WATER ACTIVITY

AIR CHIP TECHNOLOGY

FAST AND PRECISE WATER ACTIVITY MEASUREMENTS.

INTRODUCING AIRCHIP DIGITAL TECHNOLOGY.

- Determine product quality with ROTRONIC Aw products
- ROTRONIC Aw devices for laboratory and portable systems
- Special USB probes for direct PC connection
- Aw Quick function provides accurate Aw readings within a few minutes
- Laboratory bench-top indicator reads up to 4 probes simultaneously
- Large choice of probes for different applications
- Easy to calibrate and maintain

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BE PRECISE:
ADVANTAGES AT A GLANCE.

ROTRONIC offers a complete range of water activity products. Use any combination of probes to fit your application. ROTRONIC products are freely combinable and can be perfectly adapted to your needs. The devices are accurate and are characterized by their high efficiency, exchangeability, and ease of calibration.

What is water activity?

Water activity, by definition, is the measurement of water vapor pressure generated by the free or non-chemically bound water in foods and other products. The bound water and moisture content cannot be measured directly with this method. The Aw value (range: 0.00...1.00 aw) is an important indicator for the shelf life of foods, pharmaceutical and cosmetic products and it strongly influences the occurrence and growth of microorganisms.

Why measure water activity?

The free water in a product influences its microbiological, chemical and enzymatic stability. This is of great importance especially for perishable products such as foods, grains, seeds and particularly for pharmaceutical powders and tablets. If there is too much free water, the food is spoiled. Too little water can adversely affect product properties.

The table shows typical growth thresholds below which the specified organism cannot reproduce and therefore spoil the product. Therefore water activity has a significant impact on the shelf life of a product.

The measurement of water activity also provides useful information about characteristics such as cohesion, storability, agglomeration or flow properties of powders and tablets or the adhesion of coatings.

Water activity	Contaminant
aw = 0.91...0.95	Many bacteria
aw = 0.88	Many yeasts
aw = 0.80	Many mildews
aw = 0.75	Halophile bacteria
aw = 0.70	Osmiophile yeasts
aw = 0.65	Xerophile mildew

Aw Quick functionality for very fast and precise results

Regular Aw measurement takes about an hour to determine exact Aw value. The ROTRONIC Aw Quick function allows Aw measurement results in 5 minutes or less. The function is nearly as precise as the regular measurement method. It requires an environment with stable temperatures variations which is mostly given in laboratory and indoor applications. The bench-top unit HygroLab C1, the handheld device HP23-AW-A and the software HW4-P-QUICK-Vx all include the Aw Quick capability.
For additional time saving up to 4 probes can be connected to the HygroLab C1. For applications with a large amount of measurements up to 64 USB probes can be directly connected to the HW4 software which also provides the Aw Quick function.
All measurement results are saved in log files either directly in the device or via the HW4 software on the PC.

Software calibration

It's essential that instruments have regular calibration checks traceable to national standards ensuring optimum performance at all times. HW4 software provides convenient, easy to use control of the calibration process, and if required, the sensor adjustment sequence:

- Full software control of calibration or adjustment sequence and timing
- Single or multiple points adjustment / calibration
- Precise adjustment to 0.001 Aw (0.1 %RH) and 0.1 K
- Automatic generation of adjustment, calibration and configuration reports
- Pre-configured to suit ROTRONIC SCS certified humidity standards
- User configurable calibration and adjustment process

WATER ACTIVITY

What is equilibrium relative humidity?

Equilibrium relative humidity (ERH) is the value of relative humidity into which a hygroscopic product can be placed where no net exchange of moisture between the product and the surrounding environment can take place. It is expressed on a scale of 0...100 %. ERH is typically used in the paper and pharmaceutical industries, but can be applied to almost any product that is sensitive to moisture, or where the presence of moisture can affect product handling.

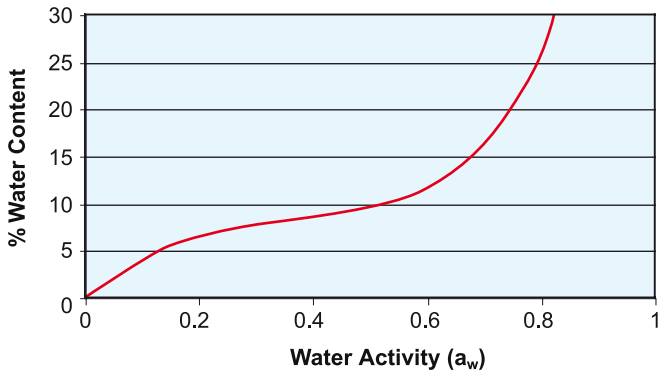
Aw or ERH?

Both Aw and ERH are an expression of the amount of free water vapor present on a product, both at its surface and within its structure, and are practically the same measurement expressed in a slightly different way. Throughout this brochure we will refer to water activity, but this can be interchanged with ERH. Where specified, ROTRONIC products offer the user the option to select display units as Aw or %RH.

What is water content?

Water content, when referring to a solid material, is an expression of the percentage of the materials weight which is water (both in liquid or gaseous phase); usually referred to as 'percent moisture content'. This term is widely used in many areas of industry.

Water activity or water content?



There is frequently confusion between water activity and water content measurements. In many industries, water content is used to control the amount of water present in a product for quantitative reasons. For example, if a product is sold by weight, controlling its water content may be useful in maintaining product quality, but can also impact on profitability (more water equals more profit). Water activity is more significant for qualitative considerations such as product stability, shelf life (e.g. microbiological & enzymatic stability, aroma retention), handling characteristics (e.g. agglomeration of powders), physical properties (e.g. dimensions of paper) and chemical stability (e.g. pharmaceuticals). Water activity and water content can be related by a graph called a Sorption Isotherm (see diagram) so if the user has the ability to measure both parameters, the relationship can be defined and each parameter derived from the other (interpolation). In practice, the sorption isotherm may be impractical to use, because, not only does the relationship between Aw and moisture content change with temperature of measurement, but also any variations in the material composition has a modifying effect. This is especially the case with products of natural origin such as food and paper. The user should therefore decide which parameter of measurement is best suited to their products and processes. For quality control purposes moisture content limits are easily converted to water activity limits by very simple comparative tests. Water activity measurement offers a non-destructive, easy-to-use measurement in a wide range of convenient configurations for both laboratory and on-site use.

HygroLab C1

Laboratory application

ROTRONIC provides a high-end laboratory device – the HygroLab C1 – for water activity measurements with up to four probes. Connect station probes and insertion probes for measuring water activity in cheese, meat, tobacco, building materials, animal feed, pharmaceuticals products and much more.

Validated software

Easy-to-use and intuitive, the laboratory grade indicator can be used by anyone. HW4 running on a PC provides remote monitoring with charting and data recording functions.

Features

- 4 input channels for HC2 station probes or HC2 insertion probes can be connected for measurement of water activity, relative humidity and temperature
- Aw Quick function for fast measurement results (typically 4-5 minutes)
- Audible alarm to indicate completed measurement
- Saves up to 2,000 data records with %RH, °C/°F, date and time

Order code	**HygroLab C1**
Probe connections	4 x HC2 station probe or HC2 insertion probe
Parameters shown	Aw, % RH, °C, °F
Aw Quick function	Integrated and via HW4 software HW4-P-QUICK-Vx (in shipment included)
Calculations	All psychrometric calculations available or user defined calculations
Probe adjustment	Single or multiple point for relative humidity & temperature One or two point temperature
Memory	4 x 500 Aw values (2,000 Aw values)
Measurement interval	1 s
Start-up time	3 s
Power supply	8...16 VDC with AC adapter
Interfaces	Ethernet and USB
HW4 compatible	V3.1 and higher
Range of application	-10...60 °C (14...140 °F) / 0...1 Aw / 0...100 %RH
LCD	3-line alphanumeric with trend indicators
Clock	Real time clock provides a time stamp for every measurement
Current consumption	Max. 120 mA (12 VDC, backlight ON, 4 probes connected, Ethernet)
IP protection class	IP21
CE / EMC conform	EMC 2008/108/EG
FDA / GAMP	FDA 21 CFR part 11 / GAMP5
Dimensions /Weight	225 x 170 x 70 mm / 1100 g
Material	Aluminum, ABS-757

Aw station probes

The station probes are designed for using with HygroLab C1 or HygroPalm HP23-AW-A. Measurement of water activity with this digital probe is precise, fast and easy. The probe can be calibrated with the HygroLab C1 or via the HW4 software. Minimized internal volume of the sensor chamber ensures fast equilibrium with all products, and an all metal construction ensures good temperature stability during measurements, with stainless steel used on all critical surfaces. Sample holders, sample containers and a sealing mechanism are detailed in accessories.

HC2-AW

Order code	HC2-AW
Probe type	Measurement probe with UART interface
Connection	Via UART, 1 m cable
For use with	HygroLab C1, HP23-AW-A
Accuracy at 23 °C ±5 K (73.4 °F)	±0.008 Aw / ±0.8 %RH / ±0.1 K
Temperature dependence	0.001 K/K, 0.0002 aw/K
Sensor	HYGROMER® WA-1 / Pt-100, 1/3 DIN Class B
Calculations	Dew or frost point
Long term stability	‹1 %RH / year
Power supply	Via display instruments
Range of application	-40...85 °C (-40...185 °F) / 0...100 %RH
Filter type	Wire mesh filter with 20...25 µm pore size
Response time τ63	‹20 s
Measurement interval	1 s
Start-up time	1.5 s
IP protection	IP20
CE / EMC conformity	EMC 2008/108/EG
FDA / GAMP	FDA 21 CFR part 11 / GAMP5
Dimensions / Weight	Ø68 x 60 mm / 600 g
Material	Stainless steel, aluminum

Typical accessories

PS-40

WP-40

AW-KHS

Typical accessories

Sample holders: WP-14-S, WP-40, WP-40TH

Disposable sample container: PS-14 (14 mm deep), PS-40 (40 mm deep)

Note: Order sample containers separately.
Sample holders can also be used as calibration device.

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HygroPalm23-AW-A

Field application

The HygroPalm HP23-AW-A offers the perfect solution for on-site water activity measurements to confirm product stability and indicate shelf life. The HP23-AW-A is suitable as a mobile laboratory unit. Equal to the HygroLab C1 the HP23-AW-A is perfect as a portable analyzer with two probe inputs for any suitable HC2 probe. The HP23-AW-A can also be used in conjunction with HW4-P-QUICK-Vx.

Portable and convenient

Handheld instrument specially configured to suit the water activity user. It includes many of the advanced features of the HygroLab C1, but in a convenient portable configuration.

Features

- 2 input channels for HC2 station probes or HC2 insertion probes can be connected for measurement of water activity, relative humidity and temperature
- Aw Quick function for fast measurement results (typically 4-5 minutes)
- Audible alarm to indicate completed measurement
- Saves up to 10,000 data records with %RH, °C/°F, date and time
- Battery charging function

Order code	**HP23-AW-A**
Probe connections	2 HygroClip2 or analog input 0...3.2 VDC (power supply for analog probe: 5 VDC)
Parameters shown	Aw, % RH, °C, °F
Aw Quick function	Integrated or via optional HW4 software HW4-P-QUICK-Vx
Calculations	All psychrometric calculations available
Probe adjustment	Single or multiple point for relative humidity & temperature one or two point temperature
Memory	Capture mode: 8 x 250 values Logging mode: 10,000 values
Measurement interval	1 s, 10 s, 1 min, 10 min
Start-up time	3 s
Power supply	9 V battery or USB/ mains adapter via mini USB
Interfaces	Mini USB
HW4 compatible	Yes, for all HW4 versions
Range of application	-10...60 °C (14...140 °F) / 0...1 Aw / 0...100 %RH
LCD	3-line alphanumeric with trend indicators
Clock	Real time clock provides a time stamp for every measurement
Current consumption	Max. 20 mA (backlight ON)
IP protection class	IP30
CE / EMC conform	EMC 2008/108/EG
FDA / GAMP	FDA 21 CFR part 11 / GAMP5
Dimensions /Weight	188 x 72 x 30mm / 200 g
Material	ABS

Compatible products

Water activity probe:	HC2-AW
Insertion probe:	HC2-P05, HC2-HP28, HC2-HP50

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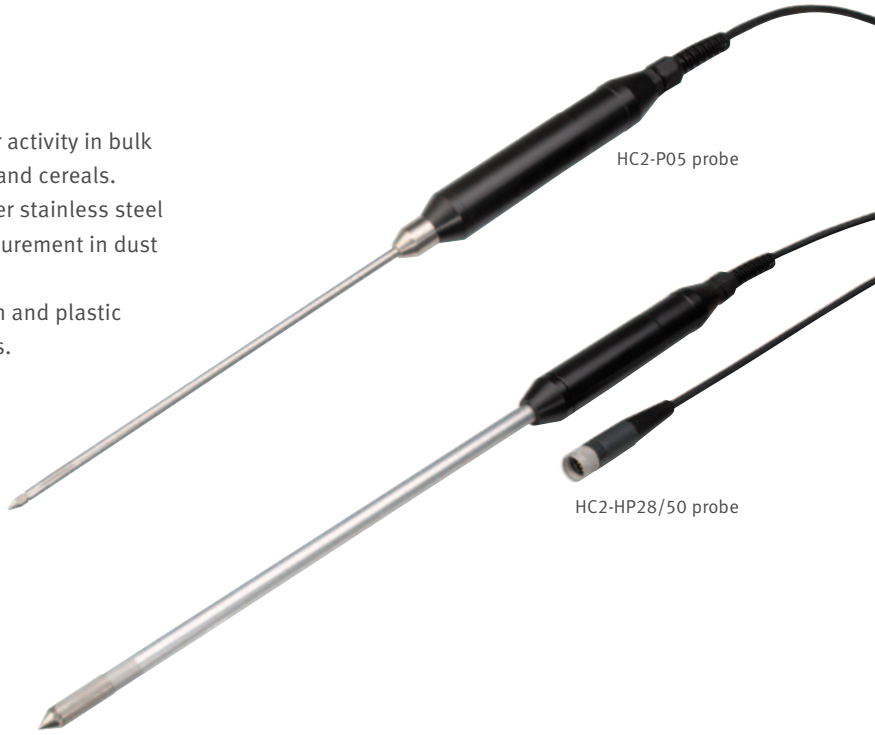
Aw Insertion probes

For direct measurement

The insertion probes are for direct measurement of water activity in bulk samples. Applications include powders, granules, grain and cereals.
HC2-HP insertion probes feature a robust 10 mm diameter stainless steel probe with replaceable sintered steel dust filter for measurement in dust bulk material.
For dust free applications like tablets, gel capsules, grain and plastic granules the HC2-P05 fits perfectly with its laser cut slots.



HC2-P05 probe

HC2-HP28/50 probe

Features

- 5 mm insertion probe for measurement in dust-free bulk materials
- 10 mm insertion probe for measurement in dusty bulk materials

Order code	HC2-P05	HC2-HP28	HC2-HP50
Probe length	Ø 5 x 200 mm	Ø 10 x 280 mm	Ø 10 x 500 mm
For use with	HygroLab C1, HP23-AW-A		
Accuracy at 23 °C ±5 K (73.4 °F)	±0.015 Aw / 1.5 %RH / ±0.3 K	±0.008 Aw / 0.8 %RH / ±0.1 K	
Temperature dependence	0.001 K/K, 0.02 %rh/K		
Sensor	HYGROMER® IN-1 / Pt-100, 1/3 DIN Class B		
Long term stability	‹1 %RH / year		
Calculations	Dew or frost point		
Power supply	3.2...5 VDC, calibrated at 3.3 VDC, current: ~4.5 mA		
Digital interface	UART to other ROTRONIC devices or PC (HW4)		
Range of application	-40...85 °C (-40...185 °F)/ 0...100 %RH		
Filter type	No filter available	Sintered steel with 5 µm pore size	
Response time τ63	‹15 s	‹20 s, with filter	
Measurement interval	1 s		
Start-up time	1.5 s		
IP protection	IP30	IP50	
CE / EMC conformity	2007 / 108 / EG		
FDA / GAMP	FDA CFR 21 part 11 / GAMP5		
Weight	160 g	200 g	300 g
Material	Stainless steel DIN 1.4305 (probe), POM (handle)		

Station probe HC2-AW-USB

Multi station application

The new station probe HC2-AW-USB offers new possibilities. The USB probe can be directly connected to a PC running HW4-P-QUICK-Vx software enabling water activity measurement capability. The HC2-AW-USB is the perfect device for a multi station application, as multiple probes can be attached to a single PC.

USB station probes

USB probes can be ordered as single probe or as a set including the HW4 software with Aw Quick function. The set offers all possibilities to measure water activity.

Features

- Complete set of probe and HW4 including Aw Quick function available
- Measurement range:
  0.00...1.00 Aw (0...100 %RH), -40...85 °C (-40..185 °F)
- USB interface for direct connection to a PC (HC2-AW-USB)

Order code	**HC2-AW-USB**	**HC2-AW-USB-SW**
Probe type	Measurement probe with USB interface	Measurement probe and software HW4-P-QUICK-Vx
Connection	Via USB to PC, 3 m cable	
For use with	Software HW4	
Accuracy at 23 °C ±5 K (73.4 °F)	±0.008 Aw / ±0.8 %RH / ±0.1 K	
Temperature dependence	0.001 K/K, 0.0002 Aw/K	
Sensor	HYGROMER® WA-1 / Pt-100, 1/3 DIN Class B	
Calculations	Dew or frost point	
Long term stability	‹1 %RH / year	
Power supply	Via USB interface	
Range of application	-40...85 °C (-40...185 °F) / 0...100 %RH	
Filter type	Wire mesh filter with 20...25 µm pore size	
Response time τ63	‹20 s	
Measurement interval	1 s	
Start-up time	1.5 s	
IP protection	IP20	
CE / EMC conformity	EMC 2008/108/EG	
FDA / GAMP	FDA 21 CFR part 11 / GAMP5	
Dimensions / Weight	Ø 68 x 60 mm / 600 g	
Material	Stainless steel, aluminum	

Typical accessories

Sample holders: WP-14-S, WP-40, WP-40TH
Disposable sample container: PS-14 (14 mm deep), PS-40 (40 mm deep)

Note: Order sample containers separately.
Sample holders can also be used as calibration device.

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Aw-Sets

The ROTRONIC Aw starter kits include everything needed for measurement and calibration. The portable units are supplied in a robust carry case.

Bench-top kit:

Order code	**HygroLab C1-SET-40**	
Set content	Bench top display device: Including: - Power adapter AC -› DC 12V - HW4 software with Aw-Quick	HygroLab C1
	Measurement probe	HC2-AW
	USB-Cable for PC connection	AC0002
	Sample holder:	WP-40
	Disposable sample container (100 pc.)	PS-14
	Disposable sample container (100 pc.)	PS-40
	Humidity standards 0.5 %RH	EA00-SCS
	Humidity standards 10 %RH	EA10-SCS
	Humidity standards 35 %RH	EA35-SCS
	Humidity standards 50 %RH	EA50-SCS
	Humidity standards 80 %RH	EA80-SCS

Handheld kit:

Order code	**HP23-AW-A-SET-14** with 14 mm sample holder	
Set content	Handheld instrument	HP23-AW-A
	Measurement probe	HC2-AW
	Sample holder	WP-14-S
	Disposable sample container (10 pc.)	PS-14
	Humidity standards 10 %RH	EA10-SCS
	Humidity standards 35 %RH	EA35-SCS
	Humidity standards 50 %RH	EA50-SCS
	Humidity standards 80 %RH	EA80-SCS
	Carry case	AC1124

Order code	**HP23-AW-A-SET-40** with 40 mm sample holder	
Set content	Handheld instrument	HP23-AW-A
	Measurement probe	HC2-AW
	Sample holder	WP-40
	Disposable sample container (10 pc.)	PS-40
	Humidity standards 10 %RH	EA10-SCS
	Humidity standards 35 %RH	EA35-SCS
	Humidity standards 50 %RH	EA50-SCS
	Humidity standards 80 %RH	EA80-SCS
	Carry case	AC1124

Aw Accessories

Sample holders and sample containers

The sample holders provide excellent sample containment and optimum temperature stability. The WP-40TH can be attached to a water bath for additional temperature control.
The disposable sample containers ensure the optimum sample volume is introduced into the sample holders. They prevent the sample holders from coming into direct contact with the product being tested, thereby preventing soiling or cross contamination. The sample containers also provide a convenient means of collecting and storing samples.

Sample holders

Order code	WP-14-S	WP-40	WP-40TH
Type	Sample holder		
Use with	PS-14	PS-14 / PS-40	PS-14 / PS-40
Height	14 mm	40 mm	40 mm
Material	V2A steel		Brass, nickel-plated
Weight	350 g	1250 g	1550 g

Sample holders

Order code	PS-14	PS-40
Type	Sample container	
Use with	WP-14-S WP-40 / WP-40TH	WP-40 / WP-40TH
Height	14 mm	40 mm
Packaging unit	100 pc.	

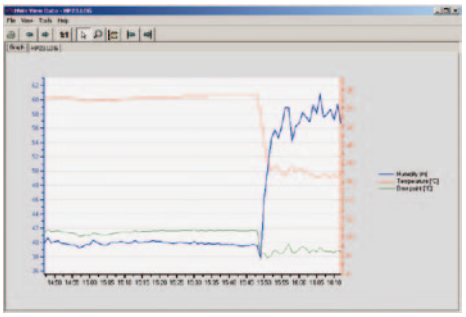
Clamp sealing mechanism

In the case of very dry or very moist samples additional mechanical sealing of the Aw measurement probe and sample holder may be necessary to prevent external conditions influencing the sample.

Order code	AW-KHS
Use with	WP-40 / WP-40TH
Weight	1100 g

HW4 Software

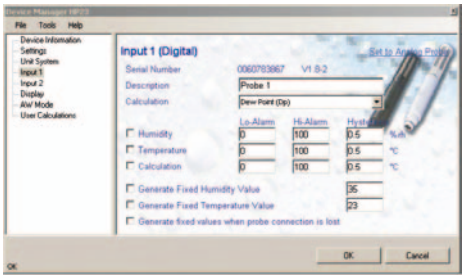
Fully compatible



The HW4 software is compatible with all ROTRONIC products with USB, UART or Ethernet interface. The HW4 software is WINDOWS 7 compatible and runs on 64bit PC systems. It enables useful functions like:

- Live display of current measurements
- Recording of measurement data
- Instrument configuration
- Probe calibration
- Online calculation of any humidity or moisture parameter
- Alarms with notification can be sent via e-mail or SMS text
- Aw Quick function included (HW4-P-QUICK-Vx)

Viewing of measured values/monitoring



Viewing of measured values is very easy and user-friendly. Files of any device shown in the device tree can be copied and opened directly with the HW4 explorer. The data is presented in table or graph form. The graph module can be configured by the user.

Instrument configuration

HW4 software can be used to adjust the settings of ROTRONIC instruments and probes. The following functions and settings can be changed:

- General device settings
- Password protection of device settings
- Change of unit systems metric / english
- Aw mode settings

Humidity standards

On-site calibration and adjustment of ROTRONIC probes. With the humidity standards, a calibration device and HW4 software running on a PC this is easily achieved. It is also possible to calibrate and adjust probes with the HygroLab C1 or HP23-AW-A.

Order code	Humidity value	Uncertainty at 23 °C (73.4 °F)
EA00-SCS	0.5 %RH	±0.3 %RH
EA05-SCS	5 %RH	
EA10-SCS	10 %RH	
EA20-SCS	20 %RH	
EA35-SCS	35 %RH	±0.5 %RH
EA50-SCS	50 %RH	±0.9 %RH
EA60-SCS	60 %RH	
EA75-SCS	75 %RH	
EA80-SCS	80 %RH	±1.2 %RH
EA95-SCS	95 %RH	

ROTRONIC WORLDWIDE

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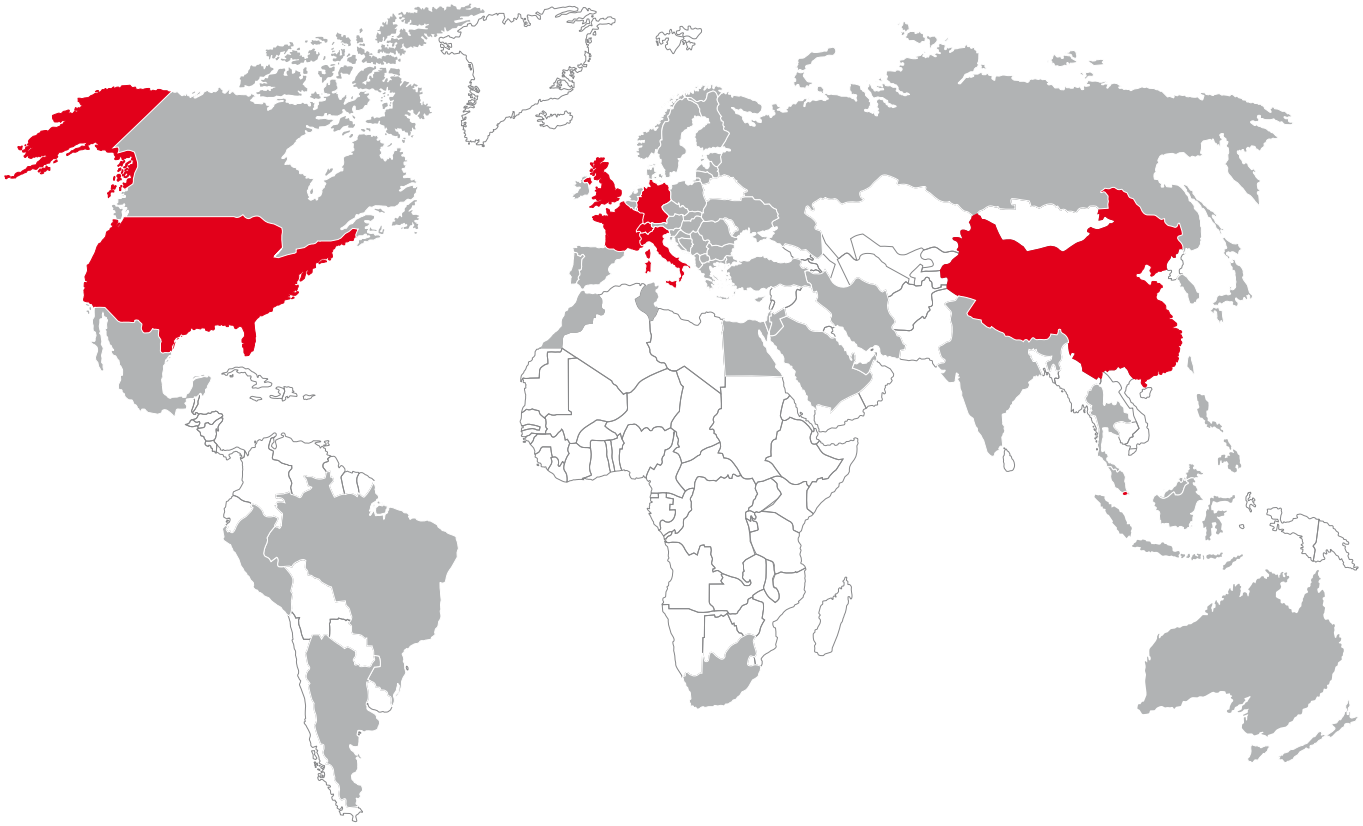
ROTRONIC International

ROTRONIC Partners



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