Features

- Displays level and height or percentage filled.
- Very large 26mm (1”) digits.
- Piegraph indication: ten segments.
- Number of digits for level: 5½.
- Selectable on-screen engineering units; volumetric or mass.
- Operational temperature -40°C up to +80°C (-40°F up to 178°F).
- Very compact design for panel mount, wall mount or field mount applications.
- Auto backup of all settings.
- Rugged aluminum field mount enclosure IP67/NEMA4X.
- Intrinsically Safe - ATEX, IECEx and CSA approval for gas and dust applications.
- Explosion/flame proof II 2 GD EEx d IIB T5.
- LED backlight option.
- Loop or battery powered, 8 - 24V AC/DC or 115 - 230V AC power supply.
- Sensor supply 8.2 / 12 / 24V DC.

Signal input

Level

- (0)4 - 20mA.
- 0 - 10V DC.

Applications

- Applications where a basic level measurement display is required without level monitoring and linearisation.
**General information**

**Introduction**
The F070 is a straightforward level indicator. The measuring unit to be displayed is simply selected through an alfa-numerical configuration menu. No adhesive labels have to be put on the outside of the enclosure: a weather proof and user friendly solution!
The configuration of the Span, off-set and number of decimals is done through software functions, without any sensitive dip-switches or trimmers. A wide selection of options further enhance this model's capabilities, including Intrinsically Safe for hazardous area applications.

**Display**
The display has very large 26mm (1") digits which can be set to show level and height or percentage filled. As the F070 has been designed for field mounted applications, a smart display update function has been incorporated. Related to the lower temperatures, the update frequency of the LCD is tuned automatically to achieve a readable display even at -40°C / -40°F.

**Backlight**
For those applications where readability during day and night is an issue, a bi-color backlight is available. The background color green or amber and the intensity can be adjusted from the keyboard. The display is a transreflective type, which means that a high contrast reading is guaranteed in full sunlight as well as during the night. This backlight option is also available Intrinsically Safe.

**Configuration**
All configuration settings are accessed via a simple operator menu which can be pass-code protected. Each setting is clearly indicated with an alphanumerical description, therefore avoiding confusing abbreviations. All settings are safely stored in EEPROM memory in the event of sudden power failure.

**Signal input**
The F070 does accept (0)-20mA and 0-10V input signals from any type of level measurement device. Also a 4-20mA input loop powered model is available.

**Power supply**
Several power supply options are available to power the F070 and sensor. A battery powered version with a long life lithium battery which will last up to five years. A 4-20mA input loop powered version is available as well. A real sensor supply is offered with the 24V AC/DC or 115-230V AC power supply option.

**Hazardous area**
For hazardous area applications, this model has been ATEX, IECEx and CSA certified Intrinsically Safe for gas and dust applications, with an allowed operational temperature of -40°C to +70°C (-40°F to +158°F). FM certification is expected to be available in 2009. A flame proof enclosure with ATEX certification offers the rating II 2 GD EEx d IIB T5.

**Enclosures**
Various types of enclosures can be selected, all ATEX, IECEx and CSA approved. As standard the F070 is supplied in an GRP panel mount enclosure, which can be converted to an IP67 / NEMA 4X GRP field mount enclosure by the addition of a back case. Most popular is our aluminum field mount enclosure with IP67 / NEMA 4X rating. Both European or U.S. cable gland entry threads are available.

**Overview application F070**
Dimensions enclosures
Aluminum & GRP panel mount enclosure

Aluminum & GRP field / wall mount enclosures

Terminal connections power supply
PB/PC - PD - PL - PX

Terminal connections power supply PF - PM
Typical wiring diagram F070-A-PB-(PX)

Type PB: BATTERY POWERED

Backlight option: type ZB
20 - 30V DC
(not used in this example)

Power supply type PX:
8 - 30V DC
(not used in this example)

Circuit depends on type of signal

Common ground

* Sensor supply voltage: Terminal 3: not available.

Typical wiring diagram F070-A-PX-ZB

Type PX: BASIC 8 - 30V DC POWER SUPPLY (STANDARD)

Backlight option: type ZB
20 - 30V DC

Power supply type PX:
8 - 30V DC

Circuit depends on type of signal

Common ground

* Sensor supply voltage: Terminal 3: not available.

Typical wiring diagram F070-A-PL-ZB

Type PL: INPUT LOOP POWERED

Backlight option: type ZB
20 - 30V DC

Level input type A - PL:
Input loop powered 4 - 20mA

Sensor supply: sensor is externally powered.

Typical wiring diagram F070-A-PD-ZB

Type PD: 16 - 30V DC POWER SUPPLY

Backlight option: type ZB
20 - 30V DC

Sensor supply type PD:
16 - 30V DC

Level input type A:
(0)4 - 20mA

* Sensor supply voltage: Terminal 3: not available.
Terminal 6 with type PD: voltage as connected to terminal 5 (internally linked).
Typical wiring diagram F070-A-PF-ZB

**Type PF:**
24V AC / DC POWER SUPPLY

Backlight option: type ZB
Internally powered.

- Supply *
- Signal
- Main supply
- Common ground
- Power supply type PF: 8 - 24V AC / DC
- Earth

Level input type A: (0)4 - 20mA

* Sensor supply voltage: Terminal 7: 8.2 / 12 / 24V DC.

Typical wiring diagram F070-A-PF-ZB

**Type PM:**
115 - 230V AC POWER SUPPLY

Backlight option: type ZB
Internally powered.

- Supply *
- Signal
- Common ground
- Main supply
- L1
- N
- Earth

Level input type A: (0)4 - 20mA

* Sensor supply voltage: Terminal 7: 8.2 / 12 / 24V DC.
Hazardous area applications
The F070-XI has been certified according ATEX and IECEx by KEMA and according CSA c-us for use in Intrinsically Safe applications with an ambient temperature of -40°C to +70°C (-40°F to +158°F).

- The ATEX markings for gas and dust applications are:
  - II 1 G Ex ia IIC T4
  - II 1 D Ex iaD 20 IP 65/67 T 100 °C.
- The IECEx markings for gas and dust applications are: Ga Ex ia IIC T4 and Ex iaD 20 IP 65/67 T100 °C.
- The CSA c-us markings are: Class I/II/III, Division 1, Groups A, B, C, D, E, F, G, Temperature class T4 and Class I, Zone 0, AEx ia IIC T4.
- FM approval is expected to become available in 2009.

It is allowed to connect up to three I.S. power supplies to power the unit, sensor and backlight. The F070-PD-XI offers the input voltage to power an analog sensor.

An ATEX approved flame proof enclosure with rating II 2 GD EEx d IIB T5 is available as well. Please contact your supplier for further details.

Certificate of conformity KEMA 05ATEX1168 X
- IECEx KEM 08.0006X • CSA.08.2059461 X

Configuration example IIA - IIB and IIC - F070-A-PX-XI-ZB - Basic power supply 8 - 30V DC

<table>
<thead>
<tr>
<th>TERMINAL CONNECTORS F0 - series</th>
<th>HAZARDOUS AREA</th>
<th>SAFE AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply backlight</td>
<td>Backlight option: type ZB</td>
<td>Power supply For example MTL5025</td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
<td>+ Uo = max. 30V</td>
</tr>
<tr>
<td>Main supply</td>
<td></td>
<td>- Io = max. 200mA</td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
<td>= max. 0.75W</td>
</tr>
<tr>
<td>I.S. level sensor - input type A: (0)4 - 20mA</td>
<td>Power supply type PX: 8 - 30V DC</td>
<td>+ Uo = max. 30V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Io = max. 150mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= max. 0.92W</td>
</tr>
</tbody>
</table>

Note: above values are safety values. Consult the technical specification for operational values.

* Sensor supply voltage for analog level sensor type A / U: not available in this example. Please note: type PX may be used in combination with the battery (type PC). PX will power the unit; the battery will be disabled automatically till power is disconnected.
**Configuration example IIA - IIB and IIC - F070-A-PD-XI-ZB - Power supply 16 - 30V DC**

TERMINAL CONNECTORS

<table>
<thead>
<tr>
<th>F0 - series</th>
<th>HAZARDOUS AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply backlight</td>
<td>Backlight option: type ZB</td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
</tr>
<tr>
<td>Supply</td>
<td></td>
</tr>
<tr>
<td>Main supply</td>
<td></td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
</tr>
<tr>
<td>Circuit diagram of signal</td>
<td></td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
</tr>
</tbody>
</table>

* Sensor supply voltage for analog level sensor type A / U: Terminal 6: as input voltage terminal 5 (internally linked).

Please note: type PD may be used in combination with the battery (type PC). PD will power the unit; the battery will be disabled automatically till power is disconnected.

**TERMINAL CONNECTORS**

<table>
<thead>
<tr>
<th>F0 - series</th>
<th>HAZARDOUS AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply backlight</td>
<td>Backlight option: type ZB</td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
</tr>
<tr>
<td>Supply</td>
<td></td>
</tr>
<tr>
<td>Main supply</td>
<td></td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
</tr>
<tr>
<td>Circuit diagram of signal</td>
<td></td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
</tr>
</tbody>
</table>

**Configuration example IIA - IIB and IIC - F070-A-PL-XI-ZB - Input loop powered**

TERMINAL CONNECTORS

<table>
<thead>
<tr>
<th>F0 - series</th>
<th>HAZARDOUS AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply backlight</td>
<td>Backlight option: type ZB</td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
</tr>
<tr>
<td>Supply</td>
<td></td>
</tr>
<tr>
<td>Main supply</td>
<td></td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
</tr>
<tr>
<td>Circuit diagram of signal</td>
<td></td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
</tr>
</tbody>
</table>

Sensor supply is not available: unit is input loop powered (type PL).

Please note: type PL may be used in combination with the battery (type PC). PL will power the unit; the battery will be disabled automatically till power is disconnected.
### Technical specification

#### Display

**General**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>High intensity reflective numeric and alphanumeric LCD, UV-resistant.</td>
</tr>
<tr>
<td>Dimensions</td>
<td>90 x 40mm (3.5&quot; x 1.6&quot;).</td>
</tr>
<tr>
<td>Digits</td>
<td>5½ very large 26mm (1&quot;) digits. Various symbols and measuring units.</td>
</tr>
<tr>
<td>Piegraph</td>
<td>Ten segments - related to the input signal.</td>
</tr>
<tr>
<td>Refresh rate</td>
<td>User definable: 8 times/sec. - 30 secs - off.</td>
</tr>
<tr>
<td>Option ZB</td>
<td>Transflective LCD with bi-color LED-backlight; green / amber. Intensity and color selected through the keyboard. Good readings in full sunlight and darkness. Also available Intrinsically Safe.</td>
</tr>
</tbody>
</table>

#### Operating temperature

| Standard unit | -40°C to +80°C (-40°F to +178°F). |
| Intrinsically Safe | -40°C to +70°C (-40°F to +158°F). |

#### Power requirements

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type PB</td>
<td>Long life Lithium battery - life-time depends upon settings and configuration - up to 5 years.</td>
</tr>
<tr>
<td>Type PC</td>
<td>Intrinsically Safe long life lithium battery - life-time depends upon settings and configuration - up to 5 years.</td>
</tr>
<tr>
<td>Type PD</td>
<td>16 - 30V DC. Power consumption max. 1 Watt.</td>
</tr>
<tr>
<td>Type PF</td>
<td>24V AC / DC ± 10%. Power consumption max. 15 Watt.</td>
</tr>
<tr>
<td>Type PL</td>
<td>Input loop powered from sensor signal 4 - 20mA (type A).</td>
</tr>
<tr>
<td>Type PM</td>
<td>115 - 230V AC ± 10%. Power consumption max. 15 Watt.</td>
</tr>
<tr>
<td>Type PX</td>
<td>8 - 30V DC. Power consumption max. 0.3 Watt.</td>
</tr>
<tr>
<td>Type ZB</td>
<td>20 - 30V DC. Power consumption max. 1 Watt. With type PF / PM: internally powered.</td>
</tr>
<tr>
<td>Note PB/PF/PM</td>
<td>Not available Intrinsically Safe.</td>
</tr>
<tr>
<td>Note PF/PM</td>
<td>The total consumption of the sensor and backlight type ZB may not exceed 400mA @ 24V DC.</td>
</tr>
<tr>
<td>Note</td>
<td>For Intrinsically Safe applications, consult the safety values in the certificate.</td>
</tr>
</tbody>
</table>

#### Sensor excitation

| Type PB/PC/PX | Not available. |
| Type PD | The sensor supply voltage will be according to power supply voltage (as connected to terminal 5). |
| Type PF / PM | 8.2 / 12 / 24V DC - max. 400mA @ 24V DC. |

#### Terminal connections

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Removable plug-in terminal strip. Wire max. 1.5mm² and 2.5mm².</td>
</tr>
</tbody>
</table>

#### Data protection

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>EEPROM backup of all settings. Data retention at least 10 years.</td>
</tr>
<tr>
<td>Pass-code</td>
<td>Configuration settings can be pass-code protected.</td>
</tr>
</tbody>
</table>

### Casing

#### General

| Window | Polycarbonate window. |
| Sealing | Silicone. |
| Control keys | Three industrial micro-switch keys. UV-resistant silicone keypad. |

#### Aluminum wall / field mount enclosures

| General | Die-cast aluminum wall/fiel mount enclosure IP67 / NEMA 4X with 2-component UV-resistant coating. |
| Dimensions | 130 x 120 x 75mm (5.12" x 4.72" x 2.95") - W x H x D. |
| Weight | 600 gr. |
| Type HA | Cable entry: 2 x PG9 and 1 x M20. |
| Type HM | Cable entry: 2 x M16 and 1 x M20. |
| Type HN | Cable entry: 1 x M20. |
| Type HO | Cable entry: 2 x M20. |
| Type HP | Cable entry: 6 x M12. |
| Type HT | Cable entry: 1 x ½" NPT. |
| Type HU | Cable entry: 3 x ½" NPT. |
| Type HZ | Cable entry: no holes. |

#### GRP wall / field mount enclosures

| General | GRP wall/fiel mount enclosure IP67 / NEMA 4X, UV-resistant and flame retardant. |
| Dimensions | 130 x 120 x 75mm (5.12" x 4.72" x 2.95") - W x H x D. |
| Weight | 600 gr. |
| Type HD | Cable entry: no holes. |
| Type HE | Cable entry: 2 x Ø 16mm and 1 x Ø 20mm. |
| Type HF | Cable entry: 1 x Ø 22mm (7/8”). |
| Type HG | Cable entry: 2 x Ø 20mm. |
| Type HH | Cable entry: 6 x Ø 12mm. |
| Type HJ | Cable entry: 3 x Ø 22mm (7/8”). |
| Type HK | Flat bottom, cable entry: no holes. |

#### Panel mount enclosures

| Dimensions | 130 x 120 x 60mm (5.12" x 4.72" x 2.36") - W x H x D. |
| Panel cut-out | 115 x 98mm (4.53" x 3.86") L x H. |
| Type HB | Die-cast aluminum panel mount enclosure IP65 / NEMA 4. |
| Weight | 600 gr. |
| Type HC | GRP panel mount enclosure IP65 / NEMA 4, UV-resistant and flame retardant. |
| Weight | 450 gr. |

#### ABS wall / field mount enclosures

| General | Silicone free ABS wall/fiel mount enclosure IP65 with EPDM and PE sealings. UV-resistant polyester keypad (old HD enclosure). |
| Dimensions | 130 x 114 x 71mm (5.1" x 4.5" x 2.8") - W x H x D. |
| Weight | 450 gr. |
| Type HS | Cable entry: no holes. |

### Display example

```
<table>
<thead>
<tr>
<th>428.35</th>
</tr>
</thead>
<tbody>
<tr>
<td>52.3</td>
</tr>
<tr>
<td>0%</td>
</tr>
</tbody>
</table>
```
Hazardous area

Intrinsically Safe

ATEX certification II 1 G Ex ia IIC T4.
IECEx certification Ex ia IIC T4.
CSA c-us Intrinsically Safe for Class I/II/III, Div. 1, Groups A, B, C, D, E, F, G, Temp. class T4 and Class I, Zone 0, AEx ia IIC T4.

Ambient -40°C to +70°C / -40° to +158°F.

Explosion proof

ATEX certification II 2 GD EEx d IIB T5.

Explosion proof

Type XF Dimensions of enclosure: 300 x 250 x 200mm (11.8” x 9.9” x 7.9”) L x H x D.

Environment


Signal input

Level sensor

Type A (0)4 - 20mA. Analog input signal can be scaled to any desired range within 0 - 20mA.
Type U 0 - 10V DC. Analog input signal can be scaled to any desired range within 0 - 10V DC.

Accuracy Resolution: 16 bit. Error < 0.01mA / ± 0.05% FS. Low level cut-off programmable.

Span 0.001 / 199,999 with variable decimal position.
Offset -99,999 / +199,999 units.

Update time Four times per second.

Voltage drop Type A: max. 2V DC @ 20mA.
Voltage drop Type A - PL (loop powered): max. 2.6V DC @ 20mA.

Load impedance Type U: 3kΩ.

Relationship Linear and square root calculation.

Note For signal type A and U: external power to sensor is required; e.g. type PD.

Note Span for height is 0.01 / 199,999 with variable decimal position.

Operational

Operator functions

Displayed functions • Level.
• Height or percentage (or no indication).

Level

Digits 5½ digits.
Units L, m³, GAL, USGAL, KG, Ib, bbl, no unit.
Decimals 0 - 1 - 2 or 3.

Height

Digits 6 digits.
Units mm, cm, m, mtr, inch, ft, nmwk, mmwc, cmwk, cmwc, mwk, mwc, inwc, ftwc, mbar, bar, psi, no unit.
Decimals 0 - 1 or 2.

Percentage

Digits 3 digits.
Decimals 1.

Intrinsically Safe isolators accessories

ACG01 MTL5011B - One channel pulse or switch output transfer from hazardous area to safe area, including power supply.
ACG02 MTL5025 - One channel power supply from safe area to hazardous area (e.g. to power the unit with PD or to power a switching or analog device in hazardous area).
ACG03 MTL5042 - One channel 4 - 20mA repeater from hazardous area to safe area, including power supply.
ACG04 MTL 5051 - Bi-direction serial-data-isolator (for Modbus communication).
ACG05 MTL5018 - Two channel pulse or switch output transfer from hazardous area to safe area , including power supply.
ACG06 MTL5012 - One channel pulse or switch output transfer from hazardous area to safe area, including power supply.
ACG07 MTL5045 - One channel isolated driver bringing 4 - 20mA from safe area to hazardous area, including power supply.

Accessories

Mounting accessories

ACF02 Stainless steel wall mounting kit.
ACF05 Stainless steel pipe mounting kit (worm gear clamps not included).
ACF06 Two stainless steel worm gear clamps Ø 44 - 56mm.
ACF07 Two stainless steel worm gear clamps Ø 58 - 75mm.
ACF08 Two stainless steel worm gear clamps Ø 77 - 95mm.
ACF09 Two stainless steel worm gear clamps Ø 106 - 138mm.
ACF10 Customized Grevopal tagplates for ACF02 and ACF05, including stainless steel screws.
Dimension: 95mm x 12.5mm (3.75” x 0.50”).

Cable gland accessories

ACF20 For HA enclosure, includes O-rings.
ACF25 For HE enclosure, includes locknuts and O-rings.
ACF26 For HF enclosure, includes locknuts and O-rings.
ACF27 For HG enclosure, includes locknuts and O-rings.
ACF28 For HH enclosure, includes locknuts and O-rings.
ACF29 For HJ enclosure, includes locknuts and O-rings.
ACF32 For HM enclosure, includes O-rings.
ACF33 For HN enclosure, includes O-rings.
ACF34 For HO enclosure, includes O-rings.
ACF35 For HP enclosure, includes O-rings.
ACF39 For HT enclosure, includes O-rings.
ACF40 For HU enclosure, includes O-rings.

Blind plug accessories

ACF50 For HA enclosure, includes O-rings.
ACF55 For HE enclosure, includes locknuts and O-rings.
ACF56 For HF enclosure, includes locknuts and O-rings.
ACF57 For HG enclosure, includes locknuts and O-rings.
ACF58 For HH enclosure, includes locknuts and O-rings.
ACF59 For HJ enclosure, includes locknuts and O-rings.
ACF62 For HM enclosure, includes O-rings.
ACF63 For HN enclosure, includes O-rings.
ACF64 For HO enclosure, includes O-rings.
ACF65 For HP enclosure, includes O-rings.
ACF69 For HT enclosure, includes O-rings.
ACF70 For HU enclosure, includes O-rings.
## Ordering information

**Standard configuration:** F070-A-HC-PX-XX-ZX.

### Ordering information: F070 - -H -P -X -Z

### Level sensor input signal

- **A**  (0)4 - 20mA input.
- **U**  0 - 10V DC input.

### Panel mount enclosures - IP65 / NEMA4

- **HB**  Aluminum enclosure.
- **HC**  GRP enclosure.

### GRP field / wall mount enclosures - IP67 / NEMA4X

- **HD**  Cable entry: no holes.
- **HE**  Cable entry: 2 x Ø 16mm & 1 x Ø 20mm.
- **HF**  Cable entry: 1 x Ø 22mm (7/8")
- **HG**  Cable entry: 2 x Ø 20mm.
- **HH**  Cable entry: 6 x Ø 12mm.
- **HJ**  Cable entry: 3 x Ø 22mm (7/8")
- **HK**  Flat bottom, cable entry: no holes.

### Aluminum field / wall mount enclosures - IP67 / NEMA4X

- **HA**  Cable entry: 2 x PG9 + 1 x M20.
- **HM**  Cable entry: 2 x M16 + 1 x M20.
- **HN**  Cable entry: 1 x M20.
- **HO**  Cable entry: 2 x M20.
- **HP**  Cable entry: 6 x M12.
- **HT**  Cable entry: 1 x 1/2"NPT.
- **HU**  Cable entry: 3 x 1/2"NPT.
- **HZ**  Cable entry: no holes.

### ABS field / wall mount enclosures

- **HS**  Silicone free ABS field enclosure IP65 – Cable entry: no holes (old HD enclosure).

### Power supply

- **PB**  Lithium battery powered.
- **PC**  Lithium battery powered - Intrinsically Safe.
- **PD**  16 - 30V DC + sensor supply.
- **PF**  24V AC / DC + sensor supply.
- **PL**  Input loop powered from sensor signal 4 - 20mA (type A).
- **PM**  115 - 230V AC + sensor supply.
- **PX**  Basic power supply 8 - 30V DC (no sensor supply).

### Hazardous area

- **XI**  Intrinsically Safe.
- **XF**  EExd enclosure - 3 keys.
- **XX**  Safe area only.

### Other options

- **ZB**  Backlight.
- **ZX**  No options.

The bold marked text contains the standard configuration.

Available Intrinsically Safe.