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Product Name :	**Product Code :**
Complete training system for DC Industrial Drives	CE165

Description :

Complete training system for DC Industrial Drives

Technical Specification :

Complete training system for DC Industrial Drives
Complete training system for study of DC Industrial Drives with minimally the following characteristics:
Objectives
Protective measures and electrical safety
Setting up variable speed DC drives and putting them into operation
Assessment of control response
Topics
Automatic control of multi-quadrant drive
Introduction to the requirements
Analysis of controlled systems
Analysis of actuating static converters
Optimisation of the current control loop
Recording of armature circuit constants
Adaptation of current controller
Adjustment of current limiting
Optimisation of speed control loop
Putting thyristor speed control in the first quadrant into operation
Setting of DC chopper and inverter stability limits
Recording of static converter control characteristic
Determination of armature circuit constants

Recording of the transient function of the controlled variable, armature current
Recording of the transient function of the controlled variable, armature current, with and without adaptive controller
Switchover of static converters
Setting current limiting
Determination of the integral-action coefficient for the drive
Determination of the transient of the controlled variable, speed
Recording a switching diagram
Each system is composed minimally by the following components:
1x Thyristor Speed Control Unit
Compact static converter for setting, and performing open and closed loop control of DC voltage and current. In addition to making a multitude of experiments possible, can also be used to control the speed of a shunt wound machine with 0.1 kW to 2.6 kW with cascade current control in 4-quadrant operation.
In detail the unit contains:
Mains switch and delayed response main contactor for armature and exciter voltages
Separate fuses, which can be serviced externally, for excitation, the electronic components and three-phase current -Exciter voltage output: 220 V, 1 A -Thyristor power circuit with two fully controlled B6 bridges for circulating- current-free 4-quadrant operation, Nominal data (UL1N = 90 V): 0...230 V, 12 A,
Indication of the active static converter via 2 LEDs
Complete electric isolation between power circuit and control and regulating unit -Extensive fault monitoring with signalling and switch-off. Activates for phase-failure, rotating field fault, machine or equipment overheating and time limit
Control and regulating electronics with extensive indication, setting and measuring possibilities
Open- and closed-loop control:
Potentiometer for setpoint potentiometer with changeover switch for single quadrant and four quadrant operation
Run-up integrator with potentiometer for the run-up time: 0.1...100 V/s
Speed controller with summing point:
2 inverting and 1 non-inverting inputs -variable gain VN = 1...10 for actual speed value
Coarse and fine adjustment of the proportional coefficient:
KPN = 0.5...5/5...50
Coarse and fine adjustment of the reset time: TNN = 0.1 s...1 s/1 s...10 s -I controller can be switched off
Overdrive indication with LED
Both converters I and II have a potentiometer for current limitation
Imax I = 0...12 A; Imax II = 0...12 A -Instantaneous comparator with adjustable hysteresis
Absolute-value generator with measurement socket for control signal INVert -Adaptive current controller with summing point:
2 inverting and 1 non-inverting inputs -recognition of intermittent current with LED display and measurement socket for the control signal STL (intermittent current) -reduction of the reset time to 1/10, when intermittent current is present, can be switched off
Coarse and fine adjustment of the proportional coefficient: KPI = 0.05...0.5/0.25...2.5
Coarse and fine adjustment of the reset time: TNI = 10 ms...100 ms/100 ms...1 s
I controller can be switched off
Overdrive indication with LED
Trigger point limiter with possible settings for:
Rectifier stability limit 0Â°...80Â°
Inverter stability limit 180Â°...100Â°
Switching logic with measurement sockets for the control signals and with a control input STOP
4-quadrant indication with 4 LEDs
Current measurement with current converters -The control set provides six double-pulse trains which are switched through to the thyristors of the rectifiers I or II via 12 gate pulse transformers:
Supply voltage:
Control unit: 230 V, 50 Hz with mains connection cable and earthing pin plugs
Power circuit: via external three-phase transformer 3 x 45/90 V, 50 Hz

1x Tacho Generator 0.1/0.3
For registering the speed of electrical machines of the 0.1 and 0.3 kW series.
Output voltage: Â± 1 V / 1000 min-1
1x DC Compound Machine 0.3
DC compound machine for motor and generator operation is isolatedâ€¢ built on an aluminium base. The machine can be used as shunt, series, or compound wound machine, series winding with tap for compounding and shunt winding. The machine is protected by a built-in stator winding temperature switch against overload. Machine with one shaft end is insulated built on an aluminium base with glides. The machine is to be operated on the machine bench. All connections are brought out on the overhead connection box separated on 4 mm safety plugs. The nominal ratings are mounted on three rating plates on the connection box. In addition to the protective conductor connection attachment for potential equalization line via M6 thread on the connection box is also Ratings:
Electrical ratings:
Ratings for operation as Shunt machine As motor:
Power: 0,3 kW
Voltage: 220 V
Current: 1,8 A
Excitation voltage: 220 V
Excitation current: 0,26 A
Speed: 2000 rpm
As generator:
Power: 0,22 kW
Voltage: 220 V
Current: 1 A
Excitation voltage: 220 V
Excitation current: 0,26 A
Speed: 2500 rpm
Ratings for operation as Series machine As motor:
Power: 0,3 kW
Voltage: 220 V
Current: 1,74 A
Speed: 2050 rpm
As generator:
Generator mode not specified
Ratings for operation as Compound machine
As motor:
Power: 0,3 kW
Voltage: 220 V
Current: 1,83 A
Excitation voltage: 220 V
Excitation current: 0,26 A
Speed: 1645 rpm
As generator:
Power: 0,22 kW
Voltage: 220 V
Current: 1 A
Excitation voltage: 220 V
Excitation current: 0,26 A
Speed: 2400 rpm
Mechanical dataâ€Ÿs:
Type of construction: B3
Shaft end: 1
Base: Alumium

Connection box: Top
Temperature class: B (120Â°)
Degree of protection (IP): IP20
Temperature detectors: Bimetal switches 110Â° NC (normally closed)
Efficiency class: IE1
1x Machine Base Bench 120 cm
2x Coupling and schaft end guard 0.3 transparent
Plug-on cover as contact protection for rotating parts of electrical machines of the 0.3 kW series and for shaft monitoring by the machine test system. Installed on an aluminum base with slider. The shaft cover can be converted to the shaft end cover by using of an acrylic glass end plate.
Scope of delivery:
Hexagon socket wrench 2,5 mm; acrylic glass end plate with screw
1x Coupling 0.3
Rubber coupling sleeve for mechanical connection of two electrical machines of the 0.1 or 0.3 kW series.
1x Three phase high power measurement device with WIFI, display, tablet app and PC software. The Three phase high power measurement device is a combination of isolated and differential oscilloscope, multimeter, wattmeter, energy analyzer and recorder. It was designed in its concept for demonstration and laboratory experiments.
The Three phase high power measurement device has been optimized for the following applications:
Energy grids:
Voltage and frequency stability
Load behavior of networks Effect of harmonics Electrical machines:
Inrush current of transformers and machines
Ratio of transformers
Efficiency of machines
Power Electronics:
Rectifier
DC / DC converter DC / AC converter frequency converter filter
Three phase high power measurement device in detail:
Simultaneous measurement of U, I, ju, j, f and P in 4 channels
Instantaneous values U, I and P
Averaged values U, I and P
RMS values (AC + DC) U and I
RMS values (AC) U and I
Fundamental wave filters Delta connection adjustment universal connection options
Via USB-Type C connection with PC or laptop
Via the WLAN option with the school network or setting up your own access point automatic or manual range selection
Electrical power calculation S, P, QC and QL
Electrical work WS, W and WQ
Resistance calculation R, Z, XC, XL, G, Y BC and BL positive sequence component, negative sequence component and zero sequence component in 3-phase systems Derivative with respect to time, integral over time, FFT analysis, mean value, histogram, and model
Drivers allow you to evaluate the data with LabVIEW and
MATLAB
Possibility of manual operation directly on the device by means of a rotary selector with cursor keys
Direct reading in 9 cm, backlit display
Display of up to 24 measured values in one display
Display of all values for each channel
Display of all values in tabular form
Display of measured values in diagram
Display of a vector diagram
Wireless connection to the tablet app via WLAN for experimenting with tablet and smartphone (iOS, Android and

Windows)
Measuring instrument category CATIII 300: allows the use of the measuring instrument from tests with safety extra-low voltage (SELV) via 3-phase systems with or without neutral conductor up to testing in power electronics, eg. B. DC link voltage of 700 V DC
FPGA-based real-time processing in the device enables comprehensive network analysis in the three-phase networks, which are displayed directly on the device in the vector diagram

Technical specifications:
DISPLAY & OPERATION
Graphic display: 9 cm (3.5 "), QVGA, colored, light (adjustable up to 400 cd / mÂ²)
Operation: Pushbutton and incremental encoder with pushbutton
INPUTS & OUTPUTS
Inputs: 4 isolated measuring channels CAT III 300, each with
I and U measurement (max. 8 can be used at the same time) Input A -D: U and I connection via 4 mm safety sockets
Measuring ranges U: 25/70/250/700 VAC Â± 36 / Â± 100 / Â± 360 / Â± 1000 VDC
Measuring ranges I: 0.7 / 1.6 / 7/16 / AAC Â± 1 / Â± 2.5 / Â± 10 / Â± 16 ADC
Sampling rate: max. 1,000,000 values / s per channel at U and I max. 500,000 values / s
General
Loudspeaker: Error message when exceeding the measuring ranges
Data storage: 100,000 readings for each measurement series, built-in Micro SD card (4 GB) for over a thousand measurement files and screenshots
WLAN: 802.11 b / g / n as access point or client (WPA / WPA2)
VNC server: integrated
USB ports: Connect a USB Type C
Mainâ€™s voltage: 230 V 50 - 60 Hz (conversion to 115 V possible)
Connected load: 50 W
Dimensions: 300 mm x 300 mm x 180 mm
Weight: 3.7 kg Scope of Delivery:
Power cord
USB A / C cord
Includes software with the following characteristics: Software for recording and evaluating measurement data acquired via Three phase high power measurement device, with comprehensive integrated help Functionality and many operable experiment examples.
Including measurement server for the distribution of live measurements, table and diagram as well as measurement files on tablets or smartphones.
School license for use on any number of PCs in a school or institute
Supports up to 8 measurement devices, via USB-ports
Supports Joule and Wattmeter and Universal Measuring
Instrument
Supports sensor boxes
Additionally supports numerous devices via the serial interface (e.g. VideoCamera IRPD, balance)
Connection to the integrated measurement server in the local network via QR code
"Plug and play" enabled for easy use: the software automatically detects the connected devices and sensor boxes and displays these graphically, inputs and outputs are activated simply by pointing and clicking and typical experiment parameters are automatically loaded (depending on the connected sensor box)
Measurement data can be displayed in the form of analog/digital instruments, tables and/or diagrams (also simultaneously, with user-definable axis assignment)
Measured values can be recorded manually (at keystroke) or automatically (choice of time interval, measured time, lead time, trigger or additional measurement condition) Powerful evaluation functions including various fits (straight line, parabola, hyperbola, exponential function, free fitting), integrals, diagram labeling, calculation of user-definable formulas, differentiation, integration, Fourier transforms
Experiment files in XML-data format

Convenient exporting of measurement data and diagrams via the clipboard
"Logbook" function lets you briefly document other experiment information in the experiment file
Complete with more than 150 experiment examples from physics, chemistry and biology with detailed descriptions - Graphical display, sensor box and connector allocation when the experiment file is loaded
Free updates and demo version available through our internet homepage
Transformer 45/90, 3 N Power supply and experiment unit for the area of power electronics, equipped with:
Mains switch: cam switch, 3-pole
Mains voltage: 3 x 400 V, Â± 10 %, 50...60 Hz
Outputs: 3 x 90 V/1.5 A AC with 3 center taps 45 V 1 x 230 V/1 A DC motor protection switch 0.63....1 A (prim.)
Output: via eighteen 4-mm safety sockets
Connecting cable and Cekon plug 16 A
Function generator 200 kHz
Microprocessor controlled signal generator for experiments on training panels
Function: Sine/triangle/square/DC
Square-wave signal: duty cycle 10%...90%, adjustable in steps of 5%
Frequency range: 100 mHz...200 kHz
Resolution: 1 mHz...100 mHz, depending on frequency
Output voltage: 0...20 Vpp continuous
DC offset: Â±10 V
Display: four-digit 7-segment display for signal parameters and functions
Attenuation: 0 dB, -20 dB, -40 dB
Output impedance: 50 Î©
Trigger output: TTL level
Outputs: 4-mm safety sockets
Power supply: +/-15 V DC or alternatively plug-in adapter, 12
V Plug-in power supply 12 V AC Primary: 230 V AC, 50/60 Hz
Secondary: 12 V AC, 20 VA
Connection: female
LIT: Power Electronics and Drive Technology (in English)
Compact static converter-fed d.c. machines. Basic theoretical informationâ€™s, equipment descriptions, experiment instructions.
DIN A4, in English
Blank panel, 100 mm, CPS
For mounting in any empty spaces in experiment assemblies to ensure a uniform appearance of the entire assembly. The plates are not equipped with any mounting hardware.
Dimensions:
Height: 297 mm
Width: 100 mm
Mobile Experiment Stand
Mobile experiment stand with tray, 4 castors, 2 of them can be locked. With aluminium profile 120 x 40 mm, surface powder-coated, colour dark grey DB 703 size: 1970 x 1294 x 700 mm prepared for assembling a panel frame, three level Assembly set for installation on site.
Mobile cable holder
For the organized, space-saving and mobile suspension of experiment cables. Two additional side receptacles for thicker cables (e.g. power cable, PC connecting cable, ...)
Material: rectangular steel, powder coated in DB gray; four light-weight casters; cable troughs in light gray
Cable troughs: 58
Dimensions (Width x Depth x Height): 550 x 404 x 1322 mm
1x Power Supply â€“ Transformer 90/45V Power supply and experiment unit for the area of power electronics, equipped with:
Mains switch: cam switch, 3-pole
Mains voltage: 3 x 400 V, Â± 10 %, 50...60 Hz
Outputs: 3 x 90 V/1.5 A AC with 3 center taps 45 V 1 x 230 V/1 A DC motor protection switch 0.63....1 A (prim.)

Output: via eighteen 4-mm safety sockets
Connecting cable and Cekon plug 16 A 1x Function Generator 200kHz
Microprocessor controlled signal generator for experiments on training panels.
Function: Sine/triangle/square/DC
Square-wave signal: duty cycle 10%...90%, adjustable in steps of 5%
Frequency range: 100 mHz...200 kHz
Resolution: 1 mHz...100 mHz, depending on frequency
Output voltage: 0...20 Vpp continuous
DC offset: Â±10 V
Display: four-digit 7-segment display for signal parameters and functions
Attenuation: 0 dB, -20 dB, -40 dB
Output impedance: 50 Î©
Trigger output: TTL level
Outputs: 4-mm safety sockets
Power supply: +/-15 V DC or alternatively plug-in adapter, 12 V AC (included: Universal plug-in power supply, e.g. for CASSY, counter S, counter P, electrometer amplifier etc. Primary: 230 V AC, 50/60 Hz, secondary: 12 V AC, 20 VA Connection: co-axial power connector
1x Panel Frame two-level, T-base, without channel.
Height: 73,0 cm
Width: 124 cm
Depth: 30 cm
1x Safety Bridging Plugs with Tap, black, set of 10 ten 4-mm safety bridging plugs with 19 mm spacing, color black, with 2 4-mm taps max. current rating: 32 A.
1x Safety connecting leads, 32 A Red/Black/Blue set of 32 4-mm safety connecting leads with 2.5 mm2 cable, current rating 32 A, consisting of: 2 each safety connecting lead, red 100 cm
2 each safety connecting lead, blue 100 cm
2 each safety connecting lead, red 50 cm
2 each safety connecting lead, blue 50 cm
2 each safety connecting lead, red 25 cm
2 each safety connecting lead, blue 25 cm
4 each safety connecting lead, black 100 cm
6 each safety connecting lead, black 50 cm
6 each safety connecting lead, black 25 cm
4 each safety connecting lead, black 10 cm
1x Safety Connecting Leads Yellow / Green
4-mm safety connecting leads with 2.5 mm2 cable, current rating 32 A, consisting of:
4 each safety connecting lead,yel/grn 100 cm
4 each safety connecting lead,yel/grn 50 cm
2 each safety connecting lead,yel/grn 25 cm
2x Adapter sockets set of 2 for conversion of equipment with 4-mm sockets for safe use in the low-tension range, with Allen wrench for fast and easy installation.

Naugralabequipments

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