

Publisher

IGVW

Interessengemeinschaft
Veranstaltungswirtschaft

SQQ10

Qualification for
Information and
Communication Technology
Level 1

Version 06/2024

PRELIMINARY NOTE

The aim of the quality standards (SQ = Standard of Quality) is to define the required quality level of services in the event industry.

The quality standards of IGVW take into account the current legal situation at the time of publication and, based on this, describe the specific working methods and necessary competencies in the event industry. They provide an overview of the applicable legal bases, standards, and requirements for occupational health and safety.

The IGVW standard SQQ10 defines the necessary competencies for working as a qualified information and communication technology specialist Level 1 and specifies the scope of related qualification measures.

This quality standard was developed by the responsible committee of IGVW with the participation of the DGUV department for stages and studios, the working group of safety specialists in the event industry (SiFa.VT), and the working group of safety engineers from ARD.ZDF media academy, Bavaria Film, BR, Deutschlandradio, DW, HR, MDR, RTL Germany, NDR, ORF, RB, RBB, RBT, SRG-SSR, SR, Studio Hamburg, SWR, WDR, and ZDF.

IGVW – The publisher of this standard is the Interessengemeinschaft Veranstaltungswirtschaft e.V. (IGVW). Contact details and representatives are published on the website www.igvw.org.

Efforts were made to use gender-neutral terms in the formulation of personal designations. Where this was not successful, the male form of the personal designations includes all genders due to better readability.

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1 | INTRODUCTION

The SQQ10 is a quality standard (SQ) in the field of qualification (SQQ), published by the Interessengemeinschaft Veranstaltungswirtschaft (IGVW) e.V. It is titled "Qualification for Information and Communication Technology LEVEL 1", abbreviated as "ICT LEVEL 1".

Further qualifications will be developed and added in the future.

The SQQ10 defines a professional specialization qualification in the field of information and communication technology in the event industry at level 4 of the DQR (German Qualifications Framework) or the equivalent EQF level 4 (European Qualification Framework). It complements the training to become a specialist in event technology (DQR level 4) and builds on the competencies acquired there, particularly in the area of energy distribution, but it is also open to career changers with professional experience in event technology.

The learning objectives of the SQQ10 are formulated in small steps based on competencies for easy implementation, European harmonization, and quality assurance.

The scope of the SQQ10 is 121 hours. At least 90 hours must be accompanied by instructors. The remaining hours are for self-study phases and possibly practical day projects.

The implementation of the SQQ10 is open to any educational provider who has signed the IGVW's self-commitment declaration for educational providers.

2 | SCOPE

The qualification for Information and Communication Technology LEVEL 1 defines a professional specialization qualification in the field of information and communication technology in media and event technology.

Qualified Information and Communication Technology LEVEL 1 specialists install, maintain, and operate information systems and all devices related to information and communication technologies (ICT) in the media and event technology environment.

Qualified Information and Communication Technology LEVEL 1 specialists provide network infrastructures in places such as theaters, trade fairs, museums, theme parks, radio and television, production facilities of the event industry, congress centers, and event venues.

3 | NORMATIVE AND INFORMATIVE REFERENCES

- **VERORDNUNG (EU) 2016/679**
General Data Protection Regulation (GDPR)
- **BetrSichV**
Ordinance on Industrial Safety and Health, including relevant TRBS and BekBS
- **DGUV Vorschrift 3/4**
Electrical installations and equipment
- **DGUV Information 203-039**
Handling of Fiber Optic Communication Systems (LWLKS)
- **ISO/IEC 7498-1**
Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model — Part 1
- **IEEE 802.3**
IEEE Standard for Ethernet
- **IEEE 802.11**
Information Technology--Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks--Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications
- **IETF RFC 791**
Internet Protocol version 4 (IPv4) Specification

- **IETF RFC 1180**
TCP/IP tutorial
- **IETF RFC 2460**
Internet Protocol, Version 6 (IPv6) Specification
- **IETF RFC 6890**
Special-Purpose IP Address Registries
- **ANSI/TIA-568.2-E**
Balanced Twisted-Pair Telecommunications Cabling and Components Standard
- **ANSI/TIA-568.3-E**
Optical Fiber Cabling and Components Standard
- **DIN 15781**
Event technology - Media server
- **DIN 15782**
Media and sound technology - Structured media cabling systems
- **DIN EN 50173-1**
Information technology - Generic cabling systems - Part 1: General requirements
- **igvw SQP4**
Mobile electrical installations in event technology
- **igvw SQQ1**
Qualified Electrician for Event Technology

4 | TERMS

- **APIPA**
Automatic Private IP Addressing
- **ARP**
Address Resolution Protocol
- **BSSID**
Basic Service Set Identifier
- **CLI**
Command Line Interface
- **CoS**
Class of Service
- **DFS**
Dynamic Frequency Selection
- **DHCP**
Dynamic Host Configuration Protocol
- **DiffServ**
Differentiated Services
- **DNS**
Domain Name System
- **DoS**
Denial of Service
- **EMI**
Electromagnetic Interference
- **EUI64**
Extended Unique Identifier 64
- **GDPR**
General Data Protection Regulation
- **IaaS**
Infrastructure as a Service
- **ICMP**
Internet Control Message Protocol
- **IDS**
Intrusion Detection Systems
- **IGMP**
Internet Group Management Protocol
- **IP**
Internet Protocol
- **IPAM**
IP-Address-Management
- **IPS**
Intrusion Prevention Systems
- **ITAM**
IT-Asset Management
- **LAG**
Link Aggregation Groups
- **LAN**
Local Area Network
- **LWLKS**
Fiber Optic Communication Systems
- **MAN**
Metropolitan Area Network
- **MIB**
Management Information Base
- **MIMO**
Multiple-Input Multiple-Output
- **NA**
Numerische Apertur
- **NAS**
Network-Attached Storage
- **NAT**
Network Address Translation

- **NDP**
Neighbour Discovery Protocol
- **NTP**
Network Time Protocol
- **OSI-Modell**
Open Systems Interconnection-Modell
- **OTDR**
Optical Time Domain Reflectometer
- **PaaS**
Platform as a Service
- **PAT**
Port Address Translation
- **PoE**
Power over Ethernet
- **PTP**
Precision Time Protocol
- **QoS**
Quality of Service
- **RFI**
Radiofrequenz-Interferenz
- **SaaS**
Software as a Service
- **SAN**
Storage Area Network
- **SAT**
Source-Address-Table
- **SLA**
Service Level Agreements
- **SLAAC**
Stateless Address Autoconfiguration
- **SNMP**
Simple Network Management Protocol
- **SSID**
Service Set Identifier
- **STP**
Spanning Tree Protocol
- **TCP**
Transmission Control Protocol
- **TCP/IP**
Internet Protocol Suite
- **TPC**
Transmit Power Control
- **UDP**
User Datagram Protocol
- **VLAN**
Virtual Local Area Network
- **WAN**
Wide Area Network
- **WAP**
Wireless Access Point
- **WLAN**
Wireless Local Area Network

5 | RECOMMENDED ENTRY REQUIREMENTS

To ensure optimal learning success, participants should have knowledge of event technology (e.g., two years of practical professional experience) and possess English language skills (A2 level).

6 | TAXONOMY

The SQQ10 describes the taxonomy of the desired learning outcomes with the verbs listed below:

LEVEL 1 – Remember (Know): The graduate is aware of the existence of the subject matter. They may not necessarily be able to explain it and may not have fully understood it, but they have heard of it and can, if confronted with a corresponding problem, specifically explore and activate this knowledge through inquiries or self-research.

Used verbs: knows

LEVEL 2 – Understand: The graduate can successfully apply this skill in practice according to a given plan.

Used verbs: understands, sets up, puts into operation, provides

LEVEL 3 – Apply: The graduate has comprehended the subject matter to the extent that they can confidently apply this knowledge in practice, transfer it to related problem areas, and explain it to others (e.g., also employees).

Used verbs: applies, uses, operates, monitors, fixes

7 | QUALIFICATION CONTENTS

The qualification contents are modular and consist of theoretical and practical parts. The duration is specified in hours. A teaching day should not exceed 6 hours.

7.1 | Network Technology | 40 hours

7.1.1 OSI Layer Model

- **knows the OSI Layer Model** | 1 hour
 - ▶ Basics of the OSI Layer Model
(Note: The focus of the instruction should be on Layers 1 to 4)
 - ▶ Functions of the OSI layers
 - ▶ Layer transitions
 - ▶ Interoperability and network communication
- **understands the IEEE 802.3 communication protocol** | 2 hours
 - ▶ Understanding of the IEEE 802.3 communication protocol
 - ▶ Structure of the Ethernet frame
 - ▶ Knowledge of switching methods
 - ▶ Understanding access methods
 - ▶ Addressing in Layer 2
- **applies unicast, multicast, broadcast communication principles** | 1 hour
 - ▶ Routing principles
 - ▶ Practical applications in unicast
 - ▶ Practical applications in multicast
 - ▶ Practical applications in broadcast

7.1.2 TCP/IP

- **understands IPv4/v6 addressing & routing** | 1 hour
 - ▶ Understanding of IPv4, IPv6 addressing
 - ▶ Subnetting
 - ▶ Routing principles

- **knows the Address Resolution Protocol (ARP) and the Neighbor Discovery Protocol (NDP) | 1 hour**
 - ▶ Address Resolution Protocol (ARP)
 - ▶ Basic understanding of ARP
 - ▶ Neighbor Discovery Protocol (NDP)
 - ▶ Understanding IPv6 neighbor discovery
 - ▶ Router solicitation and advertisement

- **can apply static and dynamic routing | 1 hour**
 - ▶ Basics of static routing
 - ▶ Basics of dynamic routing
 - ▶ Route configuration
 - ▶ Usage scenarios

7.1.3 Addressing & Routing

- **applies Network Address Translation (NAT) | 1 hour**
 - ▶ Basics of NAT
 - ▶ Types of NAT
 - ▶ NAT configuration
 - ▶ NAT applications

- **applies Port Address Translation (PAT) | 1 hour**
 - ▶ Basics of PAT
 - ▶ Understanding IP addresses and ports
 - ▶ PAT configuration
 - ▶ PAT applications

- **applies addressing in IPv4 networks | 2 hours**
 - ▶ Basics of IPv4 addressing
 - ▶ IPv4 address configuration
 - ▶ Dynamic addressing (DHCP)
 - ▶ Automatic Private IP Addressing (APIPA)
 - ▶ Knowledge of RFC 6890

- **knows the procedures for addressing in IPv6 networks** | 2 hours
 - ▶ Basics of IPv6 addressing
 - ▶ IPv6 address configuration
 - ▶ Dynamic addressing (DHCPv6)
 - ▶ Stateless Address Autoconfiguration (SLAAC)
 - ▶ Extended Unique Identifier 64 (EUI64)
 - ▶ Knowledge of RFC 6890

- **can efficiently transmit data using multicast or Internet Group Management Protocol (IGMP)** | 2 hours
 - ▶ Basics of multicast
 - ▶ Multicast addressing
 - ▶ IGMP
 - ▶ Multicast and IGMP configuration
 - ▶ Application scenarios

- **applies TCP and UDP ports** | 1 hour
 - ▶ Basics and functionality of TCP and UDP ports
 - ▶ Application of port numbers

7.1.4 Network Protocols

- **understands Transmission Control Protocol (TCP) and User Datagram Protocol (UDP)** | 1 hour
 - ▶ Basics and functionality of TCP and UDP
 - ▶ Application of TCP and UDP
 - ▶ Error handling and reliability

- **uses Internet Control Message Protocol (ICMP) for error diagnosis and resolution in IP networks** | 0.5 hours
 - ▶ Basics and functionality of ICMP
 - ▶ ICMP message types
 - ▶ Error diagnosis with ICMP
 - ▶ Applying ICMP tools

- **sets up Domain Name System (DNS) | 1 hour**
 - ▶ Basics and functionality of DNS
 - ▶ Application of DNS
 - ▶ DNS configuration and maintenance

- **applies Dynamic Host Configuration Protocol (DHCP) | 1 hour**
 - ▶ Basics and functionality of DHCP
 - ▶ DHCP configuration
 - ▶ Application of DHCP

- **applies IP Address Management (IPAM) | 1 hour**
 - ▶ Basics and functionality of IP Address Management
 - ▶ Application of IPAM

7.1.5 Network Topologies

- **understands computer network topologies | 0.5 hours**
 - ▶ Basics of network topologies
 - ▶ Knowledge of standard topologies
 - ▶ Understanding advantages and disadvantages

- **understands redundancy concepts | 0.5 hours**
 - ▶ Basics and functionality of redundancy and resilience
 - ▶ Importance of redundancy
 - ▶ Importance of resilience
 - ▶ Redundancy concepts
 - ▶ Monitoring and maintenance

- **understands Spanning Tree Protocol (STP) | 1.5 hours**
 - ▶ Basics and functionality of STP
 - ▶ Differences in STP variants
 - ▶ Advantages of STP
 - ▶ STP configuration

- **understands Link Aggregation Groups (LAG)** | 1.5 hours

- ▶ Basics and functionality of link aggregation
- ▶ LAG types and protocols
- ▶ LAG configuration
- ▶ Redundancy
- ▶ Scalability and performance

7.1.6 LAN/MAN/WAN Technologies

- **knows the concepts of Local Area Network (LAN), Metropolitan Area Network (MAN), and Wide Area Network (WAN)** | 0.5 hours

- ▶ LAN technologies
- ▶ MAN technologies
- ▶ WAN technologies
- ▶ Topology and architecture
- ▶ Protocols and services

7.1.7 Virtual LAN (VLAN)

- **can apply Virtual LAN (VLAN)** | 2 hours

- ▶ VLAN for segmenting physical networks
- ▶ VLAN technologies and standards
- ▶ VLAN concepts
- ▶ VLAN configuration
- ▶ Security aspects

7.1.8 Quality of Service (QoS)

- **knows Quality of Service (QoS) and Class of Service (CoS)** | 0.5 hours

- ▶ QoS/CoS goals
- ▶ QoS/CoS mechanisms and models
- ▶ QoS/CoS applications

- **knows Differentiated Services (DiffServ)** | 0.5 hours

- ▶ Basics of DiffServ
- ▶ Features of DiffServ
- ▶ Application scenarios

7.1.9 Time Protocols

- **can set up network time synchronization** | 1 hour
 - ▶ Basics and differences in time synchronization
 - ▶ Protocol comparison of NTP and PTP
 - ▶ NTP and PTP configuration and implementation
 - ▶ Application scenarios

7.1.10 Firewalling

- **can operate firewalls** | 4 hours
 - ▶ Basics of firewall technology
 - ▶ Types and operation of firewalls
 - ▶ Types of rule sets
 - ▶ Firewall configuration
 - ▶ Application scenarios

7.1.11 Wireless Communication Technologies

- **knows IEEE 802.11 (Wireless Local Area Network)** | 2 hours
 - ▶ Basics of IEEE 802.11
 - ▶ WLAN modes
 - ▶ SSID and BSSID
 - ▶ Roaming
 - ▶ IEEE 802.11 standards
 - ▶ Aspects for secure operation of WLAN networks
 - ▶ Application scenarios

- **knows the basics of physical transmissions** | 1 hour
 - ▶ Basics of electromagnetic radiation (EMS)
 - ▶ Formation and propagation of electromagnetic waves
 - ▶ Reflection and absorption

- **knows the basics of WLAN signal transmission** | 1 hour
 - ▶ Access methods in WLAN
 - ▶ Antenna characteristics
 - ▶ Channel bandwidths
 - ▶ MIMO (Multiple-Input Multiple-Output)
 - ▶ Signal strength and range
- **knows available frequency bands and basics of frequency management** | 1 hour
 - ▶ Frequency bands for wireless networks
 - ▶ Dynamic Frequency Selection (DFS) and Transmit Power Control (TPC)
 - ▶ Channel usage and coexistence
 - ▶ Frequency spectrum and bandwidth
 - ▶ Channel selection and planning
 - ▶ Interferences
 - ▶ Spectrum analysis and monitoring
 - ▶ Frequency management tools
- **knows methods for planning and simulating wireless networks** | 2 hours
 - ▶ Basics of network planning
 - ▶ Coverage planning
 - ▶ Capacity planning
 - ▶ Selection and alignment of antennas
 - ▶ Site survey
 - ▶ Regulatory requirements
 - ▶ Documentation
 - ▶ Simulation tools
- **can operate Wireless Access Points** | 4 hours
 - ▶ Commissioning and basic configuration of Wireless Access Points (WAP) and controllers
 - ▶ Documentation

7.2 Media Networks | 6 hours

7.2.1 Basics

- **can use media networks** | 3 hours
 - ▶ Requirements for media networks
 - ▶ Protocols and standards
 - ▶ Bandwidth management
 - ▶ Diagnosis and troubleshooting

7.2.2 Requirements of Media Networks

- **knows the requirements and peculiarities of data transmissions for audio technology** | 0.5 hours
 - ▶ Peculiarities of audio transmission
 - ▶ Quality requirements
 - ▶ Application scenarios
- **knows the requirements and peculiarities of data transmissions for intercom technology** | 0.5 hours
 - ▶ Peculiarities of intercom systems
 - ▶ Quality requirements
 - ▶ Application scenarios
- **knows the requirements and peculiarities of data transmissions for lighting technology** | 0.5 hours
 - ▶ Peculiarities of lighting technology
 - ▶ Quality requirements
 - ▶ Application scenarios
- **knows the requirements and peculiarities of data transmissions for video technology** | 0.5 hours
 - ▶ Peculiarities of video transmission
 - ▶ Quality requirements
 - ▶ Application scenarios

- **knows the requirements and peculiarities of data transmissions for energy distribution systems** | 0.5 hours
 - ▶ Peculiarities of control and signaling systems for energy distribution
 - ▶ Quality requirements
 - ▶ Application scenarios

- **knows the requirements and peculiarities of data transmissions for rigging and stage control systems** | 0.5 hours
 - ▶ Peculiarities of control and signaling systems in rigging and stage technology
 - ▶ Control of electric chain hoists and integration of load cells
 - ▶ Quality requirements
 - ▶ Application scenarios

7.3 Cloud Technologies | 2 hours

- **knows the basics of cloud concepts** | 2 hours
 - ▶ Basics of cloud service models (Software as a Service (SaaS) / Platform as a Service (PaaS) / Infrastructure as a Service (IaaS))
 - ▶ Basics of cloud deployment models (Public Cloud / Private Cloud / Hybrid Cloud)
 - ▶ Aspects for secure operation

7.4 Providing Networks | 25 hours

7.4.1 Administration

- **can operate network devices** | 1 hour
 - ▶ Device identification
 - ▶ Device setup
 - ▶ Cabling
 - ▶ Device settings
 - ▶ Power supply
 - ▶ Initial configuration
 - ▶ Configuration files
 - ▶ Device reset
 - ▶ Firmware updates
 - ▶ Status check

- **can operate network devices** | 2 hours
 - ▶ Handover
 - ▶ Production operation
 - ▶ Transition to operation
 - ▶ Adjustments during operation
 - ▶ Maintenance window
 - ▶ Automation
 - ▶ Configuration versioning
 - ▶ Documentation of changes
 - ▶ Auto-discovery

- **applies access methods to network devices** | 2 hours
 - ▶ Command Line Interface (CLI)
 - ▶ Web interface
 - ▶ Configuration software
 - ▶ Centrally managed systems
 - ▶ Authentication

- **knows the basics of monitoring and remote monitoring of network devices** | 2 hours
 - ▶ Simple Network Management Protocol (SNMP)
 - ▶ SNMP versions
 - ▶ Management Information Base (MIB)
 - ▶ SNMP software
 - ▶ Syslog
 - ▶ Log analysis
 - ▶ Alerts and notifications
 - ▶ Security aspects and benefits

- **can operate switches** | 6 hours
 - ▶ Hub functions
 - ▶ Bridge functions
 - ▶ Source Address Table (SAT)
 - ▶ Segmentation
 - ▶ Switch functions
 - ▶ Unmanaged switches
 - ▶ Managed switches
 - ▶ Switch configuration
 - ▶ Application scenarios

- **can operate routers and firewalls** | 4 hours
 - ▶ Commissioning and basic configuration of routers
 - ▶ Commissioning and basic configuration of firewalls
 - ▶ Documentation
- **knows media converters and media extenders** | 0.5 hours
 - ▶ Basics of media converters
 - ▶ Basics of media extenders
- **knows different types of modems** | 0.5 hours
 - ▶ Basics of modems
 - ▶ Types of modems
 - ▶ Application scenarios
- **knows network storage (NAS, SAN)** | 1 hour
 - ▶ Basics of Network-Attached Storage (NAS)
 - ▶ Basics of Storage Area Network (SAN)
 - ▶ Application scenarios

7.4.2 Documentation

- **can document an existing network and extract information from existing documentation** | 2 hours
 - ▶ Labeling
 - ▶ Network diagrams
 - ▶ Inventory lists
 - ▶ Configuration documents
 - ▶ Cabling plans
 - ▶ IP Address Management (IPAM)
 - ▶ IT Asset Management (ITAM)
 - ▶ Version control
 - ▶ Access rights
 - ▶ Documentation benefits

7.5 Virtualization | 2 hours

- **knows hypervisors for virtualizing computers** | 2 hours
 - ▶ Basics
 - ▶ Application scenarios

7.6 Physical Transmission Media | 14 hours

7.6.1 Copper Cabling Technology

- **understands the structure and function of copper network cables and connectors** | 0.5 hours
 - ▶ Cable types
 - ▶ Connectors and plug types
 - ▶ Shielding types
 - ▶ Twisting
- **understands the properties of different types of copper network cables and standards** | 0.5 hours
 - ▶ Cable classes and categories
 - ▶ Transmission speeds
 - ▶ Frequency ranges
 - ▶ Cable lengths
 - ▶ Cable types
 - ▶ Areas of application
- **identifies interference factors in copper network cables and can resolve them** | 1 hour
 - ▶ Electromagnetic interference (EMI)
 - ▶ Radio frequency interference (RFI)
 - ▶ Crosstalk
 - ▶ Signal distortion
 - ▶ Cable breakage and damage
 - ▶ Length restrictions
 - ▶ Environmental influences

- **assembles connectors on copper network cables | 2 hours**
 - ▶ Necessary tools
 - ▶ Required materials
 - ▶ Cable preparation
 - ▶ Wire arrangement and twisting
 - ▶ Connector attachment
 - ▶ Shielding and grounding
- **can measure copper network cables and document the results | 1 hour**
 - ▶ Knowing the measuring devices
 - ▶ Validation and certification
 - ▶ Conductivity test
 - ▶ Length measurement
 - ▶ Attenuation measurement
 - ▶ Crosstalk measurement
 - ▶ Signal quality check
 - ▶ Operating frequency check
 - ▶ Error detection and resolution
 - ▶ Standards
 - ▶ Reporting

7.6.2 Power over Ethernet (PoE)

- **understands the functionality of power transmission over network cables (Power over Ethernet (PoE)) and provides this | 2 hours**
 - ▶ Basics of PoE
 - ▶ PoE standards (IEEE 802.3 / Passive PoE)
 - ▶ PoE sources and sinks
 - ▶ Power budget
 - ▶ Monitoring and error diagnosis

7.6.3 Structured Cabling

- **knows the terms and concepts of structured cabling and can apply them as needed | 1 hour**
 - ▶ Basics of structured cabling
 - ▶ Components of structured cabling
 - ▶ Application-neutral cabling systems
 - ▶ Standards and norms
 - ▶ Scalability and future-proofing

7.6.4 Fiber Optic Technology

- **understands the application scenarios of fiber optics** | 0.5 hours
 - ▶ Basics of fiber optic technology
 - ▶ Application scenarios

- **understands the function and structure of fiber optics, their different cable types and standards, and their respective properties** | 1 hour
 - ▶ Single-mode and multi-mode fibers
 - ▶ Cable standards and norms
 - ▶ Core and cladding materials
 - ▶ Core diameter
 - ▶ Numerical aperture (NA)
 - ▶ Attenuation and dispersion
 - ▶ Bandwidth and modes
 - ▶ Light sources and receivers

- **can choose the appropriate connection method for fiber optics** | 0.5 hours
 - ▶ Connection methods
 - ▶ Connectors and adapters
 - ▶ Polishing types
 - ▶ Standards and norms

- **can resolve interference factors in fiber optics** | 1 hour
 - ▶ Optical windows
 - ▶ Dispersion
 - ▶ Contamination
 - ▶ Bending losses
 - ▶ Attenuation

- **can assemble fiber optics and derive occupational safety measures for handling Fiber Optic Communication Systems** | 2 hours
 - ▶ Preparation
 - ▶ Splicing methods
 - ▶ Splicing devices
 - ▶ Connector assembly
 - ▶ DGUV Information 203-039

- **can measure fiber optics and document the results** | 1 hour

- ▶ Knowing the measuring devices
- ▶ Conductivity measurement
- ▶ Optical power measurement
- ▶ Optical reflection measurement
- ▶ Optical Time Domain Reflectometer (OTDR)
- ▶ End-face microscopes
- ▶ Measurement cables and adapters
- ▶ Measurement protocols
- ▶ Standards and norms

7.7 Network Security | 8 hours

7.7.1 Concepts

- **knows concepts, techniques, and workflows for network security** | 2 hours

- ▶ Security goals
- ▶ Security models
- ▶ Security policy
- ▶ Encryption
- ▶ Intrusion Detection/Prevention Systems (IDS/IPS)
- ▶ Authentication and access control
- ▶ Identity management
- ▶ Patch management
- ▶ Security monitoring and logging
- ▶ Incident response
- ▶ Security audits and penetration testing
- ▶ Business continuity and disaster recovery

7.7.2 Dangers and Risks

- **knows the dangers and risks in operating a network** | 2 hours

- ▶ Denial of Service (DoS)
- ▶ Social engineering
- ▶ Phishing
- ▶ DNS/ARP poisoning
- ▶ Spoofing
- ▶ VLAN hopping
- ▶ Man-in-the-middle attacks

- ▶ Exploits/vulnerabilities
- ▶ Physical access

7.7.3 Segmentation

- **knows network segmentation as a security strategy for networks** | 1 hour
 - ▶ Goals of network segmentation
 - ▶ Segmentation techniques
 - ▶ Segmentation at the access control level
 - ▶ Implementation of VLAN
 - ▶ Segmentation at the subnet level

7.7.4 Standards

- **knows legal foundations and standards** | 2 hours
 - ▶ Data security
 - ▶ Data protection
 - ▶ GDPR
 - ▶ Copyright and intellectual property
 - ▶ Compliance requirements
 - ▶ Certifications
 - ▶ Service Level Agreements (SLA)
 - ▶ Liability and compensation
- **can apply risk assessments for their own work area** | 1 hour
 - ▶ Basic understanding
 - ▶ Legal regulations
 - ▶ Identifying hazards
 - ▶ Risk assessment
 - ▶ Protective measures
 - ▶ Documentation
 - ▶ Implementation / effectiveness control
 - ▶ Review and adaptation
 - ▶ Communication
 - ▶ Continuous improvement

7.8 Ethical Foundations | 2 hours

- **understands the responsibility when accessing data and the necessary careful handling of it | 2 hours**
 - ▶ Awareness of responsibility
 - ▶ Data protection and confidentiality
 - ▶ Compliance with guidelines and regulations
 - ▶ Security awareness
 - ▶ Abuse prevention
 - ▶ Code of conduct
 - ▶ Training and sensitization

7.9 Error Analysis and Correction | 19 hours

- **applies processes for analyzing and resolving network problems | 10 hours**
 - ▶ Identifying network problems
 - ▶ Diagnosing network problems
 - ▶ Root cause analysis
 - ▶ Solution development
 - ▶ Implementation of solutions
 - ▶ Monitoring and testing
 - ▶ Documentation
 - ▶ Communication
 - ▶ Quality control
 - ▶ Continuous improvement
- **can use troubleshooting tools appropriately | 9 hours**
 - ▶ Familiarity with tools (e.g., cable tester, OTDR, LED tester, signal generator, port mirroring, network taps, packet capture, CLI, Wi-Fi analyzer, IP scanner, bandwidth speed tester)
 - ▶ Identification of use cases
 - ▶ Correct operation and configuration
 - ▶ Data analysis and diagnosis
 - ▶ Network performance optimization

8 | EXAMS

Exams for all levels are to be taken both theoretically and practically.

Exemption from exams or individual exam parts (e.g., due to professional qualifications) is generally not possible.

To pass the theoretical exam, at least 70% of the possible points must be achieved in all parts of the exam.

The practical exam is passed when the necessary skills in the key areas of the exam are demonstrated. These are evaluated by the examiner as "Passed" or "Not Passed."

The exam at each level can be repeated twice if not passed. Passed parts of the exam can be credited and do not need to be retaken.

In accordance with this quality standard, lecturers should preferably not be used as examiners in the subject they themselves have taught.

The documentation of the exam and the results must be kept by the educational provider for at least five years.

8.1 | External Exam

The exam for individuals who have not participated in a qualification course (external exam) is exclusively carried out by educational providers certified according to AZAV (Accreditation and Licensing Ordinance for Employment Promotion) (*see also chapter 8.2 para. 2*).

8.2 | Admission to the Exam

Anyone who has attended a qualification course for Information and Communication Technology LEVEL 1 and has completed the entire qualification measure within 12 months can be admitted to the final exam.

In special cases, individuals who can provide evidence and credibly demonstrate through certificates or their professional activities that they have acquired knowledge, skills, and experience equivalent to the contents of the qualification course for Information and Communication Technology LEVEL 1 can also be admitted to the final exam.

Additionally, the entry requirements for the qualification course for Information and Communication Technology LEVEL 1 mentioned in chapter 5.1.1 must be met.

8.3 | Theoretical Exam

The theoretical exam is taken in writing and consists of the following separate parts:

- **Network Technology (30 minutes)**
- **Transmission Media (15 minutes)**
- **Network Security (15 minutes)**
- **Network Administration (15 minutes)**
- **Legal Foundations (15 minutes)**

Alternatively, the respective parts of the exam can be tested individually in the respective modules.

8.4 | Practical Exam

The practical exam in the form of a technical discussion lasts **45 minutes** per person. An additional **15 minutes** of preparation time should be scheduled. The exam consists of the following contents:

- **Implementation of a given plan (30 minutes)**
- **Methodical error analysis and resolution (15 minutes)**

9 | CERTIFICATE OF QUALIFICATION

The educational provider issues a certificate of qualification according to Annex II to participants who have passed the exams.

10 | EDUCATIONAL PROVIDERS, TRAINERS AND EXAMINERS

The implementation of the qualification measure requires careful fulfillment of all requirements set by this standard by the educational provider, trainers, and examiners.

Educational providers who conduct a qualification measure according to this standard commit to complying with all requirements set by this standard. They sign the self-commitment declaration for educational providers for the implementation of qualification measures according to the quality standards of IGVW and send the signed self-commitment declaration to the IGVW office before conducting the qualification measures. This also applies to in-house qualifications.

10.1 | Tasks of the Educational Providers

The educational provider is responsible for the qualification, examination, and issuance of certificates of qualification. This includes the careful review of entry requirements for participation in the qualification.

Additionally, it includes:

- **Selection of qualified trainers**
- **Adherence to the time frame of the qualification**
- **Implementation of the content**
- **Material provision for practical training**
- **Careful conduct and documentation of the exam**

10.2 | Requirements for Trainers

Anyone who meets the following requirements can act as a trainer for the qualification in Information and Communication Technology LEVEL 1:

- **Current professional activity, professional training, experience, and comprehensive knowledge of the respective qualification contents of chapter 7**
- **Sufficient knowledge of current and generally accepted rules of technology**
- **Ability to support learning processes and manage group processes**

10.3 | Requirements for Examiners

Anyone who meets the following requirements can act as an examiner for the qualification in Information and Communication Technology LEVEL 1:

- **Current professional activity, professional training, experience, and comprehensive knowledge of the respective qualification contents of chapter 7**
- **Sufficient knowledge of current and generally accepted rules of technology**

11 | ENTRY INTO FORCE

This standard comes into force on June 28, 2024.

ANNEX

Annex I – Distribution of Qualification Contents

Topic (6 hours = one teaching day)	Hours
Network Technology	40
Media Networks	6
Cloud Technologies	2
Providing Networks	25
Virtualization	2
Physical Transmission Media	14
Network Security	8
Ethical Foundations	2
Error Analysis and Correction	19
Exams (incl. preparation)	3
Total	121

equivalent to approximately **161 teaching units** (TU) of 45 minutes each.

Legend

Some explanatory notes on the structure of the standards:

- SQ** Standard of Quality
- O** Organisation
- P** Code of practice/working procedure
- Q** Qualification

1, 2, 3, ... Consecutive numbering

O Organisation/Documentation

Internal set-up and organisation of operations/documentation and certification of processes

P Code of practice/working procedure

Supply and use of working materials

Q Qualification

Qualification of skilled workers and specialists

Annex II – Sample Certificate of Qualification

[EDUCATIONAL PROVIDER'S NAME OR LOGO]

CERTIFICATE OF QUALIFICATION

«*[First Name Last Name]*»
born on [Date of Birth]

has attended the course for acquiring the qualification according to the IGWW standard

SQQ10 Qualification for Information and Communication Technology Level 1

between *[Start Date of the Course]* and *[End Date of the Course]*

and has fulfilled all required performance records.

Date of final exam: *[Date]*

Contents of the qualification according to IGWW SQQ10 - Qualification for Information and Communication Technology Level 1 as of 06/2024

Name of the examiner for the practical exam: [First Name Last Name of the Examiner]

Date, Location

[Signature of the Educational Provider]

IGVW

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Veranstaltungswirtschaft

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SQQ10-EN-06/2024-001