# BTU MEASUREMENT SYSTEM


上海贝菲自动化仪表有限公司
SHANGHAI BEIFEI AUTOMATION INSTRUMENT CO., LTD

# BTU MEASUREMENT SYSTEM

BFG BTU Measurement System is used to measure individual energy consumption in any liquid heating/cooling systems. This system is also used to measure performance of energy saving system or the loss of efficiency which is directly tied to loss of revenue.

The BFG BTU Measurement System is supplied complete with electromagnetic flowmeter and temperature probes.

The system real-time detects the temperature of supply and return pipe. It also monitors the instantaneous flow rate according to Heat Exchange of Thermodynamics principle. The BFG BTU meter automatically integrates energy consumption and transfers it to the computer. The consumption volume can be checked by a tenant or operator with no worries. It provides real time information such as instantaneous temperature, flow rate, energy consumption, and others.

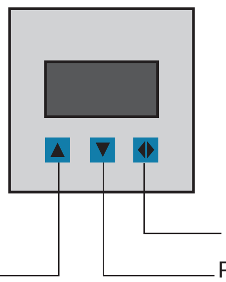
## Measuring Principle

BFG BTU meter calculates energy consumption by flow rate and temperature difference, the formula is:

$$\mathbf{Q} = \int_{\tau 0}^{\tau 1} q_m \Delta h \, d\tau = \int_{\tau 0}^{\tau 1} \rho \, q_v \Delta h \, d\tau$$

Notes:

- Q: Heat consumption or cool consumption ( unit: J )
- $q_m$: Unit weight of water passed flow meter (unit: kg/h)
- $q_v$: Unit volume of water passed flow meter (unit:$m^3$/h)
- ρ: Density of water (unit: kg/ $m^3$)
- Δh: Enthalpy of water (unit: J/kg)
- τ:Time (unit: h)




## Modes of Operation

When the water or other liquid passes through the pipe line, the flow meter measures the instantaneous flow rate ‘q’ and sends it to the BFG BTU meter then the temperature sensor measures the return pipe temperature ‘T1’ and supply pipe temperature ‘T2’ and also sends it to BTU meter.

According to above formula, BFG BTU meter integrates the cooling or heat consumption. If T1>T2, integrates cooling consumption, otherwise integrates heat consumption. Finally, the BFG BTU meter stores the data and displays on LCD.

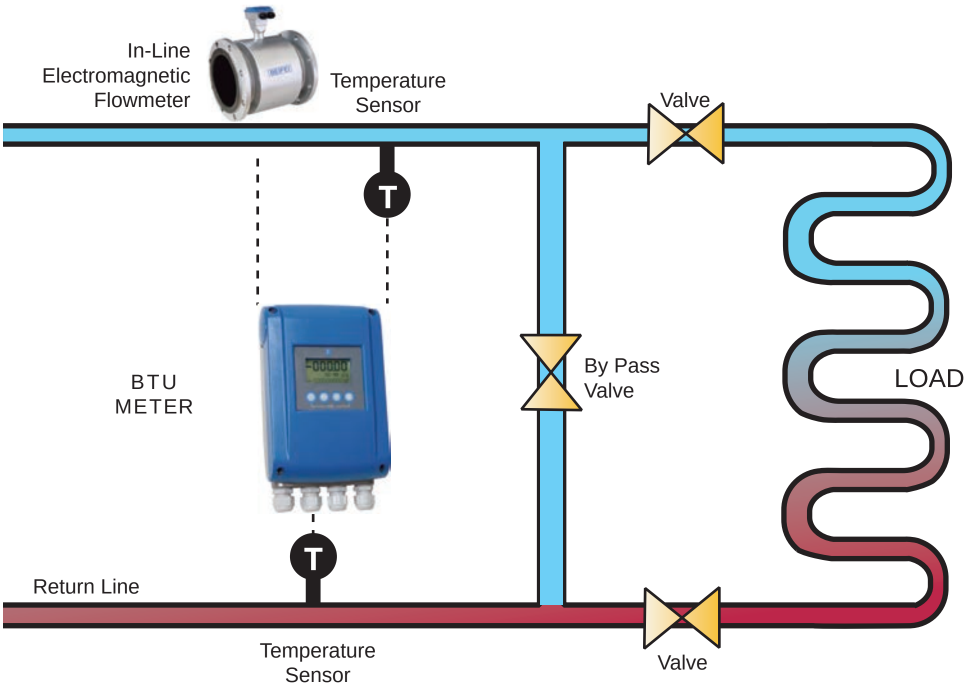
## Features / Benefits

- Complies with OIML R75 and EN1434 standards.
- Real time display of supply / return water temperature, instantaneous flow rate, cooling consumption value, heating consumption value, instantaneous power, total flow rate etc.
- Four different units of measurements available: MJ, GJ, kWh/h, MWh/h
- Password protection available.
- RS485 Communication protocol.
- Matched pair of 3-wire Temperature sensor PT1000, for higher resolution and better accuracy.

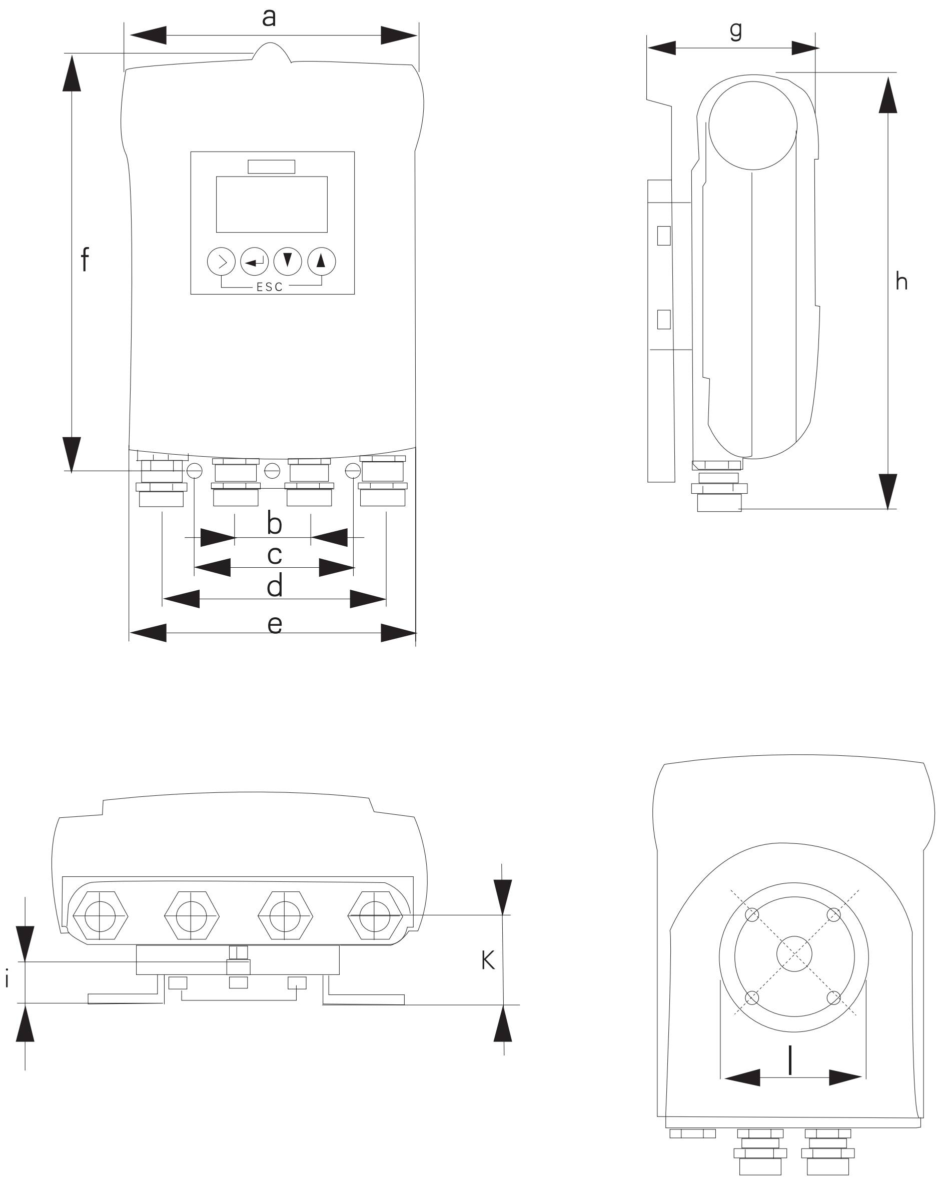
## Specification

| | |
|---|---|
| Operating Voltage: | 85 - 250 VAC, 45 - 63Hz |
| Temperature Range: | 0 - 199.9 °C |
| Matched with Temperature Sensor: | PT1000 |
| Flow Rate Range: | (0 - 99999)$m^3/h$ |
| Cooling Consumption Accumulated Range: | (0 – 999999999)$m^3$ |
| Heating Consumption Accumulated Range: | (0 – 999999999)$m^3$ |
| Communication Interface: | RS-485 |
| Communication Rate: | 300 - 38400 bps |
| Dimension: | 214 mm x 164 mm x 71 mm |
| System Accuracy (Including flowmeter, temperature sensors): | < +/-2% |

## BTU Measurement System



## Dimensions (In mm) - BTU Meter




| | 尺寸[mm] | | | | | | | | | | | 重量 [kg] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | h | i | k | l | |
| 墙挂式 | 161 | 40 | 87.2 | 120 | 155 | 241 | 95.2 | 257 | 19.3 | 39.7 | Φ72 | 约1.9 |

## TEMPERATURE SENSORS

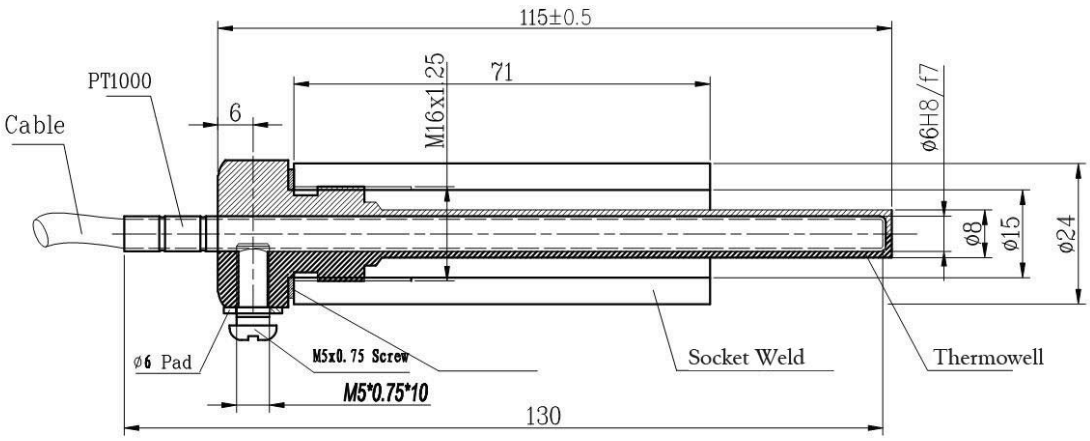
Type: 3-wire PT1000 Temperature sensors
Location: 1 x Supply Line and 1 x Return Line
Complete with: Thermowell and Socket Weld

### PT1000 Reference Table

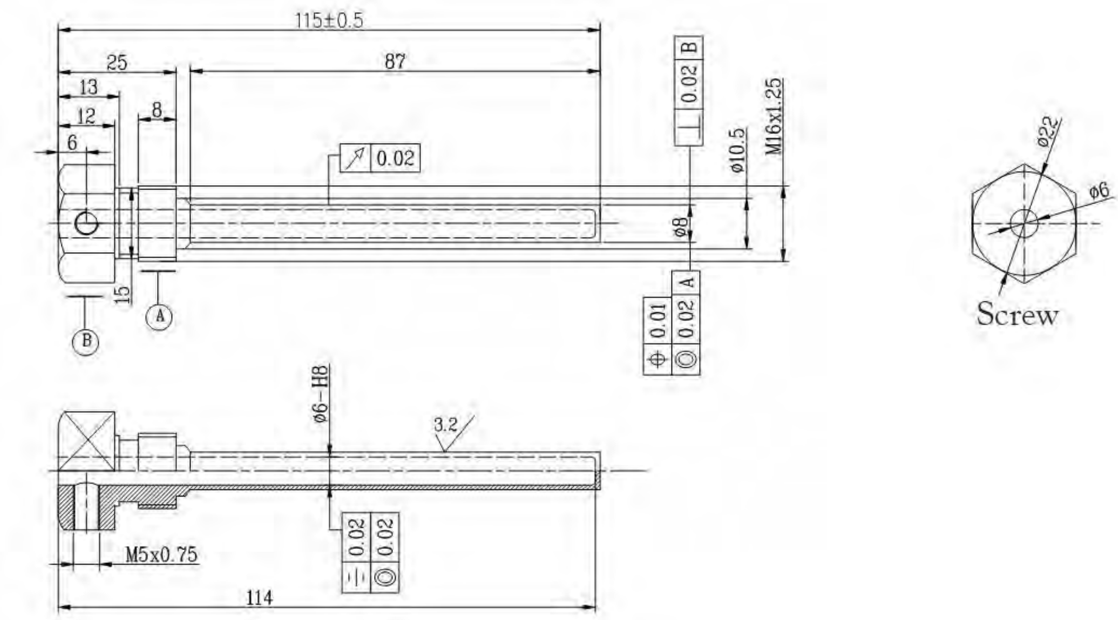
| °C | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1000.0 | 1003.9 | 1007.8 | 1011.7 | 1015.6 | 1019.5 | 1023.4 | 1027.3 | 1031.2 | 1035.1 |
| 10 | 1039.0 | 1042.9 | 1046.8 | 1050.7 | 1054.6 | 1058.5 | 1062.4 | 1066.3 | 1070.2 | 1074.0 |
| 20 | 1077.9 | 1081.8 | 1085.7 | 1089.6 | 1093.5 | 1097.3 | 1101.2 | 1105.1 | 1109.0 | 1112.8 |
| 30 | 1116.7 | 1120.6 | 1124.5 | 1128.3 | 1132.2 | 1136.1 | 1139.9 | 1143.8 | 1117.7 | 1151.5 |
| 40 | 1155.4 | 1159.3 | 1163.1 | 1167.0 | 1170.8 | 1174.7 | 1178.5 | 1182.4 | 1186.2 | 1190.1 |
| 50 | 1194.0 | 1197.8 | 1201.6 | 1205.5 | 1209.3 | 1213.2 | 1217.0 | 1220.9 | 1224.7 | 1228.6 |
| 60 | 1232.4 | 1236.2 | 1240.1 | 1243.9 | 1247.7 | 1251.6 | 1255.4 | 1259.2 | 1263.1 | 1226.9 |
| 70 | 1270.7 | 1274.5 | 1278.4 | 1282.2 | 1286.0 | 1280.8 | 1293.7 | 1297.5 | 1301.3 | 1305.1 |
| 80 | 1308.9 | 1302.7 | 1316.6 | 1320.4 | 1324.2 | 1320.8 | 1331.8 | 1335.6 | 1339.4 | 1343.2 |
| 90 | 1347.0 | 1350.8 | 1354.6 | 1358.4 | 1362.2 | 1366.0 | 1369.8 | 1373.6 | 1377.4 | 1381.2 |
| 100 | 1385.0 | 1388.8 | 1392.6 | 1396.4 | 1400.2 | 1403.9 | 1407.7 | 1411.5 | 1415.3 | 1419.1 |

# Dimension (In mm)

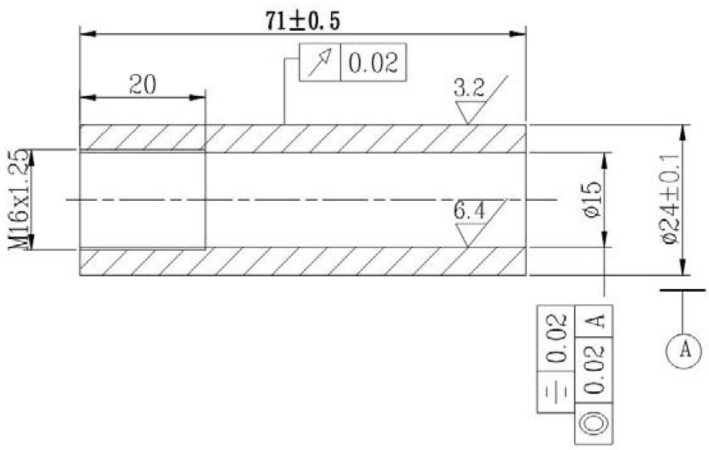
## PT1000 Temperature Sensor with Thermowell and Socket Weld




## Thermowell




## Socket Weld



# Specification - Flow Sensor

Flow Sensor

## Performance

| | |
|---|---|
| | Full bore electromagnetic Flowmeter |
| Accuracy | +/- 0.5% |
| Repeatability | +/- 0.1% |
| Full Scale Range Setting | 0.3 m/s to 15 m/s |
| Fluid Conductivity | > 5 µS/cm |
| Fluid Temperature | -25°C to130°C |
| Ambient Temperature | -40°C to 65°C |
| Calibration Certificate | Wet Calibration – 3 Points (Additional Test Points Upon Request) |

## Sensor

| | |
|---|---|
| Model | BFG |

## Process Connection

| | |
|---|---|
| Size | DN3-DN2600 |
| Type | Flange – DIN 2501/ ANSI/JIS |
| Pressure Rating | Refer To Page 8. Higher Pressure Rating Available On Request |

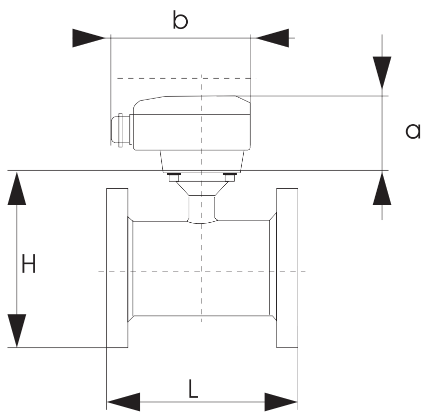
## Material

| | |
|---|---|
| Tube | SS304 |
| Liner (Wetted Parts) | Hard Rubber (Std) / PTFE/ Others On Request |
| Signal Electrode (Wetted Parts) | SS316 (Std)/ Hastelloy C/ Tantalum/ Titanium |
| Process - Flange | Carbon Steel (Std)/ SS304 (Optional With Price Adder) |
| Housing | Steel With Epoxy Paint |
| Grounding Rings (Optional) | SS304 / SS316 |
| Flow Direction | Bi-directional (Forward / Reverse) |
| Protection Class | IP 68 |

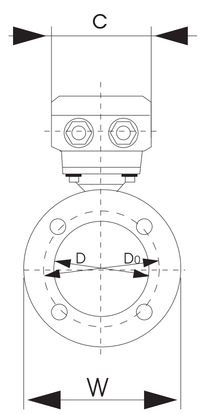
## Dimension - Sensor

| Size (mm) | *Pressure Rating PN | Dimension (mm) | | |
|---|---|---|---|---|
| | | L | W | H |
| 15 | 40 | 150 | 154 | 95 |
| 20 | 40 | 150 | 158 | 105 |
| 25 | 40 | 150 | 164 | 115 |
| 32 | 40 | 150 | 184 | 140 |
| 40 | 40 | 150 | 189 | 150 |
| 50 | 40 | 200 | 194 | 165 |
| 65 | 40 | 200 | 204 | 185 |
| 80 | 40 | 200 | 212 | 200 |
| 100 | 16 | 250 | 258 | 220 |
| 125 | 16 | 250 | 273 | 250 |
| 150 | 16 | 300 | 303 | 285 |
| 200 | 10 | 350 | 361 | 340 |
| 250 | 10 | 400 | 406 | 395 |
| 300 | 10 | 500 | 458 | 445 |
| 350 | 10 | 500 | 510 | 505 |
| 400 | 10 | 600 | 568 | 565 |
| 450 | 10 | 600 | 618 | 615 |
| 500 | 10 | 600 | 671 | 670 |
| 600 | 10 | 600 | 781 | 780 |
| 700 | 10 | 700 | 898 | 895 |
| 800 | 10 | 800 | 1012 | 1015 |
| 900 | 10 | 900 | 1114 | 1115 |
| 1000 | 10 | 1000 | 1225 | 1230 |

* Please request for drawing for dimensions of higher pressure rating




a = 77 mm
b = 139 mm
c = 106 mm



# Ordering Information

*(Example)* **BFG** **H** **15** **S** **B** **0** **0**

**BFG** — **Model**

**BFG-** Remote (RFT202) [DN3 - DN2600]

**H** — **Liner**

P - PTFE (max. temp. <180℃)
H - Hard Rubber (max. temp. <80℃)

**15** — **Meter Size**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | - | 1/8" | (DN3 | PN40) | | | | | |
| 6 | - | 1/4" | (DN6 | PN40) | | | | | |
| 10 | - | 3/8" | (DN10 | PN40) | | | | | |
| 15 | - | 1/2" | (DN15 | PN40) | 2F | - | 10" | (DN250 | PN10) |
| 20 | - | 3/4" | (DN20 | PN40) | 3H | - | 12" | (DN300 | PN10) |
| 25 | - | 1" | (DN25 | PN40) | 3F | - | 14” | (DN350 | PN10) |
| 32 | - | 1¼" | (DN32 | PN40) | 4H | - | 16” | (DN400 | PN10) |
| 40 | - | 1½" | (DN40 | PN40) | 4F | - | 18” | (DN450 | PN10) |
| 50 | - | 2" | (DN50 | PN40) | 5H | - | 20” | (DN500 | PN10) |
| 65 | - | 2½" | (DN65 | PN40) | 6H | - | 24” | (DN600 | PN10) |
| 80 | - | 3" | (DN80 | PN40) | 7H | - | 28” | (DN700 | PN10) |
| 1H | - | 4" | (DN100 | PN16) | 8H | - | 32” | (DN800 | PN10) |
| 1Q | - | 5" | (DN125 | PN16) | 9H | - | 36” | (DN900 | PN10) |
| 1F | - | 6" | (DN150 | PN16) | 1T | - | 40” | (DN1000 | PN10) |
| 2H | - | 8" | (DN200 | PN10) | | | | | |

**S** — **Electrode**

**S** - SS 316 Ti / 1.4571 (Std)
B - Hastelloy B-2
H - Hastelloy C-4
M - Titanium
T - Tantalum
P - Platinum

**B** — **Pressure Rating**

0 - DIN Standard
A - JIS 10K
**B** - PN 10
C - PN 16
D - PN 25
E - PN40
F - ANSI 300 lbs
G - ANSI 150 lbs
I - ANSI 600 lbs
Other upon request

**0** — **Flange Material**

**0** - Carbon Steel (Std)
3 - SS304

**0** — **Earthing Rings Size (Selection based on Meter Size)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **0** | - | None | | 2H | - | 8" | (DN200) |
| 15 | - | ½" | (DN15) | 2F | - | 10" | (DN250) |
| 20 | - | ¾" | (DN20) | 3H | - | 12" | (DN300) |
| 25 | - | 1" | (DN25) | 3F | - | 14” | (DN350) |
| 32 | - | 1¼" | (DN32) | 4H | - | 16” | (DN400) |
| 40 | - | 1½" | (DN40) | 4F | - | 18” | (DN450) |
| 50 | - | 2" | (DN50) | 5H | - | 20” | (DN500) |
| 65 | - | 2½" | (DN65) | 6H | - | 24” | (DN600) |
| 80 | - | 3" | (DN80) | 7H | - | 28” | (DN700) |
| 1H | - | 4" | (DN100) | 8H | - | 32” | (DN800) |
| 1Q | - | 5" | (DN125) | 9H | - | 36” | (DN900) |
| 1F | - | 6" | (DN150) | 1T | - | 40” | (DN1000) |

# Ordering Information

*(Example)*

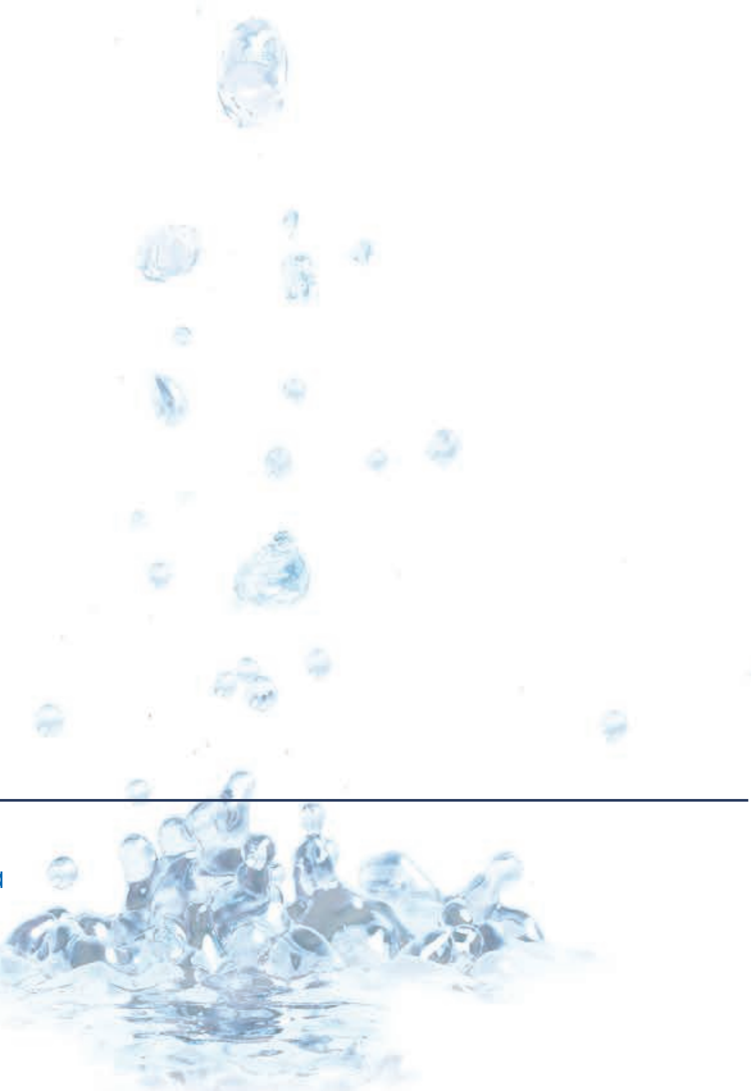
0 — **Power Supply**
- **0** - 85 - 220 VAC
- K - 24 VDC

0 — **Cable Gland**
- **0** - Converter Housing with Threads for Cable Connector M 20 x 1.5 (Std)
- 1 - Converter Housing with Threads for Cable Connector NPT 1/2"
- 2 - Converter Housing with Threads for Cable Connector G 1/2"

C — **Cable**
- **C** - Cable (10m - Std)
- LXX - Other length

## Ordering Code: (Example)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| H | 15 | S | B | 0 | 0 | 0 | 0 | C |



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