White Paper

GHMT PREMIUM Verification Program (GHMT PVP) –
Transparent and independent proof of a constantly high quality standards

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Introduction



Nowadays every company uses information technology. This ranges from the individual workplace to several thousand network ports and connected peripherals. Structured cabling provides access to special applications and allows business data to be transmitted back and forth. Often the investment made in the cabling costs is recouped many times over. Security related processes are now more and more often processed via the network - and if function is compromised this can have far-reaching consequences on both a human and an environmental level.

High availability of applications and network services requires not only a well thought out and logical network design, but also a sound foundation: a reliable passive network infrastructure. It is not enough, however, to simply carry out acceptance inspections: important EMC parameters such as Screening Attenuation or Coupling Attenuation cannot even be determined with standard field measuring equipment. And discrepancies in the geometry or material composition cannot be detected with standard acceptance inspections. This makes it all the more important to keep a close eye on the quality of the cabling components to be employed - ideally before installation.

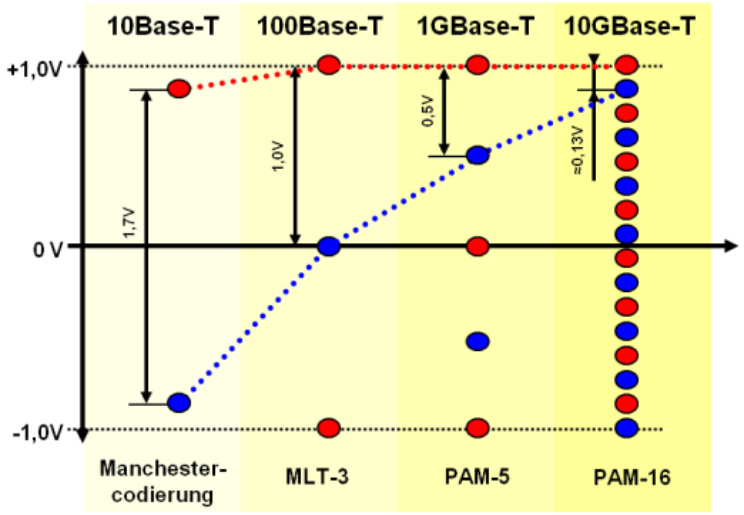
As a DIN EN ISO/IEC 17025 certified test laboratory with almost twenty years of market experience, *GHMT* provides a highly effective quality assurance program for users and product suppliers alike - ***GHMT PVP***.

> ***"GHMT PREMIUM VERIFICATION PROGRAM:*** HIGHLY EFFECTIVE QUALITY ASSURANCE PROGRAM FOR USERS AND PRODUCT SUPPLIERS ALIKE"

Market situation, development

Every user quite rightly expects and assumes that the stated properties of cabling components - such as "Category 6_A" - are actually met by each and every individual item. In reality this is, however, quite often simply not the case.

The specifications set by international standards for cabling components have been raised considerably for several years now. Back in 1993 very few suppliers could imagine that the Western Plug, originally designed as a telephone plug, would be able to achieve transmission rates of more than 10 Megabit Ethernet. With this networking technology long gone are the days of 10 Mbps with a focal frequency of "only" 10 MHz and a threshold between two logical states "0" and "1" of 1.7 volts. Nowadays it is a case of transmission rates of 10 GBit/s (factor 1,000!) with a focal frequency of 417 MHz and a threshold of only 125 mV.

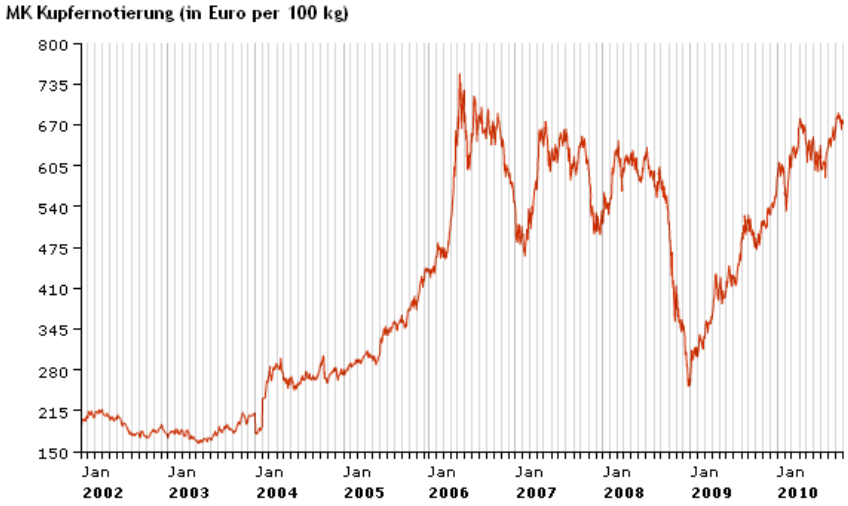


Threshold for the various coding procedures

The transmission medium used is no longer a telephone cable (e.g. J-2Y(St)Y St III Bd), but symmetrical horizontal cabling developed for high frequencies (e.g. S/FTP cable).

Optical fibre technology has also seen a similarly rapid development. While in the past we used to have bandwidth length products of 200 MHz x km (OM1, Overfilled Launch), we now have 4700 MHz x km ("Laser" Launch). There is a very clear trend in technological developments: faster, higher, further ....!

The trend in potential market prices, on the other hand, has for many years seen a downturn, particularly in Europe. While in 1993 a state-of-the-art category 5 cable in Germany cost 1.20 DM/m, roughly 0.61 €/m, nowadays prices have spiralled down to stand at only 0.30 €/m for category 7 horizontal cabling. And this, although costs for energy and in particular costs for the production of the necessary raw materials (such as copper) have seen a notable increase. This development has its repercussions!



Development of coper pricing 2002 - 2010

Some users were already aware of quality deficits in cabling components even before the price hike in raw materials in 2005, and before the more stringent requirements for cabling components came into force. In response, these users turned to GHMT for product-specific, neutral product testing and quality controls for a defined percentage of the cabling components to be installed (e.g. horizontal cabling, connection components) so that faulty products, or products that did not meet the specifications, were excluded from the installation.

The resulting inspection costs for this were spread across the costs per product unit, or assigned to the total for certain projects. Lead times for the complex laboratory tests also had to be taken into account. Quarantine stores were set up in response to this. All these steps that had to be individually carried out meant extra work.

Users who in the past set high standards for the performance of the cabling components still reap the benefits of these forward-thinking measures. The cabling components installed at the time nowadays still meet the even higher current requirements. A typical example of this is the high quality horizontal cables that were installed at the turn of the millennium and that still meet the current normative requirements. Infrastructures of this kind can be updated relatively quickly, simply and cost effectively by exchanging the connection technology to meet the highest requirements (e.g. performance class E_A). So there is no need to undertake costly and time-consuming horizontal cabling replacement.

"HIGH QUALITY IN CABLING COMPONENTS ENSURES THAT INVESTMENT IS PROTECTED AND PAYS OFF IN THE LONG TERM."

Manufacturer guarantees, security with limits

Manufacturers have a vested interest in their high quality cabling components being properly installed and inspected to ensure they comply with the applicable standards. This is the only way they can give a system guarantee for their cabling components - even once they have been installed. Fitters have to complete training recognised by the manufacturer and send the results of the inspection to the manufacturer for testing. Providing the installation was carried out by an authorised installer and the test report from the inspection tests show no abnormalities, generally, depending on the manufacturer, a performance guarantee covering up to 25 years is given for cabling components.

If the cabling components fail during this term, the manufacturer will replace the cables free-of-charge and may also cover the costs for the replacement. However, any costs resulting from the breakdown (known as financial losses, such as costs resulting from a production standstill) are

explicitly excluded from the guarantee. So failure of only a few data links can soon mean losses of several tens of thousands of Euros and more.

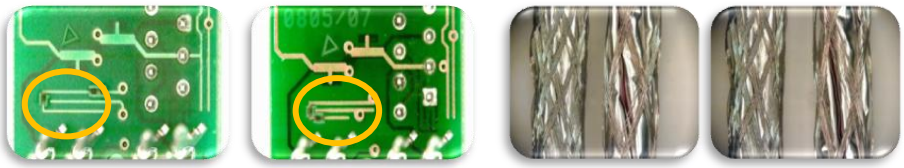
This also highlights the need for high quality when it comes to cabling components. There simply is no "100%, no worries guarantee" for cabling components.

"THE BEST GUARANTEE IS ONE WHERE THE PRODUCT QUALITY IS SO HIGH THAT THE GUARANTEE NEVER NEEDS TO BE APPLIED."

Need for neutral and transparent quality control

A large number of damage appraisals carried out at the consumer's site have shown that suspected faults in the application itself or in the active devices were actually down to quality deficiencies in the passive cabling components. These ranged from non-compliance with the normative and acquired specifications, to premature material fatigue and to incompatibility of the various cabling components with each other. A significant reason for this development is the need to constantly optimise production in response to fierce competition.

The simple fact that the cabling components were produced by a brand manufacturer or came from a renowned supplier is now by no means a guarantee that the desired quality is maintained across the entire batch production. During the product life cycle, it is common practice for components to be modified and optimised. Unfortunately, these product modifications do not always mean a "technical improvement", but often serve simply to force down production costs, which often has a negative impact on the performance and quality of the cabling components. Outsiders such as re-sellers, end customers, installation service providers or planners are often not informed about these product changes. It is more often the case that these components are still marketed under the same sales conditions.



Possible product changes:
Left: Changed board layout (adjustment components)
Right: Reduction in the level of braided screen coverage

"Optimisations" of this kind affect both copper cabling products (e.g. Twisted Pair) and fibre optic cabling. An example of the way in which products are changed is a reduction in the level of screen coverage or the foil thickness. If these elements are reduced too significantly, the EMC parameter coupling resistance, or coupling attenuation changes. This may result in a failure to observe normative limits. The customer is unaware of this from the inspection tests, because the field testers do not check this parameter. So it makes sense for an independent and neutral inspection to be carried out early on. These product specific or consumer specific tests mentioned in the previous section cannot in most cases be performed economically.

In a large number of discussions with quality-conscious users, engineering offices and manufacturers, GHMT was able to ascertain in 2004 what the market expectations were for a newly defined, transparent and practical quality testing procedures for cabling components.

The following criteria were cited as being important for consumers and planners:

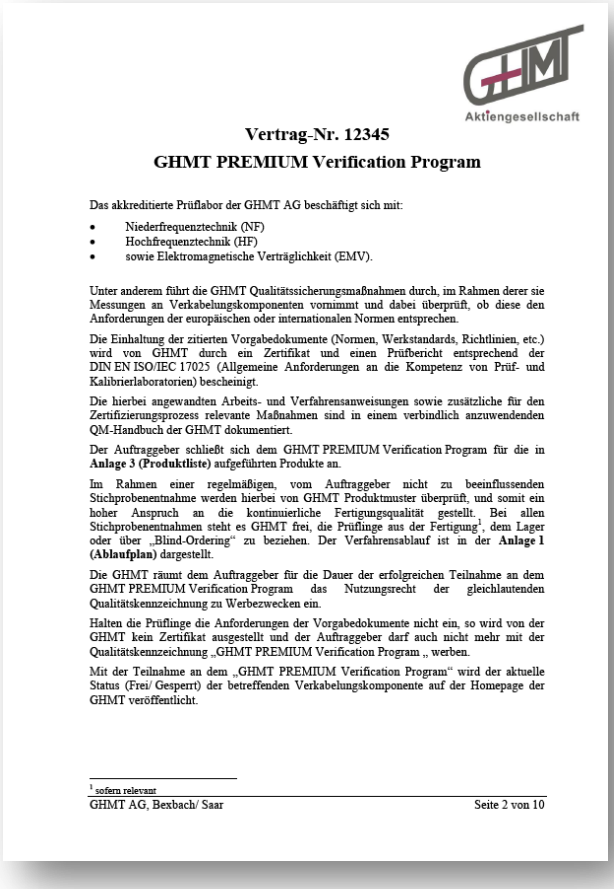
- **Ongoing** product quality **control**
- **Realistic test conditions and sampling** (test what I buy)
- **Transparency for all** market players (What has been agreed? What are the test results?)
- **Elimination of project-specific inspection costs** for the cabling components.

The manufacturers we interviewed also valued inspection procedures that are

- Recognised on both a national and international level.
- Ensuring **transparent and fair equal treatment** in requests for quotations.
- Providing the option **to distinguish high quality products.**
- Opening new **opportunities** arising from **unique selling points**.

Neutral, transparent and extremely sophisticated: *The GHMT PREMIUM Verification Program*

The demand for **ongoing inspection of the cabling components** made by the consumer and the planner can only be implemented on the basis of a sound contractual agreement between GHMT on the one hand and the product supplier on the other hand. The contract on which this is based is transparent and identical for each manufacturer.



Vertrag-Nr. 12345

GHMT PREMIUM Verification Program

Das akkreditierte Prüflabor der GHMT AG beschäftigt sich mit:

- Niederfrequenztechnik (NF)
- Hochfrequenztechnik (HF)
- sowie Elektromagnetische Verträglichkeit (EMV).

Unter anderem führt die GHMT Qualitätssicherungsmaßnahmen durch, im Rahmen derer sie Messungen an Verkabelungskomponenten vornimmt und dabei überprüft, ob diese den Anforderungen der europäischen oder internationalen Normen entsprechen.

Die Einhaltung der zitierten Vorgabedokumente (Normen, Werkstandards, Richtlinien, etc.) wird von GHMT durch ein Zertifikat und einen Prüfbericht entsprechend der DIN EN ISO/IEC 17025 (Allgemeine Anforderungen an die Kompetenz von Prüf- und Kalibrierlaboratorien) bescheinigt.

Die hierbei angewandten Arbeits- und Verfahrensanweisungen sowie zusätzliche für den Zertifizierungsprozess relevante Maßnahmen sind in einem verbindlich anzuwendenden QM-Handbuch der GHMT dokumentiert.

Der Auftraggeber schließt sich dem GHMT PREMIUM Verification Program für die in **Anlage 3 (Produktliste)** aufgeführten Produkte an.

Im Rahmen einer regelmäßigen, vom Auftraggeber nicht zu beeinflussenden Stichprobenentnahme werden hierbei von GHMT Produktmuster überprüft, und somit ein hoher Anspruch an die kontinuierliche Fertigungsqualität gestellt. Bei allen Stichprobenentnahmen steht es GHMT frei, die Prüflinge aus der Fertigung[1], dem Lager oder über „Blind-Ordering" zu beziehen. Der Verfahrensablauf ist in der **Anlage 1 (Ablaufplan)** dargestellt.

Die GHMT räumt dem Auftraggeber für die Dauer der erfolgreichen Teilnahme an dem GHMT PREMIUM Verification Program das Nutzungsrecht der gleichlautenden Qualitätskennzeichnung zu Werbezwecken ein.

Halten die Prüflinge die Anforderungen der Vorgabedokumente nicht ein, so wird von der GHMT kein Zertifikat ausgestellt und der Auftraggeber darf auch nicht mehr mit der Qualitätskennzeichnung „GHMT PREMIUM Verification Program „ werben.

Mit der Teilnahme an dem „GHMT PREMIUM Verification Program" wird der aktuelle Status (Frei/ Gesperrt) der betreffenden Verkabelungskomponente auf der Homepage der GHMT veröffentlicht.

[1] sofern relevant

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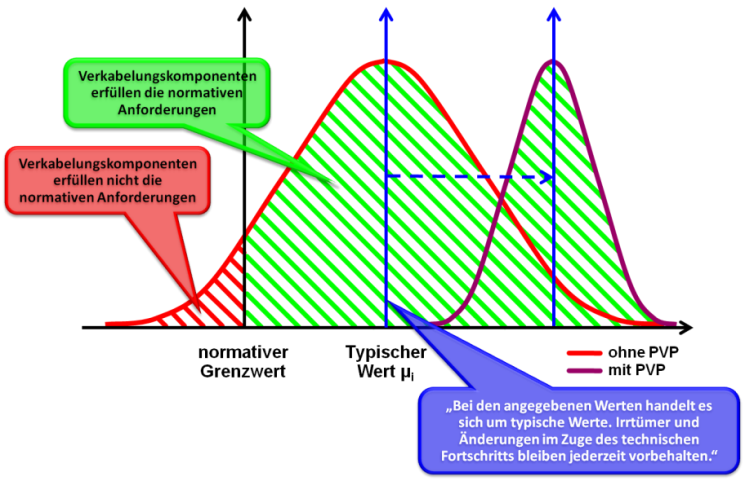
Contract on participation in the *GHMT PREMIUM Verification Program*

As well as the rights and obligations for both contractual parties, the detailed verification process described in the contract is also binding. This process ensures that each cabling component that is produced meets the applicable normative requirements. This requires a much higher process consistency in production and can therefore be seen as PREMIUM aspect.

The consequences of non-compliance with the **international standards** are also set out in the contract. Here, it is important to point out that the **normative requirements for every tested product must be met.** A statistically founded restriction, where only 95% of the supplied products have to meet the normative requirements does not apply. This reflects the practical approach of the planners and the end customers who have no means of carrying out a statistical survey themselves.

The performance of cabling components shows a dispersion in accordance with the normal **distribution** in general (Gaussian distribution). This is why data sheets often have **typical values** for certain parameters (such as insertion loss). In practice, this means that part of the supplied components **do not actually meet the normative limits** (red envelope curve). The cabling components that take part in *GHMT PVP* have a lower distribution, as each cabling component has to at least meet the normative requirements. This can be shown on a graph with a shift in the normal distribution towards higher reserves and towards the normative limit, while at the same time there is a reduction in the distribution range (purple envelope curve). This step means that ***GHMT PVP* components easily meet the normative requirements.**



"GHMT PVP COMPONENTS EASILY MEET THE NORMATIVE REQUIREMENTS".

The **suppliers must agree, as contractual partners, that the results of the *GHMT* inspections may be published**, so that the necessary **transparency** is ensured. It is essential to have a **practice-oriented sampling system**: As the test laboratory responsible for testing, only if we are **permitted to collect the necessary samples anywhere and any time unannounced** can the situation the customer encounters be realistically reproduced.

Another part of the contractual agreement is that the manufacturer is obliged to notify *GHMT* of **any product change** in the cabling components, which has an effect on the electrical or mechanical performance. *GHMT* then tests if the cabling components still meet the *GHMT PVP* requirements despite this change, and may if necessary exclude the product from the *GHMT PREMIUM Verification Program*.

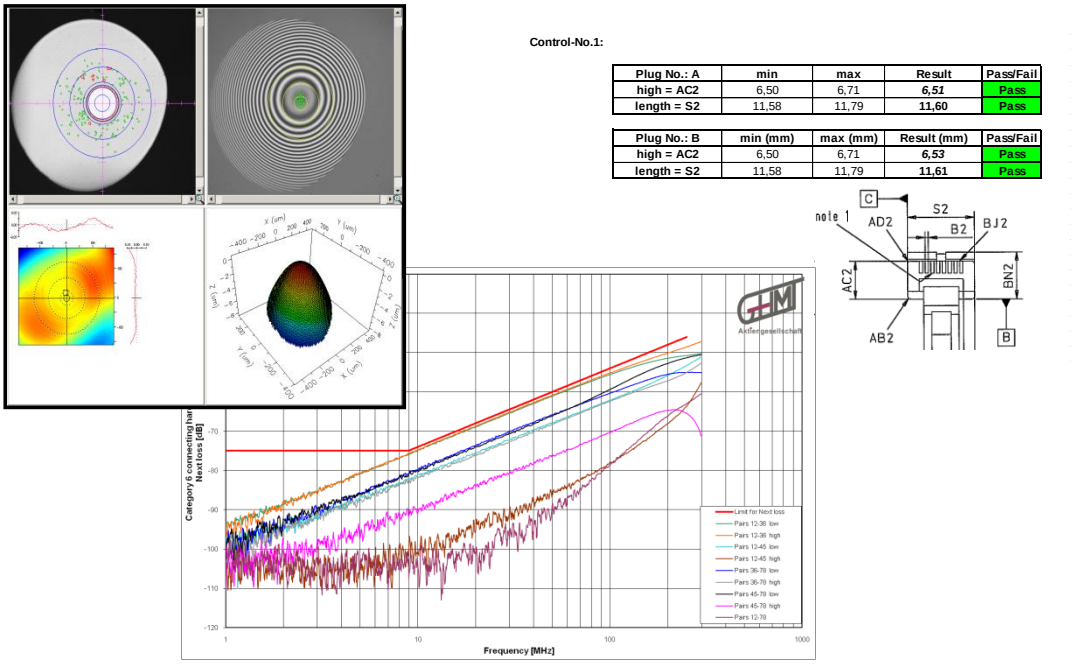
Breaches of contract (e.g. failure to notify GHMT about a product change) oblige the manufacturer to pay a defined **contractual penalty** and lead to the **blocking of the affected product.** This also has an important role to play to maintaining the agreed "rules of the game".

This is a unique **procedure in this branch and sets high product quality demands, as each supplied product has to demonstrate that any claims made in terms of product quality are justified.** This is the only way to ensure that the customer actually receives the quality he was expecting.

The *GHMT* PVP process

There is an extensive and clearly defined test procedure before a product can be included and listed in the *GHMT PREMIUM Verification Program*. The first step is for the supplier to register the cabling component with *GHMT*. Once the contractual arrangements have been made, the manufacturer sends a sample of the cabling component to the GHMT accredited test laboratory where it is tested to ensure it complies with the relevant, normative limits. For copper cabling components these may typically be parameters for low and high frequency and EMC, for optic fibre cabling components these may be the parameters of insertion loss and return loss and interferometry. In addition to this, cabling components undergo mechanical tests (such as tension and insertion/withdrawal cycle tests), visual assessments (microscopy, polished sections) and environmental tests ("ageing behaviour"). The results of this entry test form the product's fingerprint.

> **"WITH *GHMT PVP* EVERY USER ACTUALLY RECEIVES THE HIGH PRODUCT QUALITY HE WAS EXPECTING."**



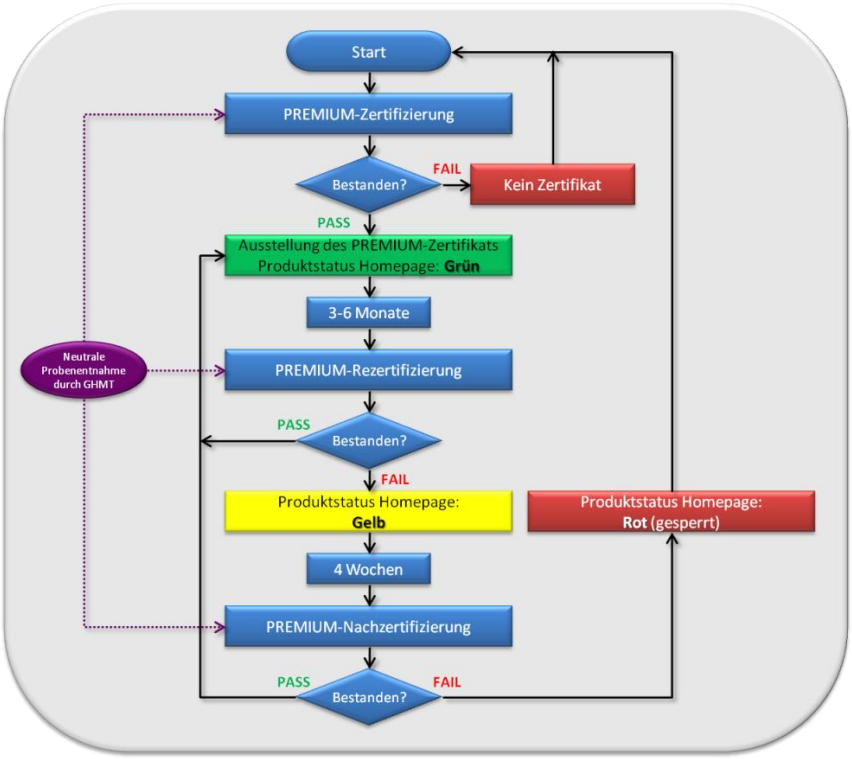
Sample selection of *GHMT PVP* measuring results

Providing the sample presented by the manufacturer passes this first hurdle, GHMT takes more samples directly from the supplier or from a cabling project and from the running manufacture and also tests these to ensure they meet the normative requirements. When these samples are taken, *GHMT* ensures that the samples are produced under conditions that are suitable for serial production. This means that the samples are actually taken from serial production and are not from a production cycle that has been modified for type approval, which is more like a complex mini batch production.

Only if these samples also fully meet the defined *GHMT PVP* requirements is the product included in the *GHMT PREMIUM Verification Program*, and listed on the GHMT homepage. From this point onwards *GHMT* is permitted to test the cabling components at irregular intervals to ensure they meet the normative requirements. These tests will be carried out at least twice per calendar year.

GHMT acquires these samples exclusively in accordance with market typical and practice-oriented conditions: cabling components, for example, are taken from installation companies directly from the building site, or are ordered from wholesalers without the manufacturer being aware that *GHMT* has placed the order (blind ordering). This also means that GHMT PVP participants have no influence on how the sample is acquired. Sometimes users also directly supply GHMT with samples for larger projects. If you as a user would like to make use of this option, please contact us.

The binding verification process for *GHMT PVP* is described below. It also outlines the measures that are taken if a cabling component does not pass a *PREMIUM* recertification.



GHMT PREMIUM Verification Program flow chart

GHMT PVP – exclusively for individual components

Only single cabling components are included in the *GHMT PREMIUM Verification Program*.

The performance class of a permanent link or a channel is crucial for the transmission of a data service. The assessment of the performance of a permanent link or channel does not give a clear picture of the actual performance of the cabling components used here. This means, for instance, that poorer features of the connection components may be compensated by good cable properties.

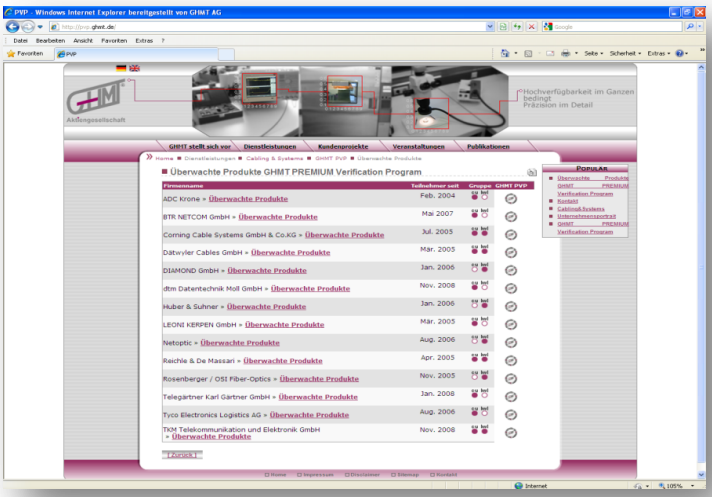
If the quality of the individual components fluctuates across the batch, this is not clearly shown in a link or channel test alone.

To precisely monitor the performance of the components of a network cabling system so that it is easily understood by all those involved, only single cabling components are included in the *GHMT PREMIUM verification program.*

Listing the *GHMT PVP* cabling components - The *GHMT PVP* homepage

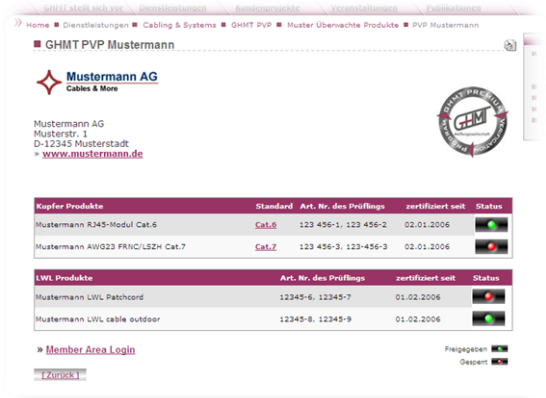
An important consideration when the *GHMT PREMIUM Verification Program* was introduced was that a list of all participating cabling components that was updated every day was available free-of-charge to all interested parties. *GHMT* publishes this freely accessible list at http://pvp.ghmt.de. All monitored cabling components are listed on this website with the following details:

- Manufacturer
- Product name
- Article number
- Applicable assessment standard (e.g. Cat. 6_A / IEC 60603-7-51)
- Date of first certification (since when have the cabling components been tested by *GMHT PVP*?)
- Current *GHMT PVP* status



"TRANSPARENCY WITH THE DAILY UPDATED STATUS DISPLAY FOR THE *GHMT PVP* ASSESSED CABLING COMPONENTS."

The daily *GHMT PVP* status is published on the *GHMT* homepage using traffic light colour coding. This coding is as follows:



- Status Green: The cabling components meet the requirements of the applied assessment standard. This is confirmed with a PVP certificate which remains valid for up to six months.
- Status Yellow: The cabling components do not, for the first time in the re-certification, meet the requirements of the applied assessment standard. A re-certification has to be carried out on the cabling components within four weeks. If this re-certification is successful, this is confirmed with a certificate valid for up to six months. The status for this product is then switched back to Green .
- Status Red: In the re-certification, the cabling components repeatedly fail to meet the requirements of the applied assessment standard. The cabling components are excluded from the *GHMT PVP*. This status is visible online for at least six months.

"GHMT PREMIUM Verification Program" versus *"standard type approval"*

With the *GHMT PREMIUM Verification Program* manufacturers of cabling components face the specific challenge that their products are regularly tested by *GHMT* to ensure they meet the normative requirements, but that the manufacturer is not in a position to influence at what intervals the inspections are carried out. So the manufacturer has to always expect that samples of its products will be taken from the market and tested by a neutral party.

Generally the same normative specifications are used for the assessment of type approval. Unlike GHMT PVP, however, samples selected for the test are provided directly to the laboratory from the manufacturer or supplier. There is no neutral sample acquisition. Type approval involves only a single test on a few samples without automatically initiated repeat tests. In this case, the manufacturer alone is responsible for ensuring that the components supplied in a batch have the same properties as the tested type sample, and in a best case scenario relies on the implemented quality assurance processes such as ISO 9001.

Type approval mainly serves to verify the basic normative conformity of cabling components. Type approval is therefore often used to assess system performance properties, to verify the performance of a channel or permanent link in accordance with a specific class pursuant to a standard (e.g. class E_A).

GHMT PVP clearly sets the stakes higher than standard type approval, although it applies the same normative requirements.

GHMT PVP: Benefits for the user and the manufacturer

The *GHMT PREMIUM Verification Program* is designed as a tool for users who intend to implement an economical and recognised procedure to maintain the necessary and specified product quality.

By applying GHMT PVP the user efficiently and transparently shows that high quality is demanded from the cabling components at all times. Once a company has agreed that it is essential that the products meet normative requirements and that extra costs involved in carrying out internal quality checks should be avoided, the aims of users, decision makers, controlling and purchasing departments converge in *GHMT PVP*. Calls for tenders are thereby efficiently based on a fair and comparable scale.

Our ongoing communication with users and manufacturers shows that this requirement is becoming more and more important, particularly for companies operating on an international level. There are a variety of reasons for this: they range from EMC and technical motivation (such as 10GBase-T, switching to 40GBase-T, etc.) to group-wide, global standardisation requirements and investment protection for the years to come. *GHMT PVP* provides an established tool to meet the resulting demands for quality and technical specifications for cabling components, even on an international level.

"THE *GHMT PREMIUM VERIFICATION PROGRAM* PROVIDES A WIN-WIN SITUATION FOR USERS AND SUPPLIERS."

As a rule, *GHMT PVP can be easily integrated into existing, internal company QA processes, or these processes are intensified with GHMT PVP*. GHMT PVP can also be included in the newly defined quality plan in accordance with DIN EN 50174-1. This quality plan has to be put in place before installation is started, so that the components used are compatible with each other and with the existing cabling.

With *GHMT PVP* with only a very small outlay, users benefit from high quality cabling components which meet the normative requirements - standards they have every right to expect.[1]

Suppliers who participate in the *GHMT PVP* are clearly set apart from their competitors: They clearly show their customers from a neutral standpoint that the advertised performance of their cabling components is actually achieved. This sets them apart from manufactures who only use internal test procedures and who at times only suggest compliance with the promised performance.

Successfully undergoing ongoing strict and independent quality controls gives customers confidence in the manufacturer's certifiably better quality. This message is easy to put across and gives a manufacturer a competitive edge.

This interplay provides a reliable win-win situation for both the user and the supplier.

***GHMT PVP* in public calls for tender**

The *GHMT PVP* quality certification is an advantage for the consumer - not least an economic advantage, which private customers can apply without restriction when it comes to the decision on awarding the contract. For public clients the question is often raised as to whether a *GHMT PVP* certification can be applied as a criterion in performance requirements or in awarding the contract, in the light of the restrictions imposed by competition law and public procurement law.

A commissioned external assessment of the *GHMT PREMIUM Verification Program* which examined the program with regard to competition laws concluded that in principle public authorities are independent in deciding on the installed capacity required. Public authorities are free to decide on the type and scope of the services to be provided - down to the last detail. This means that public authorities can decide whether lower quality standards will suffice or if higher quality performance standards are required in the call for tender. They are entitled to demand appropriate proof of consistently higher quality and safety standards in the form of certification.

GHMT PVP certified cabling components can be obtained by any bidder, and the certification program itself is open to each and every supplier of cabling components.

There are no underling **misgivings in terms of competition law on demanding *GHMT PVP* certificates** as a suitable criterion for awarding a contract whenever the corresponding quality standards for the posted service can be objectively justified.[2]

At the end of the day, a selection based on *GHMT PVP* is the only way to ensure fair competition, because fairness can only be guaranteed where controls and checks are in place.

"QUALITY PRODUCTS IN PUBLIC CALLS FOR TENDER? NO PROBLEM WITH THE *GHMT PREMIUM VERIFICATION PROGRAM*!"

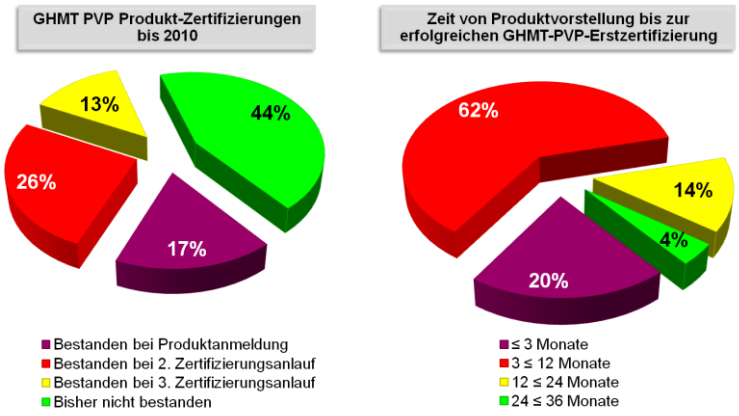
[1] We would be happy to provide you with the corresponding tender specifications for the GHMT PREMIUM Verification Program.
[2] We are of course happy to provide you with the full assessment of fair competition law on request.

Review - taking stock after six years of *GHMT PVP*

Six years after the introduction of *GHMT PVP*, this program has become established as a sophisticated and sensible program for quality controls independent of the manufacturer. Many noteworthy consumers and planners trust *GHMT PVP* as an effective means for identifying products that meet their requirements. It provides decision makers with important arguments in favour of using the product they select. The number of suppliers taking part in the *GHMT PVP* represent the market range - and so customers can be confident when selecting a supplier based on their individual requirements and preferences.

Successful suppliers participating in the program have an excellent opportunity to set themselves well apart from lower quality suppliers, as these other suppliers do not consistently meet the quality requirements - or sometimes do not even meet them at all - and therefore are not entitled to participate.

Although all that is actually required is that the products meet the stated standards, the benchmark for this is already very high: It can take 12 months, and sometimes up to 36 months from the initial presentation of a product to the GHMT test laboratory to definite compliance and thereby participation in GHMT PVP. Nonetheless, 44% of cabling components do not receive the *GHMT PREMIUM* rating despite three certification attempts.



This low percentage clearly shows that although many manufacturers would like to participate in the *GHMT PVP* with their cabling components, many of these products are simply not able to consistently meet the access requirements.

Summary

Experience in recent years has shown that not all cabling components meet the advertised normative standards. The causes for this are - aside from significantly increased requirements in terms of performance - the tough competition in this market from central Europe and notably increased prices for raw materials and energy. This means that manufacturers often have to optimise their product processes. Product quality deficits are then not uncommon. Even the premise that cabling components from a brand name producer are a guarantee that the quality is consistent over the entire batch production nowadays no longer applies.

Manufacturer system guarantees only give users a limited level of security, as these only cover the replacement of faulty cabling components and in some cases their installation. Any further claims, such as costs resulting from the downtimes of the cabling links are not covered, but can be several times higher than the reimbursed hardware costs.

The *GHMT PREMIUM Verification Program* meets the need that many end customers and planners have for a neutral, transparent and long-term control of cabling components for conformity with standards. *GHMT* is able to choose the source of the sample and the test time for the cable components, to ensure practice-oriented sampling conditions (e.g. directly from a construction site).

A commissioned assessment has concluded that there are no legal objections in terms of fair competition laws to demanding cabling components participating in the G*HMT PREMIUM Verification Program* for public calls for tender.

Participating manufacturers are obliged to inform *GHMT* of any changes to the product that have an impact on the mechanical or electrical performance of the cabling components. Any breach of contractual arrangements results in a high penalty fee and can even mean that the product is excluded from *GHMT PVP.*

The current status of all cabling components participating in the *GHMT PVP,* updated every day, can be accessed free-of-charge at http://pvp.ghmt.de . A traffic light system shows at a glance if the product met the normative requirements (= status green) or not (= status red) at its last inspection.

By applying *GHMT PVP* the user efficiently and transparently shows that high quality is demanded from the cabling components at all times. This is a unique procedure in this branch and sets high product quality demands, as each supplied product has to demonstrate that any claims made in terms of product quality are justified.

Future prospects

GHMT PVP already has very stringent requirements for ongoing, verifiable product quality for the cabling components it tests. However, our experience from project management is always making its way back into the program. This ensures that there are no gaps in the PVP process which could in the long term lead to a dilution of our high quality standards. New normative and customer requirements are also integrated into the program, such as the implementation of further test parameters (e.g. Power over Ethernet).

GHMT PVP is an essential quality assurance component - starting from planning, through to implementation, and to accepting the cabling project. The following are other essential components of this process:

- Standardised planning and installation specifications (*GHMT Planning Guideline*)
- Qualification of the persons responsible for planning and installation
- Measurement-based assessment during the installation phase (*GHMT IT-Check*)

For further information on *GHMT* and our services "Cabling & Systems", "Electromagnetic Compatibility– EMC in installations and systems" or "Wireless Applications" please visit our homepage http://www.ghmt.de.

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