

Multi-Place Cold Finger Model .64 for research on paraffin precipitation and inhibitors

NEW:
WAT determination
& PPT ASTM D97
extension +
remote control

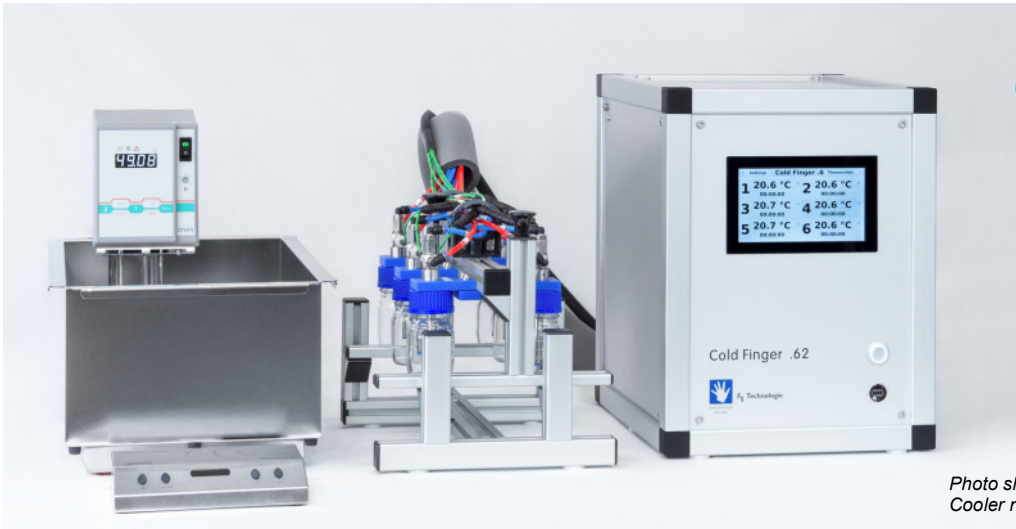


Photo shows 6-place version.
Cooler not depicted.

The principle of the Cold Finger instrument is an inverted pipeline. The cooled metal finger simulates the pipeline's inner wall. The heated and stirred oil flows around it. When the finger's temperature falls below the WAT, wax starts to deposit on its outside.

The wax deposition process depends on the oil and finger temperature, the finger-surface-to-oil-volume ratio, the temperature gradients and the stirrer speed.

Combining multiple cold finger units in one heating bath gives the ability to perform surveys on wax inhibitors, e.g. testing different chemicals on one oil or one chemical with different concentrations.

- 6 places (cold finger units), **12/18 places** available
- Requires just one single mains power socket
- Big color touch screen displays data values and curves
- Individual temperature control on each cold finger
- Stand-alone, **no PC required** (can be connected)
- NEW:** Remote control from your office desk (optional)
- NEW:** WAT determination extension available
- NEW:** PPT ASTM D97 extension available
- 3** different deposit **weight determination** methods
- Sample bath or dry-block thermostat
- Cold finger inserts exchangeable, **with or without sleeve**, different diameters and lengths

The Cold Finger apparatuses by F5 Technologie combine accuracy, ergonomics and flexibility to a



maximum benefit to researchers and producers in the field of paraffin deposition inhibition. So, the experimental approach to research in paraffin deposition effects becomes reliable and reproducible.

The user interface with a big color touch screen and a front side USB port for data storage provides all functionality without the requirement to connect a PC. Of course, connecting a PC keeps being possible (software included).

Temperature control accuracy and stability has been improved to an even higher level than before.

Applications:

- Wax inhibitor development
- Relative effectivity determination
- Paraffin content determination
- Retrieving the paraffin from the sample



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**High Pressure
Cold Finger Unit**



HP cold finger unit (100 bar)

The instrument is scalable by means of the heating and cooling thermostat's power, but also by the number of cold finger units.

As a new feature we offer **2 alternative sample temp control systems**:

- **thermostat baths**
 - active cooling option
 - direct contact of thermal fluid to the sample jars
- **dry-block thermostats**
 - avoids hot thermal fluid
 - no cooling option
 - 100 ml sample jars only

The 12- or 18-place version of the instrument combines **2 or 3 independent groups of 6 cold fingers each**. Each group has its own heating thermostat and circulation cooler, so each group may have different sample temperatures. Although all cold finger units of one group are cooled by an individual circulating cooler, **each cold finger has its individual temperature sensor and control**.

So, an equal temperature for all fingers can be provided, but also different set temperatures.

The temperature sensor measures the **cold finger's wall temperature**. A special setup keeps this assembly as small as possible. It is installed in a screw cap which fits on a standard GL45 sample jar. The jars are hooked in a holder which is immersed into the heating bath. Magnetic stirrers keep the sample homogeneous.



100 and 250 ml sample jars

The stirrer speed can be set arbitrarily and is a measure for the sample's shear rate to the cold finger surface.

100 ml and 250 ml standard flasks with GL45 thread are used as sample jars. The cold finger inserts can be **disassembled easily**. Cold finger insert types of different length and diameter are available.



Cold finger inserts of various sizes

The 6 cold fingers of one group are hooked onto a holder and **can be taken out of the bath/ thermostat individually or simultaneously**. A practical stand is used to support the holder while the sample jars are removed to retrieve the deposit.

The deposited wax is wiped off with a cloth and weighed or the complete cold finger sleeve with the deposit is removed and is weighed. A balance with a resolution of **0.001 g (1 µg)** is recommended. The deposit is not lost and can be kept for further analysis.

During a test, **the sample** in each cold finger unit can be **retrieved or replaced**. Also, a **treating chemical can be injected** at any time.



U-Tube shaped cold finger - fully compatible



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Cold finger unit with insert with removable sleeve (left) and with standard insert (right)

3 Methods of Deposit Weight Determination

The standard cold finger inserts to the cold finger units are designed for the “wipe off” method or the “weigh back” method.

However, sometimes the “weigh directly” method is preferable, for example when the deposit is very sticky or requires drying in an oven to evaporate light fractions.

For this case, we provide inserts with removable sleeves. These are fully compatible to the cold finger unit, inserts with and without sleeve can even be operated in a mixed configuration.

Of course, all three methods can be combined.

Wax Appearance Temperature

Knowing the Wax Appearance Temperature (WAT) of a sample is crucial for determining the optimal cold finger test settings. Our WAT extension offers 3 independent measuring places.

The WAT extension has a small footprint and is placed besides the cold finger sample bath. It is connected to the cold finger control unit. The included software upgrade provides full functional and graphical integration of the WAT extension into the WinCF PC software.



WAT extension with 3 places



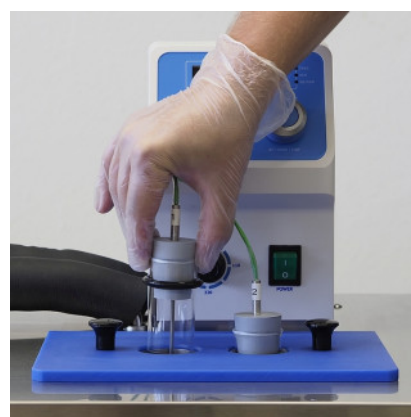
Bottle Test accessory with 15 places (10 places equipped)

API Sedimentation/Demulsification Test

The optional insert to the cold finger sample bath provides sedimentation and de-mulsification testing (“bottle test”) at controlled temperatures. Temperature ramps are possible, and the cold finger control unit provides timers to keep track on the test places.

Pour Point Test acc. to ASTM D 97

This extension consists of a special insert to the cooler which holds 2, 3 or up to 4 PP jars. The CF main unit controls the cooler and reads the temperatures for a measurement according to ASTM D97. The data is stored on a connected PC or directly on a USB memory stick.



PPT extension with 2 places



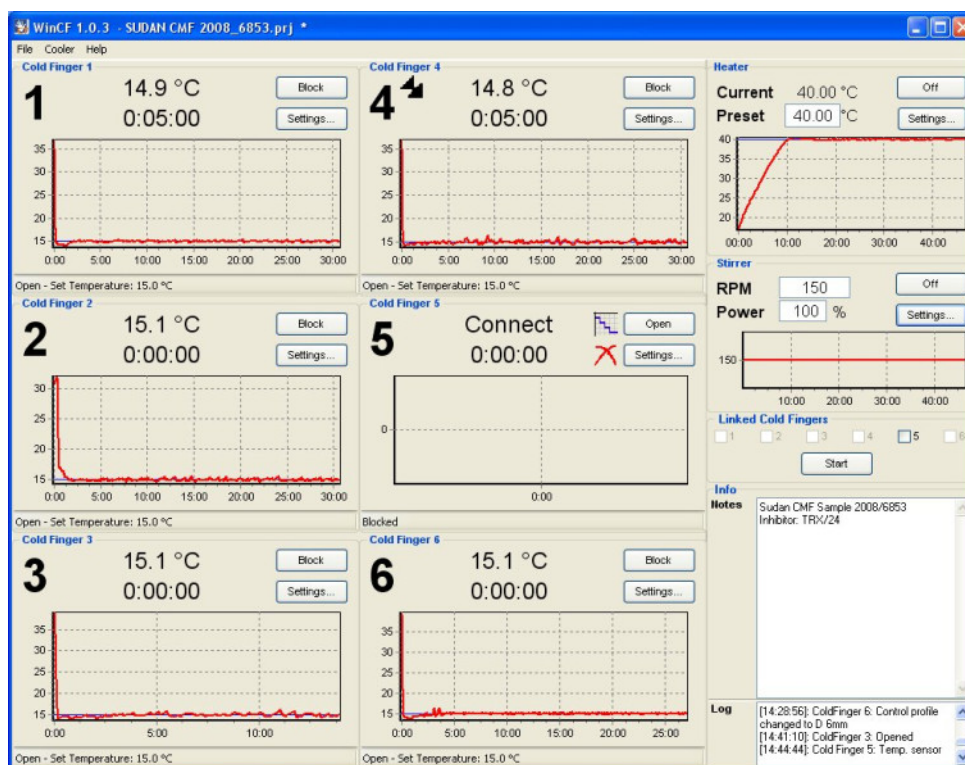
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The Cold Finger instrument by F5 Technologie can be used **stand-alone** with full functionality. The included WinCF software for a Windows PC offers a bigger user interface than the built-in touch screen. The PC just requires a free USB port to connect to the cold finger apparatus.



Test settings can be stored and retrieved again. Each cold finger can be switched on/off individually and has its own timer for independent test times.

Technical Data:

- | | |
|----------------------------------|--|
| Number of cold fingers: | 6 (12- and 18-place version available) |
| Cold fingers: | Material: Stainless steel
Standard: straight, diameter 12 mm, length 72 mm
also available with removable sleeves
Big size: straight, max diameter 24 mm, max length 102 mm
Small size: straight, diameter 10 mm, max length 102 mm
U-Tube shaped cold fingers and other alternatives available. |
| Sample volume: | 50 to 250 ml: 100 or 250 ml standard flasks with gas-tight GL45 thread |
| Temperature range: | of sample: ambient to +60 °C , accuracy ±0.2 °C
optional: ambient to +90 or +120 °C
of cold finger fluid: -25°C to +90 °C , accuracy ±0.1 °C
(alternatives available, e.g. more cooling power)
NEW: Differential temperatures of >60°C between finger and sample |
| Pressure range: | ambient or 100 bar with optional HP cold finger unit
(more than one HP unit possible per instrument) |
| Cooling power: | 450 W @ 20°C (scalable with additional/bigger coolers) |
| Stirrer speed: | 0/100 to 2000 rpm |
| Data display/storage/evaluation: | On the instrument's color touch display and by our WinCF software |
| Power supply: | 240 VAC / 50Hz, 120 VAC / 60Hz, alternatives available |
| Power consumption: | 3200 W max |



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User interface with big color touch screen and new front side USB port for data/test settings storage

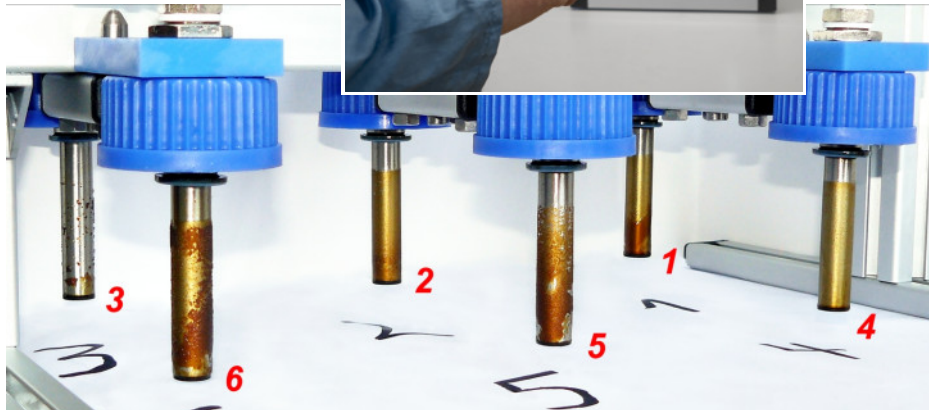


Optional: Sample bath cooling coil

Optional: Remote Control



Front side USB port for data and test settings storage



Test results from customer's lab: Blank test is no 6

Scope of Delivery:

Main unit:	With color touch screen, data storage on USB stick, complete standalone operation without PC possible
Valve banks:	Valve bank for automated cooling fluid distribution
Cold finger units:	6 units, complete with 100 ml GL45 sample jars (borosilicate glass), high-power stirrer bars, temperature sensors Optional: Kit for sample retrieval and chemical injection
Sample temperature control:	We have 2 alternative options available: a) Stainless steel bath with heating thermostats. Active cooling available optionally (also at later point in time). b) Dry-block heating thermostat. No thermal fluid but also no cooling option. The thermostats are controlled by the main unit. Magnetic stirrers homogenise the samples.
Circulation coolers:	The cooler is controlled by the main unit. Cooling power: 450 W @ 20°C, scalable (also later) with bigger or additional coolers.
Balance (optional):	Digital precision balance, resolution 0.001 mg (1 µg). Automated measurement data transfer.
Computer (optional):	Standard Windows PC with screen, keyboard and mouse. The PC is connected to the main unit by a standard USB interface (no special PC hardware required).
Software:	WinCF software pre-installed and on CD with extended features, data visualization, data storage, data export.
Manual:	Hardware and software manual in printed form (English) and on CD.
Accessories:	Tool set, cooling fluid hoses, thermal insulation, stirrer bar retriever, set of spare parts.



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