



# WHY CERTIFY

## COPPER & FIBER STRUCTURED CABLING

Digital Pocket Guide



**FLUKE**  
networks

Not just installed. Certified.



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# Introduction

A man with a beard and safety glasses, wearing a blue shirt, is working on a complex network of cables in a server room. The background is filled with blue and yellow lights, creating a bokeh effect. A yellow circle is visible in the top left corner of the page.

*"As cabling standards have evolved over the years, installers and contractors have adapted to meet these changes, ensuring standards compliance for manufacturer warranties and delivering high-quality work."*

In today's data-centric world, the rapid deployment of data centers and the explosive growth of Internet of Things (IoT) devices is driving a significant IT/OT convergence. This convergence represents the merging of information technology (IT) and operational technology (OT), integrating the tools businesses use to collect data with those used to control processes. As a result, nearly everything is becoming IP-based.

The infrastructure being deployed, including copper and fiber cabling, forms the foundation of the network. Deploying this infrastructure is a substantial investment, especially considering that network equipment such as switches, routers, and servers will be replaced multiple times over the lifespan of the cabling, which can last decades.

As technology continues to evolve, new advancements are constantly being developed to increase data transfer capabilities over existing infrastructure. This digital pocket guide highlights the benefits of cable certification for the network installer and contractor confirming the quality of work and ensuring warranty status. For the network owner, certification ensures the cabling infrastructure can support network demands today and in the future.

# New technology. All-in-one solutions.

**Save up to £ 5,400 on network test solutions for copper and fiber certification, troubleshooting and more.**

Fluke Networks is boosting the value of your investment with unbeatable deals in our largest end of year sale. Get major discounts on best-selling products including the DSX Cable Analyzer™ cable testers, CertiFiber® Pro, OptiFiber® Pro, LinkIQ™ Network+Cable Tester and more.

Our new all-in-one solutions are designed to meet your needs, from the Starter Kit for electrical installers to the Expert and Troubleshooting Kits offering advanced testing and certification of copper, fiber and active networks including PoE.

**Plus**, a 1-year Premium Care – Gold plan is included on selected products – or can be purchased separately.

This promotion is valid from September 1st to December 13th, 2024.



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# How does it work?

No returns, registrations or hassles. Simply contact Fluke Networks and take advantage of these great discounts.



1. Select your kit



2. Contact Fluke Networks



3. Enjoy instant savings

	Expected savings* in EUR	What is it?
Starter Kit	Save <b>£ 1,600</b>	Essential test and certification solution for twisted pair structured copper cabling up to Cat 6A
Pro Kits	Save up to <b>£ 3,000</b>	High accuracy network test solution offering comprehensive standards compliance and certification for up to 40 Gigabit Ethernet deployments
Evolution Kits	Save up to <b>£ 4,500</b>	Add-on modules for the DSX2-5000 and DSX2-8000 to include fiber Optical Loss Test Set (OLTS) certification, and/or Optical Time Domain Reflectometer (OTDR) for troubleshooting and certification, and fiber inspection modules
Troubleshooting Kit	Save <b>£ 1,800</b>	Comprehensive copper and fiber troubleshooting solution for professionals wanting to ensure optimal network performance and reliability
Expert Kits	Save up to <b>£ 5,800</b>	All-in-one solution for testing and certifying: <ul style="list-style-type: none"><li>• Copper: High accuracy network test solution offering comprehensive standards compliance and certification for up to 40 Gigabit Ethernet deployments</li><li>• Fiber: Fiber Optical Loss Test Set (OLTS) certification, and/or Optical Time Domain Reflectometer (OTDR) for troubleshooting and certification and fiber inspection modules</li><li>• Active network connections, including Power-over-Ethernet (PoE)</li></ul>

\*Note: Our authorized distributors are free to provide additional price discounts and, thus, higher end-customer savings.

Contact your Fluke Networks representative for further details or additional pricing information.  
Call: +44-(0)20-79420721, +31-(0)20-7132984, or email: [info@flukenetworks.com](mailto:info@flukenetworks.com)

Terms and Conditions apply. Promotion sponsor: Fluke Europe B.V.

Find out more by visiting: <https://rb.gy/v82epk>

# Why Standards Compliance Matters

## Why do we discuss it?

Compliance with the Standards is required before Manufacturer Warranty Statements are issued.



*"Certification will always be required for warranty, regardless of the number of drops on a project."*

Franck Staka, Panduit Product Line Manager

## Why is it important?

Provides all the evidence an installer or contractor needs to demonstrate that a proper job was executed.

## **System warranties can be up to 25 years**

Leading manufacturers of cabling and connecting hardware typically offer 15, 20 or 25-year standards-based system warranties.

### **Warranted installations meet the following requirements:**

1. Each link and/or channel in the structured cabling system meets or exceeds the performance requirements of the designated link and/or channel classification defined in the Cabling Standard(s) listed on the warranty certificate.
2. Each link and/or channel in the structured cabling system will support all current and future network applications designed to run on the designated link and/or channel as defined in the Cabling Standard(s) listed on the warranty certificate.
3. All cabling, connecting hardware and cable used in the structured cabling system is free of defects and there is proof of good workmanship.

### **"Insurance"**

- Even when a manufacturer does not require a certification report for a system warranty, Installers and Contractors always certify the network to avoid any disputes regarding the quality of their workmanship.
- In the event of litigation, reports generated using a DSX CableAnalyzer™ or CertiFiber™ Pro Fiber Optical Loss Test Set are accepted by all authorities and provide installers and contractors with the evidence required to verify that the job was performed correctly."



# Cabling: Performance Benchmarks and Expectations

## What Standards are relevant?

TIA-568 (USA) and ISO 11801 (Europe) define the performance expectations for cabling.

Field tester performance requirements per cable type	
ISO/IEC Class of link	IEC 61935-1 tester level
D	IIe
E	III
E <sub>A</sub>	IIIe
F	IV
F <sub>A</sub>	V
I/II	VI

## What do the Standards define?

In copper cabling, performance specifications rely on electrical parameters such as signal strength (Insertion Loss) and interference (NEXT), and return loss (RL). In fiber optics, the focus is on loss budgets and length with no defined tester accuracy requirements.

## The differences between TIA and ISO/IEC

- TIA and ISO/IEC standards are almost always in alignment, but the various standards typically use different terminology and are almost never updated simultaneously on the same schedule.
- They do strive to develop performance parameters and recommendations that harmonize with each other as much as possible due to the need for manufacturers/suppliers to be able to produce standards-compliant connectivity solutions.
- The TIA TR-42 Engineering Committee and the joint ISO/IEC WG3 Working Group that both develop and maintain cabling standards for user-owned buildings (commercial buildings, residential buildings, data centers, industrial buildings, etc.), share many of the same active participants.
- CENELEC standards and those from other regional cabling groups actively contribute to TIA and ISO/IEC and their standards are usually identical to or based on TIA and ISO/IEC publications.

### IEC 61935-1:2019

IEC 61935-1:2019 specifies reference measurement procedures for cabling parameters and the field tester performance requirements to measure cabling parameters identified in ISO/IEC 11801.

For certifying different classes of cabling links, testers must meet multiple IEC 61935-1 levels. For example, the DSX-5000 performance specifications are:

- Exceed Level IIIe requirements of TIA 1152.
- Level IV of IEC 61935-1.
- Exceed Level V requirements as in the draft fourth edition of IEC 61935-1.

# PASS\* Test Result

## Is there more than a "PASS" or "FAIL"?

Yes, Marginal Passes or a PASS\* occur as well.



## Are these important?

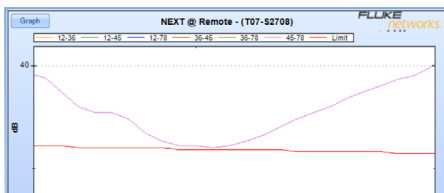
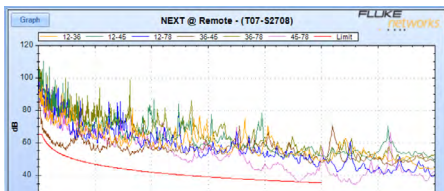
A marginal pass occurs when the margin between the limit and the test is less than the accuracy of the tester. Per TIA, the link meets specification. But, these measurements will typically get rejected. Ultimately, it will depend on the contract whether or not these results are accepted.

The standards-based PASS\* rating indicates that an installed link meets the minimum acceptable standards, but is close to the failure threshold. Essentially, it means the cable narrowly meets the test criteria established by industry standards or specific requirements.

However, marginal passes raise performance concerns. While technically compliant, these cables may not perform at an optimal level, which can lead to future issues, especially when subjected to additional stress or environmental factors over time.

Cables with marginal passes may deteriorate more rapidly under regular usage compared to those with more comfortable safety margins. This concern is particularly pronounced in high-performance or mission-critical networks.

In practice, a marginal PASS\* often prompts installers or contractors to take additional measures, such as re-terminating the cable, enhancing connections, or even replacing the cable entirely, to ensure long-term reliability and optimal performance.



Zooming in highlights the small margin.

# Best Practices for MPTL Link Testing



## Why is MPTL special?

Due to the wide deployment of IoT and Power-over-Ethernet (PoE) devices now get connected directly to the network, bypassing the need for a wall power outlet.

## How should you do it?

The Standards require that to get a LinkWare™ report with “MPTL” on it, you must run the test with a DSX CableAnalyzer™ Series tester using a Permanent Link Adapter (PLA) on one end and a Patch Cord Adapter (PCA) on the other.

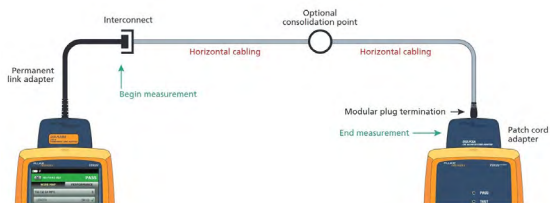
## The Applicable Standards

MPTL is included in the ANSI-TIA 568.2-D and defined in the ISO/IEC Technical Report 11801-9910. The application of terminating horizontal cable to RJ-45 plugs and connecting directly into a device was first documented in the BICSI 005-2016 Electronic Safety and Security standard as a modified one-connector permanent link.

## Testing an MPTL with a Channel Adapter is Unreliable

Testing a link terminated to an RJ-45 with a channel adapter at the far end excludes the mated connection at the far end from the test making this testing method unreliable and not representative of the entire link. It leads to optimistic results with a lot of headroom that can potentially overlook any poor termination practices of the far-end plug connection. The risk is that a link will not function properly once a device is connected.

Recognition of the MPTL in industry standards created the need for a new, more accurate test method. To include the final plug connection when testing, TIA 568.2-D standards recommend using a PCA at the far end rather than a channel adapter, as shown below. ISO/IEC TR 11801-9910 also describes this test method in Clause 8.



TIA 568.2-D and ISO/IEC TR 11801-9910 standards both recommend using a PCA at the far end (right) rather than a channel adapter.

# Testing for PoE Readiness

## Why should you do it?

It is important to ensure that the cable meets the performance requirements for the intended PoE standard.

Test regime for reference performance and installation performance of E2E link, direct attach cabling and MPTL		
Transmission parameter	Reference conformance testing	Installation conformance testing
Return loss	Normative	Normative
Insertion loss	Normative	Normative
Pair-to-pair NEXT	Normative	Normative
PS NEXT	Calculated	Calculated
Pair-to-pair ACR-N	Calculated	Calculated
PS ACR-N	Calculated	Calculated
Pair-to-pair ACR-F	Normative	Normative
PS ACR-F	Calculated	Calculated
Direct current (DC) loop resistance	Normative	Normative
Direct current (DC) resistance unbalance within a pair	Normative	Optional
Direct current (DC) resistance unbalance between pairs	Normative	Optional
Propagation delay	Normative	Normative
Delay skew	Normative	Normative
Unbalance attenuation, near-end (TCL)	Normative	Optional
Unbalance attenuation, far-end (ELTCTL)	Normative	Optional
Coupling attenuation	Normative	Optional
PS ANEXT	Normative	Normative (sampled)
PS ANEXTavg	Calculated	Calculated
PS AACR-F	Normative	Normative (sampled)
PS AACR-Favg	Calculated	Calculated
Wire-map	Normative	Normative

## What are the risks?

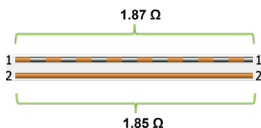
PoE operation may be at risk during maximum load and any poor contacts may further degrade over time.

On the previous page you see an overview of all the parameters that are being described in ISO/IEC 14763-4. Note the difference between the "reference conformance testing" column and the light green "installation conformance testing" column.

In this last column, the Resistance Unbalance measurements appear as optional. They are actually very important for the proper functioning of PoE and are increasingly being required by Consultants and Project Managers.

## Resistance Unbalance Explained

Resistance Unbalance is the difference in resistance between wires in each pair. In the underneath example, the resistance is  $3.7 \Omega$  Resistance Unbalance =  $0.02 \Omega$ .



Result not saved		PASS	
RESISTANCE	VALUE $\Omega$	RESISTANCE UNBALANCE VALUE $\Omega$	LIMIT $\Omega$
1,2	3.7	0.02	0.15
3,6	3.7	0.02	0.15
4,5	3.7	0.01	0.15
7,8	3.6	0.01	0.15
LIMIT	21.0		

Screenshot of a Resistance Unbalance measurement.



## When should you do it?

Always. After you have completed a measurement you will want to save the results.

**LINKWARE**  
CABLE TEST MANAGEMENT SOFTWARE

**Cable ID:** 2/FP/A01/ U36-3/CL/K01-04  
**Date / Time:** 05/29/2013 08:02:13 PM  
**Headroom:** 3.8 dB (NEXT 12-45)  
**Test Limit:** TIA Cat 6A Perm. Link - PoE  
**Cable Type:** Cat 6A U/UTP  
**Calibration Date:** 04/30/2013

**Operator:** Annie Howe  
**Software Version:** V2.0  
**Limita Version:** V2.0  
**NVP:** 68.2%

**Test Summary:** PASS  
**Model:** DSX-5000  
**Main S/N:** 1234511  
**Remote S/N:** 1234516  
**Main Adaptor:** DSX-PLA004  
**Remote Adaptor:** DSX-PLA004

Length (m), Limit 50.0	(Pair 36)	15.0
Prop. Delay (ns), Limit 498	(Pair 45)	60
Delay Skew (ns), Limit 44	(Pair 45)	7
Resistance (ohms), Limit 21.0	(Pair 45)	2.6
Resist. Unbal. (ohms)	(Pair 45)	0.04

Insertion Loss Margin (dB) (Pair 45) 36.1  
Frequency (MHz) (Pair 45) 500.0  
Limit (dB) (Pair 45) 43.8

Worst Case Margin		Worst Case Value		
PASS	MAIN	SR	MAIN	SR
Worst Pair	12-45	12-45	12-36	36-45
NEXT (dB)	3.8	4.6	5.5	8.8

Wire Map (T568B)  
PASS

Insertion Loss (dB)

NEXT @ Remote (dB)

Project: Evergreen Way

LINKWARE Version 8.0

*"Requiring tests from a Fluke certification tester in the native .FLW format has allowed us, on multiple occasions, to identify the root cause of marginal or failing links. Having the ability to review these tests remotely and provide quick feedback saves us time and travel, keeps our customers on schedule, and saves our installation partners time and money."*

Simon's Dave Valentukonis

## Why should you do it?

Good record-keeping is a smart practice. It enforces installation accountability and integrity, helps to resolve disputes and facilitates more efficient troubleshooting.



# Benefits of Certification for Installers and Contractors

## Why should you be?

Demonstrates a professional approach to installation and testing, building trust with clients and stakeholders.



The Fluke Certified Cabling Test Technician (CCTT) program is developed around the Versiv™ Cabling Certification System, LinkWare™ PC Cable Test Management Software and the LinkWare™ Live Cloud-Based Certification Project Management solution.

## Why should you do it?

By completing a training program, like the Fluke CCTT, which covers both theory and practical hands-on experience, you demonstrate competency in field of certifying copper twisted pair and fiber optic cabling infrastructure.

## What does the CCTT include?

The Fluke Certified Cabling Test Technician course consists of a copper and a fiber course, each including classroom training, hands-on labs, and exam/certification exercises. Products covered include:

- DSX CableAnalyzer™ Series (5000 and 8000)
- CertiFiber™ Pro Optical Loss Test Set
- OptiFiber™ Pro Optical Time Domain Reflectometer
- FI-7000 and 7300 FiberInspector™ Pro/Ultra Cameras
- Fiber Optic Cleaning Kits
- LinkWare™ Live / LinkWare™ PC

## Benefits of Personal Certification

- Stay current and competitive: It is important to stay on top of the critical technological developments in network cabling infrastructure.
- Career advancement: Certification can lead to better job opportunities, higher pay, and career growth.
- Employer confidence: Employers are more likely to hire certified technicians, knowing they meet industry standards.
- Professional recognition: Certification adds credibility and recognition in the field.



For more information please visit:

<https://www.flukenetworks.com/cocontent/certified-cabling-test-technician-training-program>

# Conclusion

It is critical to ensure the cabling infrastructure can handle the expected network load and speed. Properly certified installations are less likely to encounter issues, leading to reduced downtime and repairs.

Moreover, adhering to industry standards is often obligatory for projects and holds great importance for legal and safety compliance, thus mitigating liability concerns for both installers and building owners.

Certification reports document the quality and reliability of a network cabling system. They provide a detailed account of the testing process, results, and compliance with industry standards, serving as a crucial reference for installers, inspectors, contractors and network administrators.

The detailed test results provided in these reports help to quickly identify and resolve potential issues, simplifying future troubleshooting and maintenance tasks. Furthermore, comprehensive records ensure that any future upgrades or alterations to the network can be planned and executed with a thorough understanding of the existing infrastructure.





For more information:

[www.flukenetworks.com](http://www.flukenetworks.com)

Want to talk to an expert then locate you local contact number on:

[www.flukenetworks.com/contact](http://www.flukenetworks.com/contact)



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