



Building Services 2 – Integration: Assignment 1

M&E Design and Appraisal for HT 641

Module Code: ACBA5017

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Introduction:

This report aims to provide a comprehensive mechanical and electrical design specification for a social housing new-build domestic dwelling in Wales. The primary objective of this design is to integrate essential building services whilst complying with current UK and Welsh Building Regulations.

Purpose and Scope

The focus of this report is to design and evaluate the technology, building performance and whole life implications. The report covers the design and evaluation of the following proposed systems:

- Mechanical: Heating & hot water provided by a high-efficiency combination boiler and Mechanical Ventilation with Heat Recovery (MVHR) system.
- Electrical: Energy efficient lighting, small scale power distribution and modern telecom infrastructure.
- Public Health and Life Safety Systems: Above and below ground drainage systems and a mandatory domestic sprinkler system [Welsh Government 2020].

Design Philosophy

This report adopts a holistic approach to building services integration. Systems have been proposed based on their contribution to a sustainable future, considering energy reduction, ease of maintenance and the requirements for safe installation access.

Key Assumptions

The following assumptions have been made that have not been addressed in the provided HT 641 specification sheet:

Building Fabric

It is assumed that the building meets the fabric requirements in Approved Document L Volume 1 [Approved document L]. It is assumed that the building is airtight to protect against air infiltration losses and is tested to

Passivhaus maximum requirement of 0.6 h^{-1} @ 50 Pa [Bleicher, D 2017 & BRE 2014]. It is assumed that thermal bridges have been mitigated as discussed within BS EN ISO 14683:2017 [British Standards Institution 2017].

Site and Infrastructure

The service void is assumed to be 400mm deep providing sufficient space for ducting. It is assumed that all necessary utilities (mains gas, high pressure mains water and foul drainage) are running to the property.

Occupancy

It is assumed that the maximum occupancy of the property is 6 people.

Mechanical Systems Design

Heating and Domestic Hot Water:

Heating and domestic hot water will be supplied by a gas fired condensing combination boiler. To meet the requirements of Approved Document L Volume 1 the boiler must meet a minimum seasonal efficiency of 92% and include at least two heating zones with independent temperature and time controls with an additional boiler interlock which shuts the boiler off when there is no demand [Welsh Government 2022]. Zoning could be used to separate the ground and first floor, this allows the occupants to only heat areas of the house that they are actively using, helping to increase the efficiency. As we have assumed that the property airtightness of 0.6 h^{-1} @ 50 Pa we further improve the efficiency of the boiler as infiltration would increase heat loss in the building reducing the demand on the boiler [Bleicher, D 2017 & BRE 2014].

The proposed location for the boiler is in the first-floor cupboard adjacent to bedroom 4 with defined maintenance clearances of 600mm front and side clearance shown on the plans as a hatched area; this is to allow for easy maintenance of the boiler. A combination boiler also provides hot water without the need for a hot water storage cylinder; this helps to maximise the total usable floor area within the property.

Additionally, in accordance with Approved Document L Volume 1 gas fired combination boilers should operate at a max of 55 degrees Celsius, this allows for future proofing as radiators will not need to be resized if a heat pump is retrofitted later [Welsh Government 2024].

Room	Wattage Required (W)	Radiator Specification (mm)
Kitchen	1169	600 Hx1400 W
Lounge	1941	2x 600 H x 1100 W
GF WC	100	Chrome Towel Rail 800 W x 500 H
FF Bathroom	286	Chrome Towel Rail 1200 W x 600 H
Bedroom 1	990	600 H x 1200 W
Bedroom 2	1053	600 H x 1300 W
Bedroom 3	629	600 H x 800 W
Bedroom 4	686	600 H x 900 W

(Toolstation n.d)

AREA SCHEDULE

WDQR 2021 Area Requirements

6 Person 4 Bed House: 110.0m²

Measured GIA: 110.4m²

WDQR 2021 General Storage Requirements

6 Person 4 Bed House: 3.0m²

GF Store 2.4m²

Airing Cupboard (AC) 0.9m²

Cumulative Total: 3.3m²

MEP & PLANT PROVISIONS

Information presented indicatively for coordination with all - including manufacturer & model specification - TBC by relevant specialist consultant / subcontractor. All revisions to the plant specification must be reported for coordination.

CONSTRUCTIONS

External walls 550mm

Internal walls 100mm

Intermediate floors 400mm

Constructional thicknesses are indicative only & must be coordinated with fabric requirements for acoustic, fire & thermal performances on a site-by-site basis. All TBC by the constructional preferences of the appointed contractor.

This plan should be read in conjunction with the M&E design report for HT641

All hot & cold water feeds are to be designed by the contractor undertaking the works. Boiler condensate pipe to be determined by contractor.

Room	Wattage Required (W)	Radiator Specification (mm)
Kitchen	1169	600 Hx1400 W
Lounge	1941	2x 600 H x 1100 W
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GROUND FLOOR PLAN

FIRST FLOOR PLAN

Heating Plans for HT641

Designed by: DH

Scale: 1:100 @A3

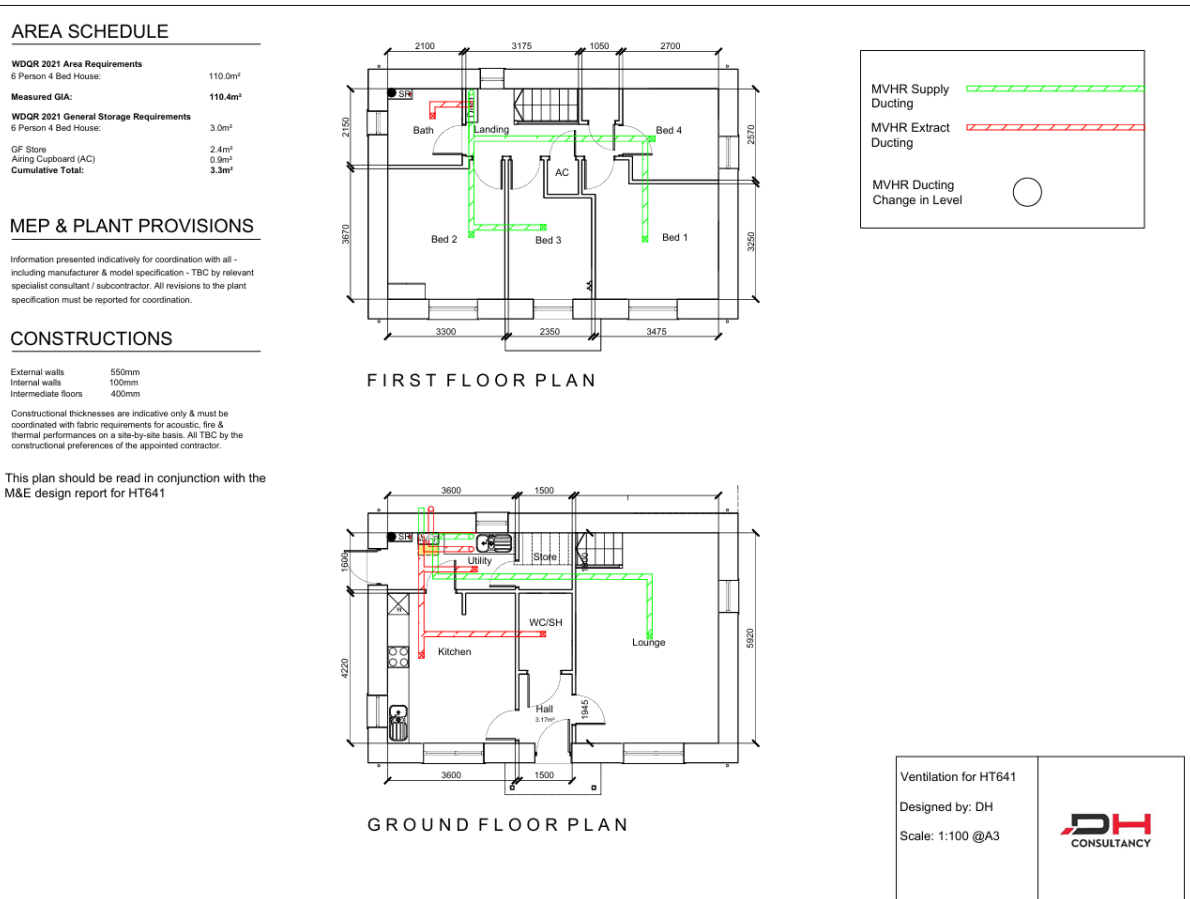
Ventilation System Design:

For this design an MVHR system is to be utilised to meet the AECB Carbon lite guidance. As stated in the AECB Carbon Lite guidance ventilation should adopt the Passivhaus requirements of 30m³/hr per person ventilation rate. For a 6-person occupancy this results in a continuous supply of 180m³/hr, ensuring complete moisture control [AECB 2025 & Passivhaus Trust 2018].

To comply with the AECB and Passivhaus standards a minimum heat recovery of 90% should be incorporated into the design to ensure the system can reclaim almost all heat outgoing. Additionally, a target specific fan power of under 0.45W/m³/hr to minimise electric consumption of the ventilation system [AECB 2025 & Passivhaus Trust 2018].

The unit is to be installed in the utility room on the ground floor, a maintenance footprint of 600mm has been included in the design to allow for easy maintenance of the unit. As per the Passivhaus good practice for MVHR a 10mm undercut will be on all internal doors to allow for air transfer between rooms [Passivhaus Trust 2018].

By specifying the requirements at a higher standard than the building regulations we can account for the whole life of the building by significantly reducing future heating costs as well as being a future-proofed asset.



Electrical Systems Design

Lighting Strategy:

The lighting design for this development is engineered to exceed the minimum standards outlined in Approved Document L Volume 1. Lighting within the property will be supplied by LED units with a minimum 80 lm/W to reduce the electrical demand. Zonal control will also be used in larger rooms like the kitchen/diner this allow for the occupant to only light the sections of the room in use helping to further reduce energy consumption. All external lighting will use motion sensors and daylight cut-off switches to prevent the lighting from operating whilst not in use or during the daytime [Scottish Executive 2007 & Welsh Government 2024].

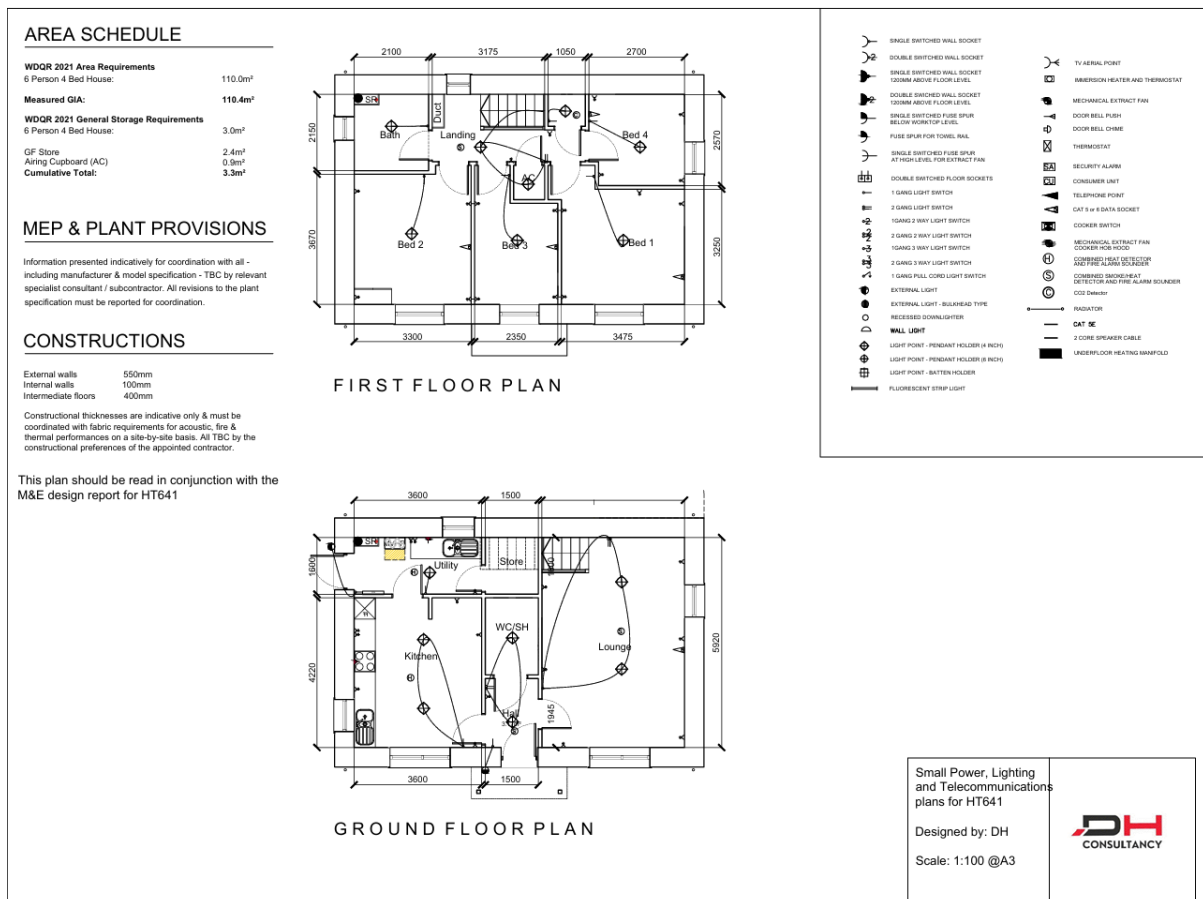
Small Power Distribution:

The small power layout is designed for a 6-person occupancy, ensuring that the property can handle modern electrical load without the need for extension leads. High-load appliances are grouped into the utility room and kitchen with their own dedicated spaces and electrical connections; a

dedicated circuit will be provided for the MVHR to ensure operational continuity. Additionally, a service zone will be provided on all external walls and internal partitions to maintain the airtightness within the property [Passivhaus Institute 2020 & Welsh Government 2010]. The consumer unit will be in the utility room with a clear 600mm maintenance zone marked on the design drawing.

Telecommunications and Future Proofing:

As part of the Approved Document Part R all new dwellings need to include the infrastructure for a connection to a 1 gigabit network [Welsh Government 2025 & Welsh Government 2023]. This can be provided by fibre-to-the-premises (FTTP) which allows for the high 1 gigabit speeds required [Neos Networks (n.d)]. To future proof the property and provide connection points category 6 shielded data points should be provided to the lounge and all four bedrooms, supporting the shift toward increased bandwidth demand. By providing a high-speed connection into the property we can utilise smart home integration by using Wi-fi enabled thermostats to remotely access the heating controls and develop heating programs. This helps to further reduce heating expenditure [Uswitch (n.d)].



Public Health and Life Safety

Above and Below Ground Drainage:

The drainage design follows technical standards defined in Approved Document H (Welsh Government 2010).

A 110mm PVC single stack system is specified and located internally within the ground floor utility room. This location allows the stack to serve the utility appliances, ground floor W/C and the first-floor bathroom. To limit noise, transfer the SVP will be boxed in with 12.5mm Sound bloc Plasterboard [British Gypsum (n.d)] and will be wrapped in 25mm acoustic mineral wool in order to comply with Approved Document E (Welsh Government 2010).

Placing the SVP adjacent to the external utility door provides a strategic advantage for maintenance. An internal rodding eye will be installed at the base of the stack with an access hatch to allow for easy clearing of blockages. All foul drainage will be dispersed into the mains foul drainage system with a manhole for rodding or jetting.

Surface Water & SuDS:

In accordance with Welsh Statutory Standards, surface water is separated from foul drainage and should be managed by Sustainable Drainage Systems (SuDS) (Welsh Government 2019). The site layout utilizes permeable paving and a rear garden soakaway to handle storm surges helping to ensure the development is resilient against flooding.

Fire Suppression:

In alignment with the Domestic Fire Safety (Wales) Measure 2011 (Welsh Government 2020), an automatic fire suppression system is mandatory for this dwelling. This system is designed to meet BS9251 Category 1 standards. Concealed overhead sprinkler heads are specified for all habitable rooms (lounge, kitchen/diner, bedrooms 1-4). The control valves and flow switch are to be fitted to the utility room opposite the sink unit, this ensures they are accessible for annual testing. The system will be mains fed via a 32mm incoming water main which must deliver 100L/min at 2 bars for at least 10 minutes, to ensure hydraulic performance during an emergency, a priority demand valve is installed on the cold-water feed. This ensures during an emergency the valve automatically isolates the domestic water supply (BSI 2021).

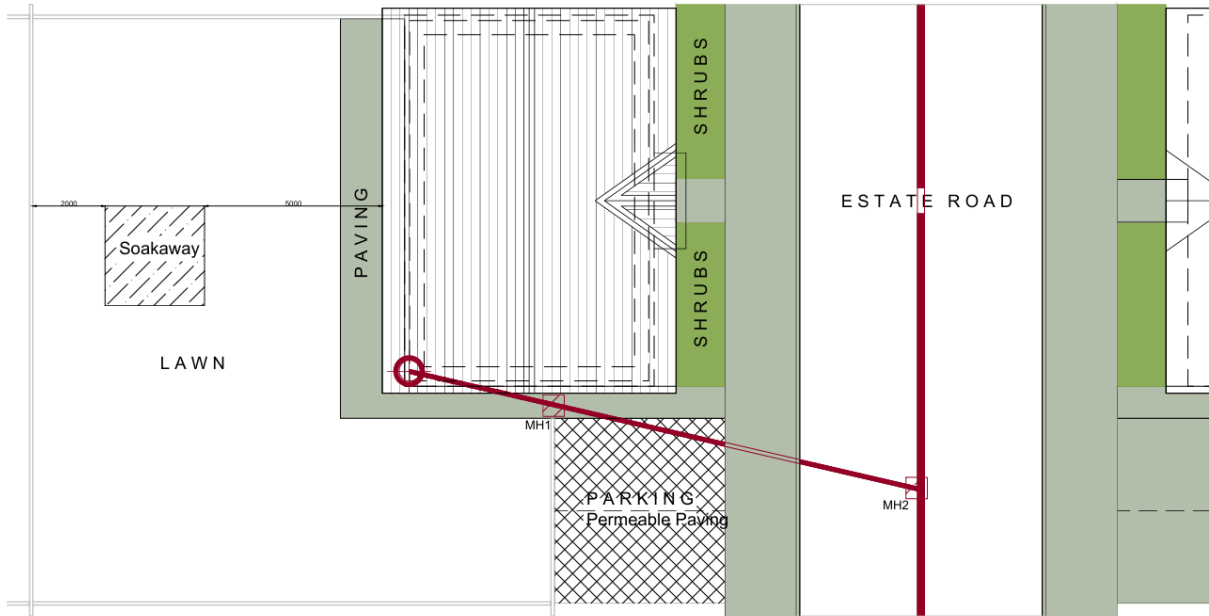
Compliance WHQS23:

The public health design also aims to satisfy the Welsh Housing Quality Standards 2023 by prioritising safety and maintainability. By locating the SVP in the utility room and including additional soundproofing, the design isolates potential noise and maintenance issues from the living areas, supporting a high-quality living environment. Additionally, the separation of surface water prevents hydraulic overloading of the public sewer, fulfilling the environmental resilience criteria of the standard (Welsh Government 2024).

CARPENS

ORIENTATION

ESTATE ROAD



This plan should be read in conjunction with the M&E design report for HT641

All internal waste pipework to be determined by the contractor, foul drain to connect into mains drainage at a 1:40 gradient.

Drainage Plans for HT641

Designed by: DH

Scale 1:100 @A3



AREA SCHEDULE

WDQR 2021 Area Requirements	
6 Person 4 Bed House:	110.0m ²
Measured GIA:	110.4m²
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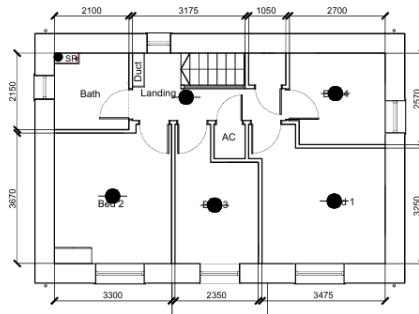
CONSTRUCTIONS

External walls	550mm
Internal walls	100mm
Intermediate floors	400mm

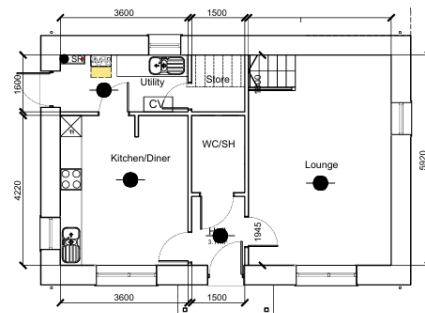
Constructional thicknesses are indicative only & must be coordinated with fabric requirements for acoustic, fire & thermal performances on a site-by-site basis. All TBC by the constructional preferences of the appointed contractor.

This plan should be read in conjunction with the M&E design report for HT641

Runs for each sprinkler to be specified by the contractor



FIRST FLOOR PLAN



GROUND FLOOR PLAN

Sprinkler for HT641

Designed by: DH

Scale 1:100 @A3



Product Specifications

The following products have been chosen to ensure compliance with Welsh Building Regulations.

Boiler	Worcester Bosch Greenstar 8000 Life
Heating Controls	Hive Active Heating Multizone
Ventilation	Zehnder ComfiAir 225
Internal Lighting	Aurora Mpro
External Lighting	Steinel L 800 SC
Consumer Unit	Hager Design 30 Consumer Unit
Small power	MK Logic Plus 2-gang Double Pole Switched Socket. Mk Grid Plus for high load appliances.
Telecomms	Excel Networking Category 6A F/FTP (Shielded) Cable & MK Logic Plus Cat6 Shielded Modules.
SVP & Waste Pipework	110mm PVC single stack
Fire Suppression	Rapidrop RD208 Residential Concealed Sprinkler

Critical Appraisal and Evaluation

Sustainable Futures and Whole Life Performance:

The M&E design for the HT641 typology has been critically evaluated against net zero operational scenarios outlined in the technical feasibility study.

By prioritising Passivhaus standard airtightness of $0.5 \text{ m}^3/\text{m}^2/\text{hr}$ over active renewable energy generation, the design reduces the dwelling's primary space heating demand.

While the specified Zehnder ComfoAir 225 represents a higher initial capital cost compared to a standard system (Mechanical Extractor Fans), the whole life appraisal demonstrates that its 92% heat recovery efficiency is the primary driver for the net zero target. Additionally, without this unit, the potential for damp and mould increases due to the exceptional

airtightness. This unit operates to ensure occupant health and comfort is maintained.

The heating system design operates at a flow temperature of 55 Degrees Celsius. Although a gas-fired boiler is specified for the current build phase to reduce capital expenditure, the radiator sizing and 400mm service voids ensure the property is heat pump ready. This allows a seamless transition to low-carbon technology at the end of the boiler's lifecycle without invasive retrofitting.

Safe Installation and Maintenance:

In compliance with CDM Regulation 2015 (The Construction (Design and Management) Regulations 2015), the design practises the safety of occupants and maintenance personnel throughout the building's lifecycle.

The decision to allow for maintenance clearances during the design phase allows for clear access to systems requiring routine maintenance, this helps to ensure the systems can easily be maintained without the risk of injury or requiring invasive maintenance.

Alignment with WHQS23:

This design aims to accommodate the affordable warmth and decarbonisation sections of the Welsh Housing Quality Standards 2023. By reducing air leakage and recovering 92% heat on exhaust air the design minimises the resident's exposure to fluctuating energy prices, a core requirement for social and affordable housing. WHQS23 also mandates the prevention of damp and mould (Welsh Government 2024), the continuous mechanical ventilation ensures relative humidity remains stable, protecting both the building fabric and health of occupants.

Conclusion:

This report presents an integrated M&E design, fully compliant with current Welsh Building Regulations and Net Zero targets.

The design prioritises a fabric first approach, utilising Passivhaus standard airtightness and thermal bridging prevention with a 92% efficient MVHR system to reduce space heating demand. This minimises the reliance on

the combination boiler while the radiators and ceiling voids allow for future decarbonisation.

Crucially, the specification addresses Welsh Statutory requirements through a Fire Suppression system and SuDS drainage, ensuring compliance with WHQS23 for safety and affordable warmth.

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- **British Gypsum (n.d.)** *Gyproc SoundBloc 12.5mm*. Available at: <https://www.british-gypsum.com/products/board-products/gyproc-soundbloc-12-5mm> (Accessed: 21 January 2026).
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- **Scottish Executive (2007)** *Guidance Note: Controlling light pollution and reducing lighting energy consumption*. Edinburgh: Scottish Executive.
- **Steinel (n.d.)** *Sensor-switched LED outdoor light L 800 SC Anthracite: Technical Specifications*. Herzebrock-Clarholz: Steinel.
- **The Construction (Design and Management) Regulations 2015** (SI 2015/51). Available at: <https://www.legislation.gov.uk/ukxi/2015/51/contents> (Accessed: 21 January 2026).
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- **Welsh Government (2010)** *Approved Document E: Resistance to the passage of sound*. 2003 edition incorporating 2004 and 2010 amendments. Cardiff: Welsh Government.
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- **Welsh Government (2010)** *Approved Document P: Electrical safety – Dwellings*. 2006 edition incorporating 2010 amendments. Cardiff: Welsh Government.
- **Welsh Government (2019)** *Sustainable Drainage (SuDS) Statutory Guidance*. Cardiff: Welsh Government.
- **Welsh Government (2020)** *Approved Document B Volume 1: Fire safety - Dwellinghouses*. 2006 edition incorporating 2010, 2016 and 2020 amendments. Cardiff: Welsh Government.
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- **Welsh Government (2024)** *Approved Document L Volume 1: Conservation of fuel and power - Dwellings*. 2022 edition incorporating 2024 amendments. Cardiff: Welsh Government.
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Appendices:



Data Sheet 4.26 Issue E



Residential Lead Free Flat Concealed Pendent, K4.9 Model: RD208

General Description

The Model RD208 Residential Flat Concealed Sprinklers are automatic sprinklers of the compressed fusible solder type. These are decorative and fast response. The Cover Plate Assembly hides the Deflector, Heat Responsive Element etc., which is concealed above the ceiling. The cover plate has a flat profile, and its diameter is extremely small 68mm (2 5/8"). The push-on and/or thread-on, thread-off design of the concealed cover plate assembly allows easy installation of the cover plate. Therefore, the Model RD208 should be your first choice when aesthetics is the major consideration for ultimate appeal and unbeatable performance is desired. The Model RD208 is designed for the residential occupancies and it is perfect for use in homes, hotels and other living quarters.

Model RD208 is suitable for BS9251, [BS]EN16925 residential sprinkler systems, wet pipe residential sprinkler systems for one and two Family Dwelling and manufactured homes as per NFPA13D; wet pipe residential sprinkler systems for Residential Occupancies up to and Including Four Stories in Height per NFPA 13R; or, wet pipe sprinkler systems for the residential portions of any occupancies per NFPA 13. The Model RD208 has a 4.9 K-factor that meets the required residential flow rates with minimal residual pressure, which allows for smaller pipe sizes and water supply requirements.

For extended installation flexibility, the Model RD208 provides 12.8mm (1/2") vertical adjustment. This adjustment in installation decreases the need for precise cutting of the pipe that drops to the sprinkler and allows for a perfect fit with a range of pipe lengths.

The heat sensitivity and water distribution design of Model RD208 allows for an increased chance of residents' escape or evacuation in case of fire. However, residential fire sprinkler systems are not a substitute for fire safety awareness or fire safety construction required by building codes.

"Lead Free" is defined in the Reduction of Lead in Drinking Water Act (S.3874) endorsed by AWWA's Water Utility Council, and California Assembly Bill #1953 as having less than or equal to a weighted average of 0.25% lead in wetted surface of pipes, plumbing fittings and fixtures.

Technical Data

Item Number	Description
Approvals	cULus listed to UL199 (replaces UL1626) UL-EU listed to [BS]EN12259-14
Model	RD208
Max. Working Pressure	12.1 bar (175 psi)
Discharge Coefficient	K70 [K4.9]
Temperature Rating (Colour Code)	Sprinkler: 72°C / 162°F (Uncoloured)* Cover Plate: 60°C / 140°F (No Mark) Sprinkler: 96°C / 205°F (White) Cover Plate: 72°C / 162°F (White Mark)
Vertical Adjustment	12.8 mm (1/2")
Finishes	White, Ivory, Beige, Brown, Black, Nickel, Wood Grain or Custom painted
Physical Characteristics	Ref. Figure 1 and 1.1

*UL-EU Listed 72°C (162°F) only

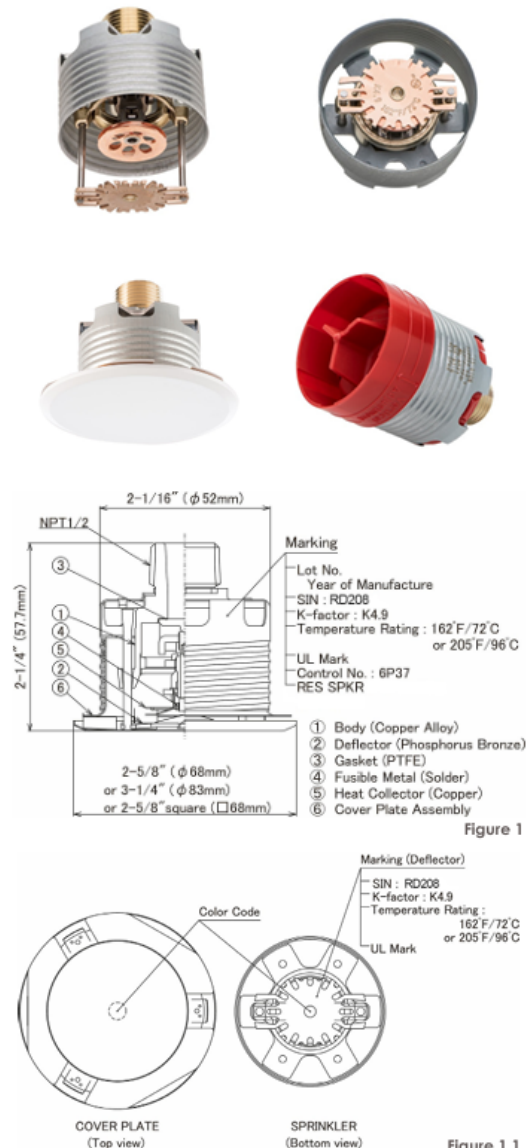


Figure 1.1

DS: 4.26
Issue E
09/09/2021
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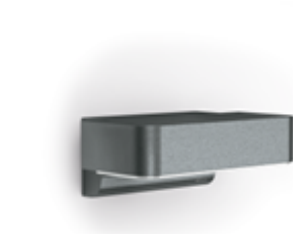
Page 1 of 6

Rapidrop Global Ltd reserves the right to change the design, materials and specifications without notice to continue product development

Sensor-switched LED outdoor light

L 800 SC

Anthracite
EAN 4007841 065690
Article number 065690



Function description

The most modern outdoor light in the world. Designer sensor-switched outdoor light L 800 SC with invisible high-frequency sensor, ideal for building entrances and fronts of buildings, 7,5 W STEINEL LED lighting system, 466 lm, 140° coverage angle, reach from 1 - 5 m, for stylish downlighting, includes soft light start and optional manual override. Wirelessly interconnectable by Bluetooth Mesh and adjustable and controllable via free app.

Technical specifications

Dimensions (L x W x H)	146 x 230 x 88 mm	Photo-cell controller	Yes
With lamp	Yes, STEINEL LED system	Transmitter range	30 m
Manufacturer's Warranty	3 years	Transmitter power	< 1 mW
Settings via	App, Bluetooth Mesh	Luminous flux total product	466 lm
With remote control	No	Measured luminous flux (360°)	466 lm
Version	Anthracite	Total product efficiency	62 lm/W
PU1, EAN	4007841065690	Colour temperature	3000 K
Application, place	Outdoors	Lamp	LED cannot be replaced
Application, room	garden, front door, courtyard & driveway, all round the building, terrace / balcony	Service life LED L70B50 (25°)	> 60000 h
Colour	Anthracite	Base	without
includes sheet of self-adhesive numbers	No	LED cooling system	Active and Passive Thermo Control
Package content	1	Soft light start	Yes
Installation site	wall	Continuous light	selectable
Impact resistance	IK03	Functions	Motions sensor
IP-rating	IP44	Twilight setting	2 - 2000 lx
		Time setting	5 s - 60 Min.
		Basic light level function	Yes

<https://www.steinel.de>

Subject to technical modifications

01.2026 Page 1 from 3



Product Description: mPro™ Fixed IP65 Dimmable Fire Rated Downlight

Fixed, integrated, fire rated 6W LED downlight with unique convertible design to fit ceiling voids as shallow as 50mm. Incorporated miniaturised NanoDrive™ power supply. Available in 2700K, 3000K and 4000K, mPro™ delivers up to 107lm/W making it the most efficient fire rated downlight on the market. Interchangeable bezels available in White, Matt White, Polished Chrome and Satin Nickel. FastRFix™ rapid install system connector included for faster installation.

PLEASE NOTE: Any purchases before 01/01/2021 has a 5 Year Warranty

SKU Code	Wattage	Colour	Lumens	Lumens/Watt	Beam Angle	SKU Type
AU-MPRO1A/27	6	2700	560	94	60	Triac Dimmable
AU-MPRO1A/30	6	3000	600	100	60	Triac Dimmable
AU-MPRO1A/40	6	4000	640	107	60	Triac Dimmable

MK Modular Datacoms

Standards and approvals

Logic Plus™ Telephone and Data sockets comply with the following:

Telephone sockets K420 and K421

BS 6312: 2.2, OFTEL Approval NS/G(23)/100005

Modular Frontplates K190 to K194

BS 5733: 2010 (where applicable)



Technical specification

Electrical

Cable types:

Telephone CW1311, CW1293, CW1308, CW1316

No. of cables per termination:

Telephone: 2

Termination type:

R111 & Telephone - IDC

Physical

Temperature range:

Ambient air -20°C to +60°C

IP rating:

IP2XD

Max. installation altitude:
2000 metres

Description

A unique modular system in the distinctive Logic Plus™ style comprising a range of socket modules for Data and Telephone use, with 4 matching frontplates capable of accepting combinations of interchangeable modules. The 'clip-in' design provides a high degree of versatility, making the system ideal for use in all commercial and industrial applications.

Features

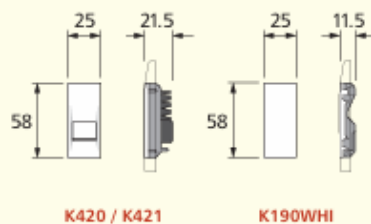
- Meet all relevant BS, OFTEL and cabling standards
- Interchangeable modules clip into frontplates
- Front fixing facilitates easy exchange of modules
- Part of a range of products for telephone and data processing requirements
- Quick, simple and reliable IDC connectors
- Can be specified for many applications
- Fit in plaster depth boxes

BOX TYPES

Where there is more than one module in a frontplate, the depth of the box is determined by the module with the deepest back projection.

Ref.	Min. box depth mm	Flush box List No.	Surface box List No.
K420	16	3995ZIC	K2160 & 2161WHI
K421	16	3995ZIC	K2160 & 2161WHI
K190	16	3995ZIC	K2160 & 2161WHI
K487	16	3995ZIC	K2160 & 2161WHI

Dimensions – Data and TV modules (mm)



Plateswitches

Standards and approvals

All Logic Plus™ plateswitches comply with BS EN 60669-1: 1999

Technical specification

Electrical

Voltage rating:
250V a.c. 50Hz

Current ratings:
10 amps – no derating when used on fluorescent
or inductive loads

20 amps – no derating when used on fluorescent
or inductive loads

Terminal capacity:
All products except K4870/71/72
4 x 1mm²
4 x 1.5mm²
3 x 2.5mm²
2 x 4mm²
1 x 6mm²

For products K4870/71/72
4 x 1mm²
4 x 1.5mm²
2 x 2.5mm²
1 x 4mm²

Contact gap:
3mm switch contact gap

Physical

Operating temperature:
-5°C to +40°C

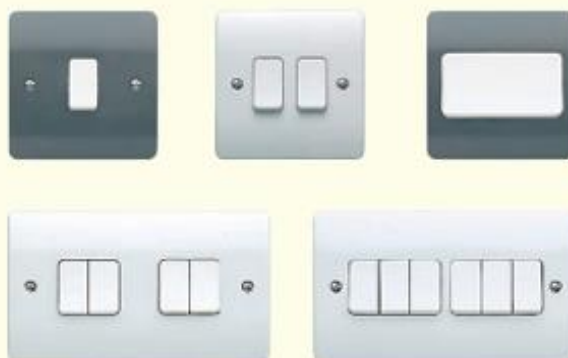
IP rating:
IP20D

Max. installation altitude:
2000 metres

Operational testing (all plateswitches)
tested to 100,000 operations for mechanical life
tested to 40,000 operations at 10 amp rating
tested to 10,000 operations at 20 amp rating

Cable Management

Logic Plus™ plateswitches can be mounted in a variety of MK trunking systems.



Description

Logic Plus™ plateswitches are designed to blend in with the decor, whilst complementing a wide range of other Logic Plus™ accessories. They are designed for easy installation in plaster depth boxes and are suitable for controlling lighting circuits in domestic, commercial and industrial applications.

Neon locator

A textured, polycarbonate moulding allowing the glow of the neon to be seen at almost any angle. Designed to complement the Logic Plus™ 1, 2, or 3 gang plateswitches.

It is easy to install in existing locations. For 3 gang applications using a 25mm deep box simplifies wiring.



Features

- Two way switches can be wired as one or two way
- All products clearly printed with BS Nos., ratings, etc
- Matching Grid switches available in 10 or 20A ratings
- 3mm switch contact gap
- Positive switch action
- Top access, backed out and captive terminal screws (except Logic Plus list numbers K4870, K4871 and K4872)
- Neon locator available making switch easy to find in darkened rooms

Switchsocket Outlets

Standards and approvals

Logic Plus™ 13A socket outlets comply with BS 1363: Part 2: 1995.

Replacement fuses to the 3 gang socket outlets comply with BS 1362: 1973.

Technical specification

Electrical

Voltage rating:
250V a.c.

Current rating:
13A per socket outlet
(except 3 gang which is 13 amp in total)

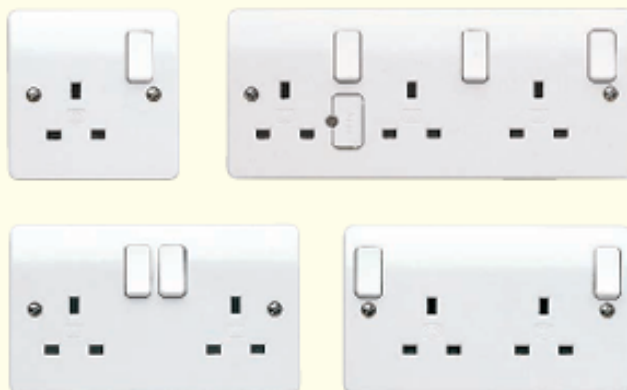
Terminal capacity:
Live, neutral & earth
3 x 2.5mm²
3 x 4mm²
2 x 6mm² (standard)
(Dual earth terminals on 1st Nos.
K2781, K2657, K2737, K2746, K2757)

Physical

Ambient operating temperature:
-5°C to +40°C
(not to exceed an average of more than 25°C in any 24 hour period)

IP rating:
IP2XD

Max. installation altitude:
2000 metres



Description

A range of socket outlets designed for ease of installation and having all the advantageous design features of the Logic Plus™ range. The 2 gang sockets with outboard rockers are of particular value for use by the infirm and partially sighted.

Non-standard clean earth sockets are for use on installations where restricted access is required and will only accept a 647WHI 13A non-standard plug with T-shaped earth pin. The sockets have two independent earth terminals so that they can also be used for 'clean earth' installations. K2746CE and K2947CE also have two independent earth terminals for 'clean earth' installations.

A variety of sockets (see Technical specification) are fitted with two earth terminals on a common busbar to provide a double earth facility for use when installations require a high integrity protective connection as specified within BS 7671: 2008.

The products can be quickly installed as replacement for existing 13 amp sockets or in a new installation.

Fuse carriers

(3 gang switchsocket only)

The fuse carrier is opened by a fast-acting, screwdriver-operated, worm-drive screw for ease of replacement.

Round pin sockets

A range of round pin sockets is also available, switched and unswitched.

BOX TYPES				
	Flush	Flush (for extra wiring space)	Surface Insulated	Surface Metal
1 gang	861ZIC	866ZIC	K2140WHI	K2211ALM/K2213ALM
2 gang	862ZIC	886ZIC	K2142WHI	K2212ALM/K2214ALM
3 gang	K863ZIC	Not available	K2153WHI	Not available

For a full range of corresponding products, see pages 42-60 in the product selector.

Excel Cat6A Patch Lead F/FTP Shielded LSOH Blade Booted 1 m Yellow

Item Code: 100-166

excel
without compromise.



✕ Specified to 500 MHz

✕ Suitable for 10 Gigabit 10GBase-T, PoE++ applications

✕ Individual foil screen over each pair

✕ Blade style moulded strain relief boot with clip protector

✕ LSOH outer sheath 6.2 mm Dia

✕ CIBSE TM65 Embodied Carbon: 0.217 kg CO2e

Product Overview

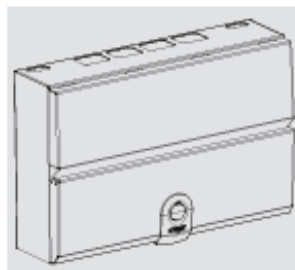
Excel Category 6A (Augmented Category 6) patch leads take the performance capabilities of copper infrastructure to new levels. Designed to the current ISO and EIA/TIA standards for Class Ea augmented Category 6A performance these products are intended to deliver reliable, high network performance including support of emerging applications such as 10GBase-T, 10 Gigabit Ethernet.

Each Excel Category 6A patch lead consists of 4 twisted pairs of 26AWG stranded copper wires, an aluminium/polyester foil tape provides an individual screen for each pair. These pairs are then cabled together, with different lay lengths to ensure optimum performance. Staggered pin RJ45 Screened plugs, terminate the cable, and each lead is fitted with colour coded slimline moulded boots, suitable for use in high density router or switch blades.

Product Specifications

Feature	Values
Cable type	F/FTP
Category	6A (IEC)
Length	1 m
Type of connector connection 1	RJ45 8(8)
Type of connector connection 2	RJ45 8(8)
Outer sheath colour	Yellow
Strain relief boot	Moulded-on
Lockable	no

(Excel (2026))



Design 30 Consumer Unit Instructions/Data Sheet

This Consumer Unit and Hager devices conform with the following standards:
 Consumer Unit: BS EN 61439-3 including Annex ZB.
 Switch-disconnectors: BS EN 60947-3.
 Residual Current Circuit Breaker (RCCB): BS EN 61008-1
 Residual current operated circuit breaker with integral overload (RCBO): BS EN 61009-1
 Miniature Circuit Breaker (MCB): BS EN 60898-1

Installation Instructions:

All product(s) must be installed by a suitably competent electrician giving consideration to their intended use and in accordance with the current edition of BS 7671 (IET Wiring Regulations).

The Electricity at Work regulations and the Health and Safety at Work Act shall be complied with.

Only equipment and arrangements specified in Hager's technical documentation / catalogue shall be used.

Install in the horizontal plane only.

Important notice:

To prevent potential overheating from loose connections the installer shall check connections are tight to the torque levels stated in these instructions prior to energizing this board. This check should include factory made connections which may have loosened in transit.

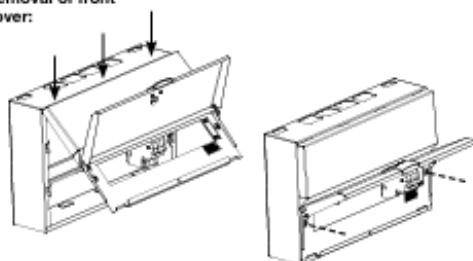
For additional cable protector plates please use:

Insulated ref. **VM02CE**

Metal ref. **VM01CE**

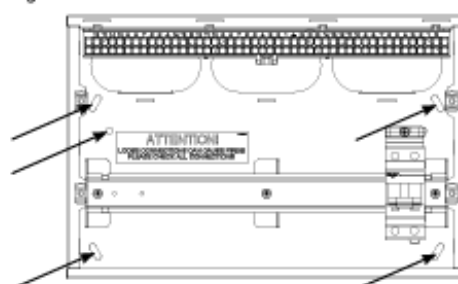
Good workmanship and proper materials must be applied by the installer. The cable entry method shall, as far as reasonably practical, maintain the non-combustible arrangement of the enclosure. Account shall be taken of these instructions.

Removal of front cover:



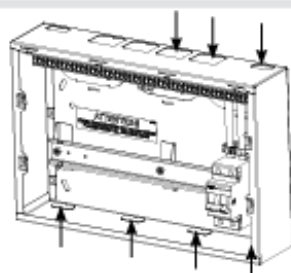
Easy fit front cover assembly allows the cover to be located at the top of the board and locked into place that enables the cover to stay secure when replacing or removing during an installation.

Wall Fixing:

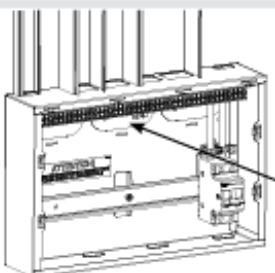


The units have multiple fixing points that will suit No.8 & No.10 screws

Cable entry facilities:



Where Electrical Knockouts are provided for top or bottom cable entry are sized and positioned to suit standard trunking i.e 100x50mm, 50x50mm & 40x25mm, grommet strip is provide to protect the cables when entering the board.



Rear cable entries shall enter through selected rear Knockout; once the Knockout is removed the cable protector bracket can be fitted to allow safe installation of the cables. Grommet strip lengths: **Small EKO** - 79mm, **Large EKO** - 127mm **Rear EKO** - 255mm

Note: Only BASEC approved cable should be used
 1.0mm² to 16mm² for outgoing cables
 up to 35.0mm² for incoming live cables
 Single conductors below 1.5mm² need to be doubled back in the terminal bar.

CERTIFICATE

Certified Passive House Component

Component-ID 1558vs03 valid until 31st December 2026

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category: **Air handling unit with heat recovery**
Manufacturer: **Zehnder Group Nederland B.V.**
Netherlands
Product name: **ComfoAir 225**

Specification: Airflow rate < 600 m³/h
Heat exchanger: Recuperative

This certificate was awarded based on the product meeting the following main criteria

Heat recovery rate $\eta_{HR} \geq 75\%$
Specific electric power $P_{el,spec} \leq 0.45 \text{ Wh/m}^3$
Leakage < 3 %
Comfort Supply air temperature $\geq 16.5^\circ\text{C}$ at outdoor air temperature of -10°C

Airflow range

60–150 m³/h

Heat recovery rate

$\eta_{HR} = 92\%$

Specific electric power

$P_{el,spec} = 0.37 \text{ Wh/m}^3$

cool, temperate climate



**CERTIFIED
COMPONENT**

Passive House Institute

www.passivehouse.com

Zehnder Group UK Ltd (2022)

**BOSCH****Greenstar 8000 Life**

GR8300iW 30 S NG

7738100807

The information provided fulfills the requirements of regulations (EU) 811/2013 and (EU) 813/2013.

Product data	Symbol	Unit	7738100807
Condensing boiler			Yes
Low temperature boiler			No
B1 boiler			No
Cogeneration space heater			No
Equipped with a supplementary heater?			-
Combination heater			No
Rated heat output	P_{rated}	kW	30
Seasonal space heating energy efficiency	η_s	%	94
Energy Efficiency Class			A
Useful heat output			
At rated heat output and high temperature regime	P_4	kW	29,5
At 30 % of rated heat output and low temperature regime	P_1	kW	9,9
Useful efficiency			
At rated heat output and high temperature regime	η_4	%	88,5
At 30 % of rated heat output and low temperature regime	η_1	%	98,7
Auxiliary electricity consumption			
At full load	e_{lmax}	kW	0,067
At part load	e_{lmin}	kW	0,014
In standby mode	P_{SB}	kW	0,001
Other items			
Standby heat loss	P_{sby}	kW	0,071
Ignition burner power consumption	P_{ign}	kW	0,000
Emissions of nitrogen oxides (only gas- or oil fired)	NO_x	mg/kWh	23
Annual energy consumption (average climate conditions)	Q_{HE}	kWh	-
Annual energy consumption	Q_{HE}	GJ	50
Sound power level, indoors	L_{WA}	dB	53

Specific precautions for installation, maintenance as well as recycling and/or disposal are provided within the installation and operating manuals. Read and follow the installation and operating manuals.

(Worcester Bosch (n.d.))