*
- *Study the following pages with wiring diagrams per classification.*

#### **Serial number and year of production**

This information can be looked-up on the display: setup function (par. 3.2.2.).

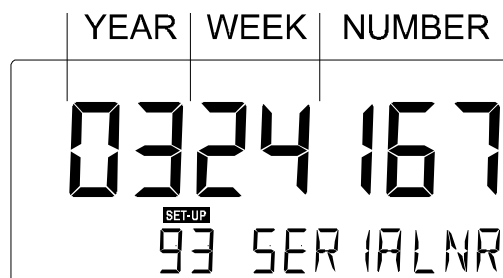


Fig. 12: Example serial number.

Label information pulse input type - F0..P-XI (inside and outside the enclosure)

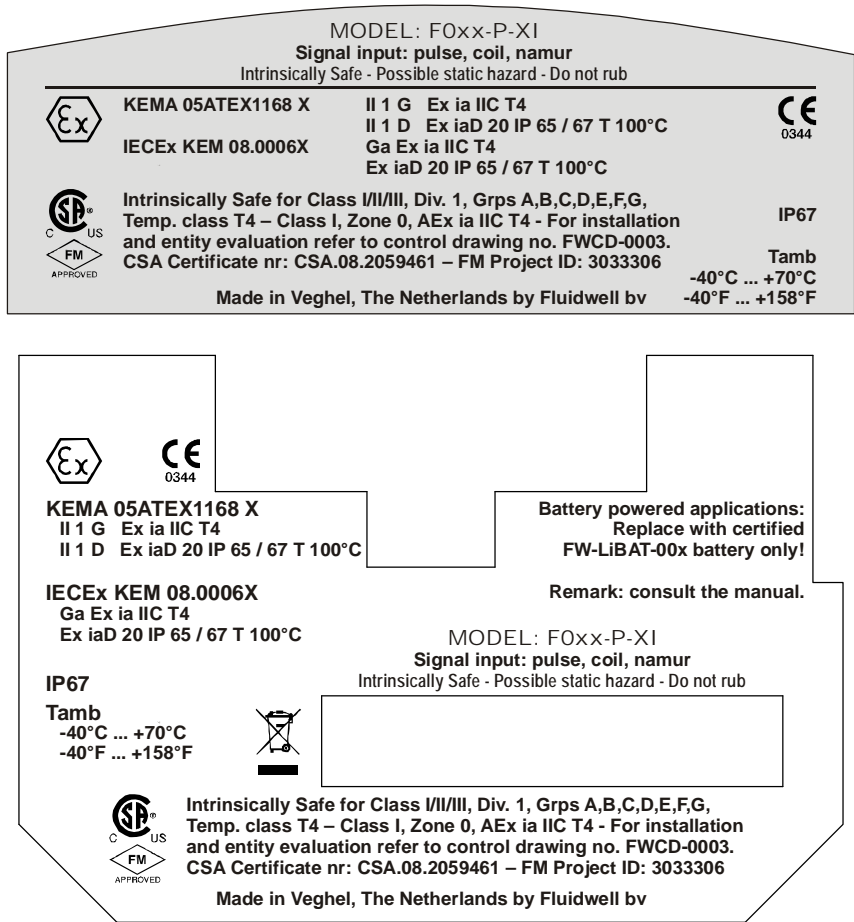


Fig. 13: Label information Intrinsically Safe application.

5.2. TERMINAL CONNECTORS INTRINSICALLY SAFE APPLICATIONS:

Terminal connectors F093-P-(PC / PD / PX)-XI-(ZB):

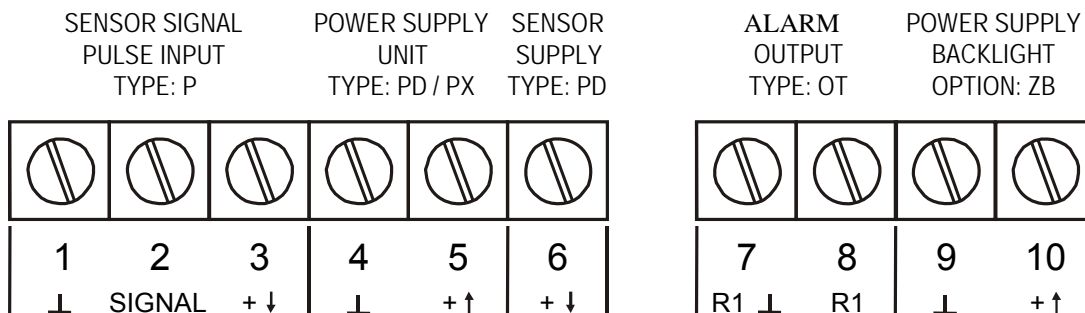


Fig. 14: Overview terminal connectors XI - Intrinsically Safe applications.

Remarks power supply options:

**Type PC:** offers - additional to type PX - an internal Intrinsically Safe lithium battery. This ATEX certified battery (FW-LiBATT-xxx) may be changed in hazardous area.

**Type PD:** offers with terminal 6 - additional to type PX - a real sensor supply of 8.2V DC to power a Namur sensor for example.

**Type PX:** as standard, all intrinsically product are supplied with terminal 4 and 5 to power the product externally.

5.3. CONFIGURATION EXAMPLES INTRINSICALLY SAFE APPLICATIONS:

Configuration example no. 1

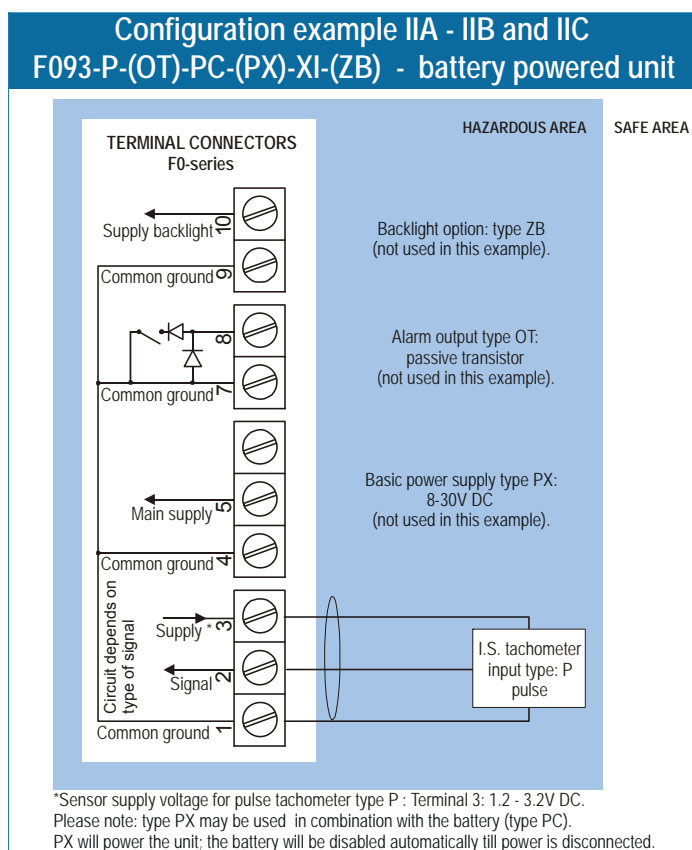


Fig. 15: Configuration example Intrinsically Safe.

Configuration example no. 2

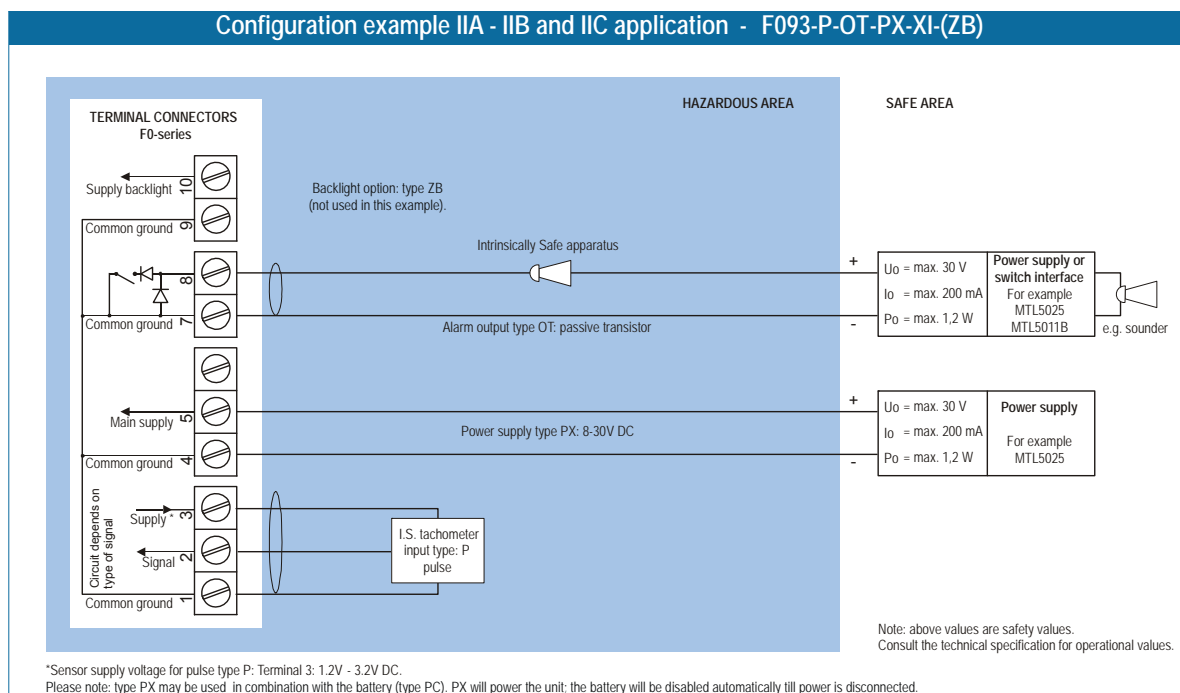


Fig. 16: Configuration example Intrinsically Safe.

Configuration example no. 3

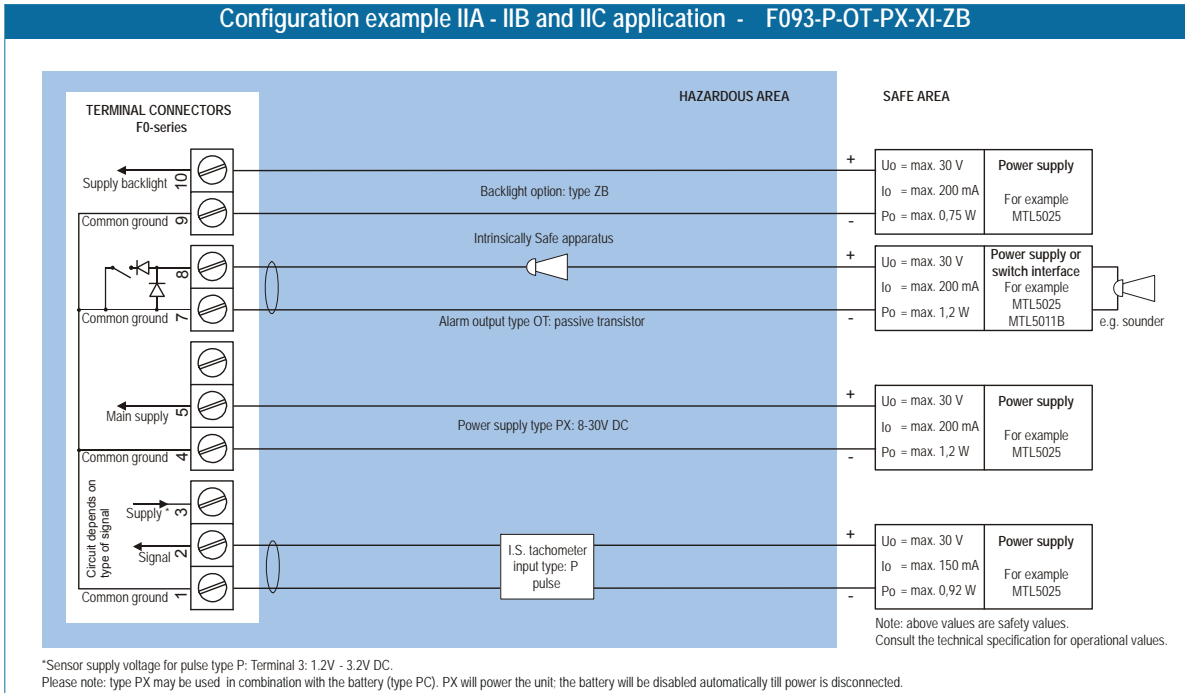


Fig. 17: Configuration example Intrinsically Safe.



## 5.4. BATTERY REPLACEMENT INSTRUCTIONS

# INSTRUCTION SHEET BATTERY REPLACEMENT FW-LiBAT-001

**Manufacturer**  
Fluidwell bv - The Netherlands  
www.fluidwell.com - sales@fluidwell.com

**Safety Instructions**  
**WARNING:** Fire, explosion or severe burns may result if mistreated. Do not recharge, crush, disassemble, incinerate, heat above 100°C (212°F) or expose contents to water.

**Replacement Instructions**  
Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Instruction before carrying out its instructions.

It is allowed to replace the Intrinsicly Safe battery FW-LiBAT-001 in hazardous area. The battery may only be replaced with an original FW-LiBAT-001 manufactured by Fluidwell bv.

For replacement, unplug the connector carefully and lift the old battery out of the mounting clip. The new battery can be placed in the clip and the connector plugged on the board.

**Disposal**  
Disposal should be done in accordance with applicable regulations, which vary from country to country. Trashing of used batteries is forbidden and disposal can be done through non-profit organizations mandated by local authorities or organized by professionals.

**Battery label:**

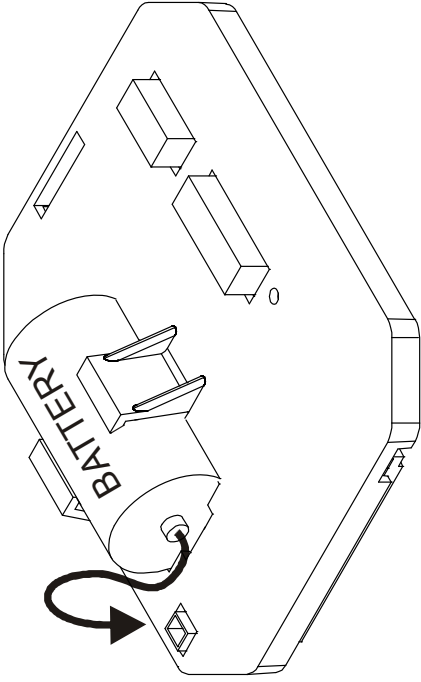
CE 0344 II 1 G Ex ia IIC KEMA 03ATEX1071 U  
Ga Ex ia IIC IECEX KEM 08.0005U

Fluidwell bv - Intrinsicly Safe Battery Consult manual for replacement instructions.  
Part. no.: FW-LiBAT-001 **WARNING:** Fire, explosion or severe burns may result if mistreated. Do not recharge, crush, disassemble, incinerate, heat above 100°C (212°F) or expose contents to water.

Uo = 3.9V Co = 100µF  
Io = 35mA Lo = 25mH  
Po = 35mW Ta = -40°C to +70°C

**Primary Lithium Battery - Only replace with Fluidwell I.S. battery pack !**

**F0-series:**



FW-LiBAT-001 - INST001








Fig. 19: Battery replacement instructions Intrinsicly Safe Battery.

## 6. MAINTENANCE

### 6.1. GENERAL DIRECTIONS



- *Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.*
- *The F093-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.*
- *Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.*

The F093-P does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the users responsibility to take all precautions to dehumidify the internal atmosphere of the F093-P in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.

#### **Battery life-time:**

It is influenced by several issues :

- Type of sensor: read chapter 3.2.3. NPN and PNP inputs consume more energy than coil inputs.
- Input frequency: the higher the frequency, the shorter the battery life-time.
- Engine speed calculation: the lower number of pulses (SETUP 26) the shorter the battery life-time.
- Display update: fast display update uses significantly more power.
- Alarm output.
- Low temperatures; the available power will be less due to battery chemistry.



Note !

**Note:** *It is strongly advised to use only necessary functions.*

#### **Check periodically:**

- The condition of the casing, cable glands and front panel.
- The input/output wiring for reliability and aging symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the Tachometer might be necessary. Do not forget to re-enter any subsequent K-factor alterations.
- The indication for low-battery.
- Clean the casing with soapy-water. Do not use any aggressive solvents as these might damage the coating.

### 6.2. REPAIR

This product cannot be repaired by the user and must be replaced with an equivalent certified product. Repairs should only be carried out by the manufacturer or his authorized agent.

## APPENDIX A: TECHNICAL SPECIFICATION

### GENERAL

Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Digits	Seven 17mm (0.67") and eleven 8mm (0.31"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec - 30 secs.
Type ZB (option)	Tri-color configurable LED-backlight - green, amber with red flashing during alarm. Intensity adjustable from the keyboard.

Enclosures	
General	Die-cast aluminum or GRP (Glassfibre Reinforced Polyamide) enclosure with Polycarbonate window, silicone and EPDM gaskets. UV stabilized and flame retardant material.
Control Keys	Three industrial micro-switch keys. UV-resistant silicone keypad.
Painting	Aluminum enclosure only: UV-resistant 2-component industrial painting.
Panel-mount enclosures	Dimensions: 130 x 120 x 60mm (5.10" x 4.72" x 2.38") – LxHxD.
Classification	IP65 / NEMA4
Panel cut-out	115 x 98mm (4.53" x 3.86") LxH.
Type HC	GRP panel-mount enclosure
Type HB	Aluminum panel-mount enclosure
Field/wall-mount enclosures	Dimensions: 130 x 120 x 75mm (5.10" x 4.72" x 2.95") – LxHxD.
Classification	IP67 / NEMA4X
Aluminum enclosures	
Type HA	Drilling: 2x PG9 – 1x M20.
Type HM	Drilling: 2x M16 – 1x M20.
Type HN	Drilling: 1x M20.
Type HO	Drilling: 2x M20.
Type HP	Drilling: 6x M12.
Type HT	Drilling: 1x ½"NPT.
Type HU	Drilling: 3x ½"NPT.
Type HV	Drilling: 4x M20
Type HZ	No drilling.
GRP enclosures	
Type HD	No drilling.
Type HE	Drilling: 2x 16mm (0.63") – 1x 20mm (0.78").
Type HF	Drilling: 1x 22mm (0.87").
Type HG	Drilling: 2x 20mm (0.78").
Type HJ	Drilling: 3x 22mm (0.87").
Type HH	Drilling: 6x 12mm (0.47").
Type HK	Flat bottom - no drilling.
ABS enclosure	
Type HS	Silicone free ABS enclosure with EPDM and PE gaskets. UV-resistant polyester keypad. (no drilling)

Operating temperature	
Operational	-40°C to +80°C (-40°F to +178°F).
Intrinsically Safe	-40°C to +70°C (-40°F to +158°F).

Power requirements	
Type PB	Lithium battery - life-time depends upon settings - up to 5 years.
Type PC	Intrinsically Safe lithium battery - life-time depends upon settings - up to 5 years.
Type PD	16-30 V DC. Power consumption max. 1 Watt.
Type PF	24V AC/DC +10%. Power consumption max. 15 Watt.
Type PM	115-230V AC +10%. Power consumption max. 15 Watt.
Type PX	8-30 V DC (also available with PB / PC). Power consumption max. 0.3 Watt.
Type ZB	20-30V DC. Power consumption max. 1 Watt. Note: with type PF / PM: internally powered.
Note PF / PM	The running hours consumption of the sensor, active output type OA and backlight type ZB may not exceed 400mA@24V DC.
Note I.S. application	for intrinsically safe applications, consult the safety values in the certificate.

Sensor excitation	
Type PB / PC / PX	Sensor supply voltage: 3.2V DC for pulse signals and 1.2V DC for coil pick-up. Please note: this is not a real sensor supply. Only suitable for sensors with a very low power consumption like coils (sine wave) and reed-switches.
Type PD	With pulse input type P: sensor supply 1.2, 3.2, 8.2V DC - max. 5mA@8.2V DC.
Type PF / PM	With pulse input type P: sensor supply 1.2, 3.2, 8.2, 12 and 24V DC - max. 400mA@24V DC

Terminal connections	
Type:	Removable plug-in terminal strip. Wire max. 1.5mm <sup>2</sup> and 2.5mm <sup>2</sup>

Data protection	
Type	EEPROM backup of all settings. Data retention at least 10 years.
Pass code	Configuration settings can be pass code protected.

Hazardous area (option)	
Intrinsically safe Type XI	<p><b>ATEX approval:</b> II 1 G Ex ia IIC T4 II 1 D Ex iaD 20 IP 65 / 67 T 100°C</p> <p><b>IECEX approval:</b> Ga Ex ia IIC T4 Ex iaD 20 IP 65 / 67 T 100°C</p> <p><b>CSA / FM approval :</b> IS Class I/II/III, Division 1 Groups A to G T4 Class I zone 0 AEx ia IIC T4</p>
Explosion proof Type XF	ATEX approval ref.: <EX> II 2 GD EEx d IIB T5. Weight appr. 15kg. Dimensions of enclosure: 350 x 250 x 200mm (13.7" x 9.9" x 7.9") LxHxD.

Environment	
Electromagnetic compatibility	Compliant ref: EN 61326 (1997), EN 61010-1 (1993)
Low voltage directive	Compliant ref: EN60950.

## INPUT

Tachometer	
Type P	Coil/sine wave (minimum 20mVpp or 80mVpp - sensitivity selectable), NPN/PNP, open collector, reed-switch, Namur, active pulse signals.
Frequency	Minimum 0 Hz - maximum 7 kHz for engine speed. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-Factor	0.000010 - 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.
Note	For coil signal input: higher sensitivity is available - type ZF (10mVpp) / type ZG (5mVpp).

## OUTPUT

Alarm output	
Function	high, low or high and low engine speed alarm.
Type OT	One passive transistor output - not isolated. Load max. 50V DC - 300mA.
Type OA	One active 24V DC transistor output; max. 400mA per output (requires type PF or PM).
Type OR	One mechanic relay output; max. switch power 230V AC - 0,5A (requires type PF or PM).

## OPERATIONAL

Operator functions	
Displayed functions	<ul style="list-style-type: none"> <li>• running hours and/or engine speed.</li> <li>• running hours and accumulated running hours. running hours can be reset to zero by pressing the CLEAR-key twice.</li> <li>• alarm value's low - high engine speed</li> <li>• alarm values can be entered (this function can be disabled)</li> </ul>

Running hours	
Digits	7 digits.
Units	hours
Decimals	0 or 1.
<b>Note</b>	running hours can be reset to zero.

Accumulated running hours	
Digits	11 digits.
Units / decimals	according to selection for running hours.

Engine speed (RPM)	
Digits	7 digits.
Units	RPM
Decimals	0 or 1.
Time units	/sec - /min - /hr - /day.

Alarm values	
Digits	7 digits.
Units	According to selection for engine speed/running hours.
Decimals	According to selection for engine speed/running hours.
Type of alarm	Low and/or high engine speed alarm and/or running hours alarm.. Includes delay time alarm and configurable alarm output.

## APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F093-P is going to be installed or while it is in operation.

### Tachometer does not generate pulses:

Check:

- Signal selection SETUP - 61,
- Pulse amplitude (par. 4.4.2. / 4.4.3.),
- Tachometer, wiring and connection of terminal connectors (par. 4.4.2. / 4.4.3.),
- Power supply of Tachometer (par. 4.4.2. / 4.4.3.).

### Tachometer generates "too many pulses":

Check:

- Settings for running hours and Engine speed: SETUP 11-14 and 21-27,
- Type of signal selected with actual signal generated - SETUP - 61,
- Sensitivity of coil input - SETUP - 61 and par. 4.4.2 / 4.4.3.
- Proper grounding of the F093-P - par. 4.4.1.
- Use screened wire for Tachometer signals and connect screen to the "⊥" terminal.

### Engine speed displays "0 / zero" while there is RPM (running hours is counting):

Check:

- SETUP 22 / 25: are the K-factor and time unit correct?
- SETUP 26 / 27: The unit has to count the number of pulses according to SETUP 26 within the time according to SETUP 27. Make sure that 27 is set to 10.0 seconds for example : the result is that the unit has at least 10 seconds time to measure the number of pulses according to SETUP 26.

### The pass code is unknown:

If the pass code is not 1234, there is only one possibility left: call your supplier.

## ALARM

When the alarm flag starts to blink an internal alarm condition has occurred. Press the "select button" several times to display the 5-digit error code. The codes are:

0001: irrecoverable display-data error: data on the display might be corrupted.

0002 irrecoverable data-storage error: the programming cycle might have gone wrong: check programmed values.

0003: error 1 and error 2 occurred simultaneously

The alarm condition will almost certainly be handled internally and if all mentioned values still appear correct, no intervention by the operator is needed. If the alarm occurs more often or stays active for a longer time, please contact your supplier.

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## LIST OF CONFIGURATION SETTINGS

SETTING	DEFAULT	DATE :	DATE :
<b>1 - RUNNING HOURS</b>	Enter your settings here		
11 rst hrs	push clear		
12 decimals	0000000		
13 min freq	00100		
<b>2 - ENGINE SPEED</b>			
21 decimals	0000000		
22 K-factor	0000001		
23 decimals K-factor	0		
24 calculation / pulses	010		
25 cut-off time	30.0 sec.		
<b>3 - ALARM</b>			
31 alarm	enable		
32 RPM zero	default		
33 alarm value low	0		
34 alarm value high	0		
35 delay time alarm low	0.0 sec		
36 delay time alarm high	0.0 sec		
37 alarm hour	0		
38 alarm output	hi - lo		
<b>4 - DISPLAY</b>			
41 function	rpm		
42 display	all		
43 clr hrs	operate		
44 alarm set	operate		
45 acc hours	hide		
46 backlight	green		
47 bl alarm	off		
48 brightness	5		
<b>5 - POWER MANAGEMENT</b>			
51 LCD-new	1 sec.		
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61 signal	npn		
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71 model	F093-P	F093-P	F093-P
72 software version	03.06.____	03.06.____	03.06.____
73 serial number	-----	-----	-----
74 pass code	0000		
75 tagnumber	0000000		

