# Part Specification

BDR THERMEA GROUP

| Title | Item Number | Revision |
|---|---|---|
| Pump UPML 25-105 PWM | 7724382 | 02 |

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| Revision | Change Description | Refers To |
|---|---|---|
| 01 | Initial document, based on PSP-7605809-04 and MR 6631. Pump head changed. | |
| 02 | Agreed deviations added. Exact description of change in pump compared to previous described in Grundfos “ECD” document dates 18th april 2018. At BDR this ECD document can be found in PSP revision “References” folder. | |
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CHECK REVISION AND STATUS BEFORE USE

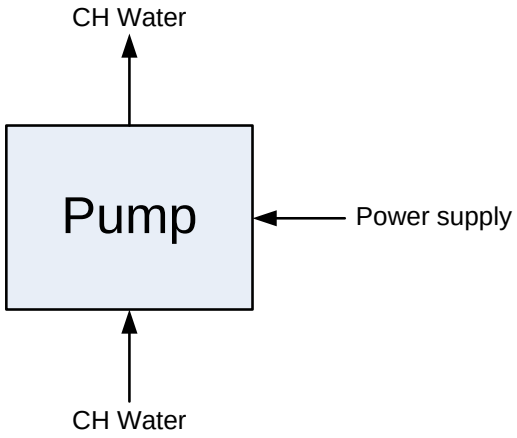
# 1 Part services and summary

## 1.1 Purpose

The purpose of this document is to describe the operational requirements that the part has to fulfil and the environments the part is exposed to. The document is created at the birth of part and maintained through the whole life cycle of the part.

## 1.2 Scope

The product will be applied in a gas condensing wall-hung boiler up to 110 kW (Hi). It takes care of the circulation of central heating (CH) water. When the boiler is in “Domestic Hot Water (DHW) operation, the pump circulates the water through a heat exchanger or external boiler for DHW.




## 1.3 Acronyms, Abbreviations and Definitions

Explanation of all acronyms, abbreviations and definitions used is this document are stated here:

| Acronym or abbreviation | Description |
|---|---|
| PWM | Pulse Width Modulation |
| $H_i$ | Net Caloric value (inferior) |
| RH | Relative Humidity |
| mbar(a) | Absolute pressure |
| $L_{WA}$ | Sound power level |
| DAF | Dry and Air Free |
| $l_n$ | Normal litres (@$p_{atm}$ = 1013 hPa and T = 288 K) |
| $m^3_{st}$ | Standard cubic meter (@$p_{atm}$ = 1013 hPa and T = 273 K) |

| Definition | Description | Agreed deviation |
|---|---|---|
| Environment | Surrounding of the specified part. | |
| Gas | • The gas input can vary within the complete 2nd and 3rd gas family according to EN437 in all European countries including UK, with the knowledge that UK gas contains additives like MEG, DEG and TEG (Mono-, Di- and Tri-Ethylene Glycol). See G.I.S.E6:2006 (Gas Industry Standard)<br>• Gas according to Dutch NTA 8837.<br>• The gas can contain particles ≤ 50 µm. | |
| Air | • With a pollution degree of 3 as defined in EN 60664.<br>• Particulate matter with size 10 micron in diameter (PM10) 50 µg/$m^3$ max.<br>• Other air quality aspects according to directive 2008/50/EG. | |
| Gas air mixture | • A mixture of air and gas in the ratio λ (lambda).<br>• λ = 1.0 means that there is exactly enough air for complete combustion of the gas (stoichiometric combustion).<br>• λ = 1.5 means that there is 50% more air than necessary for the combustion. | |
| Flue gas | Flue gas formed during the combustion of the gas air mixture. Flue gas can contain the following components:<br>• $O_2$<br>• $CO_2$<br>• CO<br>• $NO_x$<br>• $N_2$<br>• $H_2O$<br>• $C_xH_y$<br>• Cl<br>• $SO_2$ | |
| Condensate | • Fluid formed during the condensation of flue gas.<br>• Concentration of the components in the condensate is dependent on the gas type used, | |

| | | |
|---|---|---|
| | flue gas situation, etc., so the concentration data can only be regarded as indicative.<br>• The pH value of the condensate is ≥ 1.<br>• Due to the combustion, concentrations can occur like listed below:<br>o $SO_4^{2-}$ ≤ 152 mg/l<br>o $NO_3^-$ ≤ 424 mg/l<br>o $NO_2^-$ ≤ 0.6 mg/l<br>• Due to aluminium heat exchanger and chimney systems, concentrations can occur like listed below:<br>o Aluminium ≤ 70 mg/l<br>o Cadmium ≤ 1 µg/l<br>o Chrome ≤ 250 µg/l<br>o Copper ≤ 160 µg/l<br>o Lead ≤ 10 µg/l<br>o Nickel ≤ 60 µg/l<br>o Iron ≤ 3.1 mg/l<br>o Tin (Sn) ≤ 150 µg/l<br>o Zinc ≤ 3.3 mg/l | |
| System water | From clear mains water to water polluted with chemical compounds, bacteria, and particles from 0.1-22mm (e.g. building materials, installation materials and flakes of magnetite, flux and scale).<br>System water can contain the following components:<br>• Magnetite ≤ 5g/l<br>• Flux ≤ 2,5 g/l<br>• Chloride ≤ 100 ppm<br>• Calcium ≤ 125 ppm<br>• Sodium ≤ 20 ppm<br>• Potassium ≤ 10 ppm<br>• Magnesium ≤ 10 ppm<br>• Aluminium ≤ 5 ppm<br>• Iron ≤ 100 ppm<br>• Copper ≤ 2 ppm<br>• Zinc ≤ 5 ppm<br>• Boron ≤ 2 ppm<br>• Phosphorous ≤ 80 ppm<br>• Nitrate ≤ 25 ppm<br>• Sulphate ≤ 50 ppm<br>• Phosphate ≤ 5 ppm<br>• Silica ≤ 10 ppm | |

| | | |
|---|---|---|
| | • Ammonium ≤ 1 ppm<br>The conductivity will be less than 900 µS/cm @ 20°C. | |
| Domestic water | Domestic water for human consumption according Directive 98/83/EC and the WHO Guidelines for Drinking-water quality, 2011.<br>• Hardness: 1 - 36°dH (German hardness)<br>• pH: 6.5 - 9.5<br>• Chloride: 0 - 250 mg/l<br>• Chlorine: 0 - 5 mg/l | |

## 1.4 References

The following table summarizes the documents referenced in this document:

| Document Name and Version | Description | Location |
|---|---|---|
| 7210269/06 | Part Specification Governance: Instruction how to use the Part Specification template | BDR data centre |

## 1.5 Part Perspectives

This pump replaces the previous Grundfos UPML 25-105 130 PWM (7605809) currently in use in the Quinta 85 and Quinta 110 (among others).

# 2 Operational requirements

## 2.1 Input requirements

### 2.1.1 Operational media

| Description | Requirement | Agreed deviation |
|---|---|---|
| 2.1. Air | See §1.3 for definition | |
| 2.2. Gas | See §1.3 for definition | |

### 2.1.2 Conditions of the media

| Description | Requirement | Agreed deviation |
|---|---|---|
| 2.3. Pressure | Normal medium pressures:<br>0 – 3 bar relative pressure<br><br>Extreme medium pressures:<br>1,5 – 4 bar relative pressure<br><br>Maximum short term conditions:<br>1,5 – 4 bar relative pressure | |
| 2.4. Temperature | According time/temperature profile in figure 2.1.<br><br>• Normal medium temperatures: 0 – 82,5°C<br>• Extreme medium temperatures: 82,5 – 95°C<br>• Maximum short term conditions: >95°C | |
| 2.5. Hardness | 1 – 36°dH (Germany hardness)<br>Above 15°dH water treatment could be applied. | |
| 2.6. pH | 5 - 11 | 5 - 10 |

| | | |
|---|---|---|
| 2.7. Additives | Additives and inhibitors are used according to the manufacturer's manual<br><br>Regular additives and inhibitors used in heating systems in Europe and Northern America, including:<br>• Water with a maximum of 40% of glycol<br>• Fernox additive and inhibitor ranges<br>• GE Sentinel additive and inhibitor ranges | |
| 2.8. Cleansing materials | Applicable cleansing materials for CH systems are used according to the manufacturer's manual<br><br>Regular cleansing materials used in heating systems in Eruope and Northern America include:<br>• Fernox ranges of cleansing materials<br>• GE Sentinel ranges of cleansing materials | |

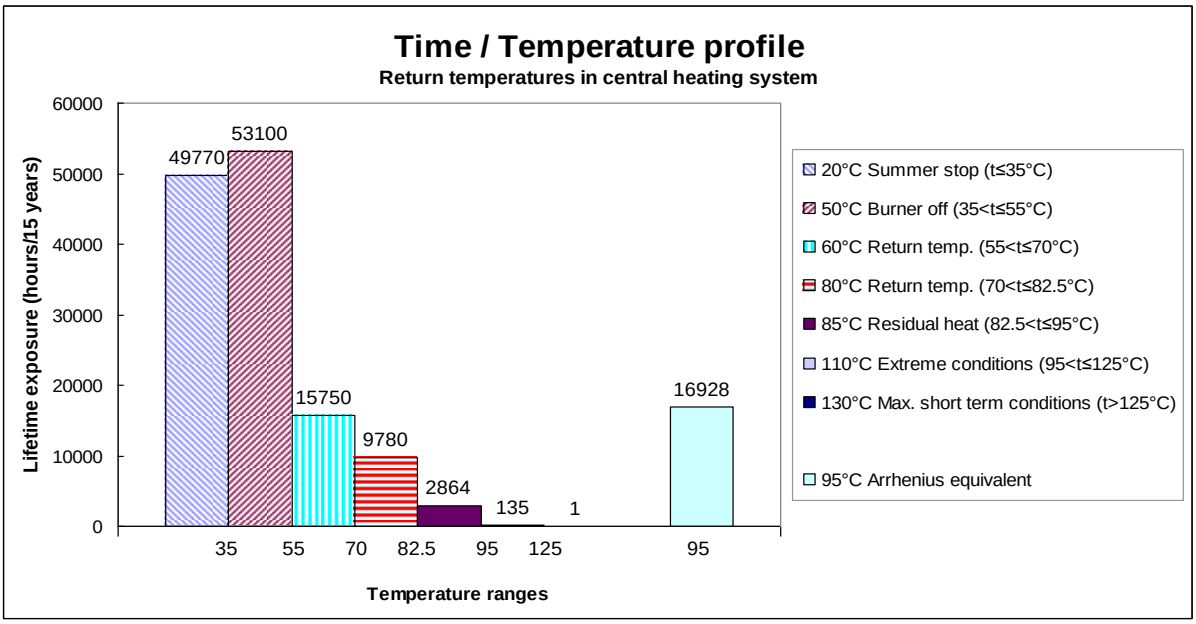



*Figure 2.1: Time/temperature profile*

### 2.1.3 Functional

| Description | Requirement | Agreed deviation |
|---|---|---|
| 2.9. Maxiumum running dry time | Minimal 3 x 20 seconds during lifetime for new pumps, bearings greased with glycerin<br><br>Minimal 1 x 10 minute during lifetime with water in rotor room | |
| 2.10. Leakage | Pump has to be watertight for the lifetime | |
| 2.11. Test pressure | 2.0 bar relative pressure with air<br>Leakage ≤ $20 \cdot 10^{-9}$ $m_n^3/s$ | 40 $mm^3/s$ @ 2,0 bar relative pressure with air |
| 2.12. Capacity of the pump | Head at 0,0 $m^3/h$: min 10,1 m $H_2O$<br>Head at 4,6 $m^3/h$: min 4,1 m $H_2O$<br>Head at 3,6 $m^3/h$: min 3,0 m $H_2O$<br>Manufacturer QH chart in figure 2.2 | |

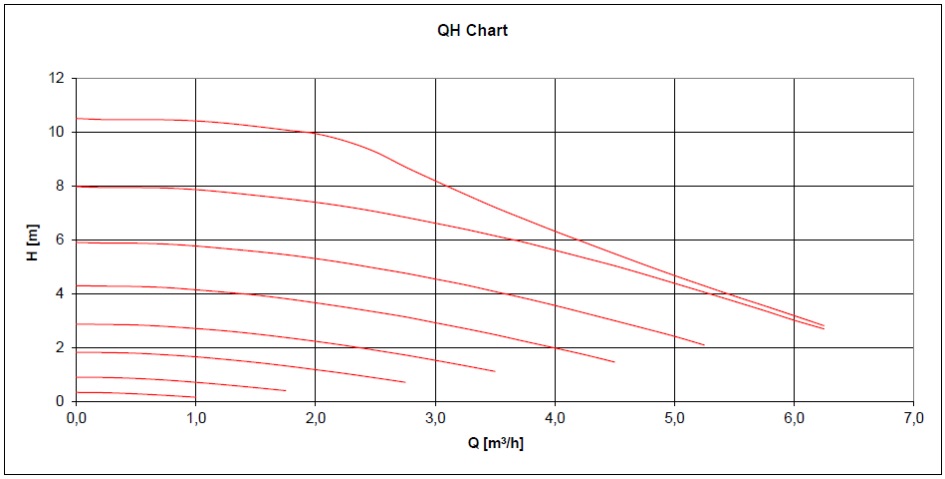



*Figure 2.2: QH chart*

| | | |
|---|---|---|
| 2.13. Jamming | Pump does not jam in production and after installation of the boiler | |
| 2.14. Rotor | Rotor may not rub the anchor, causing unacceptable noise | |
| 2.15. IP-class | IP X4D | IPX2D |
| 2.16. Sound power levels | Max A-weighted sound power levels ($L_{w(A)}$) are ≤40 db(A) over the whole working range of the pump.<br>No annoying sound from the electronic parts allowed. | |
| 2.17. Lifetime | ≥ 15 years according to the time / temperature profile in figure 2.1<br><br>≥ 16.000 h at 95°C medium temperature | |

### 2.1.4 Electrical

| Description | Requirement | Agreed deviation |
|---|---|---|
| 2.18. Power of the pump | Manufacturer power chart in figure 2.3 | |
| 2.19. Efficiency | Manufacturer efficiency chart in figure 2.4 | |

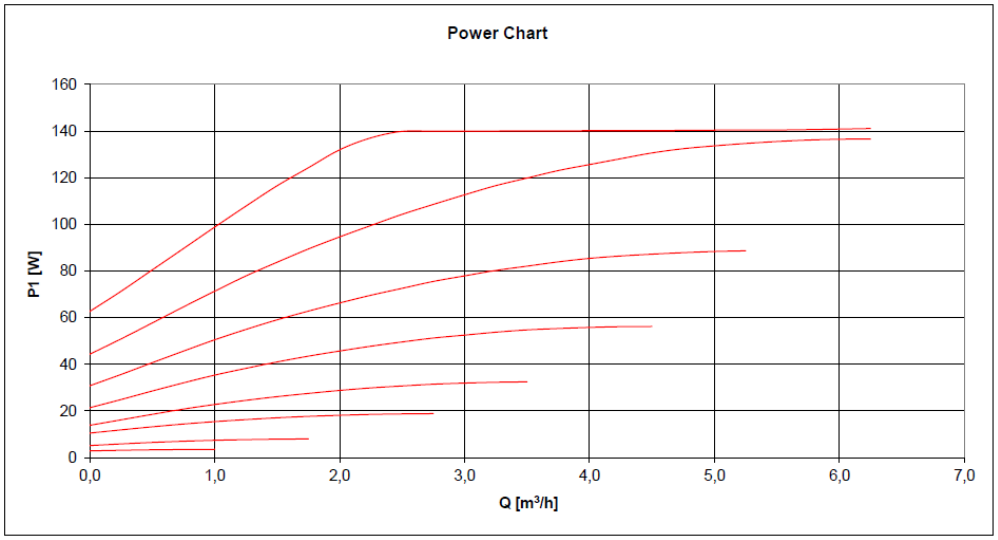



*Figure 2.3: Power chart*

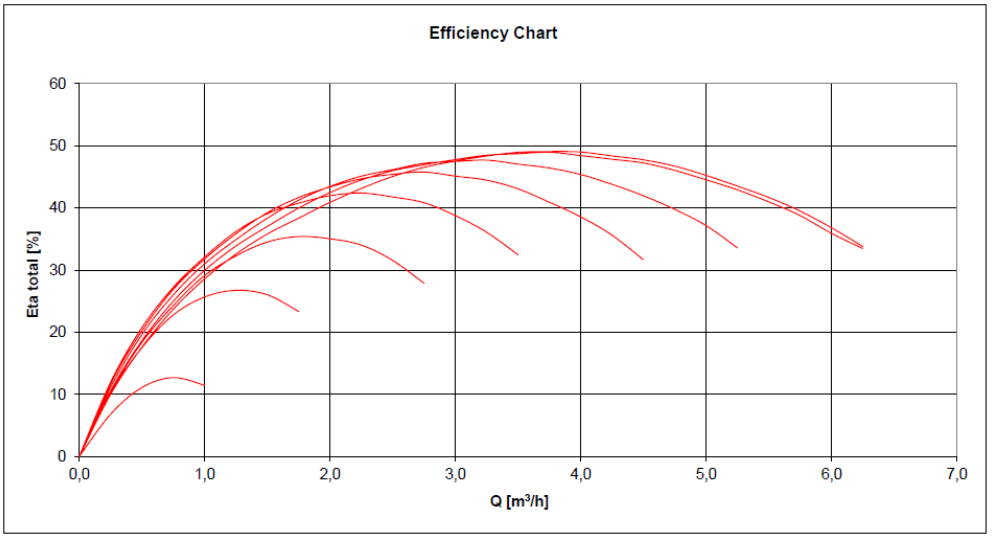



*Figure 2.4: Efficiency chart*

| | | |
|---|---|---|
| 2.20. Energy efficiency index (EEI) | The required EEI is ≤0,23 (ref. EN 641/2009 – annex I, chapter 1, sub 2) | |
| 2.21. Inrush current | Maximum inrush current is 25 A | See Grundfos "ECD" document dated 18th April 2018. At BDR this document can be found in PSP revision "References" folder for test method and outcome. |
| 2.22. Electrical insulation | According Low Voltage Directive (2006/95/EEC) | |
| 2.23. Power supply | 230 VAC (+10% / -15%)<br>50 Hz (±2 Hz) | |
| 2.24. Pump response at PWM step & Power On | Target reached at power ON: max 3,3 sec<br>Target reached at speed change: max 1,0 sec | |
| 2.25. Pump speed control | Pump will be driven by/must be compatible with: PWM Open collector output with 2k2 series resistor, frequency=100-4000Hz, supply voltage 4-24V (max peak=36V)<br>See Appendix A | |

# 3 Environments

## 3.1 Operation environments

The part is exposed to the following operational environments:

| Description | Requirement | Agreed deviation |
|---|---|---|
| 3.1. Temperature of surrounding | 0 – 70°C | 0 – 55°C |
| 3.2. Humidity of surrounding | 0 – 95%, excluding condensation | |

## 3.2 Transport and storage environments

The part is exposed to the following transport and storage environments:

| Description | Requirement | Agreed deviation |
|---|---|---|
| 3.3. Temperature of surrounding | -20 – +60°C without water inside the pump | |
| 3.4. Humidity of surrounding | 0 – 95%, excluding short term condensation during ambient temperature changes | |

# 4 Standards Compliance

## 4.1 General

This section contains a summary of all standards with which the part must comply. Each standard is listed as a specific requirement.

## 4.2 Standards

The part shall comply with directives and normative references below. If no revision is mentioned the latest revision applies. However, this document can refer to a specific revision.

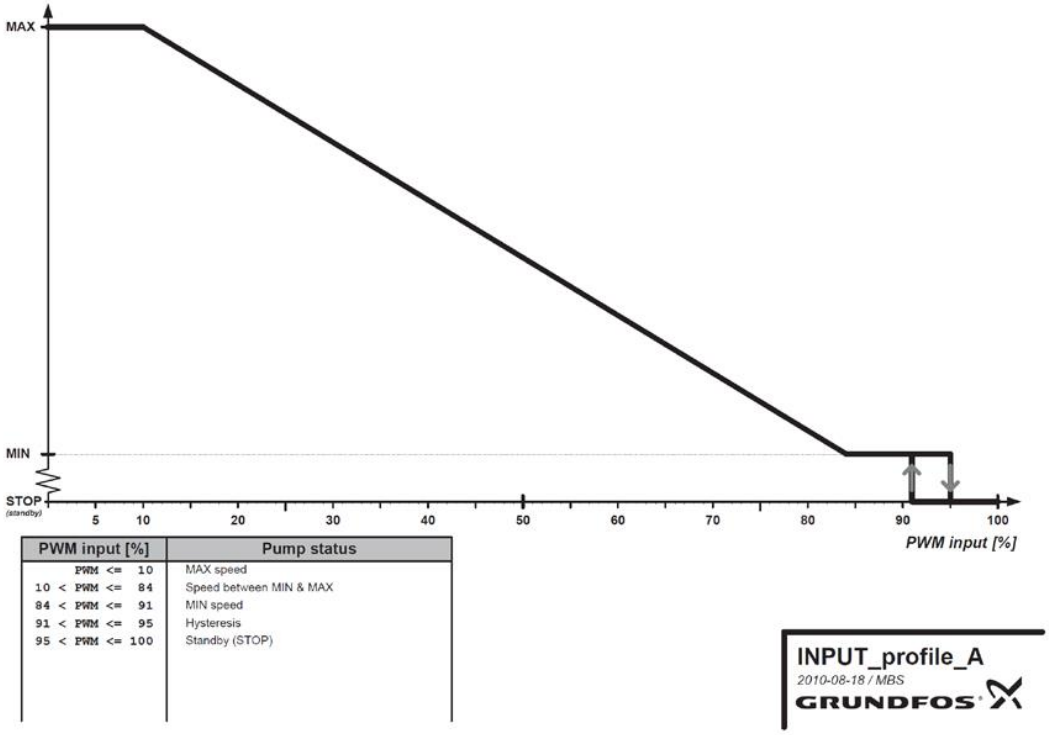
| Directive | Description |
|---|---|
| 1907/06/EC | **R**egistration, **E**valuation, **A**uthorisation and Restriction of **Ch**emicals (REACH) |
| 2008/50/EG | New air quality directive |
| 2011/65/EU | **R**estriction of the use **o**f certain **H**azardous **S**ubstances in electrical and electronic equipment (RoHS) |
| 2012/19/EU | **W**aste **E**lectrical and **E**lectronic **E**quipment (WEEE) |
| 2014/30/EU | **Electro Magnetic Compatibility Directive (EMC)** |
| 2014/35/EU | **Low Voltage Directive (LVD)** |
| 98/83/EC | Drinking Water Directive |
| Regulation (EU) 2016/426 | **G**as **A**ppliance **R**egulation (GAR) |
| 2009/125/EC | EuP/ErP Regulation for standalone/integrated circulators produced and sold in the EU. |
| 2009/641/EC | Ecodesign requirements for glandless standalone circulators and…etc |

| Normative references | Description |
|---|---|
| EN 15502-1:2012+A1:2015 | Gas-fired heating boilers - Part 1: General requirements and tests |
| EN 15502-2-1:2012+A1:2016 | Gas-fired central heating boilers - Part 2-1: Specific standard for type C appliances and type B2, B3 and B5 appliances of a nominal heat input not exceeding 1000 kW |
| ISO 3743, 4871 and 9614 | Acoustics |
| EN 55014 | EMC capabilities, 55014-1: emissions, 55014-2: immunity |
| EN50165 | Electrical equipment of non-electric heating appliances |
| EN60335-1 | Degrees of protection provided by enclosures |
| EN60335-2-51 | Electrical safety |

*In case of conflicting references, the latest version applies*

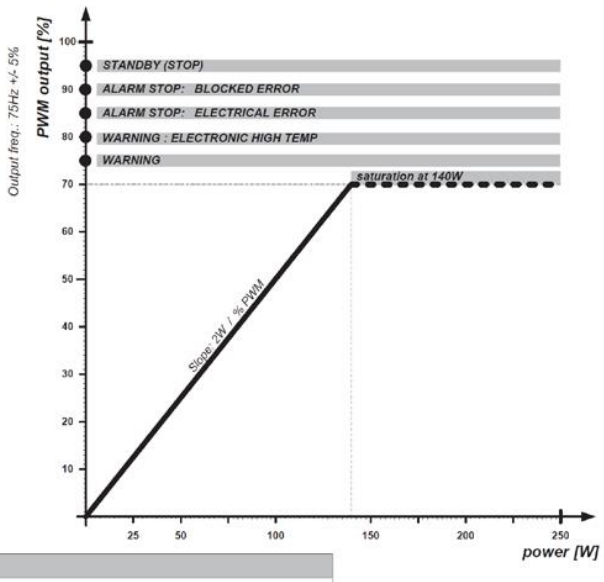
# 5 Appendices

## 5.1 Appendix A




| PWM input [%] | Pump status |
|---|---|
| PWM <= 10 | MAX speed |
| 10 < PWM <= 84 | Speed between MIN & MAX |
| 84 < PWM <= 91 | MIN speed |
| 91 < PWM <= 95 | Hysteresis |
| 95 < PWM <= 100 | Standby (STOP) |

INPUT_profile_A
2010-08-18 / MBS
GRUNDFOS




| PWM output [%] | Pump info | Prio. |
|---|---|---|
| 95 | if "PWM_in == Standby (STOP)" | 1 |
| 90 | ALARM_STOP: BLOCKED ERROR | 2 |
| 85 | ALARM_STOP: ELECTRICAL ERROR | 3 |
| 80 | WARNING : ELECTRONIC HIGH TEMP | 4 |
| 75 | WARNING | 5 |
| 0-70 | 0-140W (slope 2W / % PWM) | 6 |

**Comments**

Prio. 1, e.g. used as identification

Prio. 2, ALARM_STOP: BLOCKED ERROR: **The pump is not running**, but start again when the error disappear

Prio. 3, ALARM_STOP: ELECTRICAL ERROR: **The pump is not running**, but start again when the error disappear
e.g. undervoltage: voltage below ~120V ⇨ pump stopped (run again when voltage increase to ~130V)

Prio. 4, WARNING : ELECTRONIC HIGH TEMP : **The pump is running**

Prio. 5, WARNING: **The pump is running**,
In this case, an error has been detected but the error is not crucial and the pump is still able to pump, e.g. voltage below ~195V

OUTPUT_profile_12
2012-09-13 / OLY
GRUNDFOS