FTTH Toolcase

FHS2
FHP2
VLS8
Microscope
DRAFT VERSION

Operating manual

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Operating instructions

Optical laser source
FHS2

DRAFT VERSION

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Version	Change history	Date	Name
Ed.1.0	Creation	28/04/2021	S. Mundinger

1 Warning

Before operating the device:

Read this operating manual carefully! It contains important information about installation, ambient conditions and maintenance of the device. Keep this operating manual for future use and for handover in the event of a change of owner or operator. A PDF version of this manual can be downloaded on the ASTRO website (there may be a more recent version). The ASTRO company confirms that the information in this manual was correct at the time of printing, but it reserves the right to make changes to the specifications, the operation of the device and the operating manual without prior notice.

Warning about non-visible optical radiation

The device emits optical radiation in the non-visible range at a maximum power of –2 dBm (laser class 1).

Improper use of optical fibres with non-visible laser radiation can cause long-term damage to health, as well as damage to the device.

Never look into optical fibres with the naked eye or by means of an optical inspection device without making sure that the optical fibre for inspection emits absolutely no radiation.

The non-visible light can cause a loss of vision in the event of improper use.

Under no circumstances connect high optical powers (benchmark approx. > +16.0 dBm) during operation, as otherwise burn marks are produced at the contact points.

Always switch off the transmission power beforehand, and ensure there is no power in the glass fibres. All other safety precautions that apply to the use of high optical powers must be strictly complied with. Only personnel trained in the use of laser technology should be assigned to work to prevent any damage to health due to non-observance

Recycling: Please recycle all packaging

In accordance with the European Union (“EU”) Directive on Waste Electrical and Electronic Equipment (Directive 2002/96/EC) effective as of 13 August 2005, electrical and electronic equipment may no longer be disposed of as household waste. The manufacturer is obliged to accept the return of products like this once the end of their service life has been reached

DRAFT VERSION

2 Brief description

The optical laser source FHS2 is suitable for use as a small, handy laser transmitter that allows attenuation in optical fibres, fibre optic splitters, patch cables etc. to be measured with the aid of an optical level meter at the other end of the line.

The laser sources emits laser light within a 1310 mm or 1550 mm range, which can be set within a level range of –8 dBm to –2 dBm (–5 dBm +/– 3 dB). Settings can be made in increments of 0.1 dB using the arrow up/down.

Depending on the adapter used, SC and FC connectors (LC with a special adapter is also an option) with 0° PC or UPC angle polish can be connected.

If power is applied to glass fibres with an 8° APC, then a hybrid cable from UPC to APC is required on the laser source (e.g. connector 1: FC/UPC, connector 2: FC/APC).

If an APC 8° cable is connected to the laser source, then approx. 3.5 dB to 4.0 dB are lost due to the air gap at the connection, and the value displayed by the laser source no longer corresponds to the real optical power input.

2 × 1.2 V Ni-MH AA rechargeable batteries should be used for the power supply, and can be inserted in the battery compartment on the rear. The external power supply unit included can be used to supply the device with power even when no batteries have been inserted, while also providing the charger for the 2 × AA rechargeable batteries.

The device is switched on by briefly pressing the ON/OFF button and is then set to AUTO-OFF mode, which switches the device off automatically after approx. 5 min. If the ON/OFF button is pressed for >2 sec., then AUTO-OFF mode is switched off.

Backlighting for the display can be activated using the Light button once the device has been switched on. Pressing it a second time switches the backlighting off again.

A range of adapters (e.g. FC or SC, along with LC when applicable) are included, which can be screwed onto the device. The adapters for the laser source FHS2 are labelled with LD (laser diode) and must not be mixed up with the adapters for the optical power meter FHP2, which are labelled with PD (PIN diode). There must be no dust at all when fitting the adapters. Contact surfaces must be cleaned using technically suitable cleaning devices or cleaning agents and cleaning methods to avoid having measurements falsified by dust and other particles.

After use or once the measurement is complete, ensure that the dust cap is screwed onto the optical input to prevent contamination of the laser in the device.

2.1 Description of the device

2.2 TWIN mode – wavelength detection with FHP2 (optical power meter):

Continuity and attenuation measurements can be carried out in combination with the FHP2 power meter by inserting the FHS2 laser source on one side and measuring the level with the FHP2 level meter on the other side.

TWIN mode is a special mode that allows the FHS2 transmitter to use a log to relay control commands to the FHP2 receiver.

The FHS2 laser source can automatically switch over the FHP2 optical level meter to the right wavelength in TWIN mode. The TWIN function on the FHS2 must also be switched on for this. In this mode, a switchover from 1310 nm to 1550 nm and back on the FHS2 laser source automatically switches over the FHP2 level meter as well, without requiring the user to operate the level meter on site.

Pressing the TWIN key switches this function on or off.

2.3 CW/Hz button

Along with CW (constant wave), modulated signals can also be relayed from the FHS2 transmitter to the FHP2 level meter, which are then decrypted and displayed in the FHP2 level meter to simulate signal transport or to identify the cable. Using the CW/Hz button, the transmitter can relay

no (= constant optical signal)
a 270 Hz
a 1 kHz or
a 2 kHz

signal.

2.4 Transmission range using arrow up and down

The FHS2 optical level meter has an output level of –5 dBm after being switched on. This can be increased or decreased by 3 dB by setting the required signal strength in 0.1 dB increments using arrow up and down.

2.5 Technical specifications

Model	**FHS2D02**
Calibrated wavelengths	1310 nm ±20 nm and 1550 nm±20 nm
Laser class	1
Spectral width	±3 nm
Long-term stability	±0.2 dB
Opt. constant power (CW mode)	–5.0 dBm ±0.5 dB
Minimum opt. output power	–8.0 dBm
Maximum opt. output power	–2.0 dBm
Laser setting resolution	0.1 dB
Auto power off	Yes
Backlit display	Yes
Connectors	FC/PC, SC/PC (optional LC/PC)
Modulation options	270, 1 k, 2 kHz
Operating temperature range	–10 to +50 °C
Storage temperature range	–20 to +70 °C
Power supply	2 × Ni-MH AA rechargeable batteries (max. 2500 mAh); power supply unit 5.5 × 2.1 DC connection (6 VDC, 1000 mA)
Dimensions	160 (L)×76 (W)×45 mm (H)
Net weight	260 g
Standard accessories:	
FC/PC adapter, SC/PC adapter, 2 × AA Ni-MH rechargeable batteries, operating instructions	

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DRAFT VERSION

Operating instructions

Optical level meter
FHP2

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Warning about non-visible optical radiation

The device does not emit any optical radiation, can however be connected to a source of optical radiation.

Improper use of optical fibres with non-visible laser radiation can cause long-term damage to health, as well as damage to the device.

Never look into optical fibres with the naked eye or by means of an optical inspection device without making sure that the optical fibre for inspection emits absolutely no radiation.

The non-visible light can cause a loss of vision in the event of improper use.

High optical powers can cause burn marks on the fibre-optic contact surfaces.

Under no circumstances connect high optical powers (benchmark approx. > +16.0 dBm) into the optical receiver during operation. Switch off the laser source beforehand.

Always switch off the transmission power beforehand, and ensure there is no power flowing through the glass fibres. All other safety precautions that apply to the use of high optical powers must be strictly complied with. Only personnel trained in the use of laser technology should be assigned to work to prevent any damage to health due to non-observance

Recycling: Please recycle all packaging

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DRAFT VERSION

2 Brief description

The optical power meter FHP2 is used to measure optical levels in the laboratory, in optical LAN and WAN networks, and in HFC and FTTH networks. Optical powers with different wavelengths (850/1300/1310/1490/1550/1625 nm) can be measured at levels ranging from –50 dBm to +26 dBm.

A connector with APC (8° angle) or PC (0°) can be connected.

Before connection, an estimate of the expected level should be made (to prevent destruction due to an excessively high level) and the device be set to the wavelength required. Adapters for SC and FC (and, optionally, LC) are included.

2 × 1.2 V Ni-MH AA rechargeable batteries should be used for the power supply, and can be inserted in the battery compartment on the rear. The external power supply unit included can be used to supply the device with power even when no batteries have been inserted, while also providing the charger for the 2 × AA rechargeable batteries.

The device is switched on by briefly pressing the ON/OFF button and is then set to AUTO-OFF mode, which switches the device off automatically after approx. 5 min. If the ON/OFF button is pressed for >2 sec., then AUTO-OFF mode is switched off.

Backlighting for the display can be activated using the Light button once the device has been switched on. Pressing it a second time switches the backlighting off again.

A range of adapters (e.g. FC or SC) are included, which can be screwed onto the device. The adapters for the power meter are labelled with PD (PIN diode) and must not be mixed up with the adapters for used an optical transmitter, which are labelled with LD (laser diode). There must be no dust at all when fitting the adapters. Contact surfaces must be cleaned using technically suitable cleaning devices or cleaning agents and cleaning methods to avoid having measurements falsified by dust and other particles.

After use or once the measurement is complete, make sure that the dust cap is screwed onto the optical input port to avoid contamination of the sensor in the device.

2.1 Description of the device

Opt. measuring input (adapter: SC or FC or LC) Put the dust cap on tightly following use

Set wavelength

Switching on/off AUTO-OFF not activated when pressed and held for >2 sec. when switching on

Save/load measured values

Battery compartment on the rear of the device

Charge status of rechargeable batteries

Level display in dBm or mW. LO indicates less than – 50 dBm

Auto-OFF has been activated. After 5 min. of non-operation the device switches off. Auto-OFF not activated when ON/OFF is pressed and held for >2 sec. after

Wavelength selection/press and hold TWIN mode

dBm, dB or mW scale

Backlighting on or off

Reference setting

Mini USB for connection of a power supply unit to the bottom of the device

2.2 Wavelength detection in combination with FHS2 (optical laser transmitter):

Continuity and attenuation measurements can be carried out in combination with the FHS2 laser source by plugging in the laser source on one side and measuring the level with the FHP2 level meter on the other side.

TWIN mode is a special mode that allows the FHS2 transmitter to use a log to relay control commands to the FHP2 receiver.

The FHS2 laser source can automatically switch over the FHP2 optical level meter to the right wavelength in TWIN mode. To do so, the TWIN function must be switched on on the optical level meter (press the λ button > 2 sec.). In this mode, a switchover from 1310 nm to 1550 nm and back on the FHS2 laser source automatically switches over the FHP2 level meter as well, without requiring the user to operate the level meter on site.

Modulated frequencies can also be relayed from the FHS2 transmitter to the FHP2 level meter, which are then decrypted and displayed in the FHP2 level meter to simulate signal transport or to identify the line. Using the CW/Hz button, the transmitter can relay

no
a 270 Hz
a 1 kHz or
a 2 kHz

signal.

2.3 Measuring other laser sources

When set to manual mode, the FHP2 level meter can be set to a wavelength value of 850 nm, 1300 nm, 1310 nm, 1490 nm, 1550 nm and also 1625 nm by pressing the λ button.

To obtain correct measurements, the wavelength must be set to the same wavelength as the measurement signal. Failure to do so produces incorrect measurements.

At all times, ensure that the device cannot be destroyed due to connecting very high optical powers to the measuring receiver. When power levels are high, always switch off the transmission signal first, and only then connect the measuring receiver and switch on the transmission signal again. Carry out the steps in reverse when disconnecting. Switch off the laser first, then disconnect the measuring receiver.

2.4 Reference function (REF button):

The REF button allows the value of a level received on a previous occasion to be used as a basis for additional measurements. The additional measurements then use this base value as a reference. The current reference threshold is then set to a relative offset of 0 dB, which appears on the display after the button is pressed. The additional measurements then show the different in level to this reference threshold in dB.

Example:

You would like to test the continuity of a fibre optic splitter, however have one cable connected to the optical transmitter and one to the optical level meter leading from the splitter respectively. To exclude the conductor and insertion losses from the measurement, proceed as follows:

- Connect both fibre optic cables to an adapter, and insert one end into the optical transmitter and the other end into the power meter.
- Switch on the optical transmitter and use the optical power receiver to measure the optical level. Check the level meter to ensure that the same wavelength has been set on the transmitter and level meter. The difference in level between the transmitter output and the optical receiver is the power loss by the patch cable.
- Now press the REF button on the FHP2. A value of 0 dB is displayed, which means that both cables will not be factored into the measurement when the fibre-optic splitter is connected between them.
- Now remove the adapter between the two patch cables, and connect the transmitter to the splitter input and insert the receiver into a splitter output.
- The net splitter attenuation is now displayed in dB without the cables or plug connections impacting the test setup.

2.5 dBm/dB/mW button:

Note: Most optical powers are measured in dBm.

The dBm/dB/mW button can be used to switch over the scale from dBm (10 × log [value in mW/1mW] □ logarithmic power level in relation to 1 mW) to the absolute level in mW.

The dB setting displays the relative change in the level in dB to the reference value set beforehand. If the levels are lower than the reference value, then a minus sign appears in front of the relative differences in level; if they are higher than the reference value, then no sign appears in front of the values.

2.6 Load/Save button:

Saving measurements:

Pressing and holding the Load/Save button (Save >2 sec.) allows a measurement to be saved to the internal memory, and assigns a consecutive sequence number (starting with 001) to it. Every time the button is pressed and held, the current value is saved under the next sequence number.

If several measurements have been saved, then pressing the Load button briefly allows sequence number 001 to be displayed (001 appears at the bottom of the display).

The user can jump to the next sequence number by pressing the λ button (orange arrow up), and to the previous sequence number by pressing the REF button (orange arrow down).

Entries can be deleted by pressing the dBm/dB/mW button (labelled with DELETE above the button).

2.7 Measuring range

The FHP2 optical level meter has a measuring range from –50 dBm – +26 dBm at 1550 nm.

The FHS2 transmitter (max. output level –2 dBm) and the reception range of min. –50 dBm on the optical power meter can be used to measure an attenuation budget of max. 48 dB.

2.8 Technical specifications

Model	FHP-2B04
Calibrated wavelengths	850/1300/1310/1490/1550/1625 nm
Opt. detector type	InGaAs
Precision	±0.2 db±10 nW
Resolution	0.01 dB
Linearity	±5%
Auto power off	Yes
Backlit display	Yes
Reference measurement	Yes
Connectors	FC/PC, SC/PC (optional LC/PC)
Optical measurement range	–50 to +26 dBm @1550 nm
Wavelength detection in TWIN mode	Yes(≥–20 dBm)
Modulation detection	270, 1 k, 2 kHz (≥–20 dBm)
Operating temperature range	–10 to +50 □
Storage temperature range	–20 to +70 □
Power supply	2 × Ni-MH AA rechargeable batteries (max. 2500 mAh); mini USB cable, mini USB port power supply unit (5 VDC, 1000 mA)
Dimensions	160 (L)×76 (W)×45 mm (H)
Net weight	270 g
Standard accessories:	
FC/PC adapter, SC/PC adapter, 2× AA NiMH rechargeable batteries, operating instructions	

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Operating instructions

Visual red light source

for fault-finding in fibre optic cables

DRAFT VERSION

VLS-8

Contents

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Version	Change history	Date	Name
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The device emits optical radiation within the red light range of 650 nm with a power of approx. 10 mW.

Improper use of optical fibres with visible and non-visible laser radiation can cause long-term damage to health, as well as damage to the device.

Never look into optical fibres with the naked eye or by means of an optical inspection device without making sure that the optical fibre for inspection emits absolutely no radiation.

The visible or non-visible light can cause a loss of vision in the event of improper use.

High optical powers can cause burn marks on the fibre-optic contact surfaces.

Under no circumstances insert or unplug high optical powers (benchmark approx. > +16.0 dBm) into or from the optical receiver during operation. Switch off the laser source beforehand.

Always switch off the transmission power beforehand, and ensure there is no power flowing through the glass fibres. All other safety precautions that apply to the use of high optical powers must be strictly complied with. Only personnel trained in the use of laser technology should be assigned to work to prevent any damage to health due to non-observance.

Recycling: Please recycle all packaging

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2 Brief description

The visual red light source is used to screen optical fibres when troubleshooting and for fibre classification.

The red light source allows individual optical fibres to be localised in bundles of fibres.

Any light escaping from the fibre sheath due to crushing, broken fibres or at splices, and other occurrences, can be identified visually.

Optical fibres with a 2.5 mm connector (SC and FC types) can be inserted.

Both APC (8°) or UPC and PC (0°) connectors can be inserted.

Important – please note:

Never look directly into the beam of red light. If diffuse, unbundled light is observed at a viewing distance of approx. 40 cm, this is quite safe under normal conditions.

Do not look into the red light beam using optical loupes or lenses, or optical fibre microscopes, either. A concentrated power that is hazardous can be generated by bundling the light.

Only switch on the red light source once the patch cable or the optical fibre has been inserted into the device.

Observe the red light that is emitted at the required minimum distance.

Do not leave the red light source switched on without supervision, and instead switch it off immediately after successfully troubleshooting, and secure it against accidental and unauthorised activation.

The range of the red light is visible for up to approx. 10 km for single mode fibres G652 or G657. Optical splitters and other attenuation occurrences shorten the range

Please press and hold the left button ⏻ for approx. 3 seconds to switch it on. The same is done to switch it off.

To generate a 2 Hz pulse mode, press the right button (Fn). Pressing it again switches off 2 Hz pulse mode again.

The 2 × AAA batteries inserted in the battery compartment on the rear supply the red light source with the energy required for approx. 5–6 hours in CW (constant mode). The operating time is significantly longer in pulse mode.

After use or once the measurement is complete, ensure that the dust cap is put back onto the output to prevent contamination of the device.

2.1 Description of the device

2.2 Technical specifications

Model	VLS-8-10
Laser/LED transmission level	10 mW
Transmission type	LASER CLASS IIIB laser diode
Wavelength	650 nm ± 10 nm (visible red light)
Range in single mode fibres G652 or G657	up to 10 km
Modulated frequency	CW or 2 Hz (adjustable)
For optical connectors	2.5 mm (SC or FC or ST)
Battery life when continuous light is used	approx. 5–6 h, significantly longer when light pulses are used.
Operating temperature range	–10 to +50 □
Storage temperature range	–20 to +70 □
Power supply	2 × AAA batteries, slot on the bottom
Dimensions	120 × 33 × 30 mm
Net weight	70 g
Standard accessories:	
Operating instructions	

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Operating instructions

Fibre optic microscope

with 400× magnification

DRAFT VERSION

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Important safety notice:

The device does not emit optical power, however can be connected to fibre optic connectors to which optical power is applied. Before connecting the optical connector to the fibre microscope, all optical power in the supply cable must always, without exception, be switched off and the system secured against unintentional activation of laser radiation. Laser light, especially when optically bundled, can damage the retina of the eye and thereby permanently damage vision!

Improper use of optical fibres with visible and non-visible laser radiation can cause long-term damage to health, as well as damage to the device.

Never look into optical fibres with the naked eye or by means of an optical inspection device without making sure that the optical fibre for inspection emits absolutely no radiation.

The visible or non-visible light can cause a loss of vision in the event of improper use.

High optical powers can cause burn marks on the fibre-optic contact surfaces.

Under no circumstances insert or unplug high optical powers (benchmark approx. > +16.0 dBm) into or from the optical receiver during operation. Switch off the laser source beforehand.

Always switch off the transmission power beforehand, and ensure there is no power flowing through the glass fibres. All other safety precautions that apply to the use of high optical powers must be strictly complied with.
Only personnel trained in the use of laser technology should be assigned to work to prevent any damage to health due to non-observance.

Recycling: Please recycle all packaging

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DRAFT VERSION

2 Brief description

The optical fibre microscope allows the connector surface of SC, SC or ST fibre optic connectors to be appraised. The layout of the internal optical lenses allows 400× magnification.

Optical fibres with ferrules with a 2.5 mm diameter (SC, FC or ST) can be connected

Both APC (8°) or UPC and PC (0°) connectors can be inserted

If the optical fibre has been inserted into the front of the optical fibre microscope, then the end of the fibre can be focussed using the wheel.

Pressing the wheel below the eyepiece switches on the internal lighting, allowing the surface of the glass to be seen clearly.

The 3 × AAA batteries are inserted into the battery compartment on the same side as the optical plug contact (screw open the knurled cap).

The connection for the optical fibre can be screwed off. The glass contact surface should be cleaned regularly using a suitable cleaning material to prevent any misinterpretations due to dirt on it when viewing the surface of the fibre.

The device may lose its function after a hard impact or fall, as the internal optical lenses may break out of their holders. Please handle with care, and prevent any loss of function due to improper treatment.

Important – always ensure there are no signals!

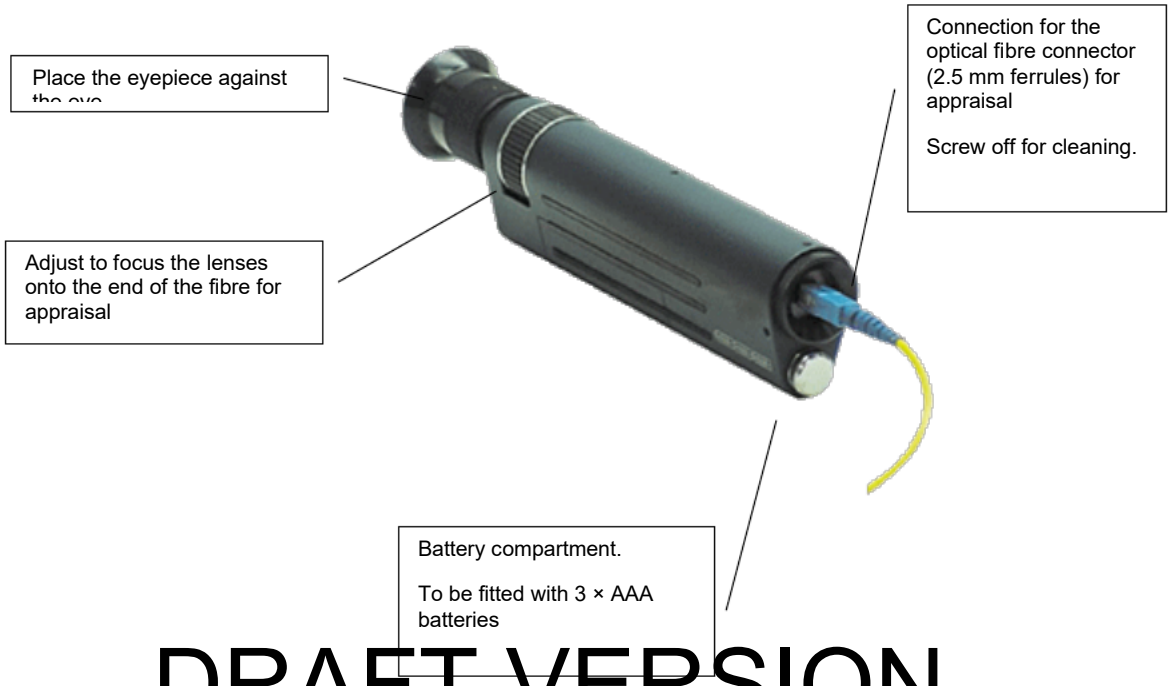
Inserting fibres that conduct laser signals is not permitted and is, in any case, prohibited.

It must be guaranteed that there are no signals.

Activating a laser on the fibre for appraisal during the testing process must be avoided as well.

Laser light can burn into the retina of the eye and cause permanent damage to vision.

2.1 Description of the device



2.2 Technical specifications

Model	FIM-9
Magnification	400×
Lighting	Built-in LED
Optical plug-in connectors	SC, FC, ST
Battery life	approx. 5–6 h
Operating temperature range	–10 to +50 □
Storage temperature range	–20 to +70 □
Power supply	3 × AAA batteries, slot on the bottom
Dimensions	220 × 55 × 40 mm
Net weight	250 g
Standard accessories:	
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