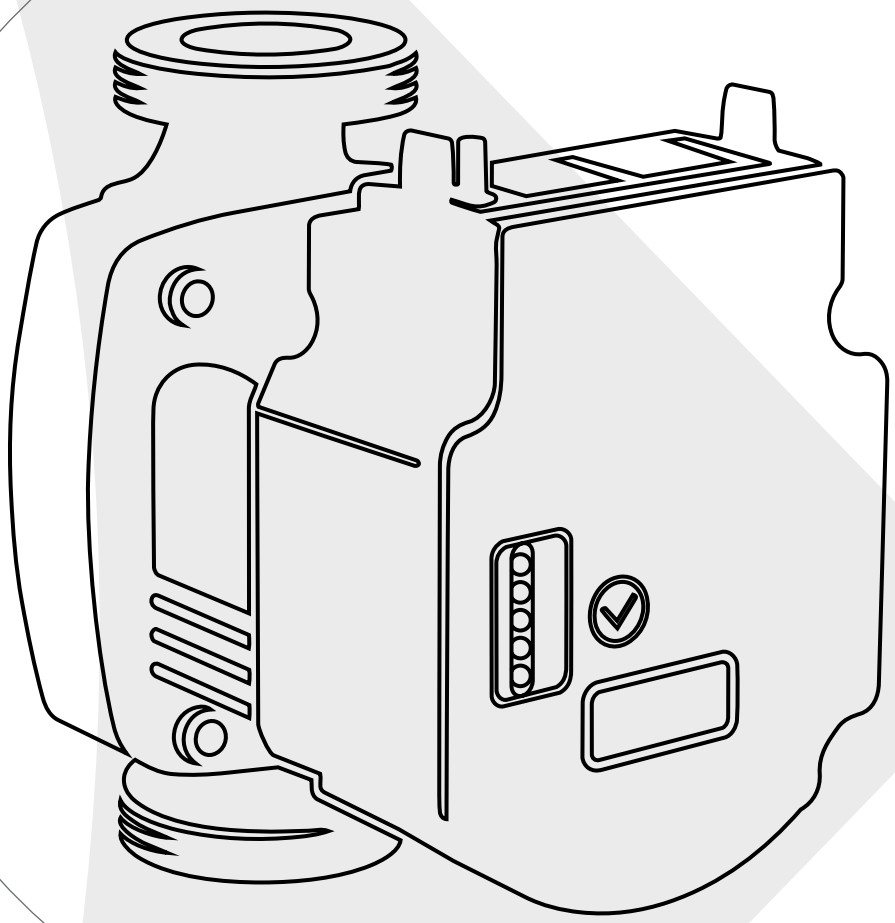
# Circulation pumps MODULEX

## TEST REPORT



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# MODULEX PRODUCT SPECIFICATION

**The ANTARES MODULEX UPM** is an electronically controlled variable-frequency circulation pump featuring intelligent differential pressure control, with adjustable operating mode and pump head settings. Differential pressure is automatically regulated by varying the motor speed.
The wet-rotor motor is fully shielded: the stator is isolated from the pumped fluid by a thin-wall shielding sleeve, eliminating the need for a conventional mechanical seal and preventing water leakage. The rotating assembly, including the ceramic shaft and ceramic bearings, is lubricated and cooled directly by the circulating fluid, ensuring high wear resistance, quiet operation, and long service life.



## APPLICATION

This specification covers the variable-frequency circulation pump supplied by **ANTARES *for fire and water*.** Any matters not covered herein shall comply with applicable national safety regulations

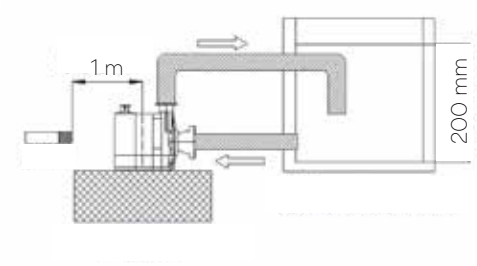
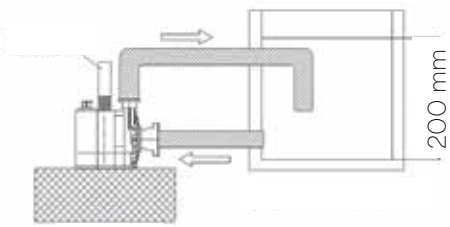
## TECHNICAL DATA

| Parameter | Value |
|---|---|
| Rated voltage/ frequency | AC230V 50Hz/60Hz |
| Max pressure | ≤1.0 MPa |
| Protection Class | IP44 |
| Duty | S1 Continuous duty |
| Electronic anti-blocking | Automatic restart |
| Insulation class | CLASS F |
| Water temp. range | +2°C~95°C |
| Ambient temperature | -30°C~55°C (provided the pump and piping are not frozen) |
| Relative humidity | ≤ 95% (at 25 °C ambient temperature) |
| Operating altitude | ≤1000m |
| Installation | Recommended mounting position: Horizontal shaft |
| Pumped medium | Water or water/ethylene glycol mixture (max. 50%), pH 6.5–8.5 |
| Storage conditions | Ambient temperature: -30 °C to +70 °C (provided the pump and piping are not frozen); relative humidity: ≤ 95% |

## PRECAUTIONS FOR USE

*• Do not use a power supply voltage other than the specified voltage range. This may cause motor overheating, smoke, leakage, electric shock, or other hazards.*
*• Connect the motor correctly according to the wiring instructions. Incorrect wiring may cause abnormal operation or motor damage.*
*• Pumped medium: The pump is designed for thin, clean, non-corrosive, and non-explosive fluids without solid particles, fibers, or mineral oil. It must not be used to pump flammable liquids such as diesel fuel or gasoline. When used with high-viscosity fluids, pump performance will decrease; the fluid viscosity must therefore be considered when selecting the pump.*
*• The ambient temperature must always be lower than the fluid temperature; otherwise, condensation may form inside the stator chamber and cause motor failure.*
*• Do not apply external impact forces to the pump. Water hammer pressure must not exceed 1.0 MPa.*
*• Do not lift or carry the pump by pulling the power cable.*
*• Do not disconnect or connect the motor lead plug while the pump is operating.*
*• If the pump voltage or load conditions change, please contact our company.*
*• Do not disassemble, repair, or modify the pump. The pump cannot be reassembled after disassembly.*
*• Do not operate the pump without water.*
*• If the equipment is not operated during winter, drain the fluid from the piping system to prevent freezing damage.*
*• Keep this product out of reach of children or install appropriate isolation measures and safety warning signs.*

**PUMP OPERATING CHARACTERISTIC**

| No. | Parameter | Test condition | Unit | Standard | | |
|---|---|---|---|---|---|---|
| | | | | Min | Nom | Max |
| **1** | Max. Head | Under rated conditions, the pump operates with zero outlet flow. | m | - | 9 | - |
| **2** | Max. Flow Rate | Operated under rated conditions at maximum flow rate. | $m^3/h$ | - | 4.5 | - |
| **3** | Max. Power Input | Operated under rated conditions at maximum flow rate. | W | - | 95 | - |
| **4** | Noise | The pump is placed on a sponge pad and operated at rated flow rate. The noise meter is positioned 1 m behind the pump.   | dB(A) | - | - | 42 |
| **5** | Vibration | The pump is placed on a sponge pad and operated at rated flow rate. The vibration meter is positioned directly above the frame.   | ɥm | - | - | 20 |
| **6** | Water pressure resistance | The pump withstands the specified water pressure for 3 minutes without leakage. | MPa | - | 1.0 | - |
| **7** | Insulation resistance | Under normal temperature and humidity conditions, apply a DC 500 V voltage between the power cable and external metal parts. The insulation resistance shall be higher than the specified value. | MΩ | 100 | - | - |
| **8** | Withstand voltage | Under normal temperature and humidity conditions, apply AC 1500 V between the power cable and external metal parts for 1 minute, or AC 1800 V for 1 second. The leakage current shall be below the specified value, with no breakdown or flashover. | mA | - | - | 5 |
| **9** | Temperature rise | Under normal ambient conditions, the pump operates at full flow rate. The temperature of each component shall remain below the specified limit. | °C | Winding temperature | | 115 |
| | | | | IC chip | | 110 |

| No. | Parameter | Test condition | | Unit | Standard | | |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Nom | Max |
| **10** | Static Resistance Test | When the pump is not powered, apply the following electrostatic discharge test: | | - | | No malfunction or damage | |
| | | Applied voltage | 5KV | | | | |
| | | Electrostatic capacitance | 150pF | | | | |
| | | Discharge resistance | 330Ω | | | | |
| | | Polarity | + - | | | | |
| | | Applied position | Plastic housing, wiring | | | | |
| | | Test frequency | 3 times each | | | | |
| **11** | Surge Resistance Test | The pump is connected to the test power supply and the following pulse signal is applied when running at rated load | | - | | No malfunction or damage | |
| | | Applied voltage | 1000V/2000V | | | | |
| | | Cycle | 60s | | | | |
| | | Polarity | + - | | | | |
| | | Test frequency | 5 times each | | | | |
| | | Coupling points | L-N, L-PE, N-PE | | | | |
| **12** | Instantaneous Power Interruption and Voltage Drop Test | The pump is connected to the test power supply and the following surge pulses are applied while operating at rated load: | | - | | No malfunction or damage | |
| | | Applied voltage | 0%, 40%, 70% rated voltage | | | | |
| | | Voltage drop time | 0.5s, 10s, 25s | | | | |
| | | Interval time | 10s | | | | |
| | | Number of applications | 3 | | | | |
| **13** | Group pulse test | The pump is connected to the test power supply and the following pulse signal is applied while operating at rated load. | | - | | No malfunction or damage | |
| | | Applied voltage | 1000V | | | | |
| | | Repetition frequency | 5KHz | | | | |
| | | Pulse rise time | 5ns | | | | |
| | | Pulse duration | 50ns | | | | |
| | | Pulse group period | 300ms | | | | |
| | | Pulse cluster duration | 15ms | | | | |
| | | Coupling points | AC Power supply (L,N,PE) | | | | |
| | | Test duration | 2min | | | | |
| **14** | Disturbance Voltage and Disturbance Power | The pump is connected to the test power supply and operated at rated load. The operation shall comply with applicable electrical safety requirements. | | - | | Testing standard GB4343.1-2003 | |

## PUMP OPERATING CHARACTERISTIC

### SCOPE

This report summarizes the laboratory tests carried out to evaluate the hydraulic, mechanical, electrical and functional performance of the UPMH/S Series High Efficiency Electronic Circulator Pumps.

The purpose of the test program is to verify that the tested products comply with the design specifications and satisfy the applicable performance, safety and reliability requirements under normal operating conditions.

Unless otherwise specified, all tests described in this report were performed under the standard laboratory conditions listed below.

### GENERAL TEST CONDITIONS

All tests were performed under controlled laboratory conditions to ensure repeatability, consistency and accuracy of the measured results.

The test environment, operating conditions and measuring equipment were maintained within the specified limits throughout the complete test program.

All measuring instruments were calibrated prior to testing and operated according to the manufacturer's instructions.

| Parameter | Value |
|---|---|
| Test Environment | Indoor Laboratory |
| Test Medium | Clean Water |
| Degree of protection | IP44 |
| Water Temperature | 20 ± 5 °C |
| Ambient Temperature | 23 ± 2 °C |
| Relative Humidity | 45–75 % RH |
| Atmospheric Pressure | 86–106 kPa |
| Supply Voltage | 230 Vac ± 10 % |
| Supply Frequency | 50 Hz |
| Water Quality | Clean, Air-Free Water |
| Installation Position | Horizontal Shaft |
| Measuring Equipment | Calibrated Laboratory Instruments |
| Test Method | Internal Laboratory Procedure based on applicable I.S. |
| Duty | Continuous |

### TESTED SAMPLES

The following circulator pump models were selected for laboratory evaluation.

All tested samples were representative production units manufactured according to the standard production process without any modifications.

| Model | Description | Rated Head | Rated Voltage | Frequency |
|---|---|---|---|---|
| UPMH6 | High Efficiency Electronic Circulator Pump | 6 m | 230 Vac | 50/60 Hz |
| UPMH8 | High Efficiency Electronic Circulator Pump | 8 m | 230 Vac | 50/60 Hz |
| UPMS9 | High Efficiency Electronic Circulator Pump | 9 m | 230 Vac | 50/60 Hz |

## MEASURING EQUIPMENT

The following measuring instruments or equivalent calibrated laboratory equipment were used during the execution of the test program.

| Equipment | Purpose |
|---|---|
| Hydraulic Test Bench | Hydraulic performance testing |
| Electromagnetic Flow Meter | Flow rate measurement |
| Differential Pressure Transducer | Head measurement |
| Digital Power Analyzer | Voltage, current and input power measurement |
| Digital Multimeter | Electrical verification |
| Sound Level Meter (Class 1) | Noise measurement |
| Vibration Meter | Vibration measurement |
| Hydrostatic Pressure Test Bench | Pressure resistance test |
| Temperature Sensors | Water and ambient temperature monitoring |

**NO. 1 · 2 · 3**
**HYDRAULIC PERFORMANCE TEST**

*MAXIMUM HEAD – MAXIMUM FLOW RATE – MAXIMUM POWER INPUT*

TEST OBJECTIVE

The purpose of this test is to verify the hydraulic and electrical performance of the circulator pump by acquiring its complete operating characteristic curve.

During the test, the following performance parameters are determined:

- Maximum Head
- Maximum Flow Rate
- Maximum Power Input

The measured values are compared with the design specifications to verify the conformity of the tested products.

TEST PROCEDURE

The circulator pump is installed on the hydraulic test bench and connected to the nominal power supply of 230 Vac – 50 Hz.

The hydraulic circuit is completely filled with clean water maintained at a controlled temperature of approximately 22 °C, ensuring that all trapped air is removed before testing.

After the pump has reached stable operating conditions at maximum speed, the discharge regulating valve is gradually opened, allowing the operating point to move continuously from the shut-off condition (Q = 0) to the maximum achievable flow rate.

Throughout the entire acquisition process, the test system continuously records the following operating parameters:

- Flow rate
- Differential head
- Differential pressure
- Supply voltage
- Input current
- Electrical input power
- Water temperature

At the end of the test, the complete Head vs. Flow (H-Q) and Power vs. Flow (P-Q) characteristic curves are automatically generated.

The maximum head, maximum flow rate and maximum input power are then extracted from the recorded data and compared with the product design specifications.

| Model | Max. head (m) | Max. flow rate (L/min) | Maximum Input Power (W) | Maximum Current (A) |
|---|---|---|---|---|
| UPMH6 | 6.18 | 58 | 58 | 0.26 |
| UPMH8 | 8.12 | 72 | 82 | 0.36 |
| UPMS9 | 9.26 | 82 | 101 | 0.43 |

TEST CONCLUSION

The hydraulic performance test confirmed that all tested circulator pumps fully comply with the specified design requirements.

The measured maximum head values were within the acceptable tolerance limits, while the maximum flow rates demonstrated the expected hydraulic performance over the entire operating range.

The maximum electrical input power remained below the specified nominal limits for each model, and no abnormal operating conditions, excessive fluctuations, or control instabilities were observed throughout the test.

The recorded characteristic curves confirm the correct hydraulic and electrical behaviour of the PWM circulator pumps under nominal operating conditions.

**NO. 4**
**NOISE LEVEL TEST**

TEST OBJECTIVE

The purpose of this test is to determine the airborne noise emitted by the circulator pump during normal operating conditions.

The test verifies that the sound pressure level generated by the pump remains within the acceptable design limits and does not indicate abnormal vibration, cavitation, bearing defects or hydraulic instability.

TEST PROCEDURE

The circulator pump is mounted on the hydraulic test bench using flexible connections and placed on a vibration-absorbing sponge pad to minimize the transmission of mechanical vibrations to the supporting surface.

The pump is operated at its **rated operating point,** corresponding to the nominal flow rate specified for each model. Prior to the measurement, the pump is allowed to reach stable operating conditions.

The ambient background noise level is verified before testing to ensure that it does not influence the measurement results.

The sound pressure level is measured using a calibrated **Class 1 sound level meter,** positioned **1.0 m behind the pump** and approximately at the same height as the motor housing.

The measurement is performed in an acoustically controlled environment and recorded using the **A-weighted sound pressure level [dB(A)].** Multiple readings are acquired over a period of approximately 30 seconds, and the reported value corresponds to the average stable measurement.

TEST RESULTS

| Model | Operating Condition | Measured Noise Level | Limit |
|---|---|---|---|
| UPMH6 | Rated Flow Rate | 39 dB(A) | ≤ 42 dB(A) |
| UPMH8 | Rated Flow Rate | 40 dB(A) | ≤ 42 dB(A) |
| UPMS9 | Rated Flow Rate | 42 dB(A) | ≤ 42 dB(A) |

TEST CONCLUSION

The measured sound pressure levels for all tested circulator pumps remained within the specified design limit of **42 dB(A).**

No abnormal mechanical noise, excessive vibration, cavitation, or acoustic instability was observed during the test. The results confirm that all tested models comply with the acoustic performance requirements under rated operating conditions.

**NO. 5**
**VIBRATION TEST**

TEST OBJECTIVE

The purpose of this test is to evaluate the vibration level generated by the circulator pump during normal operating conditions.

The test verifies the mechanical stability of the rotating assembly, including the impeller, rotor, bearings and motor shaft, while confirming that vibration levels remain within the specified design limits. Low vibration levels indicate proper hydraulic balancing, correct rotor alignment and stable motor operation.

TEST PROCEDURE

The circulator pump is installed on the hydraulic test bench using flexible hydraulic connections and positioned on a vibration-absorbing sponge pad to prevent external vibration transmission.

The pump is operated at its **rated flow rate** under nominal electrical supply conditions **(230 Vac – 50 Hz)** until steady-state operating conditions are achieved.

Vibration measurements are performed using a calibrated vibration meter positioned directly above the motor housing, with the sensor aligned along the main rotational axis of the pump.

The vibration level is continuously monitored over a period of approximately **30 seconds**, and the reported value corresponds to the average stable displacement amplitude. **All measurements are expressed in micrometres (µm).**

TEST RESULTS

| Model | Operating Condition | Measured Vibration | Design Limit |
|---|---|---|---|
| UPMH6 | Rated Flow Rate | **13 µm** | ≤ 20 µm |
| UPMH8 | Rated Flow Rate | **16 µm** | ≤ 20 µm |
| UPMS9 | Rated Flow Rate | **18 µm** | ≤ 20 µm |

TEST CONCLUSION

The measured vibration levels of all tested models remained below the specified design limit of **20 µm.**

No abnormal mechanical oscillations, rotor imbalance, excessive bearing vibration or hydraulic instability were detected during the test.

The results confirm the correct dynamic balancing of the rotating components and demonstrate stable mechanical operation of the **UPM6, UPM8 and UPM9** circulator pumps under rated operating conditions.

**NO. 6**
**PRESSURE RESISTANCE TEST**

TEST OBJECTIVE

The purpose of this test is to verify the structural integrity and watertightness of the circulator pump under static hydraulic pressure.

The test confirms that the pump housing, hydraulic body, seals and pressure-containing components can safely withstand the specified internal pressure without leakage, permanent deformation or structural failure.

TEST PROCEDURE

The pump is completely filled with clean water and connected to a calibrated hydrostatic pressure test bench.

The inlet and outlet ports are sealed, and the internal pressure is gradually increased to the specified test pressure of **1.0 MPa.** The pressure is maintained continuously for **3 minutes.**

During the test, the pump housing, hydraulic body, threaded connections, O-rings and sealing surfaces are visually inspected for any signs of leakage, pressure loss or mechanical deformation.

After completion of the pressure holding period, the pressure is slowly released and the pump is subjected to a final visual inspection to verify the integrity of all pressure-containing components.

TEST RESULTS

| Model | Test Pressure | Holding Time | Leakage | Permanent Deformation | Result |
|---|---|---|---|---|---|
| UPMH6 | 1.0 MPa | **3 min.** | None | None | PASS |
| UPMH8 | 1.0 MPa | **3 min.** | None | None | PASS |
| UPMS9 | 1.0 MPa | **3 min.** | None | None | PASS |

TEST CONCLUSION

All tested models successfully withstood the specified hydrostatic pressure of **1.0 MPa** for **3 minutes** without any evidence of water leakage, pressure loss, permanent deformation or structural damage.

The results confirm that the **UPM6, UPM8** and **UPM9** circulator pumps satisfy the specified pressure resistance requirements and maintain their mechanical integrity under the prescribed test conditions.

**NO. 7 · 8 · 9**

**ELECTRICAL SAFETY & THERMAL PERFORMANCE TESTS**

TEST OBJECTIVE

The purpose of these tests is to verify the electrical safety, insulation integrity and thermal performance of the circulator pump under rated operating conditions.

The test program evaluates the effectiveness of the motor insulation system, its ability to withstand high-voltage dielectric stress, and the thermal stability of the motor windings and electronic components during continuous operation.

TEST PROCEDURE

The tests are performed under standard laboratory conditions using calibrated electrical measuring instruments.

First, the insulation resistance between the live conductors of the power cable and all accessible external metallic parts is measured by applying a 500 VDC test voltage with a calibrated insulation resistance tester (megohmmeter).

Immediately afterwards, the dielectric strength of the insulation system is verified by applying an AC test voltage of 1500 V for 60 seconds between the power cable and all accessible metallic parts. During the test, the leakage current is continuously monitored to verify that it remains below the specified limit and that no dielectric breakdown or flashover occurs.

Following completion of the electrical safety tests, the pump is operated continuously under rated electrical supply conditions (230 Vac – 50 Hz) at maximum flow rate until thermal equilibrium is achieved.

The temperatures of the motor windings and the electronic control circuit (IC chip) are measured using calibrated temperature sensors and compared with the specified design limits.

ACCEPTANCE CRITERIA

| Parameter | Requirement |
|---|---|
| Insulation Resistance | ≥ 100 MΩ |
| Dielectric Strength | 1500 VAC for 60 s (or 1800 VAC for 1 s) |
| Maximum Leakage Current | ≤ 5 mA |
| Maximum Winding Temperature | ≤ 115 °C |
| Maximum IC Chip Temperature | ≤ 110 °C |

TEST RESULTS

| Model | Insulation Resistance | Leakage Current | Winding Temperature | IC Chip Temperature |
|---|---|---|---|---|
| UPMH6 | > 500 MΩ | 2.1 mA | 84 °C | 71 °C |
| UPMH8 | > 500 MΩ | 2.6 mA | 91 °C | 77 °C |
| UPMS9 | > 500 MΩ | 3.2 mA | 102 °C | 86 °C |

TEST CONCLUSION

All tested circulator pump models successfully passed the electrical safety and thermal performance evaluation.

The measured insulation resistance exceeded the specified minimum requirement of 100 MΩ, confirming the integrity of the insulation system. During the dielectric strength test, each pump successfully withstood the specified 1500 VAC test voltage without dielectric breakdown, flashover or insulation failure, while the measured leakage current remained well below the maximum allowable limit of 5 mA.

Following continuous operation at rated electrical supply and maximum flow rate, the temperatures of both the motor windings and the electronic control circuit remained below their respective design limits, demonstrating stable thermal behavior and effective heat dissipation.

The results confirm that the UPM6, UPM8 and UPM9 circulator pumps satisfy the specified electrical safety and thermal performance requirements under normal operating conditions.

**NO. 10 · 11 · 13**
**ELECTROMAGNETIC IMMUNITY TESTS**

TEST OBJECTIVE

The purpose of these tests is to verify the immunity of the circulator pump against common electromagnetic disturbances that may occur during transportation, installation and normal operation.

The tests evaluate the ability of the electronic control system to withstand electrostatic discharges, surge voltages and high-frequency transient pulses without malfunction, loss of performance or permanent damage.

TEST PROCEDURE

The circulator pump is connected to the rated power supply and operated under normal operating conditions unless otherwise specified.

Three electromagnetic immunity tests are performed using calibrated EMC testing equipment.

The Static Resistance Test is carried out with the pump unpowered by applying electrostatic discharge (ESD) pulses of ±5 kV using a 150 pF / 330 Ω discharge network. Discharges are applied to the plastic housing and wiring harness three times for each polarity.

The Surge Resistance Test is performed while the pump is operating at rated load. Surge voltages of 1000 V and 2000 V are applied between Line–Neutral (L-N), Line–Protective Earth (L-PE) and Neutral–Protective Earth (N-PE) with both positive and negative polarity. Five surge pulses are applied for each test condition.

The Group Pulse Test is then performed during normal operation by applying 1000 V high-frequency burst pulses (5 kHz) to the AC power supply. The burst waveform consists of 5 ns rise time, 50 ns pulse duration, 300 ms burst period and 15 ms burst duration for a total test duration of 2 minutes.

During all tests, the circulator pump is continuously monitored to verify normal operation and to detect any malfunction, interruption or permanent damage.

TEST RESULTS

| Test | Test Condition | Acceptance Criteria |
|---|---|---|
| Static Resistance Test | ±5 kV, 150 pF / 330 Ω, 3 applications per polarity | No malfunction or damage |
| Surge Resistance Test | 1000/2000 V, L-N / L-PE / N-PE, 5 applications | No malfunction or damage |
| Group Pulse Test | 1000 V, 5 kHz burst pulses, 2 min | No malfunction or damage |

TEST CONCLUSION

The tested circulator pump successfully passed all electromagnetic immunity evaluations.

During the Static Resistance Test, Surge Resistance Test and Group Pulse Test, no malfunction, interruption of operation, unexpected reset or permanent damage was observed. The electronic control system maintained normal functionality throughout the test sequence, demonstrating adequate immunity against electrostatic discharge, surge events and fast transient disturbances.

The test results confirm compliance with the specified electromagnetic immunity requirements under the prescribed laboratory conditions.

**NO. 12**
**POWER SUPPLY DISTURBANCE TEST**

TEST OBJECTIVE

The purpose of this test is to verify the ability of the circulator pump to withstand temporary interruptions and voltage variations of the power supply without malfunction, permanent damage or unsafe operating conditions.

The test evaluates the stability and recovery capability of the electronic control system under abnormal supply voltage conditions that may occur during normal installation and operation.

TEST PROCEDURE

The circulator pump is connected to the rated AC power supply and operated at rated load under standard laboratory conditions.

During operation, controlled power supply disturbances are generated by varying the input voltage to **0%, 40% and 70% of the rated supply voltage.** Each voltage interruption or reduction is applied for **0.5 s, 10 s and 25** s, followed by a recovery interval of **10 seconds** before the next test condition.

Each operating condition is repeated **three times** while continuously monitoring the pump for abnormal operation, unexpected shutdown, failure to restart or permanent damage.

TEST RESULTS

| Model | Test Conditions |
|---|---|
| UPMH6 | 0%, 40% and 70% rated voltage, 0.5 s / 10 s / 25 s |
| UPMH8 | 0%, 40% and 70% rated voltage, 0.5 s / 10 s / 25 s |
| UPMS9 | 0%, 40% and 70% rated voltage, 0.5 s / 10 s / 25 s |

ACCEPTANCE CRITERIA

| Parameter |
|---|
| No malfunction or damage |
| No malfunction or damage |
| No malfunction or damage |

TEST CONCLUSION

All tested circulator pump models successfully completed the power supply disturbance evaluation.

During the simulated voltage interruptions and voltage drop conditions, the pumps maintained safe operation and recovered normal functionality after restoration of the rated supply voltage. No malfunction, unexpected behavior or permanent damage was observed throughout the test sequence.

The results confirm that the **UPM6, UPM8** and **UPM9** circulator pumps satisfy the specified power supply disturbance requirements under the prescribed laboratory test conditions.

**NO. 14**
**ELECTROMAGNETIC EMISSION TEST**

TEST OBJECTIVE

The purpose of this test is to verify that the electromagnetic emissions generated by the circulator pump during normal operation comply with the applicable electromagnetic compatibility (EMC) requirements.

The test evaluates the levels of conducted interference voltage and interference power produced by the pump to ensure that they do not adversely affect the operation of nearby electrical or electronic equipment.

TEST PROCEDURE

The circulator pump is connected to the rated AC power supply and operated at rated load under standard laboratory conditions.

Electromagnetic emission measurements are performed using calibrated EMC measuring equipment in accordance with the applicable testing requirements of GB4343.1-2003.

The conducted interference voltage and interference power generated by the pump are measured over the specified frequency range and compared with the maximum permissible limits defined by the applicable standard.

Throughout the test, the pump operates continuously under normal operating conditions while all emission values are recorded and evaluated.

TEST RESULTS

| Model | Test Conditions | Measured Parameter |
|---|---|---|
| UPMH6 | GB4343.1-2003 | Conducted Interference Voltage |
| UPMH8 | GB4343.1-2003 | Conducted Interference Voltage |
| UPMS9 | GB4343.1-2003 | Conducted Interference Voltage |

COMPLIANCE

| Parameter |
|---|
| Compliant |
| Compliant |
| Compliant |

TEST CONCLUSION

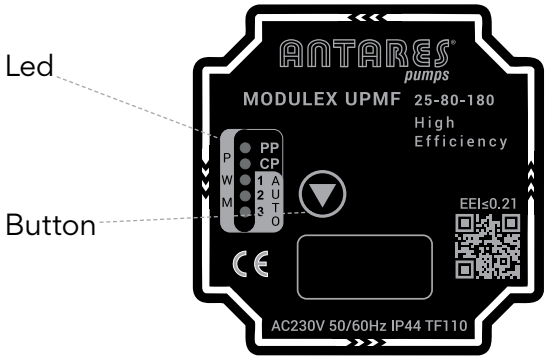
The UPM6, UPM8 and UPM9 circulator pumps successfully passed the electromagnetic emission evaluation.

The measured interference voltage and interference power complied with the requirements specified in GB4343.1-2003, confirming that the pumps operate within the permissible electromagnetic emission limits and do not generate excessive conducted electromagnetic interference during normal operation.

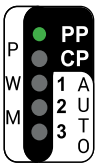
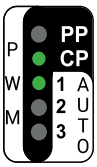
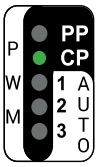
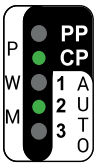
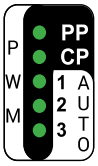
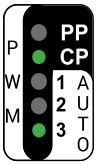
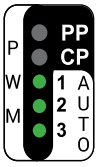
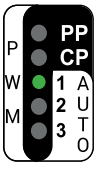
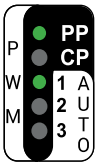
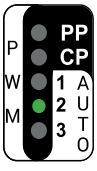
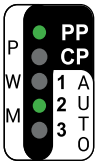
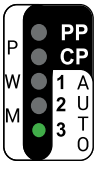
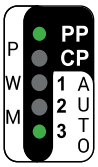
## CONTROL PANEL

The control mode and differential head can be configured.

The pump regulates its speed to maintain the selected differential pressure.
The pump function settings are indicated by the illuminated LED indicators. Press the center button to cycle through the available functions.



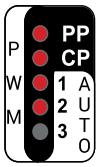
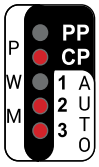
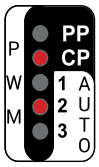
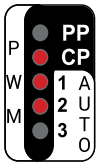
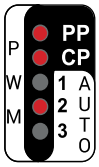
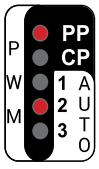
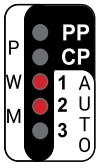

ADJUSTMENT MODE BASED ON THE ILLUMINATED LED INDICATORS.

| Function | Descriptions | Display | Function | Descriptions | Display |
|---|---|---|---|---|---|
| **PWM** | Flashing light: PWM1 mode |  | **CP I** | Constant pressure curve speed I |  |
| | Flashing light: PWM2 mode |  | **CP II** | Constant pressure curve speed II |  |
| | NON-SELECTABLE External speed control |  | **CP III** | Constant pressure curve speed III |  * |
| **AUTO** | Automatic adapt mode |  | **CS I** | Constant curve, speed I |  |
| **PP I** | Proportional pressure curve speed I |  | **CS II** | Constant curve, speed II |  |
| **PP II** | Proportional pressure curve speed II |  | **CS III** | Constant curve, speed III |  |
| **PP III** | Proportional pressure curve speed III |  * | - | - | - |

*: **mode not available** on MODULEX circulators with 6 m head **(P.110.69 - P.110.60 - P.110.68).**

FAILURE MODE CODE DISPLAYS

When the pump is in fault mode, the indicator LED remains steadily lit.

| Fault type | Fault Indicator | Led display | Fault description |
|---|---|---|---|
| **Overcurrent** | LEDs 1, 2, 3 and 4 steady red |  | If the hardware current exceeds 1.8 A, the pump stops immediately and automatically restarts after 10 s. If the fault persists, the pump continuously cycles between start and stop (FG feedback: 90%). |
| **Phase Loss** | LEDs 2, 4 and 5 steady red |  | If phase loss is detected at startup, the pump stops immediately and attempts to restart every 10 s. After 5 restart attempts, if the fault persists, the pump remains blocked (FG feedback: 95%). |
| **Rotor Blocked** | LEDs 2 and 4 steady red |  | If the motor speed remains below 500 rpm for 3 s, the pump stops and attempts to restart every 10 s, up to 5 times. If the fault persists, the pump remains blocked (FG feedback: 95%). |
| **Undervoltage** | LEDs 2, 3 and 4 steady red |  | If the input voltage falls below 140 ±10 V for 2 s, the pump enters undervoltage protection and stops. Operation resumes automatically when the voltage rises above 150 ±10 V (FG feedback: 85%). |
| **Overvoltage** | LEDs 1, 2 and 4 steady red |  | If the input voltage exceeds 280 ±10 V for 2 s, the pump enters overvoltage protection and stops. Operation resumes automatically when the voltage falls below 270 ±10 V (FG feedback: 85%). |
| **Over-temperature** | LEDs 1 and 4 steady red |  | If the IPM module surface temperature exceeds 115 °C ±10%, power is automatically reduced to 50% of the rated value. Normal operation resumes when the IPM temperature falls below 100 °C ±10%. If the condition persists, the pump continues operating in derated mode. |
| **Overheating** | LEDs 3 and 4 steady red |  | If the IPM module surface temperature exceeds 125 °C ±10%, the pump stops. Normal operation resumes when the IPM temperature falls below 100 °C ±10% (FG feedback: 95%). |

**PWM SIGNAL**

CONTROL AND SIGNALS

In PWM control mode, the pump speed is controlled by an external **PWM (Pulse Width Modulation)** signal. The motor speed varies according to the input signal duty cycle.

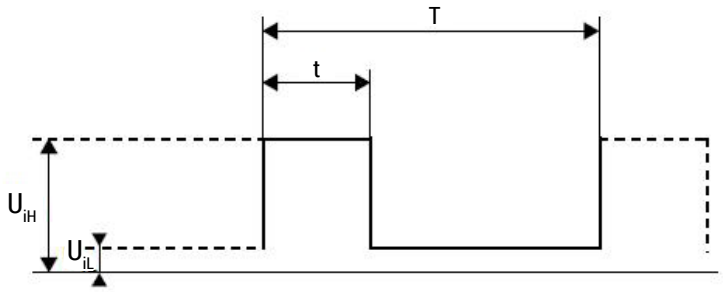
LOW-VOLTAGE PWM SIGNAL

PWM input signal frequency: **100–4000 Hz**
The **PWM IN** signal is used to set the required pump speed by varying the PWM duty cycle.
The **PWM OUT** signal provides pump feedback with a fixed frequency of **75 Hz**.

DUTY CYCLE

d%=100 x t/T

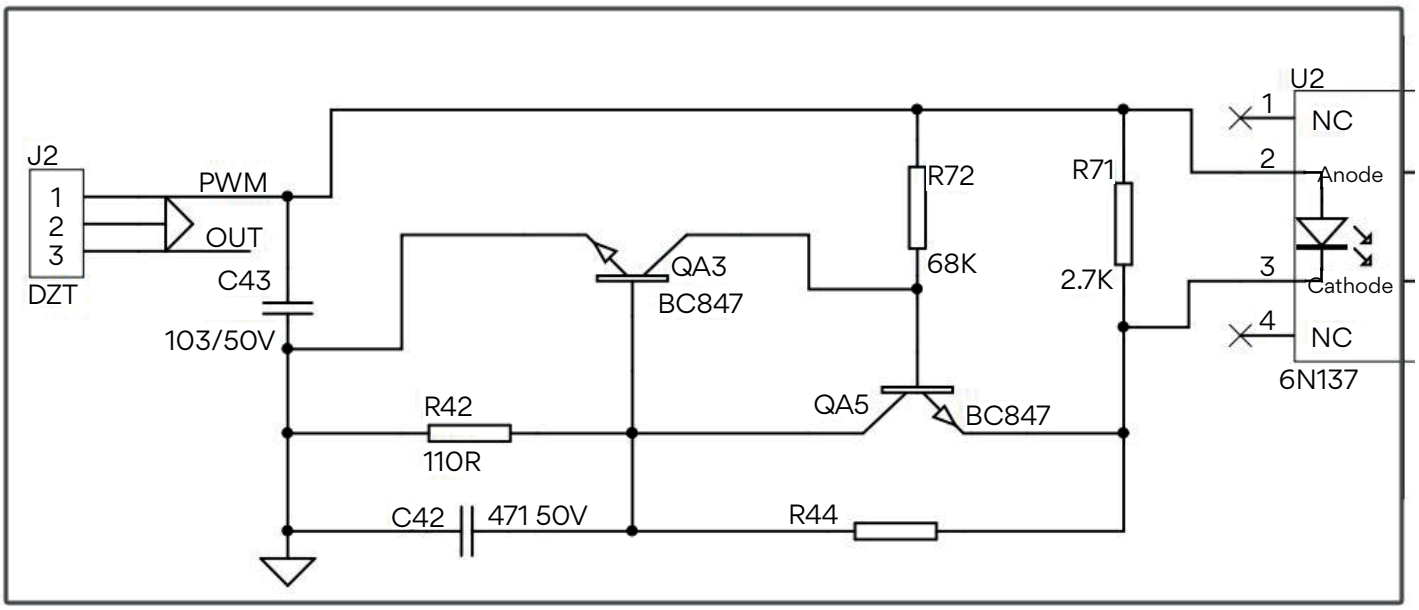
| Example | Rated data |
|---|---|
| T=2 ms (500Hz) | $U_{iH}$= 4-24 V |
| t=0.6 ms | $U_{iL}$≤1V |
| d%=100x0.6/2=30% | $I_{iH}$≤10 mA |




| Abbreviation | Description |
|---|---|
| T | Time cycle |
| d | Duty cycle |
| $U_{iH}$ | High level voltage |
| $U_{iL}$ | Low level voltage |
| $I_{iH}$ | High level input current |

CONTROL AND SIGNALS

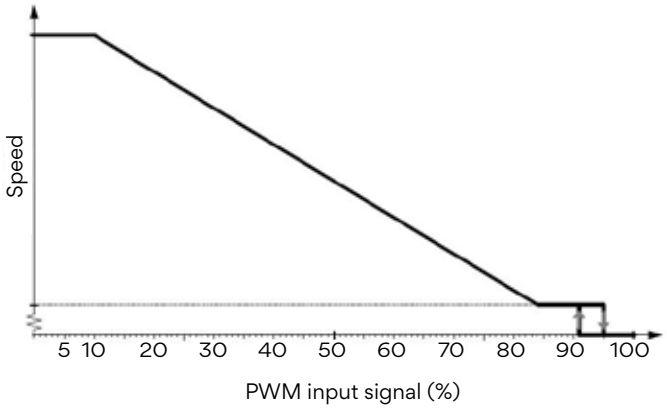
The pump is controlled by external electronic devices via the interface. The interface converts the external control signal into a signal recognized by the pump's microprocessor. In addition, the interface provides electrical isolation from the **220–240 V AC** supply, protecting users from the risk of electric shock when handling the signal wiring.



**PWM1**

At high PWM signal rates (duty cycles), a hysteresis prevents the circulating pump from starting and stoping if the input signal fluctuates around the change point.

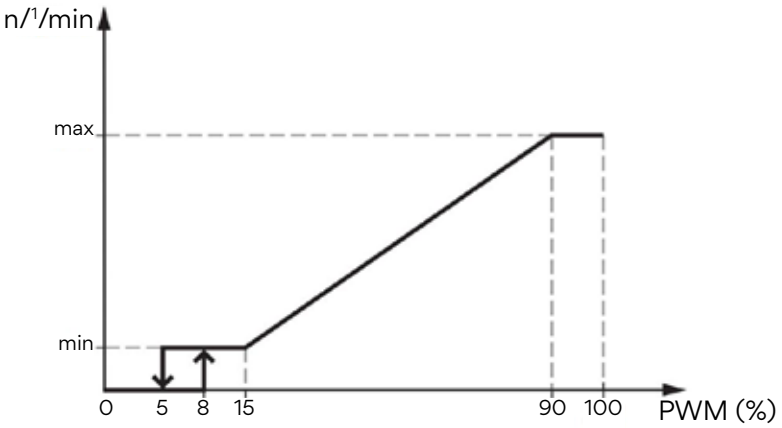
At low PWM signal rates the speed of the circulation pump is high for safety reasons. In the event of cable breakage in a system with a gas boiler, the circulation pump will continue to run at maximum speed to transfer heat from the primary heat exchanger.




| PWM input signal (%) | Pump operating status |
|---|---|
| PWM=0 | Pump switches to non-PWM mode (internal control) |
| 0<PWM≤10 | Max. speed |
| 10<PWM≤84 | Variable speed operation: from maximum to minimum |
| 84<PWM≤91 | Min. speed |
| 91<PWM≤95 | Hysteresis area: on / off |
| 95<PWM≤100 | Standby mode disabled |

**PWM2 INPUT SIGNAL (SOLAR THERMAL SYSTEMS)**

At low PWM signal rates (duty cycles), a hysteresis prevents the circulating pump from starting and stopping if the input signal fluctuates around the change point. Without PWM signal rates, the circulating pump will stop due to safety reasons. If a signal is missing, e.g. in the event of cable breakage, the circulator will stop to avoid over-heating.

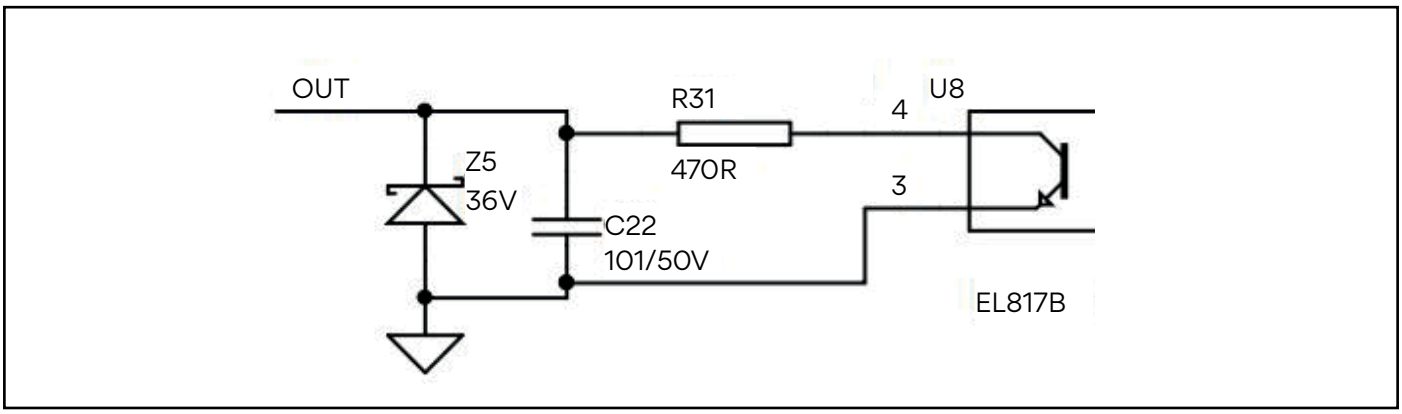


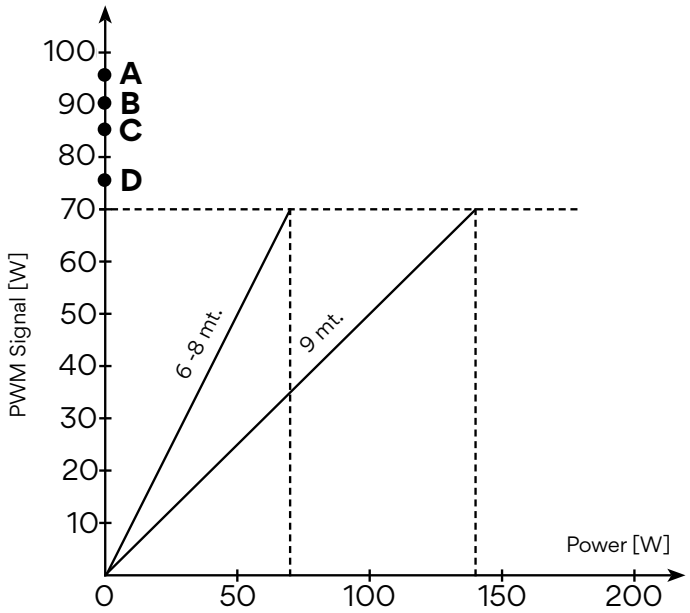

| PWM input signal (%) | Pump status |
|---|---|
| 0 | Stop |
| 0<PWM≤5 | Standby mode: off |
| 5<PWM≤8 | Hysteresis area: on / off |
| 8<PWM≤15 | Min. Speed: initial phase |
| 15<PWM≤90 | Adjustable speed: from min to max |
| 90<PWM≤100 | Max. speed |

PWM FEEDBACK SIGNAL ENERGY CONSUMPTION

The PWM feedback signal provides information on the pump operating status, including power input, flow feedback, and alarm/warning conditions.

During an alarm condition, the PWM output signal indicates the corresponding fault status. For example, if an undervoltage condition is detected, the PWM output duty cycle is set to **85%**. If the rotor is blocked, for example due to impurities in the hydraulic system, the PWM output duty cycle is set to **95%**.



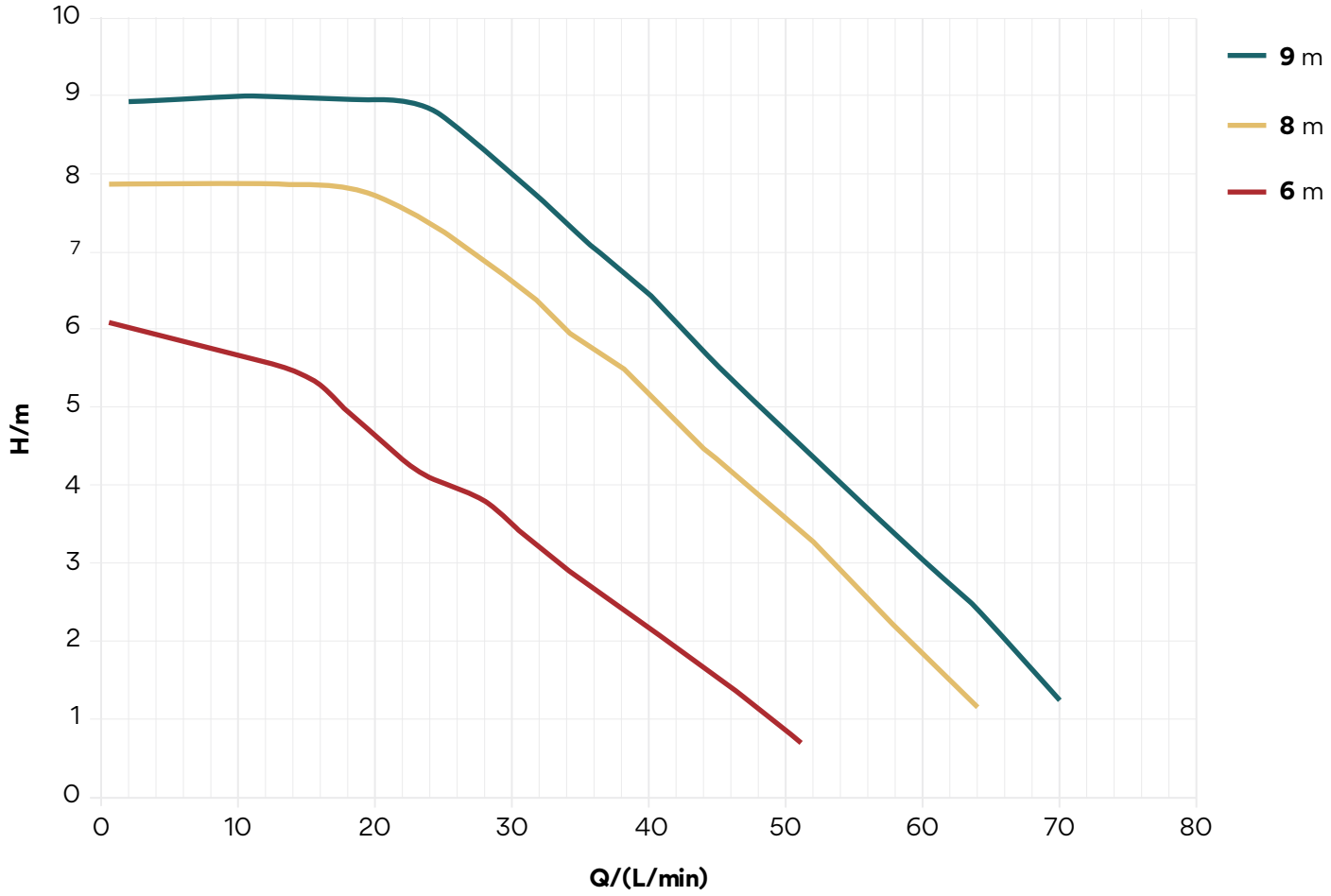

| PWM signal (%) output | Position on the graph | Pump info |
|---|---|---|
| 95 | **A** | Stand-by (like PWM STOP signal) |
| 90 | **B** | Alarm, stop, block error (blocked rotor, lack of water, stop) |
| 85 | **C** | Alarm, stop, electrical error (lack of power/overload, stop) |
| 75 | **D** | Warning (power surge, stop) |
| 0 - 70 | | Feedback absorbed power |
| Output frequency | | 75Hz+/-5% |

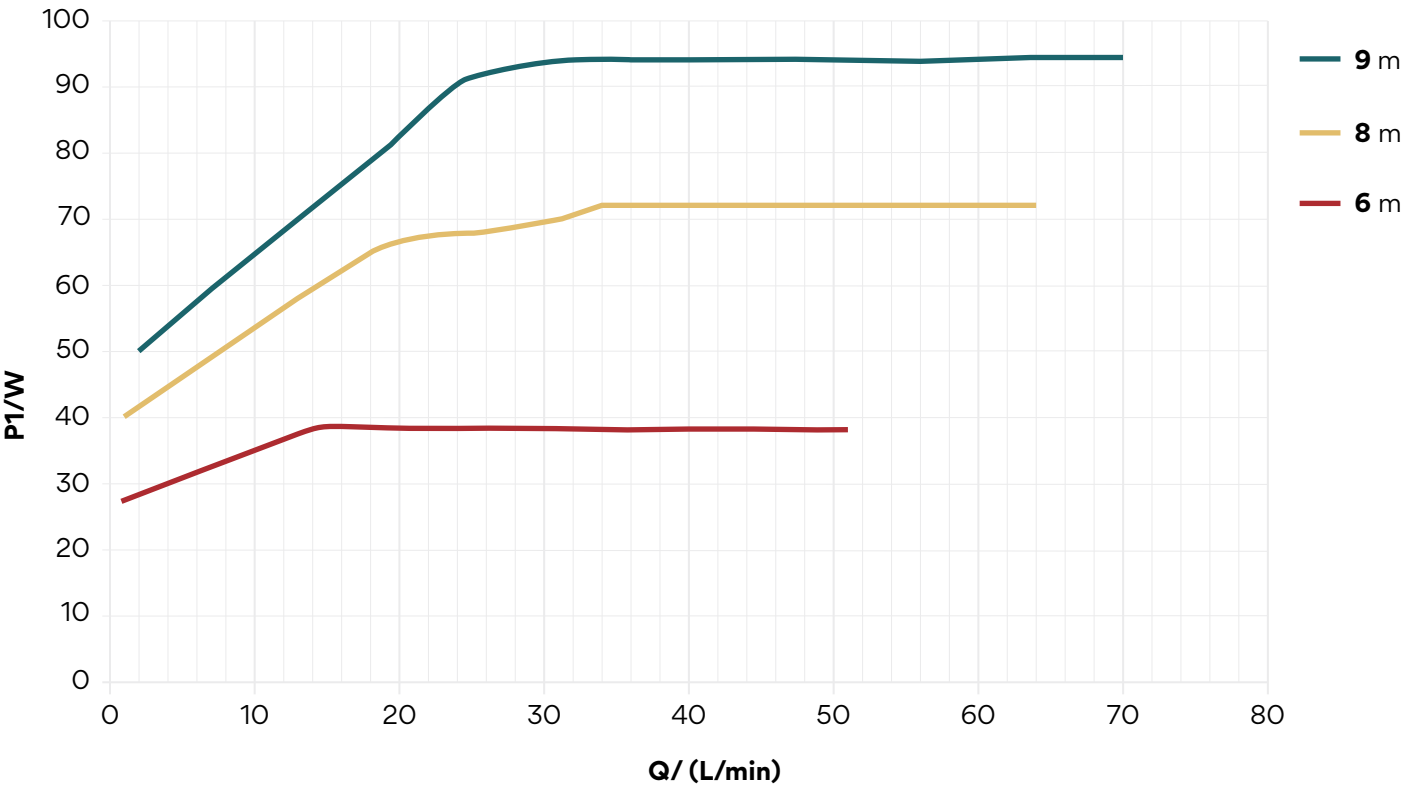
USE OF THE FEEDBACK SIGNAL:

This signal can be used to estimate the pump flow rate. It can also be used to determine the actual operating point of the system and to compare the set speed with the actual pump feedback signal.

## REAL PERFORMANCE CURVE (CS3)

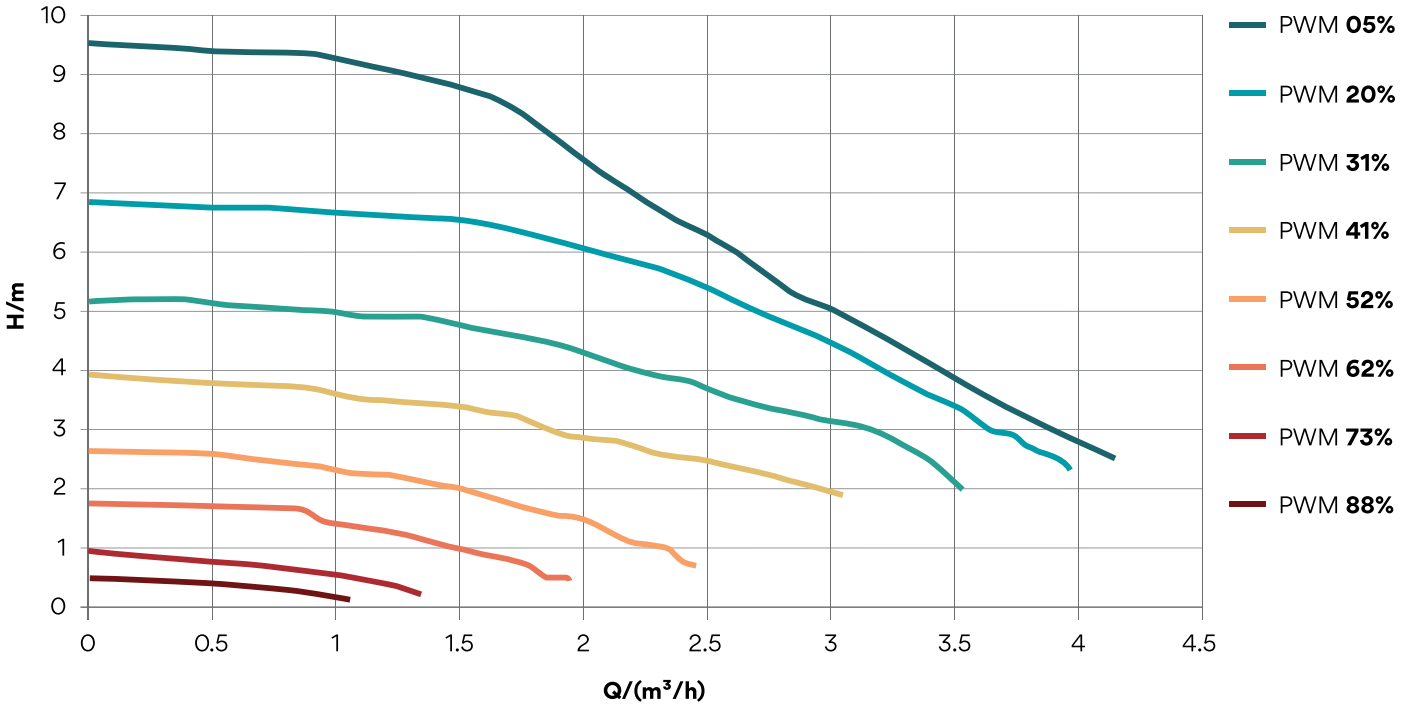
The performance curves below show the hydraulic characteristics of the pump under different operating conditions. The curves are based on tests performed with clean water at room temperature.

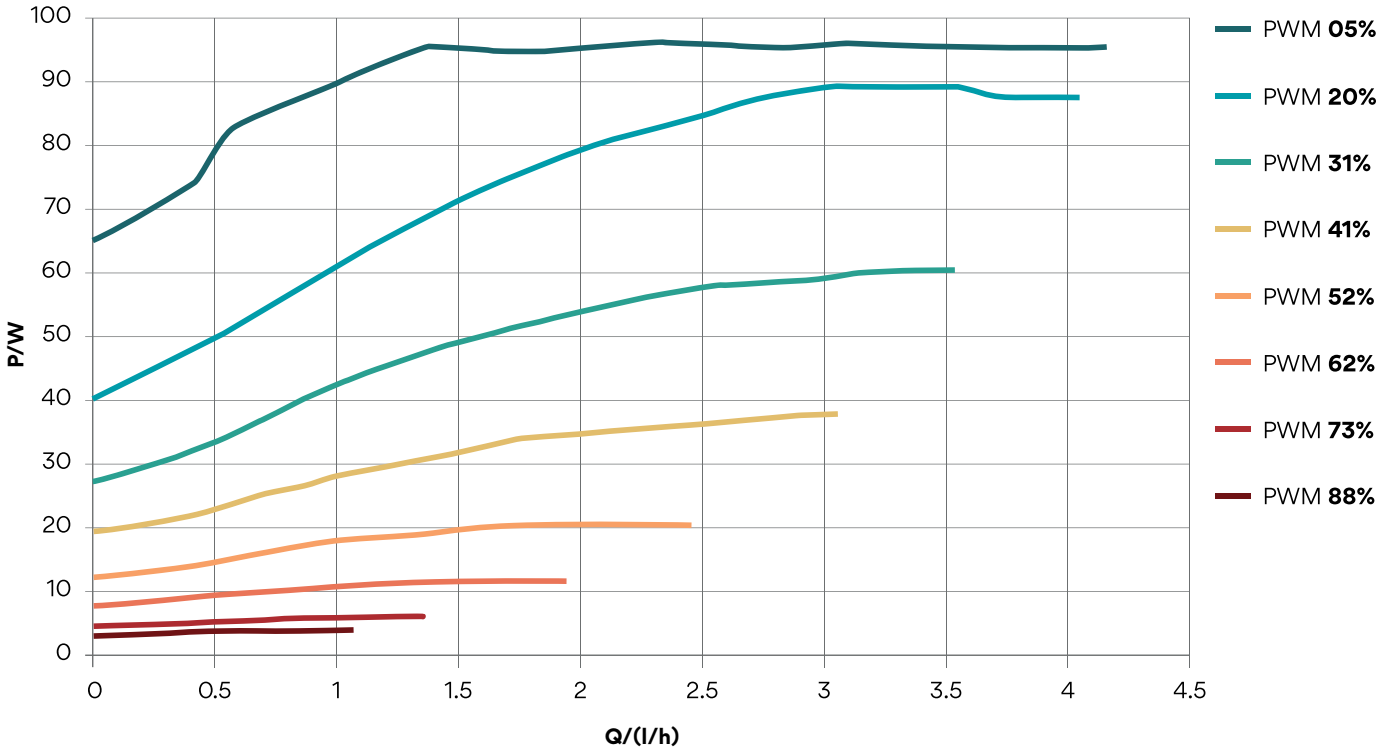


## REAL PWM PERFORMANCE CURVE (CS3)

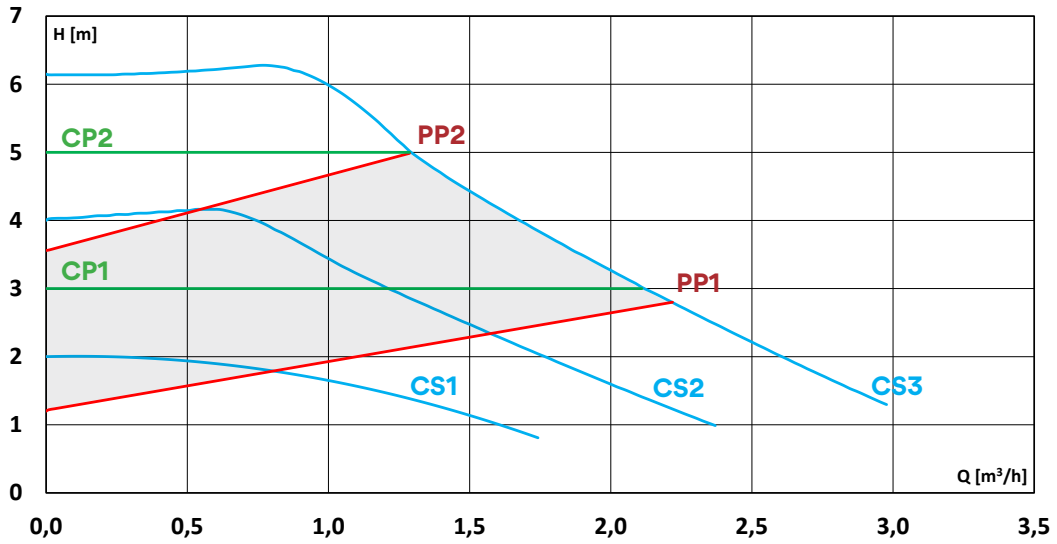
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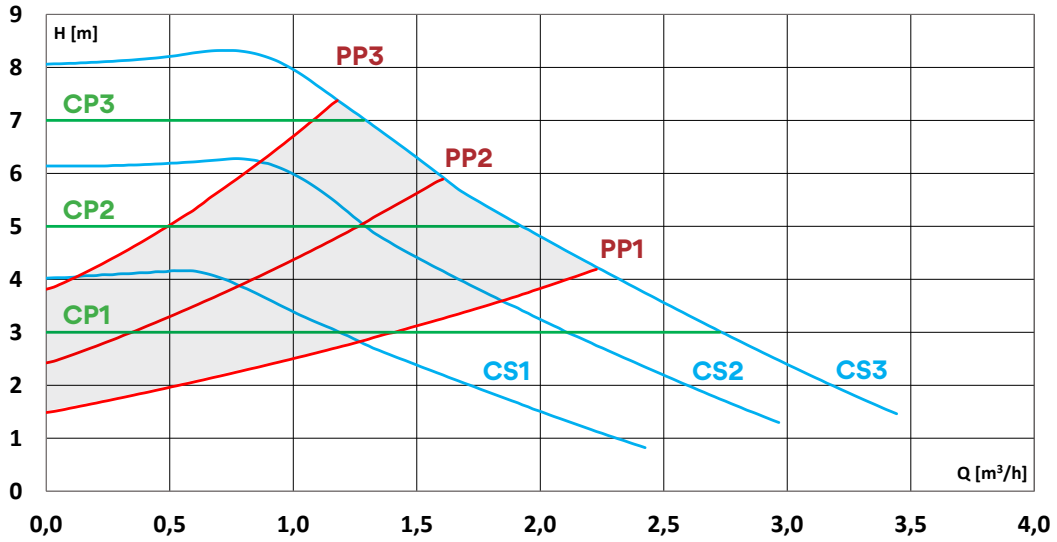



## THEORETICAL PERFORMANCE CURVES

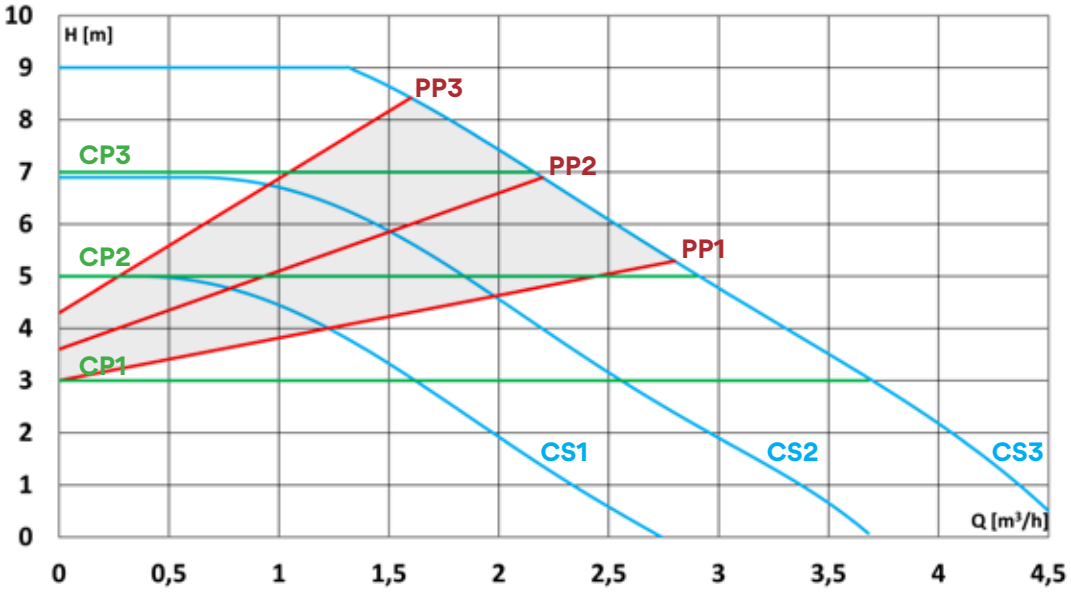
**PP** = Proportional Pressure
**CP** = Constant Pressure
**CS** = Constant Speed
**AUTO** = Self Adapt – Automatic Control




Modulex UPM
**6 m**

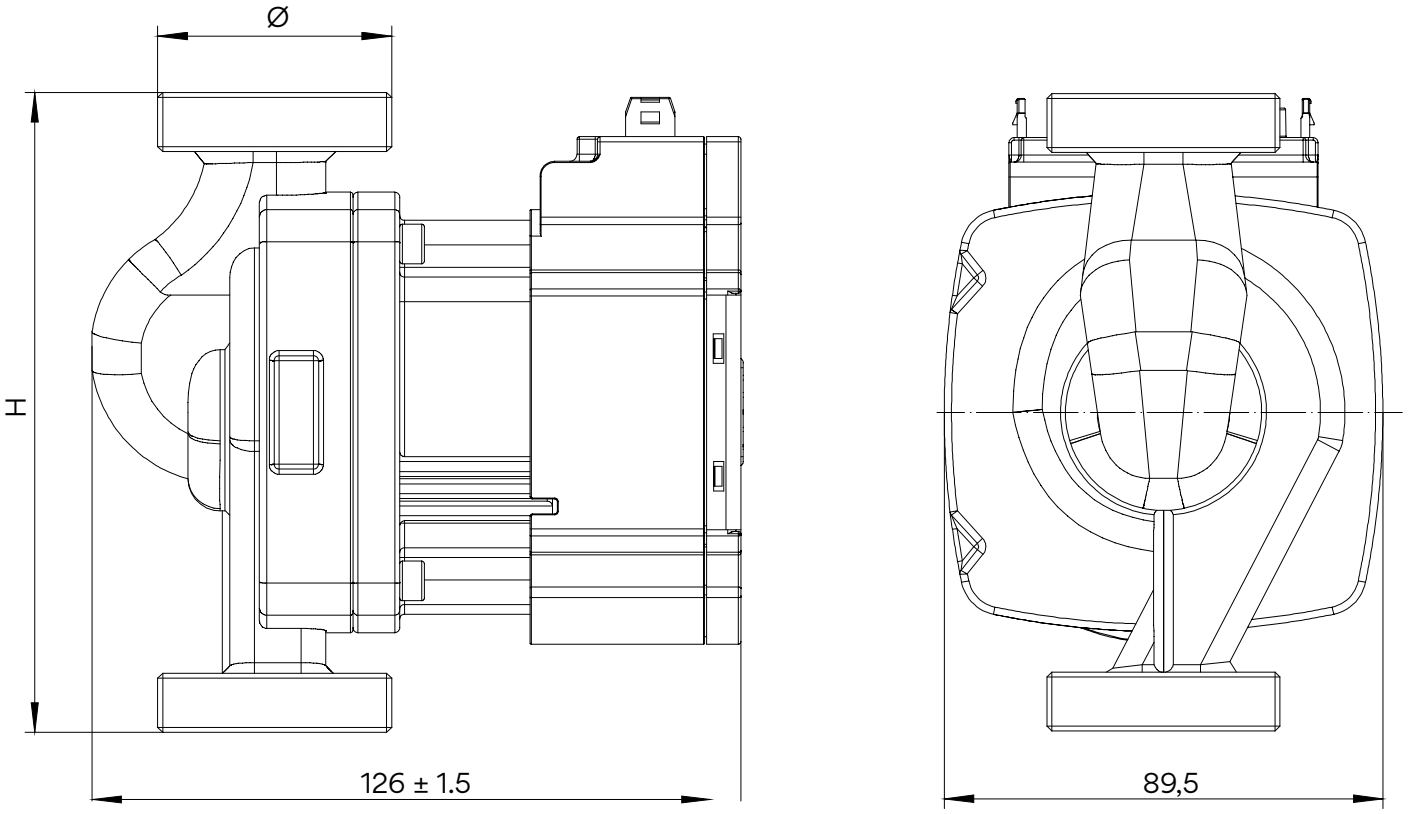



Modulex UPM
**8 m**

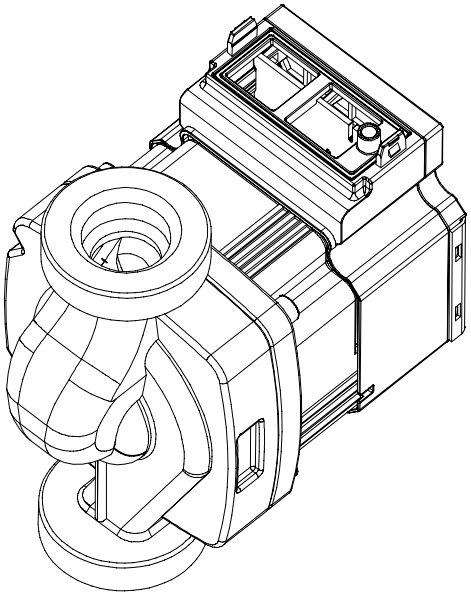



Modulex UPMS
**9 m**

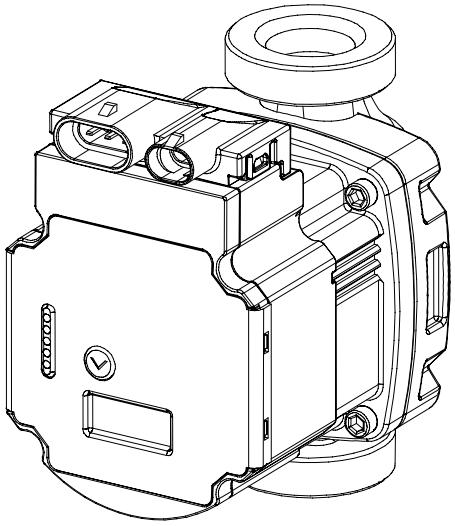
**PUMP DIMENSIONS**



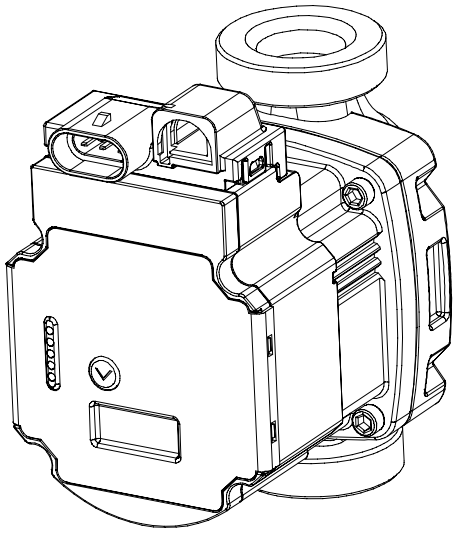

| Art. code | Name | Max. head m | H mm | Ø |
|---|---|---|---|---|
| P.110.69 | UPMH 15-60-130 | 6 | 130 | 1" M. |
| P.110.60 | UPMH 25-60-130 | 6 | 130 | 1 1/2" M. |
| P.110.68 | UPMH 25-60-180 | 6 | 180 | 1 1/2" M. |
| P.110.89 | UPMH 15-80-130 | 8 | 130 | 1" M. |
| P.110.84 | UPMH 20-80-130 | 8 | 130 | 1 1/4" M. |
| P.110.80 | UPMH 25-80-130 | 8 | 130 | 1 1/2" M. |
| P.110.88 | UPMH 25-80-180 | 8 | 180 | 1 1/2" M. |
| P.110.82 | UPMH 32-80-180 | 8 | 180 | 2" M. |
| P.112.89 | UPMF 15-80-130 | 8 | 130 | 1" M. |
| P.112.80 | UPMF 25-80-130 | 8 | 130 | 1 1/2" M. |
| P.112.88 | UPMF 25-80-180 | 8 | 180 | 1 1/2" M. |
| P.023.89 | UPMS 15-80-130 | 8 | 130 | 1" M. |
| P.023.80 | UPMS 25-80-130 | 8 | 130 | 1 1/2" M. |
| P.023.99 | UPMS 15-90-130 | 9 | 130 | 1" M. |
| P.023.90 | UPMS 25-90-130 | 9 | 130 | 1 1/2" M. |
| P.023.98 | UPMS 25-90-180 | 9 | 180 | 1 1/2" M. |



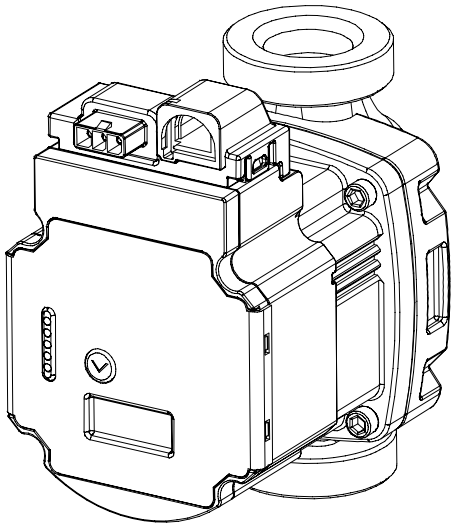
WILO INT STYLE



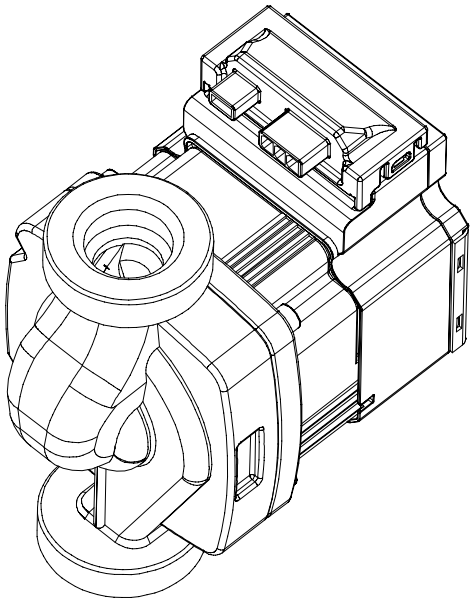
GRUNDFOS STANDARD



GRUNDFOS FCI



WILO STANDARD



COMMON STYLE