

Installation, Operation and Maintenance Instructions



KWK-EG (43-404) combined heat and power plant.

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1. An Introduction to Hoval Combined Heat and Power

1.1. Foreword

These instructions have been written to give a brief description of the KWK-EG (43-404) combined heat and power plant (CHP plant), their installation, commissioning, operation and subsequent preventative maintenance.

The installation of CHP plant and their ancillary equipment is normally carried out by a competent Engineer, and for the purpose of this manual they are regarded as the installer, and, as such, it is their responsibility to ensure that they have read and understood the contents of this manual before installing and operating the CHP plant. As the manufacturer, Hoval cannot accept any responsibility for any damage, faults or injuries caused by non compliance with this published document.

A copy of this manual must be available on site at all times as the operating personnel will need to be able to reference it as quickly as possible. It is imperative that this manual has been read and understood before operating the CHP plant.

Hoval, or Hoval approved Engineers will commission the CHP plant. It is essential that the installer and the operator of the CHP plant are present at the commissioning handover as they can then be instructed on the day-to-day use and operation of the CHP plant. If this is not possible, or additional training is required, a further site visit can be arranged through Hoval.

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1.2. Introduction

A Hoval combined heat and power plant consists of a gas fuelled internal combustion engine coupled to a three-phase synchronous generator. With the CHP plant it is designed that both the electricity and heat generated are utilised resulting in high efficiencies, much more efficient than a typical fossil fuel power station.

Hoval CHP plant is generally supplied skid mounted and housed within a sound reduction capsule for installation into a suitable building plant room. Alternatively the CHP plant can be supplied within a complete packaged plant room for external siting.

The CHP plant has highly sophisticated controls as it is responsible for the fully automatic operation of the plant. In addition to controlling the engine and monitoring all of its values, the controls are also responsible for the synchronisation of the generator to the grid and the dissipation of heat from the engine to the connected heating circuit. The emissions from the exhaust system are measured and tightly controlled to their set values. If necessary the Hoval CHP plant can be equipped to be back-up power generation should the electrical power from the mains fail. Should this be required, Hoval Technical should be contacted for assistance.

The controls from the CHP plant are from Noris Automation GmbH which are all interfaced from one central hub that can be interrogated by the touch-screen interface. Many different external interfaces can be configured, however these need to be confirmed at time of order as they may result in hardware changes. These interfaces can be either read from a master controls system or over other media such as the internet. Remote control such as the internet interface can be used to quickly rectify faults caused by changing operating conditions.

2. Safety Information

2.1. Safety Information Introduction

The CHP plant is manufactured to a very high level to ensure that it complies with all safety requirements and regulations. However, due to the nature of the equipment dangers are present and these may pose a risk if it is operated improperly or by untrained personnel.

The operator on site is responsible to ensure that only trained and authorised personnel can enter, operate and maintain the CHP plant.

Safety must never be compromised when operating or maintaining the CHP plant.

The operator on site should inspect the plant on a daily basis for any signs of damage or defects and report them immediately.

Any unauthorised modifications are prohibited as this may affect safety and correct functionality of the plant.

Before work commences for example on a preventative maintenance or break-down visit the controls must be locked off against an inadvertent start-up.

A permit-to-work system should be put in place by the operator prior to all such work being undertaken.

The exhaust system must be sealed and not have any leaks. If a gas escape is detected the CHP plant must be switched off immediately and an appropriate specialist investigate the issue.

Used oil and coolant must be disposed of in accordance to the local regulations.

2.2. Specific Warnings



Danger of death / explosion due to a potentially explosive atmosphere in the confinements of the CHP plant, as a result of a gas leakage.

If you detect an acrid smell in the confinements of the CHP plant, combustible gas has escaped into the air surrounding the CHP plant.

- No naked flames!
- Prevent Sparking! Do not operate any electrical devices such as switches or telephones.
- If the gas escape can be heard, leave the area immediately!
- If possible and it is safe to do so close the isolation valve.
- Open all external windows and doors!
- Warn any other persons in the danger zone and instruct them to leave!
- Prevent others from entering the danger zone!
- Call the fire service from a position away from the danger zone!
- Contact National Grid Gas Emergencies on 0800 111 999.

Note: all gas work must be performed by qualified and competent personnel.



Danger of death / fire as a result of a gas leakage or present combustible materials / liquids.

- No naked flames!
- If possible and it is safe to do so, close the main gas isolation valve.
- Do not enter any confined spaces!
- Alert any persons in the danger zone and instruct them to leave!
- Call the emergency services from a safe location!
- Do not attempt to put out the fire yourself unless you are confident in doing so AND you are not putting yourself at any risk.
- A fire extinguisher should be available in the plant room where the CHP plant is installed
- A dry powder fire extinguisher must be in-date and to current standards.

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Danger of death as a result of asphyxiation.

An insufficient air supply can lead to dangerous escapes of exhaust gases.

- If the ventilation is insufficient isolate the CHP plant and take it out of operation.
- Ensure all ventilation openings are unrestricted and free of any blockages.



Danger of death as a result of electric shocks.

Caution, even if the mains switch is isolated on the panel, labelled components within the control panel may still be live. High voltages are present in the electrical equipment and cables on the CHP plant. Touching any of the live components could lead to fatal injury!

- The CHP plant must always be de-energised before commencing work. Protective covers must only be removed once bare contacts are de-energised.
- Never touch expose or bare cables / contacts.
- All electrical work on the CHP plant must be performed by a Qualified Electrician.
- Only open the control cabinet when necessary.



Danger of serious injury through crushing or severing of body parts.

Depending on which mode of control the CHP plant is in, it may start-up inadvertently without any prior warning.

- Never reach into the inside of the CHP plant whilst it is running.
- Before working on the plant always ensure that it is switched into the off position.
- Only remove protective covers when necessary. Always replace the protective covers as soon as is practical to do so.



Danger of injury / hand injuries as a result of sharp edges.

- Always wear protective gloves when working on the CHP plant.
- Due to a danger of acid burns, suitable protection must be worn when working on the batteries.



Danger of injury / burns caused by very hot components, operating materials and heating water.

The CHP plant reaches very high temperatures. Even after being turned off and left to cool some components may still be hot (for example the turbocharger can run at 700°C).

- Never touch any components of the CHP plant whilst it is in operation or shortly after operation unless you are sure it is safe to do so.
- Check the temperature of specific components before touching them or performing work on the CHP plant.





3. Important Notes

3.1. Acceptance of Delivery

A visual inspection upon delivery should be performed including a check to ensure all components are present. In the event of there being damage or missing parts, the necessary steps should be followed as specified in the delivery contract.

The cost for correcting the damage shall be taken over by the individual risk bearer.

3.2. Scope of Guarantee

The guarantee does not cover defects caused by:

- Non-observance of these instructions
- Non-observance of the MAN instructions
- Incorrect installation
- Unauthorised modifications
- Improper use
- Contaminated operating media (gas, water, combustion air)
- Unsuitable chemical additives in the water circuits
- Damage due to excessive force
- Corrosion due to halogen compounds
- Corrosion due to nonconforming water quality

3.3. Instruction Manuals

As well as this document please refer to the specific MAN engine and Marelli / Stamford Generator manuals. A copy of all documentation should be kept with the CHP plant.

Additional sources of information:

- Hoval catalogue
- Standards and regulations

3.4. Standards

When installing, operating and maintaining the CHP plant you must comply with all country-specific laws, standards and directives.

The installation must be in accordance with current I.E.E. Regulations, relevant British & European standards and Codes of Practice, Building Regulations and Local Authority ByLaws.



4. Technical Data4.1. KWK-EG (43-140) Technical Data

Model			KWK EG-43	KWK EG-50	KWK EG-63	KWK EG-70	KWK EG-104	KWK EG-140
Electrical output		kW	22 - 43	25 - 50	25 - 63	35 - 70	52 - 104	70 - 140
Thermal output		kW	40 - 65	53 - 81	53 - 95	67 - 114	77 - 142	130 - 207
Fuel input		k\//	78 120	02 145	02 177	122 204	151 282	225 384
	1000/	KVV O(70 - 129	92 - 140	92 - 177	122 - 204	101 - 202	223 - 364
Electrical emiciency	100%	%	33.3	34.5	35.6	34.3	36.9	36.5
	75%	%	30.8	31.1	31.1	33.3	35.9	34.2
	50%	%	28.2	27.2	27.2	28.7	34.4	31.1
Thermal efficiency	100%	%	50.4	55.8	53.8	55.9	50.3	53.9
	75%	%	51.0	56.3	56.3	55.3	50.2	55.7
	50%	%	51.3	57.6	57.6	54 9	51.0	57 7
Total efficiency	100%	%	83.7	90.3	89.3	90.2	87.2	90.4
Total efficiency	759/	0/	01.0	97.4	03.5	90.2 00.6	07.2	90. 4 90.0
	75%	% 2/	01.0	07.4	07.4	00.0	00.1	69.9
	50%	%	79.5	84.8	84.8	83.6	85.4	88.8
CHP coefficient at full load			0.66	0.62	0.66	0.61	0.73	0.68
Working temperature max		°C	90	90	90	90	90	90
Return temperature min/max		°C	50 - 70	50 - 70	50 - 70	50 - 70	50 - 70	50 - 70
Volumetric heating flow		m³/h	2.8	3.5	4.1	4.9	6.1	8.9
Working pressure min/max		har	1-54	1-54	1-54	1-54	1-54	1-54
		Dai	FO 60	T = J.4	F0 60	1-5.4	T = J.4	T - J.4
Hydraulic resistance		mbar	00-00	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60
Natural gas pressure min/max		mbar	18 - 100	18 - 100	18 - 100	18 - 100	18 - 100	18 - 100
Natural gas consumption		m³/h	12.94	14.54	17.75	20.46	28.28	38.52
Exhaust gas temperature		°C	120	120	120	120	120	120
Required exhaust back pressure		kPa	1.5	1.5	1.5	1.5	1.5	1.5
Exhaust gas- flow - wet		ka/h	159	192	361	272	594	503
Exhaust gas flow - dry		Nm ³ /h	129	156	288	221	474	409
Standard amiasian rate	Nitragan Ovidaa	NIII /11	125	100	~500	<105	-500	-05
Standard emission rate	Nillogen Oxides	mg/inm ^e	<120	<125	<500	<125	<000	<250
(Carbon monoxides	mg/Nm³	<150	<150	<300	<150	<300	<300
Supply air temperature		°C	10 - 30	10 - 30	10 - 30	10 - 30	10 - 30	10 - 30
Supply airflow		m³/h	2500	3000	3140	4000	4200	5300
Combustion air		m³/h	125	151	290	214	478	396
Extract air temperature max		°C	50	50	50	50	50	50
Extract air temperature max		m ³ /b	2275	2040	2950	2706	2722	4004
Extract annow		111-711	2375	2049	2650	3760	3722	4904
Radiation heat max		KVV	12	15	15	20	19	25
Dimensions				See	e table of dimensi	ons		
Weight	Dry	kg	2000	2000	2100	2200	3100	3500
	Flooded	kg	2200	2200	2300	2400	3300	3700
Acoustic level at 1m (1)		dB(A)	62	62	70	70	70	70
Exhaust das acoustic level at 10n	n	dB(A)	60	60	70	70	70	70
As shows with entianal assender	/ oilonoor		40	40	10	70 E0	70 E0	70 50
As above with optional secondary	/ sliencer	UB(A)	40	40	40	50	50	50
Engine								
Manufacturer			MAN	MAN	MAN	MAN	MAN	MAN
Model			E0834 E312	E0834 E302	E0834 E302	E0836 E302	E0836 LE202	E2876 E312
ISO standard power		kW	47	54	68	75	110	150
Normal rotation speed		r/min	1500	1500	1500	1500	1500	1500
Fuel			Natural das	Natural das	Natural das	Natural das	Natural das	Natural das
Cylindor			AD	AD	AD	6D	6D	6D
Cymruer		3 ممان	41	41	41	01	01	40.00
		um	4.00	4.00	4.00	0.07	0.07	12.02
Bore		mm	108	108	108	108	108	128
Stroke		mm	125	125	125	125	125	166
Mean effective pressure		Мра	0.821	0.943	1.19	0.873	1.281	0.936
Mean piston speed		m/s	6.3	6.3	6.3	6.3	6.3	8.3
Compression ratio			13.1	13.1	11.1	13.1	11.1	12.1
		ka/b	0.075	0.075	0.075	0.1	0.125	0.125
		kg/li	0.075	0.075	0.075	0.1	0.125	0.120
Lubricating oil volume		ams	9/13	9/13	9/13	24/34	24/34	19/28
Weight-dry		kg	430	430	495	520	605	830
Generator								
Manufacturer					Marelli Ge	enerators		
Model			MJB200MB4	MJB225SB4	MJB225LA4	MJB225LA4	MJB250LA4	MJB250LB4
Mode			Synchronous	Synchronous	Synchronous	Synchronous	Synchronous	Synchronous
Rating		F/\\	5/	62	70	2,	120	175
Pototing opcod		× v~	4500	4500	13	1500	150	110
Rotating speed		i/min	1500	1000	1000	1000	0001	1500
Efficiency		%	93	93.8	93	94	94.8	93.5
Voltage		V	400	400	400	400	400	400
current		А	62	72	91	101	150	203
Frequency		Hz	50	50	50	50	50	50
Ingress protection class			IP23	IP23	IP23	IP23	IP23	IP23
Insulation system			.: <u>_</u>	<u>_</u>	н <u>г</u>	н <u>го</u>	LV	н <u>со</u> ц
Morming close			-		- -			
warning class			F	F	F	F	F	F
Weight		kg	300	350	405	405	405	710

 $^{\mbox{(1)}}$ Noise data recorded when complete with sound reduction housing.

The above quoted data is based on Natural Gas with a calorific value of 36.0 MJ/Nm³ (10.0 kWh/Nm³) and a Methane value greater than 80 Efficiency data was obtained under standard atmospheric conditions: air pressure 100 kPa, air temperature 298°K, relative air moisture 30% Clamp power at generator with $\cos \phi = 1.0$

Hoval follows a policy of continued improvement and reserves the right to change specifications without notice.

4.2. KWK-EG (200-404) Technical Data

Model			KWK EG-200	KWK EG-240	KWK EG-250	KWK EG-365	KWK EG-404
Electrical output		kW	100 - 200	118 - 240	125 - 254	182 - 365	202 - 404
Thermal output		kW	161 - 269	220 - 365	185 - 321	280 - 496	297 - 520
Fuel input		kW	312 - 538	397 - 669	374 - 680	514 - 955	560 - 1045
Electrical efficiency	100%	%	37.2	35.9	37.3	38.2	38.6
	75%	%	35.2	33.4	36.5	37.5	38.0
	50%	%	32.1	29.7	33.4	35.4	36.1
Thermal efficiency	100%	%	50.0	54.5	47.2	51.9	49.8
	75%	%	50.5	55.6	47.9	52.1	51.4
Table 1 - 10 - 10 - 1	50%	%	51.6	55.4	49.5	54.5	53.0
lotal efficiency	100%	%	87.2	90.4	84.5	90.1	88.4
	75%	% %	00.7 83 7	09.U 85.1	04.4 82.0	09.0 80.0	09.4 80.1
CHP coefficient at full load	50%	70	0.75	0.66	02.9	0.74	0 78
Working temperature max		°C	90	90	90	90	90
Return temperature min/max		°C	50 - 70	50 - 70	50 - 70	50 - 70	50 - 70
Volumetric heating flow		m³/h	11.6	15.7	13.8	21.3	22.4
Working pressure min/max		bar	1 - 5.4	1 - 5.4	1 - 5.4	1 - 5.4	1 - 5.4
Hydraulic resistance		mbar	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60
Natural gas pressure min/max		mbar	18 - 100	18 - 100	18 - 100	18 - 100	18 - 100
Natural gas consumption		m³/h	53.96	67.1	68.2	95.79	104.81
Exhaust gas temperature		°C	120	120	120	120	120
Required exhaust back pressure	;	kPa	1.5	2	1.5	1.5	1.5
Exhaust gas- flow - wet		kg/h	1101	879	1392	1989	2126
Exhaust gas flow - dry		Nm³/h	878	713	713	1587	1698
Standard emission rate	Nitrogen Oxides	mg/Nm ³	<500	<250	<500	<500	<500
	Carbon monoxides	mg/Nm ³	<300	<300	<250	<300	<300
Supply air temperature		-C	10 - 30	10 - 30	10 - 30	10 - 30	10 - 30
Compustion air		m³/h	884	7900	1120	1600	1700
Extract air temperature max		°C	50	50	50	50	50
Extract airflow		m ³ /h	5316	7200	6100	8900	9800
Radiation heat max		kW	27	36	31	45	49
Dimensions				See table of	dimensions		
Weight	Dry	kg	4300	4300	4200	5150	5300
	Flooded	kg	4500	4500	4400	5350	5500
Acoustic level at 1m (1)		dB(A)	70	70	70	70	70
Exhaust gas acoustic level at 10	m	dB(A)	70	70	70	70	70
As above with optional secondar	ry silencer	dB(A)	50	50	50	50	50
Engine							
Manufacturer			MAN	MAN	MAN	MAN	MAN
Model		L-) / /	E2876 LE302	E2842 E312	E2848 LE322	E2842 LE322	E2842 LE322
Normal rotation speed		r/min	210	250	200	360	420
Fuel		1/11111	Natural das	Natural das	Natural das	Natural das	Natural das
Cylinder			6R	12V	8V	12V	12V
Swept volume		dm ³	12.82	21.93	14.62	21.93	21.93
Bore		mm	128	128	128	128	128
Stroke		mm	166	142	142	142	142
Mean effective pressure		Мра	1.311	0.912	1.45	1.387	1.532
Mean piston speed		m/s	8.3	7.1	7.1	7.1	7.1
Compression ratio			11:1	12.5:1	12:1	12:1	12:1
Lubricating oil consumption		kg/h	0.15	0.15	0.175	0.2	0.2
Lubricating oil volume		dm ³	30/41	22/30	30/70	40/90	40/90
Weight-dry		kg	990	1300	1052	1420	1420
Generator						_	
Manufacturer						S MID255MA4	
Mode			Synchronous	Synchronous	Synchronous	Synchronous	Synchronous
Rating		k\/A	250	300	308	456	505
Rotating speed		r/min	1500	1500	1500	1500	1500
Efficiency		%	95.3	95.9	94.5	96.2	96.4
Voltage		V	400	400	400	400	400
current		А	289	347	361	527	583
Frequency		Hz	50	50	50	50	50
Ingress protection class			IP23	IP23	IP23	IP23	IP23
Insulation system			H	Н	H	H	H
Warming class			F	F	F	F	F
vveight		kg	1060	1200	1250	1800	2050

⁽¹⁾ Noise data recorded when complete with sound reduction housing.

The above quoted data is based on Natural Gas with a calorific value of 36.0 MJ/Nm³ (10.0 kWh/Nm³) and a Methane value greater than 80 Efficiency data was obtained under standard atmospheric conditions: air pressure 100 kPa, air temperature 298°K, relative air moisture 30% Clamp power at generator with $\cos \varphi = 1.0$

Hoval follows a policy of continued improvement and reserves the right to change specifications without notice.



4.3. KWK EG (43-70) Dimensions

1000mm Minimum clearance required for air supply and exhaust air.







	1	2	3	4	5	6	7
Model	Flow	Return	Gas Inlet	Exhaust Outlet	Condensate Drain	Supply Air	Extract Air
EG-43	DN32	DN32	1"	DN80	1"	400mm	350mm
EG-50	DN40	DN40	1"	DN100	1"	400mm	400mm
EG-63	DN40	DN40	1"	DN100	1"	400mm	400mm
EG-70	DN40	DN40	1"	DN100	1"	400mm	400mm

Model	А	В	С	D	Е	F	G	Н	h	1	J	Κ	L	Μ	Ν	0	Р	Q	R	S
EG-43	2950	2500	920	280	180	300	300	1955	1800	200	150	1810	150	1000	1000	1200	1500	460	1400	460
EG-50	2970	2500	920	280	180	300	300	1955	1800	200	150	1920	160	1000	1000	1200	1500	460	1400	460
EG-63	3580	3100	920	220	180	150	150	1955	1800	290	150	1840	220	1000	1000	1200	1500	550	2045	408
EG-70	3590	3100	900	195	180	150	150	1955	1800	290	150	1840	220	1000	1000	1200	1500	450	2045	408

4.4. KWK EG (104-140) Dimensions





	1	2	3	4	5	6	7
Model	Flow	Return	Gas Inlet	Exhaust Outlet	Condensate Drain	Supply Air	Extract Air
EG-104	DN50	DN50	1 1⁄2"	DN125	1"	400x700mm	400x700mm
EG-140	DN50	DN50	1 1⁄2"	DN125	1"	400x800mm	400x800mm

Model A		В	С	D	Е	F	G	Н	h	1	J	K	L	Μ	Ν	0	Р	Q	R	S
EG-104 404	45 3	3540	1100	90	180	150	150	2150	2000	345	150	2070	240	1000	1000	1200	1500	550	2384	408
EG-140 40	50 3	3540	1100	170	180	150	150	2150	2000	345	150	2145	240	1000	1000	1200	1500	550	2384	408



4.5. KWK EG (200-404) Dimensions





	1	2		3		4			5			C	5		1						
Model	Flow	Return	Gas	Inlet	Ex	haust	Outlet	Cor	Idensa	ate Dra	ain	Supp	ly Air	Ext	ract Ai	r					
EG-200	DN65	DN65	1	1⁄2"		DN1	50		1'			400x9	00mm	400>	(900m	m					
EG-240	DN65	DN65	1	1⁄2"		DN2	00		1'	•	5	500x10	000mm	500x	1000m	nm					
EG-250	DN65	DN65	2	2"		DN2	00		1'		5	500x10	000mm	500x	1000m	ım					
EG-365	DN80	DN80	2	2"		DN2	50		1'	'	6	600x10	000mm	600x	1000m	ım					
EG-404	DN80	DN80	2	2"		DN2	50		1'	•	6	600x10	000mm	600x	1000m	ım					
Model	А	B C	D	Е	F	G	Н	h	I	J	Κ	L	Μ	Ν	0	Р	Q	R	S	Т	U
EG-200	4545	4030 1260	180	300	300	300	2380	2230	395	150	2335	240	1000	1000	1200	1500	630	2654	533	395	350
EG-240	4790	4200 1600	427	300	300	300	2350	2200	250	150	2369	286	1000	1000	1200	1500	800	2890	458	450	500
EG-250	4790	4200 1600	427	300	300	300	2450	2200	250	150	2369	286	1000	1000	1200	1500	800	2896	452	450	500
EG-365	5520	4900 1720	371	300	300	300	2650	2500	250	150	2510	315	1000	1000	1200	1500	860	3596	452	570	500
EG-404	5535	4900 1720	371	300	300	300	2650	2500	250	150	2710	315	1000	1000	1200	1500	860	3594	454	570	500



5. Installation Requirements

Notes on installation and the Operation of the CHP plant

Regular preventative maintenance needs to be performed on the CHP plant to ensure it operates correctly. As well as these scheduled service visits the site operator needs to frequently check the CHP plant to ensure that everything is operating as designed.

5.1. Installation Notes

- A suitable flat, level and fire proof base must be provided to suit the flooded weight of the CHP plant concerned (not provided by Hoval).
- The CHP plant must be installed by competent persons and in accordance with the assembly instructions.
- The CHP plant must be commissioned by Hoval or by a specialist approved by Hoval.
- All building regulations must be adhered to in regards to the installation, the air duct work and the flue
 arrangement.
- All electrical regulations must be adhered to when connecting the power (i.e. G59 application must be completed if necessary).
- The relevant Gas standards must be adhered to when connecting the Gas pipe-work.
- All regulations with regard to the heating water system must be adhered to.
- All health & safety regulations applicable to the plant must be adhered to at all times.

5.2. Readiness for Operation

Gas Supply

A supply of gas at the required quality (see technical data table). This must be above the minimum pressure of 18mbar at full output, and at all times the CHP plant is operating.

Lubricating Oil in the Engine

The engine oil must always be filled to the correct level with a suitable lubricant. Details of the oil specification can be found in the engine manual.

Cooling Water

The coolant must be maintained at the required level. The coolant circuit is pressurised so must remain sealed at all times. The coolant must be to the appropriate standard as specified in the engine manual to ensure adequate protection against corrosion.

Heating Water

The heating water circuit to extract heat from the CHP plant must meet the minimum quality (see detailed specification further in the manual). The circulation pump for this circuit must be operational and above the stated minimum flow rate.

Starter Battery

The battery should always be fully charged and the fluid level maintained to its upper marking.

5.3. Further Important Information

- The installation of the CHP plant must be reported to and approved by the relevant energy supply companies.
- Certificates must be available prior to commissioning from the appropriate specialists for the gas purge test and also a pressure test for the exhaust system.
- Approval must be sought before piping the condensate to drain.

5.4. Waste Disposal

The disposal of any un-needed items such as packaging should be done so in an environmentally friendly manner.

Upon servicing the waste lubricating oil must be disposed of correctly. Proof of disposal must be documented and archived.

Modifications

Modifications to the CHP plant without written approval are not permitted.

6. Water Quality

6.1. Heating Water

The European Standard EN 14868 and the directive VDI 2035 must be observed.

In particular, attention must be paid to the following stipulations:

- Hoval CHP units are designed for heating installations without significant oxygen intake (plant type I according to EN 14868). Installations with
 - Continuous oxygen intake (e.g. underfloor heating systems without diffusion proof plastic piping) or
 - Intermittent oxygen intake (e.g. where frequent refilling is necessary)

Must be equipped with separate circuits.

- Treated filling and replacement water must be tested at least annually with the results logged and available. According to the inhibitor manufacturer's instructions, more frequent testing may be necessary.
- Refilling is not necessary if the quality of the heating water in existing installations (e.g. exchange of the CHP unit) conforms to VDI 2035. The Directive VDI 2035 applies equally to the re-placement water.
- New and if applicable existing installations need to be adequately cleaned and flushed before being filled. The CHP unit may only be filled after the heating system has been flushed.

Water Specification Limit Values

Electrical conductivity	(µS)		< 100
Oxygen	(O ₂)	mg/l	< 0.05
Chloride		mg/l	< 20
Copper	(Cu)	mg/l	< 0.05
Total Iron	(Fe)	mg/l	< 0.05
Alkaline earths		mmol/l	< 0.02
Total hardness		°dH	< 0.1
Phosphate	(PO ₄)	mg/l	5 - 10

- Parts of the CHP plant which have contact with water are made of ferrous materials and stainless steel.
- A suitable freezing-protection agent should be used, if the CHP plant and associated pipework are likely to be subjected to temperatures below 2°C.
- The pH value of the heating water should lie between 8.3 and 9.5 after 6-12 weeks of heating operation.

Filling and replacement water

- For an installation using a Hoval CHP, untreated drinking water is generally best suited as the heating medium, i.e. as filling and replacement water. However, as not all drinking water is suitable for use as as filling and replacement water the water quality must fulfil the standard set in VDI 2035. Should the mains water available not be suited for use then it must be desalinated and/ or be treated with inhibitors. The stipulations of EN 14868 must be observed.
- In order to maintain a high level of efficiency and to avoid overheating of the heating surfaces the values given in the table should not be exceeded (dependent on boiler performance ratings - for multi-boiler plants rating of smallest boiler applies and on the water content of the plant).
- The total amount of filling and replacement water which is used throughout the total service life of the CHP unit must not exceed three times the water capacity of the plant.



7. Typical Pipework Schematics

7.1. CHP in Parallel

The most efficient way of operating a CHP installation providing the Building Management System has the appropriate controls.



7.2. CHP in Series

The easiest way of fitting the CHP into building with a limited control system. This arrangement works by pre-heating the return to the boilers.



Note: The above schematics are indicative and only show the basic principle. All installations should be in accordance with local regulations.

8. Construction



8.1. Construction of The CHP Plant

- A skid-mounted unit complete with an optional sound reduction capsule or mounted within an insulated container installed complete with heat exchangers and exhaust gas silencer.
- Combustion air and all ventilation requirements are met with the fan-assisted inlet and extract air system.
- All pipe work to the flanged connections and the heat exchangers containing useful heat are fully insulated.
- Anti-vibration mounting points are used between the main frame of the skid and the engine and generator assembly stopping nuisance vibrations being transferred through the unit.
- Various information points and test points on the CHP plant are available on all of the water circuits and on the exhaust system.

8.2. The Gas Engine

A MAN gas engine with spark ignition is used in the CHP plant. This engine has electronic speed control with automatic ignition complete with all required filtration, lubrication and cooling systems required. The full specification of the engine as follows:

- Crankcase with cylinder block in one piece, made of cast iron, sealed at the bottom by an oil sump and at the rear by the flywheel control housing
- Cylinder heads with moulded-in vortex intake ducts and valve seat inserts shrunk into the cylinder heads
- · Light alloy pistons, cooled by pressurised oil from oil injection nozzles
- Angled connecting rods, a crankshaft with 7 bearings, steel-backed cast lead bronze bearing shells
- · Valves mounted vertically and with replaceable valve guides
- One inlet valve and one outlet valve per cylinder, camshaft mounted on 7 bearings
- · Forced-feed lubrication with oil filter in the main flow and cooling by means of oil cooler
- Automatic oil refill device
- · Crankshaft ventilation with oil separator and connection to combustion air
- Closed-circuit engine cooling, pump with three-phase motor, safety valve and expansion tank
- · Air intake via dry-air filter, directly from the installation room via supply air device
- Pre-engaged drive starter motor 24V
- Electronic high-performance ignition with solid-state low-voltage distribution, one ignition coil per cylinder
- Gas-air mixer, gas control damper for output and speed control
- Actuator for speed and output control
- Turbo-charger and intercooler (on some models)

8.3. The Generator

The main components of the generator are the internally-poled rotor and the wound stator complete with exciter circuit and voltage regulator using an auxiliary winding. The three-phase alternating voltage induced in the exciter circuit is rectified via the rotating diode disc and fed to the generator revolving field. Voltage stabilisation for the main generator under alternating loads is maintained by changing the field current via the thyristor actuator in the voltage regulator.

The engine cooling water heat exchanger transfers the heat from the gas engine to the external heating water system. Inside the heat exchanger, the warm engine cooling water and the cooler heating water are in counterflow, ensuring optimum heat transfer. The heat exchanger hydraulically separates the cooling water and the heating water.

8.5. Exhaust Gas Heat Exchanger

Engine Cooling Water Heat Exchanger

8.4.

In the exhaust gas heat exchanger, energy is recovered from the exhaust gas. The exhaust gas mass flow is routed over a water circuit flowing through the exhaust gas heat exchanger. The exhaust gas flows through the heat exchanger tubes on the primary side, thereby transferring its heat to the heating water (secondary side). The operating temperatures for the exhaust gas are approx. 600°C at the inlet and approx. 120°C at the outlet, and the operating temperature on the heating water side is approx. 90°C.

8.6. Engine Cooling Circuit

The cooling circuit of the gas engine is equipped with a separate expansion tank and pump which is routed via the engine cooling water heat exchanger. The engine cooling water is first routed into the cooling ducts of the engine housing, where it absorbs the transferred heat and then flows back into the engine cooling water heat exchanger. The engine cooling water heat exchanger transfers the heat to the heating water. The cooling water is always a mixture of antifreeze and a corrosion protection agent. For the full specification see the MAN manual.

8.7. Heating Water Circuit

The heating water circuit flows first through the engine cooling water heat exchanger and then through the exhaust gas heat exchanger. The CHP plant is equipped with a circulation pump which pumps a constant volume of water through the exchangers. In addition, a three-way valve is installed to regulate a constant return temperature of 70°C to the engine cooling water heat exchanger. The heat extraction system is also equipped with the relevant safety devices for temperature and pressure.

8.8. Exhaust Catalytic Convertor

The closed-loop three-way catalytic convertor and the oxidation catalyst in the case of turbocharged engines reduce the pollutants in the engine exhaust gases.

8.9. Ventilation

The CHP plant is equipped with a supply air fan which is operated in two stages. The first stage is designed to supply adequate combustion air to the engine and allow the radiant heat to be extracted. The second stage is switched on as required via a temperature sensor in the sound reduction capsule or container. The supply air is drawn in by a fan via an on-site supply air duct. The extract air should be routed to outdoors via an extract air duct (not by Hoval).

8.10. Monitoring Device

The engine and generator unit is monitored and controlled via a processor control system. All values of the engine, the exhaust and the heating water system are monitored in terms of pressure and temperature and then displayed on the touch-screen display. These values are then relayed out to a webpage for remote monitoring and can also be visible on the Building Management System (subject to the necessary interfaces being installed).



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9. Functional Description

9.1. Functional Description of the CHP Plant

The gas engine directly drives the generator which then generates a current that is fed out to the distribution main. Excess electricity can then be exported to the utility grid providing the relevant approvals (G59) are in place.

A by-product of this power generation is heat produced by the gas engine. This is absorbed into the heating circuit via engine coolant and an exhaust gas heat exchanger. This method of energy production is commonly known as co-generation or combined heat and power generation because it simultaneously generates electricity and useable heat.



- 1. Sound reduction capsule (covers not shown)
- 2. Control panel
- 3. MAN gas engine
- 4. Anti-vibration mounts
- 5. Electrical generator
- 6. Exhaust gas heat exchanger
- 7. Exhaust gas pipe
- 8. Exhaust silencer
- 9. Ventilation air intake fan
- 10. Ventilation extract air duct connection
- 11. Gas train
- 12. Heating system components
- 13. Lubricating oil tank
- 14. Engine coolant heat exchanger
- 15. Expansion vessel
- 16. Catalytic convertor

10. Control Panel - Overview

10.1. Control Panel

The CHP plant control cabinet requires its own dedicated 3-phase 400Vac supply as this is used to operate all auxiliary equipment such as pumps and the ventilation fan. The control panel also incorporates a battery charging system to act as a main failure back-up and also as a supply for the engine starter motors.

All functionality is accessible from the front of the control cabinet. The control cabinet should only be opened for service purposes, by suitably qualified and trained personel.



1. Door mounted isolator

The door mounted isolator immediately stops the engine and inhibits it from operating. Note that the fans and the lighting (if supplied containerised) are still live after switching off the door mounted isolator.

2. Emergency stop button

The emergency stop button immediately shuts down the engine. The auxiliary circuits are switched off when this button is pressed. To avoid an overheating condition due to latent heat within the engine the Manual/Automatic switch should be put to '0' and the emergency stop released. The RESET should then be pressed, this will then restart the pumps to cool the engine.

Note: On a containerised CHP unit an external emergency stop button (with break glass) along with an alarmed gas detection device are also supplied.



3. 7" graphic touch display

The main control functionality of the CHP plant is accessed using the touch screen controller. This will display all operating conditions and allow the adjustment of parameters providing the correct service codes have been input.

4. Red RESET/Fault illuminated pushbutton

The red light will illuminate when the CHP plant is in a fault condition. A detailed description of the fault is available on the touch screen controller in the alarm menu. If the fault condition has cleared then this button can then be pressed for 3 seconds to clear the fault.

5. M-0-A illuminated selector switch (Manual – Off – Automatic)

When illuminated, this indicates that the CHP plant is running. The selector switch has three positions:

- Manual: The CHP plant will start up and control to the set-point set on the display.
- Off: The CHP plant will be in an "off" condition.
- Automatic: The CHP plant will control dependant on the signals received from the Building Management System.
- 6. Yellow warning indicator lamp

The yellow lamp will illuminate when the CHP plant is in a warning condition. The warning condition will not stop the machine. If the minor problem is not rectified and worsens this will then develop into a fault. A detailed description of the warning is available on the touch screen controller in the alarm menu.

10.2. Overview of Functionality

All of the control processes for efficient and safe operation are carried out by the controller within the CHP plant control cabinet. Below is a brief overview of these main functions:

- Manual and automatic operation
- Complete CHP safety system with warning messages and self protection
- Mains and generator monitoring
- Automatic engine starter
- Electronic speed control for the rotating assembly
- Synchronisation, frequency and power output control
- Electrical output control
- Flow temperature control
- Mains back-up operation (optional)
- Remote diagnosis and interrogation available
- Operating hours, service hours, start and kWh counter.

10.3. Manual and Automatic Operation

The operating mode is selected with the mode selector switch on the control cabinet door. This switch has three positions, Manual - Off - Automatic.

Manual mode is available to operate the CHP plant on site without the need for a Building Management System. This will then automatically control to a set-point on the touch screen.

Automatic mode allows the CHP plant to respond to an external start/stop signal as well as an analogue control signal to adjust the set-point for site requirements.

When the switch is positioned to '0' the unit will perform a safe shut-down and then stop.

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10.4. Safety System

The CHP plant contains its own safety protection to ensure the correct running of the equipment. There are two tiers of safety within the CHP controls, firstly the warnings and secondly the faults. There are multiple information points measured: engine speed, water pressure, mixture pressure, water temperature, oil temperature, exhaust temperature, battery voltage, and oil level.

10.5. Grid Monitoring

The CHP plant controller has a function where it monitors the electricity from the national grid. In the event of a fault it will disconnect from the national grid in approximately 100ms. The following signals are monitored: Overvoltage/undervoltage, over-frequency/under-frequency and vector surge.

10.6. Generator Monitoring

The CHP plant controller also monitors the generator in the same way as it monitors the electricity from the national grid. The following electrical signals are monitored: Overvoltage/undervoltage, over-frequency/under-frequency, over-current, reverse power and differential current.

10.7. Engine Control

The touch-screen controller operates the engine and has the following control: Safe start and shutdown, starter and ignition, control of both gas valves, control of auxiliary equipment, speed control, engine over-run control and gas leak detection.

10.8. Speed Control

The CHP plant controller has a speed regulator to control the engine between 1440 and 1560 rpm. This controller will ramp the engine up to this speed on start-up and down from this speed when it is in its cool-down cycle. When the generator is synchronised this speed is maintained by the frequency from the grid.

10.9. Power Output Control

When the CHP plant is synchronised the control is switched from speed control to power set-point control. In automatic mode this set-point is derived from the building management system controls but in manual this set-point is input on the touch screen controller. The safety circuits can interrupt this set-point, for example if a warning signal is apparent the CHP plant will run at the pre-set reduced set-point.

10.10. Lambda Control

In order to respond to minor changes in the gas quality, the exhaust gas is measured with a lambda sensor. This acts to automatically adjust the fuelling to suit the current site conditions.

10.11 Touch Screen Display

The display is used as the interface to the CHP, showing all measured values as well as any error or warning messages. All of the operating parameters can be adjusted although the manufacturer's access code is required to do this.



11. Controls Overview

login

The service menu is restricted from unauthorised access. Pressing the login button allows access to input the password. Here you can either log in at **user** or **service level**.

		Login		27.07.2011 16:04:57
Login	Mainuser	Service		
Reset Login	Reset Login	Reset Login		
Logout	Logout Mainuser	Logout Service		
	Ben	utzerrechte Serv	ice	

Login ((User 'Service')	Login	
,	ESC	,	
			Service
Passwor	d RE	r	Reset Login
		_	
Logout	Logout Mainuser		Logout Service

If the entered password is valid the authorisation will change at the bottom of the screen.



Please note to change any of the values explained in this manual you must first log in at the user level as detailed above.

Overview of Start Screen



The start screen provides an overview of the CHP outputs and a display of the accumilated running hours with the kWh produced.

The main menu opens by tapping anywhere on the touch screen.

You can go back to the previous page by tapping this arrow button from any other screen.



Main menu



To display actual values and operate the CHP controller, the sub-menus, which are described in the following pages, are accessed by tapping the corresponding touch screen buttons shown in the menu.



module

This menu item shows an overview of the current status of the CHP plant.

The following set-points can be set for the power output in the top left area (only to be adjusted by Competent personnel):

Set-point for manual mode Set-point for power reduction mode

The signals from the Building Management System are shown in Automatic mode in the bottom right area.

		module		03.01.2012 1	7:03:43
power reference value manual ctrl.	75.0 kW		counted starts	35	
setpoint power reduction	100.0 kW		operating hours	65 h	
active power setpoint	75.00 kW		service hours	65 h	
real power	119.70 kW		service hours max.	400 h	
apparent power	119.71 kVA		cabin temperature	33.28 °C	
reactive power	-1.89 kVAr				
energy	6368 kWh		automatic operation		
			requirement	OFF	
			power setpoint	0.0 %	
	U	ser rights	Mainuser		

engine values

The important engine operating values are displayed in the engine values section.

	engine values					03.01.2012 17	:06:59		
speed 1	1500) r pm			exhaust temperature after bank 1	684 °C			
speed 2	1499) rpm			exhaust temperature after Bank 2	686 °C			
cooling water engine inlet	79.	5 °C			exhaust temperature before catalytic	0 °C			
cooling water engine outlet	85.	0°C					exhaust temperature after catalytic	0 °C	
cooling water pressure	1.90	6 bar			exhaust after heat exchanger	245 °C			
oil temperature	97.	0° 6			mixture temperature	50.2 °C			
oil pressure	7.5	3 bar			mixture pressure	1.32 bar			
					level oil sump	82.2 %			
fan stage	1	ON	2	ON	battery voltage	26.7 V			
		U	ser rights	5 N	lainuser				

line / generator

The important generator information is displayed on this screen. The active bar graphs on the right show the current outputs of the generator.

	line / generator				.01.2012 0	8:49:47
Line		generato	r	L1 [V]	L2 [V]	L3 [V]
frequency	49.97 Hz	frequency	49.97 Hz			
voltage L1	230 V	voltage L1	230 V			
voltage L2	230 V	voltage L2	230 V			
voltage L3	230 V	voltage L3	230 V			
cos phi	0.99	current L1	173 A			
parallel operation	ON	current L2	173 A			
		current L3	173 A	-	-	-
<		User rights no	one			

maintenance

The maintenance menu is important for being able to view when the next service is required. Here you also have the button where you can reset the service hours when a service has been performed. Please note, access codes will be required.

	maintenance				04.01	1.2012 08:54:48
reset the service hours						
service hours	65		code 1		0	
max. service hours	400		code 2		0	
HH:MM:SS	9	54	34			
	0	0	0			
DD:MM:JJ	4	1	2012		date/ time adjust	ment
	0	0	0			
		User rights	Mainuser			

heat circuits





The set-point values for the control circuit can be set by buttons. A keypad for entering the target value opens up when the button is pressed. **Please note only authorised and trained personnel should make any adjustments.**





EC - Emergency Cooling

Temperature set-point for engine inlet cooling water maximum temperature. If this set-point overshoots the engine is cooled via the emergency cooling system.

RL - Return Temperature Boost

Temperature set-point for engine inlet cooling water minimum temperature. When the temperature drops below this value the temperature is boosted by reducing the heat extraction function.

The 3-port mixing valves for return temperature control or emergency cooling control can be operated in manual mode for test purposes. This is accessed by the window below when you select manual operation.



When active is selected the valve will display "manual" on the schematic. The set-point for manual mode is entered as a valve position. This is a value from 0-100%. When in manual mode the warning lamp will illuminate and a warning message will be displayed in the alarm list.



lambda controller

The lambda value for the engine to control this setting automatically can be set within this menu. It is advised that this is not adjusted unless you are a competent, trained engineer.

For more detailed information regarding the lambda menu please see the Noris Automation controls manual. This menu should only be entered by a competent, trained engineer.

lambda controller			04.01.2012 0	9:44:28	
lambda control	ller				
lambda set value	1.29				
lambda current value	1.35		correction basic	curve	
output controller	0.00 %		permanent correction	0.00 %	
gasmixer	32.00 %		start offset	0.00 %	
throttle valve	56.00 %		duration start offset	5 s	
lambda set value correction value	0.000		correction 2.start	0.00 %	
activate lambda controller	deactivate		correction 3.start	0.00 %	
User rights Mainuser					



service

Settings in the service menu must only be adjusted by competent and trained persons. All options within this menu are described within their menu sets.

	Service				
	paramete	erization			
speed curve	power	curve	lambda curve		
	commis	sioning			
hardwar	re inputs	general pa	arameters		
co	ompression pres	ssure measurir	ıg		
runtime starter	5 s	start me	easuring OFF		
Tel.: +	NORIS FBarnewitz-Str 49 381-5199 440; E-r	S Automation . 10, D-18119 Rosto nail: service@noris-	ock automation.de		
	User rights	Service			

12. Pre-Commissioning

12.1 Engine

- · Site must have sufficient access for the delivery and removal of the engine oil containers
- Only use engine oil as approved by MAN
- Fill engine with oil as detailed in the MAN assembly instructions
- The oil level should never exceed maximum
- The engine must be checked for oil leaks.

Coolant must be mixed correctly and added to the coolant circuit. This coolant must be of a suitable specification and approved by MAN engines. The coolant circuit must be fully de-aerated.

12.2. Oil Supply

- · Fill the lubricating oil tank observing all safety and environmental regulations
- Check for leaks.

12.3. Gas Supply

- Approval must be in place for the use of Natural Gas
- Gas purge test and tightness test certificates need to be available prior to commencement of commissioning
- The Natural Gas supply must be installed to the current industry standards.

12.4. Heating Water System

- The heating water system must have been flushed, filled and de-aerated
- The water must be to the quality as specified earlier in this manual
- All safety equipment must be operational
- Sufficient pressure and flow must be available
- Heating load must be available for commissioning.

12.5. Electrical Connection

- A power cable for the CHP plant must be installed for the use of the auxiliary equipment
- Cabling must be installed to export electricity
- · Grid monitoring cabling must be installed to ensure synchronisation is possible
- Electrical earthing must be to current standards
- If applicable the G59 application must be in place and certification available
- All connections to the Building Management System must be in place
- An internet connection must be set-up to allow for remote monitoring
- All electrical connections must be tested to the latest relevant standards.

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13. Maintenance and Servicing

13.1 Overview

The CHP plant must have its preventative maintenance carried out at the required intervals, as specified in the MAN engine manual. This must be performed and logged to keep the warranty valid. If a service is missed the warranty is void. All maintenance work on the CHP plant must be performed by a Hoval or Hoval approved Engineer using MAN approved components. Inadequate or improper maintenance to the CHP plant will cause severe damage that may not be repairable. Hoval accepts no responsibility for any damage caused by a lack of maintenance. For the full service schedule please refer to the MAN operating and maintenance manual for the specific engine.

Before commencing any work on the CHP plant all operating values displayed on the touch screen controller must be recorded.

A fault log must be kept to allow for conclusions to be drawn and help diagnose any problems.

The CHP plant must be safely shut down and be locked off from operating to ensure the plant does not operate while it is being worked on.

A permit-to-work system should be put in place by the operator prior to all such work being undertaken.

13.2. Oil Change

After the CHP plant has been switched off it should be left to stand for 10 minutes. After this time the oil consumption since the last service can be measured and the engine can be checked for any oil leaks. The oil can then be drained from the bottom of the sump until it is empty of oil, and the oil filters can then be replaced. Once the filters have been re-fitted and the drain valve closed, oil can then be added to the maximum level on the dipstick. Only use oil as specified in the MAN engine manual.

The maximum oil level should not be exceeded. Used oil should always be analysed in accordance with the MAN requirements.

13.3. Spark plugs

Depending on the service level performed the spark plugs must be either checked or replaced. When checking a spark plug the gap must be checked and adjusted if necessary. They should then be re-fitted to the engine and tightened to a torque of 27 Nm.

13.4. Air Filter

The air filter must be cleaned or replaced depending on the service level. The airbox must be checked to ensure it is making a good seal so that all air entering the engine is passing through the air filter.

13.5. Valve Clearance

As mechanical tappets are used on the Hoval CHP plant, the valve clearance must be checked as prescribed in the maintenance schedule and readjusted if necessary in accordance with the engine manufacturer's instructions.

13.6. Starter Battery

When the CHP plant has starter motor batteries, they must be checked for any signs of leakage and the level of fluid checked. If they require topping up this must be done with distilled water.

Some CHP plants do not have starter batteries and are driven directly off the grid. In this case all cabling to the starter motor and the earthing must be checked.

13.7. Engine Coolant Pressure

If the coolant pressure in the engine is too low then this must be topped up. The correct ratio of water and antifreeze must be used. The antifreeze used must be to the correct specification as published in the MAN engine manual.

13.8. Generator

The generator electrical connections must be checked and cleaned each visit. Additional to this the generator should require no further maintenance.

13.9. Post Service

Upon completion of the service the maintenance hours must be reset on the touch screen controller. After a service, the service checklist must be completed and the CHP plant must be put back into automatic operation and re-started.

Important note: The above are for guidance only and the full servicing requirements are detailed in the MAN operations and maintenance manual for the specific engine.

OVa

Customer Service 14.



14.1. Contacting Hoval

If you have any queries regarding the CHP plant please have to hand the serial number found on the data badge and the full address of the site.

Important Contacts:

Hoval Head Office:	+44(0) 1636 672 711
Hoval Service:	+44(0) 1636 593 413
Hoval Spares:	+44(0) 1636 593 412

Below is an example of a typical data badge:

Hoval	Hovalwerk AG 9490 Vaduz, Fürste phone +423 399 2- www.hoval.com	entum Lie 400 1 6	chtenstein, Au ax +423 399 2 email: info@ho	ststrasse 70 411 val.com
Blockheizkraftwerk Typ YAD	OIKWK EG-365			
Typenbeschreibung / Typ designation				
11110600051	2011-1	0		((
Seriennummer / Serial number	Baujahr /	Year of comple	tition	
GB-NG24 1GN Newark Cer	tre Parcs			
Anlagenstandort / Location				
Brennstoff / Fuel			Erdgas	
Elektrische Leistung / Electr	ical power	kW	365	
Thermische Leistung / Therr	mal Power	kW	496	
Energieeinsatz / Input		kW	955	
Stromkennzahl / CHP coefficient			0,74	
Spannung / Voltage		V.	400	
Frequenz / Frequency		Hz	50	
Heizwasser Vorlauf / Heating water flow line		°C	90	
Heizwasser Rücklauf / Heat	ing water return line	°C	70	
Technische Daten / Technical Data				

14.2. Remote Servicing:

Providing the internet connection has been successfully set-up and commissioned to the CHP plant, Hoval have the ability to log-in to the controller and potentially diagnose any issues you may have without having to wait for an Engineer to attend site.

15. Fault Finding

alarm

15.1.Alarms

Pressing the alarm button enters you into the current alarms menu. Here you will be able to see any current alarms or warnings and their current status. Alarms will be shown in red text and warnings shown in yellow text.

A history of alarms is shown when the current alarms button is pressed.

Fault s	Fault status, 1 = current, 0 = fault cleared					
	Fau	ılt number				
	Date/time	Fault description	n			
		alarm	list	Ľ	04.01.201	2 10:37:33
1 00535	04.01.12 09:50.13	safety stop failure gas coole	ər			
1 00451	04.01.12 09:50.13	safety stop exhaust gas tem	perature after he	eat exchanger	max.	
1 00391	04.01.12 09:50.13	warning NSM relay enable	missing			
1 00338	04.01.12 09:50.13	warning manual mode mixer	return flow incre	ease		
1 00333	04.01.12 09:50.13	warning error table cooler				
1 00322	04.01.12 09:50.13	warning error Bus to the cor	itrol system			
1 00309	04.01.12 09:50.13	warning vector offset skip				
1 00308	04.01.12 09:50.13	warning lineguard in the cab	inet			
1 00153	04.01.12 09:50.13	emergency stop fire alarm s	ystem			
1 00143	04.01.12 09:50.13	emergency stop gas pressu	re line 1 min.			
1 00132	04.01.12 09:50.13	emergency stop error feedb	ack cooling wat	er pumps		
1 00131	04.01.12 09:50.13	emergency stop failure auxi	liary systems			
1 00118	04.01.12 09:50.13	emergency stop error cabin	et			
					1 - 1	
T	千千	current alarms Help	Quit	Quit all		∓ †
		User rights	Service			

The alarm history is shown when the current alarms button is pressed.

			04.01.2012 10:38:26				
1	00535 04.01.12 09:50.13 safety stop failure gas cooler						
1	00451	04.01.12 09:50.13	safety stop exhaust gas temperature after heat exchang	jer max.			
1	00391	04.01.12 09:50.13	warning NSM relay enable missing				
1	00338	04.01.12 09:50.13	warning manual mode mixer return flow increase				
1	00333	04.01.12 09:50.13	warning error table cooler				
1	00322	04.01.12 09:50.13	warning error Bus to the control system				
1	00309	04.01.12 09:50.13	warning vector offset skip				
1	00308	04.01.12 09:50.13	warning lineguard in the cabinet				
1	00153	04.01.12 09:50.13	emergency stop fire alarm system				
1	00143	04.01.12 09:50.13	emergency stop gas pressure line 1 min.	emergency stop gas pressure line 1 min.			
1	00132	04.01.12 09:50.13	emergency stop error feedback cooling water pumps				
1	00131	04.01.12 09:50.13	emergency stop failure auxiliary systems				
1	00118	04.01.12 09:50.13	emergency stop error cabinet				
	1	TT	Alarmhistory Help Quit Quit a	· 〒 〒 +			
	-		User rights Service				



15.2. Fault Codes

When monitoring the CHP plant over the internet and using the remote monitoring software the faults will be denoted by the letters WA, SS or ES followed by a fault number.

Key

WA – Warning – The CHP plant will continue to run as this fault is only a warning that should correct itself. For all Warning faults subtract 200 from the fault number.

SS – Safety Shutdown – The CHP plant will safely shutdown then resume operation once the issue is rectified. If the same fault happens three times within 24 hours a manual reset will then be required. For all Safety Shutdown faults subtract 400 from the fault number.

ES – Emergency Stop – The CHP plant will shut down immediately and require manually resetting before resuming operation.

Example: Fault Code SS 402, this will be a safety shutdown due to excessive generator current L2. This is worked as 402 - 400 = 002.

Fault No.		Description
001	-	generator current L1
002		generator current L2
003	} -	generator current L3
005	5 -	return power
007	-	overspeed 1
008	- 8	no speed signal (pick_up)
009) –	overspeed 2
010) –	gas mixer 1
012	2 -	butterfly valve
013	} –	battery voltage
016) –	level oil sump max.
017	-	level oil sump min.
018	3 -	cooling water pressure max.
019) –	Cooling water pressure min.
020) –	lubrication oil pressure max.
021	-	lubrication oil pressure min.
024	-	mixture pressure
029) –	cooling water temperature engine inlet
030) –	cooling water temperature engine outlet
031	-	power reduction and cooling water temperature engine outlet
032	2 -	oil temperature
033	- 6	power reduction oil temperature min.
035	; -	mixture temperature
036) –	power reduction, high mixture temperature
040) –	return temperature heating circuit before mixer
041	-	power reduction, high return temperature before mixer
042		return temperature heating circuit after mixer
043	} -	flow temperature heating circuit
045	; -	cabin temperature
046) –	room temperature
047	-	exhaust gas temperature after bank 1
048	3 –	exhaust gas temperature after bank 2
049) –	exhaust gas temperature before catalyst

Fault No.		Description
050	-	exhaust gas temperature after catalyst
066	-	lambda actual value
071	-	power reduction, high exhaust gas temperature after engine bank 1
072	-	power reduction, high exhaust gas temperature after engine bank 2
073	-	pressure emergency cooler circuit
100	-	overvoltage line L1
101	-	overvoltage line L2
102	-	overvoltage line L3
103	-	undervoltage line L1
104	-	undervoltage line L2
105	-	undervoltage line L3
106	-	overfrequency line
107	_	underfrequency line
108	-	Mains monitoring tripped in the cabinet
109	_	vector offset skin
112	_	overvoltage generator
112	_	undervoltage generator
114	_	overfrequency generator
115		
115	-	apperator difference current monitoring
110	-	error control cabinet
10	-	error Rus to the control system
122	-	error bus to the control system
123	-	errer oofety shoip
124	-	enor salety chain
120	-	generator switch tripped
120	-	power switch tripped
127	-	
129	-	error gas mixer line 1
131	-	failure auxiliary systems
133	-	error neat dump
143	-	gas pressure line 1 min
144	-	gas pressure line 1 max
145	-	gas density line 1
151	-	gas detector unit pre gas alarm
152	-	gas detector unit main gas alarm
153	-	fire alarm system
171	-	safety pressure limiter min.
172	-	safety pressure limiter 1 max
173	-	safety pressure limiter 2 max
174	-	safety temperature limiter 1 max
175	-	safety temperature limiter 2 max
177	-	service hours exceeded warning
178	-	service hours exceeded stop
180	-	false start
181	-	connection time generator contactor exceeded
185	-	lambda controller fault
191	-	NSM relay enable missing
192	-	NSM relay power reduction stage 1
193	-	NSM relay power reduction stage 2
194	-	stop by NSM relay
195	-	message stop remote services
196	-	message stop by remote services
197	-	message stop by remote services
198	-	warning test program is active

15.3. Gas Leaks

- Detectable by an acrid smell
- On a containerised CHP the gas detection alarm will sound
- Close the main gas valve
- Ventilate the plant room and inform the Site Manager
- Do not operate any electrical switchgear
- Inform Hoval Service

15.4. Oil Leaks

- Shut down the CHP plant
- Close the valve to the automatic oil refill tank
- Soak up any leaked oil and dispose of it in accordance to local environmental regulations
- Inform Hoval Service

15.4. Heating Circuit Leaks

- Shut down the CHP plant and close the incoming isolation valves
- Soak up any leaked water and dispose of it in accordance to the local environmental regulations
- Inform Hoval Service

15.6. Exhaust Gas Leaks

- Detectable by a smell of exhaust gas
- Close the main gas valve
- Ventilate the plant room and inform the Site Manager
- Do not operate any electrical switchgear
- Inform Hoval Service

Please refer to the Safety Information as detailed on pages 5 and 6 of this manual.

Notes



Notes



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Hoval

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