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| Gmail | **tshingombe fiston <tshingombefiston@gmail.com>** |

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| **tshingombe fiston** <tshingombefiston@gmail.com> | Mon, Mar 17, 2025 at 1:57 PM |
| To: tshingombe fiston <tshingombefiston@gmail.com> | |
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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 261 204,87  001  License, EcoStruxure Control Expert, service pack base, small S, 1 user, node locked, digital license  R 14 435,28  View Product  002  License, EcoStruxure Control Expert, with Topology Manager and M580 safety, for XL, node locked, 10 users, digital  R 246 769,59  View Product  003  Status Unavailable  Price Unavailable  View Details   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 10 234,04  001  license, EcoStruxure Control Engineering, verification, basic, node locked, 1 shot  R 5 582,20  View Details  002  license, EcoStruxure Control Engineering, documentation, basic, node locked, 1 shot  R 4 651,84  View Details   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 331 172,31  001  licence, Ecostruxure Automation Expert, standard engineering buildtime, v23  R 65 100,00  View Details  002  license, EcoStruxure Automation Expert, professional engineering, buildtime, v23  R 157 500,00  View Details  003  license, EcoStruxure Automation Expert, standard device runtime, add on, v23  R 378,00  View Details  004  license, EcoStruxure Automation Expert, high availability option, runtime, add on, v23  R 840,00  View Details  005  license, EcoStruxure Automation Expert, run time, application, permanent, 1 user, for ATV dPac  R 777,00  View Product  006  license, EcoStruxure Automation Expert, run time, application, permanent, 1 user, for M251, M262 dPAC  R 6 216,70  View Product  007  license, EcoStruxure Automation Expert, run time, application, permanent, 1 user, for M580 dPAC  R 15 540,00  View Product  008  license, EcoStruxure Automation Expert, run time, application, permannet, 1 user, for M580 dPAC with extensions  R 56 448,56  View Product  009  license, EcoStruxure Automation Expert, run time, HMI, permanent, 1 user, for Harmony ST6  R 2 625,00  View Product  010  license, EcoStruxure Automation Expert, run time, HMI, permanent, 1 user, for Harmony iPC  R 12 600,35  View Product  011  Status Unavailable  Price Unavailable  View Details   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider El  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 64 222,36  001  Motion controller LMC100 0 axis - Acc kit - Basic  End of commercialisation: 12/01/2024  Price Unavailable  View Details  002  Regulated switch power supply, modicon power supply, 3 phases, 380 to 500V AC, 24V, 20A  R 13 112,60  View Product  003  battery control module, phaseo ABL7 ABL8, 24 to 28.8V DC, phaseo ABL7 ABL8, 24V, 20A, for regulated SMPS  R 11 849,78  View Product  004  battery control module, phaseo ABL7 ABL8, 24 to 28.8V DC, phaseo ABL7 ABL8, 24V, 40A, for regulated SMPS  R 17 709,70  View Product  005  redundancy module, phaseo ABL7 ABL8, 40A, for regulated SMPS  R 5 529,38  View Product  006  electronic protection module, phaseo ABL7 ABL8, 28 to 28.8V DC, 10A, for regulated SMPS, 2 pole breaking by channel  R 8 177,54  View Product  007  buffer module, phaseo ABL7 ABL8, 24 to 28.8V DC, 40A, for power supply  R 7 843,36  View Product   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 13 327,65  001  Bus coupler, TeSys island, 24VDC, Ethernet switch (EtherNet IP / Modbus TCP)  R 8 961,41  View Product  002  Voltage interface module, TeSys island, 690VAC 47-63 Hz, Isolated switching input for safe stop  R 4 366,24  View Product   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 13 327,65  001  Bus coupler, TeSys island, 24VDC, Ethernet switch (EtherNet IP / Modbus TCP)  R 8 961,41  View Product  002  Voltage interface module, TeSys island, 690VAC 47-63 Hz, Isolated switching input for safe stop  R 4 366,24  View Product   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 385 363,62  001  redundant processor, Modicon M580, 8MB, 61 Ethernet devices, 8 local racks, 8 remote IO racks  R 177 037,09  View Product  002  power supply module, Modicon X80, 24V DC, 16.8W  R 7 707,26  View Product  003  connector kit, Modicon M340, 2 removable connectors, cage clamp, for power supply module  R 527,05  View Product  004  connector kit, Modicon M340, 2 removable connectors, spring type, for power supply module  R 561,57  View Product  005  rack, Modicon X80, 8 slots, Ethernet backplane  R 6 848,84  View Product   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  Product Selector Tool  This tool is designed to assist you through the product selection process.  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After the completion of this chapter, you will gain the core knowledge in Primary Distribution, Motor Control, Motor Protection and management, cost optimization, and service continuity.   * [Electrical Installation Design](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=%252fDeepLink%252fProcessRedirect.aspx%253fmodule%253dloRegisterAndLaunch%2526lo%253dde6c8afb-a6d4-4ad1-afcd-f03d770b6071) * [Motor Starters with Contactors](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=%252fDeepLink%252fProcessRedirect.aspx%253fmodule%253dloRegisterAndLaunch%2526lo%253df4fa51cb-1271-4489-a14b-f21059b34e87) * [Motor Protections](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=%252fDeepLink%252fProcessRedirect.aspx%253fmodule%253dloRegisterAndLaunch%2526lo%253d76de8fa3-4734-4776-8dda-c147ac5b41ad) * [Operation and Maintenance Tool](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=%252fDeepLink%252fProcessRedirect.aspx%253fmodule%253dloRegisterAndLaunch%2526lo%253d67d6f04a-a32c-4d08-b459-ff3035a750fc) * [Safety & Availability](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=%252fDeepLink%252fProcessRedirect.aspx%253fmodule%253dloRegisterAndLaunch%2526lo%253de3c444af-b0b1-4320-b220-843c2f4d7440) * [Discover EasyPact TVS](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/4de7ec38-61d1-4ae3-9458-13973e1b2a0c) * [Discover ComPacT NSX and ComPacT NSXm Offer](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/c7ce8d28-6759-4fb4-a71a-1120158ee6bf)   Industrial Automation market solutions  Find new business opportunities in Industrial Automation Market — skill up starting today  Learn more about Schneider Electric products and solutions for Industrial Automation market. Develop the expertise and upskill yourself to be fully equipped with important knowledge to better serve industrial customers. In this chapter, you will find basic short courses introducing an overview on key ranges.  eLearnings will help to increase your technical capabilities allowing you to deliver sustainable growth and gain new business perspectives on Industrial Automation market with Schneider Electric.   * [Drives Basics](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/85cab697-131f-4540-b609-db0f986b1a93) * [Control & Signaling](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/9cbdb3f8-86bc-448b-b6af-cff10310d5dd) * [Basic HMIs](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/83c04a6e-884f-455a-9bea-6ec479cbf816) * [Relays](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/e86ceb1b-c4f1-4082-a3ed-e6b0f6dbf38d) * [Power Supplies and Universal Enclosures](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/f658499e-4be3-48a2-8704-e284a0e400af) * [Altivar Soft Starter & Variable Speed Drives](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/13938e25-b2b0-41a5-8c1d-895cfaa87b36)   Secure Power solutions for data centers, critical power infrastructure and small offices  Gain new knowledge about Secure Power solutions  Discover the innovative, reliable, and energy-efficient solutions for critical power infrastructure and medium-large edge and data centers. Improve your competencies in UPS technology and the edge network. Explore Schneider's ranges of Single Phase and 3 Phase UPS systems — the fully integrated, end-to-end uninterruptible power supply solutions helping to maintain enterprise-wide networks, data centers, mission-critical systems, and industrial manufacturing processes.   * [The Schneider Electric UPS Family](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/94c6ceb0-26e3-4f7f-b580-156e9eaeb601) * [The Small Office and Home Office for Sales Associates](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/curriculum/540ccf75-da7f-4d06-9a3f-96cd4bd2b24f) * [Edge Network](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/curriculum/8f1c8896-90fe-4646-af11-8f9d79bf326b)   Digital Power solutions to increase energy efficiency  Digital Power solutions help you increase electrical system and assets reliability for your customers, avoid downtime by preventing power failures, and save money by reducing energy use and maintenance. In this chapter you will find introductory courses on the technical characteristics, functions, and applications of key product ranges.  Basic Power Metering  Learn about PowerTag, how to promote it, and how it contributes to the different digital systems in each segment. Learn about PM2000, how to install and program these meters   * [Discover PowerTag Energy Sensors](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/3a30e409-0a25-49f3-94f5-a95faced2ce5) * [EasyLogic PM2000](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/8dced6d0-5a16-484e-b2a8-00c450b4496e)   Gateways and Energy Servers  The EcoStruxure Panel Server Portfolio Overview provides the trainee with an overview of SE gateways and energy server offers   * [EcoStruxure Panel Server](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/80b824d7-a3f6-4f49-9b3e-83b92f639676)   Power Quality and Power Factor Correction  Gain more knowledge in Power Quality and Power Factor Correction in short videos   * [Power Quality and LV Power Factor Correction](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/5e796f17-8c94-497e-9ddb-66f8abcdf737) * [LV Power Factor Correction components](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/ef607544-4153-4708-9cb2-acc546266409) * [Selection of the right LV Capacitor](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/d78f810b-ae8a-488d-81ec-820800f7fa8b)   Protection Relays  This course provides an overview of offer values and ways to address customer pain points   * [Easergy P1](https://schneider-electric.csod.com/samldefault.aspx?ouid=7&returnurl=https://schneider-electric.csod.com/ui/lms-learning-details/app/course/782e1694-4ee8-4feb-8697-baae68f827c4)   Sustainability School  Gain sustainability knowledge and skills  Chapter 1: Gain knowledge  Business and sustainability go hand in hand today. In fact, the survival of our planet depends on it. Sparked by Electricity 4.0 and the rise of electrification and digitalisation, the Schneider Electric Sustainability School is your pathway to in-demand expertise and practical tools. Elevate your brand’s reputation and stand apart from the competition. Start with Chapter 1 of Schneider Electric Sustainability school and get a clear understanding of sustainability basics like climate science, scope of impact, and tracking metrics to inform your customers and gain a competitive edge. Chapters 2 and 3 are coming soon.  Top of Form  [Skip to main content](https://schneider-electric.csod.com/ui/lms-learner-home/home#mainContent)    Show Navigation Menu  [https://ci3.googleusercontent.com/meips/ADKq_NZDRuI8HfxAqNnj7DSNsOi1MzUO5wTwB_X1SL_AcFOwHdRRRKPGiWuBqewKrCse5L0usRv1JdX1379x8m0IGH0vmu70lvPrLQZgwNEXAoW6QA=s0-d-e1-ft#https://schneider-electric.csod.com/phnx/images/nophoto.png](https://schneider-electric.csod.com/Social/UniversalProfile/UPPageRedirectHandler.ashx?tab_page_id=-20016001)  [Tshingombe fiston](https://schneider-electric.csod.com/Social/UniversalProfile/UPPageRedirectHandler.ashx?tab_page_id=-20016001)  [Student](https://schneider-electric.csod.com/Social/UniversalProfile/UPPageRedirectHandler.ashx?tab_page_id=-20016001)  Navigation Menu   * [My Training Home](https://schneider-electric.csod.com/ui/lms-learner-home/home?tab_page_id=-200300006)    + [Welcome](https://schneider-electric.csod.com/ui/lms-learner-home/home?tab_page_id=-200300006) * [Learning](https://schneider-electric.csod.com/ui/lms-learner-playlist/UsersPlaylists?tab_page_id=-200300052) * [Support](https://schneider-electric.csod.com/catalog/CustomPage.aspx?id=20000165&tab_page_id=20000165) * [Schneider Electric Personalized Experience](https://schneider-electric.csod.com/catalog/CustomPage.aspx?id=20000372&tab_page_id=20000372) * [My Account](https://schneider-electric.csod.com/catalog/Prefs.aspx) * [Help](https://help.csod.com/help/csod_1/OnlineHelp_CSH.htm#-200300006) * [Log Out](https://schneider-electric.csod.com/Logout.aspx)   Main content below  Learner Home  [https://ci3.googleusercontent.com/meips/ADKq_Nb0vxcOmKt-XKYIP7vdxJRCUtbYbc_naqR0m_yc0C3oCE2OMA3b_QVrpGpug0h1yFrg94iWVe3mqVY_cNktYwgwwKHD-ciHVZ4HsjvVq3XIGu2i=s0-d-e1-ft#https://schneider-electric.csod.com/images/MyTeam/nophoto.png](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Social/UniversalProfile/Bio&TargetUser=1985024)  42  [Completions](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Social/UniversalProfile/Transcript&TargetUser=1985024&preSelectedCategoryId=3)  0  [Hours](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Social/UniversalProfile/Transcript&TargetUser=1985024&preSelectedCategoryId=3)  Your Subjects  Bottom of Form  Business Acumen, Cross-Functional, Customer Project Management, Customer Projects & Services, Digital, Digital Technologies, DLC Canada, DLC US, EcoStruxure - Innovation At Every Level, EcoStruxure for Building, EcoStruxure Plant, Electrical Distribution Services, Electrical safety and Lockout Tagout, Electrical Engineering, Field Services Business Effectiveness, Field Services Market and Customers, Fire, Chemical, PPE, Road and Emergency, Functional, Health & Safety, HMI (Terminals and Industrial PC), Industrial Automation and Control, Industrial Automation and Control Software, Industrial Communication, Industry Specific, Information Technology, IT Applications, IT Security, LegacySubject35DND, Low Voltage Products and Systems, Management and Leadership, Managing Change, Onboarding, Onboarding for All Employees, PLC, PAC and dedicated Controllers, Products, Solutions & Services, Safety, Safety Principles, Sales, Sales & Service, Sales Knowledge, Sales Methods/Process, Sales Offer & Application Knowledge, Sales Skills, Schneider Electric Essentials & Basics, Self Development, Sustainable Development, Variable Speed Drives and Soft Starters, Water and Wastewater  Your Playlists   * [0](https://schneider-electric.csod.com/ui/lms-learner-playlist/UsersPlaylists)   Created   * [0](https://schneider-electric.csod.com/ui/lms-learner-playlist/UsersPlaylists)   Followers   * [0](https://schneider-electric.csod.com/ui/lms-learner-playlist/UsersPlaylists?section=followed)   Followed  Hi Tshingombe! What would you like to learn today?    Continue Learning  Curriculum  [Schneider Home Certification](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=148e8852-b2be-48f2-89a9-21a78e7a700c" \o "Schneider Home Certification" \t "_blank)  In Progress   * Open Curriculum   Curriculum  In Progress  Curriculum  In Progress  Curriculum  In Progress  Curriculum  In Progress  Saved for Later  Curriculum  [Sustainability School for Partners Chapter 2](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=8e6f93eb-4388-403f-b913-958100554f1d" \o "Sustainability School for Partners Chapter 2" \t "_blank)  In Progress   * Launch   Most Popular  Online Class  [The Thermal Management Functions in Electrical Panels: Module 02](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=e31ff457-e0c4-48f4-8265-f0666889495d" \o "The Thermal Management Functions  in Electrical Panels: Module 02" \t "_blank)  30 minutes  Online Class  30 minutes  Online Class  30 minutes  Video  55 minutes  Test  30 minutes  Top of Form  Bottom of Form  Cornerstone OnDemand Logo  Version: 17.3.0.171  Powered by Cornerstone OnDemand, Inc. ©2000-2017  All Rights Reserved. [Terms](https://schneider-electric.csod.com/catalog/CustomPage.aspx?id=221000441) - [Privacy](https://schneider-electric.csod.com/catalog/CustomPage.aspx?id=221000441) - [Cookies](https://schneider-electric.csod.com/ui/lms-learner-home/Privacy) - [Feedback](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Home/SiteFeedback) - [Change your cookie settings](https://schneider-electric.csod.com/ui/lms-learner-home/home)   * Open Curriculum   Curriculum  [EBO 2023: Engineering EasyLogic](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=87f1f0cb-8f48-4ced-92c6-a08c90f20542" \o "EBO 2023: Engineering EasyLogic" \t "_blank)  In Progress   * Open Curriculum   Curriculum  [EBO 2023: Engineering Upgrade](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=791f3202-c48f-44ab-b5a6-b191e889abb1" \o "EBO 2023: Engineering Upgrade" \t "_blank)  In Progress   * Open Curriculum   Curriculum  [EcoXpert Smart Grid, Technical, Intermediate: Geographic Information Systems Path](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=9cb19489-9dc6-40a4-9ec7-cc8b53c86bb6" \o "EcoXpert Smart Grid, Technical, Intermediate: Geographic Information Systems Path" \t "_blank)  In Progress   * Open Curriculum   Online Class  [EcoStruxure Power Foundational 2.0](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=d7de3c02-6fd3-4fee-bcdc-87ca01fb33fd" \o "EcoStruxure Power Foundational 2.0" \t "_blank)  In Progress   * Launch   Event  [Advanced Machines with PacDrive 3 [VILT]](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=71e3c479-7374-4cb5-ba44-57ce7b59ab0a" \o "Advanced Machines with PacDrive 3 [VILT]" \t "_blank)  20 hours  Online Class  [EcoStruxure Building: Graphics Editor Intermediate](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=6c3138e7-bf3c-4009-b9e6-61cf1db7d9d4" \o "EcoStruxure Building: Graphics Editor Intermediate" \t "_blank)  In Progress  Online Class  [Fundamentals of Thermal Management in Electrical Panels: Module 01](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=f88834a2-93a3-4ee9-bcac-31b48f79a35f" \o "Fundamentals of Thermal Management in Electrical Panels: Module 01" \t "_blank)  30 minutes  Video  [SP\_MX\_2021\_Lanzamiento Square D Easy UPS 3S 10-40 kVA (208V)](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=929b2a6f-f6f9-40bf-b264-5af2ed2602e3" \o "SP_MX_2021_Lanzamiento Square D Easy UPS 3S 10-40 kVA (208V)" \t "_blank)  55 minutes  Test  [IT Solution Provider Certification Test - Select](https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=d4b80d58-175f-444e-a234-208a3d419803" \o "IT Solution Provider Certification Test - Select" \t "_blank)  30 minutes   * [Sustai](https://www.se.com/myschneider/partners?alink=https://schneider-electric.csod.com/LMS/LoDetails/DetailsLo.aspx?loid=9cb252f6-1921-4260-b01f-875be3b34296)   Top of Form  [Skip to main content](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Social/UniversalProfile/Transcript&TargetUser=1985024&RESET=TRUE&tab_page_id=-8#mainContent)    Show Navigation Menu  [https://ci3.googleusercontent.com/meips/ADKq_NZDRuI8HfxAqNnj7DSNsOi1MzUO5wTwB_X1SL_AcFOwHdRRRKPGiWuBqewKrCse5L0usRv1JdX1379x8m0IGH0vmu70lvPrLQZgwNEXAoW6QA=s0-d-e1-ft#https://schneider-electric.csod.com/phnx/images/nophoto.png](https://schneider-electric.csod.com/Social/UniversalProfile/UPPageRedirectHandler.ashx?tab_page_id=-20016001)  Main content below  Tshingombe fiston  Tshingombe fiston   * + Bio   + [Transcript](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Social/UniversalProfile/Transcript&TargetUser=1985024)   + Actions   + [Home](https://schneider-electric.csod.com/ui/lms-learner-home/home?tab_page_id=-200300006&tab_id=-1)   + [Tshingombe fiston](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Social/UniversalProfile/Bio&TargetUser=1985024)   + [My Courses: Tshingombe fiston](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Social/UniversalProfile/Transcript&TargetUser=1985024)   My Courses: Tshingombe fiston  Use the transcript to manage all active training.  0 HRS  AGGREGATE TRAINING COMPLETED  https://ci3.googleusercontent.com/meips/ADKq_NYi4H4wycdDf-0WnrDOAm61G-wNtU52OQjrgh5cvF7a47SyheC3pMiUgaWykQIud9qgqBayQf4boMmVV5uLq4VE8J7pw29UzEt2tCFJzwzLz2glfNgO7A=s0-d-e1-ft#https://schneider-electric.csod.com/Social/images/UP/prf-year.png  FISCAL YEAR ENDING  12/31/2025  https://ci3.googleusercontent.com/meips/ADKq_NaLpVFQDU6W2xmjsoqJuGppbciXvLpkHmgWfts0Q48sANP17m8EUUR3lD12KzxnyfPQw-XgjDbkiUeJ-_daS4UALX2pRfSv6udSb3OmViNJhY-IUQ5VYw=s0-d-e1-ft#https://schneider-electric.csod.com/Social/images/UP/prf-cost.png  COST  R0.00  Filter by Training Status  Active  Sort by  Date Added  Filter by Training Type  All Types  Search by Keyword  Search  Search Results (134)   * + Schneider Home Certification   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active  Bottom of Form   * + EcoXpert Smart Grid, Technical, Intermediate: Geographic Information Systems Path   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + Basic Machines with PacDrive 3 [VILT] (Test)   Due : No Due Date Status : Failed Training Type : Test Training Status : Active   * + Cybersecurity für Schneider Electric Service Partner / Cybersecurity for Schneider Electric Services Partners (German)   Due : No Due Date Status : In Progress Training Type : Online Class Training Status : Active   * + EBO 2023: Engineering EasyLogic   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + Service for Lexium [VILT] (Test)   Due : No Due Date Status : Failed Training Type : Test Training Status : Active   * + 20 Mobile Terms You Probably Know   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + EBO 2022: Engineering EBO   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + EBO 2023: Engineering EBO   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + EBO 2024: Engineering EBO   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + EBO 2022: Value Based Selling   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + DIN Ethernet Technical Overview   Due : No Due Date Status : In Progress Training Type : Online Class Training Status : Active   * + Applying OWASP 2017 Mitigations Series   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + EcoStruxure Power Foundational 2.0   Due : No Due Date Status : In Progress Training Type : Online Class Training Status : Active   * + Fundamentals of Threat Modeling   Due : No Due Date Status : In Progress Training Type : Online Class Training Status : Active   * + Sustainability School for Partners Chapter 2   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + Basic Machines with PacDrive 3 (Test)   Due : No Due Date Status : Failed Training Type : Test Training Status : Active   * + EcoStruxure Building Technical Training For EcoXperts 2023 - Proficient   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + Introduction to EcoCare : Next Generation Services Membership   Due : No Due Date Status : Registered Training Type : Online Class Training Status : Active   * + Escola de Sustentabilidade para Parceiros. Capítulo 1/Sustainability School for Partners. Chapter 1 (Portuguese)   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + Motion Block : Part I (Test)   Due : No Due Date Status : Failed Training Type : Test Training Status : Active   * + Transformers and motor applications in industries   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + EBO 2023: Engineering Upgrade   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + PowerLogic P5: Protection Engineering   Due : No Due Date Status : In Progress Training Type : Curriculum Training Status : Active   * + EVlink ProAC Calibration Law Compliant Basic (German)   Due : No Due Date Status : Registered Training Type : Online Class Training Status : Active  Top of Form   * + 1   + 2   + 3   + 4   + 5   + Next   + Last   1 to 25 of 134  Scroll  Bottom of Form  Cornerstone OnDemand Logo  Version: 17.3.0.171  Powered by Cornerstone OnDemand, Inc. ©2000-2017  All Rights Reserved. [Terms](https://schneider-electric.csod.com/catalog/CustomPage.aspx?id=221000441) - [Privacy](https://schneider-electric.csod.com/catalog/CustomPage.aspx?id=221000441) - [Cookies](https://schneider-electric.csod.com/phnx/Privacy) - [Feedback](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Home/SiteFeedback) - [Change your cookie settings](https://schneider-electric.csod.com/phnx/driver.aspx?routename=Social/UniversalProfile/Transcript&TargetUser=1985024&RESET=TRUE&tab_page_id=-8)  Product Selector Tool  This tool is designed to assist you through the product selection process.  Try our Product Selector  Top of Form  Bottom of Form  [Content](https://www.se.com/myschneider/content) [Training](https://www.se.com/myschneider/TrainingOffers) [Installed Base](https://www.se.com/myschneider/installedbase/?tab=siteoverview) [Programs](https://www.se.com/myschneider/programs)  Overview All Projects Project details  Project-28 Untitled  open  Created: 9/3/2025 Last Modified: 17/3/2025 Project Owner: Tshingombe fiston End User Company: Tshingombe engineering engineerig  BOM Manager Activity Log Documents  Add products to Bill of Materials  By product reference number #  By Excel/CSV file ( Download sample template )  Error adding products View BOM  By product segments / selection tools  Programmable controllers and I/Os  PLC, PAC, IOs and Power supplies  Motor Protection & Control  VSD, Soft Starter, Direct Starter and protections  Human-machine interfaces  HMI panels, controllers, software and Industrial PCs  Interface, Safety and Control Relays  Electromechanical, Control, Timing and Solid State Relays  Enclosures and Accessories  Enclosures, thermal management, accessories and cabling  Push Buttons, Switches, Pilot Lights and Joysticks  Harmony ranges  Motion Control and Robotics  Move the machine tooling or the part itself in a controlled, rotary or linear manner.  Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 1 Total: R 30 687,22  001  Controller, Modicon M171/M172/M173, optimized display 22 IO, Modbus  R 9 888,63  View Product  002  Modicon M171 Optimized LV Connector 1m cable  R 555,78  View Product  003  Modicon M171 Optimized AO Connector 1m cable  R 140,86  View Product  004  Modicon M171 Optimized AO Connector 2m cable  R 201,24  View Product  005  Modicon M171 Optimized Display LED  R 1 802,40  View Product  006  Modicon M171 Optimized Display LCD  End of commercialisation: 12/01/2024  R 3 104,58  View Product  007  Modicon M171 Optimized Wall thermostat without backlight  R 2 170,34  View Product  008  NTC 1,5m IP68 5x20 -50+110°C Grey  R 143,76  View Product  009  NTC 1,5m IP68 5x20 -50+110°C Grey  R 136,69  View Product  010  NTC 3,0m IP68 5x20 -50+110°C Grey  End of commercialisation: 12/01/2024  R 229,99  View Product  011  EEV Driver, Actuator  End of commercialisation: 01/23/2021  R 3 449,54  View Product  012  EEV Driver, Autonomous & Hardwired  End of commercialisation: 01/23/2021  R 3 737,01  View Product  013  EEV Driver, Autonomous & Modbus  End of commercialisation: 12/01/2024  R 4 570,62  View Product   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 30 687,22  001  Controller, Modicon M171/M172/M173, optimized display 22 IO, Modbus  R 9 888,63  View Product  002  Modicon M171 Optimized LV Connector 1m cable  R 555,78  View Product  003  Modicon M171 Optimized AO Connector 1m cable  R 140,86  View Product  004  Modicon M171 Optimized AO Connector 2m cable  R 201,24  View Product  005  Modicon M171 Optimized Display LED  R 1 802,40  View Product  006  Modicon M171 Optimized Display LCD  End of commercialisation: 12/01/2024  R 3 104,58  View Product  007  Modicon M171 Optimized Wall thermostat without backlight  R 2 170,34  View Product  008  NTC 1,5m IP68 5x20 -50+110°C Grey  R 143,76  View Product  009  NTC 1,5m IP68 5x20 -50+110°C Grey  R 136,69  View Product  010  NTC 3,0m IP68 5x20 -50+110°C Grey  End of commercialisation: 12/01/2024  R 229,99  View Product  011  EEV Driver, Actuator  End of commercialisation: 01/23/2021  R 3 449,54  View Product  012  EEV Driver, Autonomous & Hardwired  End of commercialisation: 01/23/2021  R 3 737,01  View Product  013  EEV Driver, Autonomous & Modbus  End of commercialisation: 12/01/2024  R 4 570,62  View Product   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©20  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 51 005,44  001  Motion controller LMC216 16 axis - Acc kit - Basic  End of commercialisation: 12/01/2024  Price Unavailable  View Details  002  Regulated switch power supply, modicon power supply, 3 phases, 380 to 500V AC, 24V, 20A  R 13 112,60  View Product  003  Motor circuit breaker, TeSys Deca, 3P, 1 to 1.6A, thermal magnetic, screw clamp terminals, button control  R 1 709,72  View Product  004  battery control module, phaseo ABL7 ABL8, 24 to 28.8V DC, phaseo ABL7 ABL8, 24V, 20A, for regulated SMPS  R 11 849,78  View Product  005  battery control module, phaseo ABL7 ABL8, 24 to 28.8V DC, phaseo ABL7 ABL8, 24V, 40A, for regulated SMPS  R 17 709,70  View Product  006  Easy UPS control module, 24V DC-DC, DIN Rail, Industrial, 20A  R 3 679,82  View Product  007  Easy UPS battery module, 24V DC-DC, DIN Rail, Industrial, 4.5Ah  R 2 943,82  View Product   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 110 098,24  001  Circuit breaker, ComPacT NSX400H, 70kA/415VAC, 3 poles, MicroLogic 1.3M trip unit 320A  R 14 080,25  View Product  002  Contactor body,TeSys F,3P(3NO)-AC-3, <=440V 265A without coil  End of commercialisation: 12/31/2023  R 28 920,36  View Product  003  soft starter for asynchronous motor, Altistart 22, control 230V, 230 to 440V, 75 to 132kW  R 65 378,96  View Product  004  torque limiting screws, ComPact NSX400/630, power connections, set of 12 parts  End of commercialisation: 12/01/2024  R 489,96  View Product  005  Auxiliary contact block, TeSys Deca, 1NC, front mounting, screw clamp terminals  R 277,79  View Product  006  Auxiliary contact block, TeSys Deca, 1NO+1NC, front mounting, screw clamp terminals  R 350,84  View Product  007  Auxiliary contact block, TeSys Deca, 1NO+3NC, front mounting, screw clamp terminals  R 600,08  View Product   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  mySchn  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 17 164,53  001  Motor circuit breaker, TeSys GV4, 3P, 115A, Icu 50kA, thermal magnetic, Everlink terminals  Price Unavailable  View Product  002  Contactor, TeSys Deca, 3P(3NO), AC-3/AC-3e, <=440V, 115A, 230V AC 50/60Hz coil, screw clamp terminals  R 9 642,90  View Product  003  Auxiliary contact, TeSys GV4, 690VAC, 1 NO/NC  R 606,49  View Product  004  Auxiliary contact, TeSys GV4, 690VAC, 1 NO/NC  R 606,49  View Product  005  Time delay auxiliary contact block, TeSys Deca, 1NO+1NC, on delay 10-180s, front, screw clamp terminals  R 2 393,92  View Product  006  Contactor coil, TeSys Deca, LX1D8, 230V AC 50/60Hz for 115 and 150A contactor  R 3 914,73  View Product   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  mySchneider  Top of Form  Bottom of Form  eider  Top of Form  Bottom of Form  mySchneider  Top of Form  Bottom of Form  mySchneider  Top of Form  Bottom of Form  mySchneider  Top of Form  Bottom of Form  25, Schneider Electric  mySchneider  Top of Form  Bottom of Form  mySchneider  Top of Form  Bottom of Form  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 261 204,87  001  License, EcoStruxure Control Expert, service pack base, small S, 1 user, node locked, digital license  R 14 435,28  View Product  002  License, EcoStruxure Control Expert, with Topology Manager and M580 safety, for XL, node locked, 10 users, digital  R 246 769,59  View Product  003  Status Unavailable  Price Unavailable  View Details   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 10 234,04  001  license, EcoStruxure Control Engineering, verification, basic, node locked, 1 shot  R 5 582,20  View Details  002  license, EcoStruxure Control Engineering, documentation, basic, node locked, 1 shot  R 4 651,84  View Details   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  Product Selector Tool  This tool is designed to assist you through the product selection process.  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Power Control and Protection  Power supplies and transformers  Software License Configurator  Software License Configurator  Bill of Materials  Total items selected: 0 Total: R 331 172,31  001  licence, Ecostruxure Automation Expert, standard engineering buildtime, v23  R 65 100,00  View Details  002  license, EcoStruxure Automation Expert, professional engineering, buildtime, v23  R 157 500,00  View Details  003  license, EcoStruxure Automation Expert, standard device runtime, add on, v23  R 378,00  View Details  004  license, EcoStruxure Automation Expert, high availability option, runtime, add on, v23  R 840,00  View Details  005  license, EcoStruxure Automation Expert, run time, application, permanent, 1 user, for ATV dPac  R 777,00  View Product  006  license, EcoStruxure Automation Expert, run time, application, permanent, 1 user, for M251, M262 dPAC  R 6 216,70  View Product  007  license, EcoStruxure Automation Expert, run time, application, permanent, 1 user, for M580 dPAC  R 15 540,00  View Product  008  license, EcoStruxure Automation Expert, run time, application, permannet, 1 user, for M580 dPAC with extensions  R 56 448,56  View Product  009  license, EcoStruxure Automation Expert, run time, HMI, permanent, 1 user, for Harmony ST6  R 2 625,00  View Product  010  license, EcoStruxure Automation Expert, run time, HMI, permanent, 1 user, for Harmony iPC  R 12 600,35  View Product  011  Status Unavailable  Price Unavailable  View Details   * mySchneider Terms of Use * Privacy Policy * [Cookie Notice](https://www.se.com/za/en/about-us/legal/cookie-notice.jsp) * Change your cookie settings   ©2025, Schneider Electric  mySchneider  Top of Form  Bottom of Form  mySchneider  Top of Form  Bottom of Form  mySchneider  Top of Form  Bottom of Form  On Mon, Mar 17, 2025 at 11:43 AM tshingombe fiston <[tshingombefiston@gmail.com](mailto:tshingombefiston@gmail.com)> wrote:  Help  Settings  Project List   |  |  | | --- | --- | |  |  | | Project 2025.03.17#17898 | |   Help   |  | **Project 2025.03.17**  **Total Count: 1** | | --- | --- | |  | **Project 2025.03.17** | |  |  |      |  | | --- | | ATS22C59S6U  soft starter for asynchronous motor, Altistart 22, control 110V, 230 to 575V, 200 to 500hp  [Datasheet](https://eref.se.com/us/en/scope/product/ATS22C59S6U) |   Warning: material list is maintained in your browser's 'local storage'. All information will be lost if you clear/reset your browser cookies. en\_US.json 2017/10/19 09:44:14  1 item(s) selected:  Help  Settings  Project List   |  |  | | --- | --- | |  |  | | Project 2025.03.17#17898 | |   Help   |  | **Project 2025.03.17**  **Total Count: 1** | | --- | --- | |  | **Project 2025.03.17** | |  |  |      |  | | --- | | ATS22C59S6U  soft starter for asynchronous motor, Altistart 22, control 110V, 230 to 575V, 200 to 500hp  [Datasheet](https://eref.se.com/us/en/scope/product/ATS22C59S6U) |   Warning: material list is maintained in your browser's 'local storage'. All information will be lost if you clear/reset your browser cookies. en\_US.json 2017/10/19 09:44:14  1 item(s) selected:Fundamentals of Health Care Facility Electrical Power Systems Course Outline © 2015 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Course Description With daunting aspects such as ever-changing codes and standards, increasing medical complexity, and dwindling capital budgets, hospitals and health care facilities are among the most challenging building projects. Health care facility electrical systems are complex, difficult to design, expensive to build and subject to a plethora of codes and standards as well as intensely regulated by authorities having jurisdiction over their design and construction. With new medical technologies continuing to arrive on the scene, healthcare facility electrical systems are ever changing. This course provides an introduction to the topic of healthcare facility electrical systems. Course Outline Course Objectives • Recognize the importance of electrical distribution to health care facilities, and how it differs from other types of buildings • Identify the codes, standards and guidelines which govern the design of health care facility electrical systems • Describe the elements of a health care facility’s Essential Electrical System Course Content or Material 1) Introduction 2) Different types of health care facilities have differing needs and code requirements for electrical distribution a. Hospitals b. Long-term care facilities c. Ambulatory surgery facilities d. Outpatient therapy facilities e. Outpatient facilities f. Clinics and physician offices 3) The importance of electrical distribution to hospitals a. Life support i. Patients on ventilators ii. General anesthesia b. Medical procedures c. Medical records d. Comfort e. Life Safety (fire safety) i. Illumination of the means of egress f. Without electrical power, a medical facility will close and/or be evacuated. 4) Codes, standards and guidelines a. NFPA 101 Fundamentals of Health Care Facility Electrical Power Systems Course Outline © 2015 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. b. NFPA 99 c. NFPA 110 and 111 d. NFPA 70 e. NFPA 70E i. Electrical safety for those who work on electrical gear f. FGI Guidelines g. CMS h. OSHA 5) Essential Electrical System a. Alternate source of power i. Classification of the emergency power source b. Branches of the essential electrical system i. Example: Type I systems 1. Life Safety Branch 2. Critical Branch 3. Equipment Branch ii. Type 2 and Type 3 systems c. Potential failure points within the essential electrical system 6) Assessing the need for providing an alternate source of power 7) Summary Course Assessment: Test Your Knowledge Course Survey: We Value Your Opinion  Leaderboard  2350 points 4732nd  1st level 32nd  4 badges  28th  3 completed courses223rd  3 certificates235th  On Mon, Mar 17, 2025 at 11:18 AM tshingombe fiston <[tshingombefiston@gmail.com](mailto:tshingombefiston@gmail.com)> wrote:  0% completed  Rate this course  Course rating is 4.76 stars  By Language / English  Applying Safety Rules   Student  3681  Duration*: 20 minutes*    Outline*:*  In this course, you will learn how to avoid electrical hazards as a professional by ensuring safety on the job site. You will learn about safety equipments and rules to follow to protect the installation, its users and yourself. You will also learn about some of the fundamental concepts of electricity to better understand its dangers and the importance of product sizing.    At the end of this course, you will be able to:  - To define principles safety rules  - To know standard safety equipment and specific PPE  - To memorize gestures and habits to be safe during an intervention    To achieve it, you will get access to a composition of materials as procedure block, flashcards, podcasts, interactive images and professional case studies.    Have a good journey!  *This course was made possible thanks to an international collaboration:*  *• Schneider Electric education team ;*  *• Eric Dupont, a teacher affiliated with the French Ministry of National Education ;*  *• ItyCom, a leading provider of digital learning solutions ;*  *• Cécile Lienaux, a graphic designer ;*    “*Electrical equipment should be installed, operated, services or maintained only by qualified electrical maintenance personnel. To the extent permitted by applicable law, no responsibility or liability is assumed by Schneider Electric and its subsidiaries for any type of damages arising out of or in connection with (i) informational content of this course not conforming with or not reaching requirements, expectations or purpose of any person making use thereof, or (ii) any error contained in this course, or (iii) any use, decision, act or omission made or taken on basis of or in reliance on any information contained or referred to in this course.”*  Course content  Additional content has been loaded  Discover personal protective equipment  Top of page  Top of Form  Bottom of Form  [Applying safety rules](https://university.se.com/content/lessons/732/applying-safety-rules-scorm12-dGOq9h3g/scormcontent/index.html#/)  0% COMPLETE  [Discover personal protective equipment](https://university.se.com/content/lessons/732/applying-safety-rules-scorm12-dGOq9h3g/scormcontent/index.html#/lessons/YgeqZ-ekDvtgQvzvud7AQhbOYNssFk3_)  [Practical case](https://university.se.com/content/lessons/732/applying-safety-rules-scorm12-dGOq9h3g/scormcontent/index.html#/lessons/97o7Is7tNC_AVH5WYB803ZYdwiNA2YhG)  [Electricity risks](https://university.se.com/content/lessons/732/applying-safety-rules-scorm12-dGOq9h3g/scormcontent/index.html#/lessons/kN1MaBVmbwjDIDp232pFnXIgRymsd0np)  [Safety rules for working with electrical equipment](https://university.se.com/content/lessons/732/applying-safety-rules-scorm12-dGOq9h3g/scormcontent/index.html#/lessons/dE7Iueae3w6in0TrEM3UqwlJD-VTWPv-)  [Test your knowledge](https://university.se.com/content/lessons/732/applying-safety-rules-scorm12-dGOq9h3g/scormcontent/index.html#/lessons/2Hh_5hHobbrAEmGeD14prjCCt2UkYLRu)  Conclusion   1. This lesson is currently unavailable   Must pass quiz before continuing: "Test your knowledge"  [Home](https://university.se.com/content/lessons/732/applying-safety-rules-scorm12-dGOq9h3g/scormcontent/index.html#/)  Lesson content  Discover personal protective equipment  Lesson 1 of 6  We are happy to have you with us!  To start your safety training, you will learn how to choose the appropriate personal protective equipment in order to reduce the risks of injury and accidents, whether you're at work or at home.  Continued  Personal Protective Equipment (PPE)  What is a Personal Protective Equipment (PPE)?  Personal protective equipment (PPE) is an important aspect of electrical safety, as it helps protect workers from electrical hazards.  Wearing PPE can help prevent injuries and fatalities due to electrical accidents.  It is important for workers to use the appropriate PPE for the task they are performing, and to ensure that it is in good condition and properly maintained.  What to wear to be safe during an installation?  Here is a list of basic personal protective equipment:  *Click on each tab below to learn about the different types of personal protective equipment:*  Protect the upper body.  When working on energized systems, do not pull up your sleeves.  This equipment is the standard, but it can change depending on the activities.  63% Completed  Unstarted  Unstarted  Unstarted  Unstarted  Must pass quiz before continuing: "Test your knowledge"  Lesson 3 of 6  In this chapter you will learn more about electricity to better understand safety issues.  Continued  Electricity and its dangers  Why is it risky?  Electricity is a form of energy resulting from the presence and movement of charged particles, such as electrons. It is a fundamental force of nature that is responsible for lightning, electric currents, and electromagnetic radiation.  It is generated by the movement of charged particles. For example, in a battery, chemical reactions create a flow of electrons from the negative terminal to the positive terminal, creating a voltage difference.  Electricity can be dangerous:  In most businesses and households, the voltage of the electricity and the available electrical current have sufficient power to cause death by electrocution. Even changing a light bulb without first disconnecting the lamp can be dangerous because coming into contact with the “hot”, “energized”, or “live” part of the outlet could kill a person.  Analyzing Reliability in the Data Center Outline  Course Description:  The growing reliance on information systems that operate 24 hours per day, 7 days per week, has  spawned a rapidly growing and developing industry that supplies products and services on  demand. The need for these types of information services now reaches into every business office  in the world. Unfortunately, events of all kinds including hardware failure, human error,  environmental changes, structural failure and external events, can lead to the possibility of  unanticipated systems downtime.  Modern data centers do not tolerate planned downtime and strive for no outages in a 10-year  mission. Data center operations staffs are faced with the dilemma of either downtime as a result of  insufficient physical infrastructure, or incurring extensive costs by designing in more redundancies  than is necessary. Targeted reliability solutions allow businesses to meet individual requirements of  the data center, while minimizing the total cost of ownership.  In fact, very high reliability is difficult to attain and redundant hardware is only part of the answer.  This course will demonstrate some important performance success factors and overviews best  practices for analyzing and optimizing reliability.  Course Outline:  Learning Objectives  At the completion of this course, you will be able to:  ▪Define key terms associated with analyzing reliability risks  ▪Identify some common cause failures in the data center  ▪Describe the benefits of conducting a Probabilistic Risk Assessment (PRA)  ▪Recognize the reliability advantages of utilizing scalable, modular architecture in the data center  Agenda  ▪Introduction  ▪Analyzing risk  ▪Redundancy  ▪Common cause failures  ▪Probabilistic Risk Assessment (PRA)  ▪Case study example  ▪Summary  ©2013 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners.Course Content or Material:  1) Introduction  a) Information systems need to operate 24 / 7  b) Growing and developing industry supplies products and services on-demand  c) Modern data centers do not tolerate planned downtime and strive for no outages in a 10-  year mission  d) Data center operations staffs are faced with  e) The dilemma of downtime as a result of insufficient physical infrastructure  f) Incurring extensive costs by factoring in unnecessary redundancies  g) Targeted reliability solutions allow businesses to meet individual requirements of the data  center, while minimizing the total cost of ownership  2) Reliability  a) Understanding how to best define downtime risk  i) Is important to optimizing its reliability  ii) Decreases total cost of ownership  iii) Increases agility  b) Reliability metrics statistically analyze the likelihood of a failure occurring  3) Redundancy  a) While redundancy can increase reliability, there are significant costs and potentially  serious drawbacks  b) A redundant system has more components  c) In general, systems with more components will experience more failures  4) Discussing Best Practices  a) The design, manufacture, operation, maintenance and repair of equipment  b) The gathering of data, and the review and publication of component benchmarking results  c) Consistent deployment of the language of reliability, both definitions and assumptions  d) A philosophy addressing the constant pursuit of root causes, common cause failures and  relevant data  5) Modularity and Component Count  a) Reliability can be increased through standardization  b) Modularity is a powerful concept  c) Modularizing a system can increase the number of internal components  d) Reliability analysis of modular systems must consider  i) Component design  ii) Function  iii) Dependencies  ©2013 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners.6) Benefits and Drawbacks  a) Data center testing and maintenance practices often have a significant impact on systems  reliability  b) Testing and diagnosis can improve reliability, but may also degrade it  7) UPS: Historical Perspective  a) In most UPSs, utility AC power is rectified to DC  b) The inverter synthesizes an AC voltage free from the effects of spikes, sags, harmonics,  and brief utility outages  8) Assessing Reliability  a) Product support engineers  i) Track the products' performance in actual use  ii) Identify and implement changes necessary to correct deficiencies or defects  iii) Benefit from a road map identifying components most likely to fail  b) Deviations from the predictions of the road map would identify new areas for more  intensive investigation and possible remedial action  9) The Correct Course of Action: PRA  a) The process of building the logical model results in a comprehensive review  b) The mathematical nature of the calculation limits the logical fallacies that tend to dominate  qualitative evaluation of reliability  c) The implication is that if N components are required for success, there is one, two, twice  as many, or even twice plus one as many units available  d) Not all redundancy makes the same contribution to reliability  10) Reliability Assessment Case Study  a) The mathematical models that resulted from the analysis were used to answer some key  questions  b) The scalable, modular system utilizes redundancy in nearly all components as a means of  achieving high reliability  c) MTechnology, Inc's analysis showed that  d) There are both costs and benefits to redundancy  e) Some sub-systems benefit less from redundancy than others  f) Complex mathematical formulas were utilized to calculate the case study failure rates and  common cause failures  11) Case study goals  a) To identify potential sources of failure  ©2013 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners.b) To evaluate the potential for further improvement in the scalable, modular power system’s  reliability and availability  12) Target of Case Study Analysis  a) Subjects of analysis  i) 14 - 40 kW Scalable, modular, rack based power system with PDU and static bypass  ii) 500 kW central UPS  b) Tools utilized  i) Probabilistic Risk Assessment (PRA)  ii) Fault tree  iii) Event tree analysis  iv) Bayesian updating  13) Reliability Assessment Case Study  a) All actions have both beneficial and negative affects on reliability  b) It helps to support the uptime of the servers but also can represent a point of failure  14) Comparing Modularity to the Central UPS  a) The scalable, modular system loses power to all loads only when  i) The main entrance bus fails  ii) The transfer switch fails to open  b) The probability of all 14 scalable, modular units failing simultaneously due to internal  failures is extremely low  c) PDU failure will cause partial load drop  d) Only one circuit breaker after the transfer switch will cause all critical loads to fail  15) Central UPS data  a) Battery failure is a significant contributor of failure in central UPS  b) The central UPS can fail internally, and bypass can fail, causing all loads to fail  c) PDU failure will cause partial load drop  16) Reliability Assessment Case Study: The Findings  a) The calculated reliability of the scalable, modular power system is comparable to data  published by vendors of large, central UPSs  b) The scalable, modular power system is significantly less likely to suffer a complete system  failure  c) The redundancy provided in the scalable, modular power system definitely improves the  product's reliability  ©2013 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners.17) Conclusions  a) Overall, the scalable, modular architecture had a system failure rate was approximately  40% lower than that of the central UPS system  b) Failure is defined as the loss of power for all critical loads  c) Discounting battery failures, the scalable, modular failure rate is still approximately 18%  less than that of a comparable central UPS architecture  d) If failure is defined to include dropping of any single load due to a branch circuit failure, but  not UPS failure, the scalable, modular architecture is 6% less likely to fail  e) Scalable, modular power system architecture proved more reliable than the single module  UPS with a single battery string  f) The redundant subsystems within the scalable, modular power system successfully  reduced the probability of UPS failure  g) The performance of the ATS is often the limiting factor in achieving higher reliability  18) Summary  a) Understanding how to best define downtime risk is important to optimizing its reliability,  while decreasing TCO and increasing agility  b) While redundancy can in principle increase reliability, there are significant costs and  potentially serious drawbacks  c) Data center professionals need to understand which processes are most critical, and  target reliability accordingly  d) PRA is a powerful tool when applied carefully  Course Assessment: Test Your Knowledge  Course Feedback: We Value Your Opinion  ©2013 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners.  An Introduction to Medical Gas and Vacuum Systems Course Outline © 2019 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Course Outline Course Description This course introduces plumbing and medical gas systems for medical treatment facilities. We will discuss the various types of medical gas and vacuum systems used in health care facilities. The chief purpose of these systems is to provide safe and reliable support to the medical mission. Codes and standards are also discussed. Course Objectives • Discuss the purpose of plumbing and medical gas systems for medical treatment facilities • Identify the various types of medical gas and vacuum systems used in health care facilities • Review the important codes and standards used for medical gas and vacuum systems Course Content or Material 1. Introduction a. Introduction to Medical Gas and Vacuum Systems 2. Types of medical gas and vacuum systems a. Medical gas systems i. Oxygen ii. Medical Air iii. Nitrous Oxide iv. Nitrogen v. Carbon Dioxide vi. Mixed Gases vii. Instrument air b. Vacuum Systems c. Medical/Surgical Vacuum d. Waste Anesthetic Gas Disposal e. Dental Vacuum Systems (Tim will write a script) 3. Codes, standards, regulations and authorities having jurisdiction a. NFPA 99 b. FGI Guidelines c. Local or state regulations d. Enforcement i. Certificate of occupancy ii. CMS and accreditation e. ASSE Standards 4. Categories of medical gas and vacuum systems a. Introduction to NFPA 99 Categories b. Category 1 An Introduction to Medical Gas and Vacuum Systems Course Outline © 2019 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. c. Category 2 d. Category 3 Course Assessment: Test Your Knowledge Course Survey: We Value Your Opinion  On Mon, Mar 17, 2025 at 10:39 AM tshingombe fiston <[tshingombefiston@gmail.com](mailto:tshingombefiston@gmail.com)> wrote:  We will be conducting system maintenance Sunday March 16, 2025 9:00 p.m.-11:00 p.m. EDT. Please note that you will not be able to login at this time.  Course Assessment - Results page   * [1](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-644) * [2](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-645) * [3](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-646) * [4](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-647) * [5](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-648) * [6](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-649) * [7](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-651) * [8](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-652) * [9](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-653) * [10](https://university.se.com/content/course/706/lesson/76/content/241#ef-question-654)     Question  A/n \_\_\_\_\_ measures the amount of electrical current flowing through a circuit during a specific time interval.    Ampere  Volt  Ohm  Watt  Question  Materials with \_\_\_\_\_ resistance require more voltage to make the electricity flow.    Lower  Higher  Slower  Faster  Question  True or false? The electrical load in a data center is the sum of the various pieces of data center equipment which consume and are supplied with electrical power    T  F  Question  The power in Watts is the \_\_\_\_\_ power drawn by the equipment, while Volt-Amps is called the \_\_\_\_\_ power.    Electrical, real  Apparent, real  Real, apparent  Real, solar  Question  A circuit breaker may need to switch short circuit currents as high as \_\_\_\_\_ times its rated current.    30  15  10  5  Question  Circuit breakers can fail in which of the following ways:    Failure to close, or failure to open under fault conditions  Spurious trip  Failure to operate with the time-current specifications for the unit  All of the above  Question  This form of standby power uses electromagnetism to produce electricity    a, Electrochemical generator  Battery  Fuel cell  Mechanical generator  Question  \_\_\_\_\_ occur when there is a varying quality of connections to the earth at different points in an electrical installation    Ground loops  Power factor corrected power supplies  Ground Fault Circuit Interrupters  Thermal-magnetic circuit breakers  Question  An approach to solve the problem of impulsive transients includes the utilization of which device?    Power Line Conditioners  Uninterruptible Power Supply (UPS)  Voltage Surge Suppressor (TVSS)  Modern harmonic-correction equipment  Question  According to M Technology, Inc., what percentage of the time are circuit breakers involved in a power system failure in data center electrical infrastructure?    10%  40%  70%  50%  Course Assessment - Test  Course Assessment  Number of questions:  10  Questions are shown:  One by one  So far you have done this test 1 time    [Previous unit: Online Course](https://university.se.com/content/course/706/lesson/76/content/644)  1.4% completed   * Lesson Fundamentals of Power   + [Course Overview - Passed](https://university.se.com/content/course/706/lesson/76/content/3196)   + [Online Course](https://university.se.com/content/course/706/lesson/76/content/644)   + [Course Assessment - Current unit](https://university.se.com/content/course/706/lesson/76/content/241)   + [Reference Materials](https://university.se.com/content/course/706/lesson/76/content/646)      - 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[Course Transcript](https://university.se.com/content/course/706/lesson/9/content/108) * Lesson Combined Heat and Power   + [Course Overview](https://university.se.com/content/course/706/lesson/117/content/937)   + [Online Course](https://university.se.com/content/course/706/lesson/117/content/1665)   + [Course Assessment](https://university.se.com/content/course/706/lesson/117/content/277)   + [Reference Materials](https://university.se.com/content/course/706/lesson/117/content/938)      - [Course Transcript](https://university.se.com/content/course/706/lesson/117/content/939) * Lesson Compressed Air Systems I: An Introduction   + [Course Overview](https://university.se.com/content/course/706/lesson/14/content/131)   + [Online Course](https://university.se.com/content/course/706/lesson/14/content/1897)   + [Course Assessment](https://university.se.com/content/course/706/lesson/14/content/136)   + [Course Feedback](https://university.se.com/content/course/706/lesson/14/content/564)   + [Reference Materials](https://university.se.com/content/course/706/lesson/14/content/946)      - [Course Transcript](https://university.se.com/content/course/706/lesson/14/content/947) * Lesson Energy Efficiency with Building Automation Systems I   + [Course Overview](https://university.se.com/content/course/706/lesson/135/content/1008)   + [Online Course](https://university.se.com/content/course/706/lesson/135/content/1930)   + [Course Assessment](https://university.se.com/content/course/706/lesson/135/content/294)   + [Reference Materials](https://university.se.com/content/course/706/lesson/135/content/1009)      - [Course Transcript](https://university.se.com/content/course/706/lesson/135/content/1010) * Lesson Energy Procurement I: Options in Regulated and Deregulated Markets   + [Course Overview](https://university.se.com/content/course/706/lesson/137/content/1016)   + [Online Course](https://university.se.com/content/course/706/lesson/137/content/1670)   + [Course Assessment](https://university.se.com/content/course/706/lesson/137/content/296)   + [Reference Materials](https://university.se.com/content/course/706/lesson/137/content/1017)      - [Course Transcript](https://university.se.com/content/course/706/lesson/137/content/1018) * Lesson Energy Procurement II: Introduction to Hedging in Deregulated Markets   + [Course Overview](https://university.se.com/content/course/706/lesson/138/content/1020)   + [Online Course](https://university.se.com/content/course/706/lesson/138/content/1671)   + [Course Assessment](https://university.se.com/content/course/706/lesson/138/content/297)   + [Reference Materials](https://university.se.com/content/course/706/lesson/138/content/1021)      - [Course Transcript](https://university.se.com/content/course/706/lesson/138/content/1022) * Lesson Energy Procurement III: Balanced Hedging Strategies   + [Course Overview](https://university.se.com/content/course/706/lesson/139/content/1024)   + [Online Course](https://university.se.com/content/course/706/lesson/139/content/1676)   + [Course Assessment](https://university.se.com/content/course/706/lesson/139/content/298)   + [Reference Materials](https://university.se.com/content/course/706/lesson/139/content/1025)      - [Course Transcript](https://university.se.com/content/course/706/lesson/139/content/1026) * Lesson Energy Rate Structures I: Concepts and Unit Pricing   + [Course Overview](https://university.se.com/content/course/706/lesson/140/content/1028)   + [Online Course](https://university.se.com/content/course/706/lesson/140/content/1858)   + [Course Assessment](https://university.se.com/content/course/706/lesson/140/content/299)   + [Reference Materials](https://university.se.com/content/course/706/lesson/140/content/1029)      - [Course Transcript](https://university.se.com/content/course/706/lesson/140/content/1030) * Lesson Going Green with Leadership in Energy and Environmental Design   + [Course Overview](https://university.se.com/content/course/706/lesson/152/content/1199)   + [Online Course](https://university.se.com/content/course/706/lesson/152/content/1868)   + [Course Assessment](https://university.se.com/content/course/706/lesson/152/content/310)   + [Reference Materials](https://university.se.com/content/course/706/lesson/152/content/1200)      - 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All rights reserved. All trademarks provided are the property of their respective owners. 16) Calculating Efficiency and Operating Costs a) The technical design of the modular, scalable system results in a much higher efficiency rate running on lightly loaded UPS units b) The Fortune 500 firm in our case study: i) Chooses to implement redundant UPS systems and operates each of them at 40% capacity ii) Chooses the “install as you grow” approach which accounts for the significant differences in energy savings, and therefore, lower electrical bills 17) Total Cost of Ownership a) Capital costs i) Allow for an initial build out of 27 watts per square foot for the first 5 years ii) Assume a build-out to 80 watts per square foot for an additional 5 years b) Electrical costs i) Load levels will be at 80% of 2 (N+1) capacity ii) The maximum loading on any one system is 40% c) Service costs i) Customer requires 7x24 ii) 4 hour response iii) 100% coverage on parts and labor iv) Battery maintenance will not be included 18) Key TCO Components of Payback 19) Summary a) The green data center features a safe and healthy work environment and operates in an energy efficient manner b) Five examples of green approaches in the data center include the proper use of batteries, UPSs, rightsized solutions, cooling management, and alternative energy sources. c) TCO analyses can justify investments in green technologies Course Assessment: Test Your Knowledge  Course Feedback: We Valu  ©2021 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Fundamentals of Power Outline Course Description Power is the foundational cornerstone in the data center. Many instances of equipment failure, downtime, software and data corruption, are the result of a problematic supply of power. It is imperative that servers are insulated against utility power failures, surges, and other potential electrical problems. This course will explore the topic of power, and how it is utilized within the data center. Course Outline: Learning Objectives • Identify basic electricity concepts • Describe electrical power and its generation • Differentiate between various power usages in a data center • Define power factor • Recognize the importance of electrical safety measures in a data center • Identify potential problem areas in the data center Agenda • Electrical power key terms • AC and DC power • Power factor • Volt configurations, plugs and receptacles • Circuit breakers and convenience outlets • Seven common electrical problems • Components in a data center Introduction 1) Key Terms a) Volt (V) b) Ampere (Amp) c) Ohm (Ω) d) Hertz (Hz) e) Alternating Current (AC) f) Direct Current (DC) g) Load 2) Single-phase and 3-phase Power 3) Watts and Volt-Amps ©2021 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. 4) Power Factor Correction a) Power factor of nearly 1 b) Method of offsetting inefficiencies created by electrical loads 5) Plugs and Receptacles a) The most common plug/receptacle combination for IT equipment is of an IEC design b) Also common are plugs and receptacles of the twist lock variety 6) International Electro-technical Commission Plugs 7) National Electric Manufacturers Association Plugs 8) Circuit Breakers a) A type of switch b) Designed to protect electrical equipment from damage caused by overload or short circuit c) Designed to trip at a given current level 9) Circuit Breaker Protection 10) Circuit Breaker Sizing 11) GFCI, ELCB, and RCD a) Ground Fault Circuit Interrupters (GFCI), Earth Leakage Circuit Breakers (ELCI), or Residual-Current Devices (RCD) trip a circuit if they detect a small amount of ground current b) Larger data centers use resistor banks instead of GFCI, ELCB, or RCD 12) Convenience Outlets a) Used for non-computer devices b) Allows for other non-computer equipment to be plugged in without taxing the critical load 13) Grounding a) Safety measure to protect against electric shock 14) 7 Power Problems a) Impulsive Transients b) Interruptions c) Sags and Undervoltages d) Swells and Overvoltages e) Waveform Distortion f) Voltage Fluctuations g) Power Frequency Variation 15) Standby Power and Distribution ©2021 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. a) Any power source available to the data center that supplies power when utility power is unavailable 16) Power Distribution Components a) Primary power source (Utility) b) Emergency power source (Generator) c) Circuit/Branch Circuit d) Uninterruptible Power Supply (UPS) e) Automatic Transfer Switch f) Power Distribution Units (PDU) g) Outlet Strips h) Server Plug 17) Summary a) Power infrastructure is critical to uptime b) Understanding basic power terms helps to better evaluate the interaction between the utility, standby power equipment, and load c) Failures can occur at various points in the power infrastructure, but special care should be given to the condition and coordination of circuit breakers d) Numerous power anomalies exist that can impact the uptime of data center equipment e) Understanding the threats and applying practical power solutions can help to minimize risk Course Assessment: Test Your Knowledge Course Feedback: We Value Your Opinion©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. i. The controlling variable is affected by the actions of the controlled device upon the controlled variable c. Cascading i. Used to modify the performance of closed control loops when required 5) Red Wire & Direct Digital Controls a. DDC i. More sophisticated system ii. Use electronic controllers that support multiple control loops b. Enable / disable control i. Another form of electronic control ii. Simply turns another controller on or off iii. One controller will determine when another controller is able to perform its function 6) Summary a. For an environmental control system to effectively manage the environment in a building, thereby increasing energy efficiency and occupant comfort, three things must take place: i. Data must be measured and provided as input to the system ii. Measured data then can be compared to a set of desired outcomes or instructions iii. An output is produced based on the measured data to change or maintain the environment b. A simple control loop is defined as one input to a controller housing the control logic, which provides an output to one controlled device c. Inputs and outputs may be analog or digital d. A controller may contain many control loops, and a control system may contain many controllers e. There are three types of control loops i. Open ii. Closed iii. Cascading f. And there are three common control technologies i. Pneumatic ii. Electrical, and iii. Electronic g. Electronic controls may be i. Direct Digital Control, called DDC, or ii. Enable / Disable Contro©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Combined Heat and Power (Cogeneration) Course Description: Cogeneration today is widely used throughout the world for efficient production of heat and power. Cogeneration is the simultaneous production of heat and power in a single thermodynamic process. The purpose of this course is to review the different approaches for applying technologies to the function of cogeneration. We’ll also explore the various issues and considerations for deployment of the two main types of cogeneration concepts: "Topping Cycle" plants (including “Combined Cycle” plants), and "Bottoming Cycle" plants. Pre-Requisites for this course include: Energy Rate Structures I and II. Learning Objectives: At the completion of this course, you will be able to: • Define what cogeneration is along with the primary fuels used in its creation • Identify the different approaches for applying technology to the function of cogeneration • Discuss the various factors to consider when evaluating the use of a CHP plant Course Content or Material 1) Introduction a) Technology overview b) Defining “cogeneration” i) How cogeneration occurs ii) Primary fuels used 2) Two main approaches for cogeneration technology applications a) Topping Cycle plants (including Combined Cycle plants) i) Examples ii) Overview b) Bottoming Cycle Plants i) Examples ii) Overview 3) Environmental Issues a) Benefits b) Concerns 4) Things to Consider When Applying CHP Plant a) Steam load versus electric load b) Capital utilization / productivity c) Reliability requirements (steam and electric) d) Local electricity rates e) Efficiency gains versus fuel prices f) Fuel availability and selection g) Staffing and training 5) Comparing CHP Technologies a) Diesel engine b) Natural gas engine c) Steam Turbine d) Gas Turbine©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Compressed Air Systems I: An Introduction Course Description Compressed air is widely used throughout industry. It is sometimes called the “fourth utility”, after electricity, gas and water. From mining, lumber and paper mills, petroleum, chemical, textile and glass production to small manufacturing plants and hotels, compressed air provides critical services and can often represent the majority of the facility energy costs. Since many facilities cannot function without compressed air, reliability is paramount, but given that sound operating practices can reduce energy consumption by 20% to 50%, efficiency is high on the agenda. This is the first in a series of compressed air system courses offered by Energy University. In this course, we will look at the relative inefficiency of compressed air and examine the components of a compressed air system. Course Outline Course Objectives Objectives • Explain basic compressed air terms and concepts • Describe the relative inefficiency of compressed air as a power source • Define the supply and demand sides of a compressed air system and • Identify the components of a compressed air system and explain what they do Course Content or Material 1) Introduction 2) Supply & Demand a. Divided into a supply side and a demand side 3) Compressed Air Pros & Cons 4) Compressed Air Inefficiency Examples a. Metric Unit Example b. US Customary Unit Example 5) Compressed Air Systems Optimization a. The efficiency of compressed air systems typically receives little attention i. Systems are not well understood by plant operations staff ii. Modifying a system is perceived as a risk to production iii. Vendors compete in a market where equipment is typically sold on a “lowest first bid”, without regard for the cost of operation b. Optimization leads to i. Reduced costs ii. Reduced maintenance iii. Less downtime iv. Increased production v. Improved product quality 6) Equipment Descriptions a. Fan b. Blower c. Compressor 7) Pressure Terminology ©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. a. Pressure b. Absolute Pressure c. Gauge Pressure 8) Standard Volume of Air a. Metric b. US Customary 9) Volume Flow a. Inlet flow b. Actual flow c. FAD d. Standard flow e. Capacity 10) Operating cost a. Proportional to volume b. Proportional to pressure ratio 11) Dew Point a. The temperature at which condensation begins to occur 12) Compressed Air Requirements a. Cleanliness b. Dryness c. Oil content 13) Compressed Air System Components a. Interactive element 14) Summary a. Basic compressed air terms and concepts; b. Compressed air as a source of power is relatively inefficient. However, it can be very useful and necessary at times; c. Compressed air systems are normally broken down into supply and demand side components; d. You should now be able to identify basic components of a compressed air system and explain what they do©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Energy Efficiency with Building Automation Systems Part 1 Course description: In this course we will focus on what a building automation system (BAS) is as well as some of the commonly used terminology. We will also look at some of the HVAC strategies used in building automation systems. Course Outline: Learning objectives At the completion of this course you will be able to: • Define what a building automation system is • Review the main terminology and components of a Building Automation System and HVAC system • List the most common HVAC strategies that may be controlled by a Building Automation System Course content or material 1) Introduction a. What is building automation b. What are the functions of building automation systems (BAS) 2) Parts of a BAS 3) Terminology a. Set point b. Air 4) Review of HVAC systems a. Equipment i. Air handling unit ii. Chiller iii. Cooling tower iv. Flow controller v. Boiler vi. Dual duct vii. Constant volume/variable temperature viii. Variable air volume ix. Terminal reheat©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Energy Procurement I Course Description: The procurement of energy (electricity, natural gas, fuel oil, etc.) is becoming a major part of the energy manager’s job. Cost effective energy procurement requires understanding of the market, regulatory limitations and opportunities, and contingency planning. The purpose of this course is to raise awareness of the available options for energy procurement. Learning Objectives: ▪ Define the roles of the main players in the energy supply chain ▪ Explain the major differences in regulated and deregulated markets ▪ List the main options available for optimizing energy procurement Course Content or Material: 1) Introduction 2) Types of Energy Typically Procured a) Most common electricity and natural gas b) Coal, Oil-based fuels, Steam, Compressed air 3) Energy Supply Chain a) Production, Transmission, Distribution, Supply b) Gas supply chain c) Electricity supply chain 4) Regulated and deregulated markets a) Regulated Markets b) De-regulated Markets c) Wholesale versus Retail d) Equal access to transmission and distribution e) Drivers of Deregulation f) Pricing i) in a regulated market ii) in a deregulated market g) Options in a regulated market i) Natural gas contracts ii) Power contracts h) Options in a deregulated market i) Supplier Options i) Local distributor ii) Gas or power marketers iii) Brokers iv) LDC Marketing Departments v) Aggregator vi) Power Pool and Exchange Operators vii) Overview of Supplier Options viii) Pipeline Connects for Large Consumers 5) Procurement pitfalls a) Exposure to energy price volatility that has not been identified or quantified b) Energy that is managed locally with no corporate oversight c) Procurement decisions that are made by personnel without knowledge of the energy market d) Contracts renewed based on expiration, not market conditions ©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. e) Contract renewals that embed long term risk premiums to vendors f) A conviction that hedging is speculative in nature 6) Deregulation Growing and Prices are Volatile a) Hedging b) Avoiding pitfalls of lowest price and highest risk©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Energy Procurement II Course Description: Unprecedented volatility in today’s energy markets has wreaked havoc on the profit margins and bottom lines of many industrial companies. In order to successfully manage costs in this market, it is critical to apply commodity-based market purchasing strategies—or as it is commonly known in the industry: “hedging”. Energy price risk management and hedging programs quantify exposure to adverse events and mitigate the impact of those events on financial results. An on-going Energy Risk Management program can provide for more predictable budgeting and insulate future earnings from the unpredictable effects of volatile energy prices. The purpose of this course is to address the hedging process. We will also cover the spot and forward markets as well as fixed and index linked contracts. Pre-requisites: Energy Procurement I: Options in Regulated and Deregulated Markets. Learning Objectives: At the completion of this course, you will be able to: • Explain the difference between spot and forward markets • Describe how hedging reduces your risk, and you will be able to • Define the meaning of fixed and index-linked contracts Course Content or Material 1) Introduction a) Brief overview of gas and electricity markets b) Energy procurement 2) Procurement Pitfalls a) Common pitfalls in a deregulated market b) How energy managers remedy common errors in energy procurement 3) Commodity Markets for Energy a) Commodity exchanges i. The New York Mercantile Exchange (NYMEX) ii. The Singapore Commodity Exchange (SICOM) iii. The former International Petroleum Exchange (IPE) based in London is now part of Intercontinental Exchange (ICE) iv. Over The Counter b) Energy buyer options i. Spot market ii. Forward market i. Fixed contract ii. Index-linked contract 4) Determining Energy Prices a) Total energy costs b) Regulated cost components c) Commodity-based market purchasing strategies ©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. 5) Avoiding Pitfalls of Lowest Price and Highest Risk a) Define energy purchasing strategy i) Spot purchasing versus fixed price purchasing ii) Hedging 6) Implementing Hedging a) Forward contracts b) Futures market c) Flattening a position d) Trading forward contracts e) Permutations f) Contract expiration g) Imbalances upon delivery 7) Hedging Examples a) Hedging on the forward market b) Settling contracts on the spot market 8) Fundamental Concept of Hedging a) Shaves off the extremes b) Provides predictability 9) Adopting a Balanced Approach to Hedging a) Full requirements fixed-price b) Partial fixed-price c) Partial spot market d) Staggered fixed-price commitments©2021 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Energy Procurement III: Balanced Hedging Strategies Course Description: Managing energy costs is the key to a successful profit margin and bottom line for many industrial companies. In order to successfully manage costs in this market, it is helpful to apply a balanced hedging strategy. A balanced hedging approach will quantify exposure to adverse events and mitigate the impact of those events on financial results. The purpose of this course is to describe a variety of hedging strategies, and identify the main drivers of energy prices. We will also cover how the commodity market functions to support energy trading. Pre-requisites: Energy Procurement I and Energy Procurement II. Learning Objectives: At the completion of this course, you will be able to: • Describe a variety of balanced hedging strategies • List the main drivers of energy price • Describe how commodity markets function to support energy trading Course Content or Material 1) Adopt a Balanced Hedging Strategy a) Brief overview of concepts covered in Energy Procurement II i) Full requirements fixed-price ii) Partial fixed-price iii) Partial spot market iv) Staggered fixed-price commitments b) Determination requirements i) Commitment term ii) Tolerable price levels iii) Range of tolerable cost fluctuation and iv) Minimum/maximum time horizons for making the next commitment v) Plan of action to mitigate damage for when prices change rapidly 2) Risk Tolerance a) Definition of hedge ratio b) Defining risk tolerance 3) Defining a Hedge Ratio and Strategy a) Riverbanks analogy b) Examples of hedge ratio and energy purchasing strategies 4) Exchange Operation a) How commodity exchanges function b) Commodity exchange regulation c) Commodity-based market purchasing strategies 5) Terms and Mechanisms a) The short position – which means you are agreeing to sell b) The long position – which means you are agreeing to buy c) The price of the contract d) The daily account adjustment ©2021 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. e) The final settle price f) The strip g) Futures market versus the stock market h) Final settle 6) Drivers of Energy Prices a) Supply b) Demand c) Seasonality d) News and Rumors e) Speculators 7) Commodity Risk Analysis a) Role of gas and power marketers b) Role of independent market analysis service providers 8) The Forward Curve a) Definition b) Examples 9) Price Forcasting a) Definition b) Examples 10) Other Procurement Considerations a) Price, dependability and service b) Importance of considering 11) Best Practices a) Integrates on a continual basis i) Data ii) Risk management iii) Procurement b) Employs i) Data driven decisions ii) Management approach that identifies and quantifies risk before determining the best way to manage it iii) Procurement optimisation with operations 12) Summary  10) Summary  ©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Energy Rate Structures Part 1: Concepts and Unit Pricing Course description: Understanding the forms of energy used at a facility, and the rate structure for each, is key to understanding energy costs and implementing an energy efficiency program. By understanding what you are paying for energy, and how the rate structure controls your bill, you can adopt different strategies for reducing your energy costs. You may even be able to move to a different rate structure that is more cost effective for you. In this course, we will focus primarily on gas and electricity concepts and unit pricing. Course Outline: Learning objectives At the completion of this course you will be able to: • Define and recognize the difference between consumption and demand • Identify different forms of energy pricing including • flat rates, block rates, seasonal pricing, time of use rates, and real time pricing Course content or material 1) Introduction a. Understanding different forms of energy 2) Consumption and Demand a. Difference between consumption and demand b. Example 3) Energy Pricing a. Types of energy pricing i. Flat rate ii. Block rate 1. Declining 2. Inverted iii. Seasonal rates iv. Time-of-Use rates 1. On-peak 2. Off-peak 3. Shoulder/Mid-peak v. Time of use rates vi. Real Time Pricing vii. Other forms of pricing©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Going Green with Leadership in Energy and Environmental Design Course Outline Course Description: This course defines green buildings, explains the mission of the US Green Building Council and the requirements of the Leadership in Energy and Environmental Design (LEED) rating system. Schneider Electric solutions for meeting the LEED requirements will also be explained. Course Outline: Learning Objectives At the completion of this course, you will be able to: • Define the characteristics of Green Buildings • Explain the mission of the US Green Building Council • Identify the Leadership in Energy and Environmental Design rating system • Describe Schneider Electric products and services which satisfy LEED requirements Agenda • Introduction • Impacts of US Buildings on the Environment • Advantages of building green • Review the Mission of the US Green Building Council • Discuss the LEED rating system • Discuss Schneider Electric products and services that satisfy LEED requirements • Introduce Case Studies • Summary Course Content or Material 1) Introduction a) Green Building b) Design of Leadership in Energy and Environmental Design (LEED) c) Who makes up the LEED team d) LEED reach e) Point of the LEED point based system f) Why is there a demand 2) Impacts of US Buildings on the Environment a) Impacts of US buildings on resources b) US Energy Consumption c) US Electricity Consumption 3) Advantages of Building Green ©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. a) Demand for Green Building b) Perceived Business Benefits c) Predictions in growth of Green d) Next Generations impact of perceptions of green build 4) Mission of USGBC a) Mission statement for USGBC b) What the USGBC does c) Membership 5) LEED Rating System a) LEED addresses complete lifecycle of buildings b) 4 Levels of LEED c) 6 Credit Categories d) Steps to LEED Certification e) A sample checklist f) Available resources on line 6) Schneider Electric products and services that satisfy LEED requirements a) Maximizing LEED points b) Building Automation and Control c) Critical Power and Cooling d) Engineering Services e) Field Services f) Lighting and Lighting Controls g) Power monitoring h) Variable Frequency Drives i) Renewable Energy Systems j) Available Solutions for Compliance 7) Case Studies a) Great River Energy Headquarters b) Genzyme Center c) Duke Universtiy Smart Home©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Maintenance Best Practices for Energy Efficient Facilities Course Outline Course Description Good maintenance saves energy costs! Properly maintained facilities and equipment produce quality products, reduce downtime and have lower energy costs. This adds up to real money! This course will address the importance of maintenance in facilities, discuss the savings proper maintenance can contribute, and identify techniques that can lead to the energy efficient maintenance of facilities. Course Outline Course Objectives • List organizational problems that lead to inadequate maintenance • Identify the characteristics of an effective maintenance system • List examples of energy efficiency costs caused by insufficient maintenance • Calculate the energy costs associated with various types of maintenance failure (eg in compressed air, steam, etc) • Identify simple ways that infrared, vibration analysis, and ultrasonic surveys can contribute to identifying maintenance needs Course Content or Material 1) Introduction 2) Organizational problems i) Common maintenance problem areas (1) Lack of work order system (2) Poor reporting of work orders / problems (3) Poor analysis of work orders – (Pareto analysis) (4) Inadequate preventative maintenance program (5) Inadequate maintenance training (6) Poor control of maintenance efforts (7) Lack of management attention 3) Characteristics of an effective maintenance system i) Bring discipline to the maintenance process by ensuring • Definition of responsibilities • Adequate training • Sufficient tools and equipment • Clear procedures, including evaluation of results, and an emphasis on identifying and reinforcing best practices ii) These systems can be simple, manual arrangements, or they can include capability for inputs from sensors such as differential pressure across filters, equipment temperatures and vibration iii) In either case, there are basic requirements for a work order system, work order analysis, generation of maintenance orders, and performance records of equipment. 4) Examples of energy efficiency costs i) Steam leaks ii) Steam trap failures iii) Compressed air leaks ©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. iv) Uninsulated pipes 5) Tables and charts – Calculating the cost 6) Steam Systems The steam system maintenance should include: Steam Trap Survey and Repair Leak Repair Insulation Repair 7) Compressed Air Systems i) An efficient compressed Air System must include a regularly scheduled ultrasonic leak survey for air leaks. 8) Lighting . Once your solution is defined, your maintenance program should cover: (a) Cleaning (b) Relamping (c) Monitoring compliance with expectations (d) Maintaining standard IESNA light levels 9) Motors a) Use Premium Energy Efficient motors where possible particularly for replacement of failed motors b) Use Variable Speed or Variable Frequency drives c) Use cogged belts or synchronous belts i) Properly align motors and drives (1) Use laser alignment tools for both direct drive and belt drives (a) This step is crucial to extend motor life. (i) Design motor bases for easy adjustment 10) Ultrasonic, Infrared and Vibration Analysis In the last section of this class, let’s look at some specific tools and techniques and see how they can be usefully applied to the energy-efficiency maintenance of the systems we have been discussing a) Ultrasonic Leak detectors i) Air leaks (1) Survey for air leaks during full production periods ii) Steam Traps (1) Survey steam traps during winter heating season iii) Specialty gas leaks – especially for high cost gases – Nitrogen, Argon, Carbon Dioxide iv) Vacuum system leaks v) Duct work Leakage– particularly insulated duct work vi) ID and FD fan duct leakage – particularly behind insulation blankets vii) Can be used in some production leak testing processes b) Infrared i) Infrared inspection equipment is widely available and is astonishing cheap ii) Electrical gear inspection iii) Insulation hot spots ©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. iv) Roof inspections - Aerial Infrared inspection is a cheap effective method of built up roof inspection especially identifying leak points / saturated insulation v) Boiler Lagging / Flue Gas Leaks (1) Infrared inspection can determine point where the leak starts. c) Vibration Analysis i) Motors and Bearings (1) Motor / Drive bases should have a mass that is 3 times the mass of the rotating element. Concrete is a cheap method of adding mass. ii) Fans (1) Always dynamically balance fans in place upon installation. Although fans are balanced at the factory, it is common for fans to become damaged and or out of balance during shipment or installation. iii) Production machinery (1) Vibration problems usually have one of three solutions - increase mass of the machinery, increase rigidity of the machinery, or dynamically balance the rotating element. Any or all of these methods can be used to reduce or control vibration. iv) Vibration problems once resolved usually cease to be a problem. v) Large rotating machinery – Often include vibration sensors for continuous condition monitoring Course Assessment: Test Your Knowledge Course Survey: We Value Your Opinion©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Steam Systems I: Advantages and Basics of Steam Course description: Steam has come a long way from its traditional associations with locomotives and the Industrial Revolution. Today, it serves as an integral and essential part of modern technology. This course will introduce the benefits of utilizing steam in numerous processes and discuss t selecting the appropriate pressures for each of these different processes. Course Outline: Learning objectives At the completion of this course you will be able to: ● List the advantages of steam ● Describe the formation of steam ● Understand the relationship between pressure, temperature, and energy Course content or material 1) Introduction a. Advantages of steam b. What is steam c. Definitions i. Joules ii. BTUs iii. Temperature iv. Saturation v. Enthalpy vi. Absolute pressure vii. Gauge pressure viii. Differential pressure ix. Sensible heat x. Latent heat xi. Total heat 2) Formation of Steam a. How steam is created b. Heat energy transfer i. Example c. How a boiler makes steam 3) Relationship between pressure, tem©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Waste Heat Recovery Course Description: Waste heat is present in almost all industries and processes. Opportunities exist to put this waste heat to use economically in order to reduce the energy consumption in the plant. The purpose of this course is to identify opportunities to recover waste heat, and the equipment used to recover waste heat. The process for calculating waste heat recovery will also be addressed, along with the factors that influence the feasibility of waste heat recovery. Learning Objectives: At the completion of this course, you will be able to: • List the factors that influence the feasibility of waste heat recovery • Identify opportunities to recover waste heat, the temperature ranges of heat recovered and the possible uses • Perform calculations of waste heat recovery • Categorize and explain the general operation of the main equipment used to recover waste heat Course Content or Material 1) Introduction 2) Benefits of Waste Heat Recovery a) Direct benefits i) Reduced energy consumption ii) Consequent increase in energy efficiency b) Indirect benefits i) Reduction in pollution ii) Reduction in equipment size iii) Reduction in auxiliary energy consumption 3) Factors Influencing Waste Heat Recovery Feasibility a) Sufficient quantity b) Sufficient quality c) Used economically d) Location e) Availability f) Compatibility g) Concerns h) Limits on heat recovery 4) Waste Heat a) Quality i) Dependent upon the temperature of waste heat available ii) Economic recovery would depend upon following factors: b) Quantity Of Waste Heat i) Quantity of heat (in kcal) = V x ρ x Cp x Δt c) Typical Sources Of Waste Heat i) Heat in waste gases from industrial processes (High temperature) ii) Combustion flue gas (Medium temperature) iii) Low temperature heat recovery ©2023 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. iv) Other sources of waste heat d) Uses of Waste Heat i) Waste heat can be put to use depending upon the type of plant and category of heat available particularly with relation to temperature and quantity ii) Pre heating of combustion air: iii) Pre heating of boiler feed water: iv) Vapour Absorption Refrigeration: v) Pre heating for process requirements: 5) Development Of Waste Heat Recovery System a) Compatibility of waste heat quality: b) Scheduling: c) Location 6) Waste Heat Recovery Devices a) Recuperators b) Economizers c) Waste heat boilers d) Heat pumps e) Regenerators f) Heat Wheels g) Heat Pipes h) Other Waste Heat Recovery Devices 7) Sources and Utilization of Waste Heat Summary Chart 8) Matrix of Waste Heat Recovery Devices/Applications 9) Calculating Waste Heat Recovery a) Overview b) Case Study Examples 10) Summary Course Assessment: Test Your Knowledge  Course Survey: We Value Your Opinionperature, and energy  4) Summary  d) Schneider Electric and LEEDs  8) Summary 4) Summary  7) Summary  5) Summary e) Micro-turbine f) Fuel cells 6) Summary [Skip to main content](https://university.se.com/#main-content)  [Schneider Electric University](https://university.se.com/start)  Top of Form    Bottom of Form   1. [My Courses](https://university.se.com/start) 2. [Tshingombe fiston (tshingombefiston@gmail.com)](https://university.se.com/users/edit/923018)   Tshingombe fiston  Learner  |  [tshingombefiston@gmail.com](mailto:tshingombefiston@gmail.com)    Signins / Completions    USER SINCE  16 Mar, 2025  Last login: 37 minutes ago  COMPLETED COURSES  0 / 2  PASSED TESTS  0 / 14  CEUs  0 / 0  CERTIFICATES  0  POINTS  550  Change your cookie settings  —   * [550](https://university.se.com/leaderboard)   On Sun, Mar 16, 2025 at 1:43 PM tshingombe fiston <[tshingombefiston@gmail.com](mailto:tshingombefiston@gmail.com)> wrote:  ©2021 Schneider Electric. All rights reserved. All trademarks provided are the property of their respective owners. Fundamentals of Power Outline Course Description Power is the foundational cornerstone in the data center. Many instances of equipment failure, downtime, software and data corruption, are the result of a problematic supply of power. 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All trademarks provided are the property of their respective owners. 4) Power Factor Correction a) Power factor of nearly 1 b) Method of offsetting inefficiencies created by electrical loads 5) Plugs and Receptacles a) The most common plug/receptacle combination for IT equipment is of an IEC design b) Also common are plugs and receptacles of the twist lock variety 6) International Electro-technical Commission Plugs 7) National Electric Manufacturers Association Plugs 8) Circuit Breakers a) A type of switch b) Designed to protect electrical equipment from damage caused by overload or short circuit c) Designed to trip at a given current level 9) Circuit Breaker Protection 10) Circuit Breaker Sizing 11) GFCI, ELCB, and RCD a) Ground Fault Circuit Interrupters (GFCI), Earth Leakage Circuit Breakers (ELCI), or Residual-Current Devices (RCD) trip a circuit if they detect a small amount of ground current b) Larger data centers use resistor banks instead of GFCI, ELCB, or RCD 12) Convenience Outlets a) Used for non-computer devices b) Allows for other non-computer equipment to be plugged in without taxing the critical load 13) Grounding a) Safety measure to protect against electric shock 14) 7 Power Problems a) Impulsive Transients b) Interruptions c) Sags and Undervoltages d) Swells and Overvoltages e) Waveform Distortion f) Voltage Fluctuations g) Power Frequency Variation 15) Standby Power and Distribution ©2021 Schneider Electric. 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All trademarks provided are the property of their respective owners. a) Any power source available to the data center that supplies power when utility power is unavailable 16) Power Distribution Components a) Primary power source (Utility) b) Emergency power source (Generator) c) Circuit/Branch Circuit d) Uninterruptible Power Supply (UPS) e) Automatic Transfer Switch f) Power Distribution Units (PDU) g) Outlet Strips h) Server Plug 17) Summary a) Power infrastructure is critical to uptime b) Understanding basic power terms helps to better evaluate the interaction between the utility, standby power equipment, and load c) Failures can occur at various points in the power infrastructure, but special care should be given to the condition and coordination of circuit breakers d) Numerous power anomalies exist that can impact the uptime of data center equipment e) Understanding the threats and applying practical power solutions can help to minimize risk Course Assessment: Test Your Knowledge Course Feedback: We Value Your Opinion  On Sun, Mar 16, 2025 at 1:38 PM tshingombe fiston <[tshingombefiston@gmail.com](mailto:tshingombefiston@gmail.com)> wrote:  [Skip to main content](https://university.se.com/#main-content)  [Schneider Electric University](https://university.se.com/start)  Top of Form    Bottom of Form   1. 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This easy to follow flowchart can help guide you through the warranty claim process.

**1. Collect Information**

* Document and verify driver complaint
* For automated transmissions, complete Driver Questionnaire
* Document the component model, serial number, VIN, mileage, and in-service data
* [Automated transmission driver questionnaire](https://www.eaton.com/content/dam/eaton/products/transmissions/vehicle-transmissions/eaton-automated-transmission-repair-driver-questionnaire-rrcc0015-en-us.pdf)

(PDF 180 KB)

RRCC0012

**2. Determine Warranty Coverage**

* Confirm OEM system coverage
* Beyond OEM coverage, determine if additional Eaton Standard or Extended coverage applies by using the "[What's My Warranty](https://roadrangerwarranty.eaton.com/store/order/warranty/warranty.jsp)" tool
* Refer to Eaton Warranty Guide (TCWY0900) for additional information.
* Document vehicle vocation
* Document if covered by extended protection plan

**3. Pre-Repair Support**

* Save time on overall repair by using an alternative to calling the Roadranger Call Center
  + Review the  [Warranty Repair Guidelines](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/warranty-information/guidelines.html) and the  Warranty Pre-Authorized Repair Guidelines
    - (If failure meets criteria for preauthorized warranty repair, follow published repair guidelines. No further Eaton contact is required to file a claim or guarantee payment.)
* **NOTE**: Roadranger Automated Call Center is available to all dealers.
  + Real-Time Warranty (RTW) for Manual Transmission and Clutch is restricted to authorized dealers only.  RTW is an optional program and NOT required for any warranty claim.
* Reasons to call during pre-repair support
  + Additional technical assistance is required.
  + Unclear diagnostics and troubleshooting
* In either case above, the dealer must have the following key information available prior to calling. it will be requested by the Call Center or RTW agent.
  + All Calls - Pre-Call Checklist which includes VIN, component serial number, mileage at the time of failure.
  + Automated Transmission component - Automated component Driver Questionnaire plus Pre-Call Checklist.
* [Automated transmission driver questionnaire](https://www.eaton.com/content/dam/eaton/products/transmissions/vehicle-transmissions/eaton-automated-transmission-repair-driver-questionnaire-rrcc0015-en-us.pdf)

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RRCC0012

Pre-Call Checklists

* [Clutch pre-call checklist](https://www.eaton.com/content/dam/eaton/products/clutches-brakes/eaton-clutch-real-time-warranty-pre-call-checklist-rrcc-0013-en-us.pdf)

(PDF 189 KB)

RRCC-0013

* [Automated transmission pre-call checklist](https://www.eaton.com/content/dam/eaton-cummins/products/eaton-automated-transmission-real-time-warranty-pre-call-checklist-rrcc0010-en-us.pdf)

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* [Mechanical transmission pre-call checklist](https://www.eaton.com/content/dam/eaton/products/transmissions/vehicle-transmissions/eaton-mechanical-transmission-real-time-warranty-pre-call-checklist-rrcc0017-en-us.pdf)

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RRCC0017

**1. Troubleshoot Failure and Perform Diagnostics**

* Review the available tools
  + [InfoRanger (Electronic Parts Catalog)](https://www.inforanger.roadranger.com/index.aspx)
  + Troubleshooting Manuals, Service Manuals, Service Bulletins can be found on the product page on Eaton.com or by using the search tool at the top of this page.  Example: "manual transmission service manual" or "TRSM 0970".
  + Roadranger Warranty Manual (TCWY0600) (see Important Sections: Replacement Guidelines, Limits and Exclusions, and Other Important Information)

**2. Form Repair Plan**

* Verify the complaint (may include visual inspection and/or performance verification)
* Review vehicle/component repair history in OEM system
* Identify the root cause of failure to determine the responsible party. (Note: Only defects in materials and workmanship are considered warrantable)
* Compare failure symptoms and description to select your [Preauthorized Repair Guidelines](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/warranty-information/guidelines.html).
* Establish estimate to assist in the determination of repair plan (component repair vs. replacement)
* Perform troubleshooting and diagnostics
* Review Roadranger Warranty Manual (TCWY0600)
  + Component replacement guidelines
  + Warranty limits and exclusions
  + Other Important Information
* Confirm parts availability through ordering channel (OEM System)
  + If parts are not available through your OEM's PDC network, please contact Roadranger Aftermarket Customer Support for availability at 1-800-826-4357, option 2

**3. Complete the Repair**  
  
**4. Technician to Document the following:**

* Complaint, cause (findings), correction
* All inactive and active fault codes and diagnostic labor
* Diagnostic fault tree step leading to part replacement
* List reasons for labor above normal SRT times
* Location of failed parts

**5. Repair Reasons for Claim Adjustment**

* Excessive labor, time beyond SRT, with no technical documentation (example: requesting more labor hours than repair supports with no documentation.)
* Excessive parts, over-repair, worn parts (example: sliding clutches requested when only gear failure; basic rebuild kit requested for only bearing replacement required from failure)
* **NOTE:** Parts replaced not associated with failure must be approved and paid by customer.
  + Failure, non-warrantable (example: failure caused by low lube, improper lube, no lube, shock load)

**1. Closeout Repair Order**

* If Automated Call Center or RTW is involved, dealer must close the claim with the Automated Call Center or RTW.
* Labor to be paid per OEM Chassis SRT's for a specific failure. Excessive labor to be justified in claim text (include fault codes) or have Eaton approval.
* See Eaton Warranty Manual (TCWY0600) Important Information Regarding Claim Approval

**2. File Claim**

* OEM Claim
  + Follow [OEM claim procedures](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty.html)
  + All warranty claims for component that is within OEM warranty to be filed to truck nameplate OEM.
  + Eaton supported, OEM certified dealers may be exempt from part return (OEM claims only).
* Eaton RTW Direct Pay Claim
  + Follow RTW Direct Pay Claim filing procedures as trained by your Eaton representative.
* Roadranger Warranty Direct Pay Claims
  + Use this program to file claims for Roadranger extended warranties where pre-approval has not been received from the Roadranger Call Center / RTW, or where a claim is not currently open.
  + **NOTE**: For a claim submitted for a vehicle outside the OEM published warranty, a copy of the OEM warranty coverage for the vehicle must be included with the claim.
    - Warranty claim requirements, limits, and exclusions
* Check Status
  + Once claim is entered in the Roadranger warranty system, dealer can [check the status](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/warranty-claim-status.html) by entering OEM Dealer Code and Repair Number

**3. Return Warranty Parts**

* OEM Claim
  + Follow OEM part return direction
  + Eaton supported, OEM certified dealers may be exempt from part return (OEM claims only).
* Eaton Direct Pay Claim
  + Follow Eaton part return direction
  + Part return requirements available in Eaton Warranty Manual (TCWY0600)
  + Return address and shipping instructions available on Service Bulletin (TMIB0129)
  + Please allow 10 days for claim processing (additional time for claim processing with part returns).
  + See Direct Pay Claim Verification to view your claim online.

**4. Check Claim Status**

* OEM Claim
  + Contact OEM Warranty
* Eaton Direct Pay Claim (not RTW)
  + [Direct Pay Claim Verification](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/warranty-claim-status.html)
* Eaton RTW Direct Pay Claim
  + RTW Direct Pay Claim Verification

**5. Core Credit Administration**

* Core Credit is reimbursed through the OEM for:
  + Transmission
  + Transmission Electronics
* Core credit values are communicated in the Unit Exchange Program Guide (APSL0419)

**6. Warranty Appeals**

* OEM Claim
  + Contact OEM for Warranty Appeals
* Eaton Direct Pay Claim
  + Contact Roadranger Call Center 1-800-826-HELP (4357)

Essential warranty documents

* [Eaton warranty manual TCWY0600](https://www.eaton.com/content/dam/eaton/products/transmissions/vehicle-transmissions/eaton-transmission-warranty-manual-tcwy0600-en-us.pdf)

(PDF 587 KB)

This manual includes product warranty statements for eaton commercial vehicle products, warranty terminology, warranty programs, claim procedures and claim information, important information regarding claim approval, component repair or replacement guidelines, labor hour guidelines (SRTs), limits, exclusions, and requirements.

* [Eaton warranty guide TCWY0900](https://www.eaton.com/content/dam/eaton/products/transmissions/vehicle-transmissions/eaton-transmission-warranty-guide-tcwy0900-en-us.pdf)

(PDF 725 KB)

TCWY0900 EN-US

* [Eaton warranty repair guidelines TCWY1250](https://www.eaton.com/content/dam/eaton/products/transmissions/vehicle-transmissions/eaton-transmission-warranty-repair-guidelines-tcwy1250-en-us.pdf)

(PDF 7 MB)

TCWY1250 EN-US

* [Eaton transmission, hybrid components, and clutch warranty returns shipping instructions TMIB0129](https://www.eaton.com/content/dam/eaton/support/warranty-and-returns/eaton-commercial-vehicle-warranty/eaton-transmission-clutch-warranty-return-technical-service-bulletin-tmib0129-en-us.pdf)

(PDF 802 KB)

TMIB-0129

**Frequently asked questions:**

Expand all

**How do I file a Standard, Basic or OEM warranty claim?**

**How do I file an Eaton Extended Warranty claim?**

**After a failure, what parts need to be returned and why?**

**Should the failed parts be identified?**

**Where do I find Eaton SRT's?**

**Where can I find a listing of what is not covered by Eaton Warranty?**

**Direct pay claims**

Direct pay worksheets

* [Warranty claim worksheet (English)](https://www.eaton.com/us/en-us/forms/vehicle/tcwy0023.html)

**Eaton warranty claim submission guidelines for OEM dealers**

[CAT warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/cat-warranty-claims.html)

[Ford warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/ford-warranty-claims.html)

[Freightliner warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/freightliner-warranty-claims.html)

[GMC warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/gmc-warranty-claims.html)

[Hino warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/hino-warranty-claims.html)

[International warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/international-warranty-claims.html)

[Kenworth warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/kenworth-warranty-claims.html)

[Mack warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/mack-warranty-claims.html)

[Peterbilt warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/peterbilt-warranty-claims.html)

[Sterling warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/sterling-warranty-claims.html)

[Volvo warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/volvo-warranty-claims.html)

[Western Star warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/dealer-warranty/western-star-warranty-claims.html)

Claim submission guidelines for Eaton Authorized Rebuilders

* [Eaton authorized rebuilder warranty claims](https://www.eaton.com/us/en-us/support/warranty-returns/eaton-commercial-vehicle-warranty/fleet-warranty/eaton-authorized-rebuilder-warranty-claims.html)

[Roadranger call center](https://www.eaton.com/us/en-us/support/customer-support/vehicle-phone-tree.html)

1-800-826-4357. Available 24/7 to assist you with technical or warranty claim support.

[Email us](https://www.eaton.com/us/en-us/forms/vehicle/contact-us-vehicle-group.html)

You can also email us.

[Find your rep](https://www.eaton.com/us/en-us/locate/roadranger-contacts.html)

Locate your local Roadranger representati

https://lh3.googleusercontent.com/a/ACg8ocKXAkWuMsvk1UB4tteph7ml8jYF0m9hC26Hrh4GoZCA5eWrXg=s40-p-mo

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[Contact us about a lighting project](https://www.eaton.com/us/en-us/products/lighting-controls/hazardous-area-lighting/hazardous-area-lighting-project-request-form.html)

Crouse-Hinds series LED luminaires

Designed with specific features to provide mounting flexibility and improve the speed and safety of the installation process

**Multiple mounting modules for ideal luminaire placement**

Fixture location placement and the proper mounting height are essential to designing a lighting installation that provides uniform illumination with minimal glare and light trespass. The numerous mounting styles available from Eaton’s Crouse-Hinds Division offer unparalleled flexibility, ensuring that the fixtures are installed in the correct location to properly light your application.

**Backward compatibility for simplified retrofits**

Crouse-Hinds series LED luminaires utilize the same mounting modules as our legacy HID, fluorescent and incandescent products, simplifying installation and significantly reducing costs in retrofit projects. We also offer mounting adapters and kits for quick connection to other manufacturers’ modules.

**Wiring features that reduce installation effort**

We engineer our LED luminaires to be as installation-friendly as possible. The features below help reduce installer effort, stress, and potential injury.

* Hinged support allows luminaire to hang from mounting module during wiring
* Lever lock connectors and terminal blocks for fast, plug and play wiring
* Quick clip accessory supports weight of the fixture during final tightening to the mounting module
* Quick-connect wire-free +ve/-ve connections between LED and mains (EVLL LED only).

**Poles that eliminate the dangers of working from heights**

For lights in elevated locations, OSHA/HSE regulations require fall prevention equipment any time a worker is exposed to a fall of six feet or greater. Since 2000, the #1 most frequently violated OSHA standard each year is General Requirements for Fall Protection. And while personal protection equipment will help protect workers from threat, there is still a risk of injury from a fall. Preventing the worker from being exposed to the threat altogether is the most effective risk-reduction measure.

Safety lowering poles are an effective way to **transition from protecting the worker to eliminating the risk**. By enabling the luminaire to be lowered, the safely pole allows all installation or maintenance work to safely take place on the platform or walkway. This eliminates the timely and costly need for fall protection equipment and portable ladders or scaffolds.

Safety lowering poles are a good option for industrial lighting applications in hard to reach areas, as well as for any luminaires installed on walkways, platforms, stairways and conveyors where OSHA/HSE regulations require fall prevention equipment.

**Make lighting installations safer, faster & easier with Crouse-Hinds series** [**V-Spring telescoping light poles**](https://www.eaton.com/us/en-us/catalog/fixture-hangers-and-poles/v-spring-telescoping-safety-light-pole.html)

Our patent-pending V-Spring light poles increase safety and decrease labor costs associated with lighting installation and routine maintenance.

* Spring assistance allows the luminaire to be lowered safely and easily – **eliminating the need for portable ladders and fall prevention equipment**.
* When compared to 45 degree lowering systems, the V-Spring’s spring assisted vertical movement requires **65% less force to raise or lower and removes mechanical stress on the handrail by over 300%**.
* Easily extend to any height up to 9 feet – one product covers multiple mounting heights
* 360° pole rotation allows for effortless positioning of light
* Spring assist provides true controlled lowering and requires less force to raise or lower luminaire – no strain on worker
* Fixture housing will not fall from mounting module hinge hook during installation or maintenance
* No pinch points – protects hands and fingers
* 2” bottom pole for higher structural wind ratings
* Internal conduit protects wiring from spring assist mechanism
* Drain at bottom of pole assists in preventing moisture from entering conduit system
* Factory assembled wired and sealed for maximum environmental protection

**LED Lighting Design and Specification Guide**

This LED Lighting Design and Specification Guide details key factors to consider when selecting a manufacturer for industrial lighting, and demonstrates how Eaton’s Crouse-Hinds series LED solutions are built to withstand the toughest conditions, deliver maximum lighting performance and safety, and reduce expensive maintenance costs.

[Download now](https://www.eaton.com/content/dam/eaton/products/lighting-and-controls/crouse-hinds/literature/crouse-hinds-led-lighting-design-and-spec-guide.pdf)

**More considerations**

Key factors to consider for lighting reliability in challenging harsh and hazardous area environments.

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