Seminar overview 2017

Customer & Operator

www.mwm.net



Content.

Customer Training by Caterpillar Energy Solutions GmbH	3
Welcome to the Caterpillar Energy Solutions GmbH Training Center— Your team for success	4
Course availability in our training locations	9
The Way to a qualified and competent Customer/Operator	10
Competence level of Customer/ Operator	11
Product-related Engine Technology for Gas Engines	12
TCG 2016 series CL1	13
TCG 2020 series CL1	14
TCG 2032 series CL1	15
Product-related System Technology for Gas Engines	16
Operator Seminar TEM EVO Total Electronic Management Customer Dongle Level 100	17
General Comprehensive System Technology	18
General Comprehensive System Technology Basic Knowledge Electrical Engineering	19
General Comprehensive System Technology Practice Seminar on Control Engineering	20
Electrically Instructed Persons Regarding DIN VDE 0100, DIN VDE 0105 and DGUV Regulation 3	21
Advanced Course Electrical Engineering "Electrical Drive /3-Phase Asynchronous Motors"	22
Advanced Course Electrical Engineering Part I "Synchronous Motors/Generator Operation"	23
Advanced Course Electrical Engineering Part II Practice-oriented Generator Operation	24
Terms and Conditions for the Participation in Seminars - Part 1	25
Terms and Conditions for the Participation in Seminars - Part 2	26
Seminar Fees	27
Notes Concerning Registration	28





Service Training by Caterpillar Energy Solutions GmbH – a worthwhile investment.

Training opportunities for customers and operators

The right expertise is an important basic prerequisite for qualified operation an targeted service of our gas engines, gensets and cogeneration systems. That is why our training units are a key component of MWM's comprehensive range of service.

Cross-System Information

Through the comprehensive competence of Caterpillar Energy Solutions GmbH in the engine technology, the contents of the individual training courses are always holistically oriented and provide sound, easily comprehensible know how with cross-system information.

Centralized and Decentralized Trainings

The courses are held at the Training Center in Mannheim. If required basic training and further training can also be organised regionally. In terms of content, it is possible to choose between ongoing courses that built on each other and compact, topic-related individual seminars.





Welcome to the Caterpillar Energy Solutions Training Center in Mannheim.

We would like to introduce our training team from Mannheim. For training requests please contact:

Caterpillar Energy Solutions GmbH Carl-Benz-Str. 1 DE-68167 Mannheim +49 621 384-8412 training@mwm.net



Administration and Accounting Silke Schenk



Senior Manager Training Center Jürgen Bauer



Administration and
Access Authorisation Contol Units
Anja Stockert



Welcome to the Caterpillar Energy Solutions GmbH Training Center Mannheim – Your team for success.



Senior Manager Training Center Special branch Electrical Engineering Control and Feedback Control Systems Jürgen Bauer



Trainer Gas Engine TechnologyWerner Seitz



Trainer Diesel and Gas Engine TechnologyGünter Tomiczek



Trainer Gas Engine TechnologyWerner Schlenker



Trainer Gas Engine TechnologyMark Gabersek



Trainer Gas Engine Technology Alexander Klotz





Welcome to the Caterpillar Energy Solutions Training Center in Singapore.

We would like to introduce our training team from Singapore. For training requests please contact:

Caterpillar Energy Solutions Asia Pacific Pte. Ltd. Service & Training Department

11 Kian Teck Road Singapore 628768 Claire TAN +65 6308 9292 claire.tan@mwm.net



Trainer Md Nur Islam



Administration trainings Claire Tan



TrainerTang Kok Seng



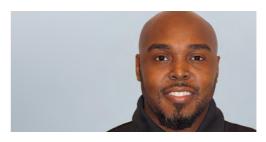


Welcome to the Caterpillar Energy Solutions Training Center in Atlanta/USA.

We would like to introduce our training team from Atlanta. For training requests please contact:

Caterpillar Energy Solutions, Inc. Sales & Service

1750 Breckinridge Parkway Suite 500 30096 Duluth, GA United States of America +1 770 279 6720 usa.service@mwm.net



TrainerKarlton Sutherland





Welcome to the Caterpillar Energy Solutions Training Center in Vigo/Spain.

We would like to introduce our training team from Vigo. For training requests please contact:

Caterpillar Energy Solution S.A. Service Center Vigo/Training Center Vigo

Muelle de reparaciones de Bouzas s/n 36.208 Vigo-Pontevedra España +34 986 247020 trainingcenter.spain@mwm.net



Trainer practical side Emilio Martinez



Administration trainings Alberto Mateo



Main trainer José Lamela



Course availability in our training locations

Course type	Mannheim	Singapore	Atlanta / USA	Vigo / Spain
Product-related Engine Technology for Gas Engines				
TCG 2016 series CL1				
TCG 2020 series CL1				
TCG 2032 series CL1				
Product-related System Technology for Gas Engines				
Operator Seminar TEM EVO Total Electronic Management Customer Dongle Level 100	•	•	•	•
General Comprehensive System Technology				
General Comprehensive System Technology Basic Knowledge Electrical Engineering	•			
General Comprehensive System Technology Practice Seminar on Control Engineering	•			
Electrically Instructed Persons Regarding DIN VDE 0100, DIN VDE 0105 and DGUV Regulation 3	•			
Advanced Course Electrical Engineering "Electrical Drive /3-Phase Asynchronous Motors"	•			
Advanced Course Electrical Engineering Part I "Synchronous Motors/Generator Operation"	•			
Advanced Course Electrical Engineering Part II Practice-oriented Generator Operation	•			



Upon request

Webex/web-based training



The Way to a qualified and competent Customer/Operator.

Engine Technology for Gas Engines

Series TCG 2016 Competence level 1 E 20 / 30 / 40

Series TCG 2020 Competence level 1 E 20 / 30 / 40 Series TCG 2032 Competence level 1 E 20 / 30 / 40

Customer Seminar TEM EVO, Total Electronic Management - Customer dongle - Level 100

Trainings in all Systems

The contents of the trainings used to impart the knowledge of assembling and function of engines. Comprehensive skills to operating of engines and plants provide additional security for later prac-

tice. Problem cases can be dealt within targeted fashion single-handed system-checking and fault correction by means of measuring technique.

General Comprehensive and Product-related System Technology for Gas

Basic Knowledge Electrical Engineering

Electrical Instructed Person regarding DIN VDE 0100, DIN VDE 0105 and DGUV Regulations 3

Advanced Course Electrical Engineering "Electrical drive / 3-Phase Asynchronous Motors"

Advanced Course Electrical Engineering "Electrical drive / 3-Phase Asynchronous Motors"

Advanced Course Part II

Practice Seminar on Control Engineering



Competence level of Customer/Operator.

Target groups	Prerequisite	Training Objectives Acquirement of various Competence levels
Customer/ Operator	 Basics about gas / diesel engines Knowledge in technical training language 	• CL1 E 20 / 30 / 40 Operation and Maintenance

Technical Content of the Competence levels

Competence level	Technical Content
• CL1 E 20 / 30 / 40 Operation and maintenance	 Job card B Maintenance activities corresponding to the maintenance schedule contained in the operation manual Visual inspections, cleaning, checking and change of maintenance parts and operating materials, easy repair and overhaul workings with standard tools, subsequent test run and checking of functions



Product-related Engine Technology for Gas Engines



TCG 2016 series CL1

Note	The seminar deals exclusively with the engine and includes the maintenance intervals E 10 up to E 40.
	Corresponding to the work content, safety shoes must be worn according to the operational safety!
Requirements	Knowledge in Gas Engine Technology are advantageous.
Target group	Customer and Operator
Duration	5 days
No. of participants	max. 8

Content	
Introduction	Factory tour, Service documentation
Design and Function of Engine, Assembly Groups and Systems	Explanation of MWM Gas Engine types and power spectrum, lubrication and cooling system, crankcase and oil pan, gear train and timing, ignition system, gas regulating line
Operation	Starting and shutdown, working materials (lube oil, fuel, coolant)
Maintenance according to Competence Level CL1	Terms (maintenance, inspection, repair), service instructions, tolerances, wear limits, valuation of coolant and lube oil, dismantling and assembling of components and units
Operation of TEM System	Display and operation menu, manual and automatic mode, required signals, setpoint settings, calibration and diagnostics, test mode auxiliaries, speed governor, ignition system, anti-knock control, histories, operational log book



TCG 2020 series CL1

Note	The seminar deals exclusively with the engine and includes the maintenance intervals E 10 up to E 40. Corresponding to the work content, safety shoes must be worn according to the operational safety!
Requirements	Knowledge in Gas Engine Technology are advantageous.
Target group	Customer and Operator
Duration	5 days
No. of participants	max. 8

Content	
Introduction	Factory tour, Service documentation
Design and Function of Engine, Assembly Groups and Systems	Explanation of MWM Gas Engine types and power spectrum, lubrication and cooling system, crankcase and oil pan, gear train and timing, ignition system, gas regulating line
Operation	Starting and shutdown, working materials (lube oil, fuel, coolant)
Maintenance according to Competence Level CL1	Terms (maintenance, inspection, repair), service instructions, tolerances, wear limits, valuation of coolant and lube oil, dismantling and assembling of components and units
Operation of TEM System	Display and operation menu, manual and automatic mode, required signals, setpoint settings, calibration and diagnostics, test mode auxiliaries, speed governor, ignition system, anti-knock control, histories, operational log book



TCG 2032 series CL1

Note	The seminar deals exclusively with the engine and includes the maintenance intervals E 10 up to E 40. Corresponding to the work content, safety shoes must be worn according to the operational safety!
Requirements	Knowledge in Gas Engine Technology are advantageous.
Target group	Customer and Operator
Duration	5 days
No. of participants	max. 8

Content	
Introduction	Factory tour, Service documentation
Design and Function of Engine, Assembly Groups and Systems	Explanation of MWM Gas Engine types and power spectrum, lubrication and cooling system, crankcase and oil pan, gear train and timing, ignition system, gas regulating line
Operation	Starting and shutdown, operating media (lube oil, fuel, coolant)
Maintenance according to the Competence Level CL1	Terms (maintenance, inspection, repair), service instructions, tolerances, wear limits, valuation of coolant and lube oil, dismantling and assembling of components and units
Operation of TEM System	Display and operation menu, manual and automatic mode, required signals, setpoint settings, calibration and diagnostics, test mode auxiliaries, speed governor, ignition system, anti-knock control, histories, operational log book





Product-related System Technology for Gas Engines



Operator Seminar TEM EVO Total Electronic Management Customer Dongle Level 100

Note	This customer dongle contains all the legal regulations to ensure a necessary operation of access. Please find prices and fees for the customer dongle in the seminar program. A review of the current software of the system is required. An update is carried out to ensure safe access, if neccessary. In accordance with the work contents, it is also advantageous to bring along a laptop.
Requirements	Participation in a "Product-related Engine Technology for Gas Engines" course is a requirement. After a successfull achievement test, the dongle authorization can be performed, if required.
Target group	Customer and Operator
Duration	4 days (5 days with an interpreter)
No. of participants	max. 8

Content	
Introduction	Combustion control, exhaust emissions, lambda operation, setpoint settings, power reduction, fuel gas characteristics, classification of combustion gases, knocking combustion, ignition temperature
Structure and Function of Components and Systems	Gas regulation lines, gas air mixture, ignition systems, Sensors (PT 100, thermocouple, Pick-Up, etc.), cooling / heating / emergency cooling circle, reading and understanding PI flow diagrams, components, security chain, plant control, TEM cabinet, PLC, TEM touch screen operation terminal
Settings	Parameter description based on the level 100
Operation of TEM System	Screen menus, manual and automatic operation, calibration and diagnostic, auxiliary test mode, speed governor, ignition system, histories, operational log book
Error Processing	Checklist for sytematic failure diagnosis, troubleshooting, assessment of characteristic curves by means of operational log book and data recording
Practical Demonstration with Simulator	Manual/automatic operation, changing of ramps, knocking, selecting and recording history curves





General Comprehensive System Technology



General Comprehensive System Technology Basic Knowledge Electrical Engineering

Note	The seminar imparts elementary knowledge in the field of electrical engineering for non-electricians with practical examples. After a successful achievement test, participants may attend continuing courses.
Target group	Customer and Operator
Duration	3 days
No. of participants	max. 8

Content	
Introduction	Basics in electrical engineering, charging, current, potential, voltage, resistance, electric conductance, resistivity, Ohm's law, series and parallel connection, magnetic field, inductance and coils
Components	Cable types, terminal strip, fuses, fault current breaker, power switch, relays, contactor, transformers, accumulators, generators (alternators), start facilities
Wiring Diagrams	Symbols and signs, designation of equipment and devices, Circuit diagrams, reading and comprehension of wiring diagrams
Systematic Troubleshooting	Examples using practical models and exhibits



General Comprehensive System Technology Practice Seminar on Control Engineering

Note	The seminar serves as a lead-in to assess control engineering processes in connection with analogue / digital speed controllers, temperature governor and general TEM-EVO control units.
Target group	Customer and Operator
Duration	1,5 days
No. of participants	max. 8

Content	
Basic Knowledge	Single and multi control loops, P-, I-, DT1-, two- and multi point governors, analogue and digital governor, loops with and without offset
Experimental Determination of Controlled Systems	Control of: position, level, temperature, flow rate, mixture and proportions
Closed Control Loops	Advanced control loop systems, cascade control, disturbance variable compensation, classical PID control loops
Practical Exercises	Setpoint sensor, comparator, PID controller, actuator, motor and generator module set



Electrically Instructed Persons Regarding DIN VDE 0100, DIN VDE 0105 and DGUV Regulation 3

In compliance with the DIN VDE 0100, DIN VDE 0105 the instruction of employees by the business employer about the perils of their job and their prevention is compulsory. Particularly the instruction of non-professionals regarding electrical engineering in a safety-conform conduct according to DGUV Regulation 3. Certification of participants with specified schedule of the important subjects. After successfull test you may attend continuing courses.
Customer and Operator
3 days
max. 8

Content	
Introduction	Basic knowledge electrical engineering, perils of electricity Ohm's law, simple electric circuit, single phase current Effect of electrical current to persons, accidents caused by elctrical current
Laws and Regulations	General electrical terms, accident prevention regulation Operational safety, accident prevention regulation regarding DIN VDE 0100 "General Rules" and DGUV regulation 2 "Electrical Installations and Equipment" Selective VDE-regulations, activities of "Electrically Instructed Persons"
Protection Measures and Protective Devices	The 5 safety rules Classification of protection measures, protection class and protective devices Three phase current, net systems and net configuration General procedure for checking according to VDE
Practical Measurements	General measurement of : current, voltage, power, resistance, insulation check



Advanced Course Electrical Engineering "Electrical Drive /3-Phase Asynchronous Motors"

Note	This seminar emphasizes the mode of operation and the operational behaviour of the most relevant 3-phase machines.
Requirements	The attendance at the lead-in "Basic Knowledge Electrical Engineering" / "Electrical Instructed Person" or in-depth knowledge in electrical engineering is necessary. After a successful achievement test, participants may attend continuing courses.
Target group	Customer and Operator
Duration	3 days
No. of participants	max. 8

Content	
Basics	Current, voltage, resistance, magnetic field, inductions / Lenz's Law, three-phase current, rotary field. Power category (apparent, effective and reactive power), power factor cos Phi, efficiency factor
Electrical Mains	Different voltage levels, assembly of electrical supply networks, mains parallel and island operation, circuit breaker
Transducer	Fundamentals transformer Assembly and function of transducers Types (voltage / current), transformation, connection diagram
3-Phase Asynchronous Motors	Design features, star/delta connection Excitation stator and rotor Operational behaviour, characteristics of torque and current, starting behaviour, slip-ring motors, pole changing motors Soft starter, frequency converter, voltage and frequency controlled drives
Safety Regulation	Safety regulation in view of the electrical equipment of motors according to EN 60204
Practical Exercises	Control possibilities by means of simulation facilities Measuring of starting and load curves



Advanced Course Electrical Engineering Part I "Synchronous Motors/Generator Operation"

Note	The participants are imparted with technical basics in generator operation and the effects of the decentralized supply on the mains operation.
Requirements	The attendance at the lead-in "Basic Knowledge Electrical Engineering" / "Electrically Instructed Persons" or in-depth knowledge in electrical engineering is necessary. After a successful test you may attend continuing courses.
Target group	Customer and Operator
Duration	2 days
No. of participants	max. 8

Content	
Basics	Technical characteristics Power and speed range, power factor, voltages, frequency, Protection class, cooling methods and heat class
Electrical and Mechanical Design	General design, stator, rotor Junction box and connections, terminal sequence and sense of rotation Excitation system
Characteristics and Operating Performance	Degree of efficiency, voltage level, adjusting range of voltage Voltage characteristic, V/f-control, parallel mode Start synchronization, net parallel mode, self-excitation, de-excitation, Surge protection, behaviour at low revolutions real- and reactive power control
Practical Exercises	Control system design at the simulator Synchronisation with synchronizers e.g. Woodward or DEIF



Advanced Course Electrical Engineering Part II Practice-oriented Generator Operation...

Subject	Advanced Course Electrical Engineering Part II Practice-oriented generator operation and recurring testing of electrical plant equipment in the low voltage range
Note	The participants learn the procedure based on first commissioning of the generator set and receive indispensable working aid and ideas for effective completion of the required preliminary operation test. The participants may bring their company's own measuring equipment to the seminar.
Target group	Qualified electricians, qualified personnel and electrically skilled persons for defined activities
Duration	1 day
No. of participants	max. 8

Content	
General	Safety precautions, marking and working method Mounting and alignment instructions Installation and connecting conditions
Preliminary Operation Test/ Troubleshooting	Generator grounding, insulation resistance measurement Rotating field and vibration measurement Checking the generator via external excitation Testing of generator windings and rotation diodes Adjustment of synchronization facilities
Voltage Regulator – Functional Test	Explanation of various wiring diagrams Voltage, low frequency and stability adjustment Reactive power control (voltage matching/static control)
Power Factor Regulator / Cos Phi - Functional Test	Explanation of various wiring diagrams Adjustment of voltage matching and stability Presettings and reactive Power VAR / power factor Cos Phi
Practical Exercise / Measuring Practice	Mechanical and electrical design based on the synchronous generator Type STAMFORD UC 274 F23 With integration of the power cabinet for mains parallel operation Measuring practice at Marelli MJB 350



Terms and Conditions for the Participation in Seminars.

The participation in seminars and courses shown in this program are geared to the product and service-related training and further education exclusively for staff members of Caterpillar Energy Solutions GmbH and the affiliated service partners.

Seminar are ordered and organized at the terms and conditions stipulated below:

The publication of this seminar program invalidates any previously published programs. The conditions and seminar fees in this document. Apply for the ordering and running of the respective seminars.

We reserve the right to change prices. All prices listed are without VAT.

 For the events run in the Training Center in Mannheim, the seminar costs include a copy of the participation documents, the provision of work overalls and writing materials, a choice of cold and hot drinks during the seminar breaks, lunch in the company restaurant and a participation certificate after successful completion of the seminar.

- Participation in the seminar is only possible after prior and confirmed application and only for the chosen seminar(s). People attending without confirmed applications cannot be considered.
- If a seminar application confirmed by the Training Center will not be taken up, the estimated cancellation fees, see the following pages, are to be applied (except on presentation of a doctors' certificate in case of unforeseen illness). Sending a replacement participant is possible without additional costs.

For special seminars a cancellation fee is listed separately as well. In addition, for special seminars in external locations transport costs for seminar equipment already incurred as well as any costs incurred for flight or hotel cancellations will be charged.



Terms and Conditions for the Participation in Seminars.

- For participants from foreign service partners, it is the responsibility of the customer to ensure that the participant has valid and adequate health and accident insurance for the stay in Germany, which has to be verified by the customer through relevant proof on request. Costs incurred by Caterpillar Energy Solutions GmbH as a result of lack of or insufficient insurance are to be refunded by the customer.
- The particular seminars carefully prepared and carried out according to the current state-of-the-art. We assume no liability for any given advice or the use of acquired knowledge.
- Kindly take care of the hotel reservation for accommodation of participants with our authorized hotels at agreed preferential prices yourself. Hotel contact details are to be found on the registration form.
- The Training Center reserves the right to cancel seminar dates for important reasons e.g. insufficient number of participants (at least 4 participants), illness of the seminar leader. The customer will be informed about this within an appropriate amount of time and about a proposed new date.

- By registering for the seminar, the customer accepts the binding nature of the conditions set down in this document.
- The customer is hereby informed that personal details will be stored in accordance with the Federal Data Protection Act.
- In view of the computer processing technology, queries and registrations for seminars are exclusively to be made to the relevant Training Center running the event using the forms in this program. For this the necessary details are to be entered into the given sections in full and in clear block capitals.

Inquiries and application please send to

training@mwm.net Tel. +49 621 384 84 12 Fax +49 621 384 84 11



Seminar Fees.

1. For the Courses contained in the Schedule:	EUR	USD
for each seminar day and participant *)	520.00	660.00

The fees listed under *) above for seminars held in the Training Centers include cold / hot drinks, lunch at the company's restaurant, provision of working clothes.

Hotel expenses are not included, these have to be settled by the attendee / ordering party with the hotel directly.

2. For Seminars to be held externally:	EUR	USD
for each trainer assignment and course day	2,200.00	2,800.00
plus travel expenses:	EUR	USD
travelling day of the trainer	1,300.00	1,600.00
other travelling expenses like flight and/or rail ticket, toll,		
taxi, custom duties, visa etc	at cost	
board and lodging	1) + 2)	
shipment costs for engines, special tools, custom duties etc.	at cost	

¹⁾ per diem flat rate acc. to rates set out in the currently valid travel guidelines of Caterpillar Energy Solutions.

²⁾ plus any additional costs for board and/or lodging, if necessary.

3. Cancellation Fees:	EUR	USD
For the courses listed in the schedule for each participant and external and special seminar.		
Handling charge for every cancellation	270.00	330.00
from 20. day until 11. day prior to the seminar	40 % of the	seminar fee
from 10. day until 7. day prior to the seminar	60 % of the	seminar fee
from 6. day until 1 day prior to the seminar	80 % of the	seminar fee
On the day of arrival and in default of appearance without cancellation.	100 % of the	seminar fee
plus additional costs arising from flight and hotel accommodation cancellation and costs potentially arising from dispatch of seminar equipment	at o	cost

4. Additional Seminar Documentation:	
The documentation is limited to one copy per participant respectively, in the case of special seminars, to the max. number of participants indicated in the seminar description, for each	
additional set	at cost

The above prices do not include VAT.



Notes Concerning Registration.

Please only use the forms prepared in the attachment for the registration of participants in training courses offered by the Training Center Mannheim. This is necessary as the incoming registration is directly processed by our EDP system. The registration form consists of 1 page, the cover sheet including data of the customer and the relevant seminar; as well as the participants data. Please fill in all columns of both forms and send it to the email address or fax number, indicated on the registration forms.

Please note that registrations with incomplete and/or illegible information or which do not comply with the specified form cannot be accepted and will not be taken into consideration.

