

The Breacan Mooney
Geothermal
Installation of the Year 2016 Competition
Dunlewey, Co. Donegal

Adjudicated by John Burgess

11th March 2016



The Geothermal Association of Ireland
Ground Source Heat Pumps and Deep Geothermal Energy

Dunlewey





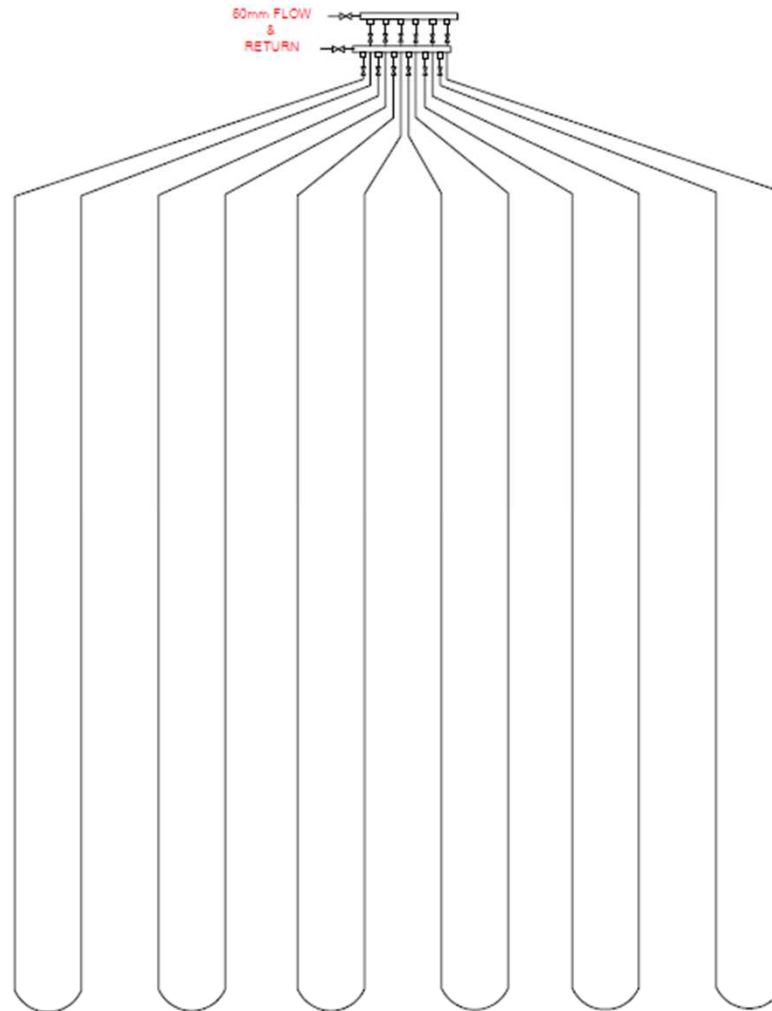












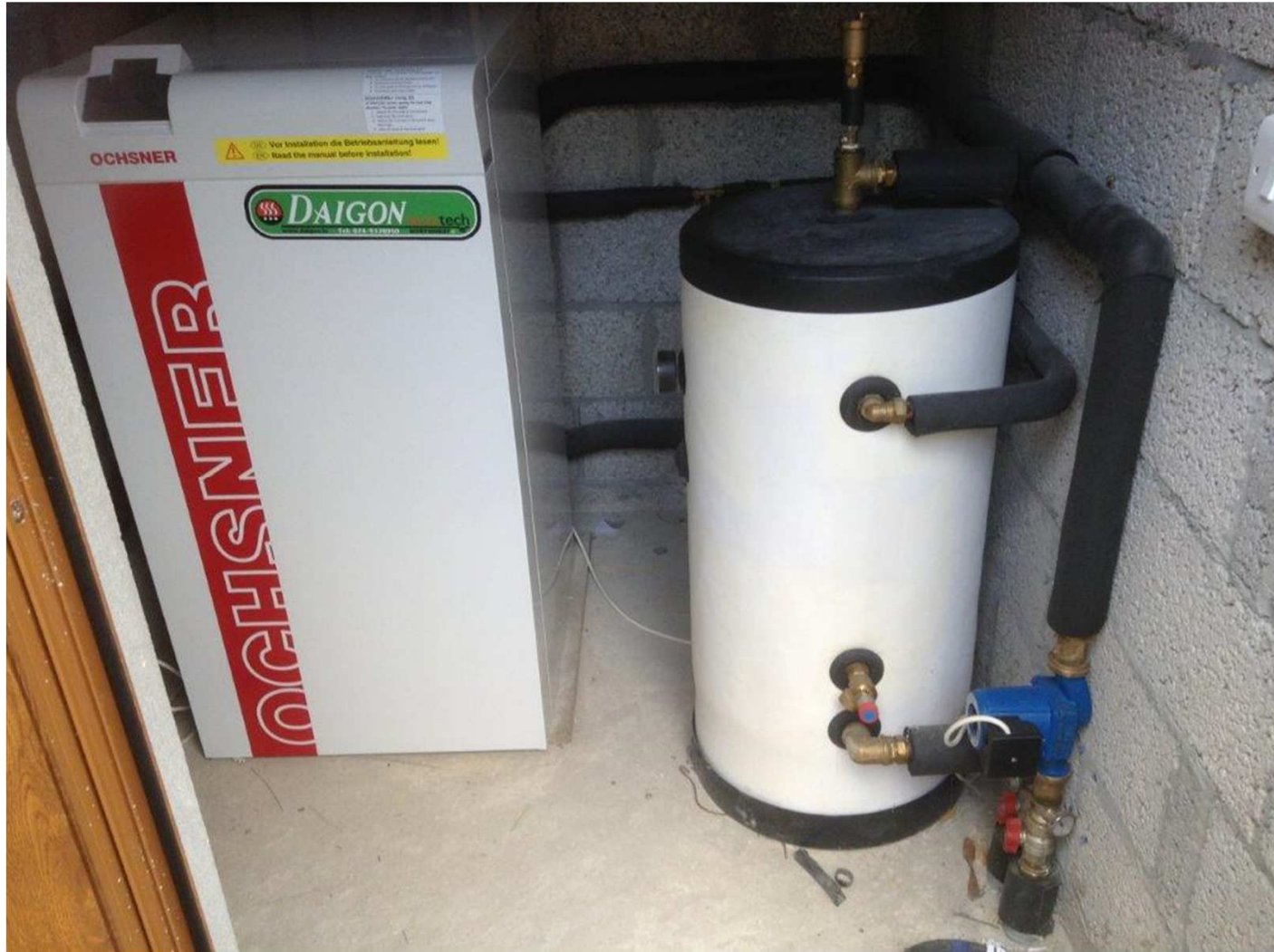
6no. 120 METER LOOPS OF
32mm COLLECTOR PIPE LAID IN
60 METER LOOPS.

50mm MDPE FLOW & RETURN
TO HEAT PUMP PLANT ROOM.

2no. 316 STAINLESS STEEL
HEADER MANIFOLDS C/W
ISOLATION VALVES AND
FLUSHING POINTS.

PRESSURE TEST OF 4bar AIR
FOR A MINIMUM OF 24 HOURS
BEFORE COVERING PIPES

COLLECTOR PIPE TO BE LAID 1
METER APART WITH 1.2
METERS OF
SCREENED CLAY COVER

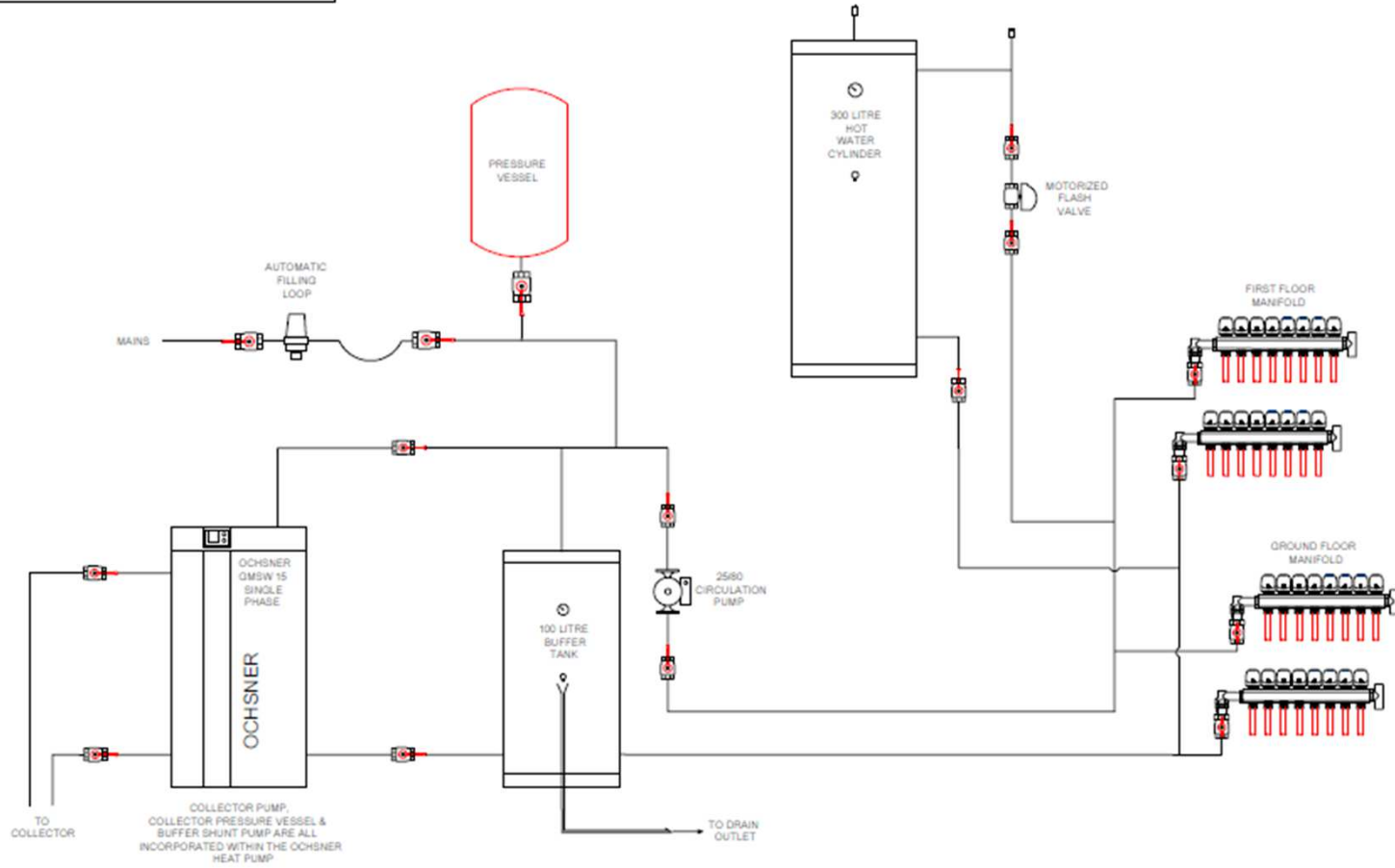


Heat Pump Type: GMSW 15 ~1/230V
Serial Number 509200691

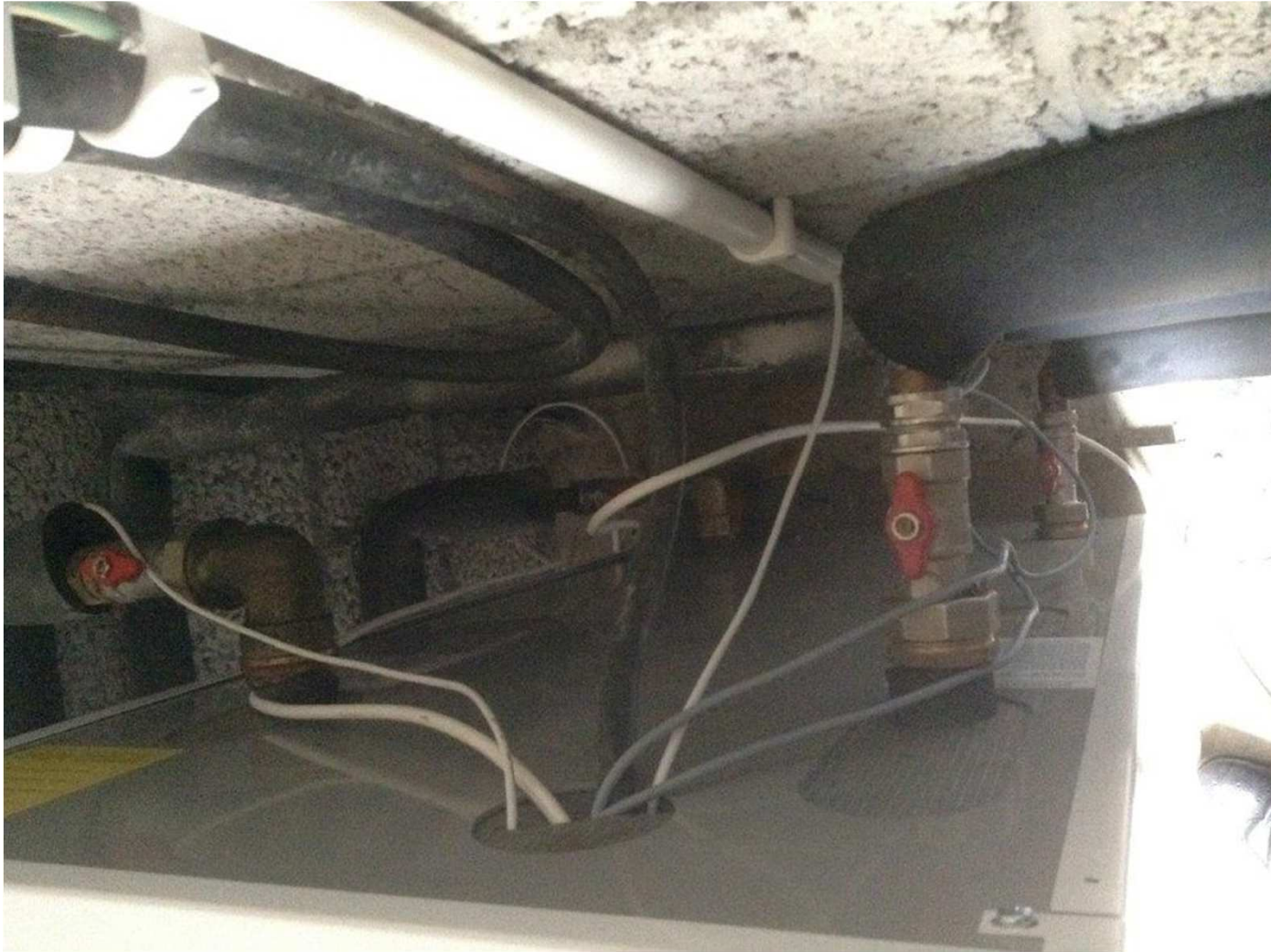


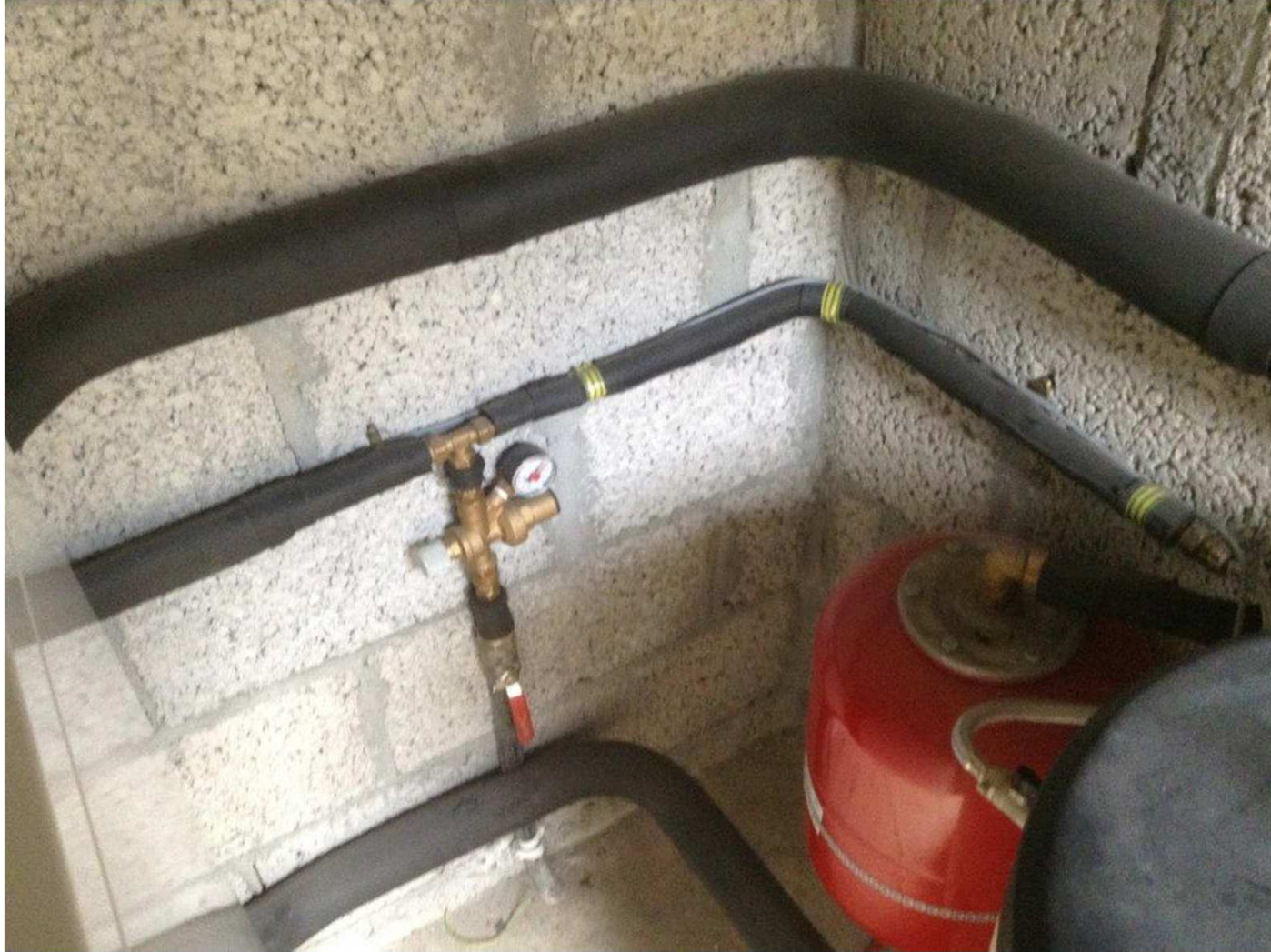
Refrigerant R407C	1,9 kg
Nominal Voltage 230V 1/N/PE 50Hz	
Heating Capacity	11,0 kW
Power Consumption	2,5 kW
Coefficient of Performance	4,4
Drawn Current/ Power Factor	13,7A/0,67 cos
Performance Data at	B0/W35
Max. Operating Current	23,5 A
Starting Current without limitation	80 A
Starting Current with limitation	40 A
Operating Range Evaporator	-5/+15 °C
Max. Operating Pressure (brine)	max. 6 bar



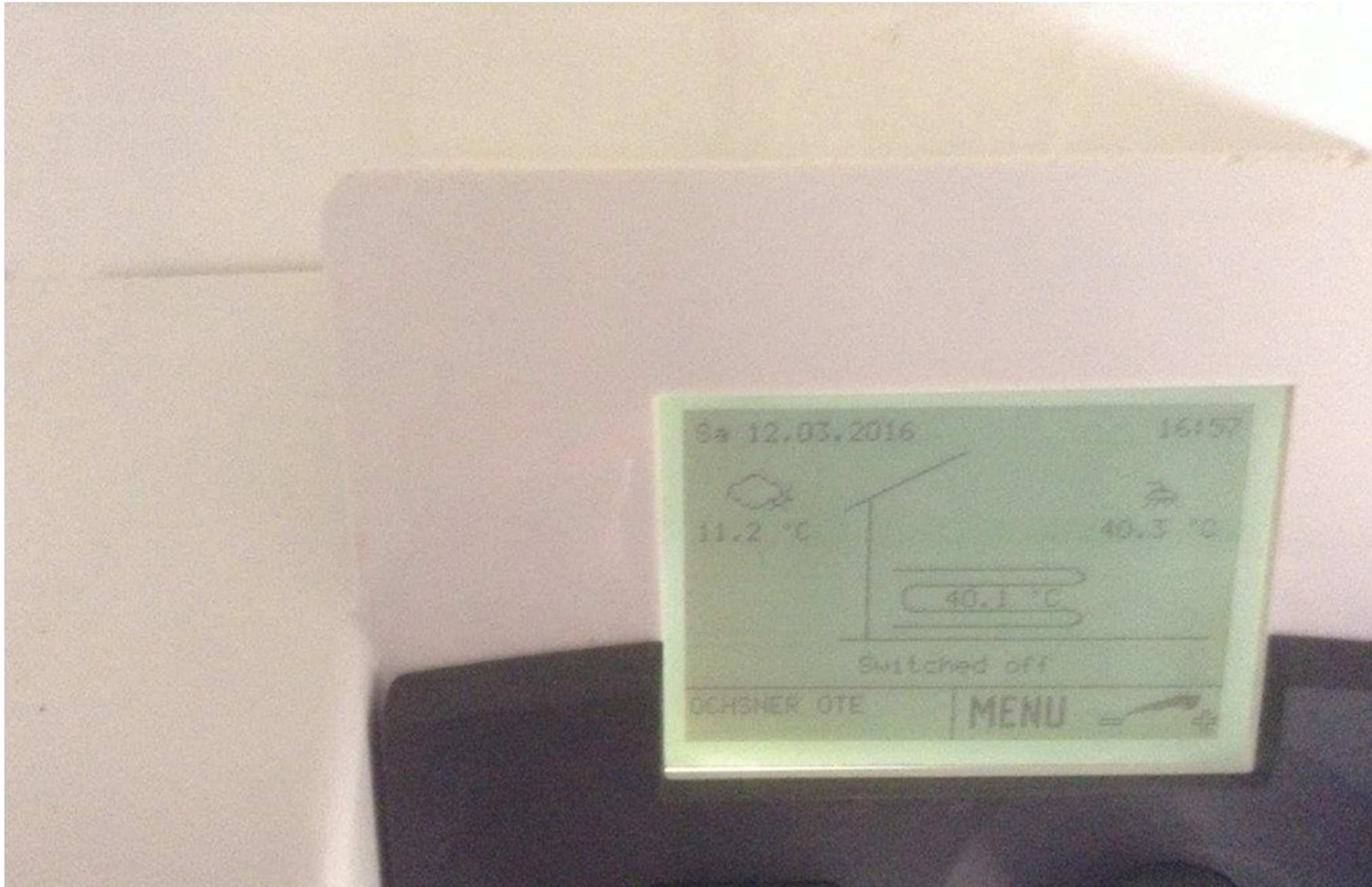














DAIGON UNDERFLOOR HEATING CONTRACTORS
 Magheramore Clonmany Co. Donegal
 Email: info@daigon.eu.com
 Web: www.daigon.eu.com

COMMISSIONING CERT. / TEST SHEET FOR HEAT PUMP OPERATION

Customer Name: Frankie Duffin
 Pump Serial No: Gucobora Co Donegal
 Certificate No: 238
 SUPER HEAT RANGE: 35.0
 SUB COOLING RANGE: 3.0
 Date: 03/12/15

COLLECTOR HEAT FLOW TEMP. TVLQ:	<u>34</u> °C
COLLECTOR HEAT RETURN TEMP. TRLO:	<u>26</u> °C
TEMP. DIFFERENCE:	<u>8</u> K
BRINE CONCENTRATION:	<u>35</u> °C
HEAT PUMP MODEL:	<u>GMSW 13</u>

DIRECT EXP. SW/BRINE	No. OF CIRCUITS:
WW/WATER	No. OF CIRCUITS: <u>6</u>
LW/AIR	EARTH-PIPE
	No. / LENGTH

TEST PRESSURE (PRESCRIBED 20BAR MAX):	<u>20</u> BAR
TESTING PERIOD (MIN 1 HOUR):	<u>20</u> MIN
VACUUM (PRESCRIBED 0.1 BAR):	<u>0.1</u> BAR
REFRIGERANT TYPE:	<u>R407</u>
QUANTITY:	<u>1.8</u> kg
EVAPORATION PRESSURE:	PVD: <u>2.3</u> BAR
EQUALS EVAPORATING TEMP:	TVD: <u>2.5</u> °C
SUCTION GAS TEMP:	TSG: <u>3.5</u> °C
OVERHEATING/SUPERHEAT (TSG-TVD):	<u>1</u> °C
CONDENSING PRESSURE:	PKD: <u>16.9</u> BAR
EQUALS CONDENSING TEMP:	TKD: <u>31.1</u> °C
LIQUID TEMP. (ABOVE RESEVIOIR):	TFL: <u>35.0</u> °C
HOT GAS TEMP:	THG: <u>39</u> °C
SUBCOOLING (TKD-TFL):	<u>1.9</u> °C

DESCRIPTION: Volts 231.1
Amps 35 @ 16.9
OK temp 5.2 °C

OPERATING MODE: SINGLE SOURCE; DUAL SOURCE. SWITCH ON TEMP: 5 °C

HEAT FLOW TEMP. TVLH: 35.1 °C
 HEAT RETURN TEMP: 30.0 °C
 TEMP DIFFERENCE ΔT: 5.1 °C

HOTWATER FLOW TEMP: _____ °C
 DHW RETURN TEMP: _____ °C
 TEMP DIFFERENCE: MAX. ΔT: _____ °C
 MAX. TEMP ACHIEVABLE: _____ °C

OCHSNER Installation Data Sheet
 U4C3/40013 P. 9

Your Order: 18780
 Our Order: AP 090873
 End User: E.T Stock 4

Installer / Systempartner:
enrotech Underfloor Heating Ltd.
 Rossalus - Castleblayney
 Co. Monaghan.
 Tel: +353(0)429749479
 Fax: +353(0)429749513
 Email: info@enrotech-heating.com
 Web: www.enrotech-heating.com

Heat Pump Type: GMSW 15 Vx Operating mode: Heating

Operating mode:	Heat Transfer:	Controller:
Intermittent	Underfloor	<input checked="" type="checkbox"/> On-Timer "CLASSIC"
Constant Parallel	2nd/3rd Heat Source	<input checked="" type="checkbox"/> On-Timer "CLASSIC PLUS"
Constant Alternative	Switch and Temperature	<input type="checkbox"/> 2nd Heat Source
Electric Heating Element		<input type="checkbox"/> Logicless mode
		<input type="checkbox"/> Failure Indicator visible

Power Supply: 230 Volt supply; 16A I23 AMP; 50 50/60 Hz; 50 50/60 Hz frequency

Test Heating Capacity: 16 kW at Outside Temperature: -1 °C
 design Heat Flow Temp: 35 °C
 Diameter pipe: _____

Hydr. Flow Split: No air/bleed; Buffer Tank; no air/bleed

Releaser Controlling: Telephone Meeter; GSM-Handy Meeter; Remote Pulse (parallel/230V); Remote Pulse (series/230V)

Room Controller: no remote control; with remote control; with LCD-display; with Type Surface

Secondary Hot Water Prod. with main HP: yes; no

by HW Meeter adapted; by Flood Pump and; by 3-way-Valve and; Electric Hot. Element 12-142 Water

CF202; by Infrared coil; by Infrared coil (up to 600 Watt & 10V); by date heat exchanger

Plate Collector:	No. of circuits: <u>6</u>	Area: <u>900</u> m²
Trench Collector:	No. of circuits:	J. Trenches: _____ m
Snake / Tap:	No. of taps:	Depth: _____ m
Min-hole yes:		Distance: _____ m

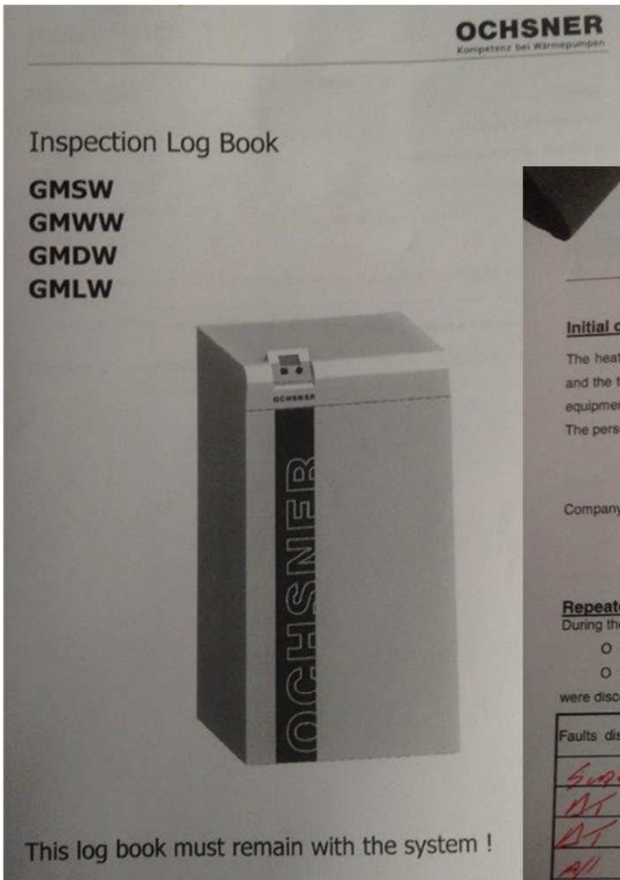
Over Expansion: min-hole yes; external valve yes

Area: _____ m²; Distance: _____ m

Water: distance HP-exposure; water Analysis result; water Analysis result; water level depth

Filter type: _____; min. Temperature water: _____ °C; anticorrosion capacity: _____

det 13.02.09



OCHSNER
Kompetenz bei Wärmepumpen

Initial commissioning:
The heat pump system was installed according to the requirements of the responsible water authority and the technical guidelines for heat pump systems and checked for the correct operation of the safety equipment. The system was handed over to the operator in proper working order on: 15/11/2010
The persons responsible for the operation and use of the heat pump system were instructed accordingly.

Company: DAIGON E.N.W. Signed: Diol M's Ganga

Repeated checks:
During the control of the heat pump system on 11/01/2011

no faults
 following faults

were discovered:

Faults discovered/ work carried out	Signed
<u>Super Heat 6.6 / subcooling 2.2. No Extra</u>	
<u>DT collector 3K @ 2.3 in GAS out in</u>	
<u>DT Heating 4.6 K @ 35°C out</u>	
<u>All sensors ok Air 6°C outside</u>	

Company: DAIGON Signed: Diol M's Ganga

OCHSNER
Kompetenz bei Wärmepumpen

Technical Data

Year of manufacture : 2009

Refrigerant : OR134a ~~NR407C~~

Filling weight : 14.9 Kg

Highest operating pressure : 27 bar

Heating rating : 11.0 kW

Pressure and seal control took place as standard production procedure according to DIN-EN 378-2

The heat pump system was checked on: 13.02.09

Company: Ochsner Wärmepumpen Signed: [Signature]

Technical Data GMSW VX					
Performance Data normal mode	GMSW7plus VX	GMSW10plus VX	GMSW 15VX	GMSW 16VX	
Heating Capacity	R0/W35	6,8	9,9	10,3	14,7
Cooling Capacity	R0/W35	5,3	7,7	7,8	11
Power Consumption	R0/W35	1,5	2,2	2,5	3,6
Coefficient of Performance	R0/W35	4,5	4,5	4,1	4,1
Drawn Current	R0/W35	7,8	11,8	13,7	20,0
Heating Capacity	R0/W50	5,9	9	9,9	13,9
Cooling Capacity	R0/W50	3,9	6,1	6,4	4,8
Power Consumption	R0/W50	2	2,9	3,5	2,9
Coefficient of Performance	R0/W50	3,0	3,1	2,8	25,2
Drawn Current	R0/W50	9,6	14,2	23,5	
Performance Data reverse mode					
Cooling Capacity	R25/W18	7,8	11	14,3	20,2
Waste heat Capacity	R25/W18	9,2	12,9	16,8	23,7
Power Consumption	R25/W18	1,4	1,9	2,5	3,5
Coefficient of Performance	R25/W18	5,6	5,8	5,7	5,8
Drawn Current	R25/W18	7,1	10,6	12,6	19,2
Compressor					
Type	Full-hermetic/Scroll				
Number	1	1	1	1	units
Power level	1	1	1	1	
Rotation speed	2900	2900	2900	2900	RpM
Max. Operating Current	12,7	19,1	23,5	23,5	A
Starting Current	50	86	80	80	A
Max. Starting Current w/ Discharge	25	43	40	40	A
Evaporator					
Type	Plate-plate Heat Exchanger				
Building Material	Stainless Steel 1.4401				
Number	1	1	1	1	units
Max. Operating Pressure (brine)	6	6	6	6	bar
Max. Operating Pressure (anti-freeze)	5	5	5	5	bar
Internal Pressure Difference	0,31	0,26	0,18	0,19	bar
Working Fluid Volume Flow Rate	2,2	2,6	2,3	3,3	m ³ /h
Working Fluid Temperature Difference	2	2,7	3	3	K
Operation Range	-5/+15	-5/+15	-5/+15	-5/+15	°C
Working Fluid	Brine max. 30%				
Rated Pressure	45	45	45	45	bar
Condenser					
Type	Plate-plate Heat Exchanger				
Building Material	Stainless Steel 1.4401				
Number	1	1	1	1	units
Max. Operating Pressure (water)	6	6	6	6	bar
Max. Operating Pressure (anti-freeze)	30	30	30	30	bar
Internal Pressure Difference	0,98	0,1	0,08	0,09	bar
Working Fluid Volume Flow Rate	1,2	1,7	1,8	2,5	m ³ /h
Working Fluid Temperature Difference	5	5	5	5	K
Operation Range	65	65	55	55	°C
Working Fluid	Water				
Rated Pressure	45	45	45	45	bar
Refrigeration Cycle					
Number of cycles	1	1	1	1	units
Refrigerant	R 407C	R 407C	R 407C	R 407C	
Amount of Fluid	1,7	1,9	1,9	2	kg
Unit Data					
Voltage/Frequency	1x230/50	1x230/50	1x230/50	1x230/50	V/Hz
Power Factor (cosine Phi)	0,83	0,81	0,79	0,79	
Fuse Protection	13	13	25	32	A
Hood Color	Cement grey RAL7030				
Housing Color	Grey/White RAL 9002				
Dimensions HxBxD [mm]	1150x400x650		1150x600x650		
Weight	115	119	138	143	kg
Anschlüsse					
Heating supply/return lines	5/4	5/4	5/4	5/4	inch
Sourceenergy supply/return lines	5/4	5/4	5/4	5/4	inch

Technical Data ground collectors						
Type	Circuits at 120m	for Type	area covered	length ¹⁾ Künette	pressure ²⁾ loss [mbar]	Volume ³⁾ [l]
SK 3	3	GMSW 6p	180-270m ²	60m	281,3	190
SK 4	4	GMSW 7p	180-270m ²	60m	218,1	260
SK 5	5	GMSW 10p	240-360m ²	80m	176,6	320
SK 6	6	GMSW 12p	360-540m ²	100m	150,8	390
SK 7	7	GMSW 15p	360-540m ²	100m	136,8	450
SK 8	8	GMSW 17p	480-720m ²	120m	116,0	520
SK 10	10	GMSW 28	480-720m ²	120m	94,6	650
SK 12	12	GMSW 33	660-990m ²	200m	82,4	780
SK 14	14	GMSW 38	660-990m ²	200m	78,6	910
SK 15	15	OSWP 46	780-1170m ²	270	60,4	970
SK 18	18	OSWP 56	960-1440m ²	330	50,5	1160
SK 25	25	OSWP 76	1260-1890m ²	250	36,8	1620
SK 30	30	OSWP 96	1500-2250m ²	450	30,8	1940

- for trench-width of 80cm
- Volume of the Brine-collector (incl. Distribution and evaporator), does not include connection fittings
- Amount of anti-freeze is 25-30% of the total volume (collector+connections)
- Pressure drop in the collector (incl. distribution) but not connection fittings

Dimensions sheet

GMSW 7 plus VX; GMSW 10 plus VX
GMWW 10 plus VX, GMWW 13 plus VX

VLH	Vorlauf Heizung/Heating Supply
RLH	Rücklauf Heizung/Heating Return
VLWW	Vorlauf Warmwasser/Hot Water Supply (Option)
RLWW	Rücklauf Warmwasser/Hot Water Return (Option)
VLO	Vorlauf Quellenergie/Source Supply
RLO	Rücklauf Quellenergie/Source Return
EA	Elektroanschluss/Wiring Connection

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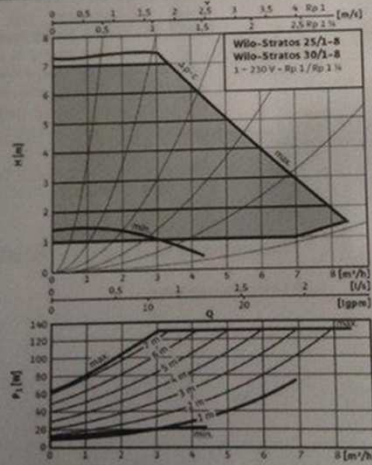
4.7.2 Heating circulation pumps GMSW

Heat pump type	Flow rate [m³/h]	Pressure drop heat pump [mWs]	Temperature difference [K]	Brine pump type	³ Factory settings [mWs]
GMSW 15 VX	1.9	0.1	5.0	Stratos Para 25/1-8	6.0
GMSW 18 VX	2.7	0.12	5.0	Stratos Para 25/1-8	5.5

4.7.3 Heating circulation pumps GMWW

Heat pump type	Flow rate [m³/h]	Pressure drop heat pump [mWs]	Temperature difference [K]	Brine pump type	Factory settings [mWs]
GMWW 15 VX	2.5	0.12	5.0	Stratos Para 25/1-8	5.5
GMWW 18 VX	3.3	0.17	5.0	Stratos Para 25/1-8	5.0

4.7.4 Duty graphs high efficient pump



³ mWs = pressure drop. conversion: kPa = mWs * 9.81

4.7 Adjustment values of High-Efficiency pumps

4.7.1 Brine circulation pumps

Using Ethylene glycol and turbulent flow, following adjustments are to be made to the brine circulation pump. The brine pumps are dimensioned at followed conditions:

- 25 % Ethylene glycol
- Brine temperature -2°C

Heat pump type	Flow rate [m³/h]	Pressure drop heat pump [mWs]	Temperature difference [K]	Brine pump type	² Factory settings [mWs]
GMSW 15 VX	3.5	0.26	2.2	Stratos Para 25/1-8	5.0
GMSW 18 VX	3.8	0.26	2.9	Stratos Para 25/1-8	4.0

Table. 1: Chart with brine pump settings



The factory setting of the pressure drop has to be compared with the total pressure drop of the heat source pipework/installation: The total pressure drop is made up of:

- 1.) internal pressure drop of the heat pump. see table 1
- 2.) pressure drop of the heat source pipework. The factory setting assumes a pressure drop of 2 mWs. The settings must be examined, and adapted if necessary

Otherwise, no guarantee or warranty claims will be recognised.

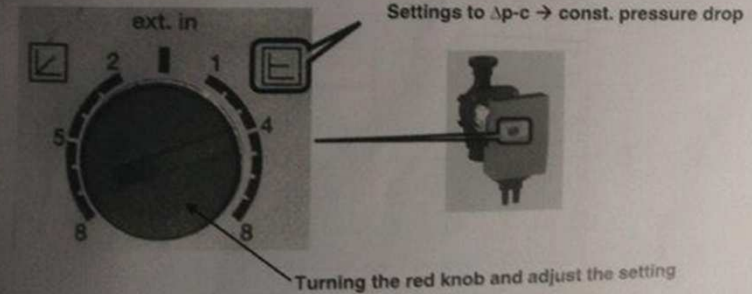


Fig. 3: Setting the pressure drop



The Geothermal Association of Ireland
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Dunlewey