

MERLIN®

TECHNOLOGY



USER MANUAL

EVO FC
wood & air humidity moisture meter

Version 01/2016

Excellent Business Conditions.



User manual
non-destructive
Wood moisture – air humidity – combination measuring device
EVO-FC

Hints of the manufacturer (read in any case before using the meter)

Congratulations – now you can measure your wood in a non-destructive way and perform air humidity measurements. The acquisition of a measuring device is a matter of trust – to welcome you as a satisfied customer, it is necessary to consider notes marked as IMPORTANT. The most important points are briefly summarized at the end of this manual –

and now best wishes for success.

1. Technical specifications

EVO-FC measuring device

Measuring depth	8mm
Minimum wood thickness	5mm
Density range	175 - 1075 kg/m ³
Timber group	1 - 21
Resolution	0,1 % humidity; 0,5 °C/°F
Measuring range	2 - 30% wood humidity* (test area to a maximum of 99%)
Temperature range	-10 °C to +60 °C (0,5 °C), 14 to 140 °F (0,5 °F)
Operating temperature	0 °C to 40 °C, 32 to 104 °F
Storage temperature	-20 °C to +60 °C, -4 to 140 °F without batteries
Temperature compensation	automatically
Menu languages	German, English, French, Italian, Spanish, Portuguese, Czech, Russian
Power supply	4 pcs. 1.5 V AA Alkaline batteries
Auto shut off function	after 6 minutes
Power input	35 mA (with backlight display)
Display	128 x 64 matrix display
Dimensions	145 mm x 65 mm x 27 mm
Weight (incl. batteries)	266 g
Protection class	IP40
Scope of supply	EVO-FC, rubber protection, batteries, user manual, plastic case

* see 7. Exceedance of measuring range

2. Description of the device EVO-FC

Field of application

The MERLIN® EVO-FC moisture meter is designed for the measurement of wood products with planed surface.

Front



THIS IS HOW IT WORKS



As soon as the sensor plate is in contact with the surface of the wood, measuring starts. The processor of the instrument analyses the sensor readings and displays the result as a percentage of moisture content in the wood.

3. Set up

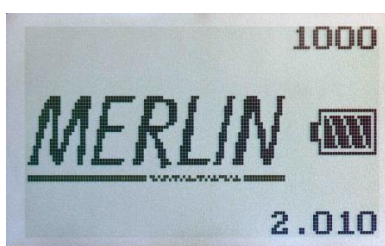
The four supplied 1.5 V Alkaline AA batteries should be inserted as described below.

- 1.) First of all remove the rubber protection cover. For that, hold the rubber protection cover at the upper side and pull it over. (Unscrew protection cap before)
- 2.) Press with one finger onto the arrow of the battery cap and pull it back.
- 3.) Put four new 1.5 Volt AA Alkaline batteries in the device. Make sure that the position of battery poles is correct.
- 4.) Press down the batteries and close the cap.

Turn the meter on by pressing the ON-button (⏻) and release it after approx. 3 seconds. The display flashes up. Now the serial number, software version and battery status appears. Afterwards the meter is ready for measurement. To turn off the meter push again the ON-button (⏻) and release it after approx. 3 seconds. The meter will turn off automatically after approx. 6 minutes if you do not push any button.

IMPORTANT: When you first receive the instrument, check for loose parts. If you notice any rattling noises, don't put the battery in, they could damage the device electrically. During transport the meter may have been damaged. Please return the instrument to your dealer for checking.

IMPORTANT: If there are no numbers displayed after depressing the "ON" button (⏻), press and release the ON button again, but with longer period between. Take care to push only one button! If there is still no display check the batteries. The batteries could be discharged or disconnected.



4. Timber table

dry density (kg/m ³)	Wood species						
200	Balsa						
250	Ceiba						
300	Alstonia						
340	Willow	Abachi					
380	Fir	Spruce l.*	Stone pine				
420	Spruce	Fir h.*	Poplar	Aspen	Hemlock	Okoume	
460	Pine	Spruce h.*	Douglas fir	Basswood	Oregon	Geronggang	Jongkong
500	Alder	Pine h.*	Cedar	Meranti			
540	Larch	Cherry	Mahogany	Durian	Rengas		
580	Ramin	Walnut	Elm				
620	Ash	Maple	Birch	Elm h.*	Bintangor	Teak	Acacia
660	Beech	Pear	Yew				
700	Oak	Hickory	Eucalyptus				
740	Keruing						
780	Simpoh						
820	Selangen						
860	Scopa						
900	Okan						
950	Bongossi						
1000	Pock wood						
1050	Ebony						

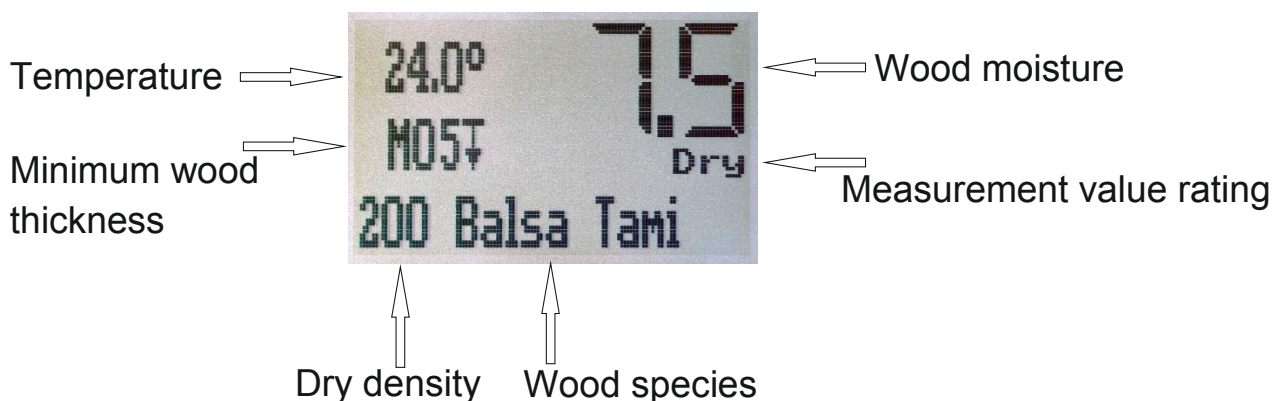
* l = light (coarse), h = heavy (fin)

Density values can vary due to the location. In this case choose the wood type depending on its actual dry density.

Species assignments are recommendations for default settings. In some cases it can be necessary to correct the settings for heartwood (+1) or sapwood (-1) due to different densities.

5. Moisture measurement

The operative meter shows following values on the display.

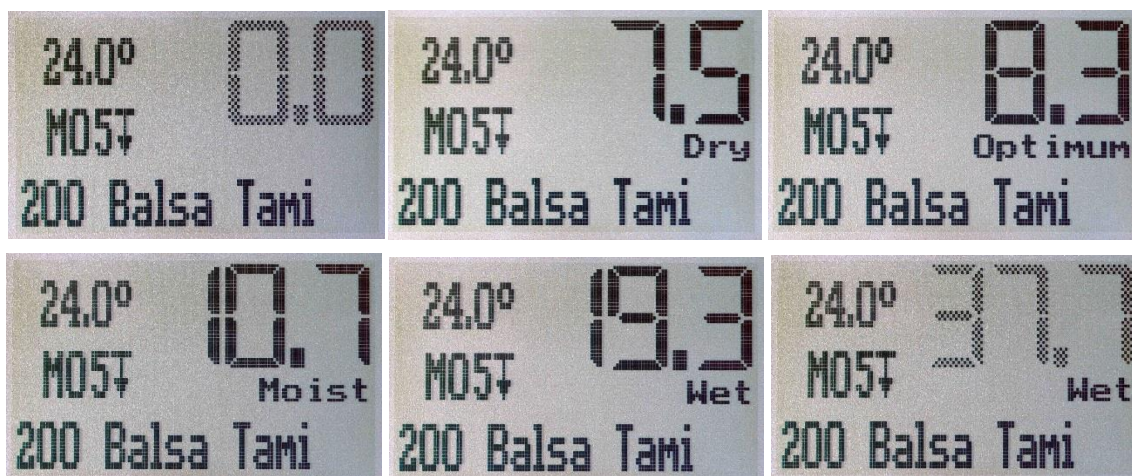


By pushing the ▲ or ▼ button you enter the wood group overview where the desired wood species (dry density) can be chosen (use the arrow buttons again). For choosing one wood species press the ON/OFF button. The wood species are in ascending order of dry density. In case you are not able to find the desired wood species in the menu of the meter we ask you to use the timber table (p. 6).

After adjustment of desired wood species press the meter with appropriate support pressure (ca. 4 kg) against the measured wood. The actual moisture content is displayed instantly.



In addition, a rating of the moisture value is displayed. There are four distinctions: dry – optimum – moist – wet. Below the lower measuring limit (below 2%) no rating is shown.



Distinctions for the evaluation

	Floorer
Dry	2 - 7,5
Optimum	7,6 - 10
Wet	10,1 - 14

! Please note !

The values are recommendations without guarantee and without liability for a standard application and can be different in each individual case, especially for non-standard applications e.g. other values are valid for damp rooms or laminated wood. To be absolutely sure seek advice from professional associations or the norm as well as supplier specifications.

Take advantage of non-destructive wood moisture measurement by not only measuring at one point of the wood, but move the meter along the wood. Only in few cases the wood is absolutely dry or wet. With this measuring method you are able to quickly determine an average value of the timber or find too moist resp. too dry areas. In terms of measurement accuracy we recommend to measure along the fibre direction.

IMPORTANT: For highest accuracy, the surface of the boards should be planed and even. For very rough lumber the measured value could be too low and a special correction factor should be determined to obtain accurate readings. If dry density of the measured wood deviates from average dry density (g/cm^3) (control density selection), it is necessary to correct downwards (sapwood, rough grained) or upwards (heartwood, fine grained).

Wood which is smaller than the sensor pad or uneven is not measured accurately.

Measuring surface: 50x105 mm

The entire sensor pad has to be covered by wood. The sensor pad has to be laying on a flat wood surface. The meter needs to be slightly pressed (ca. 4 kg) against the wood while obtaining measurements. Ensure that there is no metal or similar material underneath the wood. This can influence the measurement.

6. Determine dry density for unlisted wood species

For accurate readings of unlisted wood species the dry density should be determined according to ISO 3130 or DIN 52183. For approximate readings, we suggest the following procedure:

- Measure length, width and thickness of a block of wood in cm
- Weigh the block of wood in gram and estimate the wood moisture content in %. For improved accuracy the wood moisture content can be determined by an oven dry test.
- $(100 \times \text{weight/volume}) / (100 + \text{wood moisture content} \times 0,5) = \text{density}$

Example:

Length: 100 cm, Width: 12 cm,

Thickness: 2,55 cm,

Volume: $100 \text{ cm} \times 12 \text{ cm} \times 2,55 \text{ cm} = 3060 \text{ cm}^3$

Weight: 1415 gram at ca. 15 % wood moisture content

Density: $(100 \times 1415/3060)/(100 + 15 \times 0,5) = 0,45 \text{ g/cm}^3$ dry density

Choose the nearest wood density 460 by pressing the button ▼ or ▲

7. Exceedance of measuring range

Wood species	Dry density	Ex. min.	Ex. max
Balsa	200	2,0	30,0
Ceiba	250	2,0	29,5
Alstonia	300	2,0	29,0
Willow	340	2,0	28,5
Fir	380	2,0	28,0
Spruce	420	2,0	27,5
Pine	460	2,0	27,0
Alder	500	2,0	26,5
Larch	540	2,0	26,0
Ramin	580	2,0	25,5
Ash	620	2,0	25,0
Beech	660	2,0	24,5
Oak	700	2,0	24,0
Keruing	740	2,0	23,5
Simpoh	780	2,0	23,0
Selangen	820	2,0	22,5
Scopa	860	2,0	22,0
Okan	900	2,0	21,5
Bongossi	950	2,0	21,0
Pockwood	1000	2,0	20,5
Ebony	1050	2,0	20,0

The accuracy has been optimised for the main application range between 2 % and fibre saturation point of wood.

Variation from the oven dry test may occur in case the measured value exceeds the fibre saturation point (Ex. max. = exceedance of measuring range). This variation might be high because of a very dry outer layer and a wet heart inside the wood.

Measuring values in grey show you that the actual wood moisture is out of mentioned above measuring range!

8. Air humidity sensor (accessory)

Before connecting the air humidity sensor with the measuring device, unscrew the protection cap on the front of the measuring device. Now the plug of the RH-sensor can be plugged and screwed into the socket. The device automatically recognizes an external sensor and provides the appropriate calibration curve.

Changing the sensor in detail:

Without an external sensor the internal wood moisture sensor with the appropriate calibration curve is active. When re-inserting the sensor consider polarity. The jack and the connector have a notch (or nose), which allows the insertion of the sensor in only one position. The sensor must not be pressed by force into the socket. Mechanical or electrical damages may result! It is important to ensure that the external sensors are always screwed tightly. The sensors are not waterproof und should not be exposed high dust loadings.

IMPORTANT: temperature adjustment

To demonstrate the importance of temperature adjustment between measuring device and material to measure, the following chart shows the measuring error at a temperature difference of only 1°C / 1.8°F with various surrounding temperatures.

	10°C (50°F)	20°C (68°F)	30°C (86°F)
10% rh	±0,7%	±0,6%	±0,6%
50% rh	±3,5%	±3,2%	±3,0%
90% rh	±6,3%	±5,7%	±5,4%

At room temperature (20°C/ 68°F) and a supposed moisture value of 50% r.h. a temperature difference of 1°C / 1.8°F adds up to a measuring error of 3.2% r.h. A temperature difference of 3°C / 5.4°F leads to a measuring error of more than 10%.

Relative air humidity

Indicates the relation between the current water vapour pressure and the maximum possible water vapour pressure (called saturation vapour pressure).

The relative humidity shows the degree the air is saturated with water vapour. For example:

50% relative humidity indicates that at the current temperature and the current pressure the air is saturated with water vapour for half of its value, 100 % relative humidity means that the air is totally saturated. When the air has more than 100 % of relative humidity, the excessive moisture would condense or form fog.

Dew point temperature

The dew point indicates that temperature, the not completely saturated air has to reach in order to be completely saturated with water vapour. If the room with the current relative humidity is cooled down to the dew point temperature, the water vapour begins to condense.

EMC wood

shows the equilibrium moisture content of wood (for timber stored under these conditions) in % wood moisture and the temperature in the selected unit (°C or °F). If wood is stored over a long time under these conditions, it reaches the shown water content.

Sorts (calibration curves) for air humidity and temperature sensor

Calibration curve	Description	Unit	Measuring range
rel. humidity	relative air humidity	%rh	0 to 100%
dew point	dew point	°C resp. °F	-55 to +60°C resp. -67 to 140°F
EMC wood	wood equilibrium moisture content	%EMC	2 to 30%, (wood moisture)

The selection of the calibration curve is the same as for wood moisture sensor.

Air humidity sensors (optional):

LFTS – relative humidity and temperature sensor

rel. air humidity:	0 to 100% r.h. (resolution 0,1%)
Calibration:	10 to 90% (±2,0% r.h. at 25°C)
Temperature °C:	-10 to +60°C (resolution 0,1°C; ±0,3°C at 25°C)
Temperature °F:	14 to 140°F (resolution 0,3°F; ±0,5°F at 77°F)
Weight:	10g
Dimensions:	Ø12x72mm



FTF – humidity and temperature sensor with 2m cable

rel. air humidity:	0 to 100% rh (resolution 0,1%)
Calibration:	10 to 90% (±2,0% r.h. at 25°C)
Temperature °C:	-10 to +60°C (resolution 0,1°C; ±0,3°C at 25°C)
Temperature °F:	14 to 140°F (resolution 0,3°F; ±0,5°F at 77°F)
Weight:	110g
Dimensions:	Ø12x100mm



PFTP – precision humidity and temperature sensor with 2 m cable and stainless steel tube

rel. air humidity:	0 to 100%r.h. (resolution 0,1%)
Calibration:	10 to 90% (±2,0%r.h. at 25°C)
Temperature °C:	-10 to +60°C (resolution 0,1°C; ±0,3°C at 25°C)
Temperature °F:	14 to 140°F (resolution 0,3°F; ±0,5°F at 77°F)
Weight:	270g
Dimensions:	Ø12x300mm



FTFS – humidity and temperature sensor with 2 m cable and plastic sensor tube

rel. air humidity:	0 to 100% r.h. (resolution 0,1%)
Calibration:	10 to 90% (±2,0% r.h. at 25°C)
Temperature °C:	-10 to +60°C (resolution 0,1°C; ±0,3°C at 25°C)
Temperature °F:	14 to 140°F (resolution 0,3°F; ±0,5°F at 77°F)
Weight:	100g
Dimensions:	Ø8x150mm

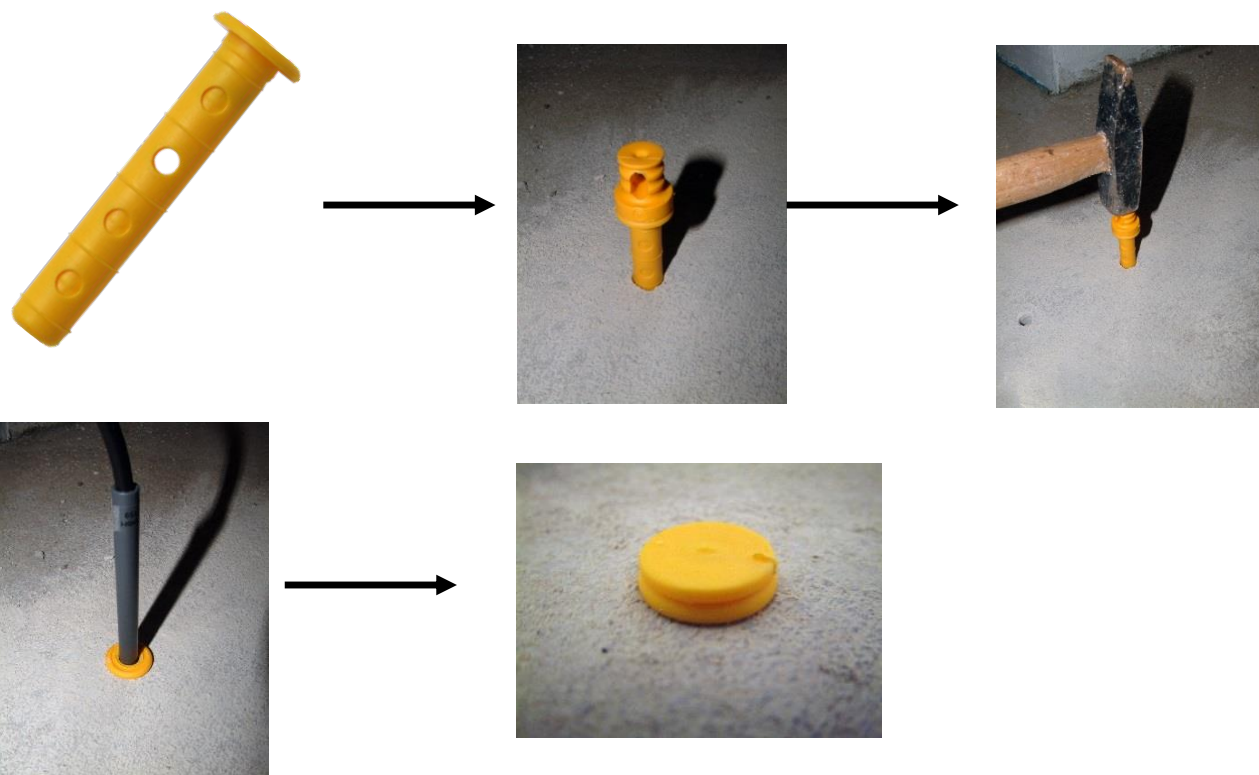


Option plastic sensor tube:



Information for measuring with RH Sensor with plastic sensor tube Ø8mm

With the aid of these measuring bushes, the relative air humidity in the floor screed can be determined. The measuring bush has to be opened at the desired measuring depth with the hammering aid. Drill a hole of 12 mm diameter in the floor screed and insert the measuring bush using the hammering aid. Then insert the sensor into the bush and let it adjust for approx. half an hour. For measuring at a later date, the measuring bush should be closed with the cap.



9. What is also important

The meters can be used in ambient temperatures between 0 °C (32 °F) and max. 40 °C (104 °F). The meter can be stored at temperatures from -20 °C (-4 °F) up to +60 °C (140 °F) without batteries. It is advisable to remove the batteries if you do not use the meter for a long time to avoid battery leakage. Avoid high moisture areas for storage. The meter can be affected by static electricity which exists close to electrical wiring. If you get erratic readings, static electricity may be the reason, change locations. Please be careful when handling the meter. Remove dirt (resin or water) before you start measurement. The display may get damaged if the meter gets dropped. If water drops are collecting on your meter, please remove immediately.

The temperature of a piece of wood should have approx. the same temperature as the moisture meter. Temperature differences above 5°C can affect the measurement results negatively.
The meter should adapt to the climate for several minutes.

SUMMARY:

- Slightly press (ca. 4 kg support pressure) the device towards wood surface, when taking a reading
- Select the appropriate wood species (dry density) using the buttons
- Perform measurements along the fibre direction
- To obtain averages or maximum values slide meter with the grain across the board.
- Measurement evaluation: The values are recommendations without guarantee and without liability. To be absolutely sure seek advice from professional associations or the Norm as well as supplier specifications.
- No foreign objects under the wood (except polystyrene)
- If you do not use the meter for a long time, remove the battery
- When a battery symbol flashes at the display, the battery needs to be exchanged
- Handle the meter with care
- If a species is not listed on the Timber Table, go to page 9 to determine the wood species
- At an exceedance of the measuring range (measurement result on the display is transparent) the measurement is above the measurement range.
- Always remove dirt on the measuring surface
- Temperature of the wood should be close to the temperature of the instrument
- The sensor pad must be completely covered by the wood.
- Consider maximum measuring depth and minimum wood thickness
- You run an average measurement based on the measurement surface

Most common reasons for measuring errors: air humidity

- Sunlight or other sources of heat or cold which do not correspond to the surrounding temperature
- Measuring errors due to too short conditioning
- Dripping or sprayed water
- Irreversible damage of the sensor due to aggressive gases
- Danger of condensation because of changing temperature
- Polluted moisture sensor
- Foreign objects on the sensor: remove with light and dry compressed air.

10. Warranty

The warranty period is 6 months for Business to Business transactions and 2 years for Business to Consumer transactions, in compliance with the above mentioned handling of the device and starts from day of delivery. This service applies to all serious defects of the device which are proved to be material or manufacturing defects.

MERLIN[®] will, at its option, either repair or replace the device without charge. There is no claim for an extended warranty period. All defects must be notified in writing after their occurrence during the warranty period. Next to an error description also mention the serial number. Any additional costs such as business interruptions, working hours, freights, customs charges are not included in this service.

No warranty in case of -

Damage in transit, improper handling, wilful damage, any modification to the device, unauthorized opening of the device. The battery is considered as a wear part and is excluded from the warranty. Before delivery of this device all technical characteristics were examined and subjected to quality control.

11. Disclaimer

For misreading and wrong measurements and of this resulting damage we refuse any liability. We recommend to prevent faulty results in measurements by checking your meters reading results within an adequate time period by the dry oven test according to DIN 52 183 Standard. The measurement capability can be checked with a test board PP2 at any time. This test board is available for purchase at your local dealer. (see 12. Accessory). Before delivery of this device all technical characteristics were examined and subjected to quality control. In every device a serial number and inspection sticker can be found. If these stickers are removed, no warranty claims can be asserted.

Technical modifications reserved

Agents and employees of MERLIN Technology GmbH are not authorized to make any modifications to this warranty or additional warranties beyond the warranty time, neither verbal nor written.

REPAIR SERVICE - In case of malfunction please send your instrument in original packaging to your local dealer or to the following address. (see 13. Technical Support)

12. Accessory (optional)

Test board PP2

It is a pleasure for us to inform you about our full range of MERLIN[®] moisture meters.

13. Technical support

Local dealer

<p>Date / Stamp</p>

or

MERLIN[®] Technology GmbH

Hannesgrub Süd 10

A - 4911 Tumeltsham

AUSTRIA

Tel. +43 (0) 7752 71966

Fax +43 (0) 7752 71988

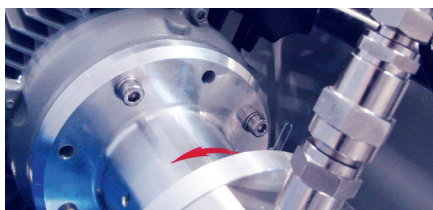
www.merlin-technology.com

office@merlin-technology.com

MERLIN[®]

TECHNOLOGY

Superior Service & Qualität



Seit 1995



MERLIN[®] Technology GmbH

Hannesgrub Süd 10
4911 Tumeltsham / Ried i.I.
AUSTRIA

Tel +43 (0) 7752 71966

Fax +43 (0) 7752 71988

office@merlin-technology.com

merlin-technology.com



Weitere Normen:

ÖNORM H 6020-1:2007 „Lüftungstechnische Anlagen in
Krankenanstalten – Projektierung, Errichtung und Kontrolle“

ISO 13485:2012 „Medizinprodukte – Qualitätsmanagement-
systeme – Anforderungen für Regulative Zwecke“

