MAS 711

The Flygt MAS 711 is a pump monitoring system designed to remember, record and present pump events fast and easily. As part of a complete Flygt pumping system, it helps reduce costs over the pump’s lifetime by facilitating maintenance and assuring safe operation, thereby increasing reliability and availability.

Detailed operation data can be accessed via MAS 711 for immediate analysis using a standard web browser on a PC (no special software required), or alternatively transferred to a higher level system such as a SCADA (Supervision Control and Data Acquisition) system.

Everything you need to know
MAS 711 monitors the pump’s temperature, leakage, vibration, current and power (optional). In addition, it has a 'black box' function in case of pump failure.

• ‘Plug-n-play’ with back-up
MAS 711 communicates with the pump’s memory for fast and easy, ‘plug-n-play’ installation and routine back-up/synchronization of operation data and settings.

• Communication options
With its ethernet, Modbus and modem communications ports, MAS 711 can communicate with most Supervision Control and Data Acquisition (SCADA) systems on the market.

The MAS 711 also contains two relays that can be configured as normally - open or normally - closed, and indicate common pump - stop condition (A - Alarm) and pump - warning condition (B - Alarm).

With the many functions and features of MAS 711, you have Flygt’s decades of knowledge and experience in monitoring and control of submersible pumps literally at your fingertips.

Flygt Part # | Description
---|---
40-501142 | Base Unit & Operator Panel
# Technical data, Base unit

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>24 V ac/dc +/-10%, (45-65 Hz)</td>
</tr>
<tr>
<td>Supply dropout</td>
<td>50 ms without function disruption</td>
</tr>
<tr>
<td>Power consumption</td>
<td>max 10 VA</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-4°F to +140°F</td>
</tr>
<tr>
<td>Humidity (non condensing)</td>
<td>RH 85%</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP20</td>
</tr>
<tr>
<td>Outer dimensions</td>
<td>(W x H x D) 6.14” x 4.5” x 2.4”</td>
</tr>
<tr>
<td>Approvals</td>
<td>CE, CSA/US</td>
</tr>
<tr>
<td></td>
<td>UL: E132545</td>
</tr>
</tbody>
</table>

## Inputs:

<table>
<thead>
<tr>
<th>Protection</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O protection</td>
<td>All I/O:s are short circuit protected</td>
</tr>
<tr>
<td>Thermal switch/PTC-thermistor</td>
<td>Short circuit warning (thermistor)</td>
</tr>
<tr>
<td>Pt100 inputs (5)</td>
<td>Inaccuracy: +/-0.5+0.01T (Temp in °C)</td>
</tr>
<tr>
<td></td>
<td>Short circuit and interruption warning</td>
</tr>
<tr>
<td>Leakage sensor inputs (3)</td>
<td>12 V dc, current sensing</td>
</tr>
<tr>
<td></td>
<td>Values of operation:</td>
</tr>
<tr>
<td></td>
<td>I &lt; 3 mA                                          Interruption</td>
</tr>
<tr>
<td></td>
<td>3 &lt; I &lt; 22 mA                                     OK</td>
</tr>
<tr>
<td></td>
<td>22 &lt; I &lt; 55 mA                                    Leakage</td>
</tr>
<tr>
<td></td>
<td>I &gt; 55 mA                                         Short circuit</td>
</tr>
</tbody>
</table>

| 4-20 mA configurable      | Default: VIS 10 (vibration sensor)                |
|                           | 18 – 24 V dc                                      |
|                           | Inaccuracy: +/-1.5%                               |

| Current transformer input | for CT with 1 A rated secondary output             |
|                          | Inaccuracy: +/-1.5%                               |

| Reset input (external/remote reset) | Configurable for closing or opening contact |
| RUN-input (pump run indication)    | Pump “on” input, used in case pump current is not measured.|
|                                  | Configurable for closing or opening contact      |

## Outputs:

<table>
<thead>
<tr>
<th>Relay Type</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Go relay (pump interlock)</td>
<td>5A/250 V ac, normally opened (NO)</td>
</tr>
<tr>
<td>A-alarm relay</td>
<td>5A/250 V ac, (NO), configurable active open or close</td>
</tr>
<tr>
<td>B-alarm relay</td>
<td>5A/250 V ac, (NO), configurable active open or close</td>
</tr>
<tr>
<td>Supply to Pump memory</td>
<td>12 V dc</td>
</tr>
<tr>
<td>Supply to Operator panel</td>
<td>12 V dc</td>
</tr>
</tbody>
</table>
MAS 711

Communication:

Ext 1. - RS-485/Modbus  For communication with central system (Flygt APP700 or PLC). MAS Base unit is slave.

Ext 2. – RS-485/Modbus  For communication with Power analyzer. MAS Base unit is master.

Local – RS-485/Modbus  For communication with Pump memory and Operator panel. MAS Base unit is master.

RS-232, D-sub 9-pole  Female contact, point-to-point protocol (for modem).

Ethernet - RJ45 contact  For direct PC-connection, local area network or the Internet.

Technical data, Operator panel:

Power supply  12 V dc from Base unit
Ambient temperature  -4°F to +140°F
Humidity (non condensing)  RH 85%
Ingress protection  Panel mounted from outside IP67  Backside IP20
Outer dimensions  (WxHxD) 5.7” x 3.8” x 0.87”
Approvals  CE, CSA/US  UL: E132545

Communication port  RS-485/Modbus to Base unit

Technical data, Pump memory:

Power supply  12 V dc + (from Base unit)
Communication port  RS-485/Modbus (Two-wire to Base unit)
Operating temperature range  -4°F to +221°F
IP-rating  27 (submersible)
Dimensions  Height 0.787” (including terminals)  Width 1.574”  Depth 1.574”
Mounting  Large pumps: On terminal plate 685 86 00 with a 4mm screw.  Midrange pumps: Part of connector unit 691 83 00.

Part numbers:

MAS 711 Operator panel  40 501140
MAS 711 Base unit  40 501141
MAS 711 Pump supervision kit (Operator panel and Base unit)  40 501142
Power Analyzer, PAN 312  40 501526

Part numbers:

Pump memory  84 00 90
Connector unit with pump memory (associated equipment for Midrange)  691 83 00

Pump memory ordered as spare part:
MAS 711
Dimensional drawings and mounting

Mount the Base unit on a 35 mm symmetrical DIN-rail.

Mount the Operator panel either in a cabinet door or panel front. An alternative is to attach it on a 35 mm symmetrical DIN-rail.

Note: The maximum thickness of a door or panel skin is 0.118".
MAS 711
Wiring & Installation Guidelines

This guideline is intended to define the required installation practice of the MAS711 equipment. It should be noted that these commonly used communications wiring guidelines need to be adhered to eliminate electromagnetic interference (EMI) or other electrical interference associated primarily with VFD applications.

All MAS711 circuits must be installed in accordance with NEC guidelines, including but not limited to articles 250, 310, 500, 725, and all local and governmental regulations that may apply. Additionally, the following installation practices must be performed:

Flygt follows FCC and CE requirements when providing control equipment and pumps. Our pumps are CE-marked according to EMC directive 2006/108/EG; all cables (power cable and control cable) must be shielded when connected to a VFD drive.

PROPER GROUNDING AND CABLE ROUTING

Always use Shielded Monitoring/Sensor cables when extending Flygt Pilot Cable conductors. The following practices shall be used when terminating the shields:

• The motor cable should be shielded and grounded at both ends (Shielded SUBCAB where shield also acts as protected earth) to prevent undesired electrical interference from the VFD (range between 1 MHz and 10MHz).

• Use EMC cable gland and assure that the shield is connected 360° in the gland or connect the shield pigtail as short as possible in the panel.

• Ensure that all control conductors are twisted together, and do not separate the conductor when cable is peeled until reaching the connection point. If possible place the control conductors in separate cable channel in the control panel to avoid coupling to other interference sources.

• Conductor Shields to connect to a ‘signal ground’ and not the protective ground. Protective ground and signal ground should be separate and is isolated from each other. They are then connected together only once at the main supply point. Parallel grounding is not allowed per NEC Art. 250.

• If ground loops, current or magnetic disturbances occur in the cable shield open the shield connection in the control panel and connect a capacitor in series between the shield and ground (e.g. 0.5µf, 1kV).
The ground system must have one system ground, where all ground connections should be connected from the control panel and various control units. Avoid ground loops through gland plates and cable gland bonding and ensure that there is no potential difference in the ground system.

Monitoring cables must be segregated from all power cables by at least 12 inches by use of separate metal conduits / cable trays grounded per NEC Article 250.

Monitoring cables should not cross power cables unless absolutely necessary and then only at 90 degree angles.

**MAS711 UNIT LOCATION PRACTICES**

MAS711 base unit and operator panel need to be isolated from the VFD unit, ideally in a separate MCC compartment or Control cabinet. Do not place any MAS components close to any component of a VFD (a minimum distance of 18 inches should be maintained from any VFD component or termination point)

If applicable, the primary of the supply transformer, assuming a 24 VAC supply is being utilized, should not be connected across 2 phases which are directly connected to the VFD input.

Using a 24 VDC supply is preferred since this will reduce the possibility of any interference from the power supply reaching the MAS unit.

Output reactors are to be fitted to the VFD when long cable lengths between the drive and the pump motor are utilized. The maximum length of power cable between the drive and the load will usually be advised by the VFD manufacturer, but will typically be between 50 and 300 feet.
MAS 711 Specifications

PUMP/MOTOR PROTECTION
All of the pump/motor unit protective and monitoring sensors shall be connected to a Flygt MAS, (Monitoring and Status) module. Each pump/motor unit shall be equipped with a MAS unit. The MAS shall be a two-piece product including the base module and an operator panel.

The operator panel shall be mounted on the dead-front panel. The operator panel shall include soft-touch type navigation keypad, alarm acknowledgement keypad, amber warning lamp, red alarm lamp and a 2-line by 20-character LCD digital display. The digital display shall provide the local readout of pump/motor sensor and alarm status and aid in navigation through the system during set-up.

The base module shall contain a processor unit having a minimum of 2Mb of memory for the logging of measurements and alarm events, two communications ports, sufficient terminals for pump/motor unit sensor connection and a Web tool. The Web tool shall be able to be accessed in the following manners; directly connected at the site with a personal computer, remotely accessed over the owner’s LAN or internet or by the use of a telephone modem.

Base System Sensors
Each pump/motor unit(s) shall be equipped with the following Base Level protection and monitoring sensors:

1. Three (3) motor winding thermal switches, one installed in each motor phase winding, and connected in series to monitor and protect the winding from over temperature operation. The thermal switches shall open, activating an alarm and stopping the motor should a high temperature event occur.
2. One (1) PT-100 temperature probe shall be installed in the motor winding to provide direct stator temperature read-out.
3. One (1) PT-100 temperature probe shall be installed to directly contact the outer race of the thrust bearing to provide for accurate temperature monitoring of the bearing.
4. One (1) Float-type Leakage Sensor (FLS) shall be provided to detect water intrusion into the motor stator chamber. If activated, the FLS will activate an alarm and stop the motor.
5. One (1) Float-type Leakage Sensor (FLS) shall be provided to detect water intrusion into the power cable junction chamber of the pump/motor unit. If activated, the FLS will activate an alarm and stop the motor.
6. One (1) Pump Memory unit shall be installed in the cable junction chamber of the pump/motor unit. The Pump Memory with 32kb of memory shall store unit data plate information, listing of pump/motor unit installed sensors and statistical operational data including number of starts, unit accumulated running time, unit service data and histogram data of motor temperature.

Optional System Sensors
Each pump/motor unit(s) can be further equipped with each of the following Optional sensors in addition to the Basic Level sensors listed above:

1. Three (3) PT-100 temperature probes, one installed in each motor stator phase winding, to provide direct stator temperature read-out of each phase winding.
2. One (1) PT-100 temperature probe shall be installed to directly contact the outer race of the upper support bearing to provide for accurate temperature monitoring of the bearing.
3. One (1) VIS-10 vibration sensor shall be installed in the power cable junction chamber of the pump/motor unit. The vibration sensor shall be capable of monitoring displacement in one plane.
4. One (1) CLS-10 water-in-oil sensor installed in the mechanical seal lubrication chamber to alarm should there be intrusion of water into the chamber.
5. One (1) Power Analyzer module. The Power analyzer shall provide additional input channels to monitor the following:
   a. System pump/motor current
   b. Individual phase pump/motor current (each of 3-phases)
   c. Current imbalance
   d. System voltage
   e. Individual line voltage (each of 3-lines)
   f. Voltage imbalance
   g. System power
   h. Power factor
   i. Energy consumption