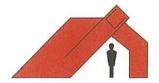


WORKING ENVIRONMENTS LTD

Monza House, Unit 4, Third Avenue, Southampton SO15 OLD Tel: 023 8070 3344 email: enquiries@workingenvironments.co.uk Fax: 023 8070 2679

TECHNICAL SUBMITTAL

Technical submittal no:	M009		Revision	no:	Α				
Contract: 277A GRAY'S INN	N ROAD, KINGS CRO	oss	Contract	: no:	CE7494				
Date: 16 NOVEMBER 20	016								
Equipment: COMBINED HEAT	AND POWER (CHP)							
General description of equipment of	offered for technica	l approval:							
CHP to the basement plantroom.									
 Rev A note: In accordance with XCO2's comments on our previous technical submittal, we can confirm the following points: The quantity and model number of the CHP is detailed within our schedule enclosed Heat loss and hot water calculations have been issued under our design technical submittals (DFM002) The system will be complete with a Flow Master as identified in the manufacturer's data sheets below, the pipework is also as per the sizes identified on the schematic diagram below in accordance with the manufacturer's requirements. Hence, no additional Hydraulic Calculations shall be provided. The CHP shall be incorporated in to our co-ordinated plantroom drawing with appropriate access requirements The manufacturer has reviewed the information provided and comments incorporated The appropriate fittings and valves will be used as per the manufacturer's recommendations The installation will be as per the manufacturer's recommendations The SAV unit is compliant with the XCO2 specification The proposed SAV unit is compliant and the manufacturer is listed within the specification schedule of authorised mechanical manufacturers 									
Drawing Ref N/A	urers	Specification ref and pages:	XCO2 19/02/16	Specification 5.	Rev T2,				
Documentation issued: 1. XCO2 Comments on previous tec 2. CHP schedule 3. Data sheet, drawings and schema		(1 page) (1 page) (19 pages)							
Signed for Working Environments		Date reply required:	30 NOVEMBE	R 2016					
Response									
Approved / not approved									
Comments: Signed:	On behalf of:		Date:						



WORKING ENVIRONMENTS LTD

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TECHNICAL SUBMITTAL

Technical submittal no:	M009		Revision no:			
Contract: 227A GRAY'S INI	N ROAD, KINGS CRO	oss	Contract no:	CE7494		
Date: 8 AUGUST 2016						
Equipment: COMBINED HEAT	& POWER (CHP)					
General description of equipment of	offered for technica	l approval:				
СНР.						
,						
Drawing ref: N/A		Specification ref and pages:	N/A			
Documentation issued:						
Data sheet, drawings and so	chematic (1	9 pages)				
a .				in the		
Signed for Working Environments		Date reply required:	17 AUGUST 2016			
Response						
Approved / not approved S	TATUS B - COMN	IENT AS NOTED				
Comments:						
 SPECIFY TOTAL NUMBER AND HEAT LOSS AND HOT WATER 	CALCULATIONS TO		S.			
3. HYDRAULIC CALCULATIONS T 4. OVERALL DIMENSIONS TO BE	CHECKED ON PLA					
5. MANUFACTURER TO REVIEW INCORPORATED.						
6. COMPATIBLE FITTING AND VA REQUIREMENTS.				ERS		
7. INSTALLATION TO CONFORM 8. ENSURE PROPOSAL IS FULLY	COMPLIANT WITH	SPECIFICATIONS		-D		
9. APPROVED MANUFACTURER ALTERNATIVE.	O DANI, PROVIDE	COST SAVING TO	CLIENT FOR PROPOSE	-U		
Signed: RC	On behalf of: XC	02	Date: 26/08/2016			

	The state of the s	
Working Environments Limited	SCHEDULE OF CHP	Sheet 1 of 1
Project: Grays Inn Road	Project No. C7494	Revision No. P1
Prepared by: M Townsend	Document No. C7494/MC17	Revision Date: TBC
Checked by: WEL		Approved by: AW/RH

The following schedule is based on equipment manufactured by SAV Limited

ipment manutactured by SAV Limited	Specification	CHP 01	1 no. XRGi 20G Load Tracker	Floor Mounted	38.7kW @ 80/50 ^O C (63.4%)	20kW (32.7%)	61.1kW	32mm	20mm	80mm dia. Internal	400V/50HZ/3Ph	49 dba @ 1m		1250mm	750mm	1200mm	750kg Each					
I ne following schedule is based on equipment manufactured by SAV Limited	Description		Model Ref	Mounting	Heat Output	Electrical Output	Gas Input Rate	Flow & Return Connections	Gas Connection	Flue Gas Discharge	Electrical Supply	Noise Output	Dimensions	Casing Height	Casing Width	Casing Depth	Weight (Dry)					



SAV United Kingdom Ltd.

Scandia House, Boundary Road, Woking, Surrey GU21 5BX Telephone: 01483 771 910 Telefax: 01483 227 519

E-mail: info@sav-systems.com Website: www.sav-systems.com

Registered in England No. 513621 VAT Registration No GB 765 3333 24

Technical Submission for:

Working Environments 27th July 2016

Jamie Sach

SAV CHP Engines

Project Location:

Grays Inn Road

Project Consulting Engineers:

XC02

Prepared by:

Ian Green on behalf of SAV UK Ltd

INTRODUCTION

This document provides all relevant technical data in support of products to be supplied /supplied for installation at **Grays Inn Road**

Documents include

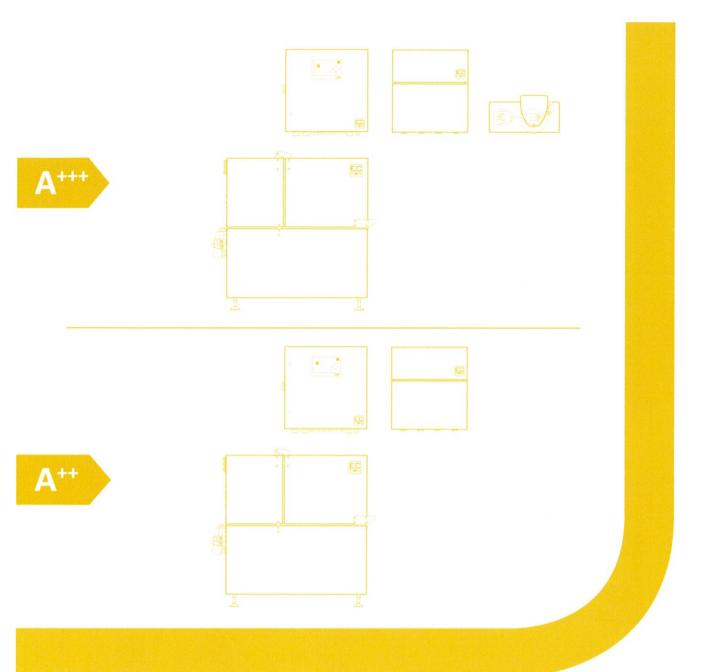
Data sheet for the CHP Engine Drawings and Schematics

Technical Data

Generic Brochures containing technical data, which are part of this document, are submitted separately for:

XRGI20G CHP engine

- · Data sheet of the 20G Engine
- Schematic of the proposed method of installation
- Dimensional drawings
- Electrical connection drawings
- · G59 drawing
- Drawing of the thermal stores
- Details on the warranty and service costs







TECHNICAL DATA FOR THE XRGI® 20

Product data sheet in accordance with Regulation (EU) No. 811/2013, Dated 26.09.2015









The XRGI® is a combined heat and power plant (CHP) that works on the principle of cogeneration.

An XRGI® system consists of three main components – the Power Unit, Q-Heat Distributor and the iQ-Control Panel. In a package with a Flow Master (temperature controll, class II = 2 %) the XRGI® is rated as seasonal space heating energy efficiency class A^{+++} .

In addition, you can also extend your XRGI® system with a storage tank with a capacity of 500, 800 or 1,000 litres for optimum operation.

ORDERING DATA

Supplier's name or trademark

Supplier's model identifier

Article number

Modules

EC POWER

XRGI° 20 without condensing technology¹

X200001

Power Unit, iQ20-Control Panel, Q80-Heat Distributor

XRGI* 20 with condensing technology¹

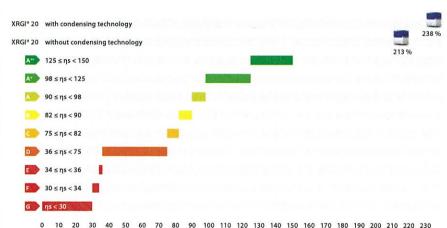
X200001+01KIT2616

Power Unit, iQ20-Control Panel, Q80-Heat Distributor + Condensing and exhaust gas heat exchanger kit

ErP-LABEL DATA²

Seasonal space heating energy efficient class	СУ	A ⁺⁺	A ⁺⁺
Rated heat output	Prated	39 kW	42 kW
Seasonal space heating energy efficiend Hs	cy;	213 %	238 %
Sound power level, indoors	Lwa	63 dB	63 dB
Electrical efficiency; in accordance with heating value Hi	Nel CHP100+SUP 0	33 %	33 %
All special precautions to be taken during installation or service	ng assembly,	Refer to Commissioning and Service Manual	Refer to Commissioning and Service Manual
¹ Return temperatures as per EN 50465 2015 7.6.1; v ² The values were rounded in accordance with the rec			



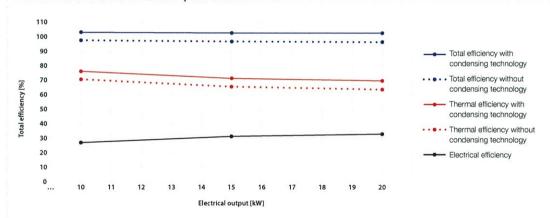


Seasonal space heating energy efficiency Hs [%]

OUTPUT	XRGI® system			GI* 20 withonsing technology		XRGI* 20 with condensing technology ¹			
	Power modulation*			50 %	75 %	100 %	50 %	75 %	100 %
	Electrical output, modu	ulating*	kW	10.0	15.0	20.0	10.0	15.0	20.0
	Thermal output, modul	ating*	kW	26.1	31.4	38.7	28.1	34.2	42.2
	Power consumption, g	as in accordance with Hi	kW	37.1	48.1	61.1	37.0	48.0	60.8
	Electrical own demand	, production	kW	0.078	0.078	0.078	0.083	0.082	0.081
	Electrical own demand, stand-by				0.025		0.025		
EFFICIENCIES	Power modulation*			50 %	75 %	100 %	50 %	75 %	100 %
& OPERATING	Electrical efficiency	in accordance with Hi	%	26.9	31.1	32.7	26.9	31.2	32.9
PARAMETERS	Thermal efficiency	in accordance with Hi	%	70.4	65.4	63.4	76.0	71.2	69.4
	Total efficiency	in accordance with Hi	%	97.3	96.5	96.1	102.9	102.4	102.3
	Seasonal space heating in operating mode ^{2,3}	g energy efficiency Naon	%		217			242	

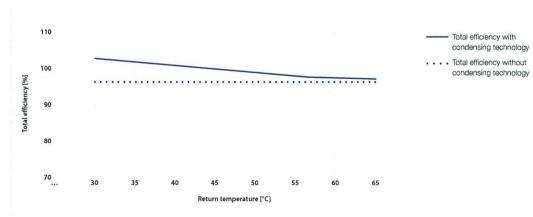
POWER MODULATION

Continuous modulation of 10 - 20 kW in power-controlled mode



TOTAL EFFICIENCY AT FULL LOAD

XRGI® 20 total efficiency / return temperature



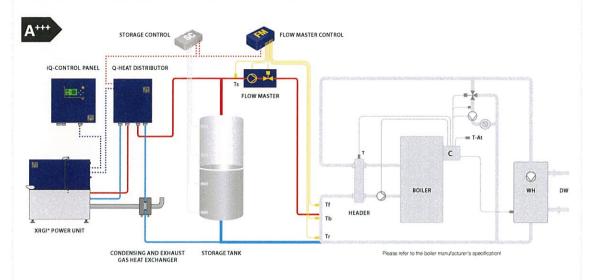
^{*} Continuous modulation in power-controlled mode

Return temperatures as per EN 50465 2015 7.6.1: Without condensing technology 47 °C, with condensing technology 30 °C.

² Based on the values measured by the Danish Gas technology Center and accredited independent third-party organisations.
³ Efficiency at rated heat output as per the delegated Commission Regulation (EU) No. 811/2013

HYDRAULIC INTEGRATION

Principle circuit diagram: Series circuit with injection - boiler with header



More principle circuit diagrams and information can be found in the EC POWER "Hydraulic Solutions".

If products from other companies are used in the system in addition to EC Power products, EC POWER assumes no liability for the accuracy of the energy efficiency class calculation for the entire system.

XRGI* system		XRGI* 20 without condensing technology ¹	XRGI* 20 with condensing technology ¹	
Flow temperature, constant	°C	~ 85	~ 85	
Return temperature, variable	°C	5-75	5-75	

FUELS

Natural gas (all qualities), propane, butane	yes	yes

EXHAUST GAS

Power modulation			50 %	75 %	100 %	50 %	75 %	100 %
Max. exhaust gas temperature		°C	w	2	120	2	-	90
Condensate		kg/h	3.50	-		3.1	3.5	3.7
Emissions	CO < 50	mg/Nm³	(7)	-	15		1.5	26
(test data)	NOx < 100	mg/Nm³	-	-	18		-	10

SOUND

Condensate		kg/h	-	-	-	3.1	3.5	3.7
Emissions	CO < 50	mg/Nm ³	-	5	15		1.7	26
(test data)	NOx < 100	mg/Nm ³	-	-	18	-	-	10

49

dB(A)

POWER CONNECTION

Voltage, 3 phases + N + Earth	V	400	
Frequency	Hz	50	

SERVICE

Service interval (operating hours)	Hours	6,000	
------------------------------------	-------	-------	--

DIMENSIONS AND WEIGHT

		XRGI" 20 Power Unit	Q80-Heat Distributor	iQ20-Control Panel
Dimensions, W x H x D	mm	750 x 1,170 x 1,250	550 x 600 x 295	600 x 600 x 210
Footprint	m^2	0.93	wall mounted	wall mounted
Weight	kg	750	44	40

All values are net and have been certified by an independent inspection body. Wellerance ± 5 %. Specifications subject to change without notice.

Sound pressure level at a distance of up to 1 m

(based on surroundings)

TECHNICAL DATA FOR THE XRGI® 20 WITH FLOW MASTER

(Temperature control, Class II = 2 %)

Product data sheet in accordance with Regulation (EU) No. 811/2013, Dated 26.09.2015















Figure shows FM type 350





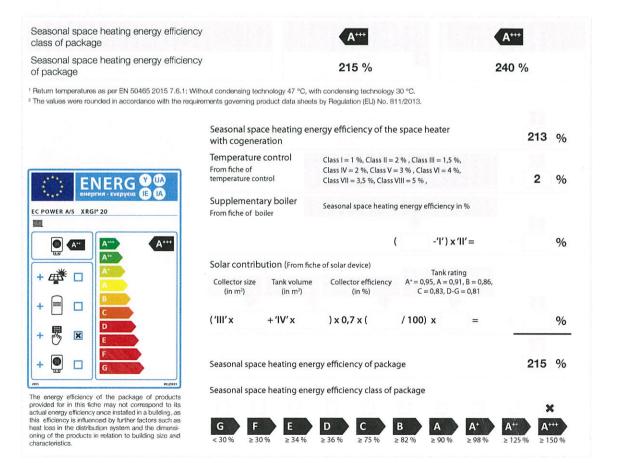
The Flow Master including Flow Master Control regulates the supply of heat from the XRGI® and from the storage tank to the consumer network. This technology enables a significantly higher heat output to be temporarily made available to the consumer side. This allows peaks of heat demand to be handled by the XRGI®, thereby extending its service life and increasing electricity production.

The 4 models can deliver a heat output of 50, 150, 250 or 350 at a ΔT of 20 K.

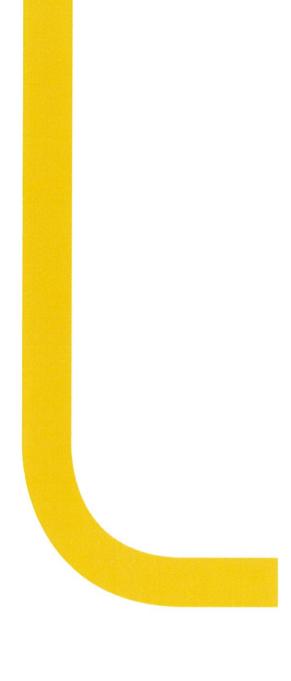
ORDERING DATA

Supplier's name or trademark		EC POWER			
Supplier's model identifier	XRGI* 20 condensing			20 with g technology ¹	
Article number	X200	0001	X200001+	+01KIT2616	
Modules		Power Unit, iQ20-Control Panel, Q80-Heat Distributor		Power Unit, iQ20-Control Panel, Q80-Heat Distributor + Condensing and exhaust gas heat exchanger kit	
Supplier's model identifier	Flo	Flow Master including Flow Master Control			
FM-type (Temperature control, Class II = 2 %)	FM 50	FM 150	FM 250	FM 350	
Article number	17D1130	17D1131	17D1132	17D1133	

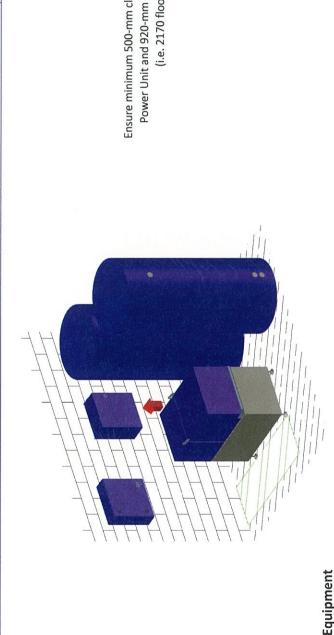
ErP-LABEL DATA²



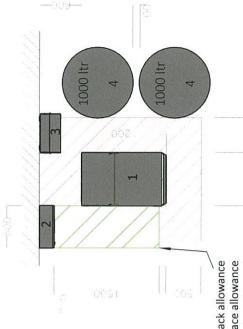








Ensure minimum 500-mm clearance in front of CHP Power Unit and 920-mm above for maintenance (i.e. 2170 floor to open lid clearance)



Space reserved for throw back allowance (installer to ensure space allowance

A minimum of 250 mm clearance between the back of the power unit

max. 10 m from heat distributor to storage vessel max. 1.5 m from power unit to heat distributor

max. 10 m from heat distributor to the main

and the flue is required for maintenance. Please allow for suitable

horizontal flue pieces before any vertical flue sections.

The Q80 must be fitted at least 1250mm from the floor (higher

than the power unit).

CHP system components should be located in close proximity to each

H 2300 Ø 990

Thermal Storage Vessel

Q80 Heat Distributor **CHP Control Panel CHP Power Unit**

4 3 7 1

(750 kg) (40 kg) (44 kg) (1133 kg)

other. Recommended lengths for mechanical connections are as

follows:

H 1250 D 1200 W 750 H 600 D 210 W 600 H 600 D 295 W 550 conforms to latest electrical regulations)

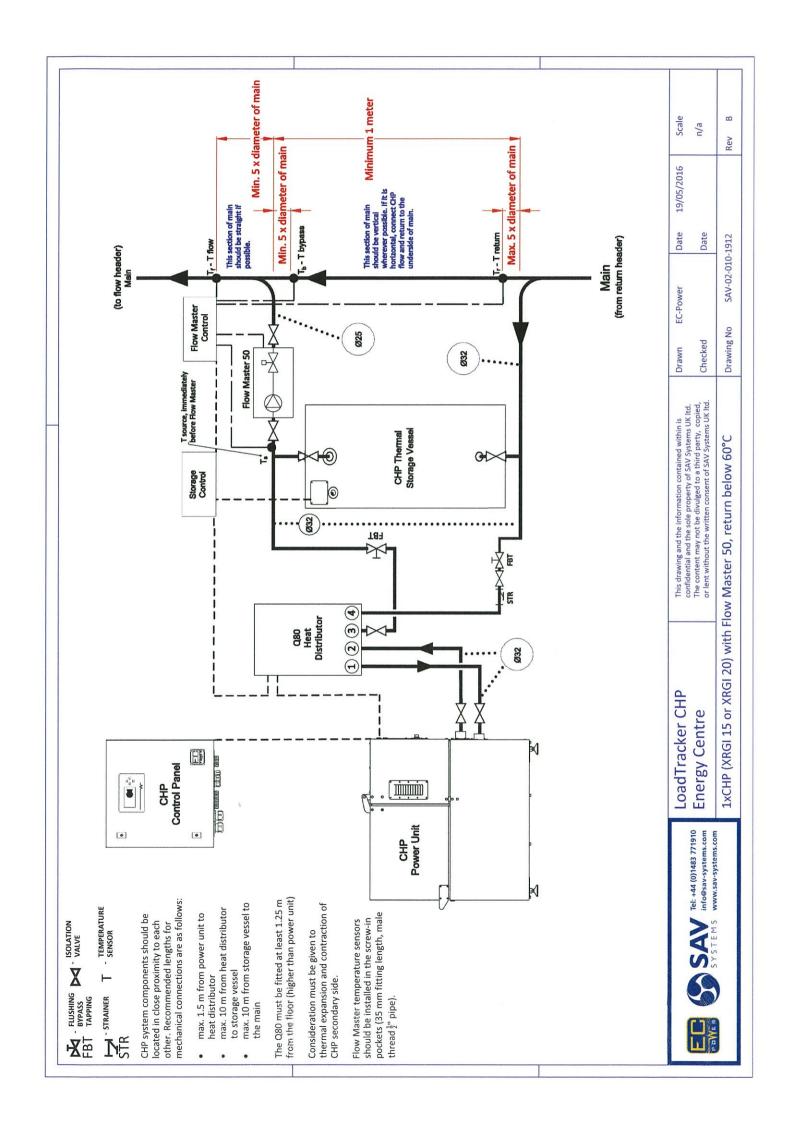
SYSTEMS www.sav-systems.com

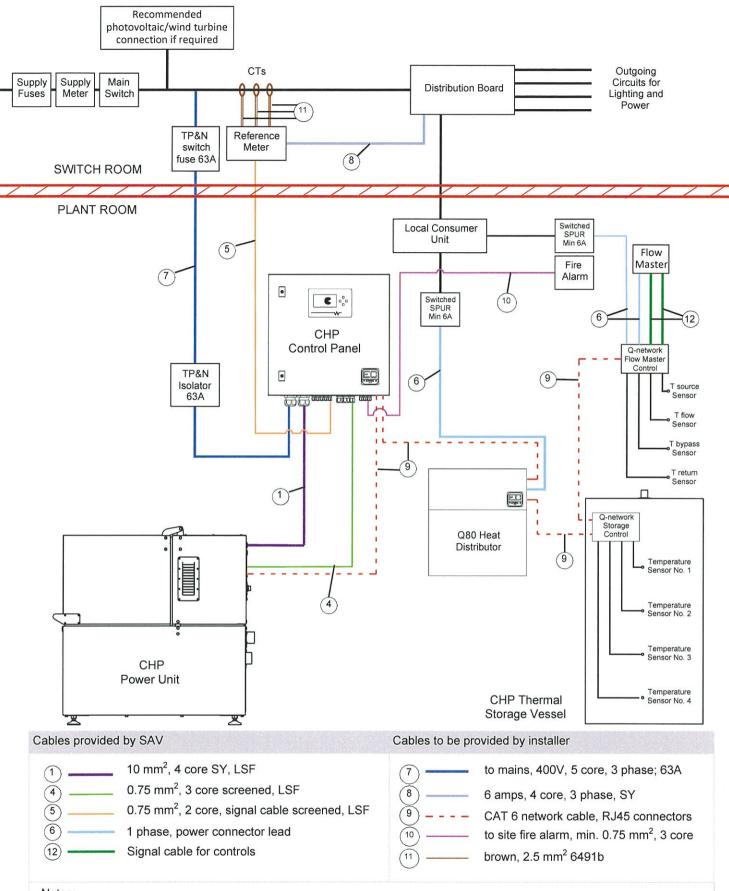
LoadTracker CHP **Energy Centre** 1 x XRGI 15 or XRGI 20 with 2 x 1000 ltr thermal storage vessel

This drawing and the information contained within is Rocinfential and the sole property of SAV Systems UK Ind. The content may not be divulged to a third party, copied, or lent without the written consent of SAV Systems UK Ind.

Rev 22/09/2015 Date Date SAV-01-010-2094 JWHH **Drawing No** Checked Drawn

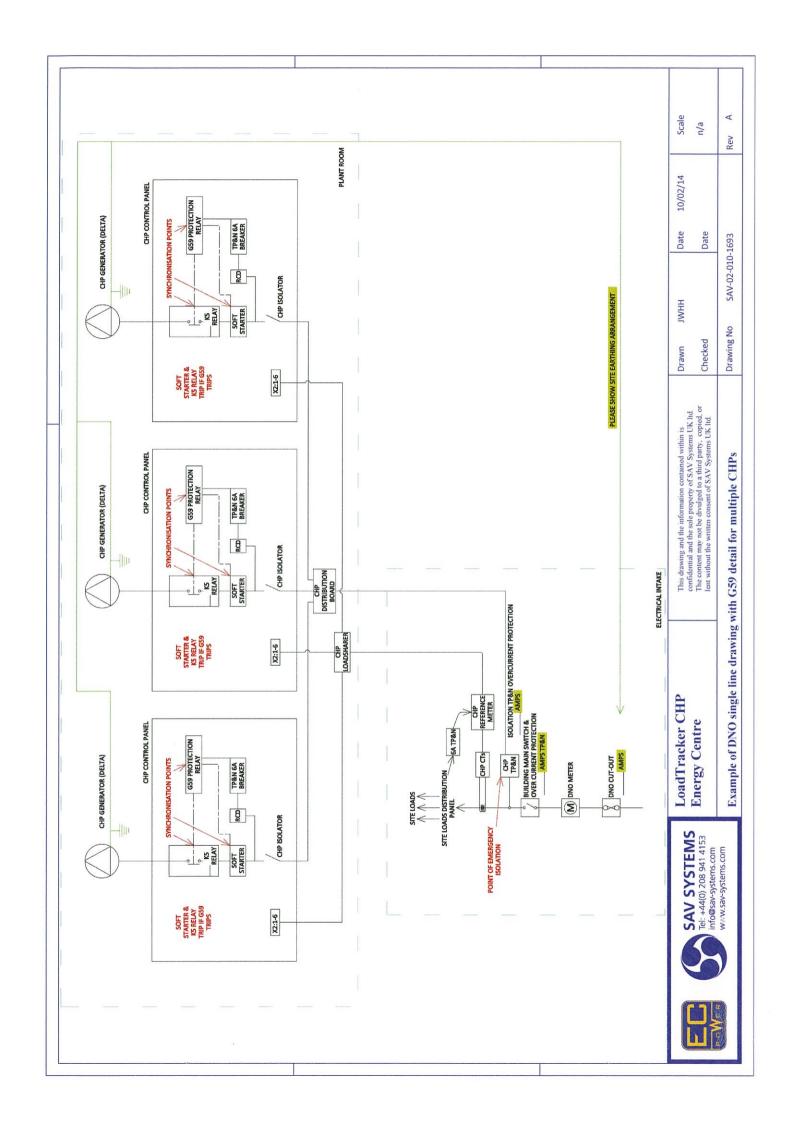
Scale





Notes:

- 1. The supply to the CHP must be taken from a point after the main switch fuse but before the CTs and distribution boards.
- 2. If using a panel board, the panel manufacturer must be informed at the planning stage to allow sufficient room for the CTs.
- 3. Standard CTs supplied by SAV are rated at 300 amps. Larger CTs (up to 2000 amps) are available on request.
- 4. If the incoming supply is higher than 2000 amps, the reference meter and CTs can be dispensed with.



Exhaust gases characteristics

	Temperature (max.)	Mass flow rate	Volumetric flow	
XRGI 6	100°C	40 kg/h (= 11.2 g/s)	44 m³/h (= 12 l/s)	
XRGI 9	100°C	39 kg/h (= 10.8 g/s)	42 m ³ /h (= 12 l/s)	
XRGI 15	120°C	95 kg/h (= 26.4 g/s)	109 m ³ /h (= 30 l/s)	
XRGI 20	120°C	80 kg/h (= 22.2 g/s)	92 m³/h (= 26 l/s)	

Table 1: LoadTracker CHP systems exhaust gases characteristics (operating on natural gas)

Flue system and ventilation requirements for LoadTracker CHP

Back pressure limits

The back pressure of flue system should not exceed 100 mm water (= 10 mbar, or 1 kPa). Under normal operation, the power unit will switch off at about 200 mm but to keep proper margin flue system should be designed for < 100 mm.

During the engine start up, there is a very short pressure peak of up to 5 kPa (50 mbar), so LoadTracker CHP systems require H1 class flue. This is a pressure tightness class of up to 5 kPa.

There are no limits to the length of the flue system as long as back pressure is kept low and the flue diameter is large enough.

Due to the temperature of the flue gases, it is not uncommon for a considerable amount of condensate to collect in the flue. It is essential that a condensate collector (trap and drain) is installed to prevent running difficulties as water may blow out when the engine starts, especially with long flue runs and higher back pressures.

Flue connection to LoadTracker CHP power unit

The CHP power unit has a 60mm diameter exhaust gas connection. A stainless steel flue connection kit is supplied with each LoadTracker CHP - as it is shown in Figure 1 below.

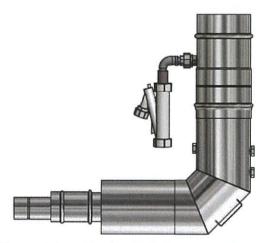


Figure 1: LoadTracker CHP flue connection kit

The last part of the flue connection kit is the vertical condensate collector piece as shown in Figure 2. It is a double wall stainless steel part, with 32 mm heat insulation, 80 mm internal diameter/145 mm external diameter.





Figure 2: Condensate collector (the drawing and the photo with the insulation and stainless band)

An installer can use flue system from the manufacturer of their choice. Only an approved flue meeting CHP requirements can be used.

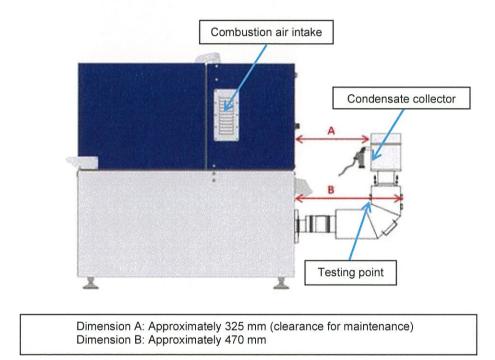


Figure 3: LoadTracker CHP flue connection kit as installed on the power unit

Flue systems for multiple LoadTracker CHP units

Multi-system installation can have flue systems from all CHP units joined together.

It is not recommended to join the CHP(s) flue with a boiler flue.

Guidance on flue installation can be found in Gas Utilization Procedures IGE/UP/3 Edition 2 "Gas fuelled spark ignition and dual fuel engines" and IGE/UP/10 Edition 3 "Installation of flued gas appliances in industrial and commercial premises".

Flue terminations

Flue terminations must comply with the current building regulations and local authority requirements.

Ventilation requirements

The LoadTracker CHP takes its combustion air from within the plant room. XRGI 6 / XRGI 9 units require a minimum air intake of 800 litres/minute and XRGI 15 / XRGI 20 units require 1650 litres/minute.

The ventilation provisions need to be calculated in accordance to British Standards (BS) 6644:2011 for non-domestic installations.

The high and low level ventilation should be direct to outside air on the same wall. The vertical distance between high and low level ventilation should be as great as possible to achieve convection airflow.

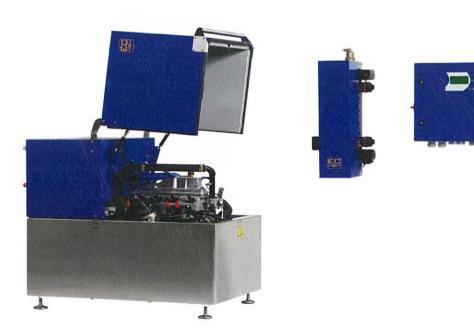


Sole UK Distributors of EC Power Denmark Products



XRGI 20G Load Tracker CHP Energy Centre Warranty & Service Document

Dated 18 September 2014



18 September 2014

XRGI 20G Load Tracker CHP Energy Centre WARRANTY

- SAV Systems warranty for LoadTracker CHP is for a period of 24 months commencing from the date of commissioning, or 90 days from the date of delivery, whichever is the earlier.
- The warranty covers the cost of parts and labour to make good any CHP related breakdown or failure of the CHP equipment which result from defects in manufacture.
- Should servicing or repairs to the equipment be carried out during the warranty period through an agreement *other than that* between the customer and SAV Systems, the warranty would no longer apply.

WATCHMAN Automatic Monitoring & Service Cover UK Price List

CONTINUING CHP MAINTENANCE

Once outside the 24 month warranty period, *Watchman Automatic Monitoring* and *Service Cover* ensures continuing rapid access to spares and specialist labour. Parts and labour for such incidents to be invoiced as and when incurred.

Servicing of a XRGI 20G power unit should be carried out either:

- a) Each time the power unit clocks up 6,000 running hours (equivalent to approximately 12 months operational running 24/7)

 Or
- b) A calendar back stop of 2 years has elapsed since the previous service. Annual Gas Safe certification of the CHP will be required if the CHP service falls into this category.
- Professional Manufacturers scheduled service of the CHP comprising of an oil change (the sump contains 40 litres, thus allowing long intervals between services), cleaning of strainers, replacement of Oil & Air filters / Spark plugs and the safe disposal of all used items. A CHP system Health Check will also be carried out as part of the service. Also included is the cost of service parts, labour and travelling within the UK.

- Gas Safe certification checks on the CHP will be carried out, including checking of emission levels, setting up the CHP engine, and the issue of a CHP Gas Safe certificate, upon completion.
- For multi-unit installations, it should be noted that site electrical demand is
 distributed approximately equally between all units by the CHP load-sharer
 device. This means that all units at any multi-unit installation should reach the
 6,000 hour threshold at around the same time. Arrangements for servicing
 should therefore be simplified.
- SAV Systems maintain a database of all EC Power CHP installations in the UK and ROI. This database includes the automatic counter for operating hours by each unit. When the counter for a XRGI 20G CHP unit gets to 5,500 hours from first start or previous service, e-mail notification of this event will be sent by SAV Systems to the client's nominated contact. This is to enable timely arrangements to be made for the next service visit.
- XRGI 20 CHP units should not normally continue operation beyond a service interval of 6,000 hours, or 2 years' calendar service, from commission.
- Should operation of a XRGI 20G CHP unit from initial commissioning continue beyond the first 6,000 hours, SAV Systems would not consider itself bound by any subsequent warranty claim.
- Gas certification. Although Gas Safe certification is an integral part of the
 initial CHP commissioning, please note that it is a legal requirement check
 due at the 12 month anniversary date from the initial commission, or the last
 service carried out. SAV can carry out this annual check, to keep certification
 in line with Gas Safe requirements.

Please see over for CHP service costing's.

CHP XRGI 20G Service Tariffs

XRGI 20G CHP Power Unit Maintenance Service Tariff

XRGI 20G CHP unit:

£1675.00 per CHP

- CHP professionally serviced iaw the manufacturers schedule using manufacturer's genuine service replacement components.
- Gas Safe checks carried out on CHP equipment.
- Gas Safe certification issued upon completion.
- · Prices are valid for 3 months from Quote date

(The service excludes the replacement of any component parts found defective during the service, unless the CHP unit is still within the manufacturer's warranty period, and the fault is not caused by an external issue)



Registration 543636