**Features**
- Displays level, height and percentage filled.
- Eight point linearisation of the tank shape - with interpolation.
- Two alarm values can be entered: low and high level alarm.
- Red flashing LED backlight in case of a level alarm.
- Large 17mm (0.67") digits.
- 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.
- 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.
- Loop or battery powered, 8 - 24V AC/DC or 115 - 230V AC power supply.
- Sensor supply 8.2 / 12 / 24V DC.

**Signal output**
- One free configurable alarm output.

**Signal input**
- **Level**
  - (0)4 - 20mA.
  - 0 - 10V DC.

**Applications**
- Level measurement where continues level monitoring and linearisation of the tankshape is important. Alternative basic models F070 and F073 or more advanced F170 and F173.
General information

Introduction
The F077 is a versatile level monitor with linearisation and continuous level monitoring feature. In addition to the average Span, eight linearisation points can be entered to compensate for the tankshape. The unit will interpolate between these points to increase the accuracy. This linearisation effects all displayed information as well as the alarm output. With the level monitoring feature, one low level and one high level alarm value can be set. A wide selection of options further enhance this model’s capabilities, including Intrinsic Safety.

Display
The display has large 17mm (0.67”) and 8mm (0.31”) digits which can be set to show level, height or percentage and alarm values. As the F077 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
The tri-color backlight in combination with the F077 offers a unique feature: in case of a level alarm, the backlight can be set to be red or flashing red / green. The background color can be set to green or amber and the intensity can be adjusted from the keyboard. The display is a transflective 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.

Alarm output
One alarm output is available to transmit the level alarm. It can be set to switched for a low, high or both alarms! The output signal can be a passive NPN, active PNP or an isolated electro-mechanical relay.

Signal input
The F077 does accept (0)4 - 20mA and 0 - 10V input signals from any type of level measurement device. Also a 4 - 20mA input loop powered model is available.

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 Ex d IIB T5.

Enclosures
Various types of enclosures can be selected, all ATEX, IECEx and CSA approved. As standard the F077 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 F077
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 F077-A-(OT)-PB-(PX)**

**Type PB: BATTERY POWERED**

- Backlight supply: type ZB 20 - 30V DC (not used in this example)
- Alarm output type OT: passive transistor (not used in this example)
- Power supply type PX: 8 - 30V DC (not used in this example)
- Level input type A: (0)4 - 20mA

* Sensor supply voltage: Terminal 3: not available.

**Typical wiring diagram F077-A-OT-PX-ZB**

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

- Backlight supply: type ZB 20 - 30V DC
- Alarm output type OT: passive transistor
- Power supply type PX: 8 - 30V DC
- Level input type A: (0)4 - 20mA

* Sensor supply voltage: Terminal 3: not available.

**Typical wiring diagram F077-A-(OT)-PL-ZB**

**Type PL: INPUT LOOP POWERED**

- Backlight supply: type ZB 20 - 30V DC
- Alarm output type OT: passive transistor (not used in this example)
- Level input type A - PL: Input loop powered 4 - 20mA

Sensor supply: sensor is externally powered.

**Typical wiring diagram F077-A-OT-PD-ZB**

**Type PD: 16 - 30V DC POWER SUPPLY**

- Backlight supply: type ZB 20 - 30V DC
- Alarm output type OT: passive transistor
- 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).
**Hazardous area applications**

The F077-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 F077-PD-XI offers the input voltage to power an analog sensor.

**Certificate of conformity KEMA 05ATEX1168 X**

- IECEx KEM 08.0006X • CSA.08.2059461 X

**Configuration example IIA - IIB and IIC - F077-A-OT-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></td>
<td>+ Uo = max. 30V</td>
</tr>
<tr>
<td>Common ground</td>
<td></td>
<td>= max. 30V</td>
</tr>
<tr>
<td>Main supply</td>
<td></td>
<td>= max. 200mA</td>
</tr>
<tr>
<td>I.S. level sensor - input type A</td>
<td>= max. 1.2W</td>
<td></td>
</tr>
<tr>
<td>* 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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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**TERMINAL CONNECTORS**

**F0 - series**

- Supply backlight
- Common ground
- Main supply
- I.S. level sensor - input type A: (0)4 - 20mA
- Alarm output type OT: passive transistor
- Power supply type PX: 8 - 30V DC
- Backlight option: type ZB
- Intrinsically Safe apparatus

**HAZARDOUS AREA**

- + Uo = max. 30V
- = max. 1.2W
- = max. 0,75W

**SAFE AREA**

- + Uo = max. 30V
- = max. 200mA
- = max. 0.75W

**Example**

- Power supply
- For example MTL5025
- Power supply or switch interface
- For example MTL5025 MTL5011B
- Power supply
- For example MTL5025
- Power supply
- For example MTL5025
- Power supply
- For example MTL5025

**TERMINAL**

- e.g. sounder

**Configuration example IIA - IIB and IIC - F077-A-OT-PX-XI-ZB - Basic power supply 8 - 30V DC**

*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 - F077-A-OT-PD-XI-ZB - Power supply 16 - 30V DC

**TERMINAL CONNECTORS**

<table>
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<th>F0 - series</th>
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<tr>
<td>Supply backlight</td>
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<tr>
<td>Common ground</td>
</tr>
<tr>
<td>Main supply</td>
</tr>
<tr>
<td>Signal circuit depends on type of signal</td>
</tr>
<tr>
<td>Common ground</td>
</tr>
</tbody>
</table>

**HAZARDOUS AREA**

- Backlight option: type ZB
- Intrinsically Safe apparatus
- Alarm output type OT: passive transistor
- Power supply type PD: 16 - 30V DC
- I.S. level sensor - input type A: (0)4 - 20mA

**SAFE AREA**

- Uo = max. 30V
- Io = max. 200mA
- Po = max. 0.75W

For example MTL5025

- E.g. sounder

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

*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.

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Configuration example IIA - IIB and IIC - F077-A-OT-PL-XI-ZB - Input loop powered

**TERMINAL CONNECTORS**

<table>
<thead>
<tr>
<th>F0 - series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply backlight</td>
</tr>
<tr>
<td>Common ground</td>
</tr>
<tr>
<td>Main supply</td>
</tr>
<tr>
<td>Signal circuit depends on type of signal</td>
</tr>
<tr>
<td>Common ground</td>
</tr>
</tbody>
</table>

**HAZARDOUS AREA**

- Backlight option: type ZB
- Intrinsically Safe apparatus
- Alarm output type OT: passive transistor
- Power supply or switch interface: 4 - 20mA loop powered

**SAFE AREA**

- Uo = max. 30V
- Io = max. 200mA
- Po = max. 1.2W

For example MTL5025

- E.g. sounder

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

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**
- **Type**: High intensity reflective numeric and alphanumeric LCD, UV-resistant.
- **Dimensions**: 90 x 40mm (3.5" x 1.6").
- **Digits**: Seven 17mm (0.67") and eleven 8mm (0.31") digits. Various symbols and measuring units.
- **Option ZB**: Transflective LCD with tri-color LED-backlight; green / amber. Red (flashing) backlight during alarm conditions. Intensity, color and alarm response selected through the keyboard. Good readings in full sunlight and darkness. Also available Intrinsically Safe.

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

**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**
- **Type**: Removable plug-in terminal strip.
  - Wire max. 1.5mm² and 2.5mm².

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

**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/field 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**: 1100 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: 2 x M20.
- **Type HO**: Cable entry: 1 x M20.
- **Type HP**: Cable entry: 6 x M12.
- **Type HT**: Cable entry: 1 x 1/2" NPT.
- **Type HU**: Cable entry: 3 x 1/2" NPT.
- **Type HZ**: Cable entry: no holes.

**GRP wall / field mount enclosures**
- **General**: GRP wall/field 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").
- **Type HB**: Die-cast aluminum panel mount enclosure IP65 / NEMA 4.
- **Weight**: 450 gr.

**ABS wall / field mount enclosures**
- **General**: Silicone free ABS wall/field 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.

**Hazardous area**

**Intrinsically Safe**
- **ATEX certification**
  - II 1 G Ex ia IIC T4.
  - II 1 D Ex iaD 20 IP 65 / 67 T 100 °C.
- **IECEx certification**
  - II 1 G Ex ia IIC T4.
  - II 1 G Ex iaD 20 IP 65 / 67 T 100 °C.
- **CSA c-us**
- **Ambient**: -40°C to +70°C / -40° to +158°F.

**Explosion proof**
- **ATEX certification**
  - II 2 GD Ex d IIB T5.
- **Type XF**: Dimensions of enclosure: 300 x 250 x 200mm (11.8" x 9.9" x 7.9") L x H x D.
- **Weight**: Appr. 15kg.
Environment

Signal input
Level sensor
Type A (0) - 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 < 0.001mA / ± 0.05% FS. Low level cut-off programmable.
Span 0.001 / 999,999 with variable decimal position.
Offset -999,999 / +999,999 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.

Signal output
Alarm output
Function User defined: low, high or both alarms output.
Type OA One active 24V DC transistor output (PNP); load max. 400mA (requires PF or PM).
Type OR One electro-mechanical relay output - isolated; max. switch power 230V AC (N.O.) - 0.5A (requires PF or PM).
Type OT One passive transistor output (NPN) - not isolated. Max. 50V DC - 300mA per output.

Operational
Operator functions
Displayed functions • Level.
• Height or percentage (or no indication).
• Low alarm value.
• High alarm value.
• Alarm values can be set (or only displayed).

Level
Digits 7 digits.
Units m, m³, GAL, USGAL, KG, lb, bbl, no unit.
Decimals 0 - 1 - 2 or 3.

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

Percentage
Digits 3 digits.
Decimals 1.

Alarm output
Alarm values
Digits 7 digits.
Units According to the settings for level.
Decimals According to the settings for level.
Type of alarm Low and high level alarm. Includes alarm delay time and configurable alarm output.

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.
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 HP enclosure, includes O-rings.
ACF65 For HT enclosure, includes O-rings.
ACF69 For HH enclosure, includes O-rings.
ACF70 For HU enclosure, includes O-rings.

Display example - 90 x 40mm (3.5" x 1.6")
Ordering information

Standard configuration: F077-A-HC-OT-PX-XX-ZX.

| Ordering information: | F077 | _ | - | H | - | O | - | 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 Silicon free ABS field enclosure IP65 – Cable entry: no holes (old HD enclosure).

Output
- OA One active transistor output - requires PF or PM.
- OR One mechanical relay output - requires PF or PM.
- OT One passive transistor output - standard configuration.

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.
- ZK No options.

The bold marked text contains the standard configuration.
❄️ Available Intrinsically Safe.

Specifications are subject to change without notice.