

GE
Energy

TECHNICAL SPECIFICATION OF THE CONTROL

4 x JGS 320 GS-L.L
Nelson Gardens LFG
J N795

Index: -
Vorbehaltlich techn. Änderungen!
Revision reserved!



© GE Jenbacher GmbH & Co OG
Achenseestr. 1-3
A-6200 Jenbach (Austria)



1. Plant Short Description	3
1.1 Plant Summary	3
1.2 Fuel Gas	3
1.3 Principal Drawing Electric	3
1.4 Heating Schematic	3
2. Auxiliaries	4
2.1 Starting Equipment	4
2.2 Control System Power Supply	4
2.3 Jacket Water Preheating M.04-W-002	4
2.5 Intercooler cooling water pump P.07-M-001[01] provided and powered by costumer	4
2.12 Temperature control	Error! Bookmark not defined.
2.16 Table cooler for intercooler 2nd stage P.07-W-002[01-06] provided and powered by costumer	Error! Bookmark not
3. Function of the Cogeneration Plant	5
3.2 Customers request with full load operation	5
3.6 Engine Control Functions	5
3.7 Generator Controller Functions	6
4. Conditions	7
4.1 Parallel Operation	7
4.2 Grid Monitoring Unit	7
4.3 Safety Loop of the CHP	7
4.4 Requirement for Cabling performed by the Customer	8
4.5 Requirements for Customers Switchgear	8
5. Operation Modes of the CHP-plant	10
5.1 Automatic Operation	11
5.2 Manual CHP-Operation	12
5.3 Automatic Synchronizing Generator Circuit Breaker	14
5.4 Manually Initiated Automatic Synchronizing Generator Circuit Breaker	14
7. Electrical Hardware	15
7.1 Module Control Cabinet per Module	15
7.2 Module Interface Cabinet	19
8. Remote Data-Transfer with DIA.NE XT - HERMES	20
8.1 General	20
8.2 Connections methods	20
8.3 Applications	21
8.4 Technical prerequisites	23

Appendix : „ALARM LIST“



Modification:

index	datum	ref. point	comment	name

1. Plant Short Description

1.1 Plant Summary

1 gas engine gensets/modules

Fitted with 3 phase synchronous generator 480/277 V \pm 10 %, 60 Hz.

Total electric power: 4x 1059 kW = 4236 kW at pf. 1

4x 1049 kW = 4196 kW at pf. 0,8

1.2 Fuel Gas

Landfill gas

1.3 Principal Drawing Electric

See J N795 +U/page 5

1.4 Heating Schematic

Customer supply and GE Jenbacher hydraulic drawing J N795 00 03



2. Auxiliaries

2.1 Starting Equipment

Starter batteries: lead/acid
24 V, 200Ah per module.
Detailed description see TA-Nr. 1000-0050.

Charger:
24 V, 40A
with integrated control system power supply 24 V =, 18 Ah. Used for module controller.

2.2 Control System Power Supply

24 V=, min. 22 - max. 30 V (inclusive of ripple) at GE Jenbacher terminal. max ripple $U_{ss} = 2,4$ V.

2.2.1 Control voltage for module control cabinet

Control voltage for module control cabinet from starter batteries.

2.3 Jacket Water Preheating M.04-W-002

3x 480/277 V, 60 Hz, 8,6 kW:
Thermostatically controlled between 131 °F – 140 °F.



Status Display (screen P_04.1)
"PREHEATING WATER CIRC. PUMP ON/OFF"
"PREHEATING ON/OFF"

The module will be preheated continuously whilst the service selector is in the manual or auto position.
When service selector switch is "OFF", preheating is switched off. (Electric heating elements, circulating pump, thermostat).

2.4.1 Jacket Water circulation pump M.04-M-002

3x 480 V, 60 Hz, 370 W:
Pump operates during engine shutdown and auxiliary cool down phase.
When service selector switch is "OFF", the circulating Pump is switched off.

2.5 Intercooler cooling water pump P.07-M-001[01] provided and powered by costumer

3x 480 V, 60 Hz, kW:
Missing information
The pump operates during module operation and during the 5-minute cool-down run.

2.21 Cooler .x .kW, .A, 480V, 60Hz, P.04-W-003[xx-xx] provided, controlled and powered by costumer

Combined cooler for hot-water circuit and low-temperature circuit.



3. Function of the Cogeneration Plant

The TI-No.. 1100-0110 „Boundary conditions for GE Jenbacher gas engines“ has to be followed.

3.2 Customers request with full load operation

The module is requested into operation via a customer supplied potential free contact (interface No. 15).

Contact closed = Module operation

Contact opened = Module stop

The start | stop selection of each individual module in order to suit the requirements of the plant should be performed in such a way that there is a minimum of 1 to 3 hrs between each start and stop of each module. The choice of which module to operate should also be related to the operating hours completed for each module.

3.6 Engine Control Functions

3.6.1 Knock control system:

Some cylinders of the engine are fitted with analogue knocking sensors (E.00-AI-101[xx]) which produce 4-20 mA signals proportional to the knocking intensity.

These knocking signals are analysed and a knocking control thus effected.

If the knocking signal exceeds a background noise level, the ignition point value is adjusted first. As an additional measure (if applicable), the intercooler temperature is lowered and, finally, the engine power during mains parallel operation is reduced by a specified time constant, until the knocking signal falls below the background noise level. Once the knocking signal has fallen below the background noise level, the engine power is returned to the rated power by increasing the time constant. If the engine power is reduced by the knocking signal to 50% of rated power, the engine is shut down on safety grounds.



Error message "KNOCKING FAILURE"



Error message "KNOCKING FAILURE CYLINDER xx"

3.6.2 Power reduction due to intercooler temperature

If the intercooler temperature (E.08-TI-001) exceeds 123,8 °F, the engine power will be reduced during mains parallel operation by 4% per additional °C. If, however, the temperature exceeds 131 °F, the engine is stopped and the error message "CHARGE TEMPERATURE MAXIMUM" appears.

3.6.3 Power Reduction due to Misfiring

Every detected misfiring is displayed. The detection takes place according power surges. Every recognised misfire event will be summarised with the misfire integrator. The increase and decrease speed of the integrator is adjustable. If the integrator reaches a level of 50% the engine output will be reduced, at an integrator level of 100% the engine output will be reduced to 50% and subsequently the engine will be stopped. A misfiring alarm will appear at a settable value of the integrator.



Message "POWER REDUCTION - MISFIRE" (screen P_41.1)

If due to misfiring, the engine power must be reduced to 50% output then a module shutdown is performed due to safety reasons.



Failure Message "MISFIRING TROUBLE"



3.6.5 Locking engine from gas supply

With locking the engine from gas supply (interface No. 60.1) the engine will be shut down without any cool-down run. The engine will be able to resume operation after deleting the lock from the gas supply and a minimum standstill time of 5 minutes.



Message "MODULE LOCKED OUT"

3.6.7 Power reduction based on a CH4 signal

(customer's 4 - 20mA signal, voltage free)

Function: with this set-up, the engine output can be reduced from 100% down to 50% depending on the CH4 signal.

Advantage: Using this approach, an over-suction of the gas system can be prevented. Furthermore this also prevents or delays an engine trip due low gas quality.

Recommended application if the engine is the only user of the gas supply!

This function can be deactivated via an external signal.



Message "POWER REDUCTION - CH4" (screen P_41.1)

3.7 Generator Controller Functions

3.7.1 Effective power reductions

To protect the generator, the effective power generated is reduced to certain limits.

A reduction takes effect in the case of:

- undervoltage (average voltage)



Message "POWER REDUCTION UNDERVOLTAGE"

- overvoltage (average voltage)



Message "POWER REDUCTION OVERVOLTAGE"

- underfrequency



Message "POWER REDUCTION UNDERFREQUENCY"

- overfrequency



Message "POWER REDUCTION OVERFREQUENCY"

- winding temperature too high (only if windings Pt100 assembled)



Message "POWER REDUCTION WINDING TEMPERATURE"

3.7.2 Reactive energy reductions

- Limiting the reactive energy / cos phi at high winding temperatures

The highest of the 3 phase temperatures is taken as the actual value of the winding temperature. This reduction is only activated if the assembled winding Pt100s are activated (not with PTC resistors).



Message "REACTIVE POWER REDUCTION WINDING TEMPERATURE"

- Generator operation at the underexcited stability limit using pole wheel angle reduction



Message "REACTIVE POWER REDUCTION POLAR WHEEL ANGLE"

3.7.3 Reactive energy / cos phi control

- **Internal setpoint:**

The cos phi is a fixed value.



4. Conditions

4.1 Parallel Operation

The module(s) operate(s) in parallel with themains. The relevant standards for parallel operation with the mains are complied with.

The engine and exhaust heat are supplied to the customers heating circuit.

Terminal point electricity:

4.2 Grid Monitoring Unit

Monitoring of the mains voltage regarding: (G59 for G.B.)

Overvoltage 3-ph 110% UN

Undervoltage 3-ph 90% UN

Overfrequency 1-ph 61,5 Hz

Underfrequency 1-ph 59 Hz

Auto reclosure, detected by a 3 phase vector shift relay within 100 msec.

After response of the mains protection relay caused by a mains disturbance, the mains circuit breaker (MCB) will be commanded open.

After response of the mains protection relay caused by a mains disturbance, the generator circuit breaker (Gen. C.B.) will be commanded open.

The maximum opening time of the MCB (Gen. C.B.) must not exceed 60 msec following a mains short interruption of minimum 200 msec (3 ph).

Warning: If the mains specification does not meet the above requirements (Continental European Standard) then GE Jenbacher will require a mains condition analysis from the customer.

4.3 Safety Loop of the CHP

4.3.1 CHP Plant Safety Loop

For the total CHP plant, a current loop safety circuit for the following is provided.

- Emergency stop (contact external | GE Jenbacher)
- Gas alarm (contact external | GE Jenbacher)
- Fire alarm (contact external | GE Jenbacher)

Tripping of the safety loop produces an immediate shut down of the total CHP plant.

4.3.2 Gas Engine Safety Loop

For each engine | CHP module, a current loop safety circuit for the following is provided.

- Emergency stop
- Over speed
- Ignition monitoring
- Control of switchgear under voltage trip device for,
Alternator reverse power
Shutdown fault
Missing power signal
Power signal overload

Tripping of the safety loop shuts down only the appropriate module | engine.



4.4 Requirement for Cabling performed by the Customer

Cable installation must comply with TA-Nr. 1000-0505.

The cross sectional areas for the power cables supplied by the installer must be in compliance with IEC 60204-1 as well as IEC 60364-5-52 (methods of installation, grouping ...).

4.4.1 Generator power cables:

See TA-Nr. 1100-0112 „Installation of GE Jenbacher Units“!

Generator current: $I_n = 1577 \text{ A}$, at p.f. 0,8.

Installed in such a manner as to reduce the risk of a short-circuit to a minimum, and not be placed close to combustible material.

4.4.2 Only flexible cables are permitted.

4.5 Requirements for Customers Switchgear

Standards:

Rated voltages $\leq 1 \text{ kV}$: IEC 60439-1, IEC 60204-1, ISO 8528-4

Rated voltages $> 1 \text{ kV}$: IEC 62271-200, IEC 60204-11, ISO 8528-4, metal enclosed and capable of withstanding an internal arc fault, and clearly marked to distinguish it from LV equipment.

4.5.1 Generator switchgear:

Circuit breaker 3 pole drawout type with motor drive (24VDC), suitable for synchronizing and BLACK OUT Start with de – excited alternator (No alternator voltage is available)

24 (110) VDC closing coil, closing time max. 70 msec. from GE Jenbacher interface until contacts of the generator C.B. are closed, transmission time for the STATUS feedback signal max. 30msec.

24 (110) VDC shunt trip coil; trip time max. 60 msec. from GE Jenbacher interface until contacts of the generator C.B. are opened, transmission time for the STATUS feedback signal max. 30msec.

24 (110) VDC under voltage trip coil

On | Off command from GE Jenbacher synchronizing only: Continuous contacts (1 NO and 1 NC) with 24 VDC, 10 A (110VDC, 0,5A) load rating.

Over current and short circuit protection with primary or secondary relays.

Adjustment over current: to 1,1 times the rated generator current, time characteristics acc. to IEC 60255-151: Very Inverse, time multiplier setting 0,6.

Adjustment short circuit: to 2,5 times generator nominal current with adjustable time delay (300 msec).

1 earthing switch for MV/HV generators

3 x fuses and potential transformer (480V/1,73 : 120V/1,73 Class 1) for measurement / protection (**ILF 13**)

3 x fuses and potential transformer (480V/1,73 : 120V/1,73 Class 1) for measurement / protection at the busbar side (1* per busbar) (**ILF 75**)

Customer supplied generator protection operate directly on the opening coil of the circuit breaker. GE Jenbacher receives a summary contact (single report). Lock out (blockage) is customer supply.



Generator transient over voltage surge protection according TA-Nr. 1100-0112:

High voltage transient surges caused by switching devices, lightning strikes on overhead cables etc., could damage the generator windings and measuring equipment. Therefore surge suppression devices must be installed.

Rating: It must ensure that the impulse level as seen at the generator terminals is reduced to less than:

Crest value $kV = 1,25 \times \sqrt{2} \times (2V_{line} + 1)$.

e.g. for a 10 kV generator: $1,25 \times 1,414 \times (2 \times 10 + 1) = 37,1 \text{ kV}$

The maximum 'front rise time' of the calculated value above is 5 micro seconds.

This can be achieved using a combination of capacitors/resistors and varistors:

e.g.: High frequency transient surge suppressors ZORC from STRIKE Technologies Ltd, South Africa.

Neutral Ground resistor: NGR (Option). NGR and CB according plant specific requirements.


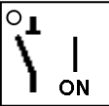
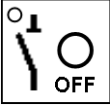


5. Operation Modes of the CHP-plant

Functions of the service selector switch and the module demand selector-switch:

Service - selector - switch	Demand - selector - switch	Start	Stop	Set point for engine power control
STOP	-	-	-	-
MANUAL	-	START – key at DIA.NE XT	STOP – key at DIA.NE XT	internal
AUTOMATIC	OFF	-	Module demand cancelled	-
	REMOTE	Demand from customer or master control	Demand is cancelled by the customer or master control	Variation: internal
				Variation: external from customer or master control
ON	-	Module is demanded	-	internal

Control of the generator circuit breaker (GCB) in dependence of the synchronizing selector switch of the module control

Synchronizing selector switch		Opening of the generator CB	Synchronizing generator CB
MANUAL		 Key at DIA.NE XT Cancellation of a running manual synchronizing	 Key at DIA.NE XT for sync. selection. Closing of the CB happens automatically.
OFF		 Key at DIA.NE XT	Synchronizing of the Generator CB will be cancelled / blocked
AUTOMATIC		automatically	automatically



5.1 Automatic Operation

According the CHP-functions for all available modules.

- with the demand selector-switch in pos. "REMOTE" via interface no. 15 from the customer or from the master control
- with the demand selector-switch in pos. „ON“

Conditions for Automatic-start:

- ☞ Service selector switch in position "Automatic"
 - Safety chain is o.k.
 - No malfunction of the module (module specific)
 - Jacket water temperature (**M.04-TI-001**) > 104 °F
 - "Lock/Release Gas Supply" (**IFL 60.1**) ON
 - Engine is not running



Visual signal "READY FOR AUTOMATIC START - ENGINE STOPPED"

Voltage free signal "ready for automatic start" (**IFL 14**)

"Demand" from the master control/from the customer (**IFL 15**)

- Contact closed: Engine starts up
- Contact opened: Engine stop's

The demand causes:



Visual signal: "START PROGRAM RUNNING"

output "Module Demanded" (**IFL 17**) ON

output "Demand for Auxiliary" (**IFL 18**) ON

6 sec. after release for start:



Visual signal: "AUTOMATIC START IS RUNNING"

Starter (**E.00-M-001[xx]**) on, ignition on

With answer back "Ignition operating", the gas valves (**P.01-YCZ-xxx**) are opened.

The engine ignites and powers up:

The starter (**E.00-M-001[xx]**) will be disengaged when the speed is higher start speed.



Visual signal: "START PROGRAM ENGINE RUNNING UP TO RATED SPEED"

Jacket water preheating (**M.04-W-002**) off.

If the engine doesn't ignite a 2nd attempt will follow.

If the 3rd attempt is also not successfully, a further start is blocked.



Visual signal "START UP TROUBLE" and further start attempts are prevented.

Operational Messages:

10 seconds after engine start and power up, the lube oil pressure monitoring (**M.03-PI-001**) is activated.



Visual signal "ENGINE IDLE OPERATION -"

Potential free contact "Operation | Engine is running" (**IFL 20**) issued to master control and for the customer.



Visual signal "ENGINE IDLE OPERATION SYNCHRONIZE-/LOAD RELEASE".

Synchronizing:

- ☞ The synchronizing is performed automatically when synchronizing selector switch is in automatic position.




 Visual signal "MAINS PARALLEL OPERATION".

Automatic Loading:

After the closure of generator C.B., the module power will be raised to its set point.

Shutdown during Automatic Operation

Reason: "Demand Module" signal (**IFL 15**) from master control/customer is removed in pos. „REMOTE“ of the demand selector-switch or with the demand selector-switch in pos. „OFF“

 The load is reduced. Once load is less than 10% PN, the generator C.B. will be opened by the breaker control.

 Visual signal " STOP PROGRAM: ENGINE COOL DOWN RUN"

After one minute cool down run, the gas valves (**P.01-YCZ-xxx**) are closed.

Contact "operation | Engine is running" (**IFL 20**) is removed.

 Visual signal "STOP PROGRAM : ENGINE STOP SEQUENCE".

Ignition off and once engine speed is less than start speed


 Visual signal "READY FOR AUTOMATIC START ENGINE STOPPED"

Shut down check of gas train (leakage detection (**P.01-US-xxx**))


Turbocharger cool down oil pump (**M.03-M-005**) for 20 minutes switched on

Auxiliaries operate for 5 minutes (hot water circulating pump (**P.06-M-001**),...)


5.2 Manual CHP-Operation

 The CHP module can be operated manually by setting the service selector switch in position "Manual". The load up/down of the module is thus manually operated. The synchronizing function is automatic or manual (manually started auto synchronizing) depending on synchronizer selector switch position.

Conditions for the Manual Start:

 Service selector switch in pos. manual.
Safety chain is o.k.
No module malfunction (module specific)
"Lock/Release Gas Supply" (**IFL 60.1**) ON
Engine is not running

 Visual signal: "READY FOR MANUAL START ENGINE STOPPED"

 Press start button for "start preparation"

The demand causes:

 Visual signal: "START PROGRAM RUNNING"

output "Module Demanded" (**IFL 17**) ON

output "Demand for Auxiliary" (**IFL 18**) ON

If all conditions are o.k.:

 Visual signal "START ENGINE (PUSH START BUTTON) "

 Press start button

Starter (**E.00-M-001[xx]**) on | Ignition on

With answer back "Ignition operating", the gas valves (**P.01-YCZ-xxx**) are opened.



The engine ignites and starts up.



Visual signal "START PROGRAM : ENGINE RUNNING UP TO RATED SPEED".



Release start button

The starter (**E.00-M-001[xx]**) will be disengaged when the speed is higher than the start speed.

The cooling water preheating (**M.04-W-002**) is switched off.

Operation signals:

10 sec. after start and power up, lube oil monitoring (**M.03-PI-001**) is switched on



Visual signal: "ENGINE IDLE OPERATION"

Voltage free signal: "Operation | Engine is running" to the customer (**IFL 20**)

Synchronizing:

The synchronizing is possible in 2 modes: manual (manual initiated automatic synchronization) and full automatic.



Manual loading (load control):

With keys on the DIA.NE in the control panel.

Shut down in Manual Operation:

Before shutting down engine, decrease load using the DIA.NE.



Synchronizing selector switch in position "Manual" or "Off"



Switch off generator C.B. with < 10 % engine power.



Visual signal: "ENGINE IDLE OPERATION SYNCHRONIZE-/LOAD RELEASE"



After 1 min. cool down run, stop engine with "Stop" button.

"Generator C.B. Release" is removed and the engine is shut down.

Afterwards the gas safety line will be checked (**P.01-US-xxx**).

Turbocharger cool down oil pump (**M.03-M-005**) for 20 minutes switched on





Visual signal: "READY FOR MANUAL START - ENGINE STOPPED"



5.3 Automatic Synchronizing Generator Circuit Breaker

- ☞ Synchronizing selector switch in position "Automatic"
 - Release from the module control (Synchronizer/Load Release)
 - Engine operating
 - Jacket water temperature (**M.04-TI-001**) > 131 °F (when service selector switch is "Automatic")
 - Generator C.B. is opened
 - Generator C.B. is ready for closure
 - Generator C.B. carriage is engaged




Automatic synchronizing selection

-  Status display "SYNCHRONIZING IS RUNNING"
-  Illuminated button "GENERATOR CIRCUIT-BREAKER ON / SELECTION" flashes
 - Select bus bar voltage
 - Select generator voltage
 - Preparation of the synchronizer
 - Select generator C.B.
 - Select speed adjustment

Automatic tuning of the generator voltage to the bus bar voltage.

Automatic tuning of the generator frequency to the bus bar frequency by the synchronizing unit.



Closing command to the generator C.B. by the synchroniser at the moment of synchronizing.

-  Illuminated button "GENERATOR CIRCUIT-BREAKER ON / SELECTION" is lighting
-  Answer back "GENERATOR CIRCUIT-BREAKER CLOSED" (screen P_11.1).
-  Status display "MAINS-PARALLEL OPERATION"

5.4 Manually Initiated Automatic Synchronizing Generator Circuit Breaker

- ☞ Synchronizing selector switch in position "Manual"
 - Release from the module control (Synchronizing | Load Release)
 - Engine operating
 - Generator C.B. is opened
 - Generator C.B. is ready for closure
 - Generator C.B. carriage is racked in




- ☞ Press button "GENERATOR CIRCUIT-BREAKER ON / SELECTION"

-  Status display "SYNCHRONIZING IS RUNNING"
-  Illuminated button "GENERATOR CIRCUIT-BREAKER ON / SELECTION" flashes
 - Select bus bar voltage
 - Select generator voltage
 - Select generator C.B.
 - Select speed adjustment

Automatic tuning of the generator voltage to the bus bar voltage.

Automatic tuning of the generator frequency to the bus bar frequency by the synchronizing unit.

Closing command to the generator C.B. by the synchroniser at the moment of synchronizing.

-  Illuminated button "GENERATOR CIRCUIT-BREAKER ON / SELECTION" is lighting
-  Answer back "GENERATOR CIRCUIT-BREAKER CLOSED" (screen P_11.1).
-  Status display "MAINS-PARALLEL OPERATION"



7. Electrical Hardware

Design of the enclosures:

All enclosed, steel, free standing cabinet with front opening door, rubber door seals, completed to terminal strips for interconnection by customer via a cable channel (double floor). Cable exit from underneath.

design according IEC 60439-1 | EN 60439-1 and ISO 8528-4.

ambient temperature 41 °F - 104 °F

Enclosures: Rittal, Type TS 8

colour RAL 7035

7.1 Module Control Cabinet per Module

Consisting of:

DIA.NE XT3 motor management system

System elements visualisation with central engine and module control

a) Visualisation:

Industrial control with 10,4" colour graphics display.

10-key numeric keyboard for parameter input.

Keys for START, STOP, display selection keys and special functions.

Interfaces:

- Ethernet (twisted pair) for connection to DIA.NE WIN server
- CAN-Bus: bus connection to the intelligent sensors and actuators
- B&R bus connection to the control in- and outputs

OPTION: Interfacing with the customer's plant management according to GE Jenbacher list of options (MODBUS-RTU Slave, PROFIBUS-DP Slave)

Protection class DIA.NE XT front: IP 65

Dimensions: W x H x D = approx. 323 x 358 x 105 (12,7 x 14,1 x 4,1 in)

A clear and functional graphic compilation of measured values is displayed on the screen. User prompts are by means of direct-acting display selection keys and function keys.

Main displays:



Generator interconnection, with electrically measured variables and display of excitation voltage (**OPTION:** generator winding temperature and generator bearing temperature displays)



Oil and engine cooling water circuits, with displays of oil pressure and temperature, and cooling water pressure and temperature.



Exhaust gas temperatures in a column graph which also displays the average temperature.



Main engine controller




Module auxiliary controller



Auxiliary systems (status display)




 Operational data, i.e. operating hours, service hours, number of starts, active power demand (kWh), reactive power demand (kVAh), and measured values for operational logbook.

 System display, i.e. time, password, brightness, contrast, diagnostics.

Graphic trending display of up to 16 measured values:


 Long term trending (1 month at a storage interval of 30 sec.)

 Short term trending (20 min. at a storage interval of 1 sec.) - stopped and stored in the event of a malfunction.

Recipe handling:

Setting, display and storage of all module parameters

Alarm management:

 Efficient diagnostic instrumentation listing all active fault messages both tabular and chronologically, with the recorded time.

b) Central engine and module control:

A real-time, modular industrial control system which handles all jobs for module and engine-side sequencing control (start preparation, start, stop, after-cooling, control of auxiliaries), as well as all control functions.


Interfaces:

Control functions:


- Speed control in idle mode and isolated operation
- Power output control in mains parallel operation, with respect to internal and external setpoint values
- LEANOX control system: the manifold pressure is controlled by the engine-driven air-gas mixer in accordance with the generator terminal power and the intercooler temperature
- Knock control system: adjustment of ignition point, power output and (insofar as possible on site) the intercooler temperature in the event that knocking is detected
- Active load sharing where several engines are running in isolated operation
- Linear reduction of power output in the event of excessive intercooler temperature and misfiring


- Interface relays as per the interface list

- Multi-transducer, to record the following electrically measured variables of the generator:

 Phase current (with slave pointer)

 Neutral conductor current

 Voltages Ph/Ph and Ph/N

 Active power (with slave pointer)

 Reactive power

 Apparent power

 Power factor

 Frequency



An additional 0 (4) - 20 mA output is produced for active power (**IFL 29**), as well as a pulse output for active power demand (**IFL 30**).

The following alternator supervisions are integrated with the multi-transducer (max. 8 functions simultaneous):

- Overload/short-circuit [51], [50]
- Over voltage [59]
- Undervoltage [27]
- Asymmetric voltage [64], [59N]
- Unbalance current [46]
- Failure Excitation [40]
- Overfrequency [81>]
- Underfrequency [81<]

- Lockable service selector switch with the following positions:

- ☞ "Stop": No start up possible
If the engine runs and the switch is turned to "STOP" the engine stops immediately.
- ☞ "Manual": Full manual operation (start, stop) possible.
The module is not available for full automatic operation.
- ☞ "Automatic": Full automatic operation in case of request from the master control or potential free contact.
 - Automatic start
 - Fully automatic operation with internal | external power command
 - Shut down of module includes 1 minute engine cool down run and 5 minute cool down run for the auxiliaries.

- Module demand selector-switch with the settings:

- ☞ external demand not available. („OFF“)
- ☞ external demand. („REMOTE“)
- ☞ external demand contacts shorted. („ON“)

Supply disconnecting device for auxiliaries with lockable switch- disconnecter



STATUS MESSAGES

In the status bar of the GUI, the current operational status of the module will be displayed. eg.

SERVICE SELECTOR SWITCH OFF

SERVICE SELECTOR SWITCH MANUAL NOT READY TO START

SERVICE SELECTOR SWITCH AUTOMATIC NOT READY TO START

READY FOR MANUAL START ENGINE STOPPED

READY FOR AUTOMATIC START ENGINE STOPPED

START PROGRAM RUNNING

START ENGINE (PUSH START BUTTON) (IN MANUAL OPERATION)

WAITING TIME BEFORE RELEASE OF NEXT MANUAL START (IN MANUAL OPERATION)

AUTOMATIC START IS RUNNING (IN AUTOMATIC OPERATION)

START PROGRAM: ENGINE RUNNING UP TO RATED SPEED

ENGINE IDLE OPERATION NO SYNCHRONIZE-/LOAD RELEASE

ENGINE IDLE OPERATION SYNCHRONIZE-/LOAD RELEASE

SYNCHRONIZING IS RUNNING



MAINS-PARALLEL OPERATION
STOP PROGRAM: ENGINE COOL DOWN RUN
STOP PROGRAM: ENGINE STOP SEQUENCE
MODULE LOCKED OUT



FAILURE MESSAGES MODULE CONTROL (ALARM MANAGEMENT):
see Appendix "ALARM LIST (STÖRMELDELISTE)"!

Synchronizing of the generator CB (and mains CB in case of pure single synchronizing)

Synchronizing elements:

- Lockable synchronizing selector switch with following positions:
 - ☞ "MANUNAL":
 - ☞ "OFF":
 - ☞ "AUTOMATIC":
- Synchronizing unit - with frequency balance and following displays:
 - Double voltmeter - for monitoring of bus bar and generator voltage
 - Double frequency meter - for monitoring of bus bar and generator frequency
 - Synchronoscope - for monitoring of the synchronizing function during synchronization
- Mains protection relay (f <>, V <>, $\Delta\theta$) - G59 for G.B.
- All required control, display and command devices
 - ☞ "GENERATOR CB ON/ SELECTION" key at the DIA.NE XT
 - ☞ "GENERATOR CB OFF" key at the DIA.NE XT
 - ☞ "Mains CB OFF - ON/ SELECTION" control switch

Synchronizing monitoring see Appendix "ALARM LIST"

Thermostatically controlled 41W cabinet ventilator.

Dimensions:

height = 2200 mm (incl. 200 mm pedestal)
width = 1000 mm
depth = 600 mm



7.2 Module Interface Cabinet

All enclosed sheet steel cabinet with forward opening door (double doors as option), fitted with rubber profile seals. Fitted to module skid and wired to the module auxiliaries and engine.
Painted in RAL 7035

Protection class: IP54 external.

Control circuit supply from the starter battery charger.

Power supply from the motor control cabinet for the charging unit
240 V, 60 Hz, 13 A

comprising:

- terminal strip with cable entry from bottom
- decentral I/O system connected via an serial interface with the central engine control system in the module control cabinet.
- measurement transducer for generator exciter voltage.
- relays, protection, motor contactors for auxiliary and valve control.

Thermostatically controlled panel air conditioner.

Module interface cabinet dimensions:

width = 800 mm

height = 1000 mm

depth = 300 mm



8. Remote Data-Transfer with DIA.NE XT - HERMES

8.1 General

HERMES is the remote data transfer solution for DIA.NE XT. HERMES is available via two connection methods and applications.

8.2 Connections methods

8.2.1 Modem

Site-Customer connection via an analogue Modem.

Scope of supply

- DIA.NE WIN – Server (Industrial PC without display, keyboard or mouse, built into the control panel, including operating system)
- Internal analogue modem.

Customer Requirements

- Analogue modem in the customers PC
- Public telephone connection with connection port for the DIA.NE WIN – Server (in the control panel) including over-voltage protection corresponding to the local telecommunication regulations.
- Public telephone connection with connection port for the customer's PC corresponding to the local telecommunication regulations.

8.2.2 LAN

Site-Customer connection via a local network.

Scope of supply

- DIA.NE WIN – Server (Industrial PC without display, keyboard or mouse, built into the control panel, including operating system)
- Ethernet – Network card (10/100 BASE T)

Customer Requirements

- Ethernet – Network card (10/100 BASE T)
- Ethernet – Cabling between the DIA.NE WIN – Server the customers PC.

8.2.3 Internet (OPTION)

Site – Customer connection via secure Internet access

Scope of Supply

DIA.NE WIN – Server (Industrial PC without display, keyboard or mouse, built into the control panel, including operating system)

Ethernet–Network card (10/100 BASE T)

Firewall–Appliance with connection feasibility to a customer network with a maximum of 10 Hosts (Installation and service by GE Jenbacher; during warranty period included, afterwards as a service package with costs) (built into the control panel)

Feature – service package (access monitoring, clock synchronization for server)

Customer Requirements



Broad band Internet access with at least two official IP addresses.
Connection feasibility for the Firewall–Appliance to the Internet–Router via Ethernet (RJ45 Connector, Network Address Translation (NAT) is not permitted) or USB type A Connector.

8.3 Applications

8.3.1 DIA.NE WIN (OPTION)

DIA.NE WIN is the Windows based „man-machine interface“ for GE Jenbacher gas engines. The system offers extensive facilities for commissioning, monitoring, servicing and analysis of the site. The option DIA.NE WIN extends the visualisation of DIA.NE XT with respect to user friendliness, historical analysis and remote use. Several service stations can be independently operated in parallel. The system consists of a central PC (DIA.NE WIN – Server) which is built in to the control panel and one or more service stations (DIA.NE WIN – Clients). The system runs on a Microsoft Internet Explorer platform.

Function

Service and monitoring, trend analysis, alarm management, parameter management, long-term data analysis, multi-user system, remote control, OPC (OLE for process control), print and export functions, operating data protocols, available in several languages.

Scope of supply

Software package DIA.NE WIN on the DIA.NE WIN – Server
DIA.NE WIN – Client Licence (Right to access of the user to the server on site)

Customer requirements

- Standard PC with keyboard, mouse and monitor (min. resolution 1024*768)
- 230 V supply for the customers' PC
- Operating system Windows 98, Windows NT, Windows 2000 or Windows XP
- Microsoft Internet Explorer (min. Version 6.0) including Java support

8.3.2 DIA.NE RMC (OPTION)

DIA.NE RMC (Remote Message Control) is the automatic alarm system for DIA.NE XT. DIA.NE RMC can fully automatically transmit essential operational information from the DIA.NE XT Alarm Management to a remote station. The messages can be forwarded to an e-mail address, fax machine or mobile phone (SMS). Furthermore the stored messages can be visualised at the remote station. The system consists of a central PC (DIA.NE WIN – Server) which is built into the control panel and one or more customer remote stations.

Function

Automatic transfer of messages to the customer via email, fax or SMS. Display and printing of the messages (also distributed via LAN). Automatic and manual transferral of messages, trend data and operating data protocols.

Scope of supply

Software package DIA.NE message on the DIA.NE WIN – Server
Software package DIA.NE control and DIA.NE report on the remote station

Customer requirements

- Standard PC with keyboard, mouse and monitor (min. resolution 1024*768)
- 230 V supply for the customers' computer.
- Operating system Windows NT or Windows XP
- Internet connection (provider account) for the case that messages from the RMC should be



forwarded to an email receiver (incl. SMS for mobiles and pagers). (Mobiles and pagers to be provided by the customer).

- Customer fax software for message forwarding via fax

OPTION:

8.3.2.1 DIA.NE message

DIA.NE message is installed on the modem servers of the plants. It is responsible for the transmission of messages and data to **DIA.NE control** in the RDT control centers.

Message transmission:

The processing of alarm messages on the module visualization units is carried out by AMM (Alarm Management) from DIA.NE. AMM records operational messages, warnings and malfunctions leading to shutdowns (the latter two are also designated as alarm messages).

Prior to a transmission the messages generated by the modules are examined according to various criteria so that the message transmission can be influenced in a specific way. The following criteria can be set:

Module, Message designation, Message number, Message type, Weekday, Time of the occurrence

If a message is classified as “to be transmitted”, it is then augmented with the plant code, plant number, module designation and the module number and transmitted to the configured RDT control centers.

Data transmission:

The HTM (Historical Trend Management) function records measured values cyclically on the **DIA.NE** visualization units and stores them in so-called log files.

OPTION:

With the RPM (Report Management) function reports (e.g. operational logbook) can be automatically generated which then are available as report files.

These files, which are stored in the modules, can be transferred manually or automatically to any desired RDT control centers.

OPTION:

8.3.2.2 DIA.NE control

In the RDT control centers **DIA.NE control** regulates the reception and archiving of all incoming messages and data. Additionally, the relaying of messages and reports via Fax and eMail (incl. SMS for cellular phones and pagers) is organized for communication with service personnel.

Messages which are received from the plants are examined according to various criteria prior to being relayed so that communication can be purposely influenced. The following criteria can be set:

Plant code, Plant number, Module, Message designation, Message number, Message type
Weekday, Time of the occurrence, Communication type (Fax, eMail, SMS)

For automatic protocolling, all recorded messages can be printed out daily. A connection check can be activated to examine the RDT link between the modem servers and the RDT control centers. This ensures that a check call is carried out on a daily basis.



OPTION:

8.3.2.3 DIA.NE report

With DIA.NE report one can display and print out messages received in an RDT control center on any number of workstations (standard PCs). To do this, the PC must be linked via a LAN to the RDT control center. For the message display one can select both the language and the desired plants.

For automatic protocolling all received messages can be printed out daily regarding specific plants. Through DIA.NE report it is also possible to print out manually compiled protocols at any time.

OPTION:

8.3.3 Remote demand/blocking with HERMES

If the service selector switch at the module control panel is in pos."automatic" and the demand-selector switch in pos."Remote", it is possible to enable (demanded) or disable (demand off) the module with a remote controllable key at the visualisation.

Note:

With this option it makes no sense to have an additional clients demand (via hardware or data bus) or a selfguidet operation (via GE Jenbacher master control, grid import /export etc.).

OPTION:

8.3.4 Remote - reset (see TA-Nr. 1100-0111 chapter 1.7)

8.4 Technical prerequisites

The customer has the responsibility to ensure that a telephone line with a separate number is available no later than the start-up of operations. The connection must be installed in the module control cabinet in which the modem server is installed. The telephone line must be operative and the number known. No charge (=tariff) impulses may be applied to the line since they could interfere with data transmission. For the telephone line on the customers side an over voltage protection has to be provided which corresponds with local rules and regulations of the telephone provider.