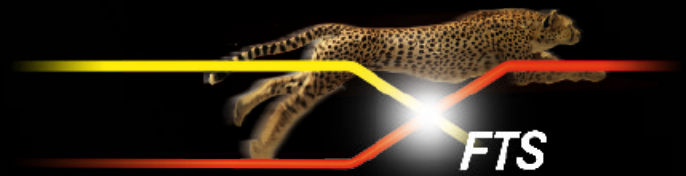




Pushing Performance

HARTING Ha-VIS Fast Track Switch





Fast Track Switching Technology

The Automation IT communication platform

The integration of automation systems has a sustained impact on company-wide IT networks, resulting in convergent Automation IT networks.

Automation IT offers users a communication platform for all applications relevant to industrial manufacturing companies.

Automation IT concentrates all applications in a uniform network infrastructure that generates uniform added value processes leading to transparent and efficient business processes.

Automation IT uses Standard Ethernet as cross-sectional technology for the communication platform that included the office, the control levels, and the field levels.

With Fast Track Switching, the HARTING Technology Group has developed a key technology for Automation IT.



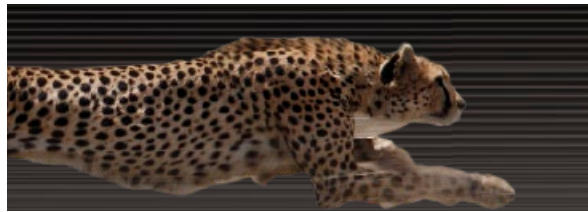
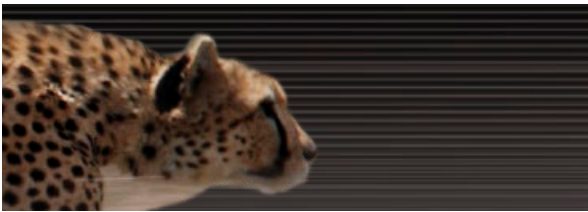
Automation requirements for Ethernet networks

Performance and determinism are the core requirements in automation.

Conventional field bus systems were developed in order to meet all aspects of these requirements. Automation is based on processes with fixed control cycles. In this context, strict compliance with the cycle time is of particular importance in order to avoid unintentional downtimes. Consequently, field bus systems have a guaranteed response time that is commonly known as determinism.

Ethernet systems do not provide this determinism as an „on-board feature“, as they are based on a statistical network access. Network performance is achieved by integrating switches as active network components. Allowances have to be made accordingly in network planning for the statistical delay generated in systems with standard Store-and-Forward switching technology.

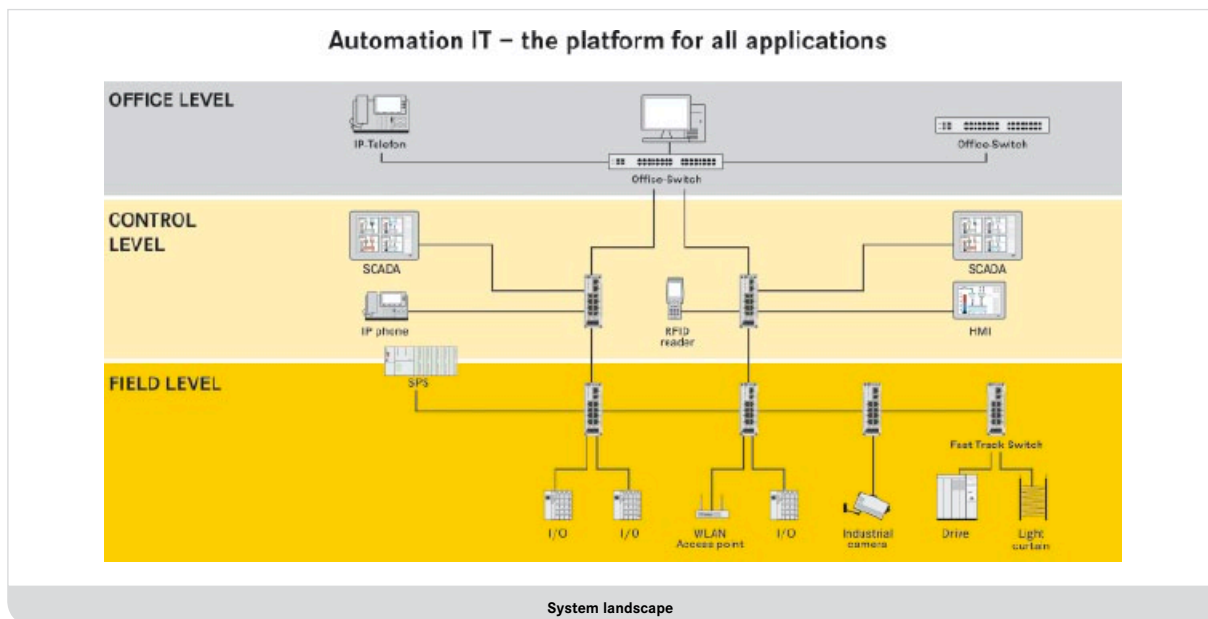
Ethernet systems that are dedicated to the handling of cyclic automation frames are less problematic, as they are capable of achieving the guaranteed response time for automation applications in a flat network hierarchy. However, any additional non-cyclic data traffic on a communication platform interferes with automation performance, as the Ethernet frames compete with this traffic in the transfer phase. This effect is strongly dependent on network load and should be taken into account when planning the network. Conventional Store-and-Forward switching provides an optional QoS (Quality of Service) function that has a corrective influence: To this end, the switch transfers frames from its memory in the order of ascending priority. In such a hierarchy, however, it cannot be prevented that other data frames are assigned the same, or even a higher priority class than the automation frames.



A further delay factor is of greater significance: If a data frame is currently active in the send phase, any successive automation frame will have to wait for the completion of the transfer of up to 1522 bytes before this channel is released again.

Moreover, the Store-and-Forward switches generate extended latency times that pose a serious restriction for cascaded

operation of the switches. In dedicated line topologies, networks operated with standard network components rapidly generate a total cycle time which is beyond the specified limits and critical in terms of the reliability of the automation application. Operations with standard switches pose high risks with regard to the flexible utilization of adapted topologies and safety communication.



FTS: The key technology for Automation IT

With its Fast Track Switching technology, HARTING has found a new solution for providing the network performance automation systems require: FTS switches guarantee this performance!

In order to achieve this goal, Fast Track Switching provides three main features: Detection of automation frames or frames that are prioritized for

transmission. Accordingly, the switch can scan the entire Ethernet header for special characteristics.

PROFINET frames, for example, are assigned Ethertype 8892 as ID that is evaluated in order to accelerate these frames. Instead of using the Store-and-Forward mode, the switches always accelerate the transfer of frames that have higher priority in cut-through

mode in order to minimize the total latency time.

The switch interrupts the transmission of any data frame that is currently active at its transfer port, saves the frame to interim memory, and instantaneously transfers the prioritized automation frame. The entire data frame is retransmitted after this operation has been completed.

Comparing Performance to Store and Forward Switching

Fast. Secure. Guaranteed.

The cut-through technology minimizes latency times in the FTS and eliminates the static delay caused by the bottleneck generated by non-automation frames.

The detected frames are always delivered reliably to their destination, independent of other network load. This is always guaranteed within a calculated time.

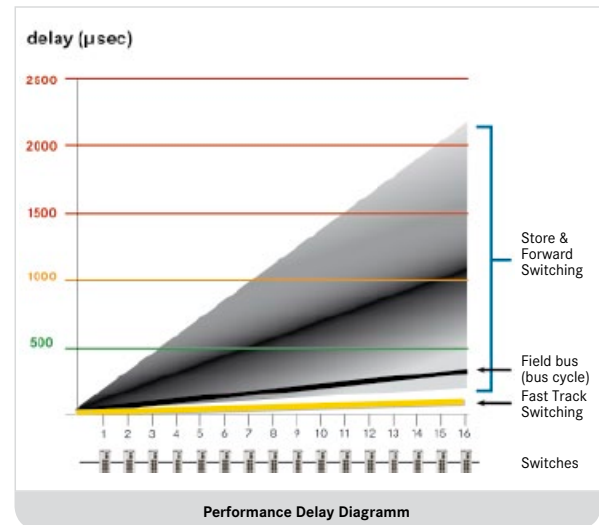
These strengths position Fast Track Switching as the ideal high-speed solution for data transmission, while simplifying network planning and ensuring safe operation.

The example below demonstrates the superior performance of Fast Track Switching compared to Store-and-Forward Switching:

An automation frame passes a route that consists of 16 switches. In standard switching technology, the Ethernet frame cycle time depends strongly on the network load. The result discloses a greater variance within the frame cycle times, with the greater part of these times within in the midrange.

As a rough indication, the diagram shows a trend in black that demonstrates a comparable frame cycle time of a field bus system widely used in automation industry and representing the current state-of-the-art with regard to determinism and transmission speed.

From the viewpoint of statistics, Store-and-Forward switching is capable of transferring the data to the destination at similar speed; however, the respective network load will more than likely reduce this capability proportionally. By contrast, Fast Track Switching delivers high-performance and deterministic results also in connection with high network traffic.

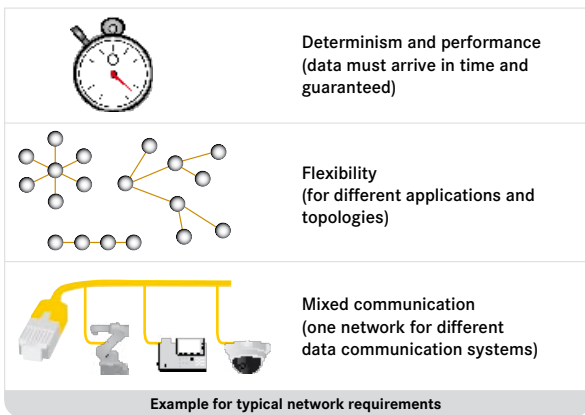


HARTING's Fast Track Switching technology establishes a universal Automation IT communication platform down to field level, while automation profiles such as PROFINET RT or EtherNet/IP that are based on "standard unchanged" Ethernet, can rely on the respective automation performance as required.

Thanks to the Ha-VIS Fast Track switches, users can now benefit from this innovative technology: With the configurable FTS 3100s, users receive a device with convenient handling features, which does not require extensive network management knowledge, while nonetheless offering sufficient headroom for customization to suit specific applications.

HARTING combines the fully managed switches of the FTS 3000 product range with the FTS technology that delivers the comprehensive and known functionality of modern managed Industrial Ethernet Switches.

Fast Track Switching opens up a wide field of applications



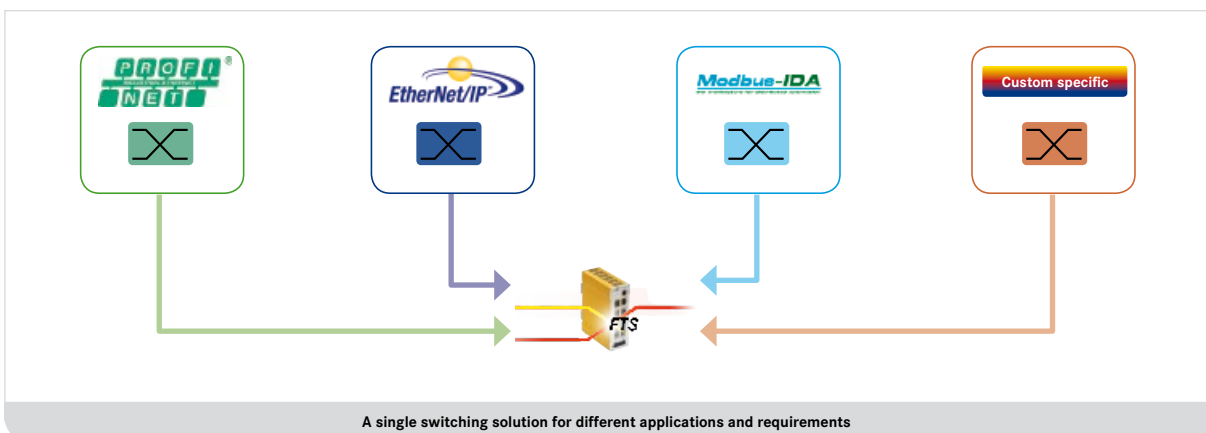
can be taken as a salient example, as companies active in these sectors are permanently faced with the task of providing system concepts that are tailored to customer requirements. Such customization also has an individual impact on basic control and communication concepts. In most situations, modifications in these areas necessitate component and provider changes. However, the implementation of other components with different form factors usually generates high costs due to changes to parts lists, redundant spare parts storage and extra project engineering costs. Moreover, the situation is further exacerbated by the fact that additional application know-how must be built up to deal with such component changes.

Integration of FTS in customer applications

The motivation for the integration of Ethernet is similar for many customer applications in the industrial environment.

Ethernet offers the option of network convergence that reduces costs and system fractures, due to the fact that a convergent Ethernet is capable of replacing many incompatible networks. However, the flexibility of the system topology is a key prerequisite in addition to deterministic behavior and satisfactory performance. The versatile applications in the machinery and plant engineering sector

Ha-VIS FTS now provides a universal switch solution for the determinism required in the various automation environments. The solution reduces the number of components to be replaced in the course of a change of the communication concept and eliminates the need for additional application know-how for the component. Operational costs for Standard Ethernet devices are optimized, because the switch guarantees the performance and determinism as required, while eliminating the need to fall back on expensive special solutions supported by all components.



Fast Track Switching in the automation system

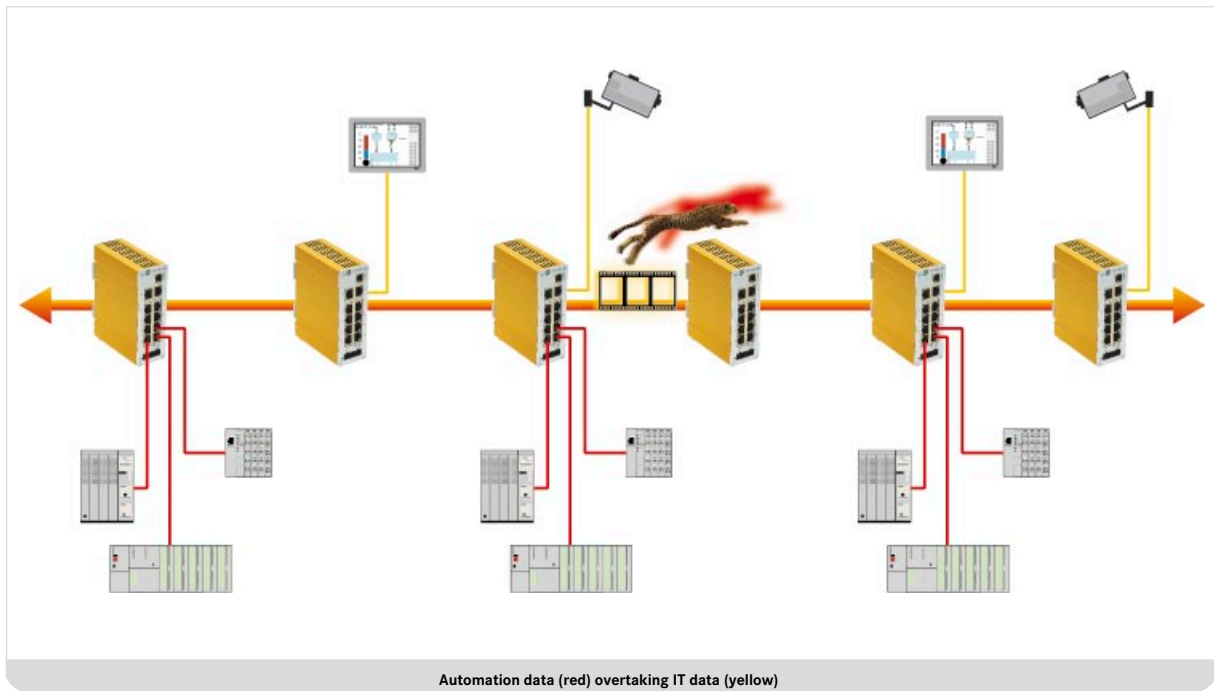
The FTS application portfolio

In all areas where diverse applications communicate on the same network, the prioritization, performance and calculated response times are important parameters for the network concepts, which positions Fast Track Switching as the ideal solution for a wide area of applications.

In addition to the default automation protocols, Fast Track Switching also supports the definition of customized protocols.

Several protocols can be combined by means of logical AND / OR operations. This provides a high degree of flexibility and virtually unlimited potentials. In the automation area,

Fast Track Switching will provide Ethernet communication solutions that will eventually gain access to the last domain of proprietary communication, i.e. to the lowest field level. This will result in a consistent Automation IT communication platform with Standard Ethernet for the entire company.

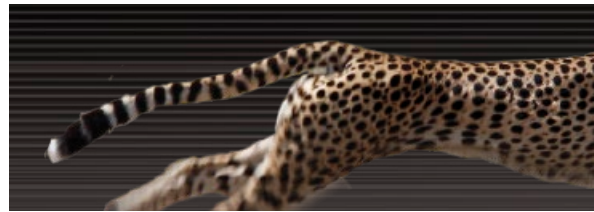


FTS in machinery and plants

Ethernet communication has long established itself as standard at process control level. To date, machinery and plant concepts still

have a multilayer design with different field bus applications. This scenario has an adverse effect on automation planning, as it is required to handle communication between diverse

media. Moreover, the high costs of maintenance have a negative impact on system and machine availability. While the current field bus systems are beset with shortcomings, they also



offer a decisive advantage. They deliver precisely the automation performance that is required, including isochronous applications. Moreover, programming is highly convenient thanks to the device profiles.

In order to provide an Ethernet system that includes these properties, different automation profiles were developed.

HARTING's FTS switch therefore supports the PROFINET profile by means of integration of the

PROFINET IO stack. This feature enables the FTS switch to be a PROFINET Conformance Class B device that can be integrated comfortably into the application using a gsdml file, similar to other automation devices.



FTS in the infrastructure of industrial buildings

Networks in industrial buildings have already developed into a communication platform. Nowadays, applications such as telecommunications, ERP or email use the same network. Most of these applications have only moderate requirements with regard to deterministic communication, so that IEEE 802.1p/q mechanisms such as QoS are considered sufficient for prioritization. As there is a current tendency of additional applications invading the network in the course of convergence, users are faced with

adverse effects on the reliability of prompt data transmission. Such applications include data from the production process, or safety-relevant data of the building control system. Office switches currently do not offer any mechanisms for the prioritization of data to be transmitted. While maintaining full compatibility, Ha-VIS FTS now provides the option of prioritizing the transfer of selected data that is relevant to specific applications. Practical operations show that users deploy an individual

method in selecting their preferred data. An application in the field of district heating and distribution of district heating can be taken as representative for the relevance FTS in practical operations where the integration of Fast Track Switching enables prioritization of time-critical control data over process data. In that area, operations with standard switch technologies have frequently caused failures and downtimes due to the bottlenecks obstructing control-relevant data.



Ha-VIS Fast Track Switch: The golden switch family

The application:

- Meets ultimate performance requirements of automation systems
- The alternative switch for flexible topologies, especially for PROFINET applications
- The ideal switch interconnecting automation and IT communication in industrial networks

The products:

- Fast Track Switching at all ports for deterministic automation
- EMC, temperature range and rugged version in metal case for all industrial requirements
- GSD files for the integration into the automation environment
- Complete management for perfect IT integration



Rugged design for industrial applications. Up to 10 Ethernet ports for connecting devices with RJ45 Fast Ethernet, or with optional optical ports.

Fast Track functionality for the acceleration of automation applications and enabling the convergence of non-automation, communication and automation applications on a single network.

Fast Track Switching technology supports mixed star topologies, as well as line topologies with a high number of cascaded switches.

The configuration of the devices can be saved to the optional plug-in SD card.

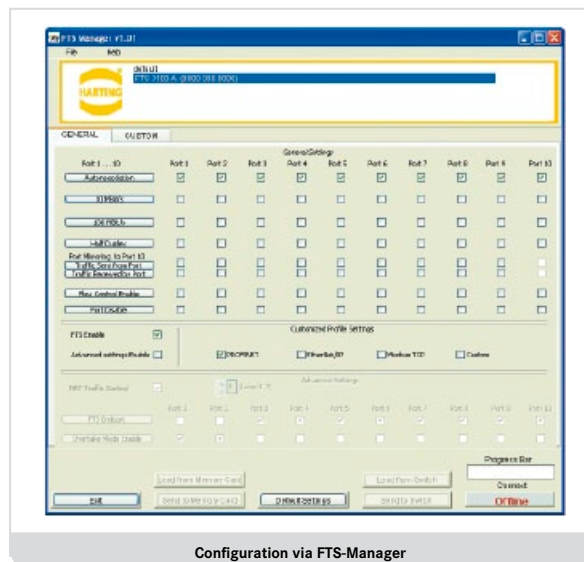
Simple operation despite versatile configuration options

The configurable: FTS 3000s

Ha-VIS FTS 3100s-A with 10 Fast Ethernet ports is an unmanaged switch that can be configured via USB port using FTS-Manager. This combines the comfortably handling of a plug-and-play device with individual setup options for the relevant automation application.

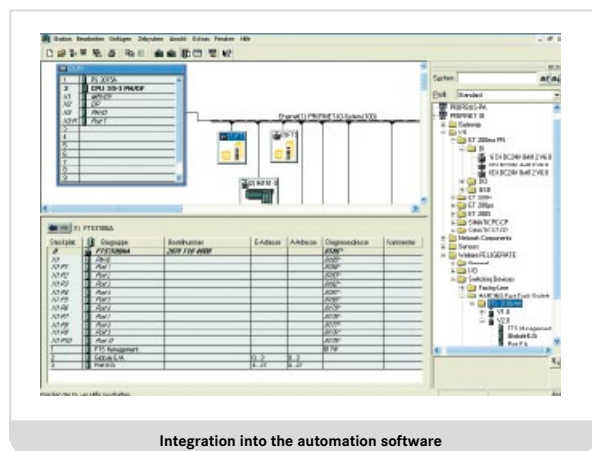
Convenient configuration of the port-related settings such as the data rate, duplex mode, port mirroring etc. Automation protocols to be detected, prioritized and accelerated can be selected in FTS-Manager.

The PROFINET, EtherNet/IP and ModbusTCP protocols are currently available with default configuration and can be easily activated by mouse click.

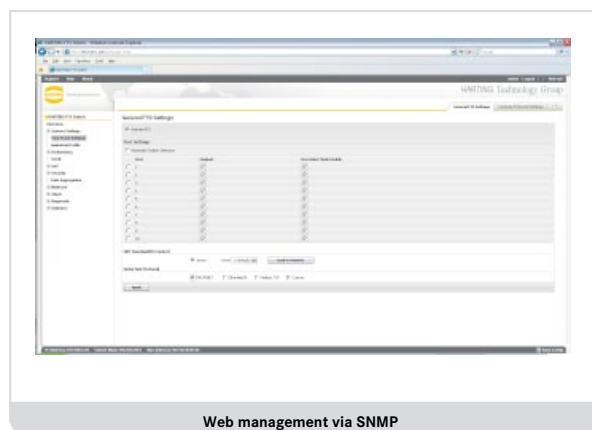


Configuration via FTS-Manager

The versatile options also include the detection of other profiles and its transfer in FTS mode. Users can also benefit, for example, from FTS for their custom profiles, i.e. the switch can be conveniently optimized for diverse applications, while the factory defaults usually suit the requirements in most scenarios.



Integration into the automation software



Web management via SNMP

The managed: FTS 3000

The Ha-VIS FTS 3000 product range combines the universal functionality of a managed switch with the high performance of Fast Track Switching.

By way of the certified PROFINET IO stack, the switch can be programmed and configured using standard automation programs. It is also possible to receive numerous alarm and diagnostics data. Optionally, different switch parameters can be reported as digital input data to the PLC.




Using IGMP snooping, the switch always ensures that only multicast data, e.g. data used for EtherNet/IP, are only routed via ports that are involved in this specific application. The Ethernet switches are designed directly for high-performance industrial applications and support three alternative access routes for management: Via SNMP, a comfortable Web access mode, or by means of configuration through automation programs. Users can select between the 6 or 10 Fast Ethernet port versions, optionally including SFP ports, as required for the insertion of optical submodules, for example.

FTS 3100s-A



TECHNICAL DATA	Number of optical fiber ports / interface		20 78 110 1000
	Number of Gigabit ports / interface		10x10/100 Base TX / RJ45
	Number of SFP modules		-
	ELECTRICAL CHARACTERISTICS	Input voltage	24 V DC
		Permitted range (min/max)	12 V to 48 V DC
		Power supply connection	Screw terminal, pluggable
		Redundant power supply	Yes
		Diagnosis LEDs	Power supply, Link, Act
	MECHANICAL DESIGN	Housing material	Aluminium, anodized
		Dimensions in mm (W x H x D)	44 x 130 x 100
		Degree of protection	IP 30
		Assembly	35-mm top hat rail in acc. with EN 60715
	ENVIRONMENTAL CONDITIONS	Operating temperature	0° C to +70° C
		Storage temperature	-40 °C to +85 °C
		Relative air humidity	30% - 90% (non-condensing)
	APPLICATIONS	Real Time	acceleration for PROFINET, EtherNet/IP, Modbus TCP
		Approvals	DNV, UL 60 950-1 in preparation: UL 508
	MANAGEMENT FUNCTIONS	Basic functions	+
		Time Settings	-
QoS regarding to IEEE 802.1		+	
VLAN		-	
Redundancy		-	
DHCP		-	
IGMP Snooping		-	
Alarm		-	
Interface		USB Configuration	
Diagnosis		+	
slot for memory card		+	

For additional information, refer to www.HARTING-FTS.com

FTS 3100-A	FTS 3060-A	FTS 3082-ASFP
		
20 78 110 4000	20 78 106 4000	20 78 110 4300
10x10/100 Base TX / RJ45	6x10/100 Base TX / RJ45	8x10/100 Base TX / RJ45
-	-	2x100 Base FX
24 V DC	24 V DC	24 V DC
12 V to 48 V DC	12 V to 48 V DC	12 V to 48 V DC
Screw terminal, pluggable	Screw terminal, pluggable	Screw terminal, pluggable
Yes	Yes	Yes
Power supply, Link, Act	Power supply, Link, Act	Power supply, Link, Act
Aluminium, anodized	Aluminium, anodized	Aluminium, anodized
44 x 130 x 100	33 x 130 x 100	44 x 130 x 100
IP 30	IP 30	IP 30
35-mm top hat rail in acc. with EN 60715	35-mm top hat rail in acc. with EN 60715	35-mm top hat rail in acc. with EN 60715
0 °C to +70°C	-40 °C to +70°C	0 °C to +60°C
-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +85 °C
30% - 90% (non-condensing)	30% - 90% (non-condensing)	30% - 90% (non-condensing)
PROFINET Conformance Class A, B, EtherNet/IP, Modbus TCP	PROFINET Conformance Class A, B, EtherNet/IP, Modbus TCP	PROFINET Conformance Class A, B, EtherNet/IP, Modbus TCP
DNV, UL 60 950-1 in preparation: UL 508	DNV, UL 60 950-1 in preparation: UL 508	UL 60 950-1 in preparation: UL 508
+	+	+
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Web-management, SNMP, PROFINET	Web-management, SNMP, PROFINET	Web-management, SNMP, PROFINET
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subject to alterations



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